# FINAL REPORT
# VALUE ENGINEERING STUDY

## City of Pueblo
## I-25/Dillon Drive
## Interchange Improvements
## Project

**June 2013**

**For SEH**

**BY SOLUTIONS ENGINEERING & FACILITATING, INC.**

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# SECTION 1 – SUMMARY

This report contains the results of the Value Engineering Study of the PACOG I-25/Dillon Drive Interchange Project. The report is organized in a drill-down format, that is, all items are presented first in summary format with increasing levels of detail as one delves (drills down) further into the report. This allows the reader to easily obtain only the information he or she desires.

The first section of the report contains an executive summary of all the value engineering proposals, their estimated savings, and their ultimate disposition. To obtain the backup information about the VE Proposal or the Review Board Decision reasoning regarding the VE Proposal use the hyperlinks shown in the summary table. The second section of the report contains a brief project background, the VE Study Team Members, a listing of the Review Board Members, and a brief description of the methodology used. The third section of the report contains detailed information about each VE Proposal. These individual proposal analyses are also organized in a drill down manner. Section Four of the report contains supplemental recommendations, i.e., ideas that the Team thought would add value to the project but do not necessarily reduce life-cycle costs. Section Five of the report contains ideas analyzed by the Team but either failed because they were thought to not be technically viable and/or did not save life-cycle costs. Section Six of the report contains functions analyzed by the VE Team. Section Seven of the report contains all of the ideas ideated by the Team both prior to and during the workshop. Section Eight of the report documents the ultimate disposition of the Team's Proposals and Supplemental Recommendations as made by the decision making board.

## SUMMARY

This Value Engineering (VE) Study generated sixteen (16) proposals and thirteen (13) supplemental recommendations.

### Caveats:

- The cost savings shown for each proposal are measured against the raw construction cost estimate ($13,254,469.85) as of 1/6/2012 from the consulting firms at the current stage of design. Therefore for consistency's sake the VE Team did not add multipliers such as contingency and construction management Fixed costs such as Right of Way Acquisition, CDOT oversight and NEPA interfaces remain the same adders.

- All savings have been rounded to reflect the level of accuracy of the VE Proposals.

- Cost estimates made by the VE Team are intended to reflect relative values between alternatives. The estimated savings identified within each proposal are based upon comparison of the proposal to the preliminary design basis. Therefore, as is true with all cost estimates, the savings indicated are only an opinion of probable construction cost.

- Only potential savings are shown. As the proposals are implemented, additional costs or savings may result from redesign or modification.

- Some VE Proposals are mutually exclusive; a few are synergistic and could result in greater cost savings if implemented together. Therefore, the potential savings are not the simple sum of all the VE Proposals presented.

# VE PROPOSAL SUMMARY TABLE

Note: To obtain the backup information about the VE Proposal or the Review Board Decision reasoning regarding the VE Proposal, use the hyperlinks shown in the summary table.

| PROPOSAL NO. | VE PROPOSAL DESCRIPTION | REVIEW BOARD COMMENTS | PAGE NO. |
|---|---|---|---|
| **Alignment** | | | |
| P01-015 | Eliminate the East Frontage Road.<br>*Initial Est. Savings: $3,600,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $3,600,000* | **Accept with Modifications** | 3-1 |
| P01-007 | Change the bridge profile along Dillon Drive to more closely follow the existing topography.<br>*Initial Est. Savings: $140,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $140,000* | **Accept** | 3-3 |
| P01-009 | Phase the construction of Dillon Drive.<br>*Initial Est. Savings: $125,000*<br>*Future Est. Savings: ($125,000)*<br>*Total Est. Savings: $0,000* | **Decline** | 3-6 |
| P01-019 | Incorporate a roundabout intersection at the east end of the Dillon Drive bridge to provide intersection flexibility and eliminate the need for superelevation on the bridge.<br>*Initial Est. Savings: $1,270,000*<br>*Future Est. Savings: $200,000*<br>*Total Est. Savings: $1,470,000* | **Accept** | 3-8 |
| P01-002 | Re-align Dillon Drive east of I-25 to re-align the I-25 off-ramp and the East Frontage Road closer to the UPRR right-of-way (ROW).<br>*Initial Est. Savings: $3,100,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $3,100,000* | **Decline** | 3-11 |
| P01-004 | Combine the two northbound (NB) off-ramps into one split ramp, with the Eden ramp parallel to I-25 under the Dillon Drive Bridge.<br>*Initial Est. Savings: $3,300,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $3,300,000* | **Decline** | 3-14 |
| **Drainage** | | | |
| P01-011 | Re-route drainage east along the south side of Dillon Drive from the existing corrugated metal pipe (ECMP) to the proposed detention pond and box culvert located on the south side of the proposed Dillon Drive Bridge.<br>*Initial Est. Savings: $1,500,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $1,500,000* | **Decline** | 3-17 |

| PROPOSAL NO. | VE PROPOSAL DESCRIPTION | REVIEW BOARD COMMENTS | PAGE NO. |
|---|---|---|---|
| **Structures** | | | |
| P01-023 | Provide a separate pedestrian structure over I-25 and narrow the Dillon Drive Bridge.<br>*Initial Est. Savings: $407,500*<br>*Future Est. Savings: ($405,000)*<br>*Total Est. Savings: $2,500* | **Decline** | 3-20 |
| P01-035 | Reduce the widths of the traffic lanes on the bridge from 12 feet to 11 feet, which is consistent with City standards.<br>*Initial Est. Savings: $44,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $44,000* | **Decline** | 3-24 |
| P01-006 | Support abutments on spread footings supported by the mechanically stabilized earth (MSE) wall embankments.<br>*Initial Est. Savings: $42,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $42,000* | **Decline** | 3-26 |
| P01-005 | Construct bridge abutment foundations outside of the MSE abutment walls.<br>*Initial Est. Savings: $0,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $0,000* | **Decline** | 3-29 |
| P01-042 | Lengthen the bridge in order to reduce or eliminate retaining wall quantities.<br>*Initial Est. Savings: $150,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $150,000* | **Decline** | 3-32 |
| P05-003 | Use two-stage MSE walls in lieu of one-stage walls.<br>*Initial Est. Savings: $100,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $100,000* | **Decline** | 3-34 |
| **Landscaping and Aesthetics** | | | |
| P06-002 | Replace stone veneer with cast-in-place concrete with formliners.<br>*Initial Est. Savings: $390,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $390,000* | **Accept** | 3-37 |
| **Miscellaneous** | | | |
| P01-014 | Extend Century Link vault manhole vertically or add access man-way to eliminate the need for relocating the fiber-optic facility.<br>*Initial Est. Savings: $400,000 to $500,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $400,000 to $500,000* | **Accept** | 3-39 |

| PROPOSAL NO. | VE PROPOSAL DESCRIPTION | REVIEW BOARD COMMENTS | PAGE NO. |
|---|---|---|---|
| P01-003 | Reallocate the Century Link fiber optic relocation costs from the project to Century Link.<br>*Initial Est. Savings: $500,000*<br>*Future Est. Savings: $0,000*<br>*Total Est. Savings: $500,000* | **Decline** | 3-41 |

At the time of the VE Study the opinion of probable unescalated construction cost was $21,727,421.85 with a raw construction cost of $13,254,469.85.

The Review Board's estimate of savings from the accepted VE Proposals is $5,440,000 (after removing overlapping savings) with an additional $ in pending (Tabled) savings.

# SECTION 2 – INTRODUCTION

## INTRODUCTION

Value Engineering (VE) analysis identifies the high cost areas of a project during the early design stages. The VE Study then determines less expensive alternative designs that can still be incorporated into the final design drawings and specifications without incurring large costs for redesign or major project delay. These VE proposals are substantiated with technical and economic analyses.

The *Final Report* includes:

- A list of the Review Board members.
- A summary of cost savings as a result of the study.
- A summary of accepted proposals.
- The documentation of the Review Board's reasoning.
- A summary of the rejected proposals will also be included in the Final Report and will include the reason(s) for their rejection. The reasons may include cost-effectiveness, reliability concerns, unusual operation and maintenance problems, or project delays.
- The contents of the *Preliminary Report*.

## PROJECT DESCRIPTION

The purpose of the project is to provide regional connectivity to I-25 to accommodate existing and planned growth along Dillon Drive and Platteville Boulevard west of I-25. This regional connectivity is envisioned by the Pueblo Area Council of Governments (PACOG) in the 2035 Long Range Transportation Plan. The need for more efficient and direct access to/from I-25 has been recognized by local agencies for many years. Several plans and previous studies have identified the need to enhance connectivity between Pueblo West and I-25.

This proposed modification to the access to I-25 will require construction of a new bridge over I-25 at Dillon Drive and new on- and off-ramps to I-25 south of that bridge. These new ramps at Dillon Drive would replace the existing south ramps at I-25/Eden interchange, which would be removed. The existing I-25 frontage road along the west side of I-25 will maintain the existing two-way connection between the south half of this interchange at Dillon Drive with the north half at Platteville Boulevard. In addition, a new northbound one-way frontage road on the east side of I-25 from Dillon Drive to Eden-Platteville is planned to provide additional regional connectivity.

<u>VE Team Focus Areas</u>

1. Need for East Frontage Road under this project? Consider delaying until future development at Eden or connection of Dillon to the east/southeast warrants installation.
2. New bridge over I-25 and walls required: Profile and superelevation. Could adjustments in the profile result in a less expensive structure or less earthwork required?
3. Utility issues – especially Century Link at the Dillon/West Frontage road intersection. If the project is required to pay for this major relocation – are there ways to mitigate that cost?
4. Aesthetics/landscaping. While a certain "look" has been promised – are there more cost-effective ways to attain a similar look?
5. Drainage facilities.

Unchangeable Items

1. Project must be consistent with the design cleared by the EA, and must remain within the footprint of impact cleared by the EA.
2. The project must be consistent with the 2035 Pueblo Area Council of Governments Long Range Transportation Plan – which calls for a split diamond interchange with the south half at Dillon Drive and the north half at Eden.
3. Project must provide for the future extension of Dillon to the east/southeast for a future connection to Dillon north of Eagleridge. The alignment of Dillon Drive at it crosses the bridge and goes east must allow it to connect with the ROW for Dillon Drive already set aside in the platted subdivision on the east side of I-25.
4. The aesthetics and landscaping must result in a "look" similar to that approved by the Urban Renewal Authority.
5. The project cannot impact the UPRR or UPRR ROW to the east.

Objectives

1. To evaluate all design components of the project and determine if alternatives which add value or reduce cost are available to improve the overall project.
2. To end up with a fully functional, stand-alone split diamond interchange with the City not having to bond for anything more than $3.4 Million or preferably a lesser amount.

# ORGANIZATION

## VE STUDY TEAM

The following individuals were members of the VE Team:

| TEAM MEMBER | FIRM | TELEPHONE/E-MAIL |
|---|---|---|
| Travis Boone, P.E.<br>Roadway | URS Corporation<br>2315 Briargate Pkwy.<br>Suite 150<br>Colorado Springs, CO 80920 | (t) 719-268-7416<br>(c) 719-243-2725<br>(e) travis.boone@urs.com |
| Robert Mero, P.E.<br>Materials | CDOT Region 6<br>4670 Holly Street<br>Denver, CO 80216 | (t) 303-398-6703<br>(c) 303-503-2249<br>(e) bob.mero@dot.state.co.us |
| Richard Mulledy, P.E.<br>City of Pueblo Representative | City of Pueblo<br>211 East “D” Street<br>Pueblo, CO 81003 | (t) 719-553-2299<br>(c)719-553-2276<br>(e) rmulledy@pueblo.us |
| Randy Simpson, P.E.<br>Structural | URS Corporation<br>7720 North 16th Street<br>Suite 100<br>Phoenix, AZ 85020 | (t) 602-861-7442<br>(c)<br>(e) randy.simpson@urs.com |
| Scott Stevens, P.E.<br>Drainage | URS Corporation<br>2315 Briargate Pkwy.<br>Suite 150<br>Colorado Springs, CO 80920 | (t) 719-533-7874<br>(c) 719-466-3406<br>(e) scott.l.stevens@urs.com |

| DESIGN TEAM MEMBER | FIRM | TELEPHONE/E-MAIL |
|---|---|---|
| Kelly Fredell, P.E.<br>Design Team Liaison | CH2M HILL<br>90 S. Cascade Suite 700<br>Colorado Springs, CO 80903 | (t) 719-477-4928<br>(c) 303-319-0801<br>(e) Kelly.fredell@ch2m.com |

| FACILITATOR | FIRM | TELEPHONE/E-MAIL |
|---|---|---|
| C. Bernerd (Bernie) Dull, P.E., CVS-Life, FSAVE<br>Facilitator | Solutions Engineering & Facilitating, Inc.<br>9032 Gray Fox Drive<br>Evergreen, CO 80439 | (t) 303-670-5620<br>(f) 303-670-0183<br>(e) bdull@solutions-engineering.com |

## THE REVIEW BOARD

The Review Board is comprised of the following representatives.

| REVIEW BOARD MEMBER | FIRM | TELEPHONE/E-MAIL |
|---|---|---|
| Mickey Beyer, P.E.<br>Assistant Public Works Director | City of Pueblo<br>211 E. "D" St<br>Pueblo, CO 81003 | (t) 719-553-2276<br>(c)<br>(e) mbeyer@pueblo.us |
| Dan Dahlke, P.E.<br>CDOT – Region 2 | CDOT Region 2<br>905 Erie Ave<br>Pueblo, CO 81002 | (t) 719-562-5509<br>(c)<br>(e) Daniel.dahlke@dot.state.co.us |
| Phil Weisbach, P.E.<br>SEH Project Manager | SEH<br>4840 Pearl East Circle, Suite 200W<br>Boulder, CO 80301 | (t) 303-441-5411<br>(c)<br>(e) pweisbach@sehinc.com |
| Earl Wilkinson, P.E.<br>Public Works Director | City of Pueblo<br>211 E. "D" St<br>Pueblo, CO 81003 | (t) 719-553-2295<br>(c)<br>(e) ewilkinson@pueblo.us |

The reviewers decide upon the status of the VE proposals in one of four ways:

1. Accept the proposed alternative as it stands. This will require the design team to implement the accepted proposed alternative. Those individuals comprising the Review Board are expected to have this authority for their respective organization.

2. Accept the proposed alternative with modifications. This disposition is similar to item 1 but with some changes imposed by the Review Board.

3. Decline the proposed alternative altogether. This disposition is obvious, but proper reasoning must be given for the *Final Report.*

4. Table (defer) the proposed alternative for further study or information gathering. If a proposed alternative is tabled, it is wise to assign responsibilities to resolve the issue(s), assign a schedule for resolution, and design a decision tree.

## METHOD OF THE VE STUDY

ANALYTICAL PROCESS

1. Information Phase

Each VE Team Member was given the plans, specifications, and cost estimate information for the project prior to the workshop. They were given instructions to familiarize themselves with the project prior to an oral briefing to be given by the owner and the designer. The facilitator asked that the design team start with a very broad overview of the project (the exact phrase used was "satellite view") of the project with concentration on purpose and need for the project. The facilitator then asked the design team to start to gradually cover the project in increasing detail (the phrase used was "airplane view" down to "feet on the ground" view). Emphasis was made as to how the project fit into scheme of things and especially the interface points at the project ends. The facilitator encouraged the other VE Team members to ask very open ended questions.

2. Function Analysis Phase

The next activity done by the VE Team was to prepare a Function Analysis Technique (FAST) Diagram. This tool forces an analytical team to look at a project with a fresh outlook. For example, if a technical group was given the assignment to improve a heating/ventilating/air conditioning system (HVAC) system for an office building they could ideate the numerous common systems, e.g., dual duct, variable air volume, multi-zone, etc. However, the phraseology of the problem has already limited the group's thinking to a mechanical system.

By using function analysis to analyze the HVAC system the VE Team would brainstorm the function "control temperature". This forces the team to broaden the number of possible solutions thus increasing the odds of achieving an improved solution. For example, by brainstorming the function "control temperature" the study team can look at insulation levels, fenestration schemes, thermal storage, reflective roofing, building axis orientation, landscaping, etc. By using the FAST Diagram the study team has been forced to abandon the paradigm of solely using a mechanical system to control temperature.

This VE Team then selected six functions that it felt covered 80% of the project cost.

3. Creative Phase

The VE Team selected the functions for brainstorming per Pareto's Law, i.e., the 20% of the functions that drive 80% of the project. The formal brainstorming session generated as many alternative methods as possible for achieving the selected functions. These were then segregated by two categories, Value Engineering Proposals (ideas that have the potential to save life-cycle costs), and Supplemental Recommendations (ideas that would improve the project, but don't easily fit into either of the previous category).

4. Analysis Phase

A rough analysis was performed by first passing or failing the brainstormed ideas, then combining or grouping similar ideas. The VE Team as a whole then discussed and recorded the relative advantages of the original concept versus the advantages of the alternative plus the risks of implementing the alternative concept. The ideas surviving these discussions were selected as candidates for further development by individual team members.

5. Development Phase

A cursory technical examination followed the analysis phase. The purpose of this examination was to see it the alternative was indeed technically viable and to better explain the alternative to the design team. An order of magnitude economic analysis of technically feasible alternatives was also made. The economic analysis was done on a life-cycle basis where appropriate. The VE Team tried to use the same base cost data as that used by the design team so that proper comparison could be made with the original concepts(s). Ideas that passed these technical and economic analyses and, in the opinion of the VE Team should be incorporated into the design, were prepared as formal proposals.

The VE Team also prepared Supplemental Recommendations. These recommendations are ideas that the VE Team thought would add worth to the project but would not necessarily save capital or future costs. The Supplemental Recommendations were not necessarily priced.

6. Presentation & Report

All proposals, supplemental recommendations, and ideas analyzed but not proposed were recorded during the VE Study and were compiled to in a *Preliminary Report* to be presented to the Review Board for their consideration. Once the Review Board has decided on the proposals' and supplemental recommendations' dispositions the *Final Report* will be prepared.

# SECTION 3 – PROPOSALS

# VALUE ENGINEERING PROPOSAL NO. 01-015

## SUMMARY PROPOSAL DESCRIPTION:

Eliminate the East Frontage Road.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 3,600,000 |
| Future: | $ 0,000 |
| Total: | $ 3,600,000 |

## Additional Description:

## Related Value Engineering Proposals and/or Supplemental Recommendations:

P01-004 - Combine the two northbound (NB) off-ramps into one split ramp, with the Eden ramp parallel to I-25 under the Dillon Drive Bridge.

| EVALUATION |
|---|
| Idea Number: 01-015<br>Idea Description: Eliminate the East Frontage Road. |
| Advantages of alternative concept:<br>1. Reduces immediate capital costs |
| Advantages of original concept:<br>1. Provides direct access to the property owners at Eden<br>2. Consistent with the EA |
| Risks of implementing alternative concept:<br>1. Requires a re-evaluation of the EA<br>2. Public outreach required to appease neighboring property owners |

**Calculations and/or Discussion**:

The East Frontage Road (EFR) is not necessary for traffic purposes (based on traffic projections), and the traffic study done in the EA phase showed that the projected 2035 "build" traffic volumes for the interchange could be adequately handled by just continuing the West Frontage Road as a two-lane facility without any east frontage road. The addition of the East Frontage Road was simply to address a handful of citizen concerns about the lack of direct access for northbound traffic to the 3-5 existing properties east of Eden/I-25. While the EFR may be considered a desirable improvement, it is not required from a traffic operations standpoint. The interchange will operate acceptably with or without the EFR.

An alternative to eliminating the frontage road could be to build the East Frontage Road at a later date. This would cost an additional $1,000,000 due to duplicated mobilization and economies of scale. This alternative could be a "project saver" if insufficient funds are available. The future cost of constructing this EFR could be passed on to developers.

Estimate

| | |
|---|---|
| Engineers Estimate for EFR Bridge | $3,600,000 |
| Estimated EA Re-evaluation | ($10,000) |

# VALUE ENGINEERING PROPOSAL NO. 01-007

## SUMMARY PROPOSAL DESCRIPTION:

Change the bridge profile along Dillon Drive to more closely follow the existing topography.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 140,000 |
| Future: | $ 0,000 |
| Total: | $ 140,000 |

## Additional Description:

## Related Value Engineering Proposals and/or Supplemental Recommendations:

P01-019 - Incorporate a roundabout intersection at the east end of the Dillon Drive bridge to provide intersection flexibility and eliminate the need for superelevation on the bridge.

| EVALUATION |
|---|
| Idea Number: 01-007<br>Idea Description: Change the bridge profile along Dillon Drive to more closely follow the existing topography. |
| Advantages of alternative concept:<br>1. Reduces the fill and retaining walls on the east side of the bridge |
| Advantages of original concept:<br>1. Lower intersection at Drury Brothers intersection on West Frontage Road |
| Risks of implementing alternative concept:<br>1. Drainage across the bridge may cause a low spot with poor drainage. Additional considerations should be included to supplement this design change. |

**Calculations and/or Discussion**:

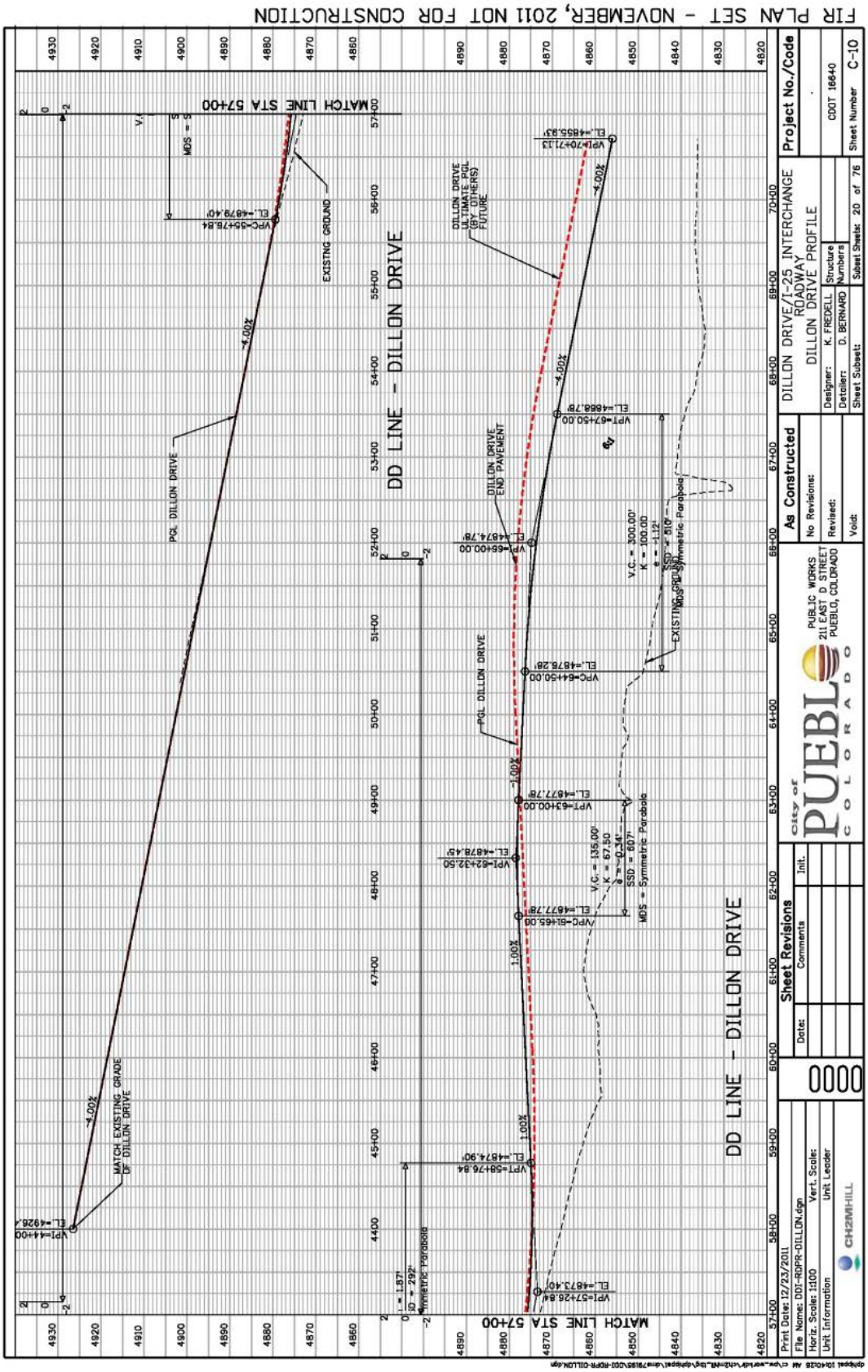
The proposed profile of Dillon Drive was developed to be lower at the west frontage road intersection in order to maintain access to Drury Brothers property to the north. Crossing the bridge, any runoff will cross the bridge from east to west. This is important to drain the water away from the low point created near the east end of the bridge due to the superelevation transition on the north edge. This can be mitigated by capturing with inlets on the west side of the bridge and directing flow to the south (Box Culvert H). However, this profile does require additional fill material, since the east end of the bridge is higher, and the bridge itself does not follow the natural contour of the land.

Alternatively, a revised profile is included for consideration. It is important to note that this profile is not incorporated into the FIR plan set as submitted. In this revised profile, the bridge profile is reversed so that there is a downgrade from west to east. This change reduces the amount of fill required on the east side of the bridge. However, this option has its cons as well. In order to facilitate drainage and avoid a low spot, a constant cross-slope must be utilized across the length of the bridge, which may not be desirable. Having a constant cross-slope may also require additional drainage structures once the median is installed in the future.

<u>Assumptions</u>

80’ Roadway Width
10’ drop in elevation over 500’ of alignment
80*10*500 = 400,000 cf/27 = 15,000 cy
15,000 cy @ $9/cy = $135,000

*Cost does not include revisions to drainage inlets


FIR PLAN SET - NOVEMBER, 2011 NOT FOR CONSTRUCTION
DD LINE - DILLON DRIVE
MATCH LINE STA 57+00
EXISTING GROUND
PGL DILLON DRIVE
DILLON DRIVE ULTIMATE PGL (BY OTHERS) FUTURE
DILLON DRIVE END PAVEMENT
MATCH EXISTING GRADE OF DILLON DRIVE
Symmetric Parabola
MDS = Symmetric Parabola
As Constructed
No Revisions:
Revised:
Void:
Sheet Revisions
Dates:
Comments
Init.
0000
DILLON DRIVE/I-25 INTERCHANGE ROADWAY
DILLON DRIVE PROFILE
Project No./Code
CDOT 16640
Designer: K. FREDELL
Detailer: D. BERNARD
Structure Numbers
Sheet Subset:
Subset Sheets: 20 of 76
Sheet Number C-10
PUBLIC WORKS
211 EAST D STREET
PUEBLO, COLORADO
City of PUEBLO COLORADO
CH2MHILL
Print Date: 12/23/2011
File Name: DDI-RDPR-DILLON.dgn
Horiz. Scale: 1:100
Vert. Scale:
Unit Information
Unit Leader

# VALUE ENGINEERING PROPOSAL NO. 01-009

## SUMMARY PROPOSAL DESCRIPTION:

Phase the construction of Dillon Drive.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 125,000 |
| Future: | $ (125,000) |
| Total: | $ 0,000 |

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

SR02-013 - Build half of the Dillon Drive Bridge now and the rest at a later time.

| EVALUATION |
|---|
| Idea Number: 01-009<br>Idea Description: Phase the construction of Dillon Drive. |
| Advantages of alternative concept:<br>1. Lowers initial construction cost.<br>2. The future phase could be linked to commercial development. A fee schedule could be set up for the future development to fund the future phase.<br>3. The two outside lanes would be able handle the existing traffic volumes and for the foreseeable future. |
| Advantages of original concept:<br>1. Dillon Road would be totally constructed and not require future attention. |
| Risks of implementing alternative concept:<br>1. Lack of future funding to construct the inside lanes.<br>2. Lack of developer support if they feel they need to contribute in order to develop<br>3. Future construction may be more costly |

**Calculations and/or Discussion**:

The construction of the future phase, the final two lanes, could become a requirement of future development based on types of development, i.e. big box stores.

Assumptions

- Delay construction of 2-11’ lanes
- Roadway base 2’ thick
- Asphalt/base section 12 ¾” thick
- 1,000’ overall length
- Construct 2-11’ lanes

| Item# | Describtion | Units | Quantity | Unit Price | Total |
|---|---|---|---|---|---|
| 1 | Roadway Base (2') | CY | 1629.63 | $9.00 | $14,666.67 |
| 2 | Asphat/base (12 3/4") | Ton | 1714.00 | $65.00 | $111,410.00 |
| | | | | **Total** | **$126,076.67** |

# VALUE ENGINEERING PROPOSAL NO. 01-019

## SUMMARY PROPOSAL DESCRIPTION:

Incorporate a roundabout intersection at the east end of the Dillon Drive bridge to provide intersection flexibility and eliminate the need for superelevation on the bridge.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 1,270,000 |
| Future: | $ 200,000 |
| Total: | $ 1,470,000 |

## Additional Description:

## Related Value Engineering Proposals and/or Supplemental Recommendations:

P01-002 - Re-align Dillon Drive east of I-25 to re-align the I-25 off-ramp and the East Frontage Road closer to the UPRR right-of-way (ROW).

| EVALUATION |
|---|
| Idea Number: 01-019<br>Idea Description: Incorporate a roundabout intersection at the east end of the Dillon Drive bridge to provide intersection flexibility and eliminate the need for superelevation on the bridge. |
| Advantages of alternative concept:<br>1. Flexibility with ramp and Dillon Drive connections as they intersect at the east end of the bridge. This flexibility allows the elimination of the superelevation in the bridge and allows the bridge skew to be reduced. |
| Advantages of original concept:<br>1. A standard intersection can be more user-friendly. The standard intersection is also less expensive than a roundabout. |
| Risks of implementing alternative concept:<br>1. Evaluation of this idea is very conceptual and will take some design effort to develop further.<br>2. Evaluation of this concept could delay the project schedule.<br>3. Roundabouts relatively uncommon in Pueblo area - driver unfamiliarity.<br>4. If a signal is installed on the west side of the bridge, a platooning effect could impact roundabout operation. A roundabout could be installed on the west side which would decrease the savings of this option. |

**Calculations and/or Discussion**:

A roundabout at the east end of the bridge significantly increases the flexibility for that intersection. This flexibility accomplishes several things that could combine to provide significant cost savings:

- Superelevation on the bridge is no longer necessary, which allows the profile to be reduced on the east side and helps with drainage on the bridge.
- The bridge can be rotated to the north to reduce the skew and the span length by 22 feet.
- The east frontage road can be re-aligned closer to I-25 to reduce major bridge or retaining wall structures.
- Profile reductions will reduce retaining wall and embankment costs.
- The connection of the future Dillon Drive to the southeast can be made at any point along the roundabout.

| | |
|---|---|
| Approximate roundabout cost | ($600,000) |
| Approximate retaining wall cost at RR ROW | ($100,000) |
| Approximate box culvert extension cost | ($50,000) |
| Approximate reduction in Dillon bridge savings | $66,840 |
| Approximate reduction in frontage road savings | $1,951,250 |
| Profile reductions not quantified | Unknown |
| Total approximate savings | $1,268,090 |

| | |
|---|---|
| Future signalized intersection costs | $200,000 |
| Future signal O&M costs | Unknown |

# VALUE ENGINEERING PROPOSAL NO. 01-002

**SUMMARY PROPOSAL DESCRIPTION:**

Re-align Dillon Drive east of I-25 to re-align the I-25 off-ramp and the East Frontage Road closer to the UPRR right-of-way (ROW).

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 3,100,000 |
| Future: | $ 0,000 |
| Total: | $ 3,100,000 |

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

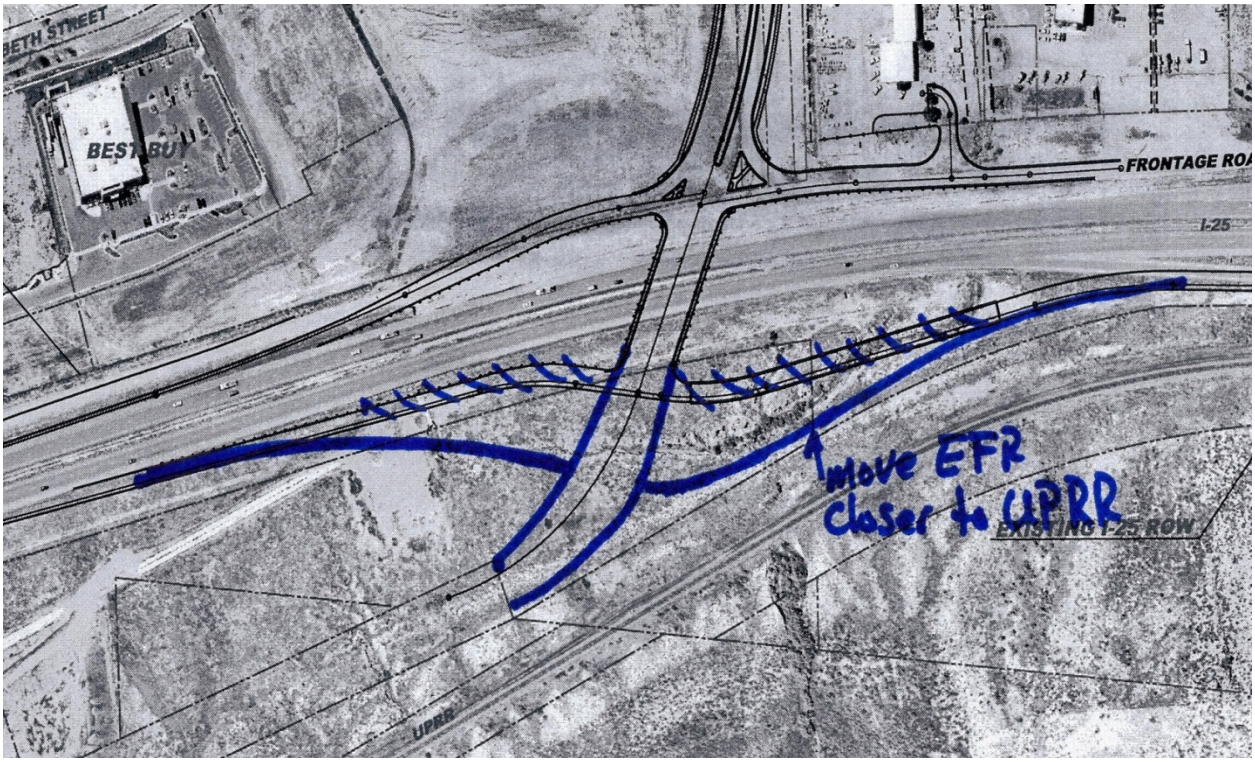
| EVALUATION |
|---|
| Idea Number: 01-002<br>Idea Description: Re-align Dillon Drive east of I-25 to re-align the I-25 off-ramp and the East Frontage Road closer to the UPRR right-of-way (ROW). |
| Advantages of alternative concept:<br>1. Reduces grading and bridge/walls required for frontage road.<br>2. Incorporates the existing Dillon ROW without impact to adjacent property. |
| Advantages of original concept:<br>1. Maximizes distance between off-ramp/frontage road from the UPRR ROW.<br>2. Avoids Old Denver Highway. |
| Risks of implementing alternative concept:<br>1. Grading at the UPRR ROW line to match existing grade.<br>2. Fill of drainage channels east of I-25.<br>3. May require lowering Dillon Drive speed limit to make curve work east of bridge.<br>4. May impact the Old Denver Highway. |

**Calculations and/or Discussion**:

The proposed realignment will move the off-ramp and East Frontage Road closer to the UPRR ROW. The intent is to reduce the grading height, thus reducing retaining wall need and bridging of the existing drainage way.

There may be impact to the existing Old Denver Highway, thus evaluation of the proposed off-ramp alignment should be performed. Also, further discussion regarding the EA status of the “Historic” Old Denver Highway should be completed to possibly rule out the need to protect the Old Denver Highway.

Proposed estimating savings is $3.1 million dollars.




| Proposed Re-Alignment of Dillon Road and East Frontage Road East | | | | |
|---|---|---|---|---|
| **Item** | **Units** | **QTY** | **Unit Price** | **Total Price** |
| Roadway Grading | CY | 20000 | $ 9.00 | $ 180,000.00 |
| Dillon Rd. Paving (HMA 6.75" + Base Course 6") | SF | 27000 | $ 2.60 | $ 70,200.00 |
| Concrete Sidewalk | SY | 400 | $ 35.00 | $ 14,000.00 |
| Concrete Curb and Gutter (outside) | LF | 600 | $ 12.00 | $ 7,200.00 |
| Concrete Curb and Gutter (median) | LF | 600 | $ 11.00 | $ 6,600.00 |
| 12 in Rip Rap Protect Drainage Bank on East Frontage Road | CY | 1670 | $ 120.00 | $ 200,400.00 |
| | **Subtotal Dillon Road Realignment** | | | **$ 478,400.00** |
| | | | | |
| **Item** | **Units** | **QTY** | **Unit Price** | **Total Price** |
| Remove proposed bridge East Frontage Road | LS | 1 | $ 2,616,200.00 | $ 2,616,200.00 |
| Retaining Wall Off Ramp | | | | |
| Structural Ex. | CY | 5740 | $ 35.00 | $ 200,900.00 |
| Structural Backfill (Class 1) | CY | 18705 | $ 15.00 | $ 280,575.00 |
| Mech. Reinforcement of Soil | CY | 8100 | $ 25.00 | $ 202,500.00 |
| Geomembrane | SY | 3075 | $ 10.00 | $ 30,750.00 |
| Precast Panel Facing | SF | 15205 | $ 17.00 | $ 258,485.00 |
| Concrete Class D | CY | 29 | $ 350.00 | $ 10,150.00 |
| Reinforcing Steel | LB | 400 | $ 1.10 | $ 440.00 |
| | | **Subtotal Removal Amounts** | | **$ 3,600,000.00** |
| | | | | |
| | | | Net Savings | **$ 3,121,600.00** |

# VALUE ENGINEERING PROPOSAL NO. 01-004

## SUMMARY PROPOSAL DESCRIPTION:

Combine the two northbound (NB) off-ramps into one split ramp, with the Eden ramp parallel to I-25 under the Dillon Drive Bridge.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 3,300,000 |
| Future: | $ 0,000 |
| Total: | $ 3,300,000 |

## Additional Description:

## Related Value Engineering Proposals and/or Supplemental Recommendations:

P01-019 - Incorporate a roundabout intersection at the east end of the Dillon Drive bridge to provide intersection flexibility and eliminate the need for superelevation on the bridge.
P01-015 - Eliminate the East Frontage Road.

| EVALUATION |
|---|
| Idea Number: 01-004<br>Idea Description: Combine the two northbound (NB) off-ramps into one split ramp, with the Eden ramp parallel to I-25 under the Dillon Drive Bridge. |
| Advantages of alternative concept:<br>1. Provides direct access to properties just east of Eden interchange without requiring two separate off ramps<br>2. Eliminates the East Frontage Road<br>3. Reduces capital cost |
| Advantages of original concept:<br>1. Provides similar access to these properties as currently designed.<br>2. Typical split diamond configuration |
| Risks of implementing alternative concept:<br>1. Will change geometry of ramp gore at Dillon Drive off ramp.<br>2. Evaluation of this option could impact the design schedule.<br>3. Potential future requirement to build east frontage road. |

**Calculations and/or Discussion**:

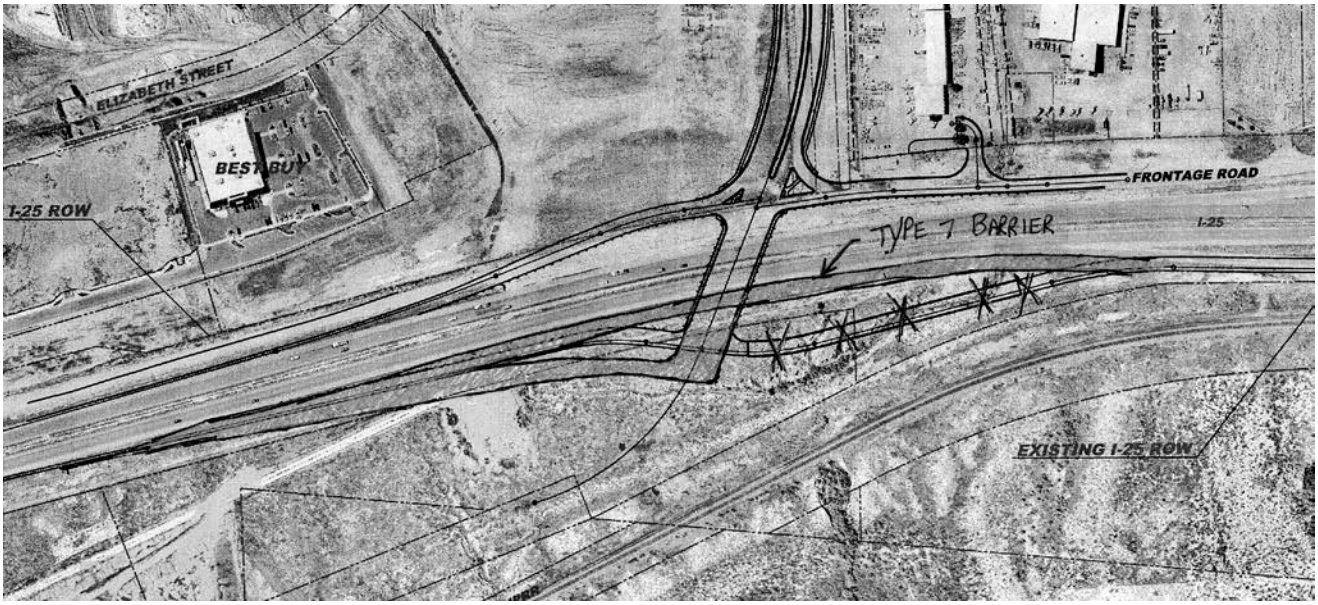
Background

The proposed split diamond interchange between Dillon Drive and Eden requires construction of a significant structure over an incised drainage channel for the east frontage road. Conceptually the structure has been evaluated as a bridge and as back-to-back retaining walls. The cost of the structure and frontage road has been estimated at $3,600,000 (Dillon Drive Phasing Technical Memorandum, dated 2/15/12.) During the design process consideration was given to eliminating the east frontage road to save cost and forcing traffic to the two-way west frontage road. Due to circuitous access, the property owners east of the Eden interchange are opposed to that option. The design also proposed separate off-ramps for each interchange, but that option was rejected by FHWA.

Option

This VE option will provide direct access to the businesses near Eden, eliminate the bridge/retaining wall structure and frontage road, and provide only one off ramp from I-25. It will be necessary to move the Dillon Drive off-ramp further to the south to accommodate this option. The off-ramp will split, with the right lane proceeding up the ramp to Dillon Drive and the left lane continuing parallel to and at-grade with I-25. This ramp lane will be separated from I-25 with a barrier. The ramp will follow I-25 until it intersects and joins with the proposed east frontage road alignment at the existing Eden off ramp. The ramp intersection with Dillon Drive could be pushed further to the east an appropriate distance. It is not necessary to lengthen the Dillon Drive Bridge with this option since sufficient space is provided along I-25 to accommodate future widening to both the inside and the outside.

This option could be considered an interim condition until such time as I-25 is widened from four lanes to six lanes. When that occurs, the east frontage road will probably need to be constructed to complete the split diamond interchange. Since the I-25 typical section is currently wide enough for five lanes between the pier and abutment face, this condition could remain even with the widening of I-25.




Cost Analysis

East Frontage Road savings: $3,600,000 (see tech memo referenced above)
New ramp alignment cost: say $309,000 (see below)

Savings $3,291,000

| Item | Unit | Quantity | Unit Cost | Total |
|---|---|---|---|---|
| Pavement Section (HMA + ABC) | SF | 34000 | $2.60 | $88,449.55 |
| Guardrail Type 7 | LF | 1500 | $80.00 | $120,000.00 |
| Box culvert extension | LS | 1 | $50,000.00 | $50,000.00 |
| Miscellaneous grading, etc | LS | 1 | $50,000.00 | $50,000.00 |
| **TOTAL** | | | | **$308,449.55** |
| | | | | |
| 6.5 in HMA on 6 in ABC = 59.583 lbs/sf HMA on 66.5 lbs/sf ABC | | | | |
| HMA at $65/ton | | | | |
| ABC at $20/ton | | | | |
| Ramp 20 ft wide, 1,700 feet long | | | | |

# VALUE ENGINEERING PROPOSAL NO. 01-011

**SUMMARY PROPOSAL DESCRIPTION:**

Re-route drainage east along the south side of Dillon Drive from the existing corrugated metal pipe (ECMP) to the proposed detention pond and box culvert located on the south side of the proposed Dillon Drive Bridge.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 1,500,000 |
| Future: | $ 0,000 |
| Total: | $ 1,500,000 |

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

| EVALUATION |
|---|
| Idea Number: 01-011<br>Idea Description: Re-route drainage east along the south side of Dillon Drive from the existing corrugated metal pipe (ECMP) to the proposed detention pond and box culvert located on the south side of the proposed Dillon Drive Bridge. |
| Advantages of alternative concept:<br>1. Reduces drainage impact at Box Culvert C (north of Dillon Drive bridge) and for property owners west of I-25.<br>2. Adds increased life by reducing flows to the existing culvert north of Dillon Drive. |
| Advantages of original concept:<br>1. Keeps flow traveling in the historic spot. |
| Risks of implementing alternative concept:<br>1. Protecting proposed detention pond from flooding or overtopping.<br>2. May require more capacity through existing culvert south of Dillon Drive bridge. |

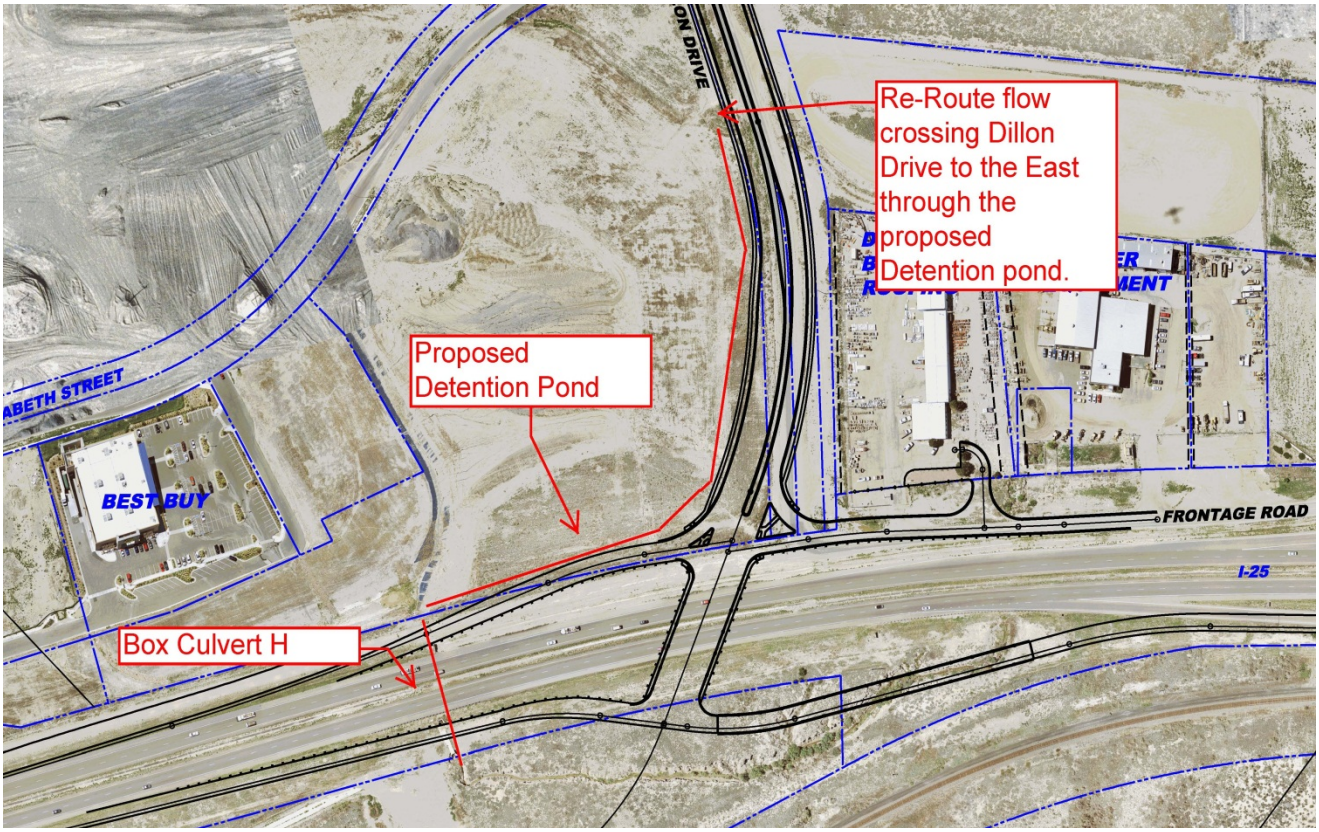
**Calculations and/or Discussion**:

The existing box culvert south of the bridge has 36 cfs available capacity for the 100-year storm based on the Drainage Report. The report also indicates that the culverts under Dillon Drive, west of the bridge, do not have enough capacity to pass the 5-year storm to the box culvert north of the bridge; thus a majority of the 100-year storm will bypass to the existing box culvert south of the bridge. The installation/extension of the culverts at Dillon Drive would not be necessary.

With the redirection of the drainage flow, the proposed sedimentation basin at the box culvert north of the bridge could be removed.

There may be a need for increased maintenance costs of the proposed detention pond due to the increased amount of flow through the pond adding sediment.

| Reroute Drainage along south side of Dillon Drive | | | | |
|---|---|---|---|---|
| **Item** | **Unit** | **QTY** | **Unit Price** | **Total Price** |
| Drainage Channel Earthwork | CY | 675 | 9 | $ 6,075.00 |
| Rip Rap | CY | 325 | $ 120.00 | $ 39,000.00 |
| | | | Subtotal Channel | $ 45,075.00 |
| | | | | |
| Remove Pre sed Basin and Channel Improvements | EA | 1 | $1,600,000.00 | $ 1,600,000.00 |
| | | | Subtotal Structure C Removal | $ 1,600,000.00 |
| | | | | |
| | | | **Net Savings** | **$ 1,554,925.00** |


Re-Route flow crossing Dillon Drive to the East through the proposed Detention pond.
Proposed Detention Pond
Box Culvert H
BEST BUY
FRONTAGE ROAD
I-25

# VALUE ENGINEERING PROPOSAL NO. 01-023

## SUMMARY PROPOSAL DESCRIPTION:

Provide a separate pedestrian structure over I-25 and narrow the Dillon Drive Bridge.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 407,500 |
| Future: | $ (405,000) |
| Total: | $ 2,500 |

## Additional Description:

## Related Value Engineering Proposals and/or Supplemental Recommendations:

SR06-003 - Simplify bridge railing (e.g., remove swoop; choose less ornate design).

| EVALUATION |
|---|
| Idea Number: 01-023<br>Idea Description: Provide a separate pedestrian structure over I-25 and narrow the Dillon Drive Bridge. |
| Advantages of alternative concept:<br>1. Narrower bridge deck<br>2. Could use historic bridge available locally<br>3. Pedestrian bridge may be less expensive to aesthetically treat<br>4. Increased safety, pedestrian, and cyclist are separated from traffic<br>5. Opportunity to delay cost of pedestrian bridge until future date |
| Advantages of original concept:<br>1. Typical City cross-section<br>2. Provides a pedestrian crossing where it is expected along the arterial roadway |
| Risks of implementing alternative concept:<br>1. Public may not want another structure over I-25 |

**Calculations and/or Discussion**:

One alternative to narrow the proposed bridge across I-25 and thus reduce cost is to relocate the pedestrians onto a stand-alone bridge structure. This bridge could be constructed concurrently, or at a later date, when pedestrian connectivity becomes important (when Dillon Drive is extended to the southeast). This would reduce the initial project cost. The bridge could be located either to the north or to the south of the proposed Dillon Drive bridge, depending on pedestrian demand and aesthetic preferences.

This new stand-alone pedestrian bridge could either be a new structure, with aesthetic elements similar to, or in lieu of, the aesthetic elements proposed for the Dillon Drive bridge, or it could be a historic bridge from another location, for example, the 180-foot Nyberg bridge owned by Pueblo County that is currently looking for a permanent location (photo attached). If a historic bridge were chosen, CDOT does have an adopt-a-bridge program that is used as Section 106 mitigation; it's a program that requires CDOT to market certain bridge types (primarily metal truss bridges) for adoption and coordinate with potential adopters. This involves developing a bridge adoption notice and sending it to historical societies and City and County planning departments, parks/recreation districts, and engineering departments to determine if there are projects where there might be a use for a historic structure. There hasn't historically been much success with the program primarily due to cost and the logistics of relocation and reassembly.

Eliminate 3 girder lines @ $28,140 = $84,420

Deck Savings

- Volume = .75' thick x 8' wide x 156' long/27 cf per cy = 35 cy
- Area = 8' x 156' = 1,248 sf
- Reinforcing = 1,248 sf x say 2.5 lbs./sf = 3,120 lb.
- Cost = 35 cy x $500/cy + 3,120 lb. x $1.10/lb. = $20,932

Sidewalk Savings

- Sidewalk Length = 156' long x 12' width = 1,872 sf
- Cost = 1,872 sf x $35 = $65,520
- Type 10 barrier savings = $236,700

TOTAL = $84,420 + $20,932 + $65,520 + $236,700 = $407,500

New Pedestrian Bridge Estimate

- Approximate Bridge Length = 180'
- Width = 15'
- Cost = $150/sf

TOTAL = 180' x 15' x $150/sf = $405,000

*Estimate for a recycled bridge may change this estimate based on assumptions stated above.*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# VALUE ENGINEERING PROPOSAL NO. 01-035

## SUMMARY PROPOSAL DESCRIPTION:

Reduce the widths of the traffic lanes on the bridge from 12 feet to 11 feet, which is consistent with City standards.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 44,000 |
| Future: | $ 0,000 |
| Total: | $ 44,000 |

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

| EVALUATION |
|---|
| Idea Number: 01-035<br>Idea Description: Reduce the widths of the traffic lanes on the bridge from 12 feet to 11 feet, which is consistent with City standards. |
| Advantages of alternative concept:<br>1. Reduced construction cost<br>2. Consistent with City standards |
| Advantages of original concept:<br>1. Meets CDOT standards |
| Risks of implementing alternative concept:<br>1. None noted. |

**Calculations and/or Discussion**:

Assumptions

1. Revise the current 12-foot lane width to 11 feet
   Total reduction in bridge width = 1 ft x 6 lanes = 6 feet
2. Eliminate 1 girder line
3. Reduce deck quantities, assume 9" average deck thickness
4. Neglect reductions in abutment, pier cap and foundation quantities

Cost Savings

Structure savings:

- Eliminate 1 girder line @ $28,140 = $28,140

Deck savings:

- Volume = .75' thick x 6' wide x 156' long/27 cf per cy = 26 cy
- Area = 6' x 156' = 936 sf
- Reinforcing = 936 sf x say 2.5 lbs./sf = 2.340 lbs.
- Cost = 26 cy x $500/cy + 2,340 lb. x $1.10/lb. = $15,574

Total = $28,140 + $15,574 = $43,714 (say $44,000)

# VALUE ENGINEERING PROPOSAL NO. 01-006

**SUMMARY PROPOSAL DESCRIPTION:**

Support abutments on spread footings supported by the mechanically stabilized earth (MSE) wall embankments.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 42,000 |
| Future: | $ 0,000 |
| Total: | $ 42,000 |

**Additional Description:**

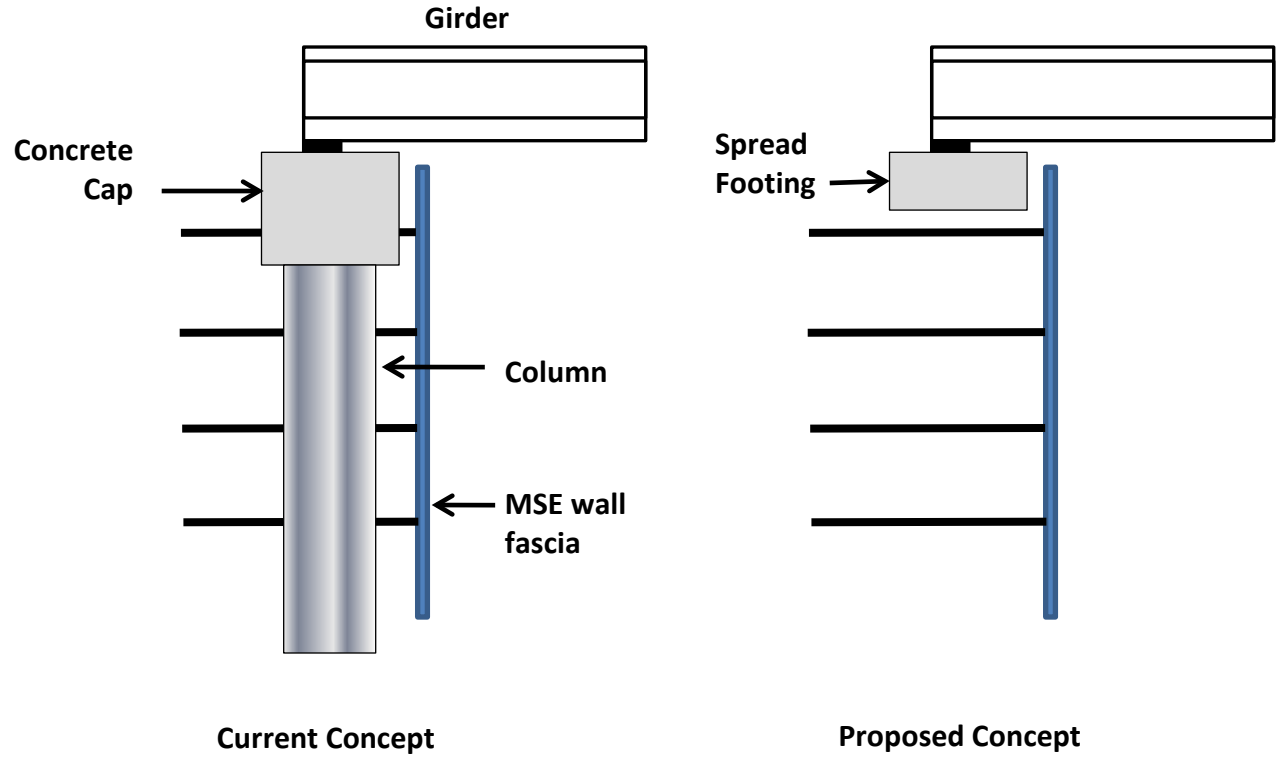
**Related Value Engineering Proposals and/or Supplemental Recommendations:**

| EVALUATION |
|---|
| Idea Number: 01-006<br>Idea Description: Support abutments on spread footings supported by the mechanically stabilized earth (MSE) wall embankments. |
| Advantages of alternative concept:<br>1. Prevents a "bump" at the end of the bridge<br>2. Reduces construction cost by eliminating deep abutment foundations<br>3. Shortens the construction schedule |
| Advantages of original concept:<br>1. Minimizes/eliminates settlement of the abutment foundations |
| Risks of implementing alternative concept:<br>1. Excessive settlement |

**Calculations and/or Discussion**:

In the current concept, the abutments are supported by deep foundations supporting a cast-in-place pile cap. Initial and long-term settlements of the bridge abutments will be virtually zero. This can lead to a “bump” at the end of the bridge due to long-term settlement of the MSE approach fill.

The proposed concept allows the bridge abutment to settle along with the MSE embankment as/if it occurs. Thus there are no differential settlements leading to poor riding conditions.



| | | | | |
|---|---|---|---|---|
| **Proposal No.01-006** | | | | |
| | | | | |
| **Approximate Quantities** | | | | |
| | | | | |
| 1. Class D Concrete in cap beams | | | | |
| Area = say 4' wide x 4' deep = 16 Sq Ft | | | | |
| Length = say 106 ft along skew | | | | |
| Volume = 16 x 106 x 2 caps / 27 cubic ft per CY = 126 CY | | | | |
| | | | | |
| 2. Class D Concrete in formed columns | | | | |
| Area = 7.1 Sq ft (36" diameter) | | | | |
| Length = say 17 ft - 4 ft = 13 ft | | | | |
| Say 8 columns at each abutment = 16 total | | | | |
| Volume = 7.1 x 13 x 8 x 2 abutments / 27 cubic ft per CY = 55 CY | | | | |
| | | | | |
| 3. Class D Concrete in spread footings | | | | |
| Area = say 8 feet wide x 3 feet deep = 24 Sq ft | | | | |
| Length = say 106 feet along skew | | | | |
| Volume = 24 x 106 x 2 abutments / 27 cubic ft per CY = 189 CY | | | | |
| | | | | |
| | | | | |
| **Estimated Cost Difference** | | | | |
| | | | | |
| Item | Unit | Quantity | Unit Cost | Amount |
| | | | | |
| Class D Concrete in cap beams | CY | -126 | 500 | -63,000 |
| Class D Concrete in formed columns | CY | -55 | 500 | -27,500 |
| Class D Concrete in spread footings | CY | 189 | 500 | 94,500 |
| 42" Diameter drilled shafts (per SSR Option 2) | LF | -240 | 190 | -45,600 |
| | | | | |
| | | | Total | -41,600 |

# VALUE ENGINEERING PROPOSAL NO. 01-005

**SUMMARY PROPOSAL DESCRIPTION:**

Construct bridge abutment foundations outside of the MSE abutment walls.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 0,000 |
| Future: | $ 0,000 |
| Total: | $ 0,000 |

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

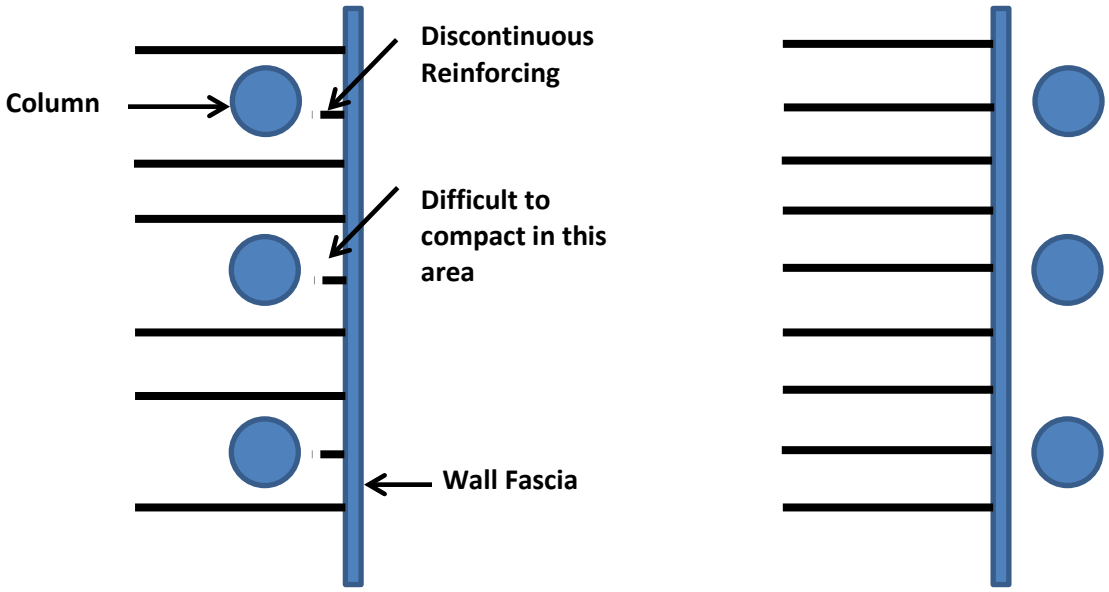
| EVALUATION |
|---|
| Idea Number: 01-005<br>Idea Description: Construct bridge abutment foundations outside of the MSE abutment walls. |
| Advantages of alternative concept:<br>1. Reduces risk of MSE wall failure<br>2. Improved constructability of the MSE walls<br>3. Reduced construction inspection requirements<br>4. Slight reduction in MSE wall quantity and costs (too small to quantify) |
| Advantages of original concept:<br>1. Possibly better aesthetics |
| Risks of implementing alternative concept:<br>1. None noted. |

**Calculations and/or Discussion**:

The cast-in-place columns supporting the abutment foundations are currently proposed to be located immediately behind the MSE wall fascia within the reinforced soil zone. This creates two potential problems:

1. Where the columns conflict with MSE reinforcing, a special detail is required to transfer the tributary load from the “missing” reinforcing to adjacent reinforcing strips.
2. Compaction between the CIP column and soil face of wall fascia is very difficult.

These constructability issues have historically been the cause of MSE wall failures (distortion of wall panels leading to settlement of the MSE backfill).




**Current Concept** **Proposed Concept**

# VALUE ENGINEERING PROPOSAL NO. 01-042

## SUMMARY PROPOSAL DESCRIPTION:

Lengthen the bridge in order to reduce or eliminate retaining wall quantities.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 150,000 |
| Future: | $ 0,000 |
| Total: | $ 150,000 |

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

P01-002 - Re-align Dillon Drive east of I-25 to re-align the I-25 off-ramp and the East Frontage Road closer to the UPRR right-of-way (ROW).

P01-019 - Incorporate a roundabout intersection at the east end of the Dillon Drive bridge to provide intersection flexibility and eliminate the need for superelevation on the bridge.

| EVALUATION |
|---|
| Idea Number: 01-042<br>Idea Description: Lengthen the bridge in order to reduce or eliminate retaining wall quantities. |
| Advantages of alternative concept:<br>1. Reduced retaining wall quantities<br>2. Improved constructability<br>3. Shorter construction schedule |
| Advantages of original concept:<br>1. None noted. |
| Risks of implementing alternative concept:<br>1. Revised alignments (see assumption No. 3) may increase construction costs<br>2. May exacerbate the grade challenges at the east end of the bridge |

**Calculations and/or Discussion**:

Assumptions:

1. Assume an 80% reduction in wall quantities
2. Use long-span bridge costs from the Structure Selection Report
3. Will require re-aligning the ramps and possibly Dillon Drive over I-25

| **Estimated Cost Savings** | | | | |
|---|---|---|---|---|
| | | | | |
| Item | Unit | Quantity | Unit Cost | Amount |
| | | | | |
| Base bridge cost (SSR Option 2) | LS | 1 | -$2,272,000 | -$2,272,000 |
| Longer bridge cost (SSR Option 5) | LS | 1 | $3,082,000 | $3,082,000 |
| Mechanical Reinforcement of Soil * | CY | -14900 | $25 | -$372,500 |
| Precast Panel Facing * | SF | -34384 | $17 | -$584,528 |
| | | | | |
| | | | Total | -$147,028 |
| | | | | |
| | | | | |
| * 80% of current estimate total | | | | |
| | | | | |

Note that these costs do not include the costs or savings associated with re-aligning the ramps or Dillon Drive. This proposal requires further evaluation to determine the roadway impacts and associated costs.

# VALUE ENGINEERING PROPOSAL NO. 05-003

**SUMMARY PROPOSAL DESCRIPTION:**

Use two-stage MSE walls in lieu of one-stage walls.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 100,000 |
| Future: | $ 0,000 |
| Total: | $ 100,000 |

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

| EVALUATION |
|---|
| Idea Number: 05-003<br>Idea Description: Use two-stage MSE walls in lieu of one-stage walls. |
| Advantages of alternative concept:<br>1. May eliminate the need to overexcavate and recompact the undocumented fills beneath the proposed MSE retaining walls<br>2. The fascia is constructed after settlement of the embankment which reduces the potential for cracking |
| Advantages of original concept:<br>1. Walls can be constructed in a single phase with backfill and fascia constructed at the same time. |
| Risks of implementing alternative concept:<br>1. Possibility of more settlement than single stage walls constructed on an engineered fill. |

**Calculations and/or Discussion**:

Conventional (one-stage) MSE walls are typically more cost-effective due to one less construction stage. However, one-stage construction must be supported on a sound subgrade to prevent excessive settlement of the wall during construction and associated cracking of precast panels.

The first phase of two-stage MSE walls has a high tolerance for settlement and is, therefore, suitable for construction on poor or unconsolidated subgrade soils. The wall fascia is constructed after settlements have occurred.

Construction Sequence

1. Construct the mechanically stabilized earth (MSE) embankment with a temporary wire facing.
2. Allow a settlement period as estimated by the geotechnical engineer and as verified by monitoring of settlements.
3. After settlements are essentially complete, install precast concrete fascia panels on the wire-faced embankment. The precast panels may be full-height or partial-height.

## Assumptions

1. Assume the MSE zone of the roadway embankments will cost slightly more due to the temporary facing. Use $30/cy in lieu of $25/cy.
2. Assume the precast fascia panels will cost slightly more per square foot due to a separate construction phase to install full- or partial-height panels. Use $25/sf in lieu of $17/sf.
3. Assume the over-excavation and re-compaction of undocumented fill is eliminated.

| Item | Unit | Quantity | Unit Cost | Amount |
|---|---|---|---|---|
| | | | | |
| Mechanical Reinforcement of Soil - current | CY | -18625 | $25 | -$465,625 |
| Precast panel facing - current | SF | -42980 | $17 | -$730,660 |
| | | | | |
| Mechanical Reinforcement of Soil - proposed | CY | 18625 | $30 | $558,750 |
| Precast panel facing - proposed | CY | 42980 | $25 | $1,074,500 |
| | | | | |
| Overexcavate and recompact * | CY | -15520 | $35 | -$543,200 |
| | | | | |
| | | | Total | -$106,235 |
| | | | | |
| * Quantity is based on Item 7 in current estimate | | | | |
| | | | | |

# VALUE ENGINEERING PROPOSAL NO. 06-002

## SUMMARY PROPOSAL DESCRIPTION:

Replace stone veneer with cast-in-place concrete with formliners.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 390,000 |
| Future: | $ 0,000 |
| Total: | $ 390,000 |

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

SR06-001 - Phase the construction of the aesthetic treatments on the bridge.

| EVALUATION |
|---|
| Idea Number: 06-002<br>Idea Description: Replace stone veneer with cast-in-place concrete with formliners. |
| Advantages of alternative concept:<br>1. Reduced cost<br>2. Reduced maintenance |
| Advantages of original concept:<br>1. More aesthetic options, larger "Northern Gateway" potential |
| Risks of implementing alternative concept:<br>1. None noted. |

**Calculations and/or Discussion**:

The following calculations represent the savings from replacing the stone veneer with cast-in-place, form lined concrete.

Assumptions

- Bridge monuments and walls – 2 ft thick
- The original aesthetic treatment costs include concrete

**Original Aesthetic Treatments**

| Task | Description | Units | Quantity | Unit Price | Total |
|---|---|---|---|---|---|
| 1 | Landscape Retaining Wall (Stone Veneer) | LF | 800 | $345.00 | $276,000.00 |
| 2 | Bridge Monuments (Stone Veneer) | EA | 4 | $170,750.00 | $683,000.00 |
| | | | | Total | $959,000.00 |

**Cast in place Aesthetic Treatments**

| Task | Description | Units | Quantity | Unit Price | Total |
|---|---|---|---|---|---|
| 1 | Concrete for Bridge Monuments | EA | 4 | $51,677.78 | $206,711.11 |
| | Concrete (2ft thick) | CY | 55.26 | $300.00 | |
| | Form Liner | SF | 900 | $30.00 | |
| | Stain | SF | 900 | $9.00 | |
| 2 | Concrete Retaining | | | $361,866.67 | $361,866.67 |
| | Concrete (2ft thick) | CY | 266.67 | $250.00 | |
| | Form Liner | SF | 7200 | $32.00 | |
| | Stain | SF | 7200 | $9.00 | |
| | | | | | $568,577.78 |

# VALUE ENGINEERING PROPOSAL NO. 01-014

## SUMMARY PROPOSAL DESCRIPTION:

Extend Century Link vault manhole vertically or add access man-way to eliminate the need for relocating the fiber-optic facility.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 400,000 to $500,000 |
| Future: | $ 0,000 |
| Total: | $ 400,000 to $500,000 |

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

P01-003 - Reallocate the Century Link fiber optic relocation costs from the project to Century Link.

| EVALUATION |
|---|
| Idea Number: 01-014<br>Idea Description: Extend Century Link vault manhole vertically or add access man-way to eliminate the need for relocating the fiber-optic facility. |
| Advantages of alternative concept:<br>1. Eliminates the need to relocate existing vault, which has been estimated at $500,000.<br>2. Provides/maintains access to existing facility. |
| Advantages of original concept:<br>1. The vault and line would be relocated and adjusted outside the roadway. |
| Risks of implementing alternative concept:<br>1. Century Link may have a maximum depth for access to vaults.<br>2. The manhole would be located in the middle of the travel lane and may not be acceptable with current design standards. Access would require closure. |

**Calculations and/or Discussion**:

The current plan calls for approximately 16’ of fill on top of the existing fiber-optic vault.

The following two options have been identified. Both options would have very similar cost/benefits.

Option 1: Extend Manhole/Risers

- The new manhole/risers would extend approximately 16’ to the proposed grade.
- The new manhole/risers would cost approximately $15,000, saving the project $485,000. ($5,000,000 - $15,000 = $485,000)
- The existing vault may require adjustments or an upgrade to be structurally adequate.

Option 2: Provide Access Man-Way

- A “bridge” or box culvert type structure would be supplied to provide access from the west slope of the frontage road to the existing vault. This would have a vertical door within the side of the proposed retaining wall.
- The new man-way vault with door would cost approximately $65,000, saving the project $435,000. ($5,000,000 - $65,000 = $435,000)

# VALUE ENGINEERING PROPOSAL NO. 01-003

## SUMMARY PROPOSAL DESCRIPTION:

Reallocate the Century Link fiber optic relocation costs from the project to Century Link.

Estimated potential savings:

| | |
|---|---|
| Initial: | $ 500,000 |
| Future: | $ 0,000 |
| Total: | $ 500,000 |

## Additional Description:

## Related Value Engineering Proposals and/or Supplemental Recommendations:

P01-014 - Extend Century Link vault manhole vertically or add access man-way to eliminate the need for relocating the fiber-optic facility.

| EVALUATION |
|---|
| Idea Number: 01-003<br>Idea Description: Reallocate the Century Link fiber optic relocation costs from the project to Century Link. |
| Advantages of alternative concept:<br>1. Century Link pays for relocation costs |
| Advantages of original concept:<br>1. No coordination required (project on schedule) |
| Risks of implementing alternative concept:<br>1. Century Link is not required to pay for relocation and project funding issues arise<br>2. Potential project delays |

**Calculations and/or Discussion**:

Because Century Link is in the public right-of-way, and not in an easement, several options may be explored in order to have Century Link be financially responsible for the relocation of the fiber optic line and vault.

- Option 1: Because the city will own and maintain the bridge, the relationship between the utility and the city can be argued to fall under the franchise agreement. The agreement should require Century Link to pay for the vertical relocation.

- Option 2: The city may be able to buy the right-of-way from CDOT, with the goal of satisfying the existing franchise agreement with the utility.

- Option 3: Pursue negotiations with Century Link to arrive at an equitable win-win solution.

# SECTION 4 - SUPPLEMENTAL RECOMMENDATIONS

The following ideas were generated by the VE Team and thought to have considerable merit. These ideas are thought to offer improvements, but either the economics were not calculable or the idea could not be developed because of insufficient information.

The VE Team suggests that these recommendations be carefully reviewed and given as much thought and effort as the formal VE Proposals.

**SUPPLEMENTAL RECOMMENDATIONS SUMMARY TABLE**

| PROPOSAL NO. | VE PROPOSAL DESCRIPTION | REVIEW BOARD COMMENTS | PAGE NO. |
|---|---|---|---|
| **Drainage** | | | |
| SR03-004 | Add an additional box culvert to accommodate excess 100-year flows not able to be conveyed by the current infrastructure at Design Points C and H. | **Decline** | 4-2 |
| **Materials** | | | |
| SR01-029 | Provide 3" of hot mix asphalt (HMA) overlay on the Dillon Dr. bridge deck. | **Accept** | 4-5 |
| SR03-002 | Place permeable pavement on Dillon Drive. | **Decline** | 4-8 |
| SR05-002 | Optimize pavement design. | **Accept** | 4-11 |
| SR01-018 | Do a Finding in Public Interest (FIPI) for reinforced concrete pipe selection. | **Decline** | 4-13 |
| **Structures** | | | |
| SR02-013 | Build half of the Dillon Drive Bridge now and the rest at a later time. | **Decline** | 4-17 |
| SR02-006 | Construct a cast-in-place and post-tensioned concrete bridge superstructure in lieu of precast-prestressed concrete girders. | **Decline** | 4-19 |
| **Landscaping and Aesthetics** | | | |
| SR06-001 | Phase the construction of the aesthetic treatments on the bridge. | **Decline** | 4-21 |
| SR01-046 | Make bridge aesthetics an integral part of the bridge abutment. | **Accept** | 4-23 |
| SR01-034 | Use xeriscape landscaping on the project. | **Accept** | 4-25 |
| SR06-003 | Simplify the bridge railing design (e.g., remove swoop; choose less ornate design). | **Decline** | 4-27 |
| SR01-017 | Require the developer or Urban Renewal District to maintain the landscaping long term. | **Decline** | 4-29 |
| SR01-045 | Construct the bridge monuments so they can accommodate the future signal equipment. | **Decline** | 4-31 |

# SUPPLEMENTAL RECOMMENDATION NO. 03-004

## SUMMARY RECOMMENDATION DESCRIPTION:

Add an additional box culvert to accommodate excess 100-year flows not able to be conveyed by the current infrastructure at Design Points C and H.

## Additional Description:

## Related Value Engineering Proposals and/or Supplemental Recommendations:

P01-011 - Re-route drainage east along the south side of Dillon Drive from the existing corrugated metal pipe (ECMP) to the proposed detention pond and box culvert located on the south side of the proposed Dillon Drive Bridge.

| EVALUATION |
|---|
| Idea Number: 03-004<br>Idea Description: Add an additional box culvert to accommodate excess 100-year flows not able to be conveyed by the current infrastructure at Design Points C and H. |
| Advantages of alternative concept:<br>1. Provides additional capacity to reduce chances of flooding at existing culverts.<br>2. Provides increased safety on I-25. |
| Advantages of original concept:<br>1. Does not require boring/open cut across I-25. |
| Risks of implementing alternative concept:<br>1. Additional costs related to new structure, crossing Interstate, and repairing Interstate. |

**DISCUSSION AND/OR CALCULATIONS**:

The proposed remaining flow of the 100-year flows that do not fit into the existing culverts is 438-cfs. An additional 6x6 concrete box culvert (or equivalent 96-inch pipe) will provide conveyance of these proposed flow rates.

Option 1 – Open-Cut Installation

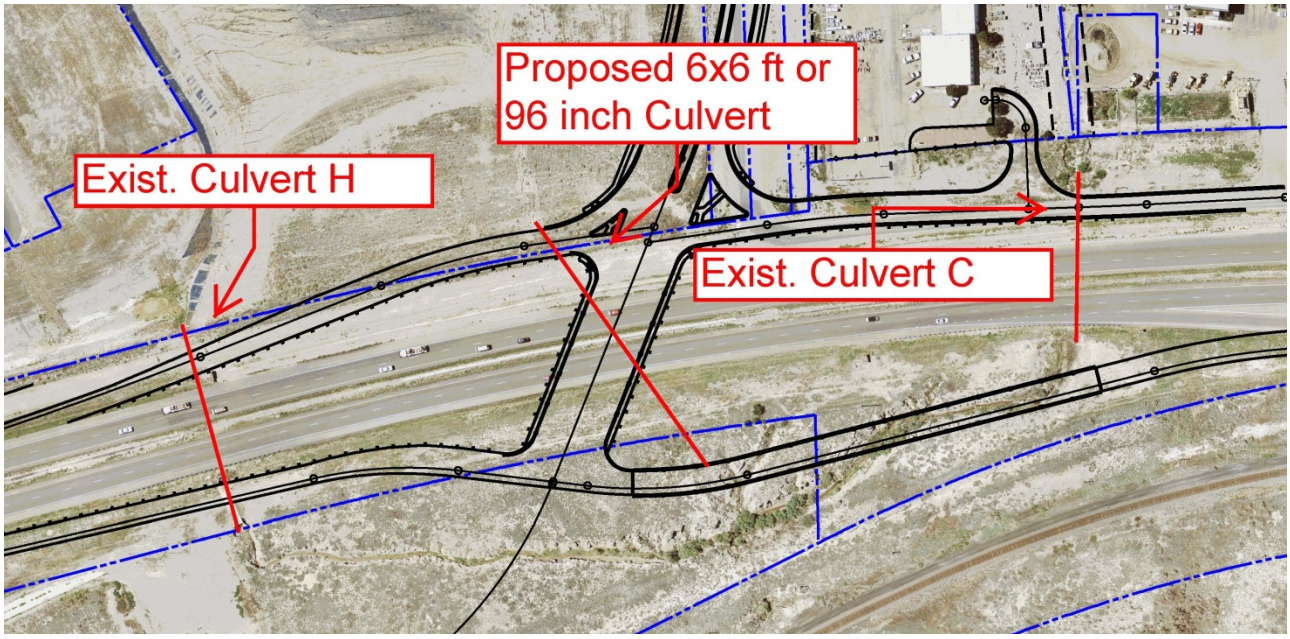
The additional costs are estimated to be $339,000.

| Combine drainage flows from both North and South Culverts (Culvert C and H) to one culvert | | | | | |
|---|---|---|---|---|---|
| Open Cut | | | | | |
| **Item** | **Unit** | **QTY** | **Unit Cost** | **Total Cost** | |
| 6X6 Concrete Box | LF | 450 | $ 550.00 | $ 247,500.00 | |
| Outlet Protection | EA | 1 | $ 35,000.00 | $ 35,000.00 | |
| Pavement Replacement | SY | 450 | $ 120.00 | $ 54,000.00 | |
| Excavation | CY | 300 | $ 9.00 | $ 2,700.00 | |
| Traffic Control | LS | 1 | $ 34,000.00 | $ 34,000.00 | |
| | | | Subtotal Additional Culvert | $ 373,200.00 | |

Option 2 - Bore 96-inch Round Pipe Section

The additional costs are estimated to be $330,000.

| Combine drainage flows from both North and South Culverts (Culvert C and H) to one culvert | | | | | |
|---|---|---|---|---|---|
| Bore | | | | | |
| **Item** | **Unit** | **QTY** | **Unit Cost** | **Total Cost** | |
| 96-inch | LF | 450 | $ 650.00 | $ 292,500.00 | |
| Outlet Protection | EA | 1 | $ 35,000.00 | $ 35,000.00 | |
| Excavation | CY | 300 | $ 9.00 | $ 2,700.00 | |
| | | | Subtotal Additional Culvert | $ 330,200.00 | |


Proposed 6x6 ft or
96 inch Culvert
Exist. Culvert H
Exist. Culvert C

# SUPPLEMENTAL RECOMMENDATION NO. 01-029

## SUMMARY RECOMMENDATION DESCRIPTION:

Provide 3" of hot mix asphalt (HMA) overlay on the Dillon Dr. bridge deck.

## Additional Description:

This option would provide a protection to the concrete bridge deck by placing a waterproofing membrane under a layer of HMA, which will serve as the bridge wearing surface.

## Related Value Engineering Proposals and/or Supplemental Recommendations:

| EVALUATION |
|---|
| Idea Number: 01-029<br>Idea Description: Provide 3" of hot mix asphalt (HMA) overlay on the Dillon Dr. bridge deck. |
| Advantages of alternative concept:<br>1. Protect the concrete deck by providing a waterproofing membrane and HMA wearing surface.<br>2. Allow for a more viable maintenance alternative in the future.<br>3. Reduce overall life cycle costs. |
| Advantages of original concept:<br>1. No additional expense. |
| Risks of implementing alternative concept:<br>1. Additional costs.<br>2. Potential to need to replace bridge surface earlier than expected due to issues with asphalt mix or construction.<br>3. Additional bridge loading due to the additional asphalt. |

**DISCUSSION AND/OR CALCULATIONS**:

CDOT standard practice in recent years has been to place a layer of asphalt over a waterproofing membrane to aid in protecting concrete bridge decks. This layer is typically 3" thick, as this will allow future milling of 2" of the surface and replacement of 2" while still leaving the waterproofing membrane intact. It is expected that the surface of the bridge deck should last for 10-15 years (depending on wear based on traffic) before resurfacing is required.

Placing an asphalt wearing surface on top of the concrete will allow maintenance forces the opportunity to perform repairs as opposed to requiring a contractor to do it as maintenance forces typically do not have the capacity or the resources to do concrete maintenance work.

If placed, installed, and maintained properly, the asphalt surface should provide adequate cover and protection of the concrete deck and minimize the need for future deck repair. It is an added cost for maintenance as well, as this surface will need to be milled and overlaid every 10-15 years; however, it is felt that this treatment will be less costly in the long run versus that where the concrete surface is exposed.

Additional Projected Cost to Project (160' x 100' bridge deck surface =>1,777.7 sy):

- HMA: $65/ton x (1,777.7 sy) x (3 in) x (110 lb/sy-in)/(2,000 lb/ton) = $19,000
- Waterproofing Membrane: $15/sy x (1,777.7 sy) = $26,000

- Total Additional Cost: = $19,000 + $26,000 = $45,000

Savings: Concrete Sealer (deleted Item) = $9,126

Asphalt Rehabilitation Cost (materials and main work only—using existing costs):

- Milling 2" = ($2/sy) x (1,777.7 sy) = $4,000
- Resurfacing 2" = ($65/ton) x (1,777.7 sy) x (2 in) x (110 lb/sy-in (2,000 lb/ton) = $13,000

# SUPPLEMENTAL RECOMMENDATION NO. 03-002

## SUMMARY RECOMMENDATION DESCRIPTION:

Place permeable pavement on Dillon Drive.

## Additional Description:

This alternative places a permeable pavement system for Dillon Drive in lieu of a conventional pavement section. The major benefit to this section would be to reduce the amount of impervious surface which would require additional drainage to the area's water quality ponds.

## Related Value Engineering Proposals and/or Supplemental Recommendations:

| EVALUATION |
|---|
| Idea Number: 03-002<br>Idea Description: Place permeable pavement on Dillon Drive. |
| Advantages of alternative concept:<br>1. Provide a water quality benefit by reducing the amount of water to be channeled to the water quality ponds on the project site<br>2. Environmental sustainability<br>3. Reducing amount of drainage from entering the bridge deck from the west |
| Advantages of original concept:<br>1. Traditional pavement sections are proven to function as designed |
| Risks of implementing alternative concept:<br>1. Increased overall cost<br>2. Increased level of specialized maintenance needed for proper function of the system elements<br>3. Sand/gravel not an option for deicing<br>4. Overall water quality benefit needs to be quantified and weighed against the additional costs |

**DISCUSSION AND/OR CALCULATIONS**:

The permeable pavement option provides an alternative to traditional pavement sections by providing an outlet for the water to drain through the pavement system rather than running off. The major advantage to this system would be the ability to channel the water directly where it needs to go, and also reduces contaminants within the water as it flows through the system. This would allow greater capacity within the water quality ponds as this water would not need to be captured there before treatment.

The system does have added real costs (the permeable asphalt mix projects to run about 40-80% more costly than regular HMA mix) as well as other drawbacks which need to be taken into account. While the system has been placed on roadways in isolated instances, it has primarily been utilized in parking lots and trails. The roadway applications are best suited to local roads that do not experience an inordinate amount of heavy vehicle traffic. A pavement design will need to be performed to determine the proper pavement thicknesses, as well as treatment of the subgrade materials.

The system will require specialized maintenance, such as vacuuming and sweeping of the pavement surface, to keep fines and other deleterious materials from clogging the system. It will also require a specialized mix to be available to perform surface repairs when those will be needed.

The cost assumptions include savings from not needing to place about 30,000 cubic yards of embankment material due to the deeper pavement section, but would require an asphalt mix about $25/ton more than the regular HMA mix, and triple the tonnage that would have been needed for the ABC layer, as 18” of class 53 gravel would be

needed. This will also require a geomembrane fabric and a subdrain in this area due to the existing soils.

# SUPPLEMENTAL RECOMMENDATION NO. 05-002

## SUMMARY RECOMMENDATION DESCRIPTION:

Optimize pavement design.

## Additional Description:

The pavement design report prepared by Geocal dated December 30, 2011 incorporates standards and guidance set forth by the City of Pueblo, CDOT, and AASHTO. That report provided a recommendation for the pavement structure for the Dillon Drive Interchange project.

## Related Value Engineering Proposals and/or Supplemental Recommendations:

| EVALUATION |
|---|
| Idea Number: 05-002<br>Idea Description: Optimize pavement design. |
| Advantages of alternative concept:<br>1. Potential reduction of import material needed<br>2. Potential for reduction of pavement structure thickness<br>3. Provide additional support for the pavement structure |
| Advantages of original concept:<br>1. Pavement section as designed and put forth meets all relevant pavement design criteria and provides a viable pavement section with the least amount of uncertainty and risk of pavement structural failure. |
| Risks of implementing alternative concept:<br>1. Developing a design that may reduce costs and materials needed that might result in a proposal that is not as technically sound in nature or as technically viable or feasible as the existing pavement design. |

**DISCUSSION AND/OR CALCULATIONS**:

The report from Geocal recommended a pavement design that consisted of hot mix asphalt pavement (HMAP) over aggregate base course (ABC) over 2' of R-40 import material. This design was based primarily on the fact that the native soils are of very poor quality and not suitable for direct build without some type of treatment or removal.

The recommendation as presented is a work that has been performed and certified by a Professional Engineer exercising professional engineering judgment. It meets all relevant design guidance and is an acceptable design for the purposes of design and ultimately construction. It is assumed that this document and design has undergone a thorough review and accepted by all relevant parties, such as the City of Pueblo and CDOT R2 Materials.

During the value engineering study for this project, the group was charged with identifying potential areas of not only cost-savings but added benefit. As pavement is a major portion of the project, and there are several challenges that exist in this area, many alternatives were discussed for investigation that are documented as considerations to meet that goal. While it is not the team's mission to attempt to redesign the pavement structure, some areas were identified that might warrant consideration, many of which were not discussed in the original pavement design report. These areas include lime treated subgrade and the use of geotextile. It is recommended that, if possible, some of these - and other alternative treatments - be considered as to their viability and usefulness in meeting the challenges of this project.

# SUPPLEMENTAL RECOMMENDATION NO. 01-018

**SUMMARY RECOMMENDATION DESCRIPTION:**

Do a Finding in Public Interest (FIPI) for reinforced concrete pipe selection.

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

| EVALUATION |
|---|
| Idea Number: 01-018<br>Idea Description: Do a Finding in Public Interest (FIPI) for reinforced concrete pipe selection. |
| Advantages of alternative concept:<br>1. Can move forward with design with a type already selected and approved<br>2. Maintains project schedule<br>3. Lower maintenance costs/longer life |
| Advantages of original concept:<br>1. Allows for competitive bidding and potentially lower costs. |
| Risks of implementing alternative concept:<br>1. May get denied. Design would have to move forward maintaining the different options for pipe, which may or may not include RCP due to the selection matrix.<br>2. Potentially higher cost |

**DISCUSSION AND/OR CALCULATIONS**:

CDOT requires that a specific material for piping cannot be specified in the project without going through the pipe selection process to select one type of pipe over another. This process is based on a number of factors to include chemical testing data. This is the case for this project choosing between CMP and RCP piping underneath Dillon. City standard is RCP only. Leaving the design open for different types of pipe could affect the design itself (sizes may be different based on velocity, sediment, scour, friction values, etc). Selecting one or the other at this point in the design will move the design forward regarding this particular issue and help maintain the project schedule.

See FIPI Form (Next Page)

**COLORADO DEPARTMENT OF TRANSPORTATION**

## PROPRIETARY ITEM – FINDING IN THE PUBLIC INTEREST (FIPI)

**INSTRUCTIONS:**
A specific patented or proprietary material, specification, or process shall not be required on a contract except as permitted in Section 8.16 of the Project Development Manual (PDM). Use this form to obtain approval of the use of a proprietary feature on a project or group of projects.

**PROPRIETARY ITEM OR PROCESS:**

| Name of proprietary item or process: | Manufacturer name, address & phone No.: |
|---|---|
| | |

**NEED FOR PROPRIETARY ITEM:**

| Check only one | LOCATION |
|---|---|
| ☐ Project Specific | Provide Project No., Project Code, and Location: |
| ☐ Corridor Specific | Provide Corridor Description: |
| ☐ Region-wide | Identify CDOT Region: |
| ☐ Statewide | |
| For a corridor, region-wide, or statewide request, a finding in the public interest will have a term of: (Check only one) | |
| ☐ 3 Years (maximum allowable) | Specify dates of term: |
| ☐ Other (specify term) | Specify dates of term: |

Page 1 of 2

CDOT FORM 1381

**CERTIFICATION**

I hereby certify that it is in the public interest to specify the above named proprietary item or process for the following reasons: (Check all that apply)

- ☐ It is essential for synchronization.
- ☐ No equally suitable alternative exists.
- ☐ It will be used for research or experimental purposes on short sections of road. (Such use must be processed through the Research Branch of DTD. Attach documentation from DTD.)

JUSTIFICATION (required). Justification consists of information that documents the reasons marked above for use of the proprietary item or process. For research or experimentation include a work plan that describes how the research or experimental feature will be used and evaluated. Attach additional pages and documentation as necessary.

**APPLICANT SIGNATURE**

| Name | Title (CDOT Project Engineer, Branch Manager, or Program Engineer as appropriate; see flowchart in section 8.16 of the PDM): | Signature |
|---|---|---|
| | | |

**APPROVAL SIGNATURES**

| | | |
|---|---|---|
| Signature | CDOT Resident Engineer (Required on project specific or corridor FIPIs) | Date |
| Signature | CDOT Research Engineer(Required for research and experimentation FIPIs) | Date |
| Signature | FHWA Operations Engineer(Required for all region-wide and statewide FIPIs and FHWA oversight project level FIPIs) | Date |
| Signature | Other (specify) | Date |

**COPIES OF APPROVED FORM TO (as appropriate):**

| | |
|---|---|
| CDOT Project Engineer: | CDOT Resident Engineer: |
| CDOT Program Engineer: | CDOT Research Engineer: |
| Standards and Specifications Engineer (all, with draft of any required specification change): | FHWA Operations Engineer: |

Page 2 of 2 **CDOT Form 1381**

# SUPPLEMENTAL RECOMMENDATION NO. 02-013

**SUMMARY RECOMMENDATION DESCRIPTION:**

Build half of the Dillon Drive Bridge now and the rest at a later time.

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

| EVALUATION |
|---|
| Idea Number: 02-013<br>Idea Description: Build half of the Dillon Drive Bridge now and the rest at a later time. |
| Advantages of alternative concept:<br>1. Save up-front cost |
| Advantages of original concept:<br>1. Completes the project as proposed<br>2. Meets stakeholders expectations |
| Risks of implementing alternative concept:<br>1. May not ever be funded<br>2. May not be conducive to aesthetic plans<br>3. May or may not spur future development<br>4. Ramp terminals would need to be designed for the ultimate layout, which may result in some throaway elements once the second phase is completed. |

**DISCUSSION AND/OR CALCULATIONS**:

The original bridge concept was designed to provide for a two-phase construction. The southern half of Dillon could be constructed in the interim condition, and then in the future, when traffic is warranted, the north half of the bridge could be constructed. The first phase will provide for a single lane of traffic in each direction from the northbound off-ramp across to Dillon Drive. The MSE walls and abutments will be constructed to the ultimate width in the first phase. If an intermediate pier is needed, it may or may not be constructed to the ultimate width. Full construction now would minimize the total cost; however, the potential public backlash from “overbuilding” may preclude this approach.

There is an initial cost savings for only building a portion of the bridge at the current time. Building the bridge later would cost additional dollars due to duplicated mobilization and cost escalation for future dollars.

# SUPPLEMENTAL RECOMMENDATION NO. 02-006

**SUMMARY RECOMMENDATION DESCRIPTION:**

Construct a cast-in-place and post-tensioned concrete bridge superstructure in lieu of precast-prestressed concrete girders.

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

| EVALUATION |
|---|
| Idea Number: 02-006<br>Idea Description: Construct a cast-in-place and post-tensioned concrete bridge superstructure in lieu of precast-prestressed concrete girders. |
| Advantages of alternative concept:<br>1. Better aesthetics<br>2. Shallower structure depth allowing a lower profile grade and minor embankment and wall savings |
| Advantages of original concept:<br>1. No falsework required<br>2. Less MOT requirements<br>3. Better safety during construction<br>4. Shorter construction schedule<br>5. Lower construction cost |
| Risks of implementing alternative concept:<br>1. More risk during construction due to MOT and construction over live traffic |

**DISCUSSION AND/OR CALCULATIONS**:

This supplemental recommendation suggests an alternative that can be detailed to provide a superior aesthetic appearance. The drawbacks include greater traffic impacts, a longer construction schedule and higher construction costs. These drawbacks were not examined in detail in this study, but could be evaluated by the design team if deemed worthwhile by the City.

# SUPPLEMENTAL RECOMMENDATION NO. 06-001

## SUMMARY RECOMMENDATION DESCRIPTION:

Phase the construction of the aesthetic treatments on the bridge.

## Additional Description:

## Related Value Engineering Proposals and/or Supplemental Recommendations:

P06-002 - Replace stone veneer with cast-in-place concrete with formliners.
SR01-046 - Make bridge aesthetics an integral part of the bridge abutment.

| EVALUATION |
|---|
| Idea Number: 06-001<br>Idea Description: Phase the construction of the aesthetic treatments on the bridge. |
| Advantages of alternative concept:<br>1. Initial cost savings, but still enables the treatments to be included. |
| Advantages of original concept:<br>1. The aesthetic treatments provide for the "Northern Gateway" effect |
| Risks of implementing alternative concept:<br>1. The "Northern Gateway" effect may be lost. |

**DISCUSSION AND/OR CALCULATIONS**:

Two options have been considered. Both options could be considered for a last ditch effort to save the project if it ends up in dire financial straits.

Option 1: Omit or delay (?) aesthetic treatments during initial phase

- Omitting the monuments, pilasters on the bridge, and the landscaping walls during the initial phase would result in approximately $1,580,000 in initial savings.
- While desirable form a visual standpoint and for providing for a pleasing “Northern Gateway” effect, the aesthetic treatments on the bridge are not essential for the traffic function of the interchange.

Option 2: Omitting Aesthetic Treatments for only the Southern Face of the Bridge

- Removing the monuments and the landscaping walls on the southern face of the bridge during the initial phase would result in approximately $479,500 in initial savings. This option caters to the traffic entering from the North.
- There may be revised or toned back landscaping with the option as well, for example, reduced irrigation, removal of trees, etc.

**Phasing of Aesthetic Treatments**

| Task | Description | Units | Quantity | Unit Price | Total |
|---|---|---|---|---|---|
| 1 | Landscape Retaining Wall (Stone Veneer) | LF | 800 | $345.00 | $276,000.00 |
| 2 | Bridge Monuments (Stone Veneer) | EA | 4 | $170,750.00 | $683,000.00 |
| | | | | Total | $959,000.00 |
| | | | | **Total/2** | **$479,500.00** |

# SUPPLEMENTAL RECOMMENDATION NO. 01-046

**SUMMARY RECOMMENDATION DESCRIPTION:**

Make bridge aesthetics an integral part of the bridge abutment.

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

P06-002 - Replace stone veneer with cast-in-place concrete with formliners.
SR06-001 - Phase the construction of the aesthetic treatments on the bridge.

| EVALUATION |
| --- |
| Idea Number: 01-046<br>Idea Description: Make bridge aesthetics an integral part of the bridge abutment. |
| Advantages of alternative concept:<br>1. Cost savings |
| Advantages of original concept:<br>1. The aesthetic treatments provide for the "Northern Gateway" effect. |
| Risks of implementing alternative concept:<br>1. The "Northern Gateway" effect may be lost. |

**DISCUSSION AND/OR CALCULATIONS**:

# SUPPLEMENTAL RECOMMENDATION NO. 01-034

## SUMMARY RECOMMENDATION DESCRIPTION:

Use xeriscape landscaping on the project.

## Additional Description:

## Related Value Engineering Proposals and/or Supplemental Recommendations:

SR01-017 - Require the developer or Urban Renewal District to maintain the landscaping long term.

| EVALUATION |
| --- |
| Idea Number: 01-034<br>Idea Description: Use xeriscape landscaping on the project. |
| Advantages of alternative concept:<br>1. Eliminates or greatly minimizes future irrigation/water usage.<br>2. Eliminate/minimize irrigation system maintenance.<br>3. Minimize landscape maintenance, e.g., mowing, trimming, etc.<br>4. Does not require construction of irrigation infrastructure. |
| Advantages of original concept:<br>1. The existing landscaping may provide for a greater "Northern Gateway" effect. |
| Risks of implementing alternative concept:<br>1. A diminished "Wow" factor of the "Northern Gateway" effect.<br>2. The initial costs may be larger. |

**DISCUSSION AND/OR CALCULATIONS**:

Xeriscaping should be considered for the project. In addition to minimizing future irrigation/water usage, irrigation system maintenance, and landscape maintenance, xeriscaping may more closely resemble the surrounding natural habitat.

As the plans stand today, a large number of trees and shrubs have been proposed.

# SUPPLEMENTAL RECOMMENDATION NO. 06-003

**SUMMARY RECOMMENDATION DESCRIPTION:**

Simplify the bridge railing design (e.g., remove swoop; choose less ornate design).

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

| EVALUATION |
| --- |
| Idea Number: 06-003<br>Idea Description: Simplify the bridge railing design (e.g., remove swoop; choose less ornate design). |
| Advantages of alternative concept:<br>1. Initial cost savings |
| Advantages of original concept:<br>1. More ornate design, bigger "Wow" effect. |
| Risks of implementing alternative concept:<br>1. The "Wow" effect may be lost. |

**DISCUSSION AND/OR CALCULATIONS**:

While desirable from a visual standpoint, and for providing for a “Wow” effect, an ornate guardrail/fence is not essential for the traffic function or safety.

# SUPPLEMENTAL RECOMMENDATION NO. 01-017

**SUMMARY RECOMMENDATION DESCRIPTION:**

Require the developer or Urban Renewal District to maintain the landscaping long term.

**Additional Description:**

**Related Value Engineering Proposals and/or Supplemental Recommendations:**

SR01-034 - Use xeriscape landscaping on the project.

| EVALUATION |
| --- |
| Idea Number: 01-017<br>Idea Description: Require the developer or Urban Renewal District to maintain the landscaping long term. |
| Advantages of alternative concept:<br>1. Eliminates or greatly reduces the city's responsibility for maintaining the landscaping. |
| Advantages of original concept:<br>1. The city would have more control over the management and maintance of the landscaping. |
| Risks of implementing alternative concept:<br>1. Future development may not be realized in the forseeable future.<br>2. Future development may be hindered by the costs associated with any maintenance agreements. |

**DISCUSSION AND/OR CALCULATIONS**:

# SUPPLEMENTAL RECOMMENDATION NO. 01-045

## SUMMARY RECOMMENDATION DESCRIPTION:

Construct the bridge monuments so they can accommodate the future signal equipment.

## Additional Description:

With the interchange project, a future signal will be required at Dillon Drive and the West Frontage Road. This recommendation calls for the signal equipment to be placed within the bridge monuments.

## Related Value Engineering Proposals and/or Supplemental Recommendations:

| EVALUATION |
|---|
| Idea Number: 01-045<br>Idea Description: Construct the bridge monuments so they can accommodate the future signal equipment. |
| Advantages of alternative concept:<br>1. Provides a dedicated, secure location to house the signal equipment. |
| Advantages of original concept:<br>1. No special considerations required above and beyond ordinary installation. |
| Risks of implementing alternative concept:<br>1. Access will need to be provided within the monuments for the signal equipment. |

**DISCUSSION AND/OR CALCULATIONS**:

A concept which was built into the design and construction of the C-470 at Alameda Parkway interchange on the west side of the Denver Metro area, placing the necessary equipment for the interchange traffic signals inside of the monuments already to be constructed, allows those monuments to serve a functional as well as an aesthetic purpose. This will also provide a secure location for the equipment to prevent tampering or damage due to weather. For these reasons, adding this feature should reduce overall life cycle costs as well. Access to the equipment will need to be provided, which could introduce additional costs to the monuments.

The photo below shows one of the monuments that is currently used to house the signal equipment on the Alameda Parkway Bridge over C-470.

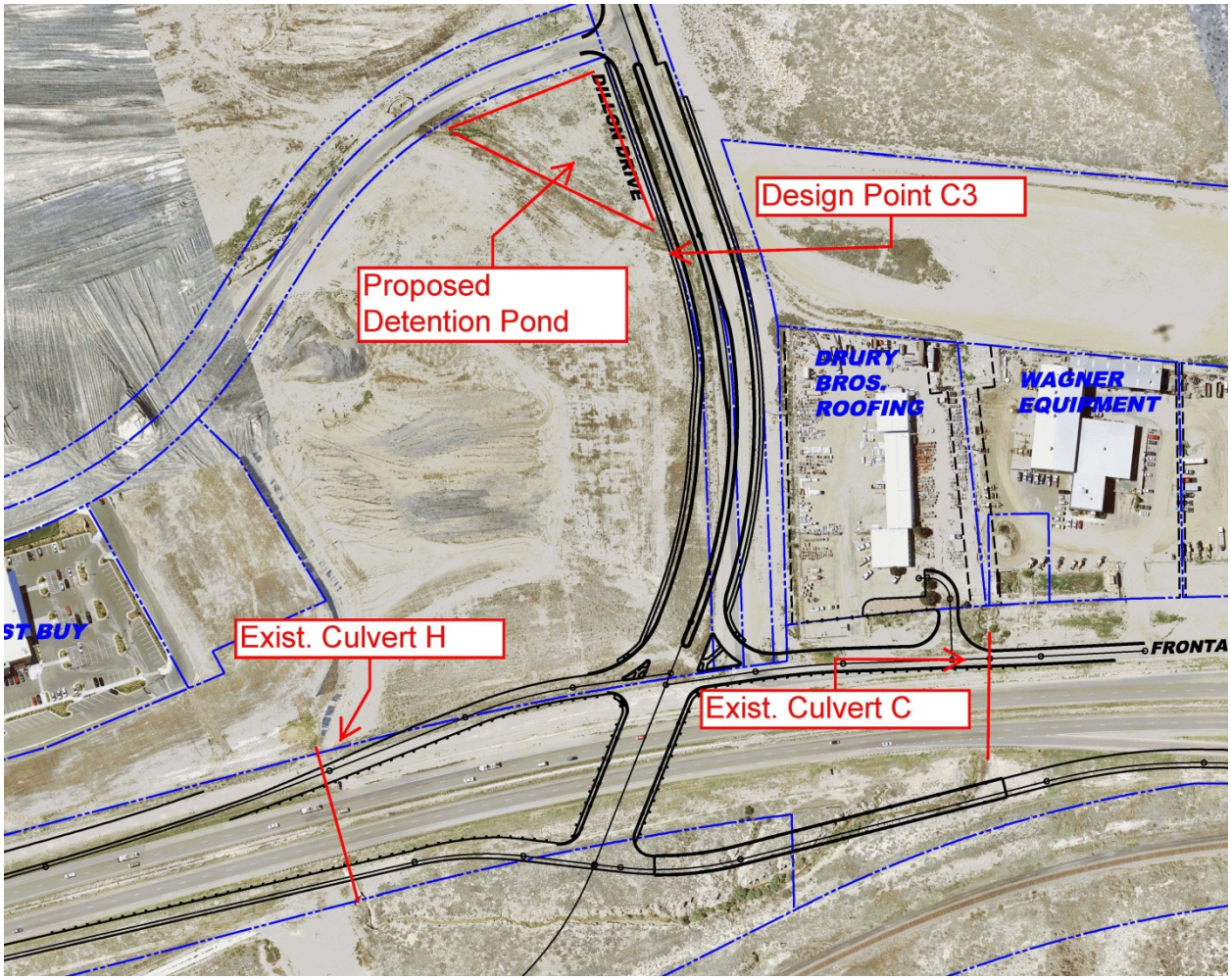
The following photograph shows the entire span of the Alameda Parkway Bridge. Note the monuments at each end of the bridge.

# SECTION 5 – IDEAS ANALYZED BUT NOT PROPOSED

| EVALUATION |
|---|
| Idea Number: 01-010<br>Idea Description: Provide a detention pond at the southeast side of intersection of Dillon Drive and Elizabeth Street to attenuate flows for the box culverts at I-25. |
| Advantages of alternative concept:<br>1. Reduce/attenuate drainage flows from design point C3 and overall impact at I-25 Box culvert crossing.<br>2. Reduces overall impact to downstream drainge system and possible reduction of storm infrastructure. |
| Advantages of original concept:<br>1. No proposed detention pond in this location<br>2. Potential commercial site. |
| Risks of implementing alternative concept:<br>1. Private Landowner would need to dedicate or sell property.<br>2. Increased maintenance of facility. |
| Conclusion:<br>Do not propose this idea because due to proposed high cost ($202,000) and high risk of drainage structure location. |

**Calculations and/or Discussion**:

The cost to add the detention pond is approximately $202,000 and the benefit would be to reduce drainage flow from the existing box culverts north and south of the existing bridge. This would assist in the passing of the 100-year storm, reduce sediment loading, and maintenance of the existing box culverts.


DILLON DRIVE
Design Point C3
Proposed
Detention Pond
DRURY
BROS.
ROOFING
WAGNER
EQUIPMENT
Exist. Culvert H
Exist. Culvert C

| EVALUATION |
| --- |
| Idea Number: 01-012<br>Idea Description: Install infiltration features within proposed channels and ponds to reduce the proposed water quality volumes and attenuate drainage flows. |
| Advantages of alternative concept:<br>1. Reduces water quality volumes.<br>2. Attenuates drainage flows. |
| Advantages of original concept:<br>1. Less expensive. |
| Risks of implementing alternative concept:<br>1. Chance of infiltration feature failure. |
| Conclusion:<br>Do not propose this idea because the existing soil types are Class D and will not promote significant infiltration. In addition, the existing Pierre shale is not desired to be wetted and discharged to Fountain Creek due to the increase amount of selenium. |

**Calculations and/or Discussion**:

| EVALUATION |
| --- |
| Idea Number: 01-013<br>Idea Description: Modify pavement design by altering pavement design software input parameters. |
| Advantages of alternative concept:<br>1. Potential for reduction in pavement structure thickness |
| Advantages of original concept:<br>1. Design that meets all relevant pavement design criteria based on the existing conditions with the least amount of risk. |
| Risks of implementing alternative concept:<br>1. Increasing the risk and potential for premature failure of the pavement section |
| Conclusion:<br>Do not propose this idea because this proposal was combined into SR05-002 - Optimize pavement design. |

**Calculations and/or Discussion**:

| EVALUATION |
|---|
| Idea Number: 01-021<br>Idea Description: Eliminate the center bridge pier. |
| Advantages of alternative concept:<br>1. Increased safety on I-25<br>2. Improved constructability<br>3. Slight reduction in aesthetic treatment costs |
| Advantages of original concept:<br>1. Shallower superstructure depth<br>2. Lower profile grade on Dillon Drive<br>3. Reduce wall and embankment cost<br>4. Lower construction cost |
| Risks of implementing alternative concept:<br>1. None noted. |
| Conclusion:<br>Do not propose this idea because it was already considered in the Structure Selection Report and was found to have a construction cost approximately 15% greater than the current alternative. |

**Calculations and/or Discussion**:

| EVALUATION |
|---|
| Idea Number: 01-026<br>Idea Description: Provide tiered retaining walls in place of the proposed single face retaining walls. |
| Advantages of alternative concept:<br>1. Reduce face of wall. |
| Advantages of original concept:<br>1. Takes less room. |
| Risks of implementing alternative concept:<br>1. None noted. |
| Conclusion:<br>Do not propose this idea because the proposed cost of the tiered walls is approximately $120/sf vs. $90/sf for single face walls. The proposed tiered walls' cost is approximately $545,000 more. |

## Calculations and/or Discussion:

| **Retaining Wall Quantities** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | **As-Designed** | | | | |
| | **UNIT** | **West Frontage** | **I-25 On Ramp** | **1-25 Off Ramp** | **Total** | **Unit Cost** | **Total Cost** | |
| Structural Ex. | CY | 3555 | 4180 | 5740 | 13475 | $ 35.00 | $ 471,625.00 | |
| Structural Backfill (Class 1) | CY | 7345 | 9460 | 18705 | 35510 | $ 15.00 | $ 532,650.00 | |
| Mech. Reinforcement of Soil | CY | 2300 | 3225 | 8100 | 13625 | $ 25.00 | $ 340,625.00 | |
| Geomembrane | SY | 1415 | 1780 | 3075 | 6270 | $ 10.00 | $ 62,700.00 | |
| Precast Panel Facing | SF | 6900 | 8875 | 15205 | 30980 | $ 17.00 | $ 526,660.00 | |
| Concrete Class D | CY | 21 | 24 | 29 | 74 | $ 350.00 | $ 25,900.00 | |
| Reinforcing Steel | LB | 300 | 350 | 400 | 1050 | $ 1.10 | $ 1,155.00 | |
| | | | | Subtotal Retaining Wall Cost (As-Designed) | | | $ 1,961,315.00 | |
| | | | | | | | | |
| | | | | **Tiered Wall** | | | | |
| | | **West Frontage** | **I-25 On Ramp** | **1-25 Off Ramp** | **Total** | **Unit Cost** | **Total Cost** | |
| Face of Wall | SF | 10346 | 5375 | 5165 | 20886 | $ 120.00 | $ 2,506,320.00 | |

| EVALUATION |
|---|
| Idea Number: 01-027<br>Idea Description: Extend the 6x6 box culvert through the channel and backfill up to the proposed east frontage road to remove the proposed bridge. |
| Advantages of alternative concept:<br>1. Removes bridge structure and drilled piers. |
| Advantages of original concept:<br>1. Leaves natural open channel. |
| Risks of implementing alternative concept:<br>1. Poor native soil conditions.<br>2. Proposed retaining walls along west side near I-25. |
| Conclusion:<br>Do not propose this idea because the cost difference between the proposed hard piping of the drainage structure is approximately $893,000 more than the proposed bridge option. |

**Calculations and/or Discussion**:

| Proposed Fill Chanel and Extend Pipe | | | | | |
|---|---|---|---|---|---|
| | | Units | QTY | Unit Price | Total Price |
| Channel | Structural Backfill | CY | 17000 | $ 9.00 | $ 153,000.00 |
| | 6X6 Concrete Box | LF | 280 | $ 550.00 | $ 154,000.00 |
| | Special Box | EA | 2 | $ 45,000.00 | $ 90,000.00 |
| | Outlet Wingwalls (CIP) | EA | 1 | $ 30,000.00 | $ 30,000.00 |
| Roadway | Retaining Wall | SF | 24000 | $ 90.00 | $ 2,160,000.00 |
| | Structural Backfill | CY | 34000 | $ 9.00 | $ 306,000.00 |
| | | | | Subtotal Box Culvert and Fill | $ 2,893,000.00 |
| | | | | | |
| Remove proposed bridge | | | | | |
| | East Frontage Road | LS | 1 | $ 2,000,000.00 | $ 2,000,000.00 |
| | | | | | |
| | | | | Net Difference | $ 893,000.00 |

| EVALUATION |
|---|
| Idea Number: 01-031<br>Idea Description: Use geotextile (separator) to enhance pavement section. |
| Advantages of alternative concept:<br>1. Provide separation between poor native soils and imported soils used to support the new pavement structure<br>2. Provide additional support for the pavement structure |
| Advantages of original concept:<br>1. No additional costs |
| Risks of implementing alternative concept:<br>1. Geotextile must be proof rolled after placement, with remaining soft spots requiring either an additional layer of geotextile or remove and replace proof rolled layer |
| Conclusion:<br>Do not propose this idea because this proposal was combined into SR05-002 - Optimize pavement design. |

**Calculations and/or Discussion**:

| EVALUATION |
|---|
| Idea Number: 01-037<br>Idea Description: Use multi-use paths in lieu of bike lanes across bridge and along Dillon Drive. |
| Advantages of alternative concept:<br>1. Narrower bridge deck.<br>2. Savings from less asphalt and base. |
| Advantages of original concept:<br>1. Project provides separate bike lanes and sidewalks |
| Risks of implementing alternative concept:<br>1. Politically unacceptable<br>2. Revised section would not meet current standards |
| Conclusion:<br>Do not propose this idea because it was determined to be unfeasible. |

**Calculations and/or Discussion**:

Assumptions

- Removal of the bike lanes along Dillon Drive and the bridge
- The sidewalks along Dillon Drive and the bridge are widened to 8’ and become multi-use paths
- The two outside lanes of on the bridge are changed to 11’ width and the bridge sidewalks are changed to 8’
- Since 6’ of decking is removed, one girder can be eliminated

**Items Removed**

| Item# | Describtion | Units | Quantity | Unit Price | Total |
|---|---|---|---|---|---|
| 1 | Dillon Rd. Roadway Base (2') | CY | 592.59 | $9.00 | $5,333.33 |
| 2 | Dillon Rd. Asphat (12 3/4") | Ton | 467.50 | $65.00 | $30,387.50 |
| 3 | Bridge Girder | EA | 1.00 | $28,140.00 | $28,140.00 |
| 4 | Bridge Decking | ft(width) | 8.00 | $2,557.00 | $20,456.00 |
| | | | | **Sub Total** | **$84,316.83** |

**Additional Concrete for Multi-Use Path**

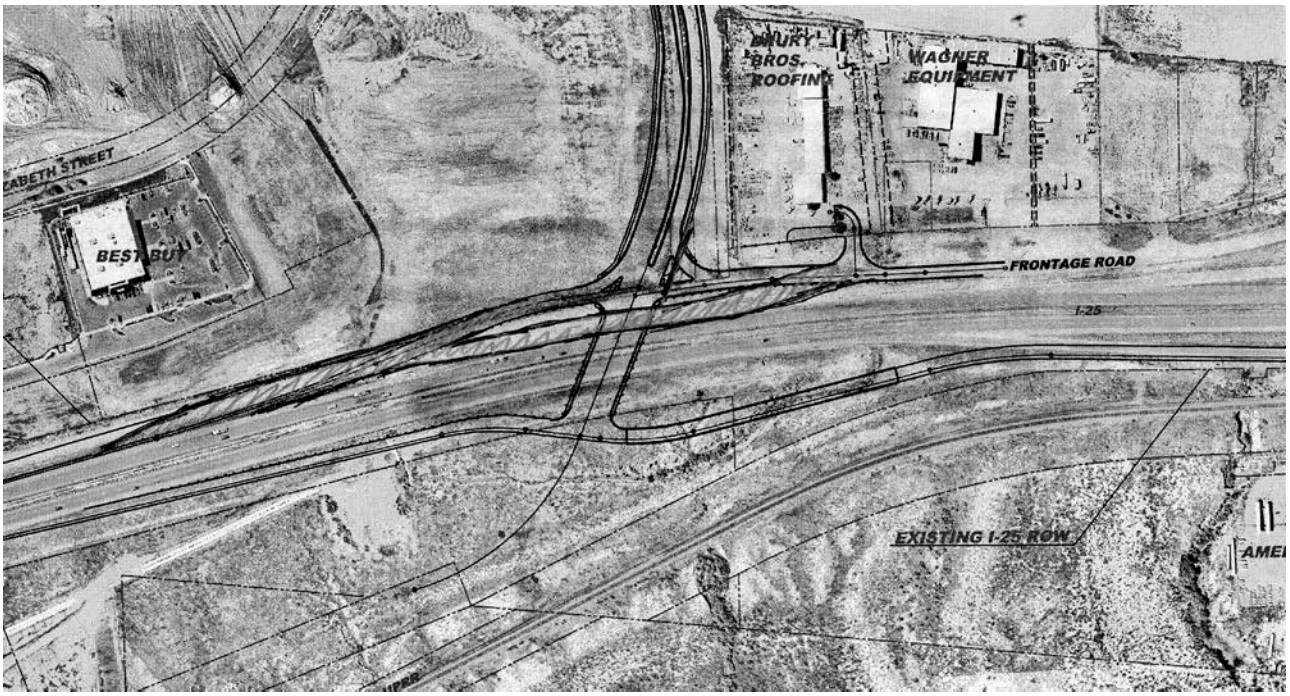
| Item# | Describtion | Units | Quantity | Unit Price | Total |
|---|---|---|---|---|---|
| 1 | Dillon Rd. Conc. Sidewalk (4') | SY | 444.44 | $35.00 | $15,555.56 |
| | | | | **Sub Total** | **$15,555.56** |

| EVALUATION |
|---|
| Idea Number: 01-038<br>Idea Description: Re-route the southbound on-ramp under the Dillon Drive bridge to reduce the retaining walls required in front of Drury Brothers and eliminate the need to relocate the Century Link fiber optic. |
| Advantages of alternative concept:<br>1. The idea will reduce the retaining walls required between I-25 and the west frontage road and may also eliminate the need to relocate the Century Link fiber. |
| Advantages of original concept:<br>1. Two-way west frontage road |
| Risks of implementing alternative concept:<br>1. Eliminates the two-way option for the west frontage road.<br>2. Requires the construction of the east frontage road.<br>3. Extends length of on ramp.<br>4. Adds a merge/weave to the southbound ramp prior to I-25 entrance.<br>5. Evaluation of this concept could delay the design schedule.<br>6. Limited cost savings - does not eliminate retaining walls. |
| Conclusion:<br>Do not propose this idea because the cost savings are not apparent and benefits to overall project are limited. |

**Calculations and/or Discussion**:

The intent of this concept is to reduce retaining walls and eliminate the need to relocate the Century Link fiber optic line. The apparent cost savings are limited. The retaining walls are not reduced, but are re-aligned. This option may eliminate the necessity to relocate the fiber optic, but there are other options that may accomplish this more effectively.

This option fails due to the limited benefits.


BEST BUY
FRONTAGE ROAD
I-25
EXISTING I-25 ROW

| EVALUATION |
|---|
| Idea Number: 01-041<br>Idea Description: Remove the ramps from Dillon Drive and keep it as an overpass only. Access would be maintained at Eden only |
| Advantages of alternative concept:<br>1. Provides east-west connection over I-25 not originally proposed in the EA<br>2. Less expensive |
| Advantages of original concept:<br>1. Better meets the City master plan |
| Risks of implementing alternative concept:<br>1. Does not meet the project purpose and need<br>2. Improvements to Eden Interchange may be required |
| Conclusion:<br>Do not propose this idea because this does not meet the project purpose and need. |

**Calculations and/or Discussion**:

A full diamond interchange at Eden was considered in the EA, but was eliminated for the following reason:

> "A full diamond at Eden would not provide more efficient and direct access to I-25 for the businesses along Platteville Boulevard/Dillon Drive in the study area and for the residents of Pueblo West. This alternative was eliminated from further consideration as it does not meet the purpose and need for the project." (Alternative Map attached)

It was considered to add the Dillon overcrossing only to add the additional east-west connectivity to match the master plan; however, this still does not provide more efficient and direct access to I-25 for the businesses along Dillon Drive and the residents of Pueblo West.

FIGURE 2-4
Full Diamond Interchange at Eden

| EVALUATION |
|---|
| Idea Number: 02-003<br>Idea Description: Use spread footing bridge foundations in lieu of drilled shafts. |
| Advantages of alternative concept:<br>1. Improved constructability |
| Advantages of original concept:<br>1. Minimal initial and long-term settlement |
| Risks of implementing alternative concept:<br>1. Possible long-term settlement |
| Conclusion:<br>Do not propose this idea because the cost is greater than drilled shafts. |

**Calculations and/or Discussion**:

The site soils appear to be suitable for spread footing foundations. Generally, spread footings are more cost-effective than drilled shaft foundations where feasible. In this project, the drilled shafts are relatively short and are a more cost-effective solution.

See calculations on the following page.

**Calculations**

Estimate dead loads:

Bridge deck weight = say .83 ft x .15 kcf = .125 ksf
Superimposed DL = .125 ksf x say 0.1 = .013 ksf
Future wearing surface = say .025 ksf
Precast girders (BT 42) = .681 klf x 12 girders / 96 ft = .085 ksf
**Total Deck DL = .125 + .013 + .025 + .085 = .248 ksf**

Abutment pile cap weight = 4'x4'x106' (along skew) x .15 kcf = 254 kips
Pier cap weight = 4' wide x 5' deep x 106' x .15 kcf = 318 kips
48" Column weight = 12.6 sq ft x say 13 ft x .15 kcf = 25 kips each
**Total abutment weight = 254 kips + 25 kips x 8 columns = 454 kips**
**Total pier weight = 318 kips + 25 kips x 8 columns = 518 kips**

Total Reactions (simple span,Service 1):

Abutment DL = .248 ksf x 96 ft width x 78 ft/2 + 454 kips = 1,383 kips
Abutment LL* = 61 kips x 6 lanes x 1.25 = 458 kips
**Abutment total = 1,841 kips**

Pier DL = .248 ksf x 96 ft width x 78 ft + 518 kips = 2,375 kips
Pier LL* = 90 kips x 6 lanes x 1.25 = 675 kips
**Pier total = 3,050 kips**

* Per AISC Moments, Shears and Reactions on Continuous Highway Bridges
(1.25 factor for HL93 loading)

Footing requirements:

Assume allowable 4,000 psf bearing pressure
Assume 4 ft footing depth, weight = 600 psf
Net allowable bearing pressure = 4,000 - 600 = 3,400 psf

Abutment footing area = 1841 kips / 3.4 ksf = 541 sq ft
Abutment footing volume = 341 sq ft x 4 ft / 27 cubic ft per CY = 51 CY

Pier footing area = 3,050 kips / 3.4 ksf =900 sq ft
Pier footing volume = 900 sq ft x 4 ft / 27 cubic ft per CY = 133 CY

**Total footing volume = 51 CY x 2 abutments + 133 CY = 235 CY**

**Estimated Cost Difference**

| Item | Unit | Quantity | Unit Cost | Amount |
|---|---|---|---|---|
| 42" diameter drilled shafts (SSR Alt 2) | LF | -360 | $190 | -$68,400 |
| Class D Concrete in spread footings | CY | 235 | $500 | $117,500 |
| | | | Total | $49,100 |

| EVALUATION |
|---|
| Idea Number: 02-007<br>Idea Description: Use precast-prestressed concrete box beams in lieu of precast-prestressed I-girders. |
| Advantages of alternative concept:<br>1. No formwork required to construct the deck slab<br>2. Shallower superstructure depth<br>3. Lower profile on Dillon Drive<br>4. Reduced retaining wall and embankment quantities<br>5. Safer construction over I-25<br>6. Less MOT on I-25 |
| Advantages of original concept:<br>1. Lower construction cost |
| Risks of implementing alternative concept:<br>1. None noted. |
| Conclusion:<br>Do not propose this idea because the estimated precast girder costs are approximately $600,000 greater than the current concept. |

**Calculations and/or Discussion**:

Current Girder Cost

1,876 lf @ $180/lf = $337,680

Box Beam Cost

3,744 lf @ $250/lf = $936,000

The difference in girder cost is approximately $600,000. There will be some savings in deck costs (thinner deck with less reinforcing) and savings in deck placement costs due to eliminating temporary formwork. Those savings are not expected to offset the increase in girder costs.

| EVALUATION |
|---|
| Idea Number: 02-012<br>Idea Description: Reduce the Dillon Drive Bridge length to accommodate the existing 4-lane template instead of the 6-lane template required in 2043. |
| Advantages of alternative concept:<br>1. Less expensive option for construction ASAP<br>2. Does not hinder present progress for a far off future condition |
| Advantages of original concept:<br>1. Does not preclude future widening of I-25 |
| Risks of implementing alternative concept:<br>1. Full bridge reconstruction will be needed when I-25 must be expanded |
| Conclusion:<br>Do not propose this idea because the projected cost savings do not justify eliminating the ability to widen I-25 without a complete rebuild. |

**Calculations and/or Discussion**:

One aspect that was investigated was that while it is fairly certain that the expansion of I-25 in this area to six lanes will ultimately happen, the question is when the traffic conditions would warrant the expansion. In addition, a future condition is that the Eden Interchange bridges do not currently meet the requirements for a 6-lane section and, as such, will also likely need to be reconstructed when this stretch of I-25 is expanded as the distance from the Dillon Drive bridge to the Eden bridges is about 2,000'.

To attempt to estimate the time when I-25 will need six lanes, traffic projections were obtained for this area from the CDOT DTD website. The projected bi-directional AADT values for future years are as follows:

- 2011 AADT (existing): 36,000 vehicles
- 2035: 64,512 vehicles
- 2050: 82,332 vehicles

To determine at what point I-25 would need to be expanded according to these numbers, a very rough capacity analysis was performed in accordance with the methodology in Chapter 23 (Basic Freeway Segments) of the 2000 Highway Capacity Manual. For freeway segments, the level of service is defined as overall density, from which traffic volumes can be calculated that relate the hourly traffic volume per lane to level of service. For freeways with a free-flow speed of 75 mph, which was assumed to be the free-flow speed for this stretch of I-25, the number of vehicles per hour per lane is 1,830 to meet level of service C and 2,170 vehicles for level of service D.

The DTD database provides a percentage value of AADT that reflects the Design Hour Volume, which is assumed to be the maximum number of vehicles on the facility. For I-25, this is 10% of AADT. Thus, the DHV in 2035 is 6,451 vehicles, and 2050 is 8,233 vehicles.

Based on the highway capacity manual values, a total hourly volume of 7,320 vehicles would represent the upper range of LOS C, while 8,680 vehicles would be the upper end range of LOS D (based on the lane volume as described above multiplied by 4 for 4 lanes). Extrapolating the DTD data showed that the overall traffic volumes that would be represented by LOS C and LOS D would occur in 2043 and 2053, respectively. These timeframes, while being quite far in the future, do not encompass the overall 75-year life span that is required for the bridge design.

To reduce the proposed bridge length to match the existing template would reduce the bridge length by 24', or the width of accommodating two additional lanes. At a cost reduction of approximately $3,000/lf of superstructure, this would result in a cost savings of $72,000. This is likely not enough cost savings to justify not building the bridge to accommodate a 6-lane I-25 section.

| EVALUATION |
|---|
| Idea Number: 03-001<br>Idea Description: Re-route drainage west of Drury Brothers and Wagner to the north 10x10 box culvert to by pass sediment and flow issues at the box culvert north of the proposed bridge. |
| Advantages of alternative concept:<br>1. Reduces sediment loading and potential flooding at box culvert north of the proposed bridge.<br>2. Removes need for proposed pre-sediment basin north of the proposed bridge. |
| Advantages of original concept:<br>1. Proposed sediment basin will remove sediment that is traveling down the existing channel. |
| Risks of implementing alternative concept:<br>1. Additional land and easement will be required.<br>2. Potential flooding of west side for existing properties.<br>3. Property acquisition will delay schedule. |
| Conclusion:<br>Do not propose this idea because the proposed property impacts and schedule implications do not warrant the cost savings trade off. |

**Calculations and/or Discussion**:

Realign the drainage channel along the west side of the existing industrial properties (approximately 900 feet) to tie into the existing channel and use the existing 10'x10' box culvert. A 50-foot easement will be required; assuming a 4-foot flat bottom trapezoid lined ditch 5-feet deep is constructed.

| Reroute West Drainage Channel from Structure C to Structure A | | | | |
|---|---|---|---|---|
| **Item** | **Unit** | **QTY** | **Unit Price** | **Total Price** |
| Trapezoidal Channel-900 LF | | | | |
| Earthwork | CY | 4000 | $ 9.00 | $ 36,000.00 |
| Rip Rap | CY | 10,400 | $ 120.00 | $ 1,248,000.00 |
| Property/Easement Acquisition | SF | 45,000 | $ 1.00 | $ 45,000.00 |
| | | | Subtotal Channel | $ 1,329,000.00 |
| Savings/Removal | | | | |
| Remove Pre sed Basin and Channel Improvements | EA | 1 | $ 1,600,000.00 | $ 1,600,000.00 |
| | | | Subtotal Structure C Removal | $ 1,600,000.00 |
| | | | | |
| | | | **Net Savings** | **$ 271,000.00** |

| EVALUATION |
| --- |
| Idea Number: 03-006<br>Idea Description: Utilize the area in the southwest quadrant of the Eden/I-25 interchange as a water quality storage area. |
| Advantages of alternative concept:<br>1. Provides water quality storage for existing highway and proposed offsite areas to the west of the interstate.<br>2. Allows fo additional borrow material for the project. |
| Advantages of original concept:<br>1. None noted. |
| Risks of implementing alternative concept:<br>1. None noted. |
| Conclusion:<br>Do not propose this idea because there is an added cost to install the pond with outlet structure and provide piping to the existing 10x6-ft box culvert to the south of the site. |

**Calculations and/or Discussion**:

| EVALUATION |
|---|
| Idea Number: 04-003<br>Idea Description: Make the Dillon interchange a Single Point Urban Interchange (SPUI). |
| Advantages of alternative concept:<br>1. Allows ramps to be constructed tighter to I-25, potentially reducing the cost of structures along the east frontage road. |
| Advantages of original concept:<br>1. Efficiently designed split diamond interchange.<br>2. More traditional interchange.<br>3. Lower cost. |
| Risks of implementing alternative concept:<br>1. Evaluation of this alternative will be an impact to the design schedule. |
| Conclusion:<br>Do not propose this idea because the skew of Dillon Drive to I-25 reduces the benefits of the SPUI on the north side of the bridge, where a tight ramp is needed most. |

**Calculations and/or Discussion**:

The SPUI concept was proposed to reduce the cost of the east frontage road, since typically ramps on a SPUI are very tight to the roadway intersected. After further evaluation, the skew of Dillon Drive to I-25 works against the ramp on the northeast corner of the bridge, which happens to be the ramp that is needed to be tighter to I-25. The construction cost of the SPUI would also be significantly higher than the currently proposed split diamond. Another disadvantage is that through-movements from I-25 northbound off ramp to the east frontage roads would be difficult to accommodate. We recommend failure of this option.

See sketch on next page.


ROOFING
EQUIPMENT
FRONTAGE ROAD
I-25
EXISTING I-25 ROW

| EVALUATION |
|---|
| Idea Number: 05-005<br>Idea Description: Use cast-in-place cantilever retaining walls supported on drilled shafts in lieu of MSE walls. |
| Advantages of alternative concept:<br>1. Reduce or eliminate the need to overexcavate and recompact the undocumented fills in the wall locations<br>2. Provides more options for aesthetic treatments with formliners<br>3. Eliminates MSE walls and associated peformance risks from the project |
| Advantages of original concept:<br>1. Lower construction cost |
| Risks of implementing alternative concept:<br>1. None noted. |
| Conclusion:<br>Do not propose this idea because the costs are over $2,000,000 higher than the current concept. |

**Calculations and/or Discussion**:

| Item | Unit | Quantity | Unit Cost | Amount |
|---|---|---|---|---|
| Deducts: | | | | |
| Mechanical Reinforcement of Soil | CY | -18625 | 25.00 | -465,625 |
| Precast panel facing | SF | -42980 | 17.00 | -730,660 |
| Overexcavate and recompact * | CY | -15520 | 35.00 | -543,200 |
| | | | Total | -1,739,485 |
| Add: | | | | |
| CIP Cantilever wall on drilled shafts | SF | 42980 | 90 | 3,868,200 |
| | | | | |
| | | | Net Difference: | 2,128,715 |
| | | | | |
| * Quantity is based on Item 7 in current estimate | | | | |
| | | | | |

| EVALUATION |
|---|
| Idea Number: 05-006<br>Idea Description: Use lightweight fill for roadway embankments. |
| Advantages of alternative concept:<br>1. May reduce or eliminate overexcavation and recompaction of undocumented fill.<br>2. Less lateral loading on retaining walls. |
| Advantages of original concept:<br>1. Traditional construction |
| Risks of implementing alternative concept:<br>1. Leading edge technology<br>2. Bridge application differs from landslide repair |
| Conclusion:<br>Do not propose this idea because the overall costs are prohibitive to implementation. |

**Calculations and/or Discussion**:

Lightweight polystyrene fill blocks have been recently used to provide a lightweight alternative to traditional fill material, and have found use on landslide repair projects, one example being CDOT project NH 050A-013, US-50 at Cerro Summit.

For this project, the materials that could be removed from the project and replaced with the polystyrene fill would be a cost savings, but the cost of the polystyrene blocks, based on the cost in the Cerro Summit project, would more than offset any savings. Perhaps the larger quantity of material could result in a reduced unit cost, but that would have to be extraordinary to allow for a cost-neutral situation.

| Polystyrene | | | | |
|---|---|---|---|---|
| | | | Add'l | |
| Item | Quantity | Unit Price | Cost | Savings |
| | | | | |
| Emb--CIP | 80000 cy | $9/cy | | $720,000 |
| Structure Exc. | 15520 cy | $35/cy | | $543,200 |
| Mech. Reinf. Soil | 18625 cy | $25/cy | | $465,625 |
| | | | | |
| Polystyrene Fill | 114145 cy | $50/cy** | $5,707,250 | |
| | | | | |
| | | NET COST ADD | $3,978,425 | |
| | | | | |
| ** This was for a project in a remote mountain area, so the unit cost may be high. | | | | |

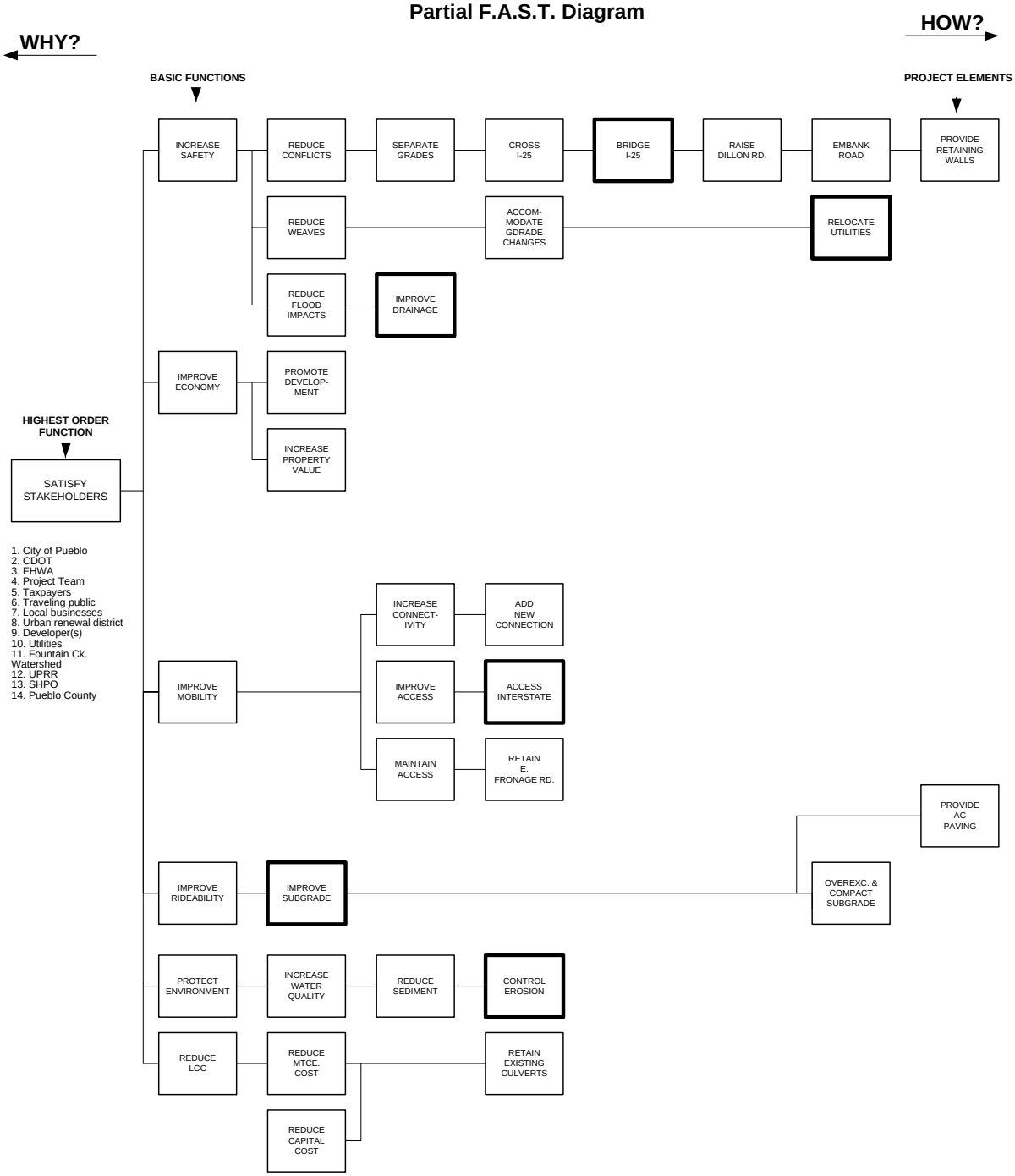
The following ideas were dismissed during the initial idea cull. They were not analyzed to the point of listing individual advantages and disadvantages.

**INITIALLY FAILED IDEAS TABLE**

| Idea No. | Idea Description | Reason for Failing Idea |
|---|---|---|
| 01-008 | Large roundabout (doughnut) interchange over I-25 | Would have a higher capital cost |
| 01-020 | Make Dillon Drive interchange a Diverging Diamond Interchange (DDI) to narrow bridge structure | Capital savings are too small for increased land use |
| 01-024 | Re-route 20-inch waterline closer to Drury Brothers property | The design doesn't call for relocating the water line |
| 01-025 | Eliminate west frontage road and use Elizabeth | Would make a very poor access situation for the existing businesses for a minor savings |
| 01-028 | Permeable overlay on bridge deck | This won't work on a bridge deck because of freezing issues |
| 01-032 | Take I-25 over Dillon Drive | Way more expensive |
| 01-033 | Lower Dillon Drive under I-25 | Expensive utility relocations, i.e., Century Link, water, & sewer. May create drainage usage. Traffic maintenance on I-25 during construction. |
| 01-040 | Partial clover leaf interchange with bridge slightly to south of proposed | No apparent advantage |
| 01-043 | Crib walls instead of MSE retaining walls | Aesthetically unacceptable |
| 02-002 | Specify Accelerated Bridge Construction (ABC) | No incentive for the additional cost |
| 02-005 | Steel bridge superstructure | Would be more expensive even when considering the proximity of CF&I |
| 02-010 | Lower I-25 and bridge profile | Would cost too much to lower I-25 and make a steep grade to tie into the Eden Interchange |
| 02-011 | Incorporate micropiles | No apparent advantage |
| 03-003 | Add a detention/water quality pond on the south side of I-25 | The existing culverts have insufficient capacity |
| 03-005 | Buy Drury Brothers and build large pond on their property | Can build ponds ind less expensive areas |
| 04-001 | Improve Eden interchange and eliminate Dillon interchange | Analyzed in the EA and failed |
| 04-002 | Eliminate Eden interchange and expand Dillon interchange | Would have too many adverse impacts on existing businesses |
| 05-004 | Eliminate MSE wall on west frontage road and replace with bridge | Would be more expensive |

# SECTION 6 – FUNCTION ANALYSIS SYSTEM TECHNIQUE (F.A.S.T.) DIAGRAM

## CITY OF PUEBLO
## Dillon Rd. Interchange Improvements
## Partial F.A.S.T. Diagram




**NOTE:**
**BOLDED BOXES INDICATE FUNCTIONS SELECTED FOR BRAINSTORMING BASED ON COST & POTENTIAL FOR IMPROVEMENT**

# SECTION 7 – BRAINSTORMING IDEAS

The following table lists all of the ideas generated by the VE Team. They are arranged by the function from which they were generated. Shotgun list ideas are alternatives the VE Team members initially brought to the workshop as a result of their pre-study assignment.

Each idea can be traced to its ultimate disposition by crosschecking the disposition column of this table with Sections 3, 4, and 5 of this report.

Some of the ideas whose disposition is listed as "As Designed" were also assumed to be "as will be designed."

PLEASE NOTE: One of the rules for creativity exercises in a formal VE Study requires the team members to "stretch" their imaginations by generating sometimes facetious and seeming nonsensical ideas in order to ideate a possible conceptual blockbuster. These ideas, too, are recorded in this table.

**Brainstorming List**

| Idea No. | Idea Description | Disposition | With |
|---|---|---|---|
| | **Shotgun List** | | |
| 01-001 | Detour traffic to Elizabeth St. during construction | As Designed | - |
| 01-002 | Re-align Dillon Drive eastern connection | Pass | - |
| 01-003 | Reallocate Century Link relocation cost | Pass | - |
| 01-004 | Combine the two northbound off ramps into a single auxiliary lane | Pass | - |
| 01-005 | Move bridge abutment foundations outside of the MSE walls | Pass | - |
| 01-006 | Support bridge abutments on MSE wall embankments | Pass | - |
| 01-007 | Change the bridge profile | Pass | - |
| 01-008 | Large roundabout (doughnut) interchange over I-25 | Fail | - |
| 01-009 | Phase the construction of Dillon Drive | Pass | - |
| 01-010 | Relocate the detention pond to south of Dillon Drive at Elizabeth Street | Pass | - |
| 01-011 | Re-route drainage to channel on south side of Dillon Drive | Pass | - |
| 01-012 | Install infiltration features to reduce flow rates | Pass | - |
| 01-013 | Modify the pavement design by changing structure coefficients | Pass | - |
| 01-014 | Extend Century Link vault manhole to eliminate relocation | Pass | - |
| 01-015 | Eliminate the East Frontage Road | Pass | - |
| 01-016 | City to buy CDOT right of way where Century Link located | Combine | 01-003 |
| 01-017 | Developer to maintain landscaping long term | Supplemental Recommendation | - |
| 01-018 | Do Finding in Public Interest (FIPI) for reinforced concrete pipe (RCP) | Supplemental Recommendation | - |
| 01-019 | Roundabout intersection East of bridge to eliminate super elevation and reduce profile | Pass | - |
| 01-020 | Make Dillon Drive interchange a Diverging Diamond Interchange (DDI) to narrow bridge structure | Fail | - |
| 01-021 | Eliminate bridge center pier | Pass | - |
| 01-022 | Eliminate an expansion joint | As Designed | - |

| Idea No. | Idea Description | Disposition | With |
|---|---|---|---|
| 01-023 | Use a pedestrian bridge built later to reduce bridge width | Pass | - |
| 01-024 | Re-route 20-inch waterline closer to Drury Brothers property | Fail | - |
| 01-025 | Eliminate west frontage road and use Elizabeth | Fail | - |
| 01-026 | Use tiered retaining walls | Supplemental Recommendation | - |
| 01-027 | Hard pipe culvert to east beyond East Frontage Road | Pass | - |
| 01-028 | Permeable overlay on bridge deck | Fail | - |
| 01-029 | Asphalt overlay on bridge deck | Supplemental Recommendation | - |
| 01-030 | Use the City's franchise agreement to force Century Link relocation | Combine | 01-003 |
| 01-031 | Use geotextile to minimize pavement section | Pass | - |
| 01-032 | Take I-25 over Dillon Drive | Fail | - |
| 01-033 | Lower Dillon Drive under I-25 | Fail | - |
| 01-034 | Xeriscaping | Pass | - |
| 01-035 | Reduce lane width on bridge | Pass | - |
| 01-036 | Remove bridge approach slabs | Combine | 01-006 |
| 01-037 | Multi use multi-use path in lieu of bike lanes | Pass | - |
| 01-038 | Southbound on ramp under bridge | Pass | - |
| 01-039 | Move East Frontage Road closer to the railroad | Combine | 01-002 |
| 01-040 | Partial clover leaf interchange with bridge slightly to south of proposed | Fail | - |
| 01-041 | Remove ramps from Dillon Dr. and keep as overpass only - access from Eden | Pass | - |
| 01-042 | Make bridge longer and reduce/eliminate retaining walls | Pass | - |
| 01-043 | Crib walls instead of MSE retaining walls | Fail | - |
| 01-044 | Move East Frontage Road closer to I-25 | Combine | 01-019 |
| 01-045 | Construct the monuments so they can accommodate the future signal equipment | Supplemental Recommendation | - |
| 01-046 | Make the bridge an integral part of the bridge abutments | | |
| | **BRIDGE I-25** | | |
| 02-001 | Single span bridge | Combine | 01-021 |
| 02-002 | Specify Accelerated Bridge Construction (ABC) | Fail | - |
| 02-003 | Consider spread footing foundation | Pass | - |
| 02-004 | Support abutments on MSE | Duplicate | 01-006 |
| 02-005 | Steel bridge superstructure | Fail | - |
| 02-006 | Cast in place bridge superstructure | Supplemental Recommendation | - |
| 02-007 | Incorporate box beams | Pass | - |
| 02-008 | Reduce bridge skew angle | Combine | 01-019 |
| 02-009 | Increase the bridge skew angle | Combine | 01-042 |
| 02-010 | Lower I-25 and bridge profile | Fail | - |
| 02-011 | Incorporate micropiles | Fail | - |
| 02-012 | Don't accommodate future I-25 expansion | Pass | - |

| Idea No. | Idea Description | Disposition | With |
|---|---|---|---|
| 02-013 | Build half of the bridge now and the rest later | Supplemental Recommendation | - |
| | **IMPROVE DRAINAGE** | | |
| 03-001 | Re-route west drainage channel | Pass | - |
| 03-002 | Permeable pavement on Dillon Drive | Pass | - |
| 03-003 | Add a detention/water quality pond on the south side of I-25 | Fail | - |
| 03-004 | Combine north and south culverts into a new larger culvert | Pass | - |
| 03-005 | Buy Drury Brothers and build large pond on their property | Fail | - |
| 03-006 | Use area west of Eden interchange for water quality/detention pond | Pass | - |
| | **ACCESS INTERSTATE** | | |
| 04-001 | Improve Eden interchange and eliminate Dillon interchange | Fail | - |
| 04-002 | Eliminate Eden interchange and expand Dillon interchange | Fail | - |
| 04-003 | Make Dillon interchange a single point urban interchange (SPUI) | Pass | - |
| | **IMPROVE SUBGRADE** | | |
| 05-001 | Pre-load the undocumented fill with embankment | Combine | 05-003 |
| 05-002 | Treat the subgrade with lime, cement, geogrid, geotextile, etc. | Pass | - |
| 05-003 | Incorporate 2 stage MSE walls | Pass | - |
| 05-004 | Eliminate MSE wall on west frontage road and replace with bridge | Fail | - |
| 05-005 | Drilled shaft supported cast in place concrete retaining wall in lieu of MSE walls | Pass | - |
| 05-006 | Use light weight fill | Pass | - |
| 05-007 | Use light weight concrete fill | Combine | 05-006 |
| | **ENHANCE AESTHETICS** | | |
| 06-001 | Phase in the aesthetic treatments on bridge | Supplemental Recommendation | - |
| 06-002 | Make bridge aesthetics integral to the bridge | Pass | - |
| 06-003 | Simplify bridge railing, e.g., remove swoop | Pass | - |
| 06-004 | Phase installation of landscaping, especially the trees and shrubs | Combine | 06-004 |
| | **RELOCATE UTILITIES** | | |
| 07-001 | Build an access to the existing Century Link fiber optic vault in lieu of relocating it. | Combine | 01-014 |

# SECTION 8 – REVIEW BOARD DECISIONS

# Summary of Responses to Value Engineering Proposals & Supplemental Recommendations Project

**Definitions of Response Terminology**

**Accept:** The proposal will be accepted and the original design concept will be modified accordingly.

**Accept with Modifications:** Portions of the recommendation will be accepted and/or the proposal will be modified somewhat.

**Table the Decision:** The proposal's disposition will be decided at future date. An individual should be assigned responsibility for follow-through.

**Decline:** The proposal will not be accepted and the original design concept will be implemented

| VE Proposal No. or Supplemental Recommendation No. | VE Proposal or Supplemental Recommendation Description | Lead Responder | Response | Total Initial Savings ($) | Total Cost Savings ($) [1] |
|---|---|---|---|---|---|
| P01-015 | Eliminate the East Frontage Road | **K. Fredell** | **Accept with Modifications** | $3,600,000 | $3,600,000 |
| P01-007 | Change the bridge profile along Dillon Drive to more closely follow the existing topography. | **K. Fredell** | **Accept** | $140,000 | $140,000 |
| P01-009 | Phase the construction of Dillon Drive. | **K. Fredell** | **Decline** | | |
| P01-019 | Incorporate a roundabout intersection at the east end of the Dillon Drive bridge to provide intersection flexibility and eliminate the need for superelevation on the bridge. | **K. Fredell** | **Accept** | $1,220,000 | $1,220,000 |

| | | | |
|---|---|---|---|
| P01-002 | Re-align Dillon Drive east of I25 to re-align the I25 off-ramp and the East Frontage Road closer to the UPRR ROW. | **K. Fredell** | **Decline** |
| P01-004 | Combine the two northbound off ramps into one split ramp, with the Eden ramp parallel to I-25 under the Dillon Drive Bridge. | **K. Fredell** | **Decline** |
| P01-011 | Re-Route drainage east along the south side of Dillon Drive from existing corrugated metal pipe (ECMP)to the proposed detention pond and box culvert located on the south side of the proposed Dillon Drive Bridge. | **D. Elsner** | **Decline** |
| P01-023 | Provide a separate pedestrian structure over I-25 and narrow the Dillon Drive Bridge. | **K. Fredell** | **Decline** |
| P01-035 | Reduce the widths of the traffic lanes on the bridge from 12 feet to 11 feet consistent with City standards | **K. Fredell** | **Decline** |
| P01-006 | Support abutments on spread footings supported by the mechanically stabilized earth (MSE) wall embankments | **M. Hildahl** | **Decline** |
| P01-005 | Construct bridge abutment foundations outside of the MSE abutment walls | **M. Hildahl** | **Decline** |

| | | | | | |
|---|---|---|---|---|---|
| P01-042 | Lengthen the bridge in order to reduce or eliminate retaining wall quantities | **M. Hildahl** | **Decline** | | |
| P05-003 | Use 2-stage MSE walls in lieu of 1-stage walls | **M. Hildahl** | **Decline** | | |
| P06-002 | Replace stone veneer with cast in place concrete with formliners. | **K. Bish** | **Accept** | $390,000 | $390,000 |
| P01-014 | Extend Century Link vault manhole vertically or add access man-way to eliminate the need for relocating the fiber-optic facility. | **B. Sloan** | **Accept** | $90,000 | $90,000 |
| P01-003 | Reallocate the Century Link fiber optic relocation costs from the project to century link. | **B. Sloan** | **Decline** | | |
| | | **SUPPLEMENTAL RECOMMENDATIONS** | | | |
| SR03-004 | Add an additional box culvert to accommodate excess 100 year flows not able to be conveyed by the current infrastructure at Design Points C and H. | **D. Elsner** | **Decline** | | |
| SR01-029 | Provide 3" Hot Mix Asphalt overlay on Dillon Dr. bridge deck. | **K. Fredell** | **Accept** | | |

| | | | |
|---|---|---|---|
| SR03-002 | Place permeable pavement on Dillon Dr. | **K. Fredell** | **Decline** |
| SR05-002 | Optimize pavement design | **K. Fredell** | **Accept** |
| SR01-018 | Do a Finding in Public Interest (FIPI) for reinforced concrete pipe selection | **K. Fredell** | **Decline** |
| SR02-013 | Build half of the bridge now and the rest later | **K. Fredell** | **Decline** |
| SR02-006 | Construct a CIP and Post-tensioned concrete bridge superstructure in lieu of a precast prestessed concrete girders. | **K. Fredell** | **Decline** |
| SR06-001 | Phase the construction of the aesthetic treatments on the bridge. | **K. Fredell** | **Decline** |
| SR01-046 | Make bridge aesthetics an integral part of the bridge abutment | **K. Bish** | **Accept** |
| SR01-034 | Use xeriscape landscaping on the project | **K. Bish** | **Accept** |

| | | | | | |
|---|---|---|---|---|---|
| SR06-003 | Simplify bridge railing, e.g., remove swoop, i.e., choose less ornate design. | **K. Bish** | **Decline** | | |
| SR01-017 | Require the developer or Urban Renewal District to maintain the landscaping long term | **K. Fredell** | **Decline** | | |
| SR01-045 | Construct the bridge monuments so they can accommodate the future signal equipment | **K. Fredell** | **Decline** | | |
| | | | **Total Cost Savings of Proposals Accepted =** | $5,440,000 | $5,440,000 |

Notes:
1. The Total Cost Savings is the designer's estimated cost savings minus the estimated cost for the design change.
2. The "Total Cost Savings of Proposals" is the sum of all savings associated with "accepted" or "partially accepted" proposals.
3. ND - Not Determined, NA - Not Applicable

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-002 |
| ***Description:*** | Re-align Dillon Drive east of I25 to re-align the I25 off-ramp and the East Frontage Road closer to the UPRR ROW. |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | This would impact the open channel we envisioned and may require the extension of the 6- x 6-ft RCB to its outlet at the UPRR. It would also impact the existing stone stacked culvert located within the railroad ROW below an existing embankment which is the ultimate discharge point Basins C and H. |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $3,100,000 |
| **Designer Savings Estimate** | $3,100,000 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $0 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-003 |
| ***Description:*** | Reallocate the Century Link fiber optic relocation costs from the project to century link. |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | In coordination with Centurylink to choose the best acceptable option. |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $500,000 |
| **Designer Savings Estimate** | $500,000 |
| **Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $0 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-004 |
| ***Description:*** | Combine the two northbound off ramps into one split ramp, with the Eden ramp parallel to I-25 under the Dillon Drive Bridge. |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | FHWA will only allow this configuration in the temporary condition, before the EFR bridge is constructed. The design team incorporated a portion of this concept by extending the Dillon Bridge to allow for either this improvement, or a third lane on I-25, providing future flexibility. |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $3,300,000 |
| **Designer Savings Estimate** | $0 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $20,000 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | -$20,000 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-005 |
| ***Description:*** | Construct bridge abutment foundations outside of the MSE abutment walls |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | No cost savings |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $0 |
| **Designer Savings Estimate** | $0 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $0 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-006 |
| ***Description:*** | Support abutments on spread footings supported by the mechanically stabilized earth (MSE) wall embankments |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | The soil will not comfortably support a spread footing. |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $42,000 |
| **Designer Savings Estimate** | $42,000 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $0 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-007 |
| ***Description:*** | Change the bridge profile along Dillon Drive to more closely follow the existing topography. |
| ***Recommended Action:*** | Accept |
| ***Discussion:*** | Profile has been modified to slope to the east, reducing the fill material on the east side of the bridge. |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $140,000 |
| **Designer Savings Estimate** | $140,000 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $140,000 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-009 |
| ***Description:*** | Phase the construction of Dillon Drive |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | Bridge will be built to its ultimate width |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $0 |
| **Designer Savings Estimate** | $0 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $0 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-011 |
| ***Description:*** | Re-Route drainage east along the south side of Dillon Drive from existing corrugated metal pipe (ECMP)to the proposed detention pond and box culvert located on the south side of the proposed Dillon Drive Bridge. |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | a. Flows from Basin C are directed today to the existing 6- x 6-ft RCB north of Dillon Drive not to the existing 6- x 4-ft RCB south of Dillon Drive. To change the point of discharge could result in flooding properties which are not flooding today and, at a minimum, the impact of this flooding would need to be evaluated and permission obtained from all property owners would be needed.<br><br>b. The pond is a water quality pond by the 6- x 4-ft RCB, not a detention pond, and does not attenuate flows. A large area and volume would be required for a detention pond which would attenuate flows. I do not know if this volume could be provided easily within the existing topography. This cost was not considered in the evaluation.<br><br>c. Re-directing flows to the 6- x 4-ft RCB would mean (assuming all of Basins H and C3 are directed to this RCB) would mean over 600 cfs would be delivered to the 6- x 4-ft RCB, well in excess of its capacity. CDOT has determined the 6- x 6- ft RCB can pass the flow at a head exceeding CDOT standards. |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | <br>$1,500,000<br>$0<br>N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $0 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-014 |
| ***Description:*** | Extend Century Link vault manhole vertically or add access man-way to eliminate the need for relocating the fiber-optic facility. |
| ***Recommended Action:*** | Accept |
| ***Discussion:*** | In coordination with Centurylink to choose the best acceptable option. |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $400,000 |
| **Designer Savings Estimate** | $100,000 |
| **Reason for Difference in Estimates** | Savings was assumed to be the difference between leaving in place or relocating. There is some cost to building the structure to incapsulate the vault. |
| ***Estimated Design Cost*** | $10,000 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $90,000 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-015 |
| ***Description:*** | Eliminate the East Frontage Road |
| ***Recommended Action:*** | Accept |
| ***Discussion:*** | East Frontage Road will be designed to 30% level of design, and then included in future phases of construction |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $3,600,000 |
| **Designer Savings Estimate** | $3,600,000 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $3,600,000 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-019 |
| ***Description:*** | Incorporate a roundabout at the east end of the Dillon Drive bridge to provide intersection flexibility and eliminate the need for superelevation on the bridge. |
| ***Recommended Action:*** | Accept |
| ***Discussion:*** | Roundabouts will be located at both intersection, on the east and west of the Dillon Drive Bridge. |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $1,520,000 |
| **Designer Savings Estimate** | $1,520,000 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $300,000 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $1,220,000 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-023 |
| ***Description:*** | Provide a separate pedestrian structure over I-25 and narrow the Dillon Drive Bridge. |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | City does not want separate structures to maintain. |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $2,500 |
| **Designer Savings Estimate** | $0 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $0 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-035 |
| ***Description:*** | Reduce the widths of the traffic lanes on the bridge from 12 feet to 11 feet consistent with City standards |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | City has declined this option as part of the maintenance agreement with CDOT. |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $44,000 |
| **Designer Savings Estimate** | $44,000 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $0 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P01-042 |
| ***Description:*** | Lengthen the bridge in order to reduce or eliminate retaining wall quantities |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $100,000 |
| **Designer Savings Estimate** | $100,000 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $0 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P05-003 |
| ***Description:*** | Use 2-stage MSE walls in lieu of 1-stage walls |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $100,000 |
| **Designer Savings Estimate** | $100,000 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $0 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | P06-002 |
| ***Description:*** | Replace stone veneer with cast in place concrete with formliners. |
| ***Recommended Action:*** | Accept |
| ***Discussion:*** | |
| ***Construction Cost Savings Comparison*** | |
| **VE Team Savings Estimate** | $390,000 |
| **Designer Savings Estimate** | $390,000 |
| **Reason for Difference in Estimates** | N/A |
| ***Estimated Design Cost*** | $0 |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | $390,000 |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR01-017 |
| ***Description:*** | Require the developer or Urban Renewal District to maintain the landscaping long term |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | A maintenance agreement is in place |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR01-018 |
| ***Description:*** | Do a Finding in Public Interest (FIPI) for reinforced concrete pipe selection |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR02-013 |
| ***Description:*** | Build half of the Dillon Bridge now and the rest at a later time |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | City does not want to build only a portion now. |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR02-006 |
| ***Description:*** | Construct a CIP and Post-Tensioned concrete bridge superstructure in lieu of a precast-prestressed concrete girders |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | Greater traffic impacts and higher construction costs. |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR03-004 |
| ***Description:*** | Provide 3" Hot Mix Asphalt overlay on Dillon Dr. bridge deck. |
| ***Recommended Action:*** | Accept |
| ***Discussion:*** | Bridge will be designed to accommodate additional 3" HMA overlay on the bridge deck. |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR06-001 |
| ***Description:*** | Use xeriscape landscaping on the project |
| ***Recommended Action:*** | Accept |
| ***Discussion:*** | Some xeriscape elements have been included in the design |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR01-045 |
| ***Description:*** | Construct the bridge monuments so they can accommodate the future signal equipment |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | Future signals are no longer needed with the roundabout configuration. |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR06-001 |
| ***Description:*** | Make bridge aesthetics an integral part of the bridge abutment |
| ***Recommended Action:*** | Accept |
| ***Discussion:*** | Pre cast panels will be incorporated into the bridge abutment. |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR03-002 |
| ***Description:*** | Place permeable pavement on Dillon Dr. |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | Results in increased cost and maintenance. |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR03-004 |
| ***Description:*** | Add an additional box culvert to accommodate excess 100 year flows not able to be conveyed by the current infrastructure at Design Points C and H. |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | Results in additional project cost |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR05-002 |
| ***Description:*** | Optimize pavement design |
| ***Recommended Action:*** | Accept |
| ***Discussion:*** | Pavement Design has been modified for increased ABC and decreased HMA on Dillon Drive only. |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR06-001 |
| ***Description:*** | Phase the construction of the aesthetic treatments on the bridge. |
| ***Recommended Action:*** | Decline |
| ***Discussion:*** | Funding source does not allow for aesthetic phasing. |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |

| **Response to Value Engineering Proposal or Supplemental Recommendation Project:** | |
|---|---|
| | |
| ***Proposal or SR No.:*** | SR06-001 |
| ***Description:*** | Simplify bridge railing, e.g., remove swoop, i.e., choose less ornate design. |
| ***Recommended Action:*** | Accept |
| ***Discussion:*** | Aesthetic elements have been approved by the urban renewal authority, a funding source of the project. |
| ***Construction Cost Savings Comparison***<br>**VE Team Savings Estimate**<br>**Designer Savings Estimate**<br>**Reason for Difference in Estimates** | |
| ***Estimated Design Cost*** | |
| ***Total Cost Savings (Designer Savings Cost Estimate - Estimated Design Cost)*** | |