SCHMUESER | GORDON | MEYER

MEMORANDUM

TO: **Larry Dragon, LoVa Director**
Dean Gordon, SGM

FROM: **Lee Barger, SGM**

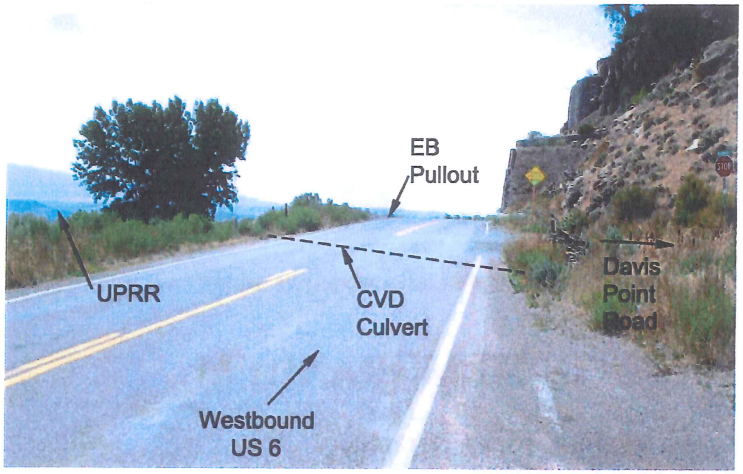
DATE: **December 3, 2009**

SUBJ: **Project # 2005-542.003**
US 6/Davis Point Trail – Preliminary Design Report

This design report was prepared to evaluate the existing conditions and design options for a portion of the Valley segment of the LoVa trail where it crosses the intersection of US 6 and Davis Point Road (CR 235), east of Silt. This location is a pinch point in the trail alignment, given the existing topography and proximity of the Cactus Valley Ditch and Union Pacific Railroad to the highway. This report will examine the existing conditions at the intersection, while exploring three design options for the Valley segment through this section. Future connections to this trail will allow a separated trail for pedestrians and cyclists from the Town of Silt to Coal Ridge High School and beyond. Currently, no trail exists on either side of this project area. The project area is entirely within the CDOT right-of-way, subjecting designs to the State's design standards, review process, and licensing agreement for a shared easement.

Existing Conditions

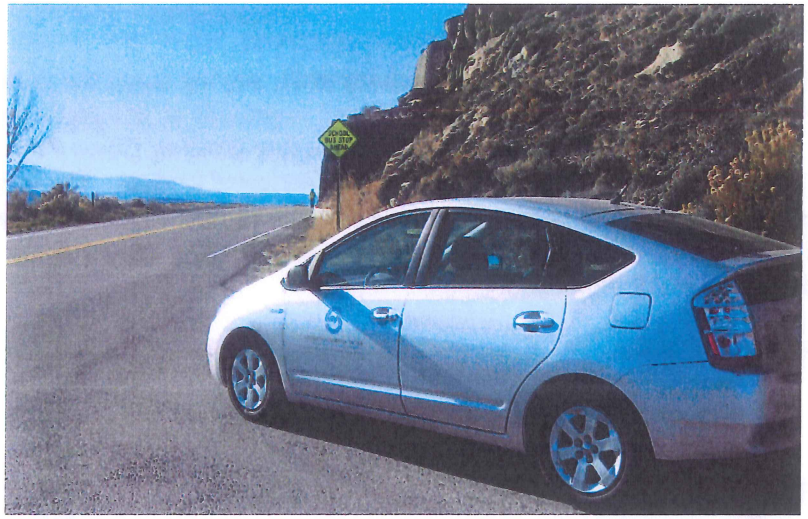
US Highway 6 is posted at 55 mph at the intersection of Davis Point Road. Davis Point intersects at about a 41° skew to the north, while the Cactus Valley Ditch (CVD) crosses US 6 in a box culvert just east of the intersection and travels west, parallel to the highway for about 500', where it crosses US 6 in a box again. A third box for the ditch exists at the far west end of the project



US 6 has two 12' travel lanes and 3' paved shoulders. The westbound shoulder is reduced to about 1 – 2' at the base of the large retaining wall, protected by Type 7 (Jersey) barrier at the shoulder. A small vertical curve crests near the west end of the retaining wall. The horizontal curvature occurs as a compound curve with a 1400' radius curve on the west connected to an 850' radius on the east. The highway is superelevated at 5% to the north (toward the retaining wall) through this compound curve, which is one percent below the AASHTO standard for this design speed.

Minimal signage exists approaching this intersection. Intersection ahead warning signs exist in both directions for Davis Point Road. In the eastbound direction, a "Falling Rock" sign is mounted west of the intersection warning sign. In the westbound direction, a "School Bus Stop Ahead" sign is mounted just east of the retaining wall to warn of the driveway access approximately 900' to the west of the sign. No curve or chevron signs exist and no guardrail is present to protect the steep slopes to the ditch measuring 1:1 in most places. The culverts crossing US 6 are poorly marked by Type 3 delineators.

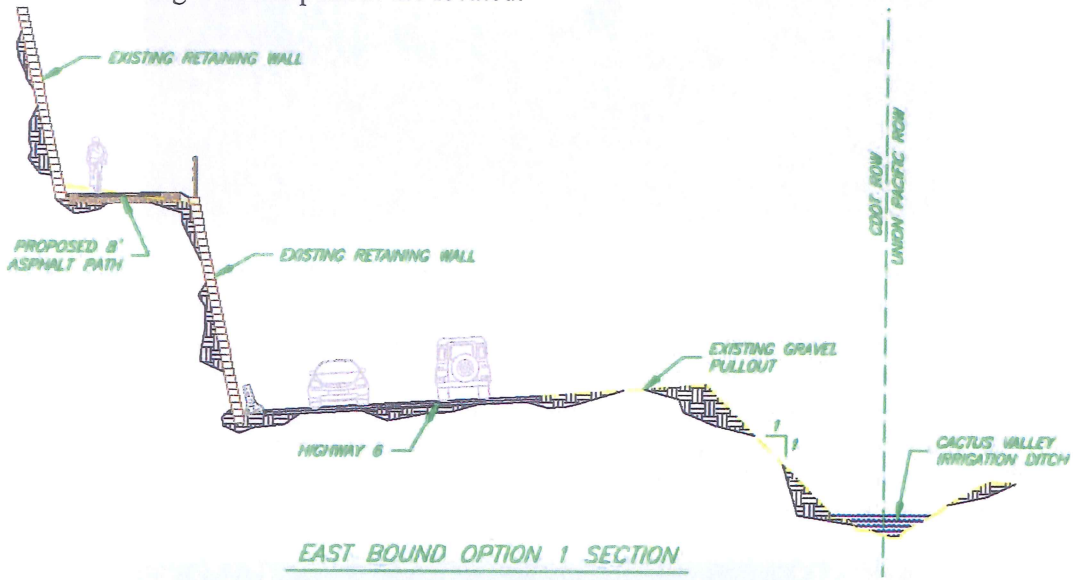
According to CDOT's State Highway Access Code, the required entering sight distance for this intersection is 550' for passenger cars and pickups and 715' for single unit trucks over 10000 lb GVW, depending on the design vehicle for this intersection. Since this intersection serves primarily residential traffic, 550' should be adequate. Sight distance was measured in the field to determine if there are any existing deficiencies at the intersection as a result of the horizontal and vertical curves and the retaining wall. The photo below shows the sight distance measurement for entering sight distance, which measured to be 275' to the west and was unlimited to the east from the intersection. Existing sight distance to the west is approximately <u>half</u> of the required sight distance per CDOT.



As the photo shows, the vehicle was stopped one car length (15') ahead of the existing stop sign for Davis Point (not in picture). The person is shown in the picture standing in the center of US 6 about 275' from the driver's eye. If the sight distance were measured from the vehicle stopped at the stop sign, existing sight distance would be closer to 171', which is the sight distance that CDOT quoted from their database for this intersection. The entering sight distance is restricted by the retaining wall in the above photo and not the vertical curve in the road. The photo below shows the westbound approach to Davis Point (still obstructed from view by the wall). This photo was taken approximately 550' feet west of the intersection.

Design Option 1

This option climbs to the top of the existing retaining wall, staying along the north side of US 6. Improvements are proposed to extend the retaining wall to provide an 8% grade up to the existing wall platform and an 8% grade down to a switchback before crossing Davis Point at grade. The trail will span the three CVD box culverts with 40' prefabricated bridges. The trail width will be reduced to 8' along the top of the existing wall, but remains 10' elsewhere. The preliminary cost for this option is approximately $1.09M. Below is a typical section shown in the curve of US 6 where the existing wall and pullout are located.



Opportunities

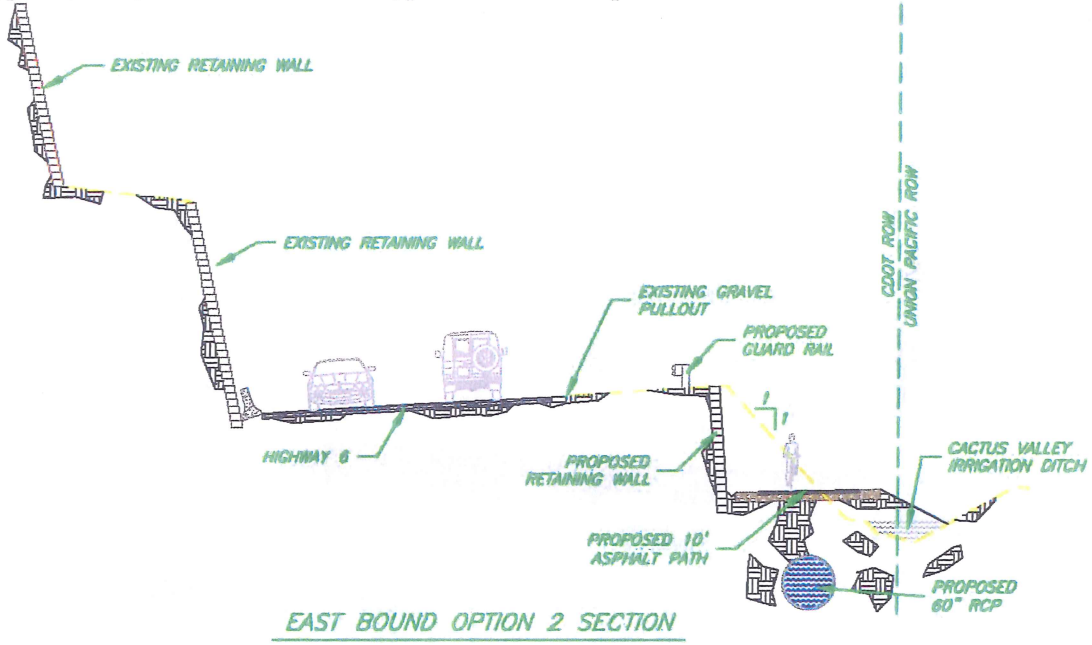
Of all the alternatives, Option 1 creates the least impact to US 6 traffic during construction, would require the simplest review by CDOT, and is the least expensive. This option avoids any crossing of the highway for trail users, other than the at-grade crossing of Davis Point. Option 1 creates a separate, dedicated path for trail users, which protects users from the flow of highway and rail traffic. This option improves and expands the retaining walls above the road to improve the stability of this steep slope. A handrail will be located at the top of the wall and should be designed to double as a rock fall mitigation fence to provide additional protection to highway vehicles. This option provides the safest protection from traffic and the most scenic experience for the trail user. The existing eastbound pullout remains under this option.

Constraints

The 8% grade of the path through the switchback by Davis Point may not get full use by most road cyclists; since they may choose to use the shoulder of US 6 for this short section. Pedestrians, young cyclists, and less-serious, recreational cyclists will be the primary users for

Design Option 2

This option crosses US 6 twice in box culverts and diverts the CVD into a siphoned 60" RCP throughout the project length. The trail shifts to the south side of US 6 between the culverts where it continues below the highway grade supported by a retaining wall structure and protected by guardrail for its entire length. Grades entering the box culverts range from 8% to 3.5% and the trail maintains a consistent 10' width for the entire length. The trail will span one CVD box culverts with a 40' prefabricated bridge at the west end of the project. Extensive wing walls, retaining walls, utility relocations, and traffic control are associated with this project considering there are two road cuts to install the culverts and RCP. The preliminary cost for this option is approximately $1.6M. Below is a typical section of Option 2 shown in the curve of US 6.



Opportunities

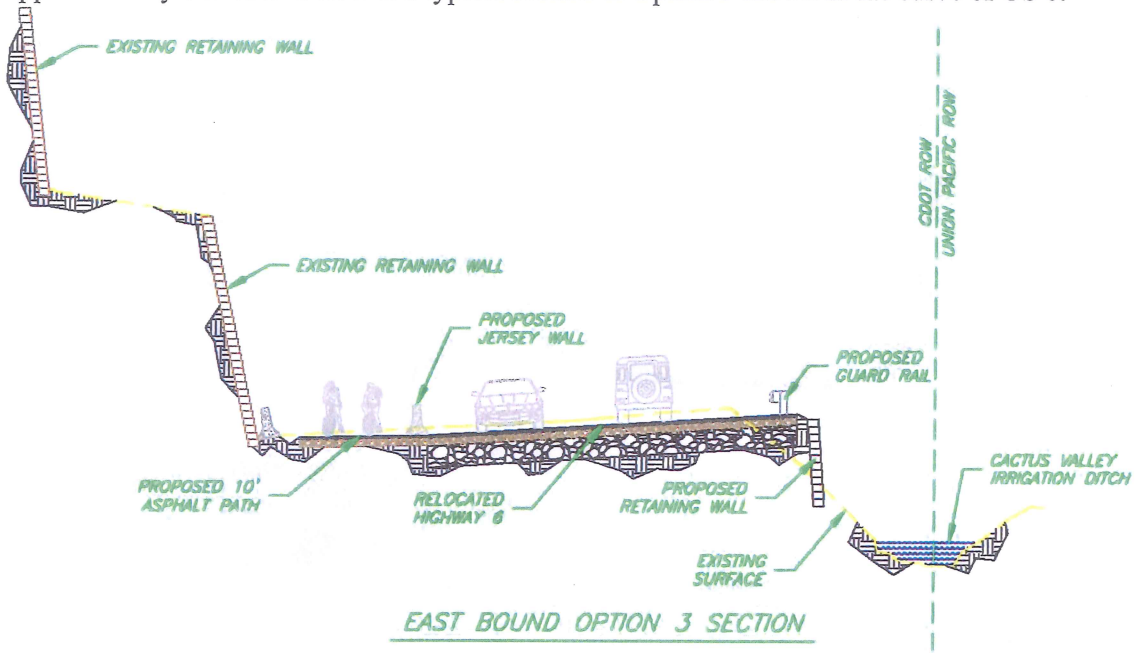
This option protects trail users from highway traffic and falling rock by separating the two users by wall, guardrail, and box culverts, and avoids disturbing the existing retaining wall and slopes on the north side of US 6. The installation of guardrail along the entire project length improves the safety for both highway and trail users. The existing eastbound pullout remains under this option.

Constraints

Of all the alternatives, Option 2 creates the most impact to US 6 traffic during construction and is the most expensive. Substantial traffic control will be necessary to construct the box culverts and retaining walls. The CDOT review process becomes considerably lengthier with this amount of

Design Option 3

This option maintains the trail alignment along the north side of US 6 at the base of the existing retaining wall, while reconstructing part of the highway by realigning the travel lanes to the south to improve the roadway geometry. The trail essentially follows the existing westbound shoulder profile and will be separated from the travel lanes by a Type 7 (Jersey) barrier. The trail will span two CVD box culverts with 40' prefabricated bridges and pass over the CVD east of Davis Point by extending the box culvert. A retaining wall protected by guardrail will be necessary to support the highway and make up the grades between the CVR and the edge of highway. The intersection with Davis Point is realigned to remove the skew at the intersection. The trail will maintain a consistent 10' width through the project length. The preliminary cost for this option is approximately $1.43M. Below is a typical section of Option 3 shown in the curve of US 6.



Opportunities

This option protects trail users from highway traffic by separating the two users using Type 7 barrier. It also avoids disturbing the existing retaining wall and slopes on the north side of US 6. This option avoids any crossing of the highway for trail users, other than the at-grade crossing of Davis Point. The installation of guardrail along the entire project length improves the safety for highway users. Sight distance for entering vehicles at Davis Point is improved by this option, since the highway lanes are realigned to the south and the Davis Point approach is realigned to intersect closer to 90°. Sight distance will improve by approximately 100' under this option. Roadway geometry is improved to AASHTO and CDOT standards.