Memorandums

Subject:	Castle Creek Bridge SH 82 Footprint and Sensitivity Analysis of Alternatives
Project Name:	New Castle Creek Bridge Investigative Study with Revised Scope (the Project)
Attention:	City of Aspen (the City)
From:	Jacobs
Date:	July 31, 2024
Copies to:	Project File

1. Introduction

This memorandum (memo) summarizes a high-level footprint and National Environmental Policy Act (NEPA) assessment performed by Jacobs for three alternatives focused on the segment of State Highway (SH) 82 between Maroon Creek Road and 7th Street. These alternatives, which are described in Section 2, are refined versions of alternatives previously considered in the Entrance to Aspen Environmental Impact Statement (EIS) process. These alternatives include the following:

- Phased Preferred Alternative (PA): Phased PA version of the from the 1998 Record of Decision (ROD) (FHWA 1998).
- Couplet (one-way pair): Considered in the Draft Environmental Impact Statement (DEIS) but eliminated during the comparative screening. An alternative version of the couplet was evaluated in the Supplemental DEIS but used a different alignment through the open space and included a roundabout at Cemetery Lane. The couplet (one-way pair) has been studied further since the EIS/ROD and has been referred to more recently as the Splitshot.
- Three-lane Shifted Bridge: Three-lane options were considered in the DEIS but eliminated in the fatal flaw screening. Another version of the three-lane option was developed more recently to address the aging Castle Creek Bridge and improve operations along SH 82 while avoiding a reroute of SH 82 through the Marolt-Thomas property to the intersection of 7th Street and Main Street.

The assessment presented in this memo is intended to provide an indication of how the alternatives may fair in a supplemental NEPA evaluation. Understanding potential outcomes of a NEPA alternatives process informs decision making to identify an efficient path forward given the regulatory context for improvements to this segment of SH 82.

2. Alternatives

The alternatives evaluated in the EIS (CDOT 1997) included a combination of highway and intersection improvements, a transit system, and an incremental transportation management program. The alternatives in this memo focus on highway, intersection, and transit improvements.

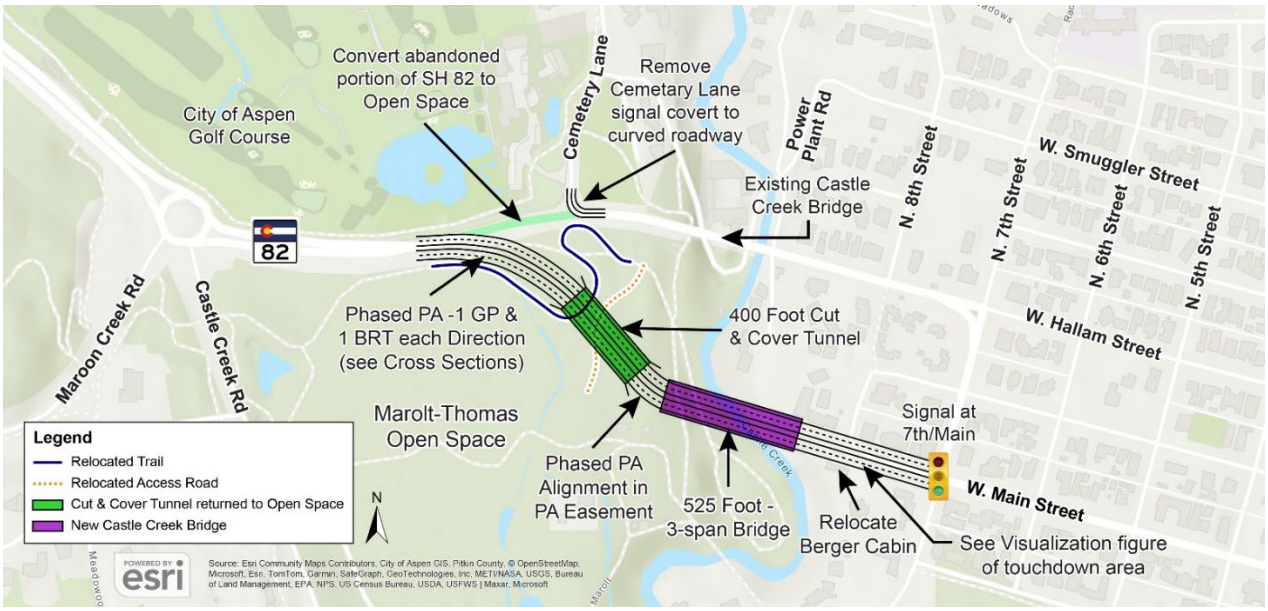
2.1 Phased Preferred Alternative

The Phased PA follows the modified-direct alignment east of the Maroon Creek Road roundabout. The SH 82 alignment would shift southeast across the Marolt-Thomas property and through a cut-and-cover tunnel 400 feet long and connect with the intersection of 7th Street and Main Street via a new Castle Creek Bridge. The initial phase of the PA in this segment includes widening SH 82 to include one travel lane and one bus-only lane in each direction. The new bus-only lanes would connect with the existing bus-only lanes that exist on SH 82 west of Maroon Creek Road.

Refinements to the Phased PA design include smoothing curves through the Marolt-Thomas property, routing the Marolt Trail over the cut-and-cover tunnel, shortening the span of the Castle Creek Bridge, and providing a signalized intersection with a left turn lane on 7th Street. The roadway width constructed for this initial phase would not accommodate future light rail that could ultimately replace the bus-only lanes in the corridor. The abandoned segment of SH 82 west of Cemetery Lane would be removed and restored as open space; however, it could also be used for a future evacuation event. This would provide the town with a redundant route. The remainder of the old SH 82 alignment between Cemetery Lane and 7th Street would be converted to a local street. Figure 1 shows a plan view of the Phased PA with minor design refinements. Figures 2 and 3 shows the cross sections of the Phased PA along the modified-direct alignment from the Supplemental DEIS. The cross section for the tunnel is slightly wider than the other segments to provide adequate space for future light rail transit (LRT).

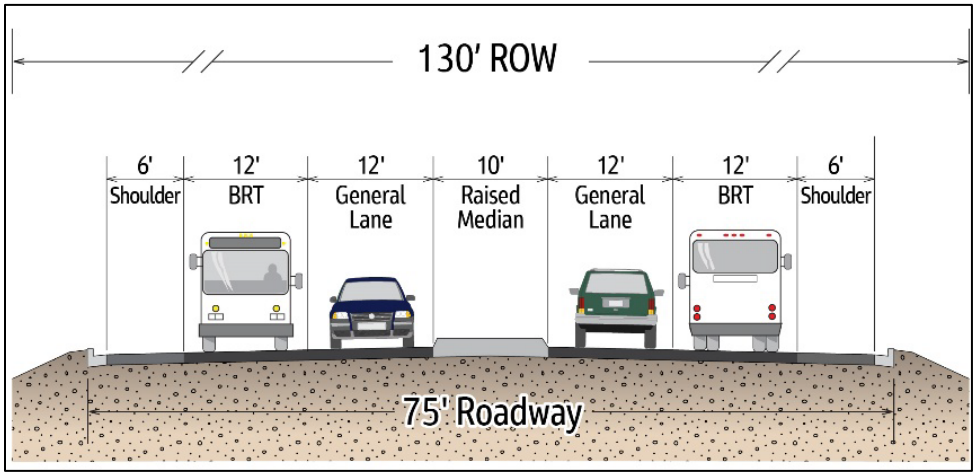
This alignment still assumes the ROD condition that the Berger Cabin at 835 West Main Street would be relocated on the parcel and land acquisition is needed for a good portion of the parcel (see Figure 2, roadway cross section). This alignment impacts parking on both sides of West Main Street (west of 7th Street), however, right-of-way would not be required on the north side of West Main Street. Additional parking could be provided on both sides of North 7th Street, as the same number of lanes on North 7th Street is no longer needed for this version. Figure 4 was developed to visualize how the alignment looks when it touches down between Castle Creek and North 7th Street.

Figure 1. Phased Preferred Alternative – Plan View



GP =general purpose
BRT = bus rapid transit

Figure 2. Phased PA – Phased PA – Roadway Cross Section



ROW = right-of-way

Figure 3. Phased Preferred Alternative – Cut-and-cover Tunnel Cross Section

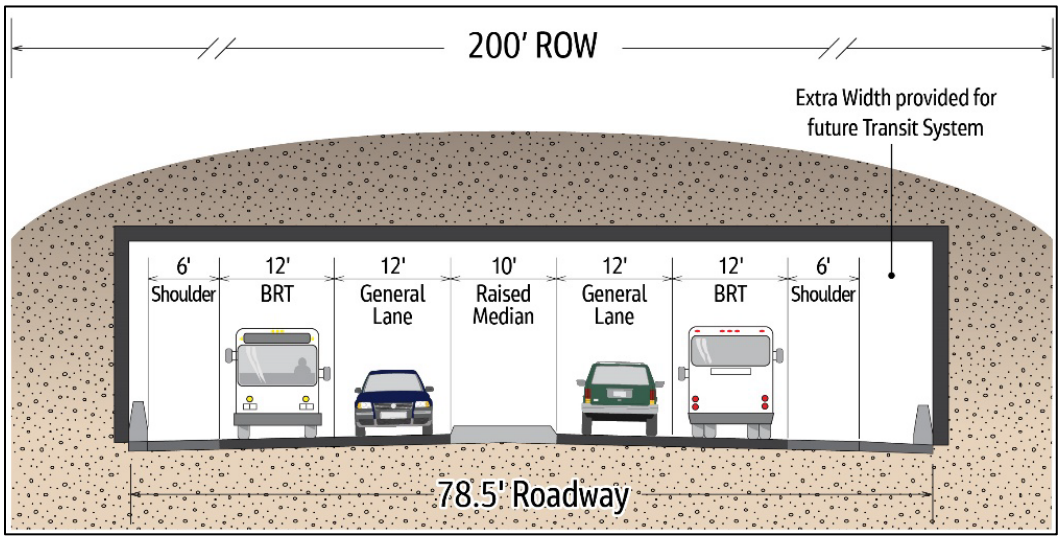


Figure 4. Phased Preferred Alternative – Visualization of Touchdown before 7th and Main Street

2.2 Splitshot

The Splitshot (referred to as the couplet [one-way pair] in the DEIS) uses a combination of the existing alignment and the modified-direct alignment east of the Maroon Creek Road roundabout. Just east of the roundabout, SH 82 would split into two separate alignments, each with one direction of traffic. Traffic would flow westbound (out of town

or out-bound) on the existing SH 82 alignment and eastbound (into town or in-bound) on the modified-direct alignment through the Marolt-Thomas property. Each alignment would have one travel lane and one bus-only lane. The new bus-only lanes would connect with the existing bus-only lanes that exist on SH 82 west of Maroon Creek Road. The roadway width constructed for this initial phase would not accommodate the future light rail that could ultimately replace the bus-only lanes in the corridor. Figure 5 shows a plan view of the Splitshot with minor design refinements. Figures 6 and 7 show the cross section of Splitshot along the modified-direct alignment. The cross section for the tunnel is slightly wider than the other segments to provide adequate space for future LRT.

There are two key differences between the Splitshot evaluated in this memo and the couplet alignment (one-way pair) evaluated in the DEIS. The first is that the alternative in the DEIS did not include the roundabout at Maroon Creek Road that exists today. Without this roundabout, operational problems were identified for this alternative because eastbound SH 82 traffic from Cemetery Lane would have to turn onto westbound SH 82 and make a U-turn at Maroon Creek Road where eastbound and westbound traffic come together. The couplet (one-way pair) was screened out during the comparative screening because of the U-turn issue and was not evaluated in detail in the DEIS. The roundabout at Maroon Creek Road minimizes these operational issues. The other difference is that the Splitshot design evaluated in this memo uses the cut-and-cover tunnel through the Marolt-Thomas property to minimize open space impacts. Because the couplet alignment (one-way pair) in the DEIS was screened out before detailed evaluation, it was never evaluated with profile options (at-grade or cut-and-cover).

Other minor refinements to the Splitshot design include smoothing curves with a slightly more direct route through the Marolt-Thomas property than is used for the Phased PA, routing the Marolt Trail over the tunnel, shortening the span of the new Castle Creek Bridge, providing a sidewalk across the new Castle Creek Bridge, and providing a signalized intersection with left turn lane on 7th Street. To improve operations for westbound traffic along the existing SH 82 alignment, there is curve softening on the northeast corners of North 7th Street and Main Street.

This alignment still assumes the ROD condition that the Berger Cabin at 835 West Main Street would be relocated on the parcel and land acquisition is needed for a good portion of the parcel (refer to Figure 6, roadway cross section). This alignment impacts parking along the south side of Main Street (west of 7th Street). On the north side, the footprint is minimized to maintain local access to North 8th Street and reconfigures parking. Additional parking could be provided on the west side of North 7th Street because the same number of lanes on North 7th Street is no longer needed for this version. Figure 8 was developed to visualize how the alignment looks when it touches down between Castle Creek and North 7th Street.

Figure 5. Splitshot – Plan View

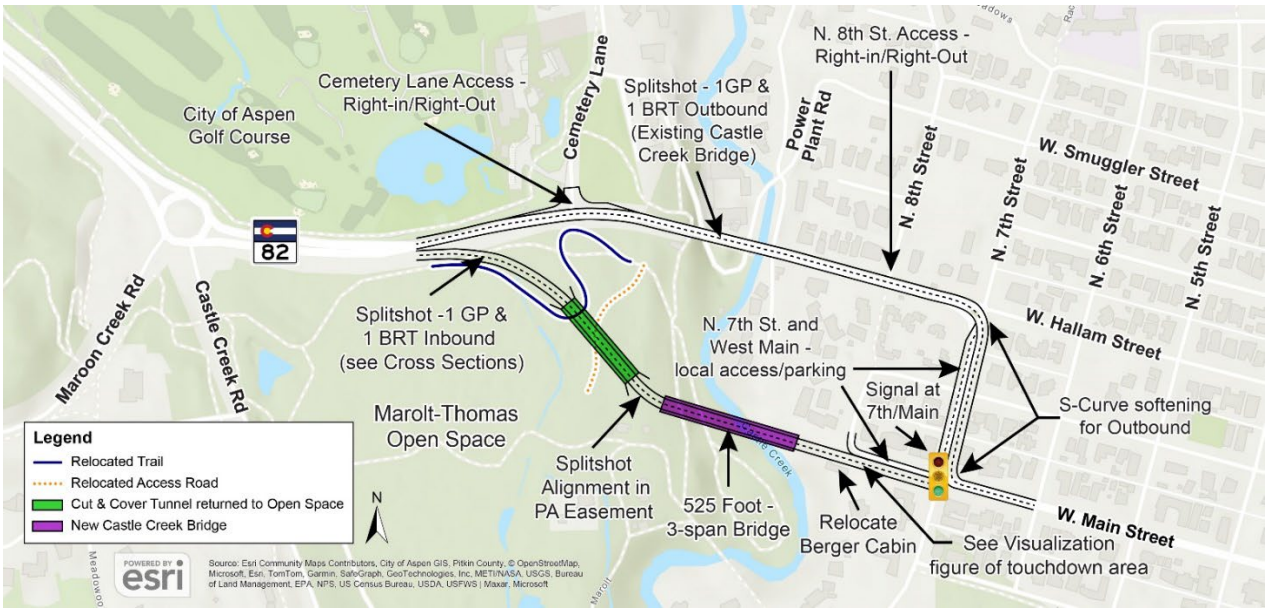


Figure 6. Splitshot – Roadway Cross Section

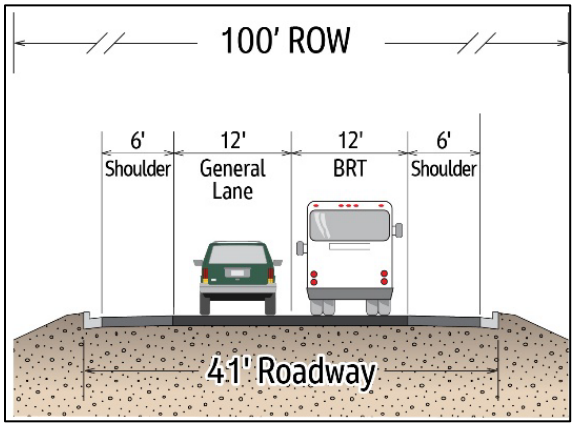


Figure 7. Splitshot – Cut-and-cover Tunnel Cross Section

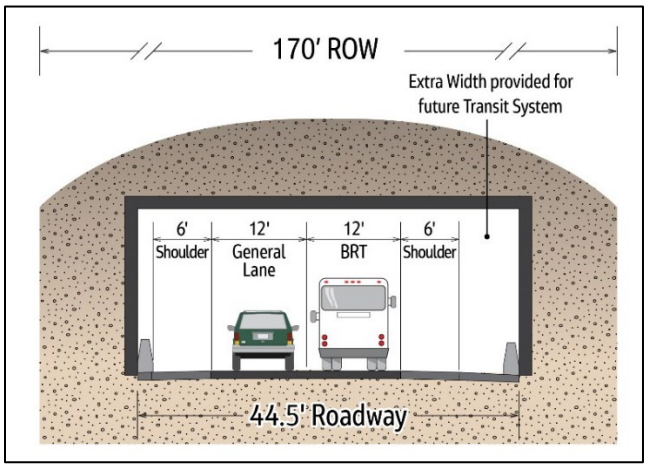


Figure 8. Splitshot – Visualization of Touchdown before 7th and Main Street

2.3 Three-lane Shifted Bridge

The Three-lane Shifted bridge uses the existing SH 82 alignment east of the Maroon Creek Road roundabout. The existing Castle Creek Bridge would be replaced with a wider bridge to facilitate continued two-lane traffic on the bridge during construction. The new bridge would include one general purpose travel lane in each direction, a bus-only lane in the westbound (out of town) direction, and a sidewalk. The new bus-only lane would connect with the existing westbound bus-only lane and a relocated bus stop along SH 82 west of Maroon Creek Road via a westbound bus bypass lane added west of Cemetery Lane. The bridge width would not accommodate a future eastbound (inbound) bus lane on the existing SH 82 alignment. However, in the future, the bridge could be reconfigured to accommodate one general purpose lane in each direction and a single-track light rail service line. This alternative also includes softening the S-curves along SH 82 to improve traffic flow and safety. The S-curves will feature a general purpose and dedicated bus lane in each direction of SH 82 essentially from 8th Street to 5th Street. Figure 9 shows a plan view of the Three-lane Shifted Bridge with bus bypass lane. The bus bypass lane requires extending the existing pedestrian underpass, and the current bus stop is relocated to the west. Additionally, the trail along the City's golf course is relocated through this stretch. Figures 10 and 11 show select cross sections of this option.

Figure 9. Three-lane Shifted Bridge – Plan View

Figure 10. Three-lane Shifted Bridge – Bus Bypass Lane Cross Section

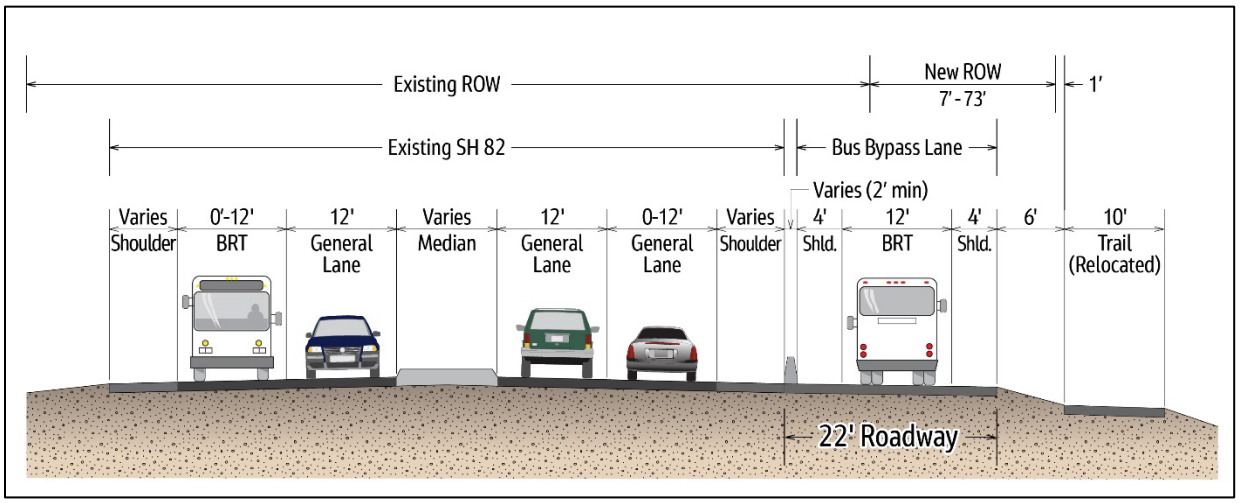
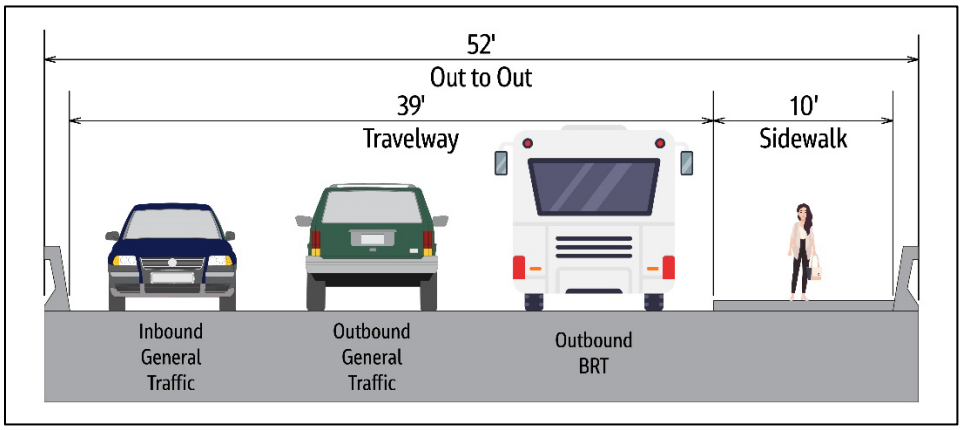


Figure 11. Three-lane Shifted Bridge – Castle Creek Bridge Cross Section



2.4 Footprint Analysis

Jacobs developed conceptual designs for all three alternatives to establish footprints for the sensitivity analysis (refer to Attachment 1 for details). For the PA and Splitshot alternatives, this approach involved replicating most of the alternative descriptions in the EIS, making modifications, assumptions, and accommodations as needed. The platform widths for these two alternatives do not include the LRT envelope across the Marolt-Thomas open space, except in the cut-and-cover tunnel.

Estimating property impacts required developing land survey data. An existing ground surface was generated from light detection and ranging (LiDAR) data and supplemented with field survey in the area from the Castle Creek to the 7th Street and West Main Street intersection. Roadway cross-section elements were generated at specific intervals to determine cut and fill limits for each alternative.

Jacobs also prepared conceptual bridge design for the Phased PA and Splitshot alternatives to identify the basic footprints of the bridge and potential construction impacts (details in Attachment 1). This information has been prepared for the Three-lane Shifted alternative as part of the SH 82 Over Castle Creek Bridge Feasibility Study (Jacobs 2024a).

3. High-level NEPA Assessment

In a July 10, 2024, letter (CDOT, pers. comm. 2024), the Colorado Department of Transportation (CDOT), in coordination with the Federal Highway Administration (FHWA) and the state attorney general's office, responded to several EIS and bridge replacement questions from the City. In this letter, CDOT indicated that regardless of how the remainder of the corridor improvements are funded, the PA will remain in effect unless CDOT and FHWA choose to withdraw the ROD, and that a new Supplemental Environmental Impact Statement (SEIS) (at a minimum) would be required to change the decision made in the ROD. Given this information, this high-level NEPA assessment

uses screening criteria consistent with the purpose, needs, and objectives developed during the Entrance to Aspen EIS process. The intent is to provide some indication of how these three alternatives might compare to each other in a SEIS or new NEPA process. This assessment is intended only to guide decision making and not intended to supplant NEPA analyses. Outcomes for NEPA processes cannot be predetermined.

This assessment factors in updated conditions and information including the following:

- Although the PA in the Final EIS and ROD assumed there would be a roundabout at Maroon Creek Road, the alternatives in the DEIS did not. This includes the Splitshot (couplet) that was eliminated during the comparative screening in the DEIS.
- Design refinements for the S-curves are included in the Splitshot and Three-lane Shifted bridge alternatives to improve traffic flow and safety on SH 82. The Phased PA alternative does not include these improvements, as SH 82 would no longer use the existing alignment under that option.
- Traffic modeling of the alternatives has been completed using future 2050 traffic volumes, providing information on transportation and transit metrics.
- Historic survey work completed this summer provides updated information on historic resources.
- Transportation corridor ROW across the Marolt-Thomas open space has been conveyed to CDOT (executed in 2002 for 4.47 acres [City 2002]).

Criteria used in this assessment are identified in Table 1. Clean Air Act requirements and community acceptability were not considered for the purposes of this exercise. Because the project area is no longer a nonattainment area, conformity would not be required to meet Clean Air Act requirements. The state has new rules related to greenhouse gas (GHG) emissions, but GHG modeling is beyond the scope of this exercise. Determining community acceptability would require outreach efforts that also are beyond the scope of this exercise. However, the criteria used give a reasonable indication of how these alternatives may fare in a SEIS or new NEPA process. Table 1 summarizes the results followed by a discussion of how each alternative performed. A rating of good, fair, or poor is assessed for each alternative.

Table 1. Screening Summary

Criteria	Phased PA	Splitshot	Three-lane Shifted
Operations			
Provides capacity for forecasted person trips (year 2050)	**Good** Provides capacity for eastbound and westbound travel forecasts. Bus operations in dedicated bus lanes can be increased to meet demand.	**Fair** Improves overall capacity, but travel times in the morning peak period are substantially impacted by Cemetery Lane traffic using the Maroon Creek Road roundabout to go east on SH 82. Bus operations in dedicated bus lanes can be increased to as demand increases, but operations at the Maroon Creek Road roundabout would continue to negatively affect ability to serve forecasted trips during the morning peak period.	**Fair** Performs better than the Splitshot for morning peak period but offers no improvement over the No Build scenario for eastbound travel. Offering only a westbound bus lane limits ability to serve more person trips as demand increases.
Limits vehicle trips into Aspen	**Good** No new capacity for passenger vehicles. Limits vehicle trips by encouraging transit use into Aspen.	**Fair** No new capacity for passenger vehicles. Ability to limit vehicle trips into Aspen is impacted by slow transit travel times in morning peak period caused by substantial operational issues at Maroon Creek Road roundabout.	**Poor** No new capacity for passenger vehicles. Offers no incentive for eastbound mode-shift for travelers coming into Aspen.

Criteria	Phased PA	Splitshot	Three-lane Shifted
Provides more accessible transportation that increases the mobility of the community	**Good** Eastbound and westbound bus -only lanes enhance transit service, improving the mobility of the community.	**Fair** Eastbound and westbound bus-only lanes enhance transit service, improving the mobility of the community. However, no improvements for morning peak-period travel.	**Fair** Westbound bus-only lane with bypass enhances transit service. Improves mobility for westbound travel only.
Allows for future transit options and upgrades	**Good** Could accommodate future LRT platform with minor widening. Existing easement across Marolt-Thomas accommodates future LRT.	**Good** Could accommodate future LRT platform with minor widening. Existing easement across Marolt-Thomas accommodates future eastbound LRT.	**Fair** Three-lane bridge and S-curve widening is designed to accommodate a single-track LRT and two general purpose lanes in the future.
Safety			
Provides system redundancy for emergency access	**Good** Provides a secondary route for emergency access.	**Good** Provides a secondary route for emergency access.	**Poor** Provides no system redundancy for emergency access.
Addresses known safety issues on SH 82 and S-curves	**Good** Eastbound and westbound SH 82 travelers avoid S-curves, and both directions of traffic are separated by raised median.	**Good** Eastbound SH 82 travelers avoid S-curves. Softens S-curves to facilitate westbound travelers. One-way couplet separates opposing directions of traffic.	**Fair** Softens S-curves to facilitate both directions of travel. Provides wider lanes in curves. No separation for opposing directions of traffic.

Criteria	Phased PA	Splitshot	Three-lane Shifted
Provides safe access at all intersections for all movements	**Good** New signalized intersection at Main and 7th Street improves safety by providing controlled access for all movements. Cemetery lane intersection converted into two-way curve eliminating intersection conflict points.	**Good** New signalized intersection at Main and 7th Street maintains safety by restricting some movements. Cemetery Lane traffic routed through Maroon Creek Road roundabout.	**Fair** Some intersection access restricted to reduce conflicts in S-curves. Cemetery Lane signal remains.
Provides safety improvements for cyclists and pedestrians	**Fair** Reduces risk of vehicle and pedestrian conflicts on existing alignment by preserving existing sidewalks on existing Castle Creek Bridge and removing SH 82 traffic from this route. No pedestrian crossing over new Castle Creek Bridge because of platform width restriction.	**Good** Preserves existing sidewalks on existing Castle Creek Bridge. Adds an additional 10-foot pedestrian crossing across new Castle Creek Bridge.	**Fair** Provides 10-foot pedestrian crossing across Castle Creek along north side (existing location).
Community and Environmental Impacts			
Minimizes/ mitigates property/ROW impacts	**Good** ~0.8 acre of ROW needed (existing transportation easement through Marolt-Thomas minimizes additional ROW needs).	**Good** ~0.8 acre of ROW needed (existing transportation easement through Marolt-Thomas minimizes additional ROW needs). ROW also could be needed along existing alignment for westbound LRT.	**Fair** ~1.7 acres of ROW needed (impacts along the City golf course; potential risk for full property acquisition under shifted bridge).

Criteria	Phased PA	Splitshot	Three-lane Shifted
Minimizes/ mitigates historic resource impacts	**Fair** No adverse impacts with mitigation; assume Berger Cabin is relocated.	**Fair** No adverse impacts with mitigation; assume Berger Cabin is relocated.	**Good** No adverse impacts.
Minimizes/ mitigates recreation impacts	**Fair** SH 82 rerouted through Marolt-Thomas open space; tunnel minimizes impacts. Reroute Marolt Trail over cut-and-cover tunnel. Loss of open space was already mitigated in 2002 land swap.	**Fair** Inbound direction of SH 82 rerouted through Marolt-Thomas open space. Tunnel minimizes impacts. Reroute Marolt Trail over cut-and-cover tunnel. Loss of open space was already mitigated in 2002 land swap.	**Fair** Minor encroachment into Bugsy Barnard Park; encroaches into the golf course requiring reconfiguration of one hole; realign Golf Course Trail.

3.1 Phased Preferred Alternative Assessment

3.1.1 Operations

The Phased PA provides dedicated bus lanes in each direction to provide reliable transit service with improved transit peak-period travel times as compared with the No Build scenario (Jacobs 2024b). This alternative performs the best of the alternatives evaluated and the improved service would likely increase demand for transit. By providing improved transit service, the Phased PA is expected to limit passenger vehicle trips into Aspen by encouraging transit use over passenger vehicle trips. The Phased PA provides no additional capacity for passenger vehicle trips. Improved transit service under the Phased PA increases the mobility of the community both for eastbound and westbound trips.

The refined version of the Phased PA evaluated in this memo narrows the cross section as compared with the version in the ROD to minimize impacts and, therefore, does not provide a transit envelop for future light rail. However, only minor widening would be needed to accommodate future light rail, and the existing transportation easement through the Marolt-Thomas property would accommodate this future transit improvement.

3.1.2 Safety

The Phased PA provides a new bridge across Castle Creek while preserving the existing Castle Creek Bridge. The existing alignment, which would connect to Cemetery Lane, would serve as an alternative route in case of a substantial emergency or congestion along the new SH 82 alignment. This alternative would address existing SH 82 safety issues by diverting SH 82 traffic from the S-curves, eliminating the need for SH 82 vehicles to navigate these sharp curves. Additionally, both directions of traffic would be separated by a 10-foot raised median (Figure 2) which eliminates potential head-to-head traffic conflicts that exist today. A new signalized intersection would be implemented at 7th Street and Main Street, providing controlled access movements to further improve safe operations. The new Castle Creek Bridge crossing would not include sidewalks; however, the existing bridge would continue to serve pedestrians and would not carry the SH 82 traffic, reducing potential for traffic and pedestrian conflicts.

3.1.3 Community and Environmental Impacts

Because CDOT and the City already executed a permanent easement through the Marolt-Thomas property, much of the ROW needed for the Phased PA already exists. However, an additional 0.8 acre would be needed on the private Berger property, east of Castle Creek, because the alignment traverses this property to connect with West Main Street.

Although an easement exists through the Marolt-Thomas property, the property is currently used for recreation. Implementing the Phased PA would introduce a transportation route through the open space, disrupting existing recreation activities. The cut-and-cover tunnel is intended to minimize the amount of disruption. The Marolt Trail would be routed over the cut-and-cover tunnel with no impact to long-term recreation use of this facility. Additionally, as part of the 2002 land swap to mitigate open space impacts, CDOT already provided far more land to the City and Pitkin County for open space than would be impacted once the PA is fully implemented.

The historic survey conducted this summer confirmed previous historic determinations from the EIS and 1987 Reevaluation (CDOT and FHWA) and recommended an additional property—the condominiums at 937 to 947 West Hallam Street—as potentially eligible to the National Register of Historic Places. The PA would not affect this property.

3.2 Splitshot Assessment

3.2.1 Operations

Similar to the Phased PA, the Splitshot provides dedicated bus lanes in each direction. This alternative provides improved transit service with improved evening peak-period transit travel times as compared with the No Build scenario (Jacobs 2024b). This improved service is expected to increase demand for transit. However, morning peak-period travel times are substantially impacted by operational issues caused by traffic from Cemetery Lane using the Maroon Creek Road roundabout to turn around and head east into Aspen. If the morning transit travel times discourage transit use for commuters heading into Aspen in the morning, these same commuters would be using a vehicle to return home in the evening. Because travel times are directly related to ridership, the level of transit ridership would not likely be as high as the Phased PA. The lower transit ridership also likely equates to the Splitshot not performing quite as well as the Phased PA in limiting passenger vehicle trips into Aspen. The dedicated bus lanes would still improve accessibility and mobility for the community. Use of a bus bypass lane at the Maroon Creek Road roundabout, as is used in the Three-lane Shifted bridge, would alleviate the transit issues but would substantially increase recreation impacts similar to the Three-lane Shifted bridge impacts.

Similar to the Phased PA, the Splitshot uses a cross section that does not provide a transit envelop for future light rail. This design decision was intended to reduce impacts. However, only minor widening would be needed to accommodate future light rail for eastbound travelers, and the existing transportation easement through the Marolt-Thomas property would accommodate this future transit improvement. Additional widening would also be needed for westbound transit users along the existing alignment, which would require additional ROW.

Regarding historic effects, the Splitshot is not expected to impact the condominiums at 937 to 947 West Hallam Street.

3.2.2 Safety

Similar to the Phased PA, the Splitshot provides two routes across Castle Creek, providing system redundancy in case of a substantial emergency or congestion along SH 82 between Maroon Creek Road and Main Street. The one-way couplet eliminates the potential for head-to-head traffic conflicts that exist today. This alternative would further address SH 82 safety issues by diverting eastbound SH 82 traffic from the S-curves, greatly reducing the number of vehicles traveling through these sharp curves. The S-curves would be softened and widened to safely facilitate westbound travel. A new signalized intersection with westbound channelization would be planned for Main Street and 7th Street, providing controlled access movements. The Cemetery Lane signal would be eliminated to facilitate westbound travel. This alternative provides a 10-foot-wide sidewalk on the new Castle Creek Bridge, which adds redundancy and improves connectivity for bicyclists and pedestrians. The existing 8-foot and 5-foot sidewalks on the existing Castle Creek Bridge would remain.

3.2.3 Community and Environmental Impacts

Because CDOT and the City already executed a permanent easement through the Marolt-Thomas property, much of the ROW needed for the Splitshot already exists. No additional ROW would be needed along the existing alignment. However, an additional 0.8 acre would be needed on the private Berger property east of Castle Creek because the alignment traverses this property to connect with West Main Street. Even though this platform width is narrower than the Phased PA, the acreage is the same because the alignment severs the property into two pieces, making the north portion unusable and thereby assumed to be acquired.

Although an easement exists through the Marolt-Thomas property, the property is currently used for recreation. Implementing the Splitshot would introduce a transportation route through the open space, disrupting existing recreation activities. The cut-and-cover tunnel and narrower platform width is intended to minimize the amount of disruption. The Marolt Trail would be routed over the cut-and-cover tunnel with no impact to long-term recreation use of this facility.

This alternative would require some ROW from the condominiums at 937 to 947 West Hallam Street and, therefore, would impact this potentially historic property.

3.3 Three-lane Shifted Bridge Assessment

3.3.1 Operations

Unlike the Phased PA and the Splitshot alternatives, the Three-lane Shifted bridge alternative only has a dedicated westbound bus lane rather than dedicated bus lanes in both directions. The proposed westbound bus lane would bypass the Maroon Creek Road roundabout, which would result in better westbound peak-hour transit travel times when compared to the No Build scenario or the Phased PA and Splitshot alternatives (Jacobs 2024b). However, eastbound transit travel times for this option do not offer an improvement over the No Build scenario and do not perform as well as the Phased PA. This alternative does not perform as poorly as the Splitshot during the morning peak period due to the operations issues with the Splitshot at the Maroon Creek Road roundabout. Inbound traffic (general and transit) is impaired by the additional extra Cemetery Lane traffic. With transit improvements only in the westbound direction, the Three-lane Shifted bridge alternative would not limit passenger vehicle trips into Aspen and does less to improve accessibility and mobility for the community.

The Three-lane Shifted bridge alternative is not designed to accommodate bus-only lanes in both directions in the future. However, the bridge is designed to accommodate a single-track LRT in the future. This would allow LRT in both directions; however, operations would be limited by the single track across the bridge.

3.3.2 Safety

The Three-lane Shifted bridge alternative does provide an additional lane across the Castle Creek crossing for emergency access or evacuations but does not provide second redundant route. This alternative does not eliminate potential head-to-head vehicle conflicts along this segment of SH 82. The S-curves would be softened and widened to improve safety for both directions of travel, with some intersection movements restricted. The existing 8-foot and 5-foot sidewalks on the existing Castle Creek Bridge would be replaced with a new 10-foot-wide sidewalk over Castle Creek, which is wider for bicyclists and pedestrians to safely pass by one another.

3.3.3 Community and Environmental Impacts

This alternative requires approximately 1.7 acres of ROW along the existing SH 82 alignment, impacting the golf course and the Bugsy Barnard Park properties. No amenities at the Bugsy Barnard Park would be impacted, but reconfiguration of one hole would be needed to accommodate widening at the golf course. The Golf Course Trail would also need to be realigned. Long-term recreation impacts are anticipated to be minimal with mitigation.

4. Conclusion

Based on the alternative evaluation criteria used in the EIS, the Phased PA performs the best of the three alternatives. It is the only alternative that would meet person trip capacity demands in the morning and evening peak periods. The transit improvements are likely to encourage transit use, thereby limiting vehicle trips into Aspen and improving the mobility of the community. The Phased PA also has good potential for future transit options because the ROW for LRT is already purchased, and minimal widening would be needed to upgrade from bus-only lanes to LRT. The Phased PA addresses known safety issues along SH 82 and at intersections and provides system redundancy for emergency evacuations. The ROW impacts of implementing the Phased PA are minimal because most of the necessary ROW was already acquired by CDOT in 2002. Routing SH 82 through the Marolt-Thomas open space would disrupt recreation activities; however, the cut-and-cover tunnel would reduce the long-term disruption. Additionally, as part of the 2002 land swap to mitigate open space impacts, CDOT already provided far more land to the City and Pitkin County for open space than would be impacted once the PA is fully implemented (City 2002).

As currently designed, the Splitshot has operational issues at the Maroon Creek Road roundabout that would substantially impact travel times in the morning peak period. This issue limits the effectiveness of implementing the bus-only lanes. This issue could be mitigated somewhat by using a bus bypass lane at the Maroon Creek Road roundabout, similar to what is used in the Three-lane Shifted bridge alternative. With this design change, the Splitshot may perform similarly to the Phased PA. However, future transit expansion for the Splitshot may be more challenging than the Phased PA because the westbound LRT is routed along the existing alignment and would need additional ROW.

The Three-lane Shifted bridge alternative would not achieve some of the Entrance to Aspen Final EIS objectives because it only provides a dedicated bus lane in the westbound direction. This alternative would not meet 2050 forecasted person trips because it offers no improvement over the No Build scenario for eastbound travel into Aspen. Consequently, it would not limit vehicle trips into Aspen and does little to improve mobility for the community. Also, it would not provide a redundant route for emergency evacuation.

If these three alternatives were evaluated in an Entrance to Aspen SEIS, the Phased PA would likely remain as the selected alternative without substantive changes to the evaluation criteria.

5. References

City of Aspen (City). 2002. *Quitclaim Deed*.

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Attachment 1: Footprint Analysis

Alternatives Methods and Approach

Jacobs developed conceptual designs for all three alternatives evaluated in the sensitivity analysis to determine approximate footprints.

For the Phased PA alternative, this approach involved the following:

- Replicating most of the description and platform widths of the Preferred Alternative (PA) as documented in the 1998 Record of Decision (ROD) (FHWA 1998).
  One exception to the platform width is omitting the light rail transit (LRT) envelope across the Marolt-Thomas open space (except in the cut-and-cover tunnel).
- Establishing an alignment with profile from SH 82 east of the roundabout to 7th and Main Street.
  - Assumes profile for cut-and-cover and bridge would need to be optimized in later engineering stages, which could result in different impacts.
- Modeling the alternative in Civil3d to mimic platform widths shown in the ROD, with the exception of not including the light rail platform. Bridge platform width (73 feet) does not include a sidewalk.
- Considerations that an LRT component could be provided for in the future.
- Assumption that intersection at Cemetery Lane is transformed into a two-way curved roadway.
- Consideration that a transportation easement exists for a future roadway.
- Consideration that the Berger Cabin at 834 West Main Street is to be relocated in accordance with the ROD and access to property maintained.
- Assumption that a signalized intersection at 7th and Main Street.
- Assumption that right-of-way (ROW) widths documented in the FHWA 1998 ROD Memorandum Of Understanding.
- Assumption that abandoned portion of SH 82 west of Cemetery Lane is converted to open space.
- Assumption that both Marolt Trail and Holden Museum access road route up and over the cut-and-cover tunnel.

Similarly, for the Splitshot alternative, designers replicated the couplet option documented in the 1995 DEIS. The alignment with profile was established similar to the

Phased PA, then modeled in Civil3d with a narrower platform width across the Marolt-Thomas property and Castle Creek. The following is the approach:

- Utilizing narrower platform widths for eastbound.
- Establishing a modified-direct alignment with profile for eastbound traffic from SH 82 east of the roundabout to 7th and Main Street.
  - Westbound (out of town) would follow the existing alignment that exists today.
  - Assumes profile for cut-and-cover and bridge would need to be optimized in later engineering stages, which could result in different impacts.
- Modeling the alternative in Civil3d to for narrower one-way platform widths. Refer to Figure 6 in the main memorandum. Bridge platform width (49 feet) includes a sidewalk and shoulders.
- Considerations that an LRT component could be provided for in the future.
- Consideration that a transportation easement exists for a future roadway.
- Consideration that the Berger Cabin at 835 West Main Street is to be relocated in accordance with the ROD (FHWA 1998) and access to property maintained.
- Assumption that a signalized intersection at 7th and Main Street, with some access restrictions.
- Preserving one-way local traffic and modified parking on the north side of West Main Street.
- Considerations for some S-curve softening and resetting of east curb line along North 7th Street to facilitate movements.
- Assumption that narrower ROW widths that are proportional to the platform widths.
- Assumption that removal of Cemetery Lane traffic signal and traffic travels one-way west to roundabout to turn around and go east into town.
- Assumption that both Marolt Trail and Holden Museum access road route up and over the cut-and-cover tunnel.
- Assumption that westbound traffic use of existing Castle Creek Bridge with no bridge modifications.

For the Three-lane Shifted bridge, the alternative is a combination of the S-curve improvements that tie into a three-lane bridge (one eastbound lane and two westbound lanes). The outside westbound lane is a dedicated bus that continues into a bus bypass lane that skirts along the golf course property and merges back into SH 82 approximately 1,400 feet west of the center of the roundabout. The following is the approach:

- Establishing a bus bypass alignment with profile from SH 82 east of the roundabout to 7th and Main Street.
  - Assumes SH 82 on existing alignment west of Cemetery Lane.
  - Assumes S-curve widening and one general purpose and one bus rapid transit (BRT) lane in each direction.
- Modeling the alternative in Civil3d for platform widths. Bridge platform width (52 feet) includes a sidewalk and shoulders.
- Assumes widening SH 82 intersection with Cemetery Lane.
  - Intersection is signal controlled.
  - Some widening to the south side of SH 82 impacting Marolt-Thomas open space
- Assumes Golf Course Trail relocated parallel and offset from bus bypass lane (Figure 10).
- Assumes pedestrian undercrossing west of roundabout is extended to facilitate bypass lane.
  - Assumes westbound bus stop relocated 400 feet west.
- Pushes westbound general traffic outside lane merge 400 feet.
- Assumes some modifications to the Golf Course are required to keep playable (moving tee boxes and repositioning greens and sand traps).
- Considerations that an LRT component could be provided for in the future.
- Elevated risk of potential full ROW take for property below the Three-lane Shifted bridge.

An existing ground surface was generated from light detection and ranging (LiDAR) surface data (courtesy of Pitkin County) and supplemented with field survey in the touchdown area, noted as top of east Castle Creek bank to 7th Street and West Main Street intersection. For each alternative, roadway cross-section elements were generated at specific intervals along the alignment to determine the impact of the cross sections on the existing surface and thereby determine a footprint for the alternative. Basically, identify the extents of cut and fill limits along each roadway corridor to estimate and compare relative impacts of each alternative.

Conceptual Bridge Design

Conceptual bridge design identifies the basic footprint of the bridge, potential limits for construction impacts, and the approximate span configuration for the bridge length. Feasible structure types are also identified, although a recommended structure type is not provided at this stage.

For the Phased PA and Splitshot alternatives, the following considerations shape the conceptual bridge layout:

- Steep terrain, influencing the bridge length and site impacts
- Construction access to build the bridge, including a construction access road to build the piers
- Castle Creek waterway, which is located under the middle of the bridge length
- Construction methods, with a focus on methods that reduce site impacts

The conceptual bridge length is approximately 525 feet for both alternatives. The conceptual layout presents a three-span bridge with the following features:

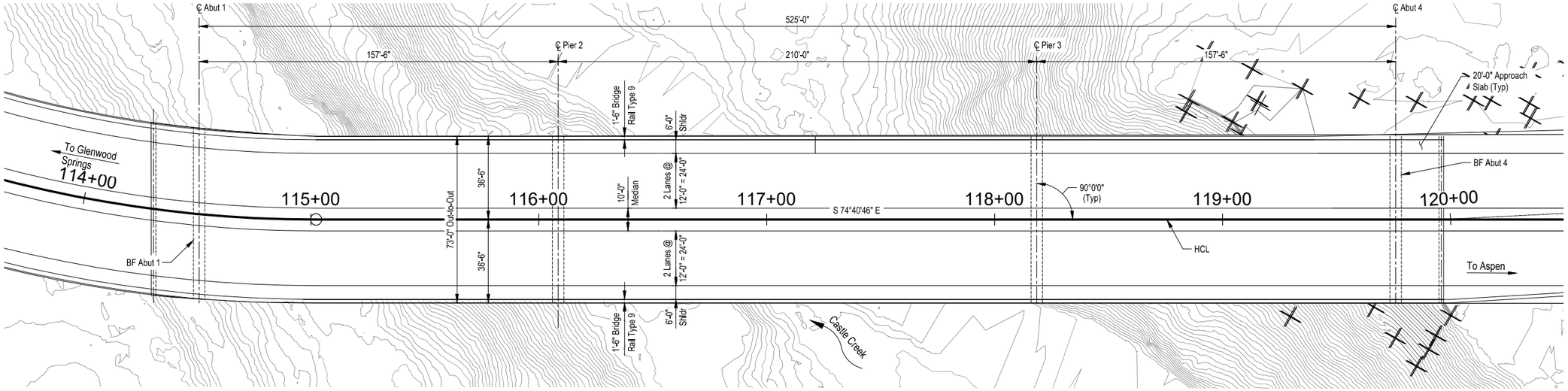
- Longer spans to reduce the number of piers required within the steep slopes
- Two piers that straddle Castle Creek to minimize permanent waterway impacts
- A construction access road with switchbacks and two creek crossings to accommodate large construction equipment for the pier construction along the steep slopes.

With longer spans and the desire to reduce site impacts, two structure types and construction methods are the most desirable: (1) concrete segmental bridge or (2) incremental launch steel bridge. Concrete segmental bridge construction is performed above the site, greatly reducing site impacts. Similarly, an incremental launch for a steel bridge allows construction to happen above the site. An incremental launch is also considered an accelerated bridge construction (ABC) method. For both methods, the foundations, piers, and abutments are built from the ground, and all other work is performed from above the site. Other construction methods require large cranes on the site, increasing the site impacts to provide the crane access and mobility and accommodate the crane pads.

To further reduce site impacts, only complex bridge types can span the entire canyon. A single tower cable stayed bridge is an example of a complex bridge type for this site. Although this eliminates the need for piers under the bridge, cranes would still be required for part of the construction, creating temporary impacts. The complex nature also significantly increases project costs, and this option was not provided as a “typical” solution.

Conceptual bridge layouts for the Phased PA and the Splitshot alternatives are shown in Attachments 2 and 3, with both a concrete segmental bridge and a steel bridge type shown for envisioning how the bridge would look. A feasible construction access road depicts a path that construction equipment takes for pier construction, using a maximum grade of 10%. Temporary impacts to the trees and vegetation along this access road will occur. The conceptual bridge layout for the Three-lane Shifted, along with other three-lane options, was previously described in the Feasibility Study (Jacobs 2024a).

Attachment 2: Phased PA Bridge Concept



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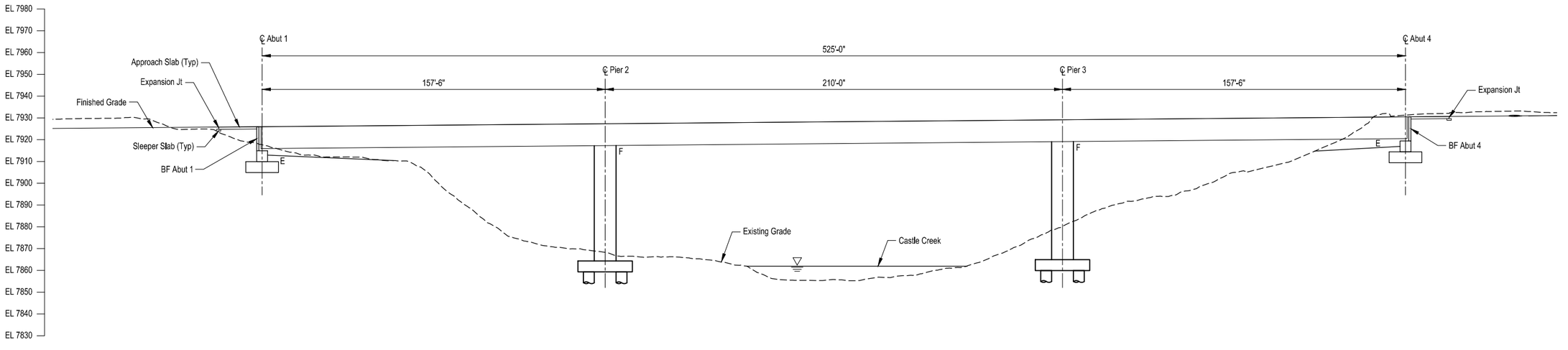

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Jacobs

Date	Comments	Init.

No Revisions:
Revised:
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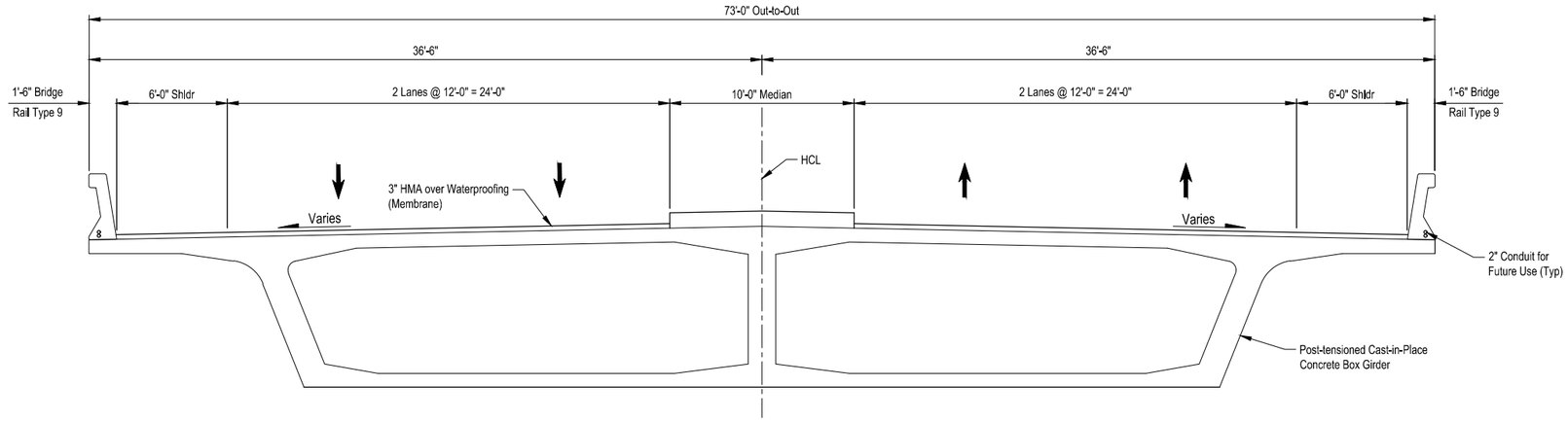
SH82 over Castle Creek Bridge
ALTERNATIVE - PHASE PA
GENERAL LAYOUT

Designer:
Detailer:
Structure Numbers
Sheet Subset: BRIDGE
Subset Sheets: of

Project No./Code
2023-218

Sheet Number



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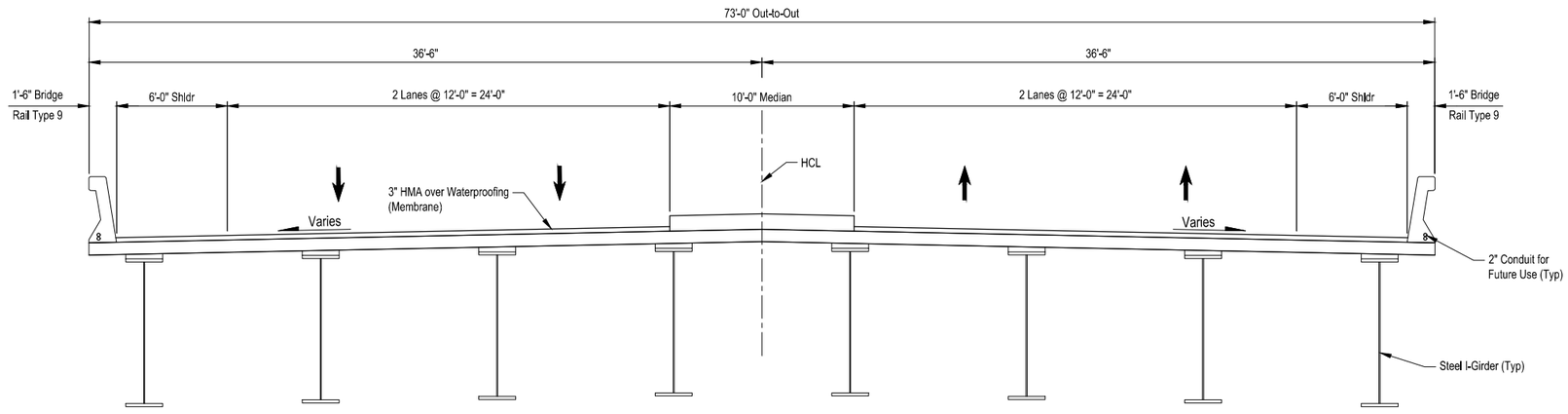
Segmental Concrete Alternative



TYPICAL SECTION
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As Constructed
No Revisions:
Revised:
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SH82 over Castle Creek Bridge
ALTERNATIVE - PHASED PA
TYPICAL SECTION

Designer:
Detailer:
Sheet Subset: BRIDGE
Structure Numbers
Subset Sheets: of

Project No./Code
2023-218

Sheet Number

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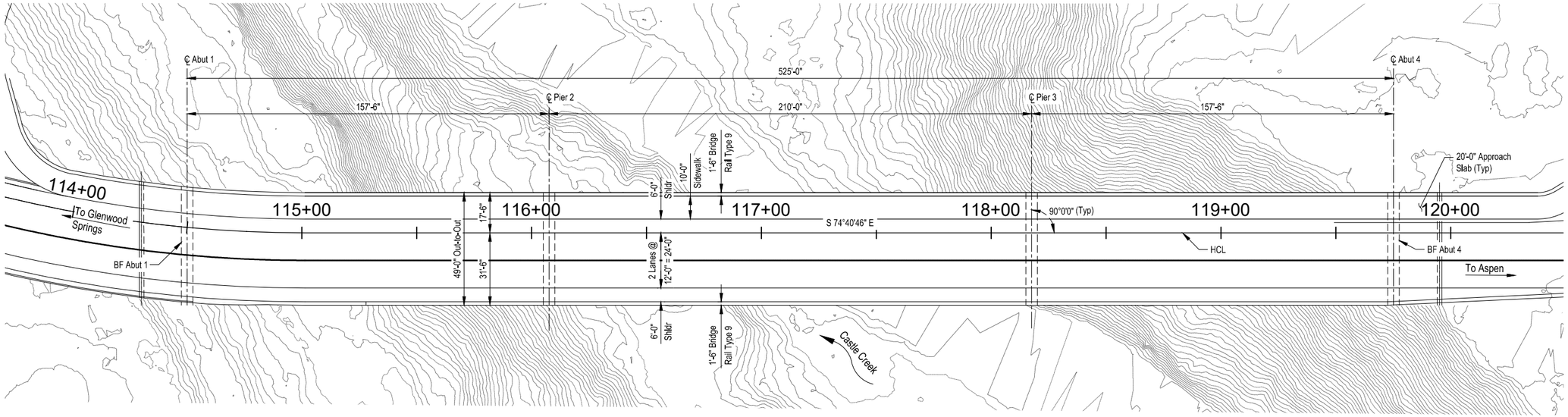
Attachment 3: Splitshot Bridge Concept



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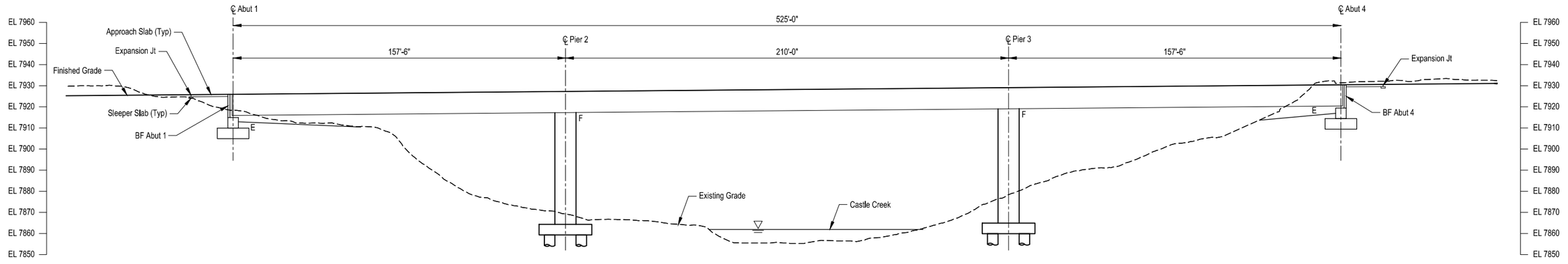

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SH82 over Castle Creek Bridge
ALTERNATIVE - SPLITSHOT
GENERAL LAYOUT

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2023-218

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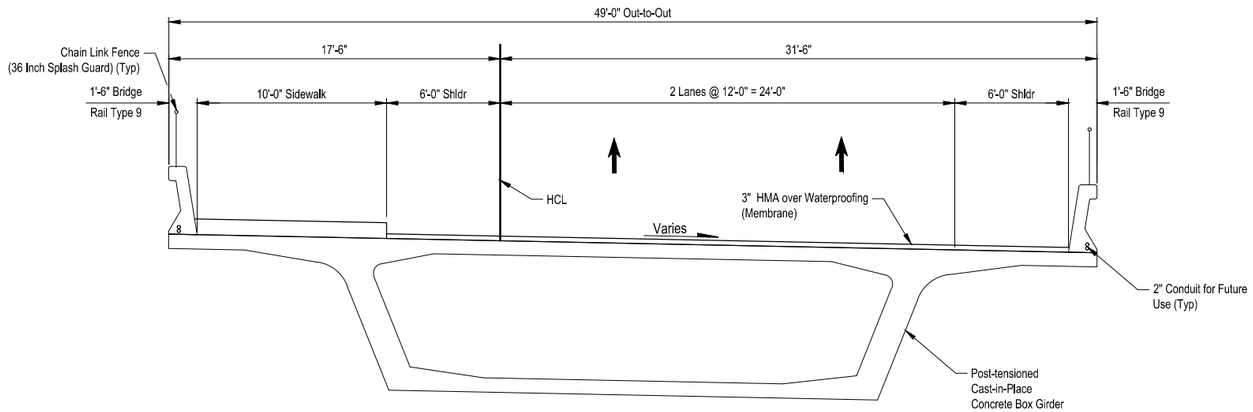
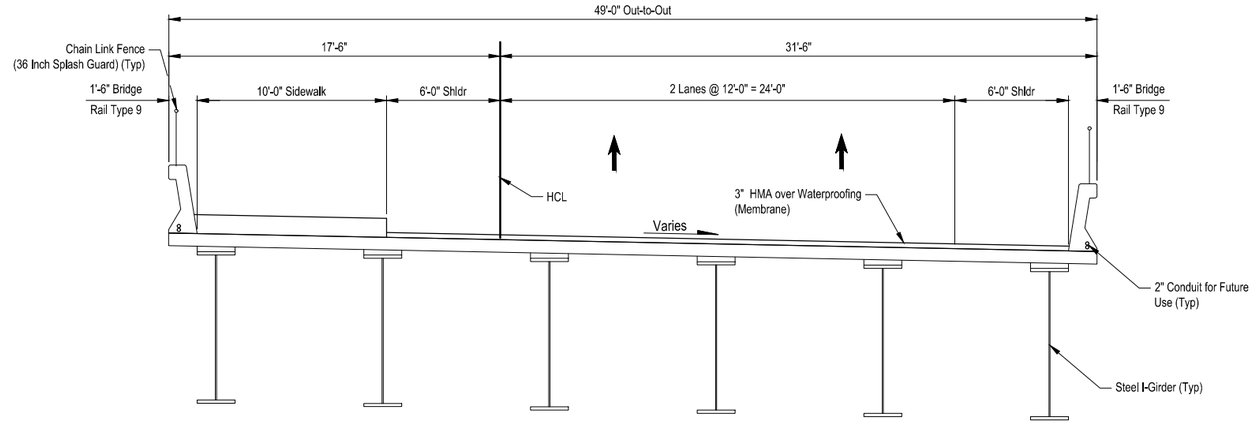


TYPICAL SECTION

Segmental Concrete Alternative



TYPICAL SECTION

Steel Girder Alternative

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Jacobs

Date	Comments	Init.

No Revisions:
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SH82 over Castle Creek Bridge
ALTERNATIVE - SPLITSHOT
TYPICAL SECTION

Designer:
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