Cornelius Pass Road Safety Improvements

Welcome and introductions

Cornelius Pass CAC 1-5-17 Agenda

5:40	Sign-in, light supper for CAC
6:00	Welcome and agenda review
6:10	What has happened since last meeting
6:20	Safety improvements package – 30% Design
7:00	Public comment
7:10	CAC questions and discussion
7:25	Close & Thanks

Agenda review

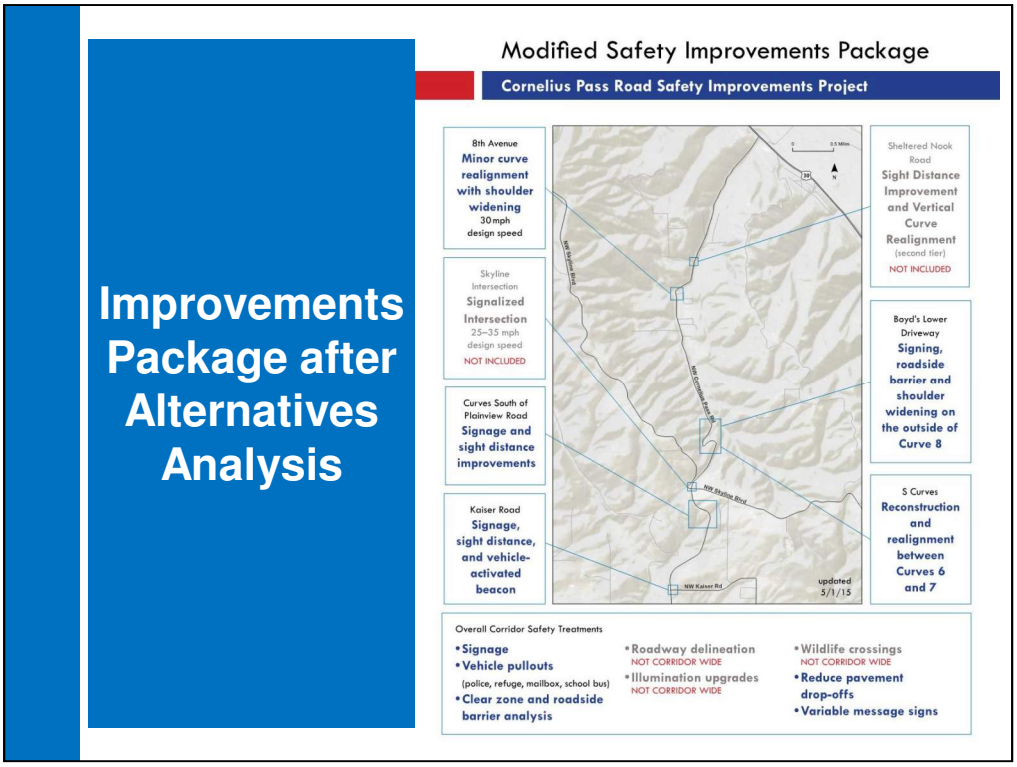
Cornelius Pass CAC
1-5-17

What has happened since we last met

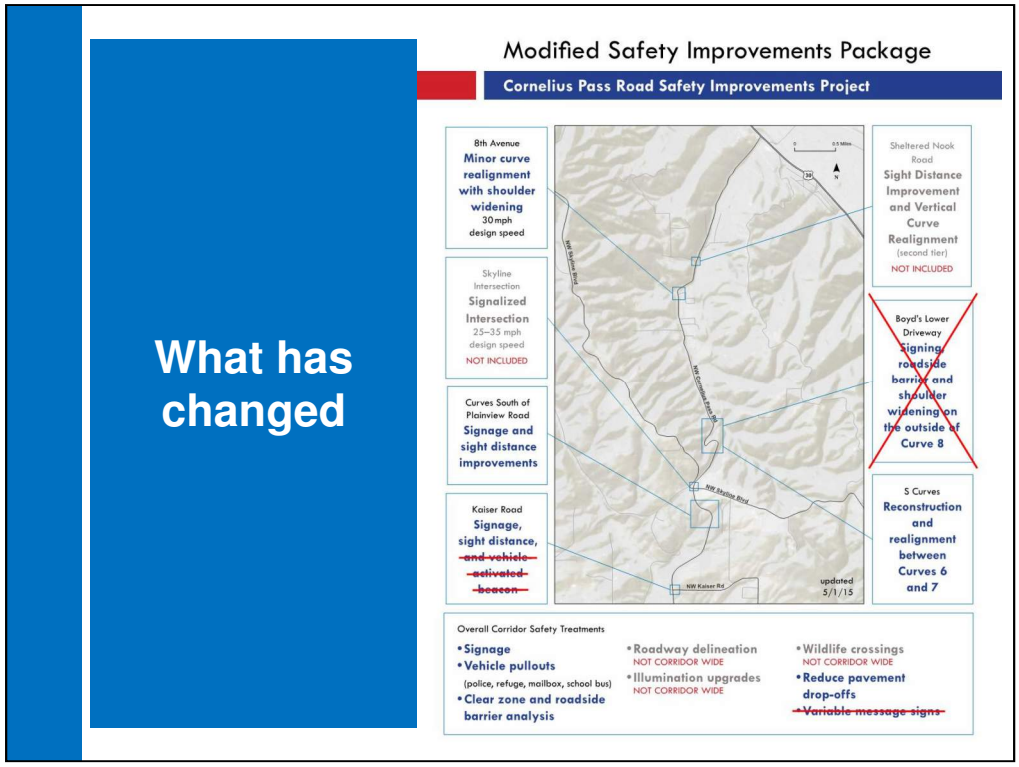
Cornelius Pass CAC
1-5-17

Activity since last CAC meeting (5-7-15):

- State approves $3.9M for project (7-15)
- ODOT contracts with design consultant to resume design work (March 2016)
- Design consultant completes design work to 30% stage (2016)

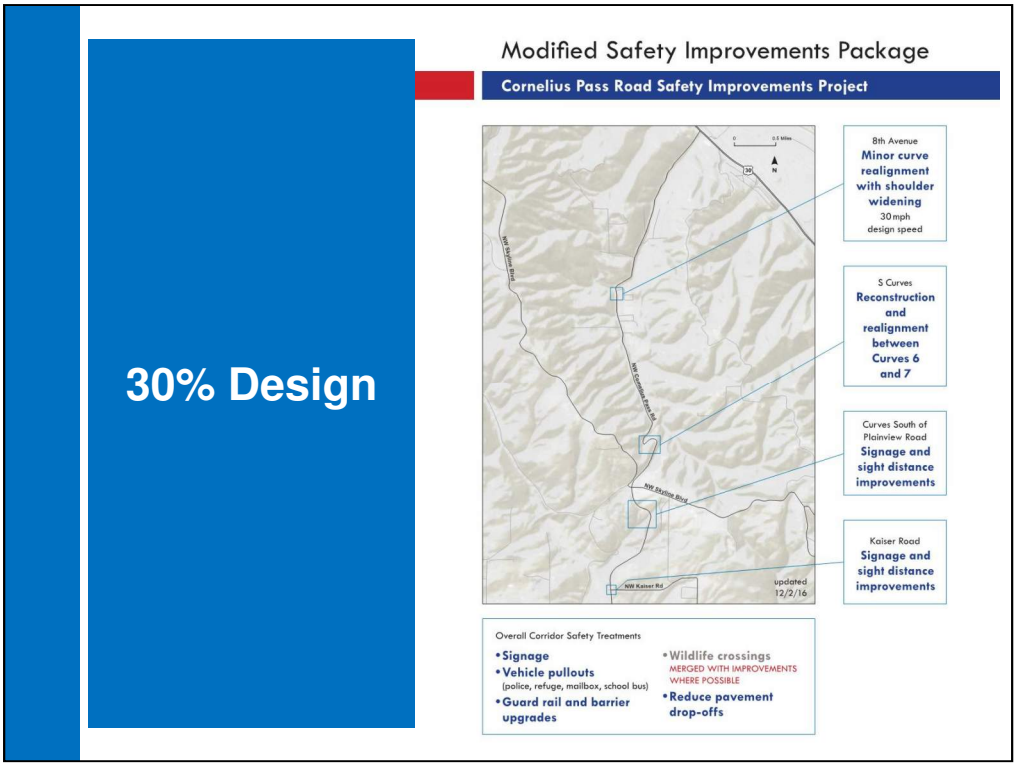


The graphic shows the last list of suggested improvements presented at CAC Meeting #5 to be taken to the 30% design level.



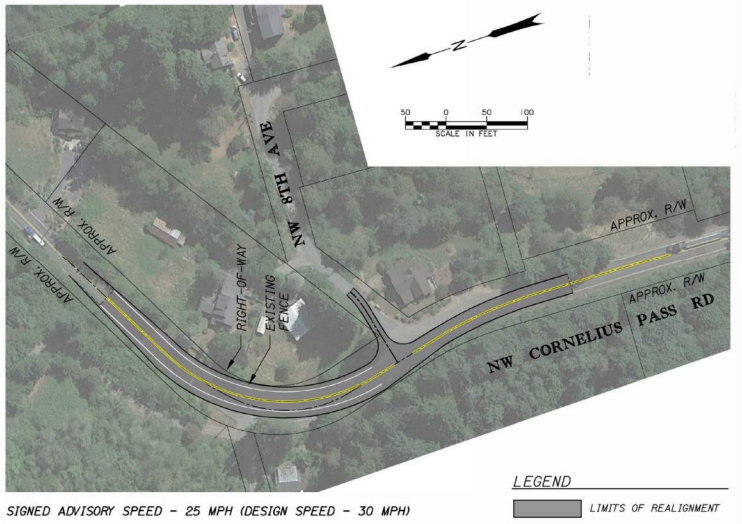
This graphic summarizes the changes the design team is suggesting be made to the list of improvements to move into final design.

Descriptions for why Boyd's Lower Driveway, the vehicle activated beacons at Kaiser Road and VMS improvements are suggested to be removed will be described in successive slides.



This is the adjusted list of improvements the team is suggesting be moved towards final design.

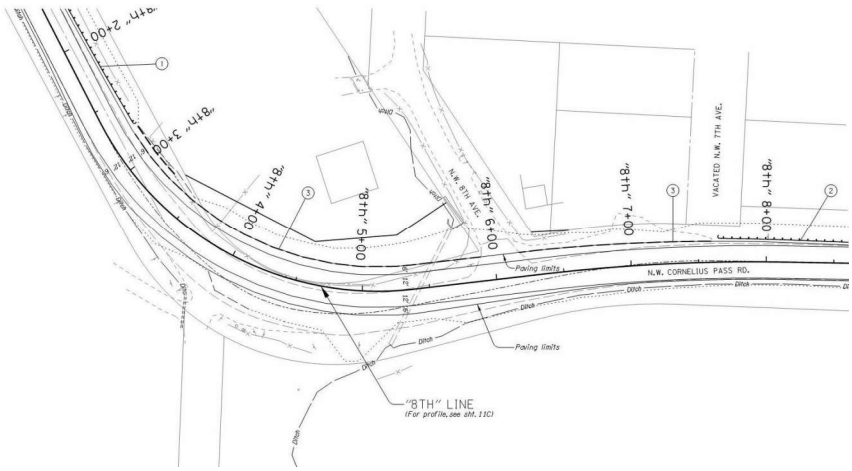
8th Avenue Minor Curve Realignment Detail from Alternative Analysis



This is the concept last shown at CAC Meeting #5 for the improvement at 8th Avenue.

The goal is to mitigate truck turnover crashes by replacing the existing compound curve with a more gradual, single curve with a 30 MPH design speed (25 MPH advisory speed).

8th Avenue Curve Realignment 30% Design

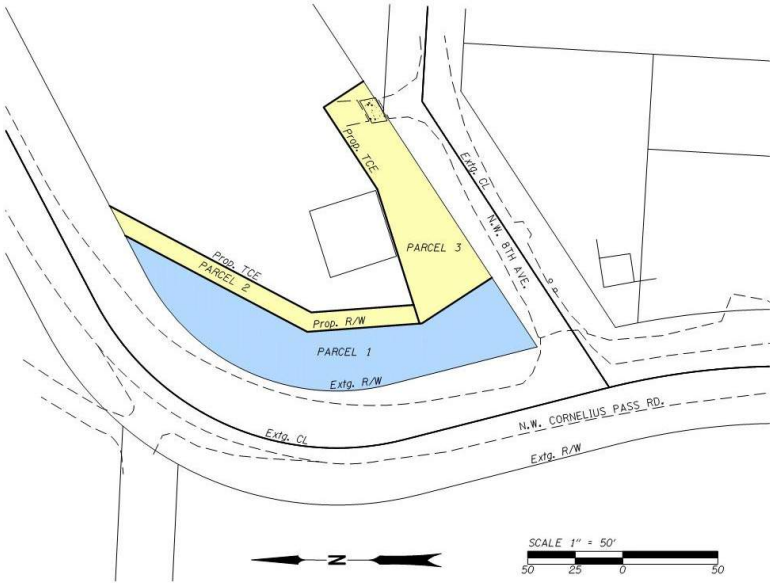


This is the design line work from the 30% design.

The centerline alignment represents the striped centerline of the road. The dimensions show 12' lanes and 6' shoulders.

The dotted line on the east side of the road represent the new bottom of slope necessary to build the road.

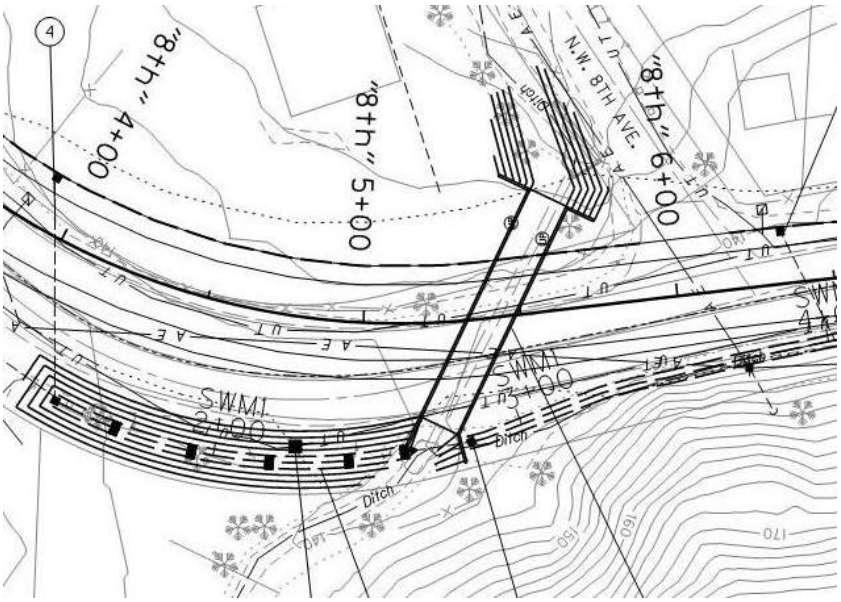
8th Avenue Right-of-Way Needs



Based on the realignment of the road, the blue area will need to be acquired.

The yellow areas are temporary construction easements being pursued to construct the project, but will be vacated and restored after the project is complete.

8th Avenue New Culvert



Since the project will be impacting an existing culvert in an historically fish bearing stream. federal requirements dictate we replace this existing pipe culvert with a much larger culvert to accommodate fish passage.

The culvert is required to be 1.5 times wider than the active channel width. This means a 12' wide culvert is needed for the existing 8' wide stream.

The need for this large culvert has generally caused the estimated project cost to go up.

This work, along with the roadway reconstruction, will require some amount of road closure time.

8th Avenue
Example Culvert for Fish Passage

This picture is an example of what the stream and culvert could look like to accommodate fish passage, however, we will likely end up with a box culvert instead of the steel arch shown.

The design will likely include large rocks like those shown as “fish rocks” to create shadows, rip rap for armoring of sharp corners, rounded streambed material, etc.

Much of this work will need to be completed within federally mandated in-water work periods likely in June/July of 2018.

Boyd's Lower Driveway Barrier and Shoulder Widening Detail from Alternative Analysis

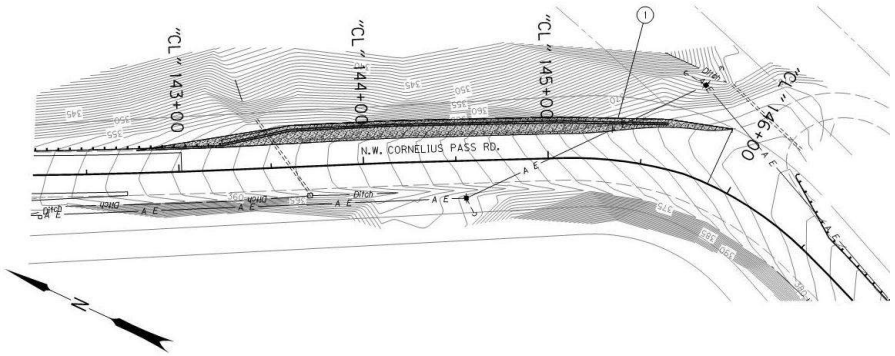
(Not Recommended)

This is the concept last shown at CAC Meeting #5 for the improvement at Boyd's Lower Driveway.

The goal was to widen the shoulder on the outside of the curve to provide more recovery area for vehicles to avoid hitting the guardrail.

Boyd's Lower Driveway 30% Design

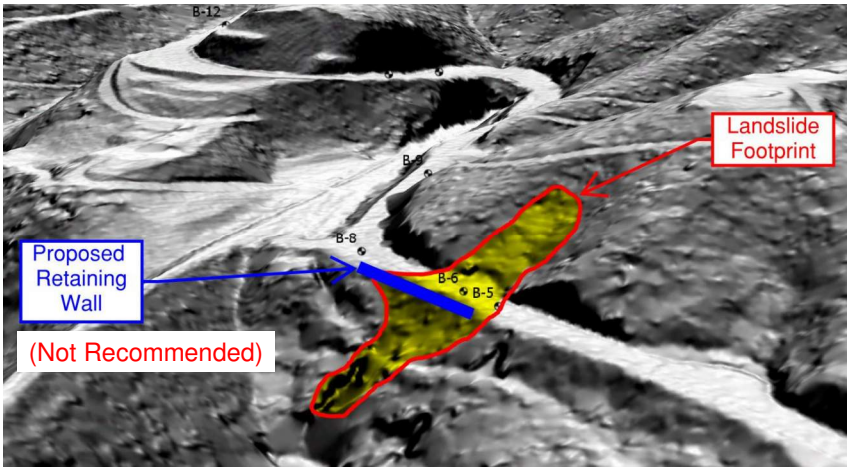
(Not Recommended)



This is the 30% design level widening detail the design team developed to show what would be needed.

This would result in about a 250' long wall with up to 12' high of exposed face below the road and 10' more of embedment.

Boyd's Lower Driveway Historic Landslide



Unfortunately, the design team discovered an historic landslide where the wall would go.

The landslide is as deep as 70' and cannot be practically mitigated with this project.

Any wall would at a minimum need to have a net zero effect on weight, and still would have a safety factor less than 1.

The wall would need to be composed of lightweight cellular concrete backfill.

The resultant wall cost would be relatively high at about $1.5M.

Boyd's Lower Driveway Prior Stabilization Work

Soil Nail Launcher

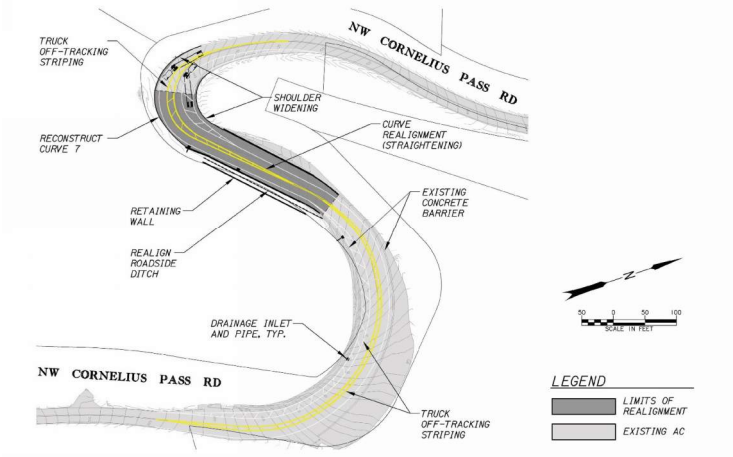
Installation occurred in mid-2000's

The design team also discovered work was previously completed at this location to stabilize the slope

The company then called Soil Nail Launcher completed this work as a pilot project to see if the soil nails would help.

Based on the relatively high cost and risk associated with this project and the relatively low benefit, the design team recommends not pursuing this improvement further.

S-Curves Tangent Realignment, Striping and Drainage Improvements Detail from Alternatives Analysis

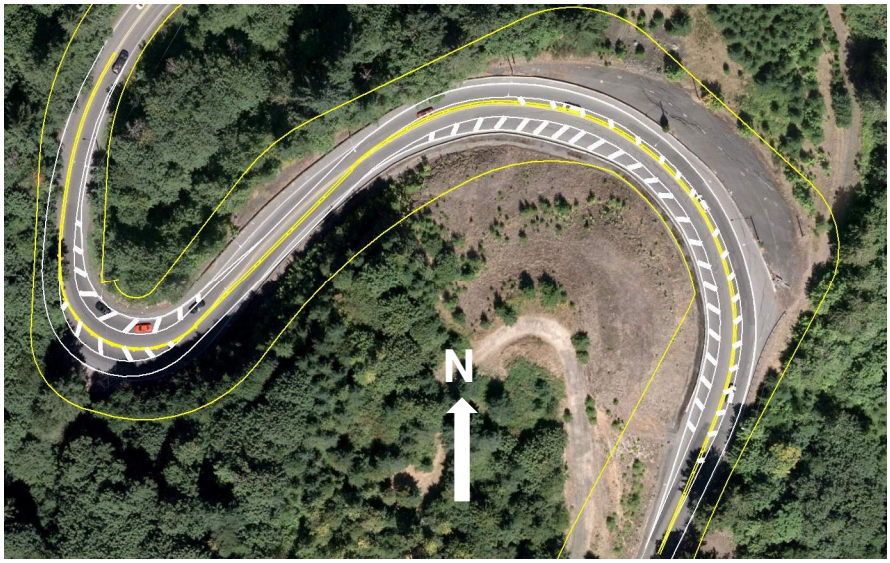


This is the concept last shown at CAC Meeting #5 for the improvement at the S-curves.

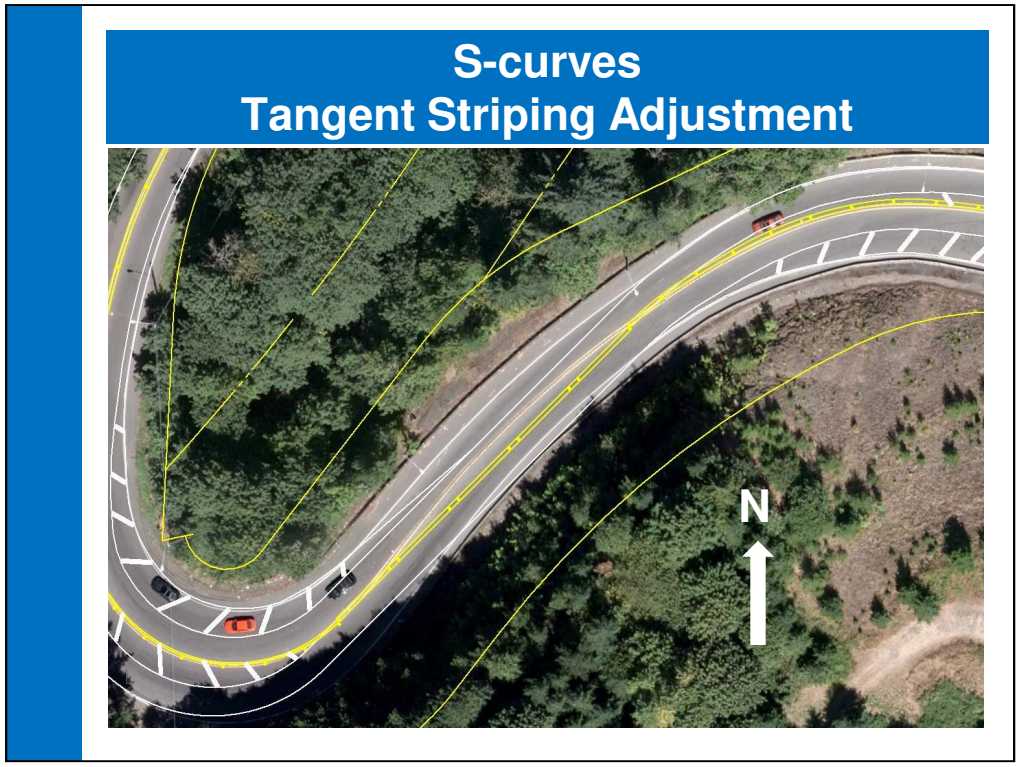
The goal is to provide a straight or “tangent” segment of roadway between the two curves to enable a better transition between the curves. This straight portion will allow the cross slope or “superelevation” of the roadway to properly transition. This should fix the issue of trucks bottoming out on the low side of the tight curve and provide an overall smoother transition.

Think of the design as pulling on a curled piece of rope to slightly straighten it out.

S-curves
Striping Adjustments

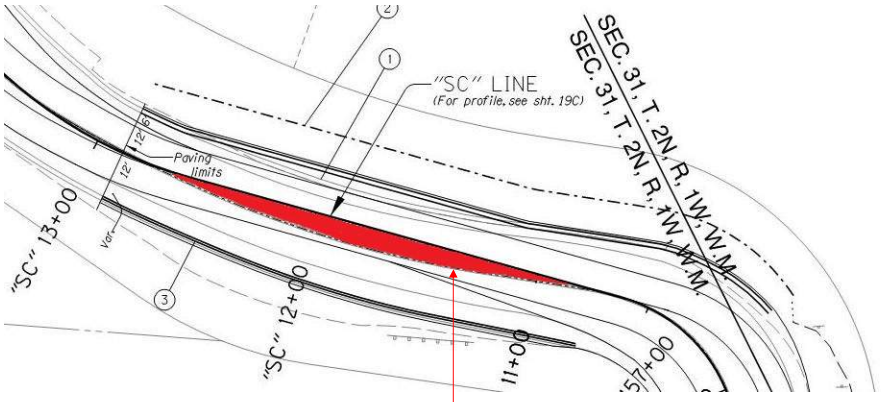


This is the striping line work from design team's 30% design.



This is a more zoomed in picture of the previous slide showing the alignment change between curves. Note the difference between the striped centerline shown in the aerial photograph and the future yellow centerline drawn.

S-curves
Widening and Realignment

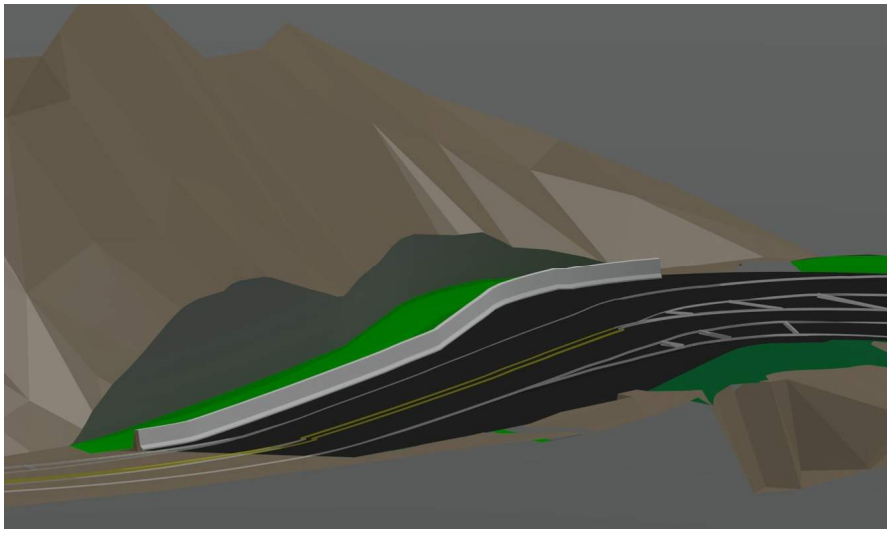


Red area represents the difference between the current curved alignment and new alignment with a straight section between curves

N

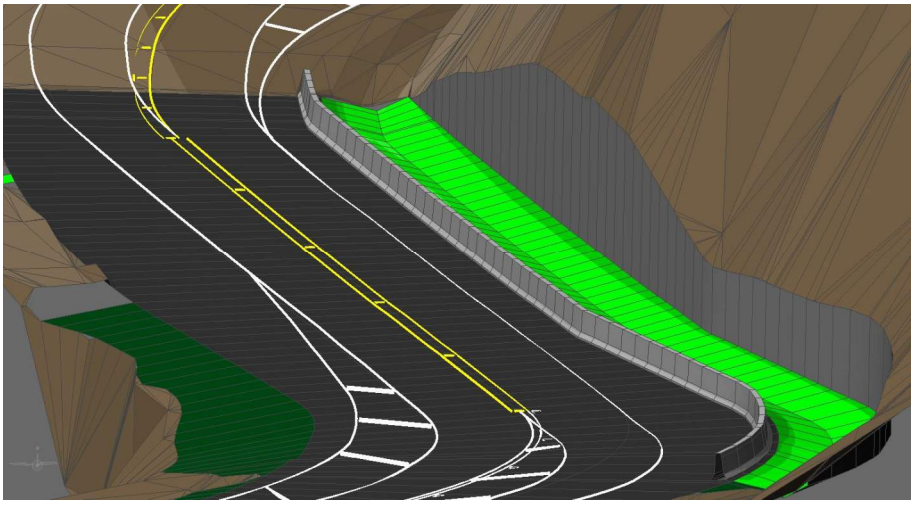
This is the same area as shown in the previous slide with the aerial image turned off.

S-curves
Rendering Looking Downhill



This is a computer generated rendering of what the improvements at the S-curves could look like from the uphill perspective. Notice the rock cut and rockfall area behind the concrete barrier.

S-curves
Rendering Looking Uphill



This is the same rendering as the previous slide, but from the downhill perspective and shows the improvements better.

The gray vertical face represents the rock cut and blasting that will be necessary. The green area is the necessary rock catchment and drainage area.

This rendering is based on actual design elevation information, so the rendering should represent the final product pending any other design adjustments.

15’ of rock catchment width is needed based on the height of the vertical face.

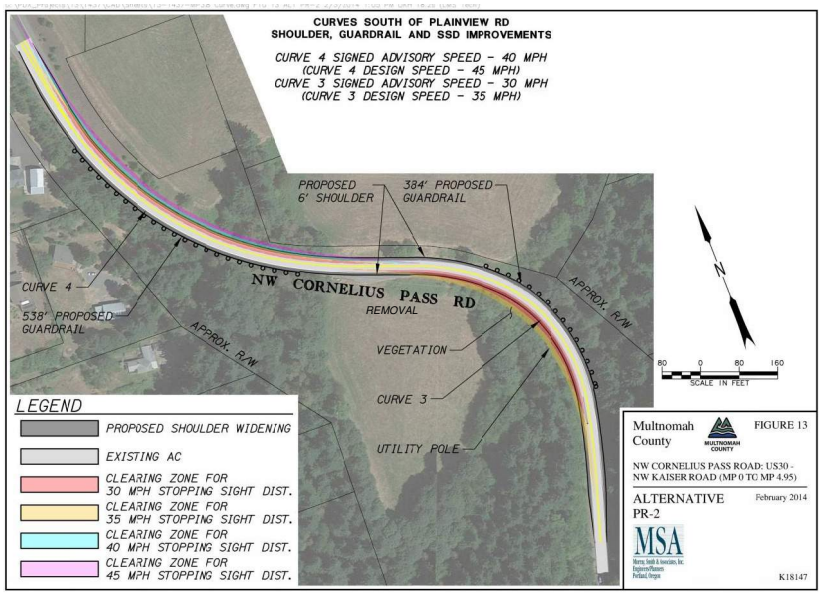
Geotechnical investigations determined the existing hillside material is composed of weathered basalt. This means the vertical face will be mostly self supporting, however, a wire mesh slope protection system with soil anchors is recommended to preserve the integrity of the surface to keep the weathered material from spalling off. This system is much less cost than a retaining wall which would otherwise be needed for softer material. As a result of the rock material to be excavated, it is expected that blasting will be required and some duration of road closure will be necessary.

S-curves - Example Overhead Curve Warning Beacon

This is an example of an overhead flashing beacon and warning sign which we plan to construct on the uphill and downhill sides of the S-curves for better awareness of these being the most constrained curves in the corridor.

This particular picture is on US26 going towards the coast. For the case of the S-curves, the “SUNKEN GRADE” sign would be replaced with a curve symbol.

Plainview Curves
Detail from Alternatives Analysis

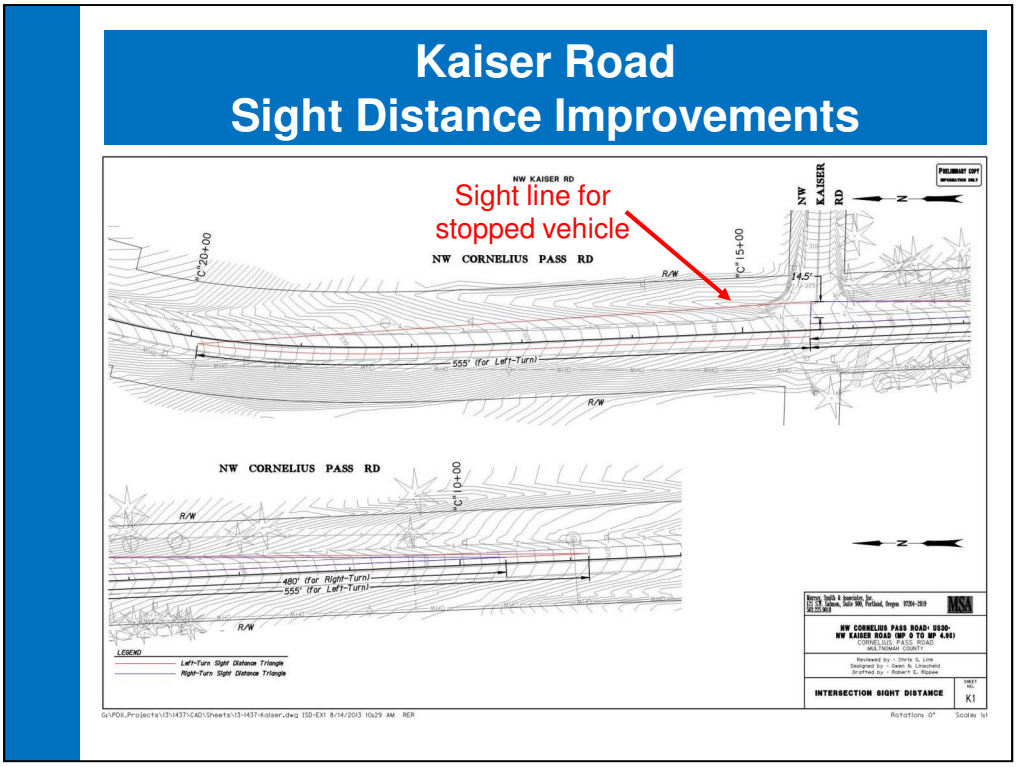


This is the concept last shown at CAC Meeting #5 for the improvement at the curves south of Plainview Road.

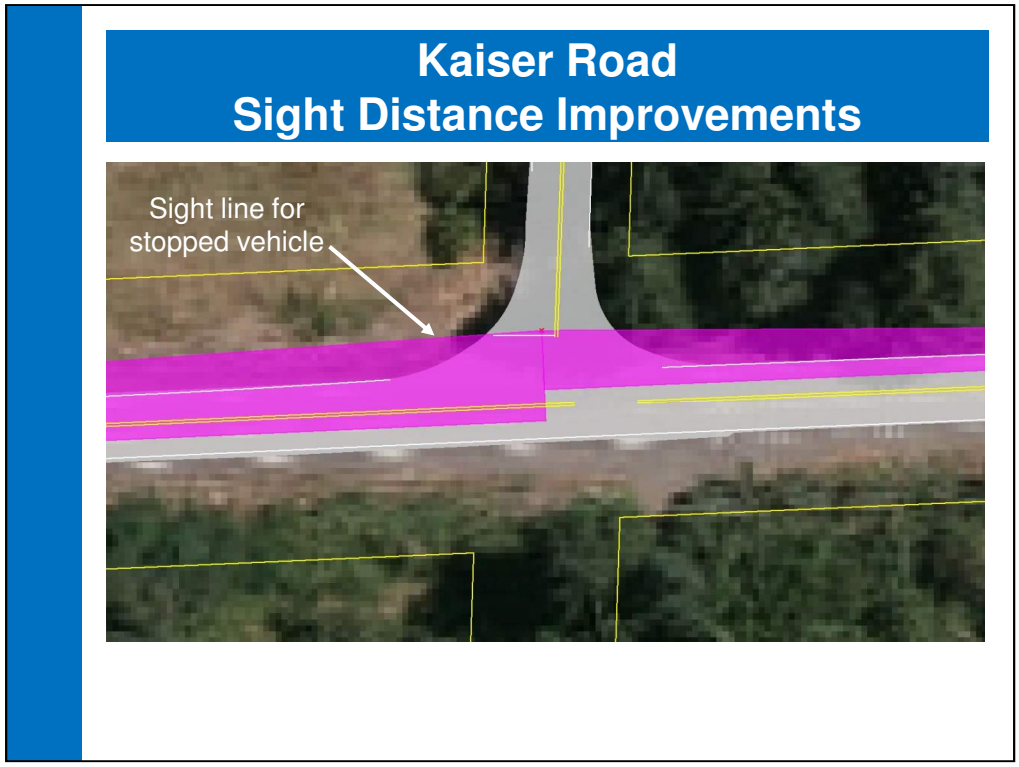
These are the first set of constrained curves coming from the south, so the plan is to complete shoulder widening for more recovery area, clearing adjacent to the roadway to provide better sight distance, and provide upgraded guardrail.

Given the relatively straightforward work, no additional significant design information was developed for 30% design. The design team plans to move forward with the improvements generally as shown.

SSD means stopping sight distance.



This image shows the theoretical sight line for vehicles on Kaiser Road stopped at the intersection with Cornelius Pass Road. One of the goals for improvements at this location was to perform clearing to remove any obstructions within this sight line.



This is a zoomed in view of the intersection of Kaiser Road and Cornelius Pass where clearing is being considered.

Sight lines have been determined to be clear on the north side of the intersection, but clearing and potentially some minor grading will be completed on the south side of the intersection where some trees and a hill partially obstruct the view.

Vehicle activated signs were also considered at this location to help mitigate crashes. However, after further analysis, these signs aren't believed to be of benefit here like they were at Sheltered Nook Road.

The crashes at this location are mostly attributed to cars turning from Kaiser and lack of stopping sight distance (as compared to rear end crashes on Cornelius Pass Road at Sheltered Nook).

If signs were to be installed, they would be either a STOPPED VEHICLES AHEAD sign for the southbound direction for cars turning left or TURNING VEHICLES AHEAD for the northbound direction. Neither of these are anticipated to be significantly helpful since there is adequate sight distance on Cornelius Pass itself to see stopped or slowing cars ahead.

As an alternative, the team may also consider minor shoulder widening in the northbound direction if budget and space is available to better facilitate right turns.

Corridor-Wide Improvements

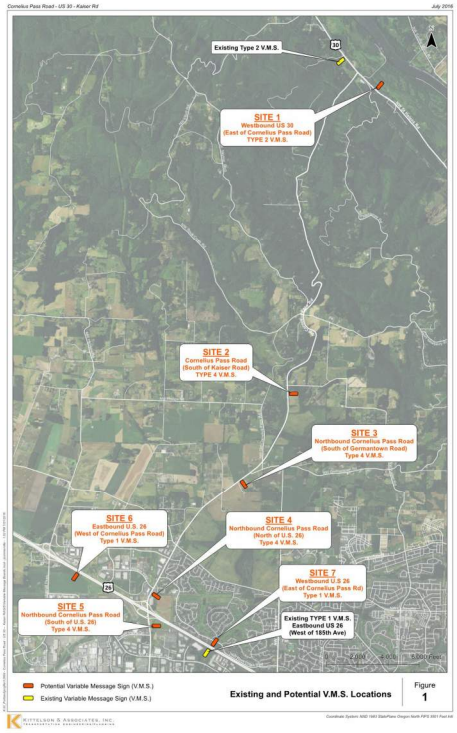
- **Variable Message Signs** (not recommended)
- **Signage** (Replace and upgrade all signs to current standards)
- **Vehicle pullouts** (police, refuge, mailbox, school bus)
- **Guardrail and barrier upgrades**
- **Wildlife crossings** (where other improvements are located)
- **Reduce pavement drop-offs** (Fill in abrupt edges with aggregate)

This is the list of corridor-wide improvements the design team considered beyond the location specific improvements.

No additional slides are provided for the wildlife crossings or reduced pavement drop-offs. Wildlife crossing concepts will be incorporated into the designs were possible as previously discussed. One such opportunity is the fish passage improvements that will be made for the culvert replacement at 8th Avenue. Reducing pavement drop-offs through addition of aggregate will be completed as previously suggested.

Variable Message Signs

(Not Recommended due to Cost and Unknown Level of Safety Improvement)



This graphic shows the locations the design team looked at for potential variable message signs. The team reviewed these internally and with ODOT.

There is really only one possible location at the north end. Since ODOT already has a SB sign on US30, and a sign would be needed to warn drivers before turning on Cornelius Pass Road, a NB sign on US30 prior to Cornelius Pass would be the resultant location.

There are multiple options for a sign location at the south end with varying benefits. Site 4 and 5 were determined to be the best, but not perfect. Washington County coordination would also be required for these locations.

The total anticipated cost for these two signs is $400,000-$500,000. Due to the relatively high cost compared to available project budget, unknown safety benefit, operational challenges between the Counties/ODOT and lack of positive feedback from the CAC and public at the last meeting, the design team is suggesting to not pursue this as an improvement.

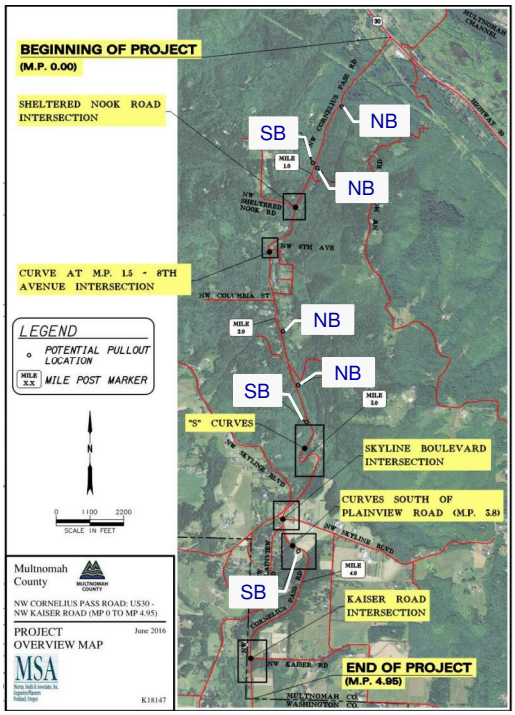
Signage Upgrade Examples

All signs in the corridor will be upgraded with this project to current standards and to provide better overall visibility. This slide shows just a few of the planned upgrades.

The top chevron sign is non-reflective and will be replaced with the reflective version as shown on the bottom. The school bus sign standard was updated in 2012 per the sign shown in the top right and will upgraded as well. The milepost sign standard has also changed, so milepost signs every half mile will be added. Advisory speed signs like that in the bottom right will also be upgraded based on the measured safe speed for each curve.

Many other sign upgrades will be completed as well.

Pullouts



This graphic shows the initial pullout locations planned as discussed at CAC Meeting #5.

These are located where there is available space and vetted with the sheriff's office.

After looking at these closer at the 30% design stage, the design team determined the pullout area sizes will vary between 800 square feet and 4,000 square feet depending on available space.

Guardrail Upgrades

Alternative	Criteria	Cost Estimate
Minimum	Upgrades and alterations to existing locations only	$138,000
Maximum	Install new guardrail in all locations as per AASHTO guidelines	$1,100,000
Less than Maximum	Reduce from "Maximum" by removing inside edges of curves	$698,000
Middle	Reduce from "Less than Maximum" by removing straight road sections or areas with greater distance to roadside obstacles	$380,000
More than Minimum	Increase from "Minimum" by installing guardrail at locations of known recent severe or fatal crashes	$210,000

This table shows the range of guardrail improvements that could be made within the project limits.

The team initially estimated about $300,000 for guardrail work, but heard public preference at CAC Meeting #5 to do as much as possible.

The team developed a methodology for creating the options which is summarized in the criteria column.

Generally, the east side of the road warrants strong consideration of guardrail for entire length from a safety analysis perspective. The need for guardrail on the west side varies, but is generally much less.

The "Less than maximum" option equates to about 15,000 linear feet (3 miles) of guardrail, mostly on the east side.

From a budget perspective, the design team believes the "Less than maximum" option can be accommodated. However, care will be needed for where guardrail is to be installed to avoid increasing the crash frequency by adding something that wasn't there before.

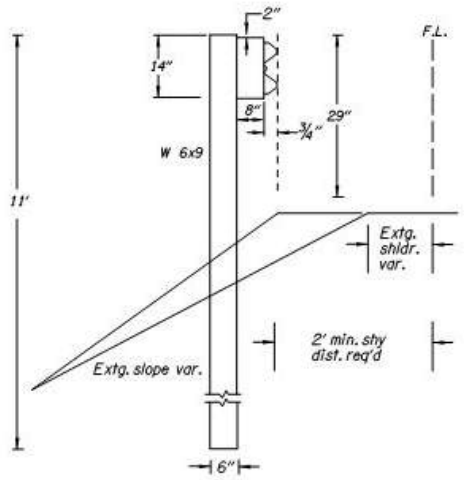
Guardrail Upgrades

Technical challenges

- Steep topography – Need for long guardrail posts
- Narrow shoulders – Need for 2' minimum shoulders
- Lack of space for end treatments
- Potential increase in property damage only crashes

This slide summarizes the primary technical challenges the design team still needs to tackle to determine where guardrail can be successfully installed. In most cases, a non-standard installation needs to be vetted and justified due to the constraints in the corridor. It is very possible that some specific locations may not end up receiving guardrail where constraints and cost outweigh the benefit. This decision making process will need to be made on a location by location basis given how much the topography changes.

Guardrail Typical Installation Detail



This detail shows the current concept of how the design team would like to achieve the minimum two feet of flat space between the striped fog line and the face of guardrail. Two feet is the absolute minimum space needed to be able to install guardrail. The detail shows the need for some additional material to be placed in a wedge shape on the edge of shoulder embankment to achieve this flat area. The current plan is to use crushed aggregate to do this, but this may not be practical everywhere such as steeply sloped locations. More design work is needed to verify if 3 miles of guardrail can really be completed utilizing this concept.

Guardrail – Example of Constraints

This a picture of just one location on Cornelius Pass where the design team will have a challenge with guardrail installation. This location is a steep driveway where a break in the guardrail is needed and where it may be challenging to provide acceptable end treatments for the guardrail.

30% Design – Cost Comparison Tool

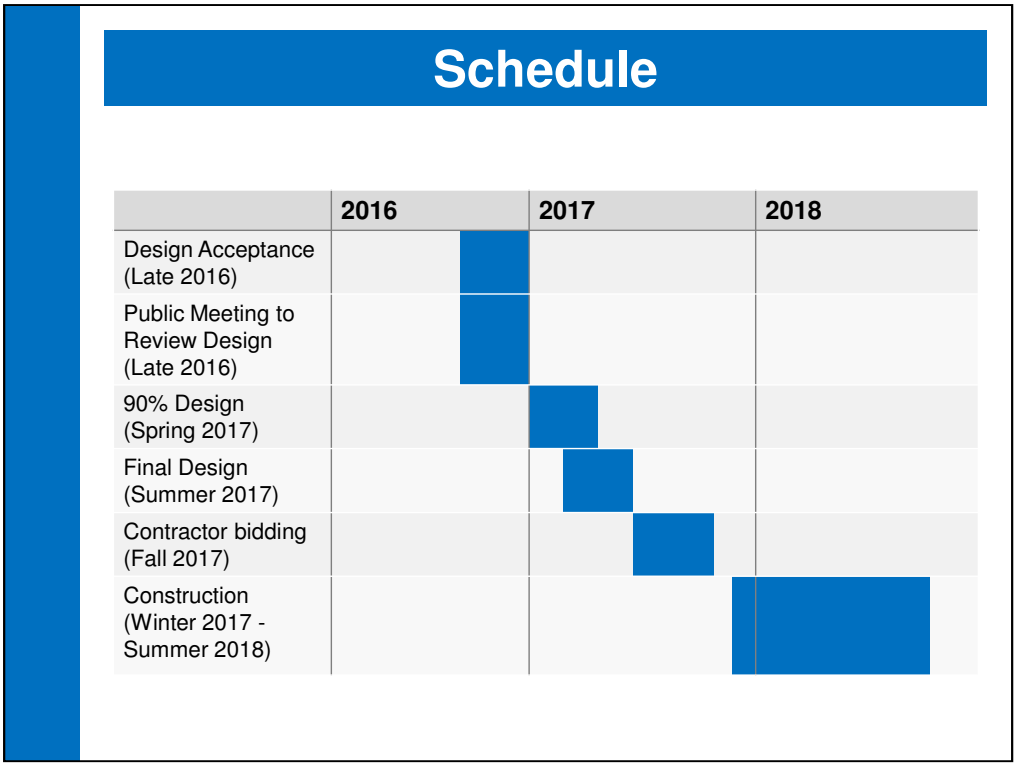
Location	Description	Alternative Cost (includes right-of-way and contingency)	Draft DAP	Suggested Option
8th Avenue Curve	Realignment of the curve	$812,000	x	x
Boyd's Lower Driveway	MSE wall	$1,539,000	x	
	Soil Nail wall	$1,280,000		
	Enhanced Barrier	$126,000		x
	No work	$0		
"S" Curves	Realignment of the tangent between curves	$720,000.00	x	x
Curves South of Plainview Rd	Clearing and 6 foot shoulders	$207,000.00	x	x
	Clearing and 4 foot shoulders	$151,000		
	Clearing only	$6,000		
Kaiser Rd Intersection	Clearing and 2 PTR signs	$146,000	x	
	Clearing and PTR sign for Left Turn	$90,000		
	Enhanced clearing	$46,000		x
	Clearing only	$10,000		
Guardrail	"Maximum" alternative	$1,100,000.00		
	"Less Than Maximum" alternative	$779,000.00	x	x
	"Medium" alternative	$380,000		
	"More Than Minimum" alternative	$210,000		
	"Minimum" alternative	$138,000		
Signs	Corridor-wide sign replacement	$314,000	x	x
Pull-Outs	Larger Pull-outs	$234,000	x	x
	Smaller Pull-outs	$136,000		
Pavement Drop-Offs	Aggregate along pavement edges	$16,000	x	x
Others Costs	Right-of-Way	$189,000	x	x
	Construction Administration	$500,000	x	x
Budget	Budget for Construction and ROW	$3,950,000	$5,456,000	$3,943,000

This table serves as a summary of the costs per improvement option.

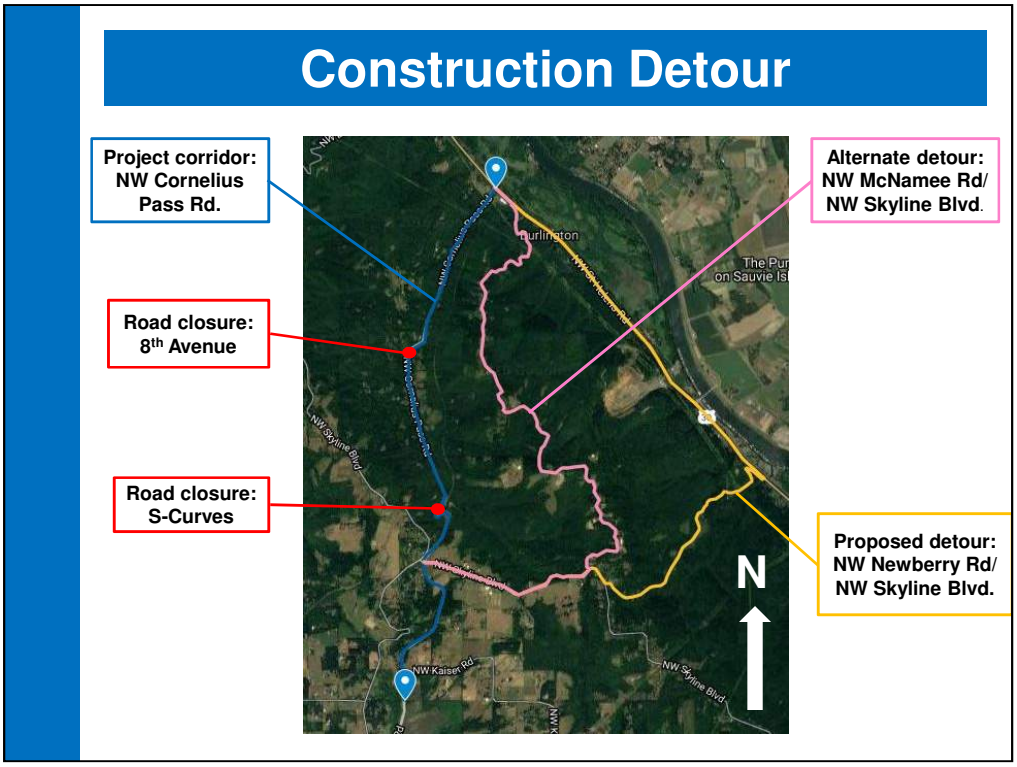
The Draft DAP column is synonymous with the 30% level of design and represents the costs associated with all the improvements that were investigated (not including the VMS signs).

The rightmost column represents the design team's suggestion for the improvements to move into final design based on the available budget and findings described on previous slides.

The primary differences are the exclusion of the shoulder widening work at Boyd's Lower Driveway and elimination of the part time restriction signs at Kaiser Road.



This is the current schedule with construction anticipated to begin at the end of 2017 or beginning of 2018.



Construction staging is one of the next major tasks the design team will be undertaking.

The image above represents two different options for detours when Cornelius Pass needs to be closed.

The duration of closure(s) is unknown at this point, but some amount of closure will be necessary for the work at 8th Avenue and the S-curves. During these closures, local access will be maintained to residences, but no through traffic will be allowed. More detailed design will be needed to confirm the minimum closure time needed.

The McNamee detour is one the County has used in the past when completing maintenance striping. ODOT has suggested the Newberry detour as a more truck friendly option. Comments from the CAC and public on these or other options would be welcome as the design team begins to determine the construction staging needs.

Cornelius Pass CAC
1-5-17

CAC Discussion

Cornelius Pass CAC
1-5-17

Public Comment

Cornelius Pass CAC
1-5-17

Next Steps

Cornelius Pass Road Safety Improvements