Memorandum 1.5

I-5 MEDFORD VIADUCT PLANNING & ENVIRONMENTAL STUDY

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Date: February 10, 2016

Subject: Estimated Costs for Retrofit, Rebuild and Reroute Scenarios

The purpose of this memorandum and the other early anchoring activity memorandums in Phase 1A of the project is to inform the Draft Problem Statement and guide further development of the project.

This memorandum is focused on providing programming-level estimated costs for the potential Retrofit, Rebuild, and Reroute scenarios for the Medford Viaduct. Because project alternatives have not yet been defined, each of these scenarios has many variables and unknowns. These conceptual cost estimates have been prepared based on the best information available at this time. These are very preliminary estimates and are intended only for providing context and understanding the order-of-magnitude of differences among the scenarios. The consultant team will develop more precise cost estimates later on, once the transportation problem statement is developed and project alternatives are defined to address the identified problems.

ODOT has previously estimated the cost of retrofitting or rebuilding the Medford Viaduct structure (Bridge Number 08332). The consultant team performed a literature search and talked to Region 3 and Bridge Section staff in the process of preparing this memorandum. For the reroute option, the consultant team made assumptions about a likely realignment length and estimated a cost based on average costs per mile of other recently completed ODOT projects. This memo summarizes the findings of that research.

Summary of Findings

Table 1 summarizes the estimated costs for each conceptual alternative within the three preliminary scenarios.

TABLE 1

Estimated Conceptual Costs by Potential Scenario

Scenario	Conceptual Alternative	Preliminary Order-of-Magnitude Cost Estimate
Retrofit	Rehabilitation and Seismic Retrofit	$40,000,000 to $80,000,000
Rebuild	New 4-lane bridge on similar alignment	$410,000,000
	New 6-lane bridge on similar alignment	$500,000,000
Reroute	New 13-mile Realignment	$1,100,000,000

Retrofit Scenario

Making repairs and performing seismic retrofits to the existing Medford Viaduct structure will be a significant infrastructure investment. At the conclusion of such a project, the structure should be considered to be low maintenance for an extended period of time. The design life for repairs is assumed to be 30 years. The bridge should also be expected to survive the Cascadia Subduction Zone seismic event, meaning seismic retrofit schemes must comply with current ODOT methodologies. The need for additional width will need to be addressed based on separate traffic analyses. Conceptual cost estimates are provided for repairs with and without widening the structure.

A review of the current bridge inspection report indicates that a bridge deck replacement is likely warranted and that repair and painting of the steel girders is warranted. The bridge deck was overlaid in 2003 and is already showing signs of distress. The majority of the surface is cracked with some delamination of the overlay. Portions of the deck show cracking and rust staining, indicating full depth cracking. There is a current STIP project for overlaying the existing deck: Key # 19540 I-5: Medford Viaduct Deck Overlay. Design is scheduled for 2016 and construction is schedule for 2018.

The majority of the steel girders have cracks in the connection between the diaphragm and girder. Nearly all of the paint system is showing signs of distress and should be replaced. Other repairs are also warranted, though these will be incidental to either the deck and girder work or the seismic retrofit work.

Based on this desk top evaluation and windshield observations, the existing structure will need, at a minimum, the following improvements over the next 30 years:

- regular roadway restriping and barrier repainting,
- steel girders repainting at least once,
- bridge deck replacement (verification of the need will occur through a future bridge deck survey), and
- drainage system replacement or modification.

A review of the plans indicates that a Phase 2 seismic retrofit of this structure is likely straightforward, though extensive. A Phase 2 seismic retrofit is intended to strengthen the existing structure in order to bring it up to the current design codes for seismic design. The columns will require the addition of a fiber reinforced polymer (FRP) or steel jacket to improve confinement of the concrete. The crossbeams will require strengthening with additional concrete and steel. The existing concrete spread footings will need to be strengthened and possibly enlarged. These items will need to be addressed at all bents in the bridge. Additionally, Bent 39, which is located near 10th Street, will require seismic isolation of the superstructure and crossbeam or replacement of the crossbeam. A Phase 1 seismic retrofit, provides simple repairs to prevent excessive movements but does not strengthen the bridge. This was previously performed on the Medford Viaduct in 2003 but will need to be modified to accommodate the Phase 2 retrofit.

The consultant team's research found one reference to a repair and seismic retrofit cost estimate prepared in the 2007-2027 Bridge Needs Study. The cost of repair and retrofit was estimated in 2007 dollars to be $28,143,000. This work included painting, scour repairs, deck rehabilitation, seismic retrofit, and a rail retrofit. The current Bridge Inspection Report (dated June 5, 2014) for this structure was retrieved from ODOT's database to evaluate current repair needs for this structure. This 2007 estimate has been escalated at 3% per year to represent 2016 dollars to approximately $40,000,000.

The estimated cost for seismic retrofit and widening is based on the retrofit cost plus the additional deck area added by widening the bridge. Assuming a standard 4-lane freeway cross-section and using $500 per square foot to represent total project cost, the widening cost is estimated at approximately $40,000,000. This brings the total project cost to approximately $80,000,000. The feasibility of traffic control during deck replacement with or without widening the structure has not been investigated in detail at this time; however, the project team is confident that Retrofit based alternatives can be developed which are both constructable and address traffic control criteria . At the alternatives development stage of the project, ODOT mobility requirements and staging duration (delay costs) will be evaluation criteria for each alternative developed within this scenario set as part of the overall constructability analysis.

These projects costs represent a high degree of variability due to several significant complexities that cannot be quantified at this time. More detailed seismic modeling would be necessary to determined specific deficiencies. Once the deficiencies are identified, determining

constructible solutions will be challenging due to many on-site constraints such as Bear Creek, Historic Downtown, Hawthorne Park and traffic control.

Rebuild Scenarios

Full replacement of the Medford Viaduct structure is another scenario to be considered. A new structure would have a 75-year design life and should be considered low maintenance for at least the first 30 years following construction. Built to current codes, the replacement bridge would be expected to survive the Cascadia Subduction Zone seismic event and serve as a Phase 2 lifeline route for recovery efforts in Southern Oregon. US 97 is ODOT's designated Phase 1 lifeline route through Southern Oregon.

The recommended roadway width for a 4-lane structure is 90 feet. In the event that a traffic study indicates a 6-lane structure is warranted, the recommended roadway width is 114 feet. The length of a replacement bridge is anticipated to be 3,300 feet. The structure would be designed to be a more aesthetically pleasing structure than the existing structure and fit in better with its surroundings. Extensive public involvement is expected during project development in order to choose a design that has the approval of the community. Additionally, traffic needs will dictate staged construction of the new structure.

The 2014 Oregon Highways Seismic Plus Report includes an estimated cost to replace the existing bridge. The cost was based on the square-feet of deck area of the proposed structure, which is assumed to be 4-lanes (approximately 90-feet wide). The cost included in this report is $373,810,000 in 2013 dollars. Inflating to 2016, the project estimate is approximately $410,000,000. The additional width for a six-lane option would be approximately 20% more, or roughly $500,000,000.

The estimated cost of constructing a new structure is $500 per square-foot for construction and $100 per square foot for existing bridge removal. The bridge only cost (in 2016 dollars) for replacement of the Medford Viaduct with a 4-lane structure is estimated to be $177,000,000. The estimated bridge only cost of replacement with a 6-lane structure is estimated to be $220,000,000. Comparing this new bridge only cost with the Seismic Plus Report's total project cost, it appears the programmed amount is reasonable at this planning stage of the project.

Similar to the Retrofit Scenario, Rebuild based alternatives can be developed which are both constructable and address traffic control criteria. At the alternatives development stage of the project, ODOT mobility requirements and staging duration (delay costs) will be evaluation criteria for each alternative developed within this scenario set as part of the overall constructability analysis.

Reroute Scenario

Without an identified alignment for the reroute option, the estimated per mile cost is based on several conservative assumptions. The route has been assumed to depart from I-5 at the Blackwell Rd. Interchange at exit 35 and re-connect at the Fern Valley Interchange, exit 24. The alignment would likely be located on the east side of I-5 and could require reconstruction of both existing interchanges at each end and construction of at least three new interchanges at major intersecting roads including Crater Lake Highway, Table Rock Rd. and N. Phoenix Rd. The overall length of the reroute scenario has been assumed to be 13 miles.

Other considerations include crossing the Rogue River, Bear Creek and other streams, navigating through or around several residential areas, golf courses, the Medford Airport and many agricultural farms. The location and extent of retaining walls and other structures are unknown, but are anticipated to be needed. The average cost assumed in this estimate may vary widely depending on the preferred alignment and associated environmental, property and structure costs.

ODOT has not previously prepared a cost estimate for the reroute scenario. Therefore, the estimated cost presented here for the reroute option is based on an average of project costs from several recent highway and freeway projects in Oregon. Projects used for the basis of calculating the average per mile cost include the Sunrise Corridor JTA, Fern Valley Interchange, Willamette River Bridge, OR62 Bypass, and Pioneer Mt. to Eddyville (shown in Table 2). The average costs include all construction, right of way, environmental and engineering fees. The average cost based on these projects is $70 million per mile (see table below for sample projects and costs).

TABLE 2

Estimated Costs by Scenario

Project Name	Project Description	Cost/Mile
Sunrise	New freeway with 3 bridges, 2 ped bridges, and 18 walls.	$60 Million
Willamette River Bridge I-5	Large freeway bridge w/one mile of new roadway	$120 Million
OR62 Bypass	4.5 miles of new highway with 2 bridges and several structures	$30 Million
Fern Valley Interchange	New interchange with 1 mile of new roadway	$70 Million
Pioneer Mt. to Eddyville	5.5 miles of new highway with several structures	$70 Million
Average Cost		$70 Million

Based on $70 million per mile and adding 20% for contingencies, the overall project cost for the 13 mile reroute scenario is estimated at $1.1 Billion. This does not include modifications to local street networks and connections.

Similar to the Retrofit Scenario, Reroute based alternatives can be developed which are both constructable and address traffic control criteria. At the alternatives development stage of the project, ODOT mobility requirements and staging duration (delay costs) will be evaluation criteria for each alternative developed within this scenario set as part of the overall constructability analysis.

Summary

As stated upfront, the purpose of this memorandum is purely to provide context and understanding the order-of-magnitude of differences among the scenarios. Many other factors beyond cost will need to be evaluated once the transportation problem statement is developed. In general, the retrofit alternatives are the most cost-effective scenario for providing a seismically resilient route for Interstate 5 through the Medford area. However, it is estimated that the design life for this option will be limited to 30 years and future repairs will likely be necessary.

The rebuild scenario is substantially more expensive than the retrofit scenario. However, this option will provide a minimum 75-year design life and will limit the need for future maintenance. Full replacement would also support staged construction that would minimize impacts to public traffic during construction.

The reroute scenario is the most expensive and complicated option of the three. This option will provide a long design life and low maintenance similar to the rebuild option, but the impacts of this option will likely be extensive on the Rogue Valley. It would also require substantial modifications to the local street networks within the Medford and Central Point area.