DATE: October 5, 2017

TO: Oregon Transportation Commission

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FROM: Matthew L. Garrett
Director

SUBJECT: Agenda D – US97 @ Wickiup Junction (La Pine) Project (C14860).

Requested Action:
Request approval to decommission the US97 @ Wickiup Junction (La Pine) Project (C14860) and use the remaining funds for further geotechnical site analysis, transportation refinement planning, and to scope short-term and long-term alternative improvements.

Background:
US 97 is critical to the state’s transportation system, freight routes, and is classified as an expressway in the area of the Wickiup Junction project. The at-grade railway/highway crossing on US 97 at Wickiup Junction is the only remaining at-grade crossing on US 97 in Oregon. Drivers on US 97 who are not familiar with the area do not anticipate stopping for trains, nor do they anticipate school buses and vehicles carrying hazardous materials that are required by law to stop at railroad crossings regardless of whether or not a train is approaching. These required stops create an unsafe situation on the high speed US 97 facility. This safety problem has resulted in alternate local school bus routing and increased travel time to avoid the BNSF/US 97 railroad crossing.

Beginning in 2009, ODOT partnered with Deschutes County and the City of La Pine to develop a solution for the safety problem at the BNSF/US 97 railroad crossing at Wickiup Junction. The selected short-term solution includes realignment of the highway to the east of its current location with an overcrossing just south of the at-grade crossing. Construction funds were not available for a modernization project. Therefore, the project was developed as a “shelf project” through 2013. In December 2013, the Oregon Transportation Commission added Enhance discretionary funding of $17 million for final design, right-of-way acquisition, and construction in the 2015-2018 STIP. During the design process, ODOT geotechnical staff drilled 12 boreholes in the area to depths ranging from 14 to 100 feet and Cone Penetration Tests (CPTs) to 125 feet to better understand the geologic conditions under the site. This investigation allowed ODOT to design the project to work given the known geology.
After completion of the design process, the project was awarded to the lowest responsible bidder, High Desert Aggregate & Paving, on December 10, 2015. Construction authorization for the project was set at $13.7 million. The remainder of the Statewide Transportation Improvement Program (STIP) funds were spent on preliminary engineering, right of way acquisition, and utility relocation.

In 2016, ODOT began construction to re-align Highway 97 over the railroad. During the first summer, the contractor placed a quarter million cubic yards of soil adjacent to the existing railroad, creating embankments that would serve as ramps to the new bridge over the railroad tracks. In Spring 2017, ODOT construction engineers observed significant and unusual settlement within embankment areas. Unlike most soils, the settlement was happening quicker with time instead of tapering off with time.

In response, ODOT stopped work at the site and expanded the ODOT geotechnical team to include geotechnical experts from Federal Highway Administration to evaluate the observations. The team recommended that portions of the existing embankment be removed to stabilize the bridge structure. Additional drill holes were performed to investigate the cause of settlement beneath the embankments. Five bore holes, to depths of around 280 feet, were drilled and sampled. Geotechnical monitoring equipment was installed. An external specialty geotechnical consultant (Cornforth) was hired to review the data and perform laboratory testing.

Laboratory testing proved difficult as the soils became fluid when being prepped for typical testing methods. Although swelling clay minerals or plant-based organics were initially suspected by Cornforth, none of these were detected. More advanced testing methods, including X-ray diffraction analysis (XRD) and scanning electron microscopy (SEM), were selected to better understand the composition of the soil. These advanced tests determined that deep soil samples underground were composed of the silica skeletons of microscopic single-celled algae known as diatoms that grow in lakes. The diatoms lived over 10,000 years ago in a lake created when lava from nearby Newberry Volcano dammed the Deschutes River. As the diatoms died, they sank to the bottom creating a layer up to 200 feet deep. Volcanic ash, pumice, sand and silt eventually created a 50-foot thick crust over the diatoms. The diatoms make up half of the upper lake deposits and as much as 80% at greater depths. This finding was in contrast to geologic maps of the area that do not indicate the presence of diatoms.

Cornforth’s Preliminary Feasibility Study (attached) states that “excessive settlement of the diatomaceous materials is the primary failure mechanism impacting the overcrossing [bridge] project.” Soils that contain diatoms have properties that are very complex and not well understood. These unknowns make certainty in engineering analyses difficult. As such, recommendations for improvements to the soil in order to stabilize future settlement and continue with bridge construction for the Wickiup Junction project will be made with a high degree of uncertainty on how those
improvements will perform over time. The extent of the diatomaceous soils are also unknown and require additional study to evaluate alternative locations for a bridge over the railroad.

Cornforth’s study also states that unacceptable differential settlement of the bridge girders has occurred, so they will need to be removed prior to construction of proposed alternatives. A range of mitigation options are constructible and include various combinations of light-weight fill and viaducts (bridge structures over land). However, the costs for these options appear to be prohibitive within current funding limitations. Accordingly, additional geotechnical study is required in order to better understand and mitigate the risk of future investments.

**Current Activity** – ODOT has been conducting bridge safety inspections since Spring 2017 when settlement beneath the soil embankments was observed. These inspections have noted deformation to the existing bridge beams (girders) and bridge abutment foundations (MSE walls). To avoid further damage and mitigate potential safety concerns, ODOT has begun the process to remove the girders. Crushed rock materials produced for this project are proposed to be used on a nearby US 97 preservation project scheduled for the 2018 construction season.

**Recommendation:**
The constructible options proposed by Cornforth and the expanded geotechnical team require investment beyond current funding limitations and include significant geotechnical risk. Accordingly, ODOT recommends that the US97 @ Wickiup Junction (La Pine) Project (C14860) be decommissioned and the remaining funds be used for further geotechnical site analysis, transportation refinement planning, and to scope short-term and long-term alternative improvements.

If this recommendation is approved, additional site work will be required to return the site to a suitable long-term condition. This work will include project site clean-up, permanent seeding, erosion control, demolition of above-ground structures (bridge and walls) and total embankment removal. ODOT will evaluate opportunities to salvage project materials such as girders, reinforcing steel, concrete barrier, illumination poles, and embankment materials. Current project funding is summarized in the table below. ODOT anticipates the remaining funding is sufficient to decommission the Project and negotiate an end to the contract. Site work would be completed by Fall 2018.

ODOT will enter into negotiations with the contractor to end work and settle outstanding contract issues. The result of these negotiations may be termination of the contract. ODOT requests that authority to terminate be delegated to its Contract Administration Engineer.

Additional analysis may be performed by ODOT’s geotechnical consultant to evaluate the limits of the ancient lake deposits. The existing five drill holes and geotechnical monitoring equipment could be
used to better understand the behavior of the diatomaceous soils. Existing embankment soils could be reconfigured to assist in evaluating recommended alternatives for a future grade separation project.

A transportation refinement plan within the US97/Wickiup Junction area may also be performed to re-evaluate short-term improvements, such as signing, striping, turn pocket channelization and intersection realignments. The study would include collaboration with the City of LaPine and Deschutes County to review opportunities to improve safety within the project area while we assess a longer-term solution.

Results from the geotechnical and transportation current and forthcoming studies will be used to formulate recommendations to the commission for future consideration. The recommendations may be used to develop scope for a future STIP project to complete selected improvements.

**STIP Funding Summary**

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<th>PHASE</th>
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*Additional remaining funds (up to $600K) could be realized if not all embankment is removed.

**Attachments:**
- Attachment 1 - Feasibility Study Report
- Attachment 2 - Vicinity Map
- Attachment 3 - Location Map
- Attachment 4 - Geotechnical Design Process, Findings and Recommendations memorandum

**Copies to:**
- Jerri Bohard
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- Hal Gard
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- Amanda Sandvig
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- Arlene Santana
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