

WSDOT 2023 Scour Training

5/30/2023 – 6/01/2023

Q&A for Module 6: Long-Term Degradation and Stream Stability (Robert Humphries and Gabriel Taylor)

- **Q: The previous “MO” was that LTD would only be limited by the presence of bedrock, is it a correct assumption we should assume bed material is completely erodible or completely non-erodible?**
 - We have found that there are other materials that are 'non-erodible', besides bedrock, depending on the stream. These materials include boulders and glacial till. Determining whether or not a material is erodible requires understanding the available stream power. Some streams are capable of scouring rock, especially fractured and weak rock. For now, we suggest using the Erodibility plot from the HEC 18, as shown in the Module 6 presentation. Our ongoing work on using the Erodibility Index will tighten this up for our Western WA intermediate geomaterials (IGMs), which currently are challenging to characterize for scour resistance.

- **Q: How do we know that the knickpoint shown in [Slide 35] will move upstream?**
 - For this particular project, we determined it wasn't a risk because we know of its historical migration which indicates that it won't come within 100 feet of the structure within 75 years (which we think of as the limiting lifespan of these structures). More broadly, one would need to assess historical LiDAR. Ideally aerial photography can sometimes capture that. But characteristically, knickpoints migrate upstream – it is their intrinsic mechanism. As long as the base level doesn't rise, it is going to continue to migrate headwards. The rate at which it does is a hot topic of research and a debate among geomorphologists – there's a bunch of factors that play into the migration rate.

- **Q: How was the DNR geology data collected? Does the boring data always align with the DNR data or is the DNR data more likely to be lower than the boring data?**
 - DNR geology data is collected by experienced geologists who field map the area and incorporate past literature and any available subsurface data. Depending on the scale of the mapping, it is typically very reliable. Our geotechnical borings generally agree with the geologic mapping, but also pick up local variations, such as the presence of man-made fill and variations within mapped deposits.

- **Q: What is the best approach in estimating LTD when we are unsure of the pathway – should we assume the most extreme scenario?**
 - This sort of analysis needs to be done on a site-by-site basis and it depends on what phase you are in the project. In the preliminary phase (when you are doing a PHD), it is better to be more conservative at that early stage because its preliminary data.

- **Q: We currently use 2-year MRI for design, is WSDOT going to change requirements to use 1.2 – 1.5 year?**
 - For now, the 2-year MRI is correct. There are some opportunities in which we can use the 1.2 – 1.5-year MRI, but coordination with HQ Hydraulics is required and these will be assessed on a case-by-case basis.

- **Q: It looks like the scour profile shown in the Module 3 is different than the scour profile shown in Module 5. Which is correct?**
 - Both are correct, one figure illustrates scour profile when lateral migration is present. The angle of repose is not incorporated in the figure in the WSDOT Bridge Design Manual as this is a case-by-case determination depending on the geological characteristics of the subsurface material on site.

- **Q: Large woody material plays an important role in bank stability, especially in Western Washington. Will future research cover this topic?**
 - We currently are researching (in conjunction with WSU) how organics contribute to or affect bank stability. We expect the report to be ready by the end of the year. However, we have already begun to incorporate the research results into our guidance. We also have a new research project that looks specifically at rootwad stability. More to come on that front.

- **Q: Shouldn't bridge sounding (if available) also be used for erosion and scour analysis?**
 - Definitely. Yes, we should be using sounding, including historical data from previous sounding, surveys, etc.

- **Q: Is sediment transport modeling [in 2D models like SRH-2D] permissible in scour analysis on WSDOT projects?**
 - No, we don't currently use the sediment transport functions in SRH-2D. This is because models must be carefully calibrated with respect to hydrology, hydraulics and sediment flux.

- **Q: How useful are the long-term degradation tools in Hydraulic Toolbox? Do you recommend using them?**
 - WSDOT does not currently use the long-term degradation tool in Hydraulic Toolbox because long-term degradation has a wide range of outcomes, and a lot of professional judgement is involved. It is a tool that has its uses, but its usefulness would have to be determined on a site-by-site basis. For instance, it does not do a good job of accounting for knickpoints, which are one of the primary causes of long-term degradation in western Washington. Thus, it would likely have a limited application in that area. WSDOT recommends a multi-disciplinary approach to scour and consideration of various tools and professional judgement to determine total scour.

- **Q: Will clay be included in the forthcoming erodibility index?**
 - Yes, all geological materials expected to be encountered in Washington will be included.