

## **WSDOT 2023 Scour Training**

5/30/2023 – 6/01/2023

### **Q&A for Module 5: Sediment Sampling for Scour Analyses (Robert Humphries and Gabriel Taylor)**

- **Q: What are the WSDOT recommended sampling methods for sands and finer substrates?**
  - WSDOT Geotechnical drilling methods are well suited for sand and fine-grained material. Module 5, Sediment Sampling for Scour Analysis, will cover this in more detail during Gabe's portion of the presentation.
  
- **Q: What about the need for characterizing and potentially sampling bank material?**
  - Bank material needs to be sampled as part of the geomorphic assessment, but not necessarily for the scour analysis. Lateral migration assessments consider the bank material, but we're looking largely at the vertical component when analyzing total scour for bridges and crossings.
  
- **Q: Is the preference that we do not take pebble counts in areas of active flow (i.e., take dry samples instead of wet samples)?**
  - Yes, a dry sample is preferred, but not always possible. Subaqueous sampling tends to skew towards the coarse end of material, so samples would not adequately capture any finer material. Dry sampling captures the finer material, thus allowing for a more accurate analysis. This is important because as the percentage of finer material goes up, so does the potential for sediment transport. However, a McNeil sampler can sometimes be used for subaqueous sampling.

- **Q: How is the erodibility index evaluated?**
  - WSDOT is working on research for this topic. The erodibility index in HEC-18 is applied to rock and requires information about the strength of the rock and the orientation of the geologic structure within the rock. We are working on applying the erodibility index to other geomaterials such as over-consolidated glacial materials and drafting guidance that we can release on how to apply the erodibility index to these materials. More information to come soon.
  
- **Q: Has WSDOT explored using the Hydraulic Toolbox image gradation tool?**
  - Yes, however, if the Hydraulic Toolbox is used we will still require the Wolman Pebble Counts to validate the results. We have used the Hydraulic Toolbox image gradation tool for verifying sediment during construction, but not for design. It seems to perform well on smaller material; however, it encounters difficulty with larger material. For instance, it sometimes has difficulty differentiating between clasts within a particle and the particle itself. Vegetation also causes some problems.
  
- **Q: Why are 110 observations used for Wolman Pebble Counts?**
  - For statistical robustness, and to account for instances when sand particles may be encountered.
  
- **Q: Can you talk briefly about when it is appropriate to use more time/cost-intensive sampling methods other than the Wolman?**
  - That is determined on a project-by-project basis and is relative to material size. If the material is a small gravel or finer, a grab sample (bucket or bag) and subsequent lab gradation analysis is preferred. For larger material (material that can practically be picked up as individual particles and measured by hand). A particle measuring template is highly recommended for efficiency and accuracy (see FHWA Bridge Scour Workshop)

- **Q: We use a “mimic reference reach” approach for fish passage projects where we take 3 pebble counts as recommended by the Hydraulics Manual, how does your recommendation of 2 pebble counts for scour in the approach and contracted sections relate to this?**
  - In fish passage design, the pebble counts are used to attain a proxy for what would be the ideal streambed sediment at that crossing. The pebble counts obtained for scour analysis on existing crossings need to occur at the approach section and contracted section. For proposed crossings, a pebble count needs to occur at the approach section and a combination of a design mix and geotechnical boring information needs to be used at the contracted section.
  
- **Q: Can you elaborate more on how do you measure and report the median size samples of bedrock that is moderately hard to hard, and hard to very hard, etc., and how this is factored into the scour analysis?**
  - This is part of the erodibility index research mentioned previously. Currently, there isn't really any guidance in the literature that answers this question, but we're working on it.
  
- **Q: D50 by weight versus volume differs greatly for poorly graded alluvium, would be important to keep them separate right?**
  - Yes, this is an important distinction. The designer needs to be mindful of the sampling technique being used and not combine various methods. For example, pebble count is percent passing by size, whereas a grab sample or boring is percent passing by weight.