POG Clarification on Defining Dredge Neat Line using GMS
Lower Fox River, OU1
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During recent conversations with the OU1 Design Team, a misunderstanding regarding the nature/characteristic of the input data collected on the OU1 project, and how this input data is utilized by the GMS-SED Model was clarified. In particular, the OU1 Design Team clarified that the GMS-SED Model, coupled with the input data collected, provides a higher level of conservatism to the design than the Oversight Team ("OT") understood. This conservatism occasionally results in defining the neat line elevation below the interface elevation between the soft sediment and the clay. This conservatism results in the dredge encountering relatively frequent "high-sub-grade" elevations without there being a proportionate number of "low-sub-grade" elevations. This conservatism was designed to attain a higher probability of achieving the RAL.

The input data that is used by the GMS-SED Model to determine the bottom surface of the soft sediments (called the mesh by the model) comes from results of poling. Poling was conducted by setting the pole on the bottom and advancing it until it stops (i.e., refusal). Care was taken so poling was conducted consistently throughout the project. This poling can distinguish between soft sediment and hard clay, gravel, dense sand, or rock, but it is unable to distinguish between soft sediment and soft clay. When soft sediment is underlain by soft clay, refusal generally occurs in the soft clay layer or at the bottom of the soft clay layer. The OT originally believed that the neat line was biased high. After discussing the use of the poling data as described above, the OT's understanding of the design of the neat line has now changed to an understanding of the conservative nature of the neat line elevation.

GW Partners and the agencies established a "high sub-grade" protocol in 2005 to minimize the amount of clay dredged in areas where the clay bottom was encountered above the neat line elevation. This protocol was instituted because the dredging of clay wastes resources and adds undesired difficulties to the project. It was hoped that the 2006 poling activities would reduce the frequency and extent of high and low sub-grade areas.

The nature/characteristics of the input data, supplemented by the 2006 poling data, generally serve to minimize low sub-grade areas. In practice, the modeling procedures have the opposite effect of increasing the frequency of high sub-grade areas encountered through dredging, especially if those high sub-grade areas are comprised of soft clays. In Sub-area POG3, a thin zone of organic, contaminated sediment is commonly underlain with a soft, clay layer. A photograph of a typical set of high subgrade verification cores is shown in Figure 1.

Figure 2 illustrates how the soft clay can affect the neat line (Errors associated with the survey elevation, sample recovery, and analytical errors are ignored for this illustration). Poling is used to define the zone of soft sediment and sampling results are interpolated within the model to prescribe the cut at the poling location. When there is a thin zone of contamination not fully extending through the sample interval, the model overestimates the depth of PCB contamination. Similarly, overestimating the thickness of the extent of soft sediment tends to drive the modeled neat line down into the soft clay layer. These two occurrences result in a conservative approach to RAL elevation establishment.

Figure 1. Sample cores used to define remaining sediment in high sub-grade areas (Foth & Van Dyke and Associates, MVC-020F).

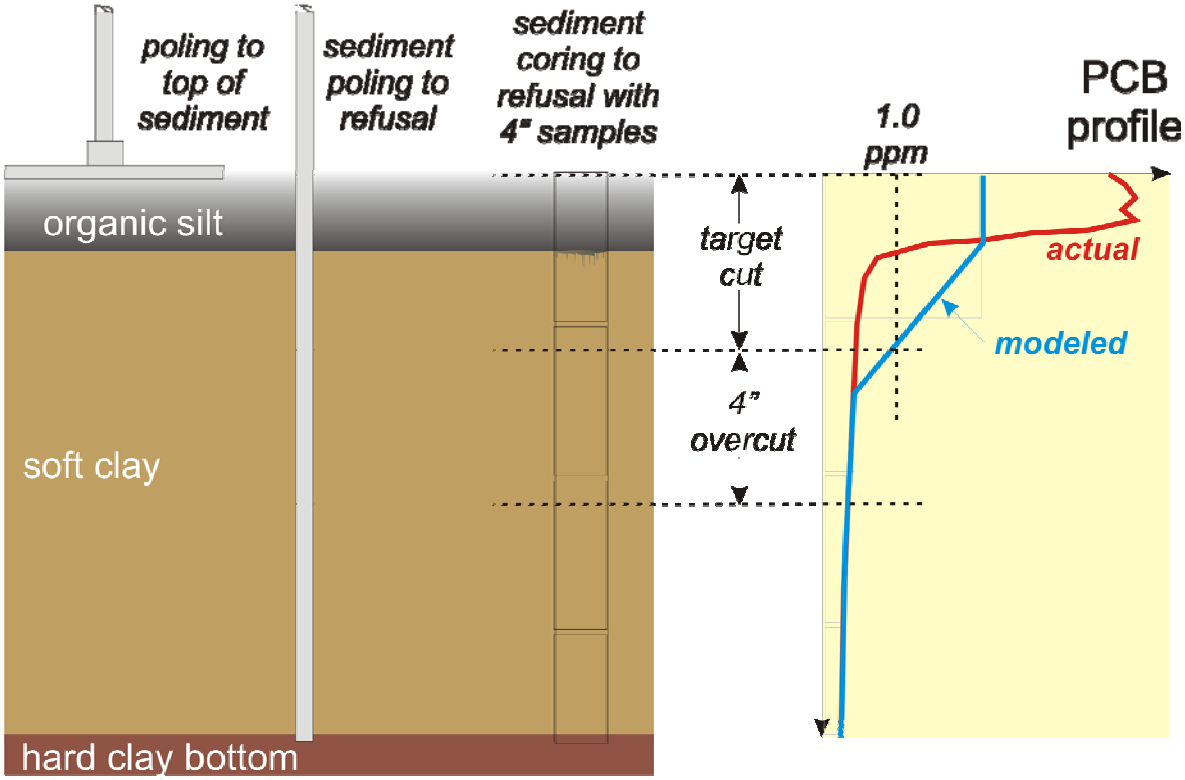

Figure 2. Schematic of sediment profile, showing extent of sampling, poling, and GMS-SED modeling results for a thin zone of organic silt underlain by a soft clay layer (Foth & Van Dyke and Associates).