Solidification of Marine Sediments at a New Jersey MGP Site

Jon Williams (jwilliams@geiconsultants.com) (GEI Consultants, Cary, NC, USA)
George Onorato (GEI Consultants, Denver, CO, USA)
Barry Raus (GEI Consultants, Mt. Laurel, NJ, USA)

Background/Objectives. This presentation describes a successful bench-scale treatability study for solidification of MGP tar-impacted marine sediments in a tidal waterway adjacent to a former MGP site in coastal New Jersey. This work was one element of a feasibility study for a large-scale ISS project on a tidal creek. The thickness of impacted sediments at this site exceeds 30 feet, and approximately half of the impacted volume is soft organic sediment. Installing ISS at this site will require working through a 25-foot water column with strong tidal currents.

Approach/Activities. Using sonic methods from barge-mounted rigs working through the tidal water column, the team retrieved sediment cores spanning the impacted depth range. The material was analyzed for physical properties such as moisture, grain size, and organic content, and then segregated into two composite mixtures (overlying soft organics versus underlying fine sand) for ISS mix design testing. Starting from a successful ISS mix design for upland soils at the adjacent MGP site, the treatability study tested an ISS reagent blend with cement, slag, and microfine silica fume. The reagent blend was tested at varying dose rates on three impacted sediment types: soft organic material, fine sand, and a 50-50 blend to mimic the transition zone between the two layers.

Results/Lessons Learned. The treatability study established ISS reagent dose ranges for each of the three types of material tested. The study proved the concept that each impacted sediment layer is amenable to solidification with a single ISS grout mix design. A single mix design will simplify the logistics of full-scale ISS installation and quality control. The required grout dosage varies by sediment type, so the field installation method must be capable of measuring and adjusting grout delivery on a per-horizon basis across the impacted sediment depth range.

Beyond the use of microfine silica fume as one of the solidification reagents, this study has several other noteworthy aspects. A cellulose-based anti-washout reagent used in the ISS grout mixtures caused unusually low slump behavior in the soft sediments. Leach testing with SPLP of raw and solidified sediments, as well as 1315 LEAF testing of successful ISS mix designs, help demonstrate the effectiveness of the remedy. Salt water durability testing showed continued strength gains for test cylinders immersed in seawater.

This presentation will describe how other practitioners can benefit from the lessons of this treatability study, and discuss some of the logistical challenges for ISS in marine sediments.