Conceptual Design for a Wetland Treatment and Habitat Improvement Cap at the Solvay Site Car Ferry Slip

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Background/Objectives. Environmental liabilities associated with the Former Milwaukee Solvay Coke and Gas Plant Site (Site) include the possible remediation of sediments within an area of the Site known as the Car Ferry Slip. WEC Energy Group was interested in generating a conceptual-level understanding of how the sediments in the Car Ferry Slip could be capped in place to isolate them from the aquatic environment. The approach being considered included the construction of a sheet pile wall at the mouth of the Car Ferry Slip to retain several feet of cap material and limit lateral movement of underlying in situ sediments during consolidation (due to the weight of the cap materials). In addition, the riparian component of the cap surface may be enhanced to include soils and wetland plants to support treatment of storm water discharges from upland areas following remediation and redevelopment of the Site. WEC was also interested in a capping strategy that provides habitat restoration elements that would address concerns from natural resource agencies and trustees.

Approach/Activities. Foth utilized available data develop a preliminary conceptual cap cross section that will isolate the contaminated sediments in the bottom of the slip. The modeling tool CapSim, from Texas Tech University, was utilized to estimate material types and layer thicknesses for the cap. Consideration was also given to the condition of shoreline structures abutting the cap as well as the assumption that pilings and shipwrecks within the slip will not be removed prior to cap placement. To isolate the contaminated sediments to be contained within the slip from the navigation channel of the Kinnickinnic River, a sheet pile wall may be placed at the mouth of the slip. Foth prepared a preliminary conceptual design of the sheet pile section, sheet length, and alignment for such a containment wall. The elements of a treatment wetland necessary to handle the volume of storm water that may be generated from the redeveloped Site were determined at a conceptual level. The incorporation of different material types (i.e., soil types that will support desired wetland plant growth), water depths, and hydraulic controls to provide appropriate retention times will be determined. The ability to improve the habitat quality of the capped slip area was considered based on the anticipated post-capping water depths, and shoreline modifications that were identified as necessary for the other components of the project.

Results/Lessons Learned. The conceptual cap design consists of 1 meter of sand placed across the entire Slip area. Based on the data available and the nature of this evaluation, a simple two layer cap model was simulated using CapSim and one chemical constituent (naphthalene) was modeled as the contaminant of concern. The cap model looked at the evolution of pore water chemical concentration over a 100-year time period. Porewater concentration of naphthalene was computed across the vertical cross section at various time periods, based on diffusion and decay and remain relatively low with the concentration being near zero in the surficial portion of the sand cap. Computer simulations of shoring stress/strain conditions using ShoringSuite Version 8.3D software by CivilTech Software, USA indicate that sheet piles with a minimum section modulus of 8 cubic inches per foot of wall (in^3/ft) would be expected to meet performance criteria under the assumed design conditions, and the required minimum embedment depth is estimated to be 16.5 feet below the base of the wall. The initial evaluation of existing and proposed site conditions indicates that a pond/treatment wetland system installed along the land/Slip interface would allow the site to comply with peak discharge reduction and TSS removal requirements of Wis. Admin. Code NR 151.