Virtual Interactive Remediation in the Groundwater Environment (VIRGE): Innovative Graphical-Simulation for Teaching Groundwater Cleanup Design

William Fish, Dept. of Civil and Env. Eng., P.O. Box 751, Portland, OR, 97207-0751 USA, fishw@cecs.pdx.edu, Michael McKillip, Dept. of Civil and Env. Eng., P.O. Box 751, Portland, OR, 97207-0751 USA, Shuguang Li, Dept. of Civil and Env. Eng., Michigan State University USA,

VIRGE (Virtual Interactive Remediation in the Groundwater Environment) is an advanced electronic resource that allows more realistic student problems, an increase in student engagement and self learning, and the incorporation of interactive, exploratory learning into the classroom. VIRGE is based on a sophisticated yet easy to use groundwater modeling and visualization program (Interactive Groundwater, IGW, Li and Liu: www.egr.msu.edu/~lishug/research/igw). Equipped with an advanced graphical interface, IGW allows for interactive visualization and manipulation of complex, multidimensional subsurface systems including hydrology, contaminant transport and the assessment of contaminated sites. Two principle educational products discussed here are the Graphical Teaching Aid (GTA) and the Student Learning Exercise (SLE), developed as part of an NSF-supported program. The GTA is a classroom-presentation guide that includes text materials for the instructor as well as supporting electronic IGW files for interactive graphical demonstrations and discussions in the classroom. Text files include a conceptual outline and a list of principles to be examined in the lecture as well as a flexible script punctuated and illustrated throughout by use of IGW as a highly interactive "electronic chalkboard". The thorough text guides the instructor in the effective use of IGW, suggests ideas to engage student interaction, and provides ways to tailor the interactive presentation to student needs. The SLE complements the GTA and is an interactive exercise to engage students in discovery learning. As with GTAs, SLEs are designed for specific levels of classes (undergraduate or graduate) and specific populations (non-technical, science, or engineering majors). Text files (background and instruction) and IGW files (for problem visualization, interactive manipulation and solution) are provided. The SLEs include interactive computer-based exercises ranging from introductory investigations to extensive, open-ended investigations comparable to geotechnical exploration projects or engineering design projects.