Background/Objectives. Supplemental Remedial Investigations and Feasibility Studies (SRI/FS) are being conducted for Operable Unit 5 (OU-5) of the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund site. OU-5 encompasses approximately 80 miles of the Kalamazoo River in Kalamazoo and Allegan Counties, Michigan. OU-5 is divided into seven areas. An FS was prepared for Area 3, a 3.4-mile stretch of the Kalamazoo River from the Otsego City Dam to the former Otsego Dam. Alternative development relied on accurate estimates of nature and extent of polychlorinated biphenyl (PCB) concentrations in floodplain soils. The Area 3 conceptual site model (CSM) recognizes that historical dam operations influence PCB concentrations and that locally concentrations can be heterogeneous but are generally located in certain geomorphic features that align with formerly inundated areas. The objective of this work was to map PCB concentrations to be consistent with the CSM/geoforms and to develop preliminary Remedial Action Levels (RALs) that would be protective of ecological receptors.

Approach/Activities. Floodplain soil PCB concentrations were evaluated by geomorphic feature and results indicated that some geomorphic features had statistical power to predict PCB concentrations. A variety of geostatistical interpolation methods were considered that incorporated geomorphic features in varying degrees, including natural neighbor, ordinary kriging, and simple kriging with locally varying means. Preliminary results for the variety of methods were compared using cross validation. One method was used in sequential Gaussian simulation (SGSIM) using a three-dimensional, curvilinear grid that followed the general flow patterns of the formerly inundated area. SGSIM is a geostatistical method that generates a large number of equally probable realizations of PCB concentrations, which can be combined to develop a realistic map of nature and extent. Population statistics of the 100 realizations were calculated and a moving window average was performed for each realization to estimate uncertainty bounds on percent of floodplains protected for various ecological receptors. A hilltopping exercise was performed iteratively using a variety of RAL values to evaluate potential clean up levels and remedial footprints.

Results/Lessons Learned. SGSIM results were consistent with CSM by accounting for short scale variability and heterogeneities of PCB concentrations while also honoring geomorphic feature boundaries. Ranges in percent of floodplain protected were useful to quantify the uncertainty. The hilltopping exercise provided valuable insight to understand implications and cost/benefit of various cleanup levels. While the geostatistical estimation method generally met the study objectives, a few hard lessons were also learned. First, a number of iterations were necessary to form sublevel geoforms to improve predictability. This helped the team realize that sophisticated models require careful review, evaluation, and interpretation of the results relative to the level of sophistication used in developing geoforms and other CSM features. Additionally, sample designs play a critical role in determining the appropriateness of the geospatial model selected. Understanding the limitations of the sample design and other factors is critical to a proper interpretation of the model predictions. Overall, the model predictions of PCB distribution within the study was improved using SGSIM. However, some areas within the geospatial model did not predict well even with adjustments.