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USING THE STOMP SIMULATOR TO ASSESS BIOSLURPING RECOVERY AND REMEDIATION PROCESSES OF LIGHT HYDROCARBONS IN CONTAMINATED AREAS

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Research documented in this thesis focuses on the multiphase flow and transport of Light Nonaqueous Phase Liquid (LNAPL) type contaminants as mediated by application of bioslurping remediation, one possible configuration of multiphase extraction (MPE). With the cooperation of the hydrology team of PNNL (Pacific Northwest National Laboratory, WA, USA), the numerical simulator STOMP (Subsurface Transport Over Multiple Phases) was modified to include bioslurping processes in 3-D assuming the presence of a fixed tube tip extraction position and using the well model concept. A base model was built using data from a hypothetical LNAPL recovery case study presented in the literature, combined with data from actual MPE field systems. The model was used to carry out a range of sensitivity analyses. These analyses were used to evaluate the effects of different elevations of the bioslurping tube tip, the progressive lowering of the tube tip, the extraction radius of influence, and the effects of vacuum pressure variations on oil recovery. The modeling results were found to be consistent with the expected physical behavior. A field case study of bioslurping was also conducted with the modified simulator. LNAPL recovery was adequately reproduced, with the predicted mass of extracted water being smaller than the field observations. In terms of free phase removal, the simulator adequately represented the multiphase extraction process intended with the bioslurping technique.