Executive Summary

This report documents an evaluation of the micropurge sampling method conducted in Test Area North (TAN) groundwater monitoring wells at the Idaho National Engineering and Environmental Laboratory (INEEL). The micropurging evaluation was directed by Waste Area Group (WAG) 10, and the results from this test are intended to provide an initial evaluation of the effectiveness of micropurge sampling at the INEEL. For this study a variable frequency drive (VFD) pump controller was developed to allow low-flow rate sample collection, and samples were collected from selected wells using both micropurge and standard sampling methods. Based upon the statistical comparison of sample analytical results it was found that micropurge sampling can generate representative groundwater samples. The analytical results from the samples are comparable to those generated by the standard sampling method currently in use (given the limits of analytes and concentration ranges tested). A cost evaluation of sampling by micropurge versus sampling by standard methods at TAN indicates significant savings may be realized through conversion to the micropurge sampling method. The significant reduction in waste water generation and sampling cost make the micropurge sampling method an attractive alternative to the current standard sampling methodology used at the INEEL.

The analytes selected for testing at TAN were trichloroethylene (TCE) and strontium-90 (Sr-90). A review of historical analytical data from groundwater monitoring wells was conducted from which four wells (TAN-09, TAN-12, TAN20, and TAN-DD2) were selected based upon their small historical variations in concentration and lack of concentration trend for the selected analytes. Geophysical logging and well construction data was also reviewed to select the optimum dedicated pump placement depth in the selected wells to obtain micropurge samples directly from the most transmissive zone of screened interval. During sample collection, purging the selected wells through the micropurge method generated, on average, less than 5% the volume of waste water generated by the standard method purging. Following sample collection and analysis, micropurge sample results indicates that for three of four sample data sets (TAN-09, TAN-20, and TAN-DD2) there is no statistically significant difference between the results from the two methods. The arithmetic means from the same three sample data sets also fell within 1.96 standard deviations (95% confidence interval) of the mean of historical sampling results. For the one sample data set in which the micropurge and standard method sample results were statistically different (TAN-12), the cause appears to be related to poor well construction and the presence of a significant amount of bentonite in the well which affected sample results. The range of TCE concentrations in the selected wells was from 3 to 39 ug/L and the range of Sr-90 concentrations was from nondetect to 323 pCi/L.

The cost comparison of micropurging and standard purging for the TAN groundwater monitoring network indicates that approximately $1,260,000 can be saved over the next 30 years through a conversion to micropurging given the current sampling plan (this is an estimated 1,200 sampling events in 39 wells with sampling frequency decreasing over time). The capital costs of dedicated pump installations can be recovered after approximately 3 years for the 29 TAN wells now equipped with dedicated pumps. The net savings on an annual basis for 48 sampling events in these 29 wells (current level of sampling) will be approximately $50,000. Analysis of sampling costs for the 10 new wells at TAN indicates that the capital costs for installing dedicated pumps can be recovered after about two rounds of sampling. Beginning with the third round of sampling, the net cost savings will be approximately $84,000 per year for quarterly sampling. Costs for purging these 10 new wells using the standard method (and there by savings through micropurge) are very high because of the large well diameter, long length of open hole, and unusually large purge volume requirements.