

Implementation of Modified Shallow Dugwells Through Community Based Programs to Provide Arsenic Safe Water in West Bengal, India

*Hira Smith MM*¹, Xavier S², Yuan Y¹, Hira A³, Chakraborty P⁴, Hore T⁵, Smith AH¹*

¹ *School of Public Health, University of California, Berkeley, USA*

² *Department of Environmental Science, St. Xavier's College, Kolkata, India*

³ *Department of Geography, Shibpur Dinobundhu(Institution) College, Howrah, India*

⁴ *Former Director, Geological Survey of India, Kolkata, India*

⁵ *C&H Environmental, Inc., New Jersey, USA*

The population of West Bengal is about 80 million and that of the district of North 24 Parganas, 7.3 million with a density of 1783 persons per sq km. Surveys show that about one million people in this district have been drinking water contaminated with arsenic above 50 ug/L. Project Well has developed a self-supporting community based mitigation program to provide arsenic safe water to the villagers of North 24 Parganas. Shallow concrete dugwells less than 25 feet deep are constructed following stipulated guidelines. The design of the dugwell differs from the traditional ones mainly by a layer of coarse sand of one-foot width that envelops the outer wall of the concrete cylinder, and by covering the wells and extracting water with hand pumps to reduce potential bacterial contamination. The function of the shroud of sand is to recharge water and also to act as a filter. In May 2002 five dugwells were constructed and monitored monthly for one year in a pilot program with measurement of arsenic concentrations and coliform bacterial counts. Except in one dugwell, arsenic concentrations were below 50 ug/L throughout the year. The annual average arsenic concentration in all five dugwells was 27 ug/L. There was a direct relationship between increases in arsenic concentrations and decreases in the volume of water in the dugwells in the dry, hot summer season. To control bacterial contamination sodium hypochlorite solution containing 5% chlorine was applied once a month. The annual average of the bacterial counts of all the five dugwells were high: total coliform bacteria, 317, and fecal coliform bacteria, 110. However a remarkable decreasing trend in the bacterial count over a one-year period has been observed with the average fecal coliform count decreasing from 100 to 26. Twenty more dugwells were constructed in 2003, and are currently being monitored. Door-to-door public education and training on dugwell maintenance has been introduced to make the system sustainable. From the pilot study, we conclude it takes more than one year to mobilize villagers and convince them to use dugwell water, and that annual testing for arsenic needs to be done in April or May. To determine the testing period for the bacteria analysis further assessment will be conducted during the extended program.