Using a Combination of Drilling Methods and Casing Advancement to Overcome Bedrock Borehole Instability"

John N. Dougherty, CDM; Joseph J. May, CDM; Steve Laramee, North Star Drilling; and Rob Alvey, U.S. Environmental Protection Agency

Abstract

A range of drilling methods including hollow stem auger, air rotary, the Atlas Copco Symmetrix overburden casing advancement system, and HQ rock coring were combined to complete 150 to 325 foot deep bedrock boreholes where highly fractured intervals have prevented borehole completion using conventional air rotary and rock coring methods. The boreholes were completed in shale and carbonate bedrock at a U. S. Environmental Protection Agency (USEPA) Superfund site in Cayuga County, New York. This combination of techniques was developed by North Star drilling and CDM to overcome persistent problems with borehole stability at the site. The initial drilling methods included installation of a 4-inch surface casing and 4-inch air rotary drilling to depth. When borehole stability problems were encountered we switched from air rotary to HQ rock coring to try to overcome the problem. However, this method was not satisfactory because we could only use the 4-inch casing once to case off an unstable zone. If a second, deeper unstable zone was encountered it was difficult to overcome. The combination of methods presented in this paper used the Symmetrix casing system to advance casing as need to case off, temporarily, unstable intervals in the borehole as they were encountered. HQ rock coring proceeded to depth inside the Symmetrix casing. Once coring was completed the boreholes are geophysically logged by the U. S. Geological Survey who is providing technical assistance to the USEPA at this site. This logging data were used to design a Westbay multi-level well for each borehole. The Symmetrix casing is withdrawn as the multi-level system is completed. This paper presents a detailed description of the drilling method, the multilevel well installation process through the casing, and discusses the advantages of this method for bedrock drilling, rock coring, and multilevel well construction.

Biographical Sketches

John N. Dougherty
CDM
Raritan Plaza I
Raritan Center
Edison, New Jersey 08818
Office: 732-590-4652
Facsimile: 732-225-6147
Email: doughertyjn@cdm.com

Mr. Dougherty is a hydrogeologist with 24 years experience in the environmental consulting and has been working at CDM since 1999. At CDM Mr. Dougherty has been concentrating on hydrogeologic characterization of USEPA Superfund sites in Region II. Many of these sites are situated in fractured bedrock terrain. He has extensive experience in many aspects of site investigation and has designed and supervised the installation of numerous monitoring wells at Superfund sites around the United States. Mr. Dougherty holds a B.S. Degree in Geosciences from The Pennsylvania State University.

Joseph J. Mayo
CDM
125 Maiden Lane, 5th Floor
New York, New York 10038
Office: 212-785-9123
Facsimile: 212-785-6114
Email: doughertyjn@cdm.com

Mr. Mayo has more than 21 years of experience on environmental projects including site assessments, remedial investigations, ecological/biological assessments, and remedial actions for USEPA Region II and other state and Federal agencies. Mr. Mayo has in-depth knowledge of Superfund, RCRA, and OSHA regulations particularly as they relate to Superfund. Mr. Mayo has taught courses on Superfund Site Assessment, Hazard Ranking System, OSHA health and safety, and he developed a class in environmental chemistry for a national audience. Mr. Mayo has an M.S. in Environmental Science from the New Jersey Institute of Technology and a B.A. in Biology from Jersey City State University.

Steve Laramee
North Star Drilling
P.O. Box 350
37 Copeland Ave.
Homer NY 13077
Office: (607) 749-6000
Fax: (607) 749-6067
Email: steve@geologic.net

Mr. Laramee is a NGWA Certified Well Driller and monitoring well installer with 21 years experience in the environmental drilling business and has been working at GeoLogic NY, Inc d/b/a North Star Drilling since 1998 and 12 years with other firms. Mr. Laramee holds an A.A.S. in Science, Resources Drilling and Blasting Technician from Sir Sanford College in Lindsay, Ontario, Canada. He has installed wells at hazardous waste sites in New York, Massachusetts, Connecticut, Vermont, Maryland, Pennsylvania and Ohio. He also has experience in subsurface exploration related to road and bridgework; hydroelectric dams and other utilities; and landfill construction.

Robert M. Alvey
ERRD-PSB
USEPA
290 Broadway
New York, New York 10007
(212) 637-3258
(212) 637-3256 fax
alvey.robert@epamail.epa.gov

Rob Alvey has over 30 years experience conducting geologic investigations for the government, environmental and utility industries. Since joining USEPA in 1997 he has been a key member of the Technical Support Team and serves as hydrogeologic expert for the Superfund program with responsibility for nearly 50 Superfund sites in Region 2. He is a member of the EPA Ground Water Forum, has served as Brownfields Project Manager, and teaches geology at York College. Alvey has B.S. and M.S. degrees in Geology from Rensselaer Polytechnic Institute and has been licensed as a professional geologist in several states.