

Hoeksema, Amy

From: Quackenbush, Peter (DNRE) [QUACKENBUSHP@michigan.gov]
Sent: Tuesday, August 02, 2011 1:23 PM
To: Hoeksema, Amy; Rogers, Joseph (DNRE)
Cc: Clearwater, Scott; Dave Favero
Subject: RE: Racer Lansing Plants 2, 3 and 6 RFI - use of visible tracer in drilling fluid

Amy, The approach described below for getting a sample representative of the formation water is acceptable.

Peter Quackenbush
Senior Environmental Engineer
Hazardous Waste Permits
517-373-7397
quackenbushp@michigan.gov

From: Hoeksema, Amy [mailto:Amy.Hoeksema@arcadis-us.com]
Sent: Tuesday, August 02, 2011 9:01 AM
To: Hoeksema, Amy; Quackenbush, Peter (DNRE); Rogers, Joseph (DNRE)
Cc: Clearwater, Scott; Dave Favero
Subject: RE: Racer Lansing Plants 2, 3 and 6 RFI - use of visible tracer in drilling fluid

Peter,

Per our telephone conversation yesterday, in addition to purging the water from the well to the point that the tracer is no longer visible (described below), we will then purge an additional 1% in volume of the total drilling fluid added during drilling. This will help assure that the remaining 1% of drilling fluid is removed and that our sample is representative of the formation water.

Please respond in the affirmative if you agree with this approach. Thanks for your input.

Best Regards,

Amy L. Hoeksema | Vice President/Operations Leader | amy.hoeksema@arcadis-us.com
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From: Hoeksema, Amy
Sent: Friday, July 29, 2011 5:23 PM
To: Quackenbush, Peter (DNRE); 'Rogers, Joseph (DNRE)'
Cc: Clearwater, Scott; 'Dave Favero'
Subject: Racer Lansing Plants 2, 3 and 6 RFI - use of visible tracer in drilling fluid

Pete and Joe,

As we discussed today in our telephone conversation, we would like to get your approval to use a visible tracer dye, fluorescein, in the drilling fluid for the RFI work that we are completing at the above referenced Plants. Since this is a

little different than the typical development of 3 times the amount of water added during drilling, we wanted to get your input and approval before proceeding.

The use of fluorescein dye in drilling water greatly reduces the chance of groundwater dilution and cross-contamination when setting temporary wells or collecting vertical aquifer profile (VAP) samples. The Sonic drilling that we are currently using at the plants often requires the addition of drilling water to provide lubrication for the casing advancement and to eliminate heave from the bottom of the casing to set a well. Spiking the drilling water with fluorescein dye provides a technical basis for Arcadis personnel to determine when purge water is representative of formation water. Since this is a little different than the typical development of 3 times the amount of water added during drilling, we wanted to get your input and approval before proceeding.

Fluorescein dye is non-toxic and breaks down quickly in sunlight. The MSDS is attached. The visible threshold for the dye is ~0.1 mg/L (100 ppb). Arcadis' SOP calls for a dye concentration of approximately 20 mg/L (20,000 ppb). Therefore, if development of a temporary or permanent well continues until the dye is no longer visible, the sampler is assured that the purge water is greater than 99% formation water. The attached picture illustrates the dye standards starting with 100% drilling water (20mg/L) solution on the left and proceeding to a 1% drilling water solution on the right.



We have used this methodology at the Rose Township site through the MDEQ RRD and EPA. If you have additional questions, please do not hesitate to call. We have ordered the dye and would like to start using it early next week. Thanks for your assistance.

Best Regards,

Amy L. Hoeksema | Vice President/Operations Leader | amy.hoeksema@arcadis-us.com

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