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MCAS EL TORO
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CLEAN II TRANSMITTAL/DELIVERABLE RECEIPT

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Code 1831.JA
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DATE: 09/06/95
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FROM:
D. J. Tedaldi, CTO Leader

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CLEAN II AQ/QC for MCAS El Toro, CTO-0080

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CLEAN II Program
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September 1, 1995

Joseph Joyce BRAC Environmental Coordinator
Department of the Navy - Southwest Division
Naval Facilities Engineering Command
Environmental Division
1220 Pacific Highway, RM 18
San Diego, CA 92132-5181

Subject: Submittal of Technical Assessment of Micropurging as a Sampling Technique for Groundwater at MCAS El Toro, CLEAN II QA/QC for MCAS El Toro, CTO-0080.

Dear Mr. Joyce:

I am providing this submittal of our Technical Assessment of Micropurging as a Sampling Technique for Groundwater at MCAS El Toro. Based on the current understanding of the situation, our recommendation is for MCAS El Toro to continue with the present system and consider micropurging only for those wells where measured hydraulic conductivity values are appropriate *and* there is some degree of uncertainty in the representativeness of the inorganics data from Rounds 1 and 2. For these wells, where the existing dedicated pumping system can achieve low flows (<100 mL/min), micropurging may be acceptable.

If micropurging is attempted at MCAS El Toro, conventional methods should also be used for the next sampling round to enable comparisons to be made. This would reduce apparent variability in the results which may be a temporal effect due to the time lag from the last round of sampling, rather than a sampling technique effect.

The mean hydraulic conductivity values at MCAS El Toro are almost the same as what has been observed at MCAS Tustin. CLEAN II, under CTO-0049, is currently planning to conduct a pilot study at MCAS Tustin to assess the comparability of the two purging methods in 11 wells. About half of the wells will be in moderately permeable silty/clayey sands and gravels with the other half in low permeability silts and clays. A draft issue paper which includes the details of the field test has been developed and will be issued for MCAS Tustin BCT review in September. When the data from these field tests become available, it is suggested that the MCAS El Toro BCT examine the results also.

If I can be of any assistance please call me in Bechtel's San Diego office at (619) 687-8780.

Sincerely,

Dante J. Tedaldi, Ph.D., P.E.
Technical Quality Assurance MCAS El Toro

Attachment: Technical Assessment of Micropurging as a Sampling Technique for Groundwater at MCAS El Toro

cc: Larry Vitale, Remedial Project Manager
Juan Jimenez, RPM Base Closure Branch
Bonnie Arthur, RPM

TECHNICAL ASSESSMENT OF MICROPURGING AS A SAMPLING TECHNIQUE FOR GROUNDWATER AT MCAS EL TORO

Background

Purging of wells prior to sampling for water quality is generally accepted. The purpose is to obtain samples which are representative of conditions within the aquifer and not within the well casing or adjacent filter pack. Within the CLEAN II Program the general practice (see CLEAN II Standard Operating Procedure (SOP) Number 8) is to pump three to five well volumes and/or until field parameters such as pH, temperature, electrical conductivity, and turbidity are stabilized. Wells completed in materials with low permeability are pumped-dry two times after allowing at least 80 percent recovery.

Conventional purging and sampling may result in excessive disturbance of the formation, which may produce turbid samples requiring filtration if the dissolved fraction is of interest. For risk assessment purposes, U.S. EPA favors nonfiltered samples for metals analyses. Since turbid samples often contain fines carrying metals of interest that will elevate the concentration of metals found in the sample, an alternative to conventional purging methods may be needed. One approach is to provide for filtered and unfiltered metals samples at wells where turbidity above 5 units is found.

In recent years attention has focused on micropurging because of advantages such as less disturbance to the sampling interval, increased spatial resolution of sampling points, less purge volume, and elimination of the need for duplicate (filtered and unfiltered) sample analyses. The overall objective of micropurging is to provide a more passive approach to sample collection. The ideal is to set the sampling device intake to a rate equal to or lower than the natural groundwater recharge rate, thereby reducing the introduction of fines or colloids into the sample. In general, the micropurging/sampling method is more cost. However, when used for sample collection at great depths, the increased labor costs may reduce or eliminate the cost advantages.

Among the reports reviewed, Gillham et al. (1985) is perhaps the most comprehensive study. They used tracer tests to evaluate the viability of micropurging. The results clearly show that the method is appropriate under specific conditions. Constant flushing due to natural groundwater flow occurs in the screened section of the wells. Therefore, very little purging in that section is required prior to obtaining a representative groundwater sample. However, their studies were limited to materials with high hydraulic conductivities. All other papers reviewed, EPA, 1993, Barcelona et al., 1994, Puls and Paul, 1995 also examined relatively high permeability formations (3 ft/d to 30 ft/d) (0.001-0.01 cm/sec). No conclusive evidence was presented to support the applicability of micropurging in low-permeable materials. In several instances necessity of more research in this area is pointed out.

CLEAN II Experiences

The CLEAN II Program often encounters sites that are underlain by clay sediments, located close to the shoreline and/or hydraulically filled. In many cases the predominant soil types have relatively low permeability (<3 ft/d (<0.001 cm/sec)). The gravel packs for wells completed in these materials are likely to be equally or more permeable than the surrounding materials. Micropurging of these wells may result in preferential evacuation of water from the gravel pack and as a result, groundwater samples would not be representative of the conditions within the formation. In addition, for sites with historical data, to assure continuity, sampling by both conventional and micropurging methods could be conducted to study the applicability of the micropurging method at a site before a final recommendation is made.

Recommendations

Our recommendation is to evaluate the use of micropurging on a case by case basis at sites which meet the minimum hydraulic conductivity requirements. At sites with high permeability (k > 3 ft/d (0.001 cm/sec)) micropurging should be considered. However, in order to correlate with the existing data, if such data exist, sampling should be conducted using both conventional and micropurging techniques to evaluate the

applicability of the micropurging method. For sites with low permeability (k < 3 ft/d (0.001 cm/sec)) conventional purging techniques should be used unless a pilot study is conducted and the results indicate otherwise.

Hydraulic conductivity within the two aquifers at MCAS El Toro is listed in Table 1. Inspection of the table indicates that, in general, conditions at MCAS El Toro are not amenable to the use of micropurging. However, there appear to be a few wells where the technique would be applicable. In addition, micropurging is supposed to purge from the most permeable section within a screened section and thus, these sections would tend to have greater hydraulic conductivities than the reported means. Based on the current understanding of the situation, our recommendation is for MCAS El Toro to continue with the present system and consider micropurging only for those wells where measured hydraulic conductivity values are appropriate *and* there is some degree of uncertainty in the representativeness of the inorganics data from Rounds 1 and 2. For these wells, where the existing dedicated pumping system can achieve low flows (<100 mL/min), micropurging may be acceptable. If micropurging is attempted at MCAS El Toro, conventional methods should also be used for the next sampling round to enable comparisons to be made. This would reduce apparent variability in the results which may be a temporal effect due to the time lag from the last round of sampling, rather than a sampling technique effect.

Table 1. Comparison of Aquifer Hydraulic Conductivity Values.

	Hydraulic Conductivity (feet/day)		
Aquifer	**Low Value**	**High Value**	**Geometric Mean**
Shallow	0.01	174	3
Deep	0.01	54	0.7

Source: Jacobs Engineering Group, Inc., 1994.

The hydraulic conductivity values presented in Table 1 are almost the same as what has been observed at MCAS Tustin. CLEAN II, under CTO-0049, is currently planning to conduct a pilot study to assess the comparability of the two purging methods in 11 wells. About half of the wells will be in moderately permeable silty/clayey sands and gravels with the other half in low permeability silts and clays. A draft issue paper which includes the details of the field test has been developed and will be issue d for MCAS Tustin BCT review in September. When the data from these field tests become available, it is suggested that the MCAS El Toro BCT examine the results also.

References

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