## Brock, Michelle D NAE

**From:** Ken Feathers [kenneth.feathers@po.state.ct.us]

**Sent:** Monday, November 19, 2001 5:00 PM

**To:** JBurleson@dcmde.dcma.mil; nwalter@mactec.com; Brock, Michelle D

**Subject:** SAEP groundwater

Hi-

I have my RI comments in review at the moment, with luck they will be out this week. Several of the comments focus on characterizations of releases to soil and relation to areas of concern. I have taken the forthcoming groundwater RI comments into account in the below comments on the groundwater work plan, which I am sending informally to move the project forward. The main point is that we need to ensure consistency of all the parts in the big picture. The groundwater invistigation must do this in addition to filling the data gaps identified in the RI. Most notable, the groundwater conceptual model should be reexamined, especially regarding middepth flow. I think you have a sense of my concerns, but if you need to discuss this informally I am available, as I think a dialogue would better reach a common understanding of the issues.

Groundwater Investigation

The qualitative DQOs focused on Volatile Organics seem reasonable, and the proposed work seems generally appropriate to address them (see sepecific comments below). However, I believe that other objectives must also be addressed:

>The groundwater conceptual model for the site requires further refinement and validation, especially as it focuses on middepth flow systems. This may necessitate additional or relocated wells or target screen elevations. Data from the OU2 investigation may fill some of the data gap. If not, triplely nested deeper wells under building 2 may be needed, as the vertical interval is long. Also, colocated water table piezometers may be needed.

>The inorganic groundwater quality requires further characterization, relative to aquifer material as a source of pollutants and fate and transport to the tidal flats. This may necessitate filtered and unfiltered samples and/or low flow sampling. Ensure data is acquired with an appropriate analytical sensitivity for evaluaiton of chronic toxicity. Metals data from the tidal flats nests may be useful, and a third near surface sampling point might complete the picture.

> Additional data acquistion to support model development may be needed- see below discussion of the model.

With regard to details of the work plan

Please ensure that details of wells/piezometers installlation in the tidal flats have been checked with OLISP and meet coastal requirements.
DEP often requests that well sampling be lagged several weeks after installation and development. The optimum delay depends upon drilling methods and amount of water used. It is also influenced by the regional gradient's ability to flush the disturbed aquifer zone past the well location.
Please note that DEP expects decisions regarding remediation compliance to be based on multiple samples, not a single sampling round. Followup will be need for confirming critical data.
DEP expects that any further bedrock evaluation will be under a separate work plan, building on data obtained from this investigation.
Soil samples from wells penetrating hot spots should be examined for presence of NAPL in the horizons where such concentrations could be expected. In addition, if NAPL is encountered, a contingency for a more robustly isolating nested well casing limiting the potential for downward NAPL migration may be needed.
Please ensure that sufficient field chemical information is gathered to allow determination of sulpher speciation in evaluation of controls on metals transport.
Evaluation of solvents in the tidal flats should include evaluation of chronic toxicity. Traci Iott of DEP should be consulted for criteria to be used.

Groundwater Model

DEP staff initial reaction to the verbal presentation of the model is that there is further work needed, especially for validation and calibration:

The density of data for initialization and characterization of the regional model seems sparse outside the quadrant occupied by SAEP. Especially critical may be the regional bedrock configuration and the permeability and stratigraphy of the valley fill.

Is a constant head boundary the best approximation of tidal influence? Essentially the regional model becomes a classic "recharge to an island" problem. If you run a idealized island with a constant head steady state and a cyclically varying wetland drained by channels are the results identical?

DEP consensus is that the regional model derived recharge of 8 inches per year is indicative of a flaw in the conceptual model, rather than a true recharge rate.

The regional steady state model may not have its boundaries established sufficiently far from the site. The wetlands near SAEP may act as constant head boundaries, but are not likely to be fully penetrating, and the deep regional flow system is bounded by bedrock to the north of the Raymark site and by the ocean to the south. Boundaries should be extended or at least reflect deeper regional flux.

Inability to model the brackish wedge might also be affecting regional model calibration. Could a compensating permeability adjustment be used as a defensible surrogate based on theroetical flow evaluations?

The Modflow model and the RI description of groundwater flow need to be reconciled. Is groundwater mound under airport or under building 2? Issue seems to be local shallow flow controls versus regional controls, and their interrelationship. Boundaries derived from regional model may be imprecise (see above). The boundary locations may be too close to the area of interest (although comments regarding number of grid cells between area of interest and boundary made during the presentation are accepted as valid.) Further validation of the hydrogeologic model and conceptual framework are needed before the model can be used as a predictive tool.

The tidal flat is emergent at low tide, with an established drainage network. The 008 drainage had a reversing tidally controlled flow. How well does the constant head boundary model this?

The comparison between dissolved-only and NAPL-present is instructive. DEP considers there is a high probability that the actual chemical system includes at

least some NAPL, and recommends that any projections based on the model take this into account

There is an insufficient period of record for monitoring to adequately calibrate and validate the model for evaluation of natural attenuation As a result, extensive sensitivity analysis should be conducted to understand potential errors in the model prediction and their sources

To the extent possible the modeled processes must be those documeted as occuring at the site More extensive comparison of processes used in the modeling and processes documented in the field are necessary to allow understanding and acceptance of the use of surrogate processes, such as used for chrome fate and transport modeling

The model-indicated vertical migration of pollutants after solvent remediation is troublesome I believe that it might be a mathematical artifact of the limited number of vertical layers in the model between the "unremediated" groundwater and the evaluation stratum Consider increasing the number of model layers in the top half of the aquifer

Consider development of a complementary larger scale model focused on pollutant transport accross the shoreline, including transport both bypassing and through the reducing tidal flat sediments This could possibly simplistically be constructed as a vertical two dimensional model perpendicular to the shoreline It should be designed to ensure diurnal effects of the tidal cycle are adequately evaluated

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