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January 6, 1998

Mr. Michael Bellotti
Olin Chemicals
P.O. Box 248
Lower River Road
Charleston, TN 37310

Re: Olin Chemicals (#828018a) - Quarterly Report #15 and Final Phase II RI Report

Dear Mr. Bellotti:

The following are comments on Quarterly Report #15 and the Phase II RI Report. As the comments on the Phase II RI report are relatively minor and as it is already labeled "final", it can be considered such and distributed to the document repositories with the quarterly reports to date. The remaining issues can be addressed in the feasibility study/design stage and future quarterly reports.

QUARTERLY REPORT #15

Proposed 1998 Monitoring Plan

The proposed 1998 monitoring plan appears adequate for surface water (quarterly at established canal and quarry locations) but the proposed annual groundwater sampling at just the three newly-installed offsite wells is inadequate. Certainly, a considerable database has been established but clearly, further monitoring is needed to assess the performance of the onsite hydraulic containment system and the migration patterns of offsite contaminant plumes. Since trends in groundwater contaminant concentrations will be critical to evaluating containment system effectiveness, the Department recommends semi-annual (at a minimum; quarterly may become necessary in some areas to assess trends) groundwater monitoring for chloropyridines and VOCs at key wells (key offsite well clusters include 104, 105, 106, 107, NESS-E, NESS-W; key onsite wells include B-17, B-6, E-1, E-3, SB-3, BR-3, BR-5A, BR-6, BR-7, BR-8, BR-102, BR-101). All other monitoring wells installed by Olin should be sampled annually (provide justification if certain wells are considered unnecessary).

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Remedial Planning Issues

DNAPL Extraction Feasibility - Within the unsaturated zone, vacuum (single and dual-phase) extraction technologies and enhancements (soil heating, steam injection, ozonation, etc.) are potential technologies for DNAPL removal particularly in areas where the bedrock hydraulic containment system has dewatered the overburden and bedrock. Within the saturated zone, the Department concurs that extraction of DNAPL below the water table would be very difficult (although air sparging is a potential technology) but insitu destruction of DNAPL and dissolved-phase contaminants by chemical oxidation is a potential remedial technology. To follow up on our E-mail communication of 11/24/97, several other vendors and researchers of chemical oxidation technologies have been provided by Ms. Diane Roote at the Ground-Water Remediation Technologies Analysis Center (800-373-1973; www.gwrtac.org). In addition to the previously mentioned:

KVA, Inc. (508-539-3002) markets the C-Sparger™ system of ozone/air sparging with an compact ozone generator/control box and a microporous sparge point which recirculates very fine ozone/air bubbles with the aim of reducing air channeling and reaching fine pore spaces.

In-Situ Oxidative Technologies, Inc. (609-275-8500) markets the ISOTEC™ process of catalyzed hydrogen peroxide to treat organic contaminants in soil and groundwater.

TerraVac, Inc. (e.g., CES @ 509-943-8810 and offices nationwide) markets OxyVac™ which introduces oxidants (e.g., hydrogen peroxide) in conjunction with their DVE and VE systems.

Other firms/groups include:

CleanOX (910-256-2920) - 10% to 35% hydrogen peroxide solutions added to groundwater to achieve Fenton's Reaction.

DOD (e.g., Massachusetts Military Reservation, Jim Plunkett, 508-563-3628) w/SUNY-Oswego, MIT, and others are investigating the use of dilute solutions of hydrogen peroxide and iron (Fenton's Reagent) to treat chlorinated solvent contamination in soil and groundwater.

DOE - Oak Ridge National Laboratory (ORNL/ESD-Olivia West) has been developing insitu chemical oxidation technology for the last 5 years and has used oxidants for deep soil-mixing and aquifer recirculation projects at sites in Ohio and Kansas City.

EPA-ORD (Scott Huling)

GEOCLEANSE (908-686-5959) - 10% to 100% hydrogen peroxide injected under pressure; conducted work at the DOE Savannah River site.

LandTech - College Station, Texas

University of Waterloo (e.g. Graham Farquahar) has been conducting lab and field studies for several years using KMnO4 to break down chlorinated ethenes.

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Other areas of insitu oxidation research include steam oxidation and electrokinetic oxidation.

Advantages of insitu chemical oxidation include insitu treatment at ambient conditions, potential for complete mineralization/destruction of non-aqueous and aqueous phase contaminants, low capital investment, and low energy requirements. Further advantages of the Olin site include both a corporate and plant culture based on chemistry (better living...?; guess that's one of the other guys) with expertise, experience, and infrastructure in oxidation chemistry and chemical handling and source areas which, while not precisely defined (further sampling may help), are relatively restricted in area. The potential for upgradient injection/infiltration galleries (and if needed, angled or horizontal borings) may obviate the concern, expressed by Olin, that existing and planned buildings may preclude source area remediation. Recirculation/reinjection of treated groundwater (if not all then perhaps the excess that the plant carbon beds cannot handle) may also be possible/beneficial (potential "closed loop"); treatment of recovered groundwater by exsitu chemical oxidation possibly could add some residual oxidant for recirculation/insitu treatment (exsitu chemical oxidation is a well-developed groundwater treatment technology - vendors include Peroxidation Systems, Solarchem, Sun River, and ULTROX). Chemical oxidation would also meet the Superfund preference for permanent remedies (contaminant destruction rather than transfer to another media). From a public relations/corporate image standpoint, the use of chemicals to address problems caused by chemicals might be an added benefit. In all, the Olin facility would make a fine demonstration site for this innovative technology and, if embraced and refined by the management of Olin Corporation, it may prove useful at other Olin facilities and for DNAPL sites in general.

Contaminant Mass Assessment

The mass estimate does not consider DNAPL below the water table which likely accounts for the majority of the contaminant mass at the site. Persistent groundwater contamination demands persistent contaminant sources; to imply that most of the contaminant mass is now abruptly dissolved in groundwater defies logic. Regarding the groundwater flux calculations, please provide the values (cross-sectional area, K, hydraulic gradient) in the calculations. What is the flux (volume/time) of groundwater under the site? How does this volume compare to the volume extracted by the groundwater containment system? Containment of groundwater contamination will likely be very difficult.

Attachment #3 - Maps/piezometric plots are missing.

Attachment #8 - Olin response to 4/18/97 NYSDEC Comments on the draft Phase II RI Report.

General Comments

II. *Barge Canal Surface Water Contamination* - The response stated: "Seepage plane exposed in the west wall of the Dolomite Products quarry..."; should be *east* wall.

III. *Effectiveness of On-site Groundwater Recovery System*
Olin stated that the pumping system had not yet achieved steady-state conditions; is the pumping system in equilibrium yet and what are the criteria?

The plant treatment system is said to be at capacity; what is the capacity of the system? During negotiations over the RI/FS work plan some years ago, Olin stated that the plant carbon beds would be used for groundwater treatment and hence would not be addressed in the FS; was the

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groundwater volume underestimated or has the plant waste stream increased or both?

What is the status of stormwater management at the Olin plant?

Regarding the MODFLOW groundwater flow model of the site, the department has not received the MODFLOW files previously requested. Since Olin has included modeling results in previous submissions and has based their conclusion of hydraulic containment partly on the results of MODFLOW computer modeling, we believe that all of the MODFLOW data files belong in the public domain. Moreover, independent verification of results is a fundamental tenet of science. If scientific experiments, demonstrations, or investigations cannot, for some reason, be independently replicated, the veracity of the results, interpretations, or conclusions cannot be established. While the Department can reconstruct the site-specific model, it would be far more time and cost-efficient (for both Olin and the Department) to use the model already constructed by Olin's consultants. Questions about the modeling effort to date include: are no-flux boundaries appropriate particularly along downgradient boundaries (areas of obvious flow), is the model domain sufficiently large, are the recharge values realistic and are buildings and pavement (no recharge) footprints accounted for, are the reductions in permeability appropriate particularly for bedrock, have transient simulations been attempted?

Given the site-specific data files, the Department can answer the above questions independently. Finally, has verification of the model been attempted with comparison of modeled data to actual pumping drawdown data and to seasonal changes in water levels?

IV. *Groundwater Quality Standards for Chloropyridines* - The poor natural groundwater quality in the area has been alluded to as justification for less stringent protection. As stated previously, these are largely aesthetic parameters; similar quality groundwater is used elsewhere. For example, I have methane, hydrogen sulfide, and radon in my home water supply (...which, you may be thinking, might explain a lot of things...).

V. *Physical/Chemical Properties of Chloropyridines*
Basic physio-chemical data (e.g., solubilities, partitioning coefficients, vapor pressures, Henry's constants, densities, viscosities, and boiling points) for chloropyridines were again requested in order to:

- assess *soil cleanup objectives*
- *human (public and worker) health risk factors;*
- *bioaccumulation in fish species*;
- *contaminant fate and transport* and;
- *the feasibility of remedial technologies.*

Olin's response was that the requested data are not likely to be useful for this purpose. It is not clear which of the above purposes is referenced but the needs are real. Solubility in water, for example, is a key parameter which can be used to estimate partitioning coefficients which, in turn, are used to determine soil cleanup objectives and to assess fate and transport (both needed for the Record of Decision). Solubilities are also useful to estimate maximum potential concentrations in groundwater and proximity to source areas. Parameters such as vapor pressure, Henry's constant, and boiling point are used in remedy feasibility and selection analysis. To complete a feasibility study without the main contaminants' physiochemical properties appears inconceivable; how was Olin's proposed choice of air stripping for groundwater treatment evaluated without these parameters? To present the findings of this study to the public without such basic properties also

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appears inconceivable. Most of these properties could be readily obtained by a reasonably equipped laboratory and frankly it's difficult to believe that the company that produces these chemicals is unaware of their physiochemical properties. These data are needed; if Olin is unable to determine or unwilling to provide these properties, please provide specific explanations.

VI. *On-site Feasibility Study Report*

3. Soil Remedial Technologies/Alternatives - While the entire comment concerned soil remediation, the response focussed on groundwater.

4. Source Areas - Data indicate distinct source areas in the vicinity of the lab sample disposal area and BR-101 (these areas are upgradient of the main source area and groundwater concentrations isopleths show closure about these points). It is agreed that analytical data to date have not defined these source areas; further characterization efforts (e.g, a tight soil gas and soil sampling grid) appear necessary in the remedial design phase. Are any monitoring points available to assess groundwater quality in the lab sample source area?

FINAL PHASE II RI REPORT

Executive Summary

Page ES-2 - The stated range of hydraulic conductivity data for shallow bedrock (4×10^{-5} to 1.7×10^{-3} cm/sec) appears underestimated considering the pump test data at BR-6A and BR-7A (10^{-2} to 10^{-3} cm/sec), the instantaneous slug recovery at BR-105 (>10^{-2} cm/sec), and the offsite slug tests along the canal (10^{-2} to 10^{-3} cm/sec). Also, much of the overburden data appears to be in the 10^{-3} cm/sec range. Further, the stated transmissivity range on page E-3 (250 to 350 ft^2/d) appears underestimated considering the range of data for BR-7A on page 2-24 (300 to 600 ft^2/day) and the data presented in Table 2-13 (250 to 1300 ft^2/day) for BR-6A. These data are key parameters in groundwater flow modeling, capture zone/containment analysis, and groundwater flux and flow estimates.

Page ES-4 - As noted above, data indicate separate source areas for the lab sample disposal area and BR-101.

The statement, "Pyridines have not been detected in the water that is pumped from the quarry to the Erie Barge Canal." is incorrect (see also pages 3-16 and 5-3). Pyridines have been detected in samples from the quarry ponds, the quarry discharge stream along I-390, and the quarry discharge point at the canal.

Page ES-6 - The 9/18/97 Olin response noted that the statements that groundwater use is precluded for aesthetic reasons would be removed from the report but they must have escaped the editor (ditto for the above comment).

Page 2-26 - The narrative lacks mention of the range of transmissivity results for bedrock in the vicinity of BR-6A (see Table 2-13).

Page 3-6 - Well pair BR-112/112D shows a downward gradient rather than BR-113.

Finally, in a telephone conversation last January, you noted the occurrence of chloropyridines at the

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Beehler-Radford (#828054) site as part of your consultant's investigation of possible other sources of chloropyridines to the Erie Barge Canal. You also noted that Olin has detailed disposal records; could you provide the disposal locations and estimated amounts of Olin wastes?

Thank you for your continued cooperation and please contact me if you have any questions or comments.

Sincerely,

James H. Craft
Engineering Geologist

c: M.J. Peachey, J. Moloughney, M. Desmond,
S. Shost, NYSDOH J. Albert, MCDOH