MEMORANDUM

To: Wilmington Environmental Restoration Committee (WERC)

From: Richard R. Lester, Stephen G. Zemba, Ph.D., and Tom Simmons

Subject: Comments to EPA on the RI/FS Workplan and Olin's response to EPA comments

Date: June 5, 2009

We write to provide comments on behalf of WERC intended for submission to the U.S. Environmental Protection Agency (EPA) on Olin Chemical's revised Remedial Investigation / Feasibility Study (RI/FS) Work Plan dated April 30, 2009. The RI/FS Work Plan was revised in response to EPA's March 12, 2009 Disapproval and Notice of Deficiencies for the Draft Project Operations Plan (POP).

Response to WERC comments

We request that EPA respond in writing to all comments received from WERC. This is especially important for issues on which EPA's position differs substantially from that of WERC. We certainly understand that the positions of EPA and WERC on some issues will differ, and that there may be a strong rationale behind EPA's position. Fully understanding EPA's rationale will allow WERC to better take EPA's position into consideration when developing future comments on activities at the Olin Chemical Superfund Site (the "Site"). It will also help us to know issues on which EPA differs from WERC's position, and the reasons for those differences, and may prevent us from repeating comments and/or devoting time to non-productive purposes.

Communication of Site data to EPA and the community

As we have commented in the past, it is essential to WERC that all data from the Site (past data and future data) be presented in an accessible, useful, and easily interpreted manner. Olin has indicated that data will be accessible to EPA on a website in Excel format that can be used to generate spatially referenced plots of chemical data in a geographic information system (GIS). Olin also has included past data in searchable PDF data tables in the Draft Focused RI Report. WERC, unfortunately, does not have the resources to generate plots of Site data in a GIS.

We have previously recommended the creation of a tool similar to that created for the Nuclear Metals Superfund Site in Concord, Massachusetts (see www.nmisite.org). This website includes an interactive web-based Geographic Information System (GIS) utility that allows anyone to graphically display sample locations and results on a map of the site, allowing easy interpretation of the data. Such a tool would aid all interested parties in evaluating the data without spending an inordinate amount of time compiling and plotting data.

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If it is not possible to implement such a tool, it is essential that EPA commit to providing all data collected at the Site to WERC in a timely manner in a format that can easily be interpreted. This may include data tables, graphical interpretations of key data, spatially referenced plots of chemical data, *etc*. Given that Olin is attempting to meld new data with old data, we do not anticipate it will be easy to interpret the basis of figures and maps that they produce. An easy means of accessing the underlying data is essential.

NDMA in private drinking water wells

Given the recent detection of *n*-Nitrosodimethylamine (NDMA) in private wells from residences along Cook Avenue west of the Olin property, it is essential that as many private wells as possible be tested in this vicinity in a timely manner. NDMA was detected in some of these wells in February 2009. It is now June, well over three months later, and letters have not been sent to adjacent well owners informing them of the presence of NDMA in drinking water. The pace of the investigation into contaminants in private drinking water wells should be faster and the process more open. We understand that data need to be disseminated in a manner that does not induce needless panic, but since these data are relevant to both the site investigation and general community awareness, they should be made public in a prudently rapid manner.

Analytical methods for NDMA

In Olin's April 29, 2009 response-to-comments document, Olin provides justification for not providing a plausible chemical reaction mechanism for the formation of NDMA in groundwater at the site. Olin stated that they worked with Dr. William Mitch, an expert in the field of NDMA presence in water, to evaluate the potential application of a test method for quantifying NDMA precursor compounds in DAPL and diffuse groundwater at the Site, but that testing of this method indicated it could not be used.

Perhaps a review of the presence of NDMA at other Olin facilities would lend some understanding to the nature and occurrence of the parent products associated with NDMA formation. While Dr. Mitch is no doubt someone with relevant experience, his qualification are not presented herein and there may be in-house Olin chemists (perhaps in product research and development) with relevant experience or with an understanding of the potential chemical speciation leading to the formation of NDMA. It remains exceedingly important that the formation of NDMA in groundwater be understood. Without an understanding of the chemistry behind NDMA formation, it is not possible to accurately predict where it might be forming nor to determine locations at which groundwater should be analyzed for its presence. Lacking this essential element of the conceptual site model, it must be assumed that NDMA may be found over widespread areas at different points in time, and that extensive, frequent monitoring will be necessary to check for its presence.

Analytical parameter list

We previously commented that hexavalent chromium, bromide, and urea should be added to the Remedial Investigation Analyte List (Table 3.1-1 of the Draft Field Sampling Plan [FSP]). EPA commented that hexavalent chromium should be tested for in soil in OU1 except in Lake Poly where oxidation-reduction conditions favor chromium III over chromium VI. Olin has added hexavalent chromium to the sampling plan for soil in OU1.

The FSP should test for hexavalent chromium in groundwater and surface water in OU2 and OU3 as well. Table 6.2-2 of the draft April 2009 Field Sampling Plan indicates that a concentration of 60 mg/l of hexavalent chromium was detected in a groundwater sample. As (1) this value is 600 times the Maximum Contaminant Level (drinking water standard) and (2) the hexavalent form of chromium is of greater toxicity and solubility, hexavalent chromium should be included as an analytical parameter (in addition to unspeciated total chromium) for groundwater and surface water. As an alternative to not including hexavalent chromium as an explicit parameter, the *de facto* assumption could be made that all chromium detected in water samples is in hexavalent form (an assumption that may be relatively accurate given the greater solubility of hexavalent *v.* trivalent chromium).

Furthermore, we would like to reiterate that bromide and urea should be included in the analyte list, as well as Kempore in soil. Sodium bromide is listed by Olin as a chemical waste product of its production of Kempore (FSP, Table 2 of Appendix A) and it could have been deposited at any number of locations on its property. Moreover, bromide may not have significant background sources, and hence it might make a good marker chemical of Olin releases. It appears from the FSP and Focused RI reports that very little historical sampling has been performed for bromide. Potential marker chemicals should not be ignored for reasons of limited toxicity as they may reflect general contaminant migration, and hence be useful in determining the overall nature and and extent of contamination.

Olin indicates in its response to comments from EPA that urea is not included in the analyte list because no toxicity information for urea is available in EPA's Integrated Risk Information System (IRIS) or the list of Regional Screening Levels (RSLs). Again, while it is true that no toxicity information is available from these sources, understanding the distribution of urea would provide useful information. Urea was used as a raw material on the Site and could therefore be used as a marker of releases from industrial activities on the property. It could also provide important information about the fate and transport of chemicals released from industrial operations.

Kempore was produced in large quantities at the Site. Olin has suggested that no analytical methods are available to test for the presence of Kempore in soil. It is frequently possible to develop new analytical methods to test for chemicals for which no existing method can quantify concentrations in soil. Given the quantity of Kempore produced at the site, it is essential that a method be developed to quantify Kempore in soil. Even a screening-level technique would be useful if able to confirm the presence or absence of Kempore. Such data could not be used for risk assessment purposes, but could be used to identify potential source areas and nature and extent of contamination.

If these parameters are not included in the analytical parameter list, EPA should provide justification for why it is not necessary to sample for these parameters in the media specified above.

Finally, tin was added as an analytical parameter in the FSP. What is the rationale for adding tin as a parameter of concern?

Risk assessment

Olin has improved the discussion of risk assessment in the RI/FS Work Plan. In the absence of any future restrictions on Site use, however, the human health risk assessment should consider future residential use of the Site as a baseline scenario. Table 2.0-1 of Volume I of the Draft Work Plan presents the human health conceptual site model for the Site. This table excludes any mention of residential exposure pathways. If these pathways are being excluded from the risk assessment, the Work Plan should explicitly state that restrictions will be placed on the property restricting future residential redevelopment of the Site.

Furthermore, Table 4.2-1 of Volume I sets forth the cancer risk range for Superfund (1 to 100 in a million) as the applicable cancer risk range for the human health risk assessment. The risk assessment should also include the risk management criteria of the Massachusetts Contingency Plan (MCP) as applicable risk goals. The allowable incremental cancer risk per the MCP is 10 in a million.

The ecological risk assessment is also critical to the RI. The list of additional guidelines that may be used to prepare and perform the ecological risk assessment (page 6-6 of Volume I of the Draft Work Plan) is identical to the list of additional guidelines for the human health risk assessment in the previous section. Furthermore, these documents do not seem particularly relevant to ecological assessment. The lack of specific ecological risk assessment guidelines suggests that the plan for the ecological risk assessment needs to be further developed.

Ecological risk is of critical importance to the RI/FS to support plans to maintain a wildlife preserve on the southern portion of the Olin property. Exposure scenarios must consider the possibility that animals living in the preserve may also forage from adjacent areas, such as contaminated areas of Olin's property.

Drinking water standards

The MCP requires all groundwater that is a potential source of drinking water to meet drinking water standards. Groundwater considered to be a potential source of drinking water includes groundwater within the Zone II of a drinking water well, within an Interim Wellhead Protection Area, within a potentially productive aquifer, or within 500 feet of a private well. The northeast portion of the Olin property is within the Zone II of a drinking water well. All groundwater that is a potential source of drinking water as defined by the MCP should be required to meet drinking water standards, including relevant groundwater on the Olin property itself.

Vapor Intrusion Screening

Although vapor intrusion screening has been added to the FSP, it is not sufficiently thorough. The presence of buildings on the property – whether currently occupied or not – provides potential *future* use exposure points. Soil-gas should be sampled in addition to groundwater screening, as recent experience with vapor intrusion shows groundwater quality to be a poor predictor of vapor intrusion. On the Olin property, potential contaminant releases to soil make many areas residual source areas, hence emphasizing the need for soil-gas screening, especially below existing foundations. Moreover, since the *potential* for vapor intrusion is under evaluation, all the remaining slabs/foundations on the property are ideal locations to sample beneath, as vapors tend to collect below buildings/slabs. The fact that some foundation slabs remain in place at the Olin Site creates an opportunity for sub-slab sampling (at least in some areas), and vapor intrusion guidance documents are increasingly emphasizing the importance of below slab soil-gas sampling. Off-site, shallow groundwater screening in OU2 is probably sufficient as the contaminant transport mechanism should be groundwater. However, in areas of special concern with potentially sensitive receptors present (such as gymnastics facility GymStreet USA on Jewel Drive), sub-slab soil-gas sampling should be undertaken.

The need for soil-gas sampling and potential need for indoor air sampling (as indicated in the Figure 4.5-1 flowchart in the FSP [Volume III]) demands specification of detailed soil-gas and indoor air sampling procedures within the FSP and QAPP portions of the RI/FS Work Plan. As with other media, specifications should include sample quantitation limits, method detection limits (MDLs), reporting limits, and project action limits (PALs).

Bedrock assessment and DAPL

Groundwater sampling north of Eames Street

The absence of a bedrock overburden well triplet (two overburden and one bedrock well) continues to be noted north of Eames Street in the direction of Main Street, an area for which minimal assessment has been conducted.

DAPL pools

Regarding the three pools of dense aqueous phase liquid (DAPL), Olin's response to comments states, "The DAPL pools are not currently moving along the bedrock surface in response to gravity. Such transport ceased long ago when the DAPL pools formed behind the bedrock saddles which act as dams within the upper portion of the Western Bedrock Valley (WBV)." The shape of these "saddles" has not been established and as a result, their continuity remains undefined. The determination that these saddles are bedrock traps that require no further assessment regarding ongoing migration into or out of these areas seems to be based on a two-dimensional understanding of the role played by these areas. The trap shown in Cross Section A to A' (Figure 6.2-24 of Volume III FSP) suggests that the DAPL pool under Main Street has accumulated to the maximum volume implying that DAPL spill over and downgradient migration is continuing. Since the processes that produce the DAPL are undetermined, it is possible that the DAPL generation is continuing. The dimensions of these traps and their orientation may assist in identifying the remedial strategies to recover and remove the DAPL pools and to guide additional assessment of the vertical and horizontal extent of the DAPL pools if they are conduits to additional migration.

DAPL migration

EPA commented that there are several areas where additional chemical and geotechnical data would be necessary to evaluate containment and control options for the DAPL. Olin responds (page 17 of the April 29, 2009 response-to-comments document) making an argument that existing data can be used and that minimal additional data collection is necessary. This is not true. DAPL may be migrating in directions as yet undefined and the additional assessment suggested by EPA, including geotechnical data, would further identify the migration pathways that would be useful in identifying a remedial strategy.

Olin appears to be using a discussion of dissolved phase and DAPL interaction and bedrock slope as justification for not assessing the bedrock overburden interaction, as well as the contaminant distribution within the bedrock in the areas listed by EPA. The bedrock transport mechanism remains as one area where significant assessment has yet to be conducted. Further assessment is necessary.

Seismic profiling

On page 18 of the April 29, 2009 response-to-comments document, Olin proposes to conduct an additional seismic refraction line along Main Street to compliment seismic profiling conducted in this area in 1996. Olin states that proposed well locations will be adjusted based on results of the seismic profiling (Section 6.1.1 in the FSP). An additional seismic line should be proposed in addition to and as a backup along the railroad bed across the Maple Meadow Brook (MMB) flood zone north of Main Street east/southeast of the bridge.

NDMA at the base of the Maple Meadow Brook (MMB) aquifer

On page 20 of the response-to-comments document, EPA comments that there is a data gap in location of the deep plume NDMA at the base of the MMB aquifer and that additional wells are needed in this area. Olin responds that there is no data gap and describes a theory in which DAPL cascades from the Upper DAPL pool to the Main Street DAPL pool, and finally to a bedrock depression in the vicinity of GW-83D under the MMB aquifer. This Olin "cascade" theory describes DAPL movement in two dimensions. The DAPL would likely have a third component of flow and it appears that EPA is attempting to assess this with their comments. None of the Olin maps have an outline of the defined limits of each trough that shows the orientation and dimensions of the troughs. This should be noted on the bedrock Figure 6.2-38 (Volume III FSP). What is the slope and orientation of the trough dip? Are the proposed seismic lines parallel to a trough as claimed by Olin if it is not mapped? Are the bedrock troughs fracture controlled? Can the top of bedrock be adequately identified with "soil borings" as suggested by Olin?

Northern delineated boundary of NDMA in groundwater

Figure 6.1-1 of the FSP delineates the extent of NDMA in groundwater. In response to an EPA comment about the northern delineated boundary of NDMA in groundwater, Olin proposes a bedrock groundwater well near the Butters Row Municipal Wells as represented in Figure 6.1-2 in the FSP of the RI/FS Work Plan. It is doubtful whether the installation of a single bedrock well in the area of the Butters Row Wells is a definitive attempt to identify the extent of ground water impacts. In addition, a single bedrock well may not identify the potential presence of a deep overburden dissolved plume. Additional well couplets or triplets are needed similar to other locations (*e.g.,* MW-62 and MW-85).

The term "northern delineated boundary" used by Olin should include the area with limited data north of Eames Street on either side of the railroad bed, where the downgradient plume boundary interpretation is based on minimal information.

Data gaps regarding groundwater in stratigraphic traps

Figure 3.2-4 (Draft Focused RI) is a computer model generated 3-D representation of the bedrock surface at the Site. Assuming that the bedrock has been interpolated correctly in this figure, there appear to stratigraphic traps as yet not assessed to the southwest of the Olin property near the intersection Eames and Main Streets and within the bedrock along the series of traps at successively low elevations leading from the Olin site to the Maple Meadow buried aquifer. This figure does not address the rock quality determination of the bedrock to assess the potential fracture controlled flow which may vary from the surface bedrock topography. While the additional cross sections proposed by EPA and agreed to by Olin (page 30 of the response-to-comments) may be helpful, it would be more useful to identify data gaps in the bedrock surface topography that could be narrowed with additional assessment of the bedrock surface along with rock quality assessment and analyses of dissolved contaminants in the bedrock and overburden aquifers.

Surface water sampling

Trend comparisons in surface water sampling are likely irrelevant as hydrologic conditions have changed over time. Any use of historic data for surface water characterization is of dubious merit given that baseline hydrological conditions have changed. We therefore recommend multiple rounds of surface water sampling be conducted in order to establish baseline conditions, and limited effort be placed on reconciling historic data.

In addition, the extent of surface water and sediment sampling should be expanded. North Pond, located to the southeast of the Olin site, previously received surface water from the contaminated OU1 area. Although there may be no hydrologic connection at present, there was a connection during some of the years of Olin's operation. Therefore, at a minimum, sediment cores should be taken from North Pond to look for evidence of Olin-related chemicals. There are enough specific chemicals related to Olin that can be used to identify its impacts from those of other potential sources of contamination.

We also recommend a greater number of locations be sampled in the Maple Meadow Brook/Sawmill Brook area. The number of proposed surface water/sediment monitoring stations (as indicated in FSP Figure 5.1-3) is relatively small given the considerable size of the Olin site. As specific examples, the distance between proposed stations MMB-SW/SD-4 and MMB-SW/SD-5 – both within the zone of impacted groundwater (as indicated in Figure 6.1-1) – is more than 1000 feet. More sampling stations along this reach would allow better resolution of water quality along the length of the potential discharge zone. Similarly, the approximately 800 feet between proposed sampling locations MMB-SW/SD-1 and MMB-SW/SD-9 is a considerable gap given that this reach straddles the tentatively defined zone of impacted groundwater.

Background levels are not explained and probably improper; new background data should be collected and plans for its use included in the RI/FS Workplan

Background levels in the FSP tables appear very high for some parameters, *i.e.*, at levels that are not typically considered to be either natural or typical urban background. Levels are presented as "Max" values, which has an ambiguous meaning. Does Olin intend to suggest that these "Max" background levels are to be considered relevant in determining site-related contaminants? If the intent is to use the background levels as floors, *i.e.*, to only consider higher levels to be above background, then this is problematic, as some "background" values are improper and exceedingly high. For example:

- FSP Table 5.5-1 lists background levels for various organic compounds (*e.g.*, toluene, perchloroethylene, 1,1,1-trichloroethane) that are not normally present at all in surface water. These may be reflective of local conditions and other (non-Olin sources), but if so, the spatial – and temporal – distribution relative to surface waters of interest is of relevance, not the "Max" background level. Also, there are *very* high levels of some metals listed (*e.g.*, arsenic and chromium). It is difficult to believe these values are representative of background conditions for streams in the Maple Meadow Brook aquifer.
- Simlarly, FSP Table 4.4-1 lists a very large ammonia concentration in sediment as the background value.

There are likely numerous other instances of background levels that are questionably high and unrepresentative.

More importantly, use of the historic data for background levels is questionable, as many changes have occurred in the area of the Olin site. Simply put, the old background data cannot be gauged for relevance. Sampling of new background conditions should be undertaken as part of the surface water sampling. Additionally, the RI/FS Work Plan should clearly state how background data will be used to differentiate site-related contaminants and/or determine the contaminants of concern for the human health and environmental risk assessments.

Proposed analytical methods do not meet many Project Action Limits (PALs)

Discussions of various PALs that are not met by method detection limits have been added to the QAPP. These discussions should consider historical sampling results and site use. With so many proposed method detection limits exceeding PALs, it is highly possible that analytical results will not be sensitive enough to characterize risks. In cases where PALs are not met by the presently proposed methods, if the contaminant is detected frequently and/or is related to the chemicals used by Olin, specialized analytical methods should be considered as these lower levels may be relevant to delineation of significant risk levels.