August 10, 2009

Mr. Jeff Lux, Project Manager
Tronox Worldwide, LLC
Cimarron Corporation
P.O. Box 268859
Oklahoma City, OK 73126-8859

SUBJECT: SUMMARY OF JULY 16, 2009 MEETING REGARDING GROUNDWATER BIOREMEDIATION AT THE CIMARRON FACILITY IN CRESCENT, OKLAHOMA

Dear Mr. Lux:

Enclosed is a summary of the subject meeting and the U.S. Nuclear Regulatory Commission staff's recommendations for a path forward. If you have any questions regarding this letter, please contact me at (301) 415-6664 or by e-mail at kenneth.kalman@nrc.gov.

Sincerely,

/RA/

Kenneth L. Kalman, Project Manager
Materials Decommissioning Branch
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Enclosure:
Summary of 07/16/09 Meeting

Docket No.: 70-925
License No.: SNM-928

cc: Cimarron distribution list

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SUMMARY OF JULY 16, 2009 NRC/CIMARRON MEETING
REGARDING GROUND-WATER BIOREMEDIATION AT THE CIMARRON FACILITY

Attendees

NRC

Ken Kalman, DWMEP
Varughese Kurian, DWMEP
Tom Nicholson, RES
Lifeng Guo, DWMEP
Jon Peckenpaugh, DWMEP (via telephone)
Mark Fuhrmann, RES

Cimarron

Jeff Lux (Tronox)
Jim Crawford (Tronox)
Roy Widman (Tronox)
Jeff Gillow (Arcadis)
Arthur Lucas (Lucas-Newman Science & Technology)
Barbara Lucas (Lucas-Newman Science & Technology)
Harry Newman (Lucas-Newman Science & Technology)
Rick Callahan (Lucas-Newman Science & Technology)
Larry Morgan (Lucas-Newman Science & Technology)

Oklahoma Department of Environmental Quality

David Cates
Nolan Newkirk
Paul Davis
Michelle Varbel

Tristate Motor Transport Company (member of the public)

John B. Hauser

Enclosure

Summary of Technical Discussions and Path Forward

Background

The Cimarron Corporation License Amendment Request (License No. SNM-928, Docket No. 70-925) dated March 26, 2009, is undergoing detailed technical review by the U.S. Nuclear Regulatory Commission (NRC) staff. On July 16, 2009, NRC and Cimarron Corporation met at the Cimarron site near Crescent, Oklahoma to discuss the amendment request proposing the use of *in situ* bioremediation at the Cimarron site. Meeting attendees included: Tronox staff and its contractors; NRC staff from the Office of Federal and State Materials and Environmental Management, and the Office of Nuclear Regulatory Research. State regulators from the Oklahoma Department of Environmental Quality (ODEQ) participated in the meeting. One member of the public participated in the morning site tour but did not stay for the afternoon technical discussions.

Introductory remarks were made by Ken Kalman (NRC) and Jeff Lux (Tronox). Jeff Lux then provided an overview of the history of decommissioning activities at the site, and the current proposal to use *in situ* bioremediation. He then led the attendees on a tour of the site, focusing on areas where remediation is proposed.

During the technical discussions, NRC staff raised questions stemming from its review of the March 26, 2009, document. The NRC staff noted that the purpose of discussing these questions was to clarify its understanding of the document and that these were not formal requests for additional information (RAIs). The staff noted that it anticipates transmitting its RAI's to Tronox in late September 2009 and completing its review in March 2010. The following narrative highlights the meeting discussions, and provides a recommended path forward by the NRC staff.

Summary of Discussions

During the site tour, and later during subsequent afternoon technical discussions, questions on the hydrologic site conceptual models were raised, particularly the role and effect of river and local flooding that may influence the re-oxidation of the treated plumes. In particular, the Spring 2007 flooding events and observed monitoring in ground-water wells were discussed in the field and later during the afternoon. Tronox emphasized that ground-water gradients did not appear to change, despite changes in the water table elevation and deeper ground-water potentiometric surfaces. Tronox considers its previous modeling in which the recharging ground water due to surface ponding or flooding which is saturated with oxygen, to be very conservative. Tronox will provide ground-water levels observed during the Spring 2007 flooding events, and also data on uranium (U) concentrations collected in 2009. NRC staff will review this ground-water data for consideration in re-calibrating the ground-water models presented in Appendix B of the Ground-Water Decommissioning Plan. NRC staff will also reconsider this information in reviewing the scenarios for re-oxidation of the sequestered U.

NRC staff asked the ODEQ staff about the Underground Injection Control (UIC) permitting process concerning the information and analysis needed by Tronox to comply with State of Oklahoma regulations. ODEQ staff will provide NRC staff with an Oklahoma State point of contact for further discussions.

Tronox indicated that information on vertical distributions of U in the plumes does not exist. NRC staff considers the 3-dimensional distribution U prior to, during and following sequestration activities as important to the demonstration of the effectiveness of in situ bioremediation. A critical aspect is the distribution of reduced iron created by the in situ bioremediation process. One suggestion was the use of geophysical surveys (i.e., electric resistivity tomography) to define the distribution of the reduced iron using time-lapse imagery as a monitoring tool. Tronox volunteered that they have used geophysical surveys at other decommissioning sites, and therefore have the equipment and knowledge to apply certain geophysical methods. The question appears to be the appropriate balance between the use of geophysical methods and ground-water monitoring over extended times and the number of samples to be collected. The use of geophysical methods could be part of a ground-water monitoring program to demonstrate the effectiveness of in situ bioremediation. ARCADIS also indicated that they have used induced polarization geophysical methods to monitor the presence and distribution of LNAPLs in the subsurface. Although ARCADIS has not used geophysical methods for *in situ* bioremediation, they would consider the feasibility of using it for monitoring at the Cimarron site.

NRC staff discussed the evolution of geochemistry during the *in situ* bioremediation process. In particular, the staff noted that several dissolved calcium uranyl carbonate species were not considered in the geochemical modeling by ARCADIS. NRC staff thought that these species may contribute substantially to the dissolved fraction of U and should be considered in future modeling. ARCADIS believes that after reduction of U(VI) to U(IV) these calcium uranyl species may not be important. When the issue of possible pore-plugging during the *in situ* bioremediation process was raised by the NRC staff, ARCADIS indicated that it occurs locally around the well screen and can be readily treated to restore the injection flow. It was acknowledged that column studies using materials from the treated aquifer will provide important confirmation of processes occurring during and following *in situ* bioremediation activities.

In addition, Jeff Lux also provided information regarding the status of activities pertaining to the Tronox filing for bankruptcy and ensuing legal actions.

Recommendations for Path Forward

The NRC staff anticipates transmitting RAIs to Tronox in late September 2009. The staff also recognized a need for additional discussion on certain technical topics such as geophysical surveys, ground-water modeling of transient events, recharge estimates, assessment of future scenarios, UIC permits required by ODEQ, and possible alternatives under the NRC's license termination rule.