STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
JACKSON DISTRICT OFFICE

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GOVERNOR

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March 11, 2008

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Mr. Michael L. Caldwell
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31700 Middlebelt Road,
Suite 150
Farmington Hills, MI 48334

Dear Sirs:

SUBJECT: Gelman Sciences, Inc. Remedial Action
Phase 2 Downgradient Groundwater Investigation Report, Unit E
Dated November 2007

We have completed our review of the Phase 2 Downgradient Groundwater Investigation Report (DGIR). Our comments on the DGIR are provided below and in the enclosed Interoffice Communication from Mr. James Coger, dated March 6, 2008.

The DGIR documents the work performed as part of Phase 2 of the investigations proposed in the October 2004 Downgradient Investigation Work Plan. As discussed by Mr. Coger, we agree that additional investigation is not needed at this time; however, we would like to clarify a few points for your information.

The downgradient investigations are intended to determine the migration pathway of the 1,4-dioxane groundwater contamination (plume) to ensure the Prohibition Zone (PZ) is protective, and to determine the need for any expansion of the PZ. The Phase 2 investigation originally proposed installation of two sets of monitoring wells (MW), only one of which was installed (MW-111). The Department of Environmental Quality (DEQ) agreed that the second set of proposed MWs, on Mulholland Street, could be postponed. The additional MWs installed in the downgradient area (east of Maple Road and within the PZ) were done at the request of the DEQ to monitor the plume greater than 85 parts per billion (ppb) in close proximity to the PZ (except for the MW-112 nest, which was installed as part of an agreement between the City of Ann Arbor and PLS). All of these MWs provided important information that Pall Life Sciences (PLS) utilized in preparing the DGIR.

Data from MW-104 and MW-110 currently indicate that the plume greater than 85 ppb has not migrated north of the PZ boundary in that area. However, PLS and the DEQ have agreed that the PZ needs to be expanded in a small area between Allison Street and Maple Road. PLS intends to submit a report by the end of March 2008 that will provide a site-wide analysis of recently collected data that we believe will allow us to move forward with the proposed area of the PZ expansion. In the interim, PLS's review of this area indicates that there are no drinking water wells in use in this area; therefore, ensuring short term protection of human health until the PZ is expanded.

While the downgradient investigation has thus far confirmed a general eastward migration of the plume, it is important to note that additional MWs will be needed in proximity to the northern and southern boundaries of the PZ as the plume migrates to the east. These MWs will be needed to provide a buffer and to ensure that the PZ remains protective.

Because the Huron River is the eastern boundary of the PZ, it is important to determine the fate of the plume greater than 85 ppb before it reaches the Huron River. The DGIR indicates that the plume will stay within the PZ and discharge into the Huron River, rather than under flow it. Additional investigation will likely be needed as the plume migrates to determine if this is the case. It will also be necessary to determine if the plume greater than 85 ppb will migrate along the axis of flow of the river, beyond the southern boundary of the PZ, as previously discussed by the DEQ and PLS.

As recommended by Mr. Coger, the sampling frequency for six of the downgradient MWs should be increased to quarterly (MW-79d, MW-82s, MW-98d, MW-103s, MW-103d, and MW-116). The previously approved monitoring schedule, dated October 31, 2007, can remain in place, as modified by this letter and our electronic mail dated February 29, 2008.

The DGIR concludes with PLS's analysis of the need for the Part B investigation that was proposed in the October 2004 work plan. The Part B investigation proposed the installation of a minimum of three MWs on the east side of the Huron River, opposite of where the plume would likely discharge to the river. PLS believes it is premature to perform the Part B investigation until the path of the plume is better understood. The DEQ agrees that the Part B investigation does not need to be performed at this time.

The last sentence of the DGIR indicates that PLS will review information regarding storm water infrastructure in areas where groundwater may discharge to surface water. We agree that this task would be useful in determining the fate of the plume in these areas and that it would be appropriate to do so when detectable concentrations of 1,4-dioxane reach these areas.

We intend to review and discuss the downgradient monitoring results with PLS during our regular technical meetings. The DEQ will require additional investigation, if needed, if the data identifies any of the following concerns relative to the path of the plume greater than 85 ppb:

1. underflow of the river;
2. migration along the axis of flow of the river, outside of the PZ;
3. migration near the PZ boundary that does not provide an adequate buffer.

In addition, investigation will be required in the event that the plume, greater than the Surface Water Human Drinking Water Value of 34 ppb for 1,4-dioxane, is found to migrate toward Barton Pond, the location of the City of Ann Arbor's water supply intake.

Please contact me if you have any questions or would like to discuss this subject in more detail.

Sincerely,

Sybil Kolon
Environmental Quality Analyst
Gelman Sciences Project Coordinator
Remediation and Redevelopment Division
517-780-7937

SK/KJ
Enclosure
cc/enc: Ms. Celeste Gill, Department of Attorney General
Mr. Mitchell Adelman, DEQ/Gelman File
Mr. James Coger, DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

TO: Sybil Kolon, Pall Life Science (PLS) Project Manager
Jackson District Office, Remediation and Redevelopment Division (RRD)

FROM: Jim Coger, Geologist
Jackson District Office, RRD

DATE: March 6, 2008

SUBJECT: Comments on the November 5, 2007, Unit E - Phase 2 Report
Downgradient Groundwater Investigation, submitted by PLS

The PLS October 2004 Work Plan for Downgradient Groundwater Investigation and Potential Underflow of the Huron River (DGWP) identified the following tasks to be completed as part of the downgradient investigation: (a) determine the probable migration pathway of the Unit E plume as it migrates hydraulically downgradient of the Maple Village Shopping Center and, (b) investigate the potential for the 1,4-Dioxane plume to underflow the Huron River.

PLS summarized the findings of the downgradient investigation in a March 2006 Phase1 Report and the November 2007 Phase 2 Report.

Eight nested monitor wells were installed at four locations as part of the Phase 1 downgradient investigation. Eight additional monitor wells were installed at five locations during the Phase 2 activities.

Part A, of the Phase 2 Downgradient Investigation, addressed analysis of potentiometric, hydraulic head, and contaminant distribution data.

PLS lists the following as “Key Observations” of their Part A analysis:

The aquifer systems are not hydraulically isolated from each other, yet separations in the aquifers occur throughout much of the investigation area. The separations are relevant to understanding the Unit E flow path as it migrates downgradient.

Downward hydraulic head gradients are predominant in the western portion of the study area (Maple Road). Upward hydraulic gradients become predominant closer to the Huron River. The western portion of the study area appears to be a groundwater recharge area, while the eastern portion of the study area is a groundwater discharge zone.

Flowing artesian conditions were encountered near the Allen Creek Drain and Huron River.

The potentiometric surface contours form a “V” shape in the Allen Creek Drain corridor. PLS states that “the shape of this feature is such that it tends to “block” groundwater from moving eastward, along the river corridor in areas east of the Allen Creek Drain.”

The predominant flow direction in the Unit E aquifer is eastward, from Maple Road toward the Allen Creek Drain. In the Allen Creek Drain area, groundwater flow direction turns to the northeast, toward the Huron River.

PLS concludes, based on potentiometric data, the Unit E plume will migrate toward the Huron River within the prohibition zone boundary.

The Phase 2 Downgradient Investigation addressed the potential for groundwater to underflow the Huron River.

PLS concludes that based on 1,4-Dioxane distribution and trend data that the majority of the Unit E plume is advancing in shallower, rather than deeper hydrofacies. Upward hydraulic gradients observed proximal to the Allen Creek Drain and Huron River should cause the plume to vent into, rather than under flow, the Huron River.

PLS also reviewed DEQ file information related to hydrogeological conditions at facilities located proximal to the Huron River and Argo Dam. PLS states that groundwater flow data, from sites located on both sides of the Huron River, reflect that groundwater flow is towards the river in the upper saturated zones.

PLS concludes that there is an extremely low potential for the Unit E plume to underflow the Huron River.

REVIEW COMMENTS

PLS generally completed the tasks proposed in the October 2004 Work Plan. As referenced above, two phases of investigation were performed. Part A of each "Phase" involved installation of monitor wells and migration pathway analysis. The tasks for Phase 2 of the investigation addressed an evaluation of the hydraulic connection between groundwater and the Huron River.

The downgradient potentiometric data supports PLS's conceptual flow model. The Unit E plume is migrating from west to east. The upward hydraulic gradients, and artesian conditions observed in the Allen Creek Drain Corridor, appear to represent that the upper portion of the Unit E aquifer will follow the potentiometric gradient to the east, and then turn northeast, discharging and/or venting into the Huron River below the Argo Dam.

Determining the migration pathway of contaminants in the deeper Unit E interval, as it approaches the Huron River, may not be feasible at this time. 1,4-Dioxane has not been detected at monitor well locations, east of MW-98d. PLS depicts a thick confining unit in the A - A' Hydrostratigraphic Cross Section, hydraulically separating the shallow and deep saturated intervals at monitor well location MW-111. Assumptions related to migration pathways and confining unit hydraulic conductivities, may or may not be relevant downgradient from MW-111, as groundwater flow regimes typically become very complex at locations where groundwater interfaces with reworked river deposits.

RECOMMENDATIONS

Additional investigation will likely be required at downgradient locations, at some point in the future. Additional monitor wells may be needed to evaluate the hydraulic separation between the shallow and deeper migration pathways as the 1,4-Dioxane plume approaches the Allen Creek Drain Corridor and Huron River. Other locations proximal to the prohibition zone boundary may require additional investigation if monitoring data indicates 1,4-Dioxane above 85 micrograms per liters is approaching the PZ boundary.

Groundwater quality data should be collected from the following monitor wells on a quarterly basis: MW-116, MW-79d, MW-82s, MW-98d, and MW-103s and d.

Potentiometric elevations should be measured in all downgradient wells at least semi-annually.

Static groundwater elevations from at least one of the "Eaton Wells" (AHW-101) should be measured on a semi annual basis. If access to these wells is not granted on an on-going basis, an additional monitor well, as proposed by PLS, will be required in the Mulholland and Liberty Road area.

If you have any questions or comments, please let me know.

JC/KJ
cc: Mitch Adelman, RRD
Dowe Parson, RRD