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GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
JACKSON DISTRICT OFFICE



STEVEN E. CHESTER
DIRECTOR

June 23, 2008

VIA ELECTRONIC AND US MAIL

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Dear Sirs:

SUBJECT: Gelman Sciences, Inc. Remedial Action

The primary purpose of this letter is to provide the Department of Environmental Quality's (DEQ) response to three recent reports submitted by Pall Life Sciences (PLS) related to the Evergreen System, as referenced below. This letter also summarizes the DEQ's position on several other issues that need to be resolved in a timely manner. The enclosed Figure 1 is provided for reference to many of the wells and locations discussed in this letter and the enclosed interoffice communications.

Valley Report and AE-3 Analysis

The DEQ staff has reviewed the Evergreen System Valley Drive Area Investigation (Valley Report), dated April 2008, submitted by PLS pursuant to the Stipulation and Order Regarding AE-3 Dispute Resolution (Stipulation) that was entered by the Court on or about August 2, 2007. The DEQ staff has also reviewed the related AE-3 Capture Analysis (AE-3 Analysis), dated April 29, 2008. Please see the enclosed interoffice communication from Mr. Richard Mandle, dated June 19, 2008, for our detailed review of these two submittals.

As you know, PLS and the DEQ entered into the Stipulation to cooperatively resolve a dispute regarding PLS's operation of the AE-3 extraction well at less than the established minimum purge rate. Paragraph 3.A. of the Stipulation required PLS to submit and implement a work plan that was "intended to assist the parties in determining whether: (i) groundwater contamination from the south is being drawn into the Evergreen Subdivision area by operation of the Evergreen Subdivision extraction wells as asserted by PLS' Motion to Amend Consent Judgment and Petition for Dispute Resolution [dated July 9, 2007]; and (ii) groundwater contamination has migrated past the capture zones of extraction wells LB-1 and LB-3." In the Valley Report, PLS indicates that not enough information has been gathered to make either of these determinations. The DEQ agrees with that assessment.

Specifically, regarding paragraph 3.A.(i) of the Stipulation, PLS states in the summary of the Valley Report that: "It had proven more difficult than anticipated to locate where 1,4-dioxane migrates north from the Unit E₁ into the Evergreen Subdivision, or to rule out that possibility." Regarding Paragraph 3.A.(ii) of the Stipulation, PLS states in the Valley Report: "It is very difficult to precisely interpret the capture of the LB/AE extraction wells by solely reviewing water level data, since the hydraulic gradient in this area is extremely flat." Instead, PLS relies on 1,4-dioxane concentrations at "key wells" to support its position that the Evergreen System has

been effective in halting the migration of the plume at concentrations above 85 parts per billion (ppb), the generic residential cleanup criterion for 1,4-dioxane in groundwater. At the same time, PLS asserts that other wells that are considerably higher than 85 ppb, downgradient of the LB-1 and LB-3 extraction wells (MW-BE-1s, 456 Clarendon and 593 Allison were each greater than 400 ppb in 2007), "do not evidence further migration of the plume, but rather *appear* to correlate to changes in the purge well operation . . ." (emphasis added) without providing further explanation or support. As mentioned above, PLS had previously asserted that 1,4-dioxane in this area was being pulled in from the Unit E plume to the south. The source of this groundwater contamination has not yet been determined.

As discussed by Mr. Mandle, the DEQ does not believe the existing extraction wells (LB-1, LB-3 and AE-3) are capturing all of the groundwater contamination migrating toward them. However, the DEQ recognizes that the existing dataset is not conclusive, in part because the entire vertical and horizontal extent of groundwater contamination that must be captured is not defined. Therefore, the DEQ is unable to determine if PLS is in compliance with Section V.A.1.(a) of the Consent Judgment, to intercept and contain the leading edge of groundwater contamination in the Evergreen Subdivision Area.

An additional area of concern, not addressed by the Stipulation, is the 1,4-dioxane contamination at MW-100, a Prohibition Zone (PZ) monitoring well adjacent to the Evergreen Subdivision Area on Valley Drive. MW-100 has been above 85 ppb since September 2007, and was 168 ppb in May 2008. The DEQ does not understand PLS's current depiction of the Unit E plume at the PZ Boundary (based on data through March 2008), which indicates that concentrations of 1,4-dioxane as high as 500 ppb are at the PZ boundary at Valley Drive, but does not depict any Unit E groundwater contamination in the Evergreen Subdivision Area. This representation implies that there is an impermeable wall at the PZ boundary and does not correspond to PLS's discussion of the source of groundwater contamination in the Dupont area, as discussed in the next section of this letter. Although there are no data points to confirm that groundwater contamination at MW-100 has migrated into the Evergreen Subdivision Area, the DEQ believes that it has, and that PLS must address it as part of its obligation to meet the objectives in the Consent Judgment for the Evergreen Subdivision Area. The Valley Report does not address the groundwater contamination at MW-100, nor has PLS indicated that the Evergreen System extraction wells have had any influence on groundwater in the area of MW-100.

As discussed above, the monitoring network is not adequate to demonstrate that the objective of intercepting and containing the leading edge of groundwater contamination detected in the vicinity of the Evergreen Subdivision Area is being met, as required by Section V.A.1.(a) of the Consent Judgment. PLS's own investigation, pursuant to the Stipulation, failed to answer the questions. Therefore, PLS must take actions to determine if this objective is being met. If PLS is not able to demonstrate that the leading edge of groundwater contamination in the Evergreen Subdivision Area is being intercepted and contained, PLS must submit a work plan to achieve that objective.

Dupont Report

The DEQ staff has reviewed the Dupont Area Investigation (Dupont Report), dated April 2008. PLS submitted a work plan for this investigation on or about August 27, 2007, in response to the DEQ's concern about increasing concentrations of 1,4-dioxane in the residential well at 465 Dupont Circle (986 ppb in April 2008). The stated focus of the work plan was to rule out the possibility that 1,4-dioxane from the Dupont area would migrate beyond the capture of the Evergreen extraction wells. The DEQ advised PLS in its initial response to that work plan,

dated October 31, 2007, that it is not possible to determine that all of the groundwater contamination is being captured when the full extent of groundwater contamination has not been defined. However, recognizing that the proposed data collection should provide information that could be used to guide a future investigation, the DEQ conditionally approved the work plan on January 14, 2008. Please see the enclosed interoffice communication from Mr. James Cogger, dated June 23, 2008, for a detailed review of the Dupont Report.

The Dupont Report indicates that the “most *plausible* explanation for 1,4-dioxane in the Dupont area continues to be the migration of 1,4-dioxane at deeper elevations from the south, such as the area near MW-30d or GSI-98-01” (emphasis added), but relies on data from MW-118 to conclude that “a wide plume migrating from the south (north of Nancy Drive) is not the source of the 1,4-dioxane in the Dupont area.”

However, PLS provides no facts to support its position. If, as PLS suggests, 1,4-dioxane at the GSI-98-01 boring (located about 300 feet east of the south end of Nancy Drive) is a potential source of 1,4-dioxane in the Dupont area, that would support the premise that there is a plume migrating from the Nancy Drive area to the Dupont area. As shown on Figure 1, both the Unit D₂ and Unit E plumes are present at the GSI-98-01 boring. Perhaps PLS intended to refer to GSI-96-01, which the Dupont work plan had cited as a potential source of the 1,4-dioxane in the Dupont area. Although PLS has not provided water quality data from either of these borings to show that groundwater contamination is present at GSI-96-01 or GSI-98-01 to support its hypothesis. The DEQ agrees that is likely the case; however, the fate of any groundwater contamination in these areas has not been determined.

It is more appropriate to consider water quality data from the TW-11 boring (about 375 feet southwest of GSI-98-01) to evaluate the possibility that a plume could be migrating from the area near the south end of Nancy Drive toward the Dupont area. First, high concentrations of 1,4-dioxane (3,100 ppb) were found during the boring of TW-11 in December 2001, at a depth similar to the well at 465 Dupont Circle. As noted by Mr. Cogger, Figure 8 of the Dupont Report indicates groundwater flow in the TW-11 area is from the southwest to the northeast, in the direction of the Dupont area. The only boring between TW-11 and MW-118, a distance of 1,800 feet, is GSI-98-01, where PLS has indicated that attempts to collect water quality data were unsuccessful. There is no basis for PLS to assert that the information gathered during the drilling of MW-118 demonstrates that there is no groundwater contamination migrating from the area around Nancy Drive toward the Dupont area. Inadequate data have been presented to conclude that contamination in the Nancy Drive area is not the source of contamination in the Dupont area.

Second, trend analysis data indicate that the source of 1,4-dioxane in the Dupont area is more likely from the area around TW-11, rather than from the area around MW-30d. MW-30d is 2,100 feet southwest of the well at 465 Dupont Circle. If 1,4-dioxane at MW-30d is the source of 1,4-dioxane at 465 Dupont Circle, then 1,4-dioxane should have impacted MW-30d before it reached 465 Dupont Circle. This is not the case. In April 1999, 1,4-dioxane greater than 85 ppb was first found at 465 Dupont Circle, three years before that concentration was found at MW-30d. The concentration of 1,4-dioxane near TW-11 in 2001 (3,100 ppb) would indicate that it was likely much higher than 85 ppb before 1999, and could be a source of 1,4-dioxane at 465 Dupont Circle.

The groundwater contamination in the Dupont area is located within the Evergreen Subdivision Area. Therefore, PLS is also required to remove all groundwater contaminants at this location, as required by Section V.A.1 of the Consent Judgment. The extent of groundwater

contamination has not been adequately defined, as discussed above; therefore, additional investigation is required before containment can be evaluated.

Wagner Road Area

The December 2004 Opinion and Order Regarding Remediation of the Contamination of the "Unit E" Aquifer (Unit E Order) required that PLS submit a work plan intended to prevent further migration of groundwater contamination of 1,4-dioxane above 85 ppb into the Unit E aquifer east of Wagner Road, "to the maximum extent feasible." PLS submitted a work plan that was conditionally approved by the DEQ and has been implemented. Two performance reviews have subsequently been submitted by PLS and reviewed by the DEQ staff. Those reviews indicate that extraction well TW-18 is capturing the center of the Unit E plume, but do not demonstrate that the northern and southern portions of the Unit E plume along Wagner Road are being captured. In the DEQ's response, dated October 31, 2007, it was noted that 1,4-dioxane above 85 ppb at MW-105d is not being captured by extraction well TW-18. PLS has presented no additional data that would change this assessment.

PLS installed MW-118 on Ferry Street east of Wagner Road in February 2008 in an attempt to address some of the DEQ's concerns regarding the northern extent of the Unit E plume. The PLS monitoring well database classifies MW-118 as a Unit E aquifer well and data from April 2008 show 1,4-dioxane at 268 ppb. However, PLS's most recent iso-concentration contour maps, submitted with the January-March 2008 Quarterly Report, indicate that the Unit E plume is not present at MW-118, but that the Unit D₂ plume is present at MW-118. Since the formations are clearly interconnected, we continue to question PLS's aquifer designations. A more accurate interpretation of the source and fate of 1,4-dioxane at MW-118 can be made after additional rounds of static water level data from monitoring wells over a wide area are collected, as done in February 2008. No report on the findings of MW-118 has been provided to the DEQ.

In the March 2007 Performance Review, PLS indicates that the Unit E and Unit D₂ plumes are difficult to distinguish in the area north of TW-18, because there is no confining material separating them. This applies in the formation at MW-94s, which is screened near the top of the 100-foot thick formation, where vertical profiling data indicates the entire thickness of the formation also exceeds 85 ppb. Because there is no monitoring well screened in the deeper portion of the formation, PLS is only able to "suggest" that TW-18 is capturing the groundwater at that depth, which is consistent with PLS's portrayal of the Unit E plume. PLS states, in the March 2007 Performance Review, that "TW-18, while operating at 200 to 220 gpm, along with other Unit E extraction wells, is capable of creating a capture zone sufficient to meet the designed objectives of the WRIR." The DEQ cannot accept this representation as proof that the objective is, in fact, being met without supporting field data.

The Unit E Order requires that groundwater contamination be captured "to the *maximum extent feasible*" (emphasis added). PLS has not provided any information regarding any efforts to maximize the ability of the Wagner Road interim response to prevent further migration of groundwater contamination into the Unit E aquifer east of Wagner Road, nor has it demonstrated that it is not feasible to do so. If PLS believes it is not feasible, it must submit its determination to the DEQ for review.

According to the conceptual model that PLS is apparently relying on to determine the migration pathways of the Unit E and Unit D₂ plumes, groundwater in the upper portion of the formation at MW-94s is migrating northeast, toward the Evergreen Subdivision Area, and groundwater in the lower portion is migrating east into the PZ. If PLS is not able to demonstrate, with current data,

that the entire width of the Unit E plume at Wagner Road is being captured, it must collect the necessary data and implement any additional remedial actions to do so, or make a demonstration that it is not feasible to meet the objective of the Unit E Order.

The Unit E Order also states that the extraction from the Unit E plume at Wagner Road should not compromise the treatment of the shallower plumes. The concentration of 1,4-dioxane in MW-94s was 2,707 ppb in April 2008, and there has been no appreciable decline in contamination since extraction at TW-18 began in January 2006. In fact, capturing the groundwater contamination at MW-94s, which is considered a Unit D₂ monitoring well, would facilitate the remediation of the shallower plumes by preventing further migration of groundwater contamination toward the Evergreen Subdivision Area.

Based on current extraction rates, there is more than 100 gallons per minute (gpm) of flow capacity available under PLS's existing National Pollution Discharge Elimination System permit. In addition, 80 gpm is being extracted from TW-17, a Unit E extraction well near the west end of the Unit E plume, where the concentration of 1,4-dioxane has been less than 200 ppb for 18 months. Some of this capacity could be utilized to remove higher concentrations of 1,4-dioxane found at Wagner Road. PLS must evaluate the feasibility of installing an additional extraction well to capture all of the groundwater contamination throughout the 100-foot thick formation near MW-94s.

Maple Road Performance Monitoring

In a letter dated December 8, 2006, the DEQ informed PLS that three additional monitoring well (MW) nests were needed in Veterans Park to monitor performance of the Maple Road interim response system relative to compliance with the court ordered performance objective. After additional correspondence and meetings, PLS agreed to install the requested wells. Two single MWs were completed in November 2007 (MW-115 and MW-116). PLS was not successful in installing a MW at the third, northernmost location. On March 12, 2008, PLS submitted a proposal to install a MW on the west side of Maple Road, in lieu of the third MW requested by the DEQ. The DEQ staff has reviewed that proposal and agrees that the proposed MW would provide useful characterization information; however, it will not satisfy need for the third MW nest in Veterans Park to monitor the performance of the Maple Road interim response. Due to the conditions encountered and difficulty in installing a MW at the proposed location, it would be appropriate to move the location approximately 100 feet to the north (shown as proposed MW-114 on Figure 1), into the parking lot area, and to use an alternative drilling method that is capable of drilling through any difficult material that may be encountered. This MW must be installed by the end of 2008, and will likely require nested MWs.

Operational Decisions

Over the past two years, the DEQ has asked PLS to provide more detail about its operational decision-making processes. The reason for this request is to ensure that PLS is utilizing appropriate methods to meet its obligations and demonstrate to the DEQ that it is meeting those obligations. PLS has made some effort to respond to these requests; however, the documents submitted to date do not satisfy our requests. As we have indicated, EPA guidance is available, as well as new software programs and new guidance for optimizing remedial decisions and evaluating the effect of those decisions. It is critical that available resources be used to help guide decisions on such a large and complex site.

Because this issue has not been resolved, the DEQ recently requested, and received, an electronic spreadsheet with the monthly pumping rates for all of the Unit D₂ plume extraction wells. As one example of how this data can be used, Mr. Mandle produced graphs that he used

to evaluate the effect of extraction on nearby monitoring wells (included in his interoffice communication). Another example where complex data analysis could provide benefit would be in the Wagner Road area, where high concentrations of 1,4-dioxane in the Unit D₂ and Unit E plumes are migrating into the Evergreen Subdivision Area and into the PZ. An analysis must be done to determine the efficiency of individual extraction wells in removal of 1,4-dioxane, and used to adjust the extraction rates to maximize removal of 1,4-dioxane. PLS may be doing this; however, it has not been presented to the DEQ

Although the Consent Judgment may not specifically require submittal of such analyses, the DEQ believes it is inherent to the remediation of such a complex site. In order to satisfy the Court's stated goal of expediting the cleanup, and for the DEQ to perform its oversight functions related to this site, the DEQ needs to know that PLS is doing all it can to optimize the operation of its remediation system. Therefore, PLS must utilize currently recognized methods of analyzing the performance of its remedial efforts and submit these analyses to the DEQ. This will allow the DEQ to determine if PLS's remedial efforts are adequate, and to assure the Court that the remediation is being performed as efficiently as possible.

The DEQ staff is willing to meet with PLS to discuss performance of this type of analysis. Alternatively, PLS may submit its proposal to provide this information, based on current analytical tools, in the Quarterly Reports. Please contact Mr. Mandle if you have any questions regarding the available resources.

Well Identification Report

The DEQ and PLS have had numerous communications regarding the requirement of the May 2005 Order Prohibiting Groundwater Use (PZ Order) for PLS to identify or verify the absence of private wells within the PZ. Although progress has been made in this regard, there are at least four significant issues where it appears the DEQ and PLS do not agree on the intent of the PZ Order. We intend to provide you with our detailed response on these issues in the near future; however, we are summarizing these issues briefly here, so that PLS can consider them along with other issues addressed in this letter.

1. The private water supply well investigation has not been thorough enough to verify the absence of private wells in some locations.
2. Any private water supply wells identified must be properly plugged, to ensure the integrity of the selected remedy, regardless of whether they are still in use.
3. At locations where wells were known to exist, or likely existed, but cannot be found, PLS must provide notice to the property owners regarding the restriction on use of groundwater and PLS's continuing obligation to plug those wells, if found.
4. The content of the final report, including a detailed parcel map showing the boundaries of subdivisions where municipal water was required at the time of construction and an electronic spreadsheet that can be searched to determine which addresses have been reviewed and the outcome of that review.

Notice of Migration

In September 2003, PLS provided notice to property owners regarding the migration of groundwater contamination beneath their properties, as required by the Part 201 Administrative Rules. In informal discussions since that time, PLS has indicated it does not intend to provide additional notifications as the plume migrates. Assistant Attorney General Celeste Gill will be communicating, under separate cover, the DEQ's position that it believes PLS is required to provide these additional notices periodically, as the plume migrates.

Conclusion

This letter documents the DEQ's position on several unresolved issues relating to PLS's current obligations to comply with the 1992 Consent Judgment, the Five-Year Plan and the Unit E Order. PLS's Evergreen System Review, dated April 2007, suggested that modifications to the remedial objectives and approach in these documents may be appropriate based on new information. In the April 2008 Valley Report, PLS referred to ". . . pending discussions between PLS and the MDEQ regarding a more integrated solution to the Evergreen/Maple Village areas . . ." Most recently, PLS has requested a meeting with the DEQ and Department of Attorney General staff "to discuss the global agreement toward future remediation and modification of the Consent Judgment." The DEQ has not yet received any proposal to make modifications, and as the DEQ has indicated over the past few months, the DEQ is willing to participate in such discussions only after receipt of PLS's proposal.

Although PLS now appears to be prepared to share its intentions with regard to a possible modification of the Consent Judgment, the DEQ believes PLS should have a full understanding of its current obligations. In addition, the DEQ does not anticipate that all of these obligations should be subject to modification. Moreover, there is no assurance that agreement on any modifications will be reached in the near term, if at all. Therefore, the DEQ is concluding this letter based on PLS's existing obligations.

The DEQ sends this letter with the hope that the Parties can resolve these issues amicably. If PLS shares this goal, the DEQ requests that PLS provide its commitment to address the issues by July 23, 2008. This commitment should include a schedule(s) for submittal of a work plan(s) with an implementation schedule(s) to:

1. Fully define the extent of groundwater contamination in the Evergreen Subdivision Area and determine if the leading edge of groundwater contamination detected in the vicinity of the Evergreen Subdivision Area, including the groundwater contamination in the Dupont Circle area and in the area of MW-100, is being intercepted and contained, and take additional remedial actions to do so, if necessary;
2. Define the nature and extent of groundwater contamination west of Wagner Road;
3. Achieve capture of all groundwater contamination at Wagner Road or provide a demonstration that it is not feasible to do so;
4. Install the third performance monitoring well in Veterans Park
5. Provide an analysis of PLS's operational decisions in all future Quarterly Reports.

Please contact me or Assistant Attorney General Gill if you have any questions.

Sincerely,

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

SK/KJ

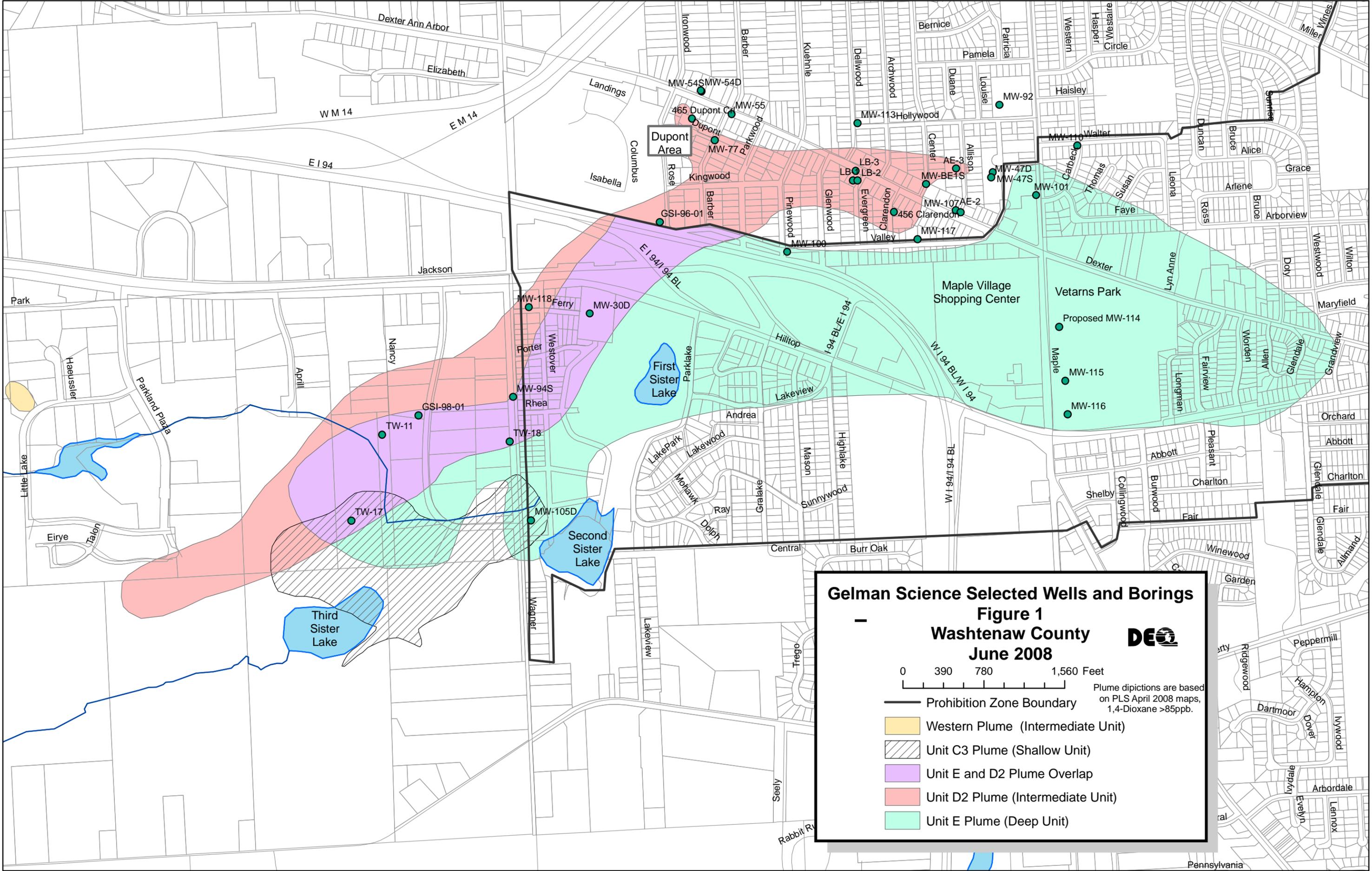
Enclosures

Mr. Farsad Fotouhi
Mr. Alan D. Wasserman
Mr. Michael L. Caldwell

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June 23, 2008

cc: Mr. Saied Tousi, Pall Corporation
Ms. Celeste Gill, Department of Attorney General
Ms. Lynelle Marolf, DEQ
Mr. Richard Mandel, DEQ
Mr. Mitchell Adelman, DEQ/Gelman File
Mr. James Coger, DEQ



Gelman Science Selected Wells and Borings
Figure 1
Washtenaw County
June 2008

DEQ

0 390 780 1,560 Feet

Plume dipictions are based on PLS April 2008 maps, 1,4-Dioxane >85ppb.

- Prohibition Zone Boundary
- Western Plume (Intermediate Unit)
- Unit C3 Plume (Shallow Unit)
- Unit E and D2 Plume Overlap
- Unit D2 Plume (Intermediate Unit)
- Unit E Plume (Deep Unit)