

Memorandum

To: Sybil Kolon, MDEQ

From: Matthew Naud, City of Ann Arbor, Environmental Coordinator

Subject: Comments Regarding Pall Life Sciences Final Feasibility Study and Regarding the MDEQ's "Proposed Remedial Alternative Gelman Sciences Unit E Aquifer Groundwater Contamination"

Introduction

The City of Ann Arbor has reviewed the Final Feasibility Study ("FS") submitted to MDEQ by Pall Life Sciences ("PLS") on June 1, 2004, and has reviewed MDEQ's subsequent "Proposed Remedial Alternative Gelman Sciences, Inc. Unit E Aquifer Groundwater Contamination." In March 2004, the City submitted comments to MDEQ concerning PLS's draft FS and PLS's recommended alternative. A copy of these comments is attached hereto for your convenient reference. The City repeats those comments and incorporates them here by reference, and asks that MDEQ include them in the public record that is considered in rendering its final decision on this matter. It would be inappropriate to allow the Unit E Plume to merely continue to migrate, unchecked and untreated until it reaches the Huron River.

Therefore, the City appreciates the effort made in devising MDEQ's Proposed Remedial Alternative to address the cleanup of 1,4 Dioxane contamination in the Unit E aquifer in a more aggressive manner than proposed by PLS. The City appreciates MDEQ's additional effort to bring in consultants to review and verify the costs of these proposals. The City therefore believes that components of the MDEQ Proposed Remedial Alternative should be adopted prior to any initiation of leading edge extraction. In doing so however, the City believes that certain enhancements should be added to the MDEQ's Proposed Remedial Alternative to ensure the most effective, protective, and community acceptable response activity is undertaken. These suggestions are outlined below.

MDEQ Proposed Remedial Alternative

The City applauds MDEQ on the Proposed Remedial Alternatives that it has devised. This shows a necessary, more aggressive approach than the inadequate recommended alternative PLS proposed in its June 2004 FS. The City believes the Proposed Remedial Alternatives outlined by MDEQ lay out a framework and several key components of a multi-faceted approach to cleanup the Unit E Plume. The City recognizes that many details remain to be developed and suggests the following.

- 1. Additional upgradient extraction is necessary and appropriate to maximize mass reduction and stem the contamination flow from the core.**

The PLS proposal to use leading edge extraction alone is not enough. There is much more highly contaminated groundwater in the Unit E Plume (and other plumes) lying in upgradient areas closer to the PLS facility. For example, the areas surrounding Maple Road contain much more contamination as do areas farther upgradient, up to and

including the Core Area near Wagner Road. If extraction was required only at the Leading Edge, the result likely would be that more highly contaminated groundwater would be drawn into the City. Therefore, the interim responses proposed by MDEQ (including extraction and treatment of contaminated groundwater from appropriate up gradient locations such as at Wagner Road and at or near Maple Road, and possibly areas in between) must be incorporated as required elements of the final remedy for the Unit E Plume. Such extraction wells have the potential to hydraulically stop further migration of contaminated water from the PLS property and will stop further migration of the Unit E Plume that already has reached the Maple Village area. This segmenting of the Plume will allow quicker clean up and will help to assure that bypassing of the capture wells will not occur.

2. Leading Edge Extraction is currently premature.

The City believes that leading edge extraction is premature until the plume is segmented and captured at the higher concentration areas. The City concurs with MDEQ's conclusion that extraction from the "leading edge" is important but not at this time. Such actions ultimately will protect currently clean aquifers underlying the City and will protect against contamination of down gradient wells that exist within the City boundaries and within Ann Arbor Township. The City recognizes that the proposal and map prepared by MDEQ is hypothetical and that the location of monitoring and extraction wells are yet to be determined and will require additional site investigation and modeling prior to being determined. MDEQ Interim Response Recommendations include extraction at Wagner Road to prevent further eastward migration of plume and at Maple Road to reduce uncertainty and flow of plume. These actions do have the potential to cut the plume into three sections. The City believes that these so-called "interim responses" must be made a required part of the final remedial actions. This will reduce overall cleanup time, protect public health and safety, and in order to protect the environment.

The MDEQ should propose a process to engage the local governments and neighborhoods affected by any leading edge extraction proposals to ensure that neighborhoods are well educated and involved in any response activities in or near residential areas. The City proposes that because of the large area affected by the E plume, remediation strategies should include monitoring or extraction wells on city-owned property to the extent practicable and engineered pipelines outside of neighborhoods to minimize local disruptions.

3. Pipeline to the Huron as a primary discharge method

The City agrees with MDEQ that there continues to be a need to handle treated water. The City concurs that in-situ treatment or reinjection are unlikely to be successful and that a pipeline to the Huron River should be engineered in the next few months and designed for the worst case scenario. This pipeline should be designed ultimately to carry all treated water from the PLS site to a point downstream from Barton Pond and the City water intake. This discharge must meet the 10 ppb daily max/3 ppb monthly average supported by City Council on several occasions. There may be opportunities to investigate reinjection opportunities, but this investigation is dependent on extensive modeling and engineering work and the pipeline guarantees that there is always a discharge method available for this remediation. The City believes that ultimately all discharges from this site that go to the Huron River should be downstream of the City's primary water intake to ensure the integrity of the municipal water supply.

The City concurs that there may be an opportunity for the City to participate in the discharge of treated water for an interim period, during dry periods. However, the storm water system may be the preferred alternative, not the sanitary system. The City's ability to participate is dependent on capacity, MDEQ approvals, and ensuring that the discharge can be regulated during storm events.

4. Review the site and build a model

The City believes that this is an ideal and overdue opportunity to have this very complicated site reviewed by outside experts to assist the MDEQ in their continuing oversight of this facility. Such a review has been performed in the past and MDEQ should ask the court to have PLS set aside funds to accomplish such a review. Much of the data on which the PLS and MDEQ studies are based are developed by PLS. An outside environmental engineering firm would provide the necessary and transparent review required to assist in the design of site investigation goals, remediation systems, model development, and support the continuing engagement of the local community in this remediation. The City believes that MDEQ should ask the court to have PLS set aside funds to support continuing public engagement efforts.

Due to the complex hydrogeology of the site and the lack of sufficient subsurface data, the City believes that the lack of a comprehensive groundwater model impedes the ability to predict the plume's migration, as well as the ability to predict most effective cleanup measures. Therefore, the City recommends that a model is needed in order to better predict effects of more extraction or reinjection on plume in order for effective cleanup of the site. A complex model of the Core and E plume should be developed immediately and ultimately incorporate the whole site. MDEQ should ask the court to have PLS set aside funds to develop such a model. PLS has already demonstrated its unwillingness to open its science to scrutiny by claiming intellectual property value to its existing, more simple modeling effort.

5. Implementation of Cleanup Activities

The MDEQ needs to be the lead agency for the cleanup. While PLS is the responsible party, the company does not have the incentives to do the research, site investigation, and simultaneous work required to effectively manage this site. For example, the City would prefer that the treatment work be bid out to companies (such as APT in California) with a proven record of effective cleanup of 1,4 dioxane and in order to prevent conflict of interests with PLS.

In summary, to ensure an effective, protective, and community acceptable clean up, the MDEQ must:

- Take the lead, active role in determining performance measures and goals for this site;
- Insure that the multiple necessary efforts are performed simultaneously including site investigation and modeling; site evaluation and treatment; and on-going community engagement;

- Engage an outside consultancy to review the whole site (e.g., CDM did so many years ago);
- Ensure the information for the site is transparent and available;
- Engage the Technical Advisory Group (including PLS if they choose to participate) as an advisory group to MDEQ; and
- Work with local governments and neighborhoods to create opportunities for the public to remain informed and engaged.



MEMORANDUM

To: Sybil Kolon, MDEQ

From: Roger Fraser, City Administrator
Matthew Naud, Environmental Coordinator

Date: Tuesday, March 16, 2004

Subject: Comments of the City of Ann Arbor Regarding the "Interim Feasibility Study for the Unit E Plume" Prepared by Pall Corporation Dated January 23, 2004 and Suggested Modifications to Remedial Alternatives Proposal by the City of Ann Arbor

Introduction

The City of Ann Arbor has reviewed with interest the January 23, 2004 "Interim Feasibility Study" prepared by Pall Corporation. The City appreciates the effort Pall has made to consider several potential alternatives to address the 1,4 Dioxane in the Unit E aquifer. The City believes that Pall's suggested "preferred alternative" (Alternative 6) is not appropriate. Instead, the City believes that a modified version of Pall's Alternative 3a or Alternative 4a (described below), or a combination of those two modified alternatives, should be implemented. In particular, installation of a discharge pipeline to the Huron River¹ as proposed in those alternatives would solve one of the most difficult problems confronted in this matter -- of what to do with the large volume of treated water. This pipeline should be installed as soon as possible. The City would be pleased to discuss the issues raised below at the convenience of Pall or MDEQ.

Alternatives 3a and 4a, and Ann Arbor's Proposed Modifications.

After careful consideration, the City believes that the preferred alternative for addressing the Unit E aquifer contamination should be a **modified** version of Pall's proposed Alternative 3a, Alternative 4a, or a combination of the two. Modified versions of these alternatives offer the best opportunity to halt the further spread of 1,4 Dioxane contamination into currently uncontaminated portions of aquifers underlying the City, offer the best, proven approach for effective extraction, treatment and disposal of the groundwater that already is contaminated and offer the most expeditious means to cleanse the aquifer system.

The Acceptable Elements of Alternatives 3a and 4a.

The City understands that, as proposed by Pall, both of these Alternatives incorporate the following elements: (i) extraction of contaminated water with purge

¹ As a slight modification to Pall's suggestions, the City believes that the discharge from that pipeline should be downstream of Barton Pond (where the City's main water intake is located) in order to avoid any possible contamination of the City's drinking water supply.

wells located at the so-called “leading edge” of the plumes (where 1,4 Dioxane is present at a concentration of 85 ppb or less²); (ii) transport of the extracted water by underground pipeline to a treatment facility; (iii) treatment of the contaminated water; and (iv) transport of the treated water by pipeline to a discharge point at the Huron River. The City believes that these alternatives offer three main features that should be incorporated into any remedy that is finally adopted for the Unit E Aquifer. First, each contemplates removal of contaminated groundwater from the aquifer, in a manner that will help to prevent contamination of aquifers that currently are clean (although the modifications noted below also are needed to achieve this objective). Second, each approach proposes to use effective treatment technology to remove or destroy the maximum amount of 1,4 Dioxane that is in water pumped from the contaminated aquifers. Third, each approach proposes to utilize a new pipeline to discharge a large volume of treated water to the Huron River. By employing a new discharge pipeline to the Huron River, these alternatives will resolve the most difficult question posed by Pall and MDEQ in its consideration of alternatives, which is: **What can be done with the purged and treated water?**

The difference between the two Alternatives is only location of the treatment system (and possibly the treatment technique to be employed). Ann Arbor does not take a position at this time on the treatment technology to be employed. The City notes that UV/Ox technology currently employed at Pall’s Wagner Road property is proven. However, the City is prepared to be convinced that an alternative technique will provide equivalent treatment. As to location of the treatment system, Alternative 3a envisions treatment at the Pall property on Wagner Road, while Alternative 4a would provide treatment at a location near Maple Road.

The Need for Modifications to Alternatives 3a and 4a.

The need for Ann Arbor’s proposed modifications is evident, because there are major concerns and uncertainties with Alternatives 3a and 4a as proposed by Pall. As an initial matter, it will take **decades** for all of the contamination currently lying in the Unit E aquifer to migrate slowly to the “leading edge” extraction wells that Pall has proposed. Meanwhile, while those decades pass, we all must hold our collective breaths and hope that the so-called “leading edge” extraction wells will actually capture all of the contamination that is headed that way. That is too long to wait and too risky a hope. For example, experience in groundwater cleanups both here and elsewhere have demonstrated that plumes of contamination often bypass the extraction wells that are supposed to capture them. In fact, that already has occurred in the Evergreen area of Ann Arbor. The extended time frame and the risk of failure represented by Alternatives

² Note, that calling 85 ppb the “leading edge” of the 1,4 Dioxane is not truly accurate. Significant amounts of 1,4 Dioxane have migrated farther downgradient, and have contaminated the Unit E aquifer, albeit at lower concentrations. This will be discussed more fully later in these comments.

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3a and 4a can be eliminated or greatly reduced by the modifications Ann Arbor proposes.

Proposed Modifications.

The modifications to Alternatives 3a and 4a that the City believes are necessary and appropriate involve installing extraction wells not only at the “leading edge” of the plume, as proposed by Pall, but also at other upgradient locations and at a downgradient location as well. In each case, Ann Arbor believes that, as proposed by Pall, water extracted from those purge wells should be piped to a treatment system located either at Pall’s Wagner Road location (as suggested by Pall’s Alternative 3) or at a site in the vicinity of Maple Road (in accordance with Pall’s Alternative 4). Specifically, Ann Arbor believes that the following extraction locations should be included as part of the remedy:

1. **Extraction At the Core.** Significant extraction at the most highly contaminated areas of Unit E, located at the so-called “Core” at Pall’s Wagner Road location should be immediately undertaken. [The City understands that Pall recently has proposed to do so, and the City applauds that undertaking.] Extraction rates at the Core in Unit E should be aggressive enough to prevent any further offsite migration of 1,4 Dioxane. This will have the benefit of stopping the source from contributing any further to downgradient contamination. Also, the timing of this aspect of the plan would be advantageous. Additional core extraction may begin immediately with existing wells, and the water can be treated using the existing treatment/disposal system. While that system is in operation, within the next six months, Pall can determine if additional onsite purge wells or treatment capacity are needed, and they may be installed and operated;
2. **Two Sets of Additional Intermediate Purge Wells.** Additional purge wells located between the “core” and the “leading edge” of the Unit E plumes should be installed in approximately two locations, to extract highly contaminated water from the area (for example, a set of purge wells in the **vicinity of Maple Road** where contamination is quite high, and another set of purge wells located upgradient **between the core and Maple Road**). These intermediate extraction wells will serve many beneficial purposes in the cleanup of the Unit E plumes. As with the proposed Core Area extraction wells, these “intermediate purge wells” will serve to halt the onward migration of 1,4 Dioxane, and will allow it to be extracted in higher concentrations which is more efficient to treat. That will also have the beneficial effect of capturing the plume closer to the treatment location

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(either at the Core or at the Maple Road area), in an area that is principally commercial (reducing concerns with neighborhood disruption). Also, by stopping migration of the plume at several locations, and capturing the water there, the chances of the plume later bypassing the most downgradient extraction wells is minimized.

3. **Leading Edge Extraction.** Pall has chosen to designate the “Leading Edge” of the Unit E plumes, as the point at which 85 ppb of 1,4 Dioxane is first exceeded. While Ann Arbor does not agree with that designation, for purposes of this discussion, the City will use that terminology. Capturing at the Core and at the Intermediate locations noted above will make great strides in overall cleansing of the aquifer. However, the leading edge of the plume still must be captured and treated. Otherwise, downgradient wells will be contaminated (e.g., the Montgomery Well which already is contaminated and other downgradient wells located within the City and Ann Arbor Township). Accordingly, Pall should place the “leading edge” extraction wells to capture whatever 1,4 Dioxane exists downgradient of the Maple Road Veterans Memorial Park area, and then should treat and dispose of the treated water through the new pipelines. Once again, these “leading edge” extraction wells will help stop further migration of the plume, will extract contaminated water and eventually may even pull back some of the contamination that has moved downgradient. Resolution of issues and concerns expressed by Pall about these extraction wells and pipelines in these more residential areas is discussed below.

4. **Extraction Downgradient of Leading Edge.** In addition to the matters outlined above, Ann Arbor believes that Alternatives 3a and 4a should be further modified with a requirement for an additional set of purge wells, located downgradient of the portion of the aquifer at which 1,4 Dioxane concentrations are at 85 ppb. This will serve two main purposes. First, it will assure that any 1,4 Dioxane that is able to bypass the “leading edge” purge wells will be captured, removed and properly treated (effectively providing a safeguard against bypassing that could result in additional contamination of downgradient, currently clean aquifers). [The possibility of Bypassing is real. It was experienced already in this area at the Evergreen location. Moreover, bypassing of purge wells has been experienced at numerous other groundwater cleanup sites in Michigan and elsewhere.] Second, although no maximum contaminant levels have been established in Michigan (or federally) for 1,4 Dioxane for municipal drinking water, 1,4 Dioxane is a probable carcinogen, and it would be inappropriate to allow levels at or near 85 ppb to flow into Ann Arbor’s municipal water supply or into private down-gradient wells that exist within the City of Ann Arbor and Ann Arbor Township (where private drinking

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water wells are utilized.) Other jurisdictions have considered the appropriate levels of 1,4 Dioxane that should be allowed in drinking water, and several have concluded that a level of 3 ppb or less would be the maximum that should be permitted. Examples of the maximum contaminant levels (concentrations) established by other jurisdictions are as follows: (i) California - 3ppb; (ii) Kentucky tap water – 1.4 ppb; (iii) Maine – 32 ppb; (iv) Missouri – 3 ppb; (v) Texas – 8.3 ppb; (vi) West Virginia – 6.1 ppb [values obtained from “1,4 Dioxane Characterization and Treatability Issues” Final Draft, August 21, 2003, by Tetra Tech EMI, 2003.] Consequently, Pall should be required to install purge wells at locations downgradient from the currently understood “leading edge” of the 1,4 Dioxane plume in Unit E.

Benefits of the Proposed Modifications (additional extraction wells).

Ann Arbor’s suggested modifications to Alternatives 3a and 4a will achieve several benefits. First, by performing significant extraction and treatment of water at the core, itself, Pall will eliminate migration of highly contaminated groundwater from its facility (as required by MCLA 324.20114). In other words, this will cut-off the source. Second, by installing two sets of intermediate purge wells, at locations between the core and the “leading edge”, Pall will halt further migration of the plume, and will extract more highly contaminated groundwater at those locations which may be more efficiently treated than waiting for contaminated groundwater to ultimately reach the current leading edge. Also, halting the plumes with these intermediate extraction wells will reduce the possibility that the plumes might bypass the final extraction wells located near the leading edge. Third, by installing extraction wells at the leading edge of the plume (85 ppb), Pall will halt further migration into currently uncontaminated or moderately contaminated aquifers. This hopefully will allow effective treatment of the contamination that has migrated to and has affected wells within the City of Ann Arbor. Finally, by extracting water from wells located downgradient of the “leading edge”, Pall will reduce the concentration of 1,4 Dioxane that already has migrated past the 85 ppb line (hopefully to degree that it will be fit for drinking water), will remove contamination from areas like the Montgomery Well and will capture any contamination that manages to bypass the “leading edge” wells, assuring protection of the currently uncontaminated aquifers.

This approach also will speed up ultimate completion of the cleanup effort. The proposed core and intermediate wells will extract large volumes of highly contaminated water, now, rather than waiting for decades until the last of that contamination migrates to the leading edge or downgradient capture wells, all the while hoping they will not be bypassed.

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Resolution of Issues/Concerns Expressed in Pall's Analysis of Alternatives 3a and 4a.

By employing a new discharge pipeline to the Huron River, these modified alternatives will resolve the most difficult question posed by Pall and MDEQ in its consideration of alternatives, which is: **What can be done with the purged and treated water?** Pall has expressed concern with the ability to obtain access for purposes of installing the discharge pipeline from the treatment site to a discharge location on the Huron River. If the modifications proposed by Ann Arbor are accepted and incorporated into the final plan, the City will pledge its support in helping to devise an appropriate route and in obtaining access for that installation. In particular, the City believes that the discharge pipeline could be most effectively and easily installed in the right-of-way along I-94 to M-14 and along that right-of-way to a discharge in the Huron River downstream of Barton Pond. (Note, Ann Arbor proposes discharge downstream of Barton Pond, because that avoids any residual concerns with discharge into a location that might affect the City of Ann Arbor's municipal water intake.)

Another major obstacle posited by Pall with implementation with either Alternative 3a or 4a (as modified by Ann Arbor's suggestions) is concern with disruption of neighborhoods within the City of Ann Arbor. Again, if Ann Arbor's proposed modifications are adopted, the City believes that those concerns may be satisfactorily addressed as follows. First, Ann Arbor will provide access for both purge well locations and transmission pipelines from those locations to the treatment facility through its City street rights-of-way on major thoroughfares. Subject to confirmation, Ann Arbor believes that appropriate purge locations can be identified along the major streets such as Jackson Road, Dexter Road and the like. By using those locations, there will be no need to take drill rigs within residential neighborhoods, themselves, or to disrupt and cause concern for residents in their neighborhoods. Second, it should be noted that Ann Arbor regularly installs pipelines through major thoroughfares such as the mentioned roadways. This can be done with minimal disruption of traffic and neighborhoods, through use of directional drilling and installation of the pipeline.

As noted, Ann Arbor has not expressed a preference for the place at which ultimate treatment should occur (at the Pall facility on Wagner Road or in the vicinity of Maple Road.) Ann Arbor believes that Pall would be in the best position to assess the extent to which the treatment location would be difficult, dangerous or overly expensive, and leaves that determination to Pall.

Possible Continued Evaluation of Other Treatment Approaches.

Ann Arbor does not discount the possibility that in the future Pall may determine that other treatment technologies might also aid in its effort to rid the groundwater aquifers of 1,4 Dioxane. The City continues to support the experimental efforts by Pall to develop effective, less invasive, and cheaper alternatives. For example, Pall has

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suggested that in situ treatment ultimately might prove beneficial. If future study and testing proves that to be true, and if there are no adverse side effects, Ann Arbor would applaud those additional efforts. However, those methods at present are unproven. Pall should not be allowed to avoid immediate action to halt the plume, extract it and treat it (as outlined above in the modified Alternatives 3a and 4a) based solely on the hope and prayer that alternative approaches may prove effective some day.

Conclusion

Again, the City pledges its support for implementation of appropriate means to extract, treat and dispose of 1,4 Dioxane and treated water. By using proven technology, Pall can extract all of the contaminated groundwater, treat it and cleanse the aquifers. By doing so, Pall also can assure that currently uncontaminated aquifers underlying the City do not become contaminated in the future. Allowing 85 ppb of 1,4 Dioxane to permeate the entire aquifer underlying the City would be highly inappropriate. Accordingly, the City requests that MDEQ approve either Alternative 3a or 4a with the modifications that the City has suggested.

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