MICHIGAN DEPARTMENT OF ENVIRONMENTAL QULITY
Jennifer M. Granholm, Governor, Steven E. Chester, Director

REMEDIATION AND REDEVELOPMENT DIVISION

FACT SHEET
DEQ'S Proposed Remedial Alternative Gelman Sciences, Inc. Unit E Aquifer Groundwater Contamination

Jackson District Office
Mitch Adelman, Supervisor
301 E. Louis Glick Highway
Jackson, MI 49201-1556

This fact sheet contains:

- Site history and background
- Summary of the Unit E Aquifer contamination
- Summary and evaluation of the remedial alternatives being considered
- Criteria used to evaluate the alternatives
- DEQ's Proposed Remedial Alternative
- Glossary – first occurrence in **bold**
- Location of information repositories
- Information on the timing and process for public comment

Public Comment Period

The DEQ will accept written comments on remedial alternatives, including its Proposed Remedial Alternative, during a 30-day public comment period:

July 7, 2004 through August 9, 2004
(see *Public Comment Information*)

Public Meeting

The DEQ will host a meeting to discuss the remedial alternatives and the **Feasibility Study**, and to answer any questions. Oral and written comments will be received at the meeting to be held from 7:00 p.m. to 9:00 p.m. on **Wednesday, July 28, 2004**, at Slauson Middle School, 1019 West Washington, Ann Arbor, Michigan.

Introduction

This fact sheet describes the alternatives considered by the Department of Environmental Quality (DEQ) for remedying groundwater contamination in the Unit E Aquifer emanating from the Gelman Sciences site of contamination in Scio Township, Washtenaw County (Fig. 1). This fact sheet also identifies the DEQ's Proposed Remedial Alternative and the rationale for its selection. The alternatives summarized in this fact sheet are described in more detail in the June 1, 2004 Feasibility Study submitted by Pall Life Sciences (PLS).

The June 1, 2004 Feasibility Study, and more comprehensive information on the Unit E Aquifer and the entire site, is available at four information repositories listed inside this bulletin and on the DEQ's Gelman Sciences, Inc. web site: www.michigan.gov/deqrrd (scroll to *What's New* and click on Gelman Sciences, Inc.). Any questions about this site may also be directed to the DEQ project manager (see *Public Comment Information*).

The Remediation and Redevelopment Division (RRD) of the DEQ is responsible for implementing **Part 201** (Environmental Remediation) of the Natural Resources and Environmental Protection Act **(NREPA)** the primary Michigan law governing cleanup of environmental contamination sites. Part 201 and the **Part 201 Rules** issued by DEQ under Part 201 establish standards and processes for remedying contamination intended to protect public health, safety and welfare, and the environment.

At this site, the RRD also oversees response actions by PLS, the successor corporation to Gelman Sciences, Inc. PLS is responsible for performing the response actions necessary to clean up the contamination under both Part 201 and a 1992 **Consent Judgment** entered in a lawsuit by the state against Gelman Sciences, *Attorney General v Gelman Sciences, Inc*. PLS's response activities are subject to DEQ review and approval, as well as the continuing oversight of the Washtenaw County Circuit Court since the state took action in 2000 to enforce the Consent Judgment.

Public Input: Public input on the Proposed Remedial Alternative is an important element in the remedy selection process under Part 201. After reviewing public comments, and any other new information, the DEQ will select a remedial alternative and direct PLS to implement it. The alternative selected may be the one proposed in this fact sheet, a modification of the proposed alternative, or a different remedial alternative. Therefore, residents of Ann Arbor, Scio Township and any other interested parties are strongly encouraged to review and comment on the technologies and alternatives presented in this fact sheet.

The DEQ will provide its decision on the remedial alternative for the Unit E Aquifer to PLS, the public and the Washtenaw County Circuit Court by September 1, 2004, as directed by the Court. **The Court has scheduled a status hearing in the matter for September 8, 2004.**

Site History

The Gelman Sciences, Inc. (Gelman) site is located on Wagner Road just south of Jackson Road in Scio Township. Pall Life Sciences (PLS) is the successor to Gelman Sciences, Inc. For simplicity, this fact sheet will refer to PLS regarding all past and current actions of the company.

From 1966 to 1986, PLS used **1,4-dioxane** in the manufacture of medical filters. Various methods of disposal and waste handling during this period resulted in releases to the environment that caused widespread groundwater contamination.

The compound 1,4-dioxane is completely soluble in water and is held together by strong bonds that prevent it from breaking down readily in groundwater. The complex geology in the vicinity of the PLS property also contributed to the widespread nature of the contamination. Toxicity testing has determined that high doses of 1,4-dioxane cause cancer in mice, and it is presumed to be a human carcinogen through long-term exposure to low doses.

Site Actions: In the fall of 1985, the first contaminated private water supply wells were discovered in the vicinity of the PLS property, and additional well sampling was done. Bottled water was provided to affected residences and businesses until the municipal water supply was extended into these areas. Beginning in 1986, investigations by PLS identified soil contamination on the PLS property and four areas of groundwater contamination extending off the property. During the course of remedial investigations, geologists assigned alphabetic designations to the various subsurface layers and aquifers, such as Unit C, Unit D, etc. In May of 2001, significant contamination was detected in new borings into the deepest, so-called "Unit E Aquifer".

PLS has been extracting contaminated groundwater from two of the shallower aquifers since 1997. This water is piped from the extraction wells to PLS's treatment building. The treated groundwater is then discharged to the Honey Creek Tributary. This remediation has significantly decreased the concentration and mass of 1,4-dioxane contamination in the shallower aquifers.

Unit E Aquifer

Investigations: The Unit E Aquifer is contaminated with 1,4-dioxane above the generic residential and commercial I cleanup criterion for groundwater (**GRCC**) of 85 parts per billion (ppb) in an area extending from Parkland Plaza to Worden Street, east of Veterans Park (Fig. 1). The Unit E Aquifer is

the deepest of the glacial aquifers, and lies just above the bedrock, over 200 feet below the ground surface in some areas.

During an investigation in the spring of 2001, it was discovered that there was no confining layer of clay separating the shallower aquifers from the Unit E Aquifer in an area west of the PLS property. The exact location(s) of the connection(s) that has allowed 1,4-dioxane contamination to migrate into the Unit E Aquifer has not been determined. Investigation to date has focused on defining the extent of contamination. Additional investigation will be required.

Site Actions: Since May 2002, PLS has been operating two extraction wells in upgradient portions of the Unit E Aquifer on its property. As of May 2004, these extraction wells are removing about 150 gallons per minute (gpm) of contaminated groundwater. The concentration of 1,4-dioxane in these wells, TW-11 and TW-12, was 630 ppb and 83 ppb respectively in May 2004. This groundwater is being treated and discharged to the Honey Creek Tributary.

Since the contamination in the Unit E Aquifer was discovered, 30 monitoring wells have been installed to determine the nature and extent of contamination. Recent investigation has focused on the area in and around Veterans Park and the Maple Village Shopping Center.

Two test wells have also been installed and aquifer performance tests have been done to help identify characteristics of the aquifer that can be used to design a system to clean up the aquifer.

In May 2004, PLS performed a test to determine if *in situ* (in place) oxidation of groundwater by injecting hydrogen peroxide into the aquifer is a feasible remedial option. Preliminary results of this testing are not promising.

Feasibility Study and Alternatives Considered

In 2003, the DEQ and PLS agreed that PLS would conduct a feasibility study to systematically evaluate remedial options for contamination in the Unit E Aquifer. The purpose of the Feasibility Study is to evaluate the available remedial alternatives that meet the objectives of Part 201, and the Part 201 Rules.

On June 2, 2004, PLS submitted its Final Feasibility Study and Proposed Interim Response Plan to the DEQ. PLS considered an array of process options that were combined into thirteen separate remedial alternatives, and are summarized below. These alternatives were screened and the eight surviving alternatives were evaluated in more detail. The estimated costs for these alternatives are shown in Table 1. PLS concluded that each of these eight alternatives adequately protects public health due to the depth of the groundwater and the existence of a municipal water supply. Alternatives that did not survive the screening process are noted below as having been eliminated. The DEQ's outline of the alternatives PLS considered is listed below. The DEQ has revised the title of some of the alternatives to more accurately reflect the proposed response action.

Alternative 1 – No Action
This alternative is considered for comparison purposes, and was eliminated due to not meeting the requirements of Part 201.

Alternative 2 – Monitored Natural Attenuation and Institutional Controls
This alternative includes:

- a hydrogeological investigation to determine where the groundwater contamination (**plume**) would flow if no remedial action is taken
- a network of monitoring wells to track the migration of the plume
- long-term monitoring
- institutional controls (deed restrictions or a local ordinance) to restrict use of the groundwater

This alternative was eliminated due to the uncertainty of public support.

Alternatives 3a-e – Groundwater Pumping at Leading Edge, Pipeline to PLS Wagner Road Facility, Treatment and Discharge by Various Methods

These alternatives share:

- extraction from three wells of approximately 500 gpm to prevent further migration of contamination in excess of the GRCC
- pipeline to PLS property on Wagner Road for treatment
- treatment with ultra-violet light and hydrogen peroxide (current method) or ozone and hydrogen peroxide

The five discharge methods/locations considered are:

a. pipeline to the Huron River
b. reinjection into plume at multiple locations on PLS property where 1,4-dioxane exceeds 85 ppb
c. reinjection into plume at multiple locations where 1,4-dioxane is 1-85 ppb
d. reinjection into plume at multiple locations where 1,4-dioxane is less than 1 ppb
e. Discharge to Honey Creek at existing outfall

Alternative 3b was eliminated due to the unknown effects of reinjection within the plume. Alternative 3d was eliminated due to the inability to reliably treat groundwater to non-detect.

Alternatives 4a-d – Groundwater Pumping at Leading Edge, Treatment with Ozone and Hydrogen Peroxide near Maple Road, Discharge by Various Methods

These alternatives share:

- extraction from three wells of approximately 500 gpm to prevent further migration of contamination in excess of the GRCC
- pipeline to the Maple Road area for treatment
- treatment with ozone and hydrogen peroxide

The four discharge methods/locations considered are:

a. pipeline to the Huron River
b. reinjection into plume at multiple locations on PLS property where 1,4-dioxane exceeds 85 ppb
c. reinjection into plume at multiple locations where 1,4-dioxane is 1-85 ppb
d. reinjection into plume at multiple locations where 1,4-dioxane is less than 1 ppb

Alternative 4b was eliminated due to the unknown effects of reinjection within the plume. Alternative 4d was eliminated due to the inability to reliably treat groundwater to non-detect.

Alternative 5 – Groundwater Pumping at Leading Edge, Pipeline to PLS Wagner Road Facility, Injection into Deep Formation Without Treatment

This alternative includes:

- extraction from three wells of approximately 500 gpm to prevent further migration of contamination in excess of the GRCC
- pipeline to PLS property on Wagner Road
- injection into the deep formation (about one mile deep, below bedrock) without treatment

Alternative 6 – Migration of Plume toward the Huron River, Groundwater Pumping near Huron River (if necessary to meet criteria), Treatment and Discharge to the Huron River

This alternative is similar to Alternative 2, with the addition of:

- a contingency to extract, treat and discharge groundwater to the Huron River if concentrations of 1,4-dioxane exceed relevant criteria
- relying on the Washtenaw County Rules and Regulations for Protection of Groundwater and court orders as institutional controls to restrict use of the groundwater

Pall Life Sciences' Proposed Remedial Alternative

PLS conducted a detailed review of the eight alternatives that survived the screening process

and chose Alternative 6, with the addition of the following interim response actions for an undetermined length of time, to reduce the mass of 1,4-dioxane, in order to minimize the possibility that downgradient groundwater extraction and treatment will be necessary:

- installation of one or two more extraction wells near Wagner Road and an increase in the extraction rate to 250 gpm (currently extracting 150 gpm from two extraction wells), with treatment and discharge to the Honey Creek Tributary under their existing discharge permit;
- extraction of 200 gpm from one well at Maple Road, nearby treatment with ozone and hydrogen peroxide and reinjection into two wells at Maple Road, north and south of the extraction point.

Criteria Relevant to Selecting a Remedial Alternative

Part 201 and the Part 201 Rules identify several criteria the DEQ must use in selecting Remedial Actions. Section 20118(2) specifies that, at a minimum, remedial actions must:

a. assure the protection of the public health, safety, and welfare, and the environment;
b. except as otherwise provided, attain a degree of cleanup and control of hazardous substances that complies with all relevant and appropriate requirements, rules, criteria, limitations and standards of state and federal environmental law. [NOTE: Section 20118(5) and (6) allows the Department to "waive" the requirements of Rule 5705(5) and 5705(6) under certain conditions. These rules specify that remedial actions not allow contaminated groundwater plumes to expand once a remedial action is initiated, and provide for active removal of hazardous substances from contaminated groundwater. Exceptions to these rules will be referred to as a **"waiver"**.]

The DEQ considers the above requirements to be "threshold criteria" that a remedial action must satisfy. In addition, the following are considered by DEQ to be "balancing criteria" in weighing alternatives that meet the threshold criteria. Section 20118(3) and (4) state that the cost-effectiveness of alternative means of complying with Section 20118 shall be considered by the Department only in selecting among alternatives that meet all of the criteria in Section 20118(2); and that remedial actions that permanently and significantly reduce the volume, toxicity, or mobility of hazardous substances are to be preferred.

Part 6 of the Part 201 Rules provide further relevant criteria regarding remedy selection. While Rule 601 reiterates the Section 20118 requirements, Rule 603 provides additional criteria the DEQ shall use in selecting remedies, including:

- The effectiveness of protecting the public health, safety, and welfare, and the environment;
- The long-term uncertainties associated with the proposed remedial action;
- The toxicity, mobility, and propensity to bio-accumulate of the hazardous substances;
- The short and long-term potential for adverse health effects from human exposure;
- The costs of the remedial action, including long-term maintenance;
- The reliability of the alternatives;
- The potential for future remedial action costs if an alternative fails;
- The potential threat to human health, safety, and welfare, and the environment associated with excavation, transportation and re-disposal or containment;
- The ability to monitor remedial performance;
- The public's perspective about the extent to which the proposed remedial action effectively addresses Part 201 and the Part 201 Rules.

DEQ Analysis of Alternatives using the Above Criteria

The DEQ agrees with the elimination of five of the thirteen alternatives considered by PLS. PLS did not consider additional combinations of alternatives as requested by the DEQ. These are addressed under *DEQ's Proposed Remedial Alternative.* The DEQ is continuing to review the Feasibility Study and will consider public comment and any new information prior to finalizing its decision on a remedial alternative for the Unit E Aquifer. There is no estimate in the Feasibility Study regarding how long it will take for each of the alternatives to achieve cleanup, making it difficult to analyze the alternatives. The only indication of the time for each alternative is in the tables, where the number of years for operation and maintenance is shown. Using the above criteria, and based on its evaluation to date, the DEQ has concluded the following for each of the eight alternatives considered in detail by PLS:

Alternative 2

PLS's estimated cost for this alternative indicates monitoring will be performed for 40 years. There is no documentation to support that the cleanup criteria will be achieved in 40 years. As proposed, this alternative does not meet the threshold criteria of assuring the protection of the public health, safety, and welfare, and the environment. This alternative is based on the assumption that the contaminated groundwater plume will migrate along a predicted path toward, and discharge entirely to the Huron River at concentrations below the **groundwater-surface water interface criterion**, as shown in the attached Fig. 11 from the PLS Feasibility Study. PLS assumes that no additional residential or community wells will become contaminated as a result of this migration, that continued hydrogeological investigation and groundwater monitoring will need to be performed to monitor the migration of the plume, and that institutional controls can prevent human exposure to the contamination.

If acceptable institutional controls can be put in place to reliably restrict human consumption of contaminated groundwater, this alternative may protect the public health and safety. However, as proposed in the Feasibility Study, the institutional controls (in the form of a local ordinance to prevent use of contaminated groundwater), combined with the City's anticipated decision not to resume operation of the **Montgomery well**, does not sufficiently restrict human consumption of contaminated groundwater. PLS indicates that the available information shows that this well will not be impacted by the contamination. However, the contaminated portion of the Unit E Aquifer is in the western portion of the wellhead protection area for the Montgomery well, the City has not abandoned this well and low levels of 1,4-dioxane have been detected in the well. In addition, the DEQ has a policy against granting waivers of its rules to allow for plume expansion in wellhead protection areas. Further, there is no provision to protect existing private water supply wells if the plume does impact them. This alternative provides no additional protection of the environment, and in fact allows the extent of environmental contamination to expand. Thus, this alternative does not attain a degree of cleanup and control of hazardous substances that complies with all relevant and appropriate requirements, rules, criteria, limitations and standards of state and federal environmental law.

This alternative may not protect the welfare of the public, and provides no reduction of volume, toxicity, or mobility of hazardous substances. There is a high degree of long-term uncertainty associated with this option. There is not currently enough information available to predict the exact route the plume will follow, including whether it will ultimately contaminate additional residential wells. Nor is there sufficient information about how long the plume will take to get to the river and/or other receptors, and what concentrations the plume will be when it arrives at receptors. The potential difficulty of securing adequate institutional controls from the City or County adds uncertainty to the feasibility of this alternative and combines with the other

uncertainties to make this alternative relatively unreliable in protecting human health, safety, welfare, and the environment. The DEQ agrees with the elimination of this alternative.

Alternatives 3a, 3c, 3e, 4a, 4c and 5

PLS's estimated cost for these alternatives indicate operation and maintenance will be performed for 20 years. There is no documentation to support that the cleanup criteria will be achieved in 20 years. These alternatives are all protective of human health, safety and welfare, and the environment, to the extent that they would prevent further migration of contamination by intercepting the leading edge of the plume (Fig. 1) with three extraction wells and piping to various locations. The differences between these alternatives are the route by which contaminated water will be transported, the method of treatment and the location and method of discharge (see *Alternatives Considered*). The long-term uncertainties of all of these alternatives involve the continued presence of groundwater contamination for at least 20 years, upgradient of the extraction wells. During this time, there would remain the possibility that uses of groundwater could allow human exposures or cause the contamination to migrate out of the expected flow path. In addition, all of these alternatives depend on 1) the construction of lengthy pipelines and 2) transport of contaminated or treated groundwater through underground pipelines to various locations for a period of 20 years. The short and long-term threats to human health, safety and welfare, and the environment posed by the construction and use of pipelines are judged to be moderate, and are not a sufficient reason to reject these alternatives, absent other negative factors.

These alternatives differ in the location of the treatment system, except Alternative 5, which does not propose any treatment. Operation of a treatment system requires the transport and handling of chemicals that can pose a threat to human health, safety and welfare, and the environment. The threat of these operations at the PLS property are minimal, but would be somewhat higher in the Maple Road area, where the treatment system would be located closer to areas used by the public. This is not a sufficient reason to reject Alternatives 4a or 4c, especially considering PLS's experience and record of operating its current treatment system with no incidents that have posed a significant threat to human health, safety and welfare, and the environment.

Alternatives 3a and 4a: Alternatives 3a and 4a propose discharge of treated groundwater to the Huron River via pipelines. Alternative 3a would involve significantly more pipeline than any of the other leading edge alternatives. Alternative 4a would place the treatment system closer to areas used by the public. Evaluation of these differences should consider costs and public acceptance of the risks associated with each alternative. The DEQ considers these two alternatives preferable to the other leading edge approaches.

Alternatives 3c and 4c: Alternatives 3c and 4c propose reinjection of treated groundwater into areas where concentrations of 1,4-dioxane range from 1 - 85 ppb. Due to the complex geology in both proposed reinjection locations, the unknown effects on the plume diminish the reliability and increase the long-term uncertainties of these alternatives. In addition, although concentrations of 1 - 85 ppb meet the GRCC, the public may not support an alternative that could expand the area that has detectable levels of contamination. The DEQ views alternatives that could result in expansion of the plume due to reinjection to be less acceptable because of the resulting uncertainty.

Alternative 3e: Alternative 3e proposes discharge of treated water to the Honey Creek Tributary (HCT) under the existing surface water discharge permit. The uncertainties of this discharge method include the available discharge capacity under the current permit and the possibility that more than 500 gpm would have to be extracted from the leading edge (there may not be adequate capacity to treat all of the groundwater to meet the performance objectives for the Unit E plume in addition to the volume that must be treated to meet the performance objectives for the shallower aquifers). The City of Ann Arbor and local

citizens have repeatedly objected to the current discharge to the HCT because of the potential for 1,4-dioxane to seep into groundwater from the HCT and because 1,4-dioxane could enter the City's water supply through the intake at Barton Pond during low flow when the daily maximum (60 ppb) is discharged or exceedances occur. Therefore, it appears that at least some of the public may not support any increased use of the HCT and that any surface water discharge permit authorizing such an increased use is likely to be challenged.

Alternative 5: There is a high degree of long-term uncertainty associated with Alternative 5 as there is not currently enough information available to ensure that the deep formation can accept the necessary volume of water.

Alternative 6

PLS's estimated cost for this alternative indicates 20 years of monitoring and then 30 years of operation and maintenance of the contingency treatment system. There is no documentation to support that the cleanup criteria will be achieved in 50 years. This alternative differs from Alternative 2 in that it proposes a contingency to intercept and treat the contamination closer to the Huron River in the event that monitoring identifies threats to water supply wells or surface water above the applicable criteria. In addition, it would rely on the existing Washtenaw County Rules and Regulations for the Protection of Groundwater (WCRRPG) as an institutional control, in conjunction with court orders. The DEQ has reviewed the WCRRPG and has determined it does not meet the requirements for an acceptable Part 201 institutional control in its current form. For example, there is no restriction on installation and operation of industrial wells, which could change the configuration of the plume. The contingency plan proposed in this alternative does add some protection to human health, safety and the environment by addressing potential exposure of receptors to contamination above applicable criteria. With this exception, the DEQ's analysis of Alternative 2 also applies to Alternative 6.

PLS states that Alternative 6 will be less disruptive and more compatible with existing land uses than the leading edge alternatives; however, it is premature to make such a statement since the ultimate path of the plume cannot be determined until a hydrogeological study is performed. The study required by such an approach would also require numerous monitoring wells, which would also be likely to create disruption of residential neighborhoods.

For the above reasons, the DEQ has determined that, under the present circumstances, Alternative 6 does not meet the criteria established by Part 201 and the Part 201 Rules.

The DEQ has evaluated what additional conditions would have to be met in order for the DEQ to approve a modified version of PLS's proposed remedial alternative, including a waiver of Rule 705(5). The DEQ offers these conditions only to allow for comparison to the other alternatives, not as a recommendation that these steps be taken.

1. Abandonment of the Montgomery well and elimination of the associated wellhead protection area designation by the City.
2. Prevention of any further migration of 1,4-dioxane contamination beyond Maple Road in excess of 2,800 ppb (the criterion protective of surface water).
3. A plan for monitoring any residential wells that are shown to be threatened by contamination, and a contingency plan to prevent unacceptable exposure if wells are affected.
4. Enactment of an acceptable institutional control, in a specified period of time, to prevent any groundwater withdrawal that would exacerbate the contamination, in addition to preventing the use of contaminated groundwater for drinking water.
5. Groundwater monitoring to ensure that contamination above the GRCC does not underflow the Huron River, with a contingency plan to intercept any such contamination.

6. Provide for acceptable disposal of the treated groundwater from the Maple Road interim response, by providing sufficient hydrogeological information to resolve concerns about reinjection, and/or by shifting to an alternate means of disposal.

DEQ's Proposed Remedial Alternative

The DEQ has reviewed each of the alternatives considered in the Feasibility Study individually and in combination with interim responses. The DEQ has determined that extraction from the leading edge alone is not as protective of human health, safety and welfare, and the environment as it would be in combination with interim responses. Interim responses would significantly reduce the overall cleanup time, thereby limiting the potential for human exposure and unexpected impacts on the plume due to any groundwater withdrawals. The following factors were considered by the DEQ in making its recommendation for the Proposed Remedial Alternative, which is summarized at the end of this section.

Interim Responses

Some of the interim responses discussed below are response activities that can be readily implemented. Due to the size of the plume, these interim responses are intended to continue in operation as part of the final remedy.

Wagner Road: The DEQ has recently directed PLS to perform an interim response near Wagner Road to prevent further eastward migration of groundwater contamination. This can be accomplished in the near-term with limited additional infrastructure, independent of any decision on a final remedy. This can likely be accomplished using the existing treatment system and available discharge capacity without compromising the ongoing cleanup of the shallower aquifers. Attaining capture any farther east using the existing system would be significantly more difficult due to the wetlands immediately east of Wagner Road.

Maple Road: Additional interim response at Maple Road is also warranted, as there is a significant change in the geology east of Maple Road that has an unexplained impact on the migration of contamination. The known concentrations of 1,4-dioxane east of Maple Road (except MW-79 on the east side of Maple Road) are significantly lower than what is found west of Maple Road. For this reason, capture of the contamination at Maple Road will significantly reduce the uncertainty involved in extracting only at the leading edge.

Discharge Methods

Securing a reliable method for discharge of treated groundwater has been difficult throughout the history of this contamination site, and the difficulty in doing so has often delayed implementation of response actions. For this reason, it is essential to identify a safe and reliable discharge method that is accepted by the general public, affected governments and property owners.

In Situ Option: As discussed in the Feasibility Study, *in situ* (in place) treatment of groundwater would reduce or eliminate the need to extract groundwater, as treatment would take place underground. Unfortunately, this technology has not been adequately developed to reliably treat such a large volume of water for this contaminant.

Reinjection Options: The Feasibility Study examined several groundwater reinjection options, two of which survived the initial screening process. As indicated under the DEQ's analysis of those alternatives, the DEQ does not consider groundwater reinjection to be a feasible discharge method for technical reasons. In addition, it appears the public may not support reinjection that could increase the area of groundwater impacted by low levels of contamination (1 - 85 ppb), as may be the case with Alternatives 3c and 4c. Reinjection would only be feasible if extensive investigation, coupled with intensive performance monitoring of reinjection, could alleviate the DEQ's and the public's concerns.

Surface Water Options: Several surface water discharge options have also been considered. Due to the distance to surface water, it is apparent that extensive lengths of pipeline would be required to transport groundwater, first to a treatment location, then to a discharge location. Although the installation of pipelines can be disruptive to the community, this is a relatively short-term inconvenience and could be accomplished using standard engineering and construction techniques, including horizontal boring in appropriate locations to minimize disturbance.

As discussed under the DEQ's analysis of Alternative 3e, there are several factors that raise questions about the feasibility of a discharge to the Honey Creek Tributary. The Allen Drain and the sanitary sewer eventually flow to the Huron River; however, neither has the capacity to allow for a continuous discharge of the volume of water necessary for remediation of the Unit E plume. The use of the Allen Drain and the sanitary sewer were considered in the Feasibility Study, and were eliminated due to capacity and other issues.

The only remaining reliable discharge option is a surface water discharge to the Huron River. The extracted groundwater (from the leading edge and Maple Road) can be piped to a treatment system via a double-walled pipeline, treated, and piped to the Huron River for discharge at a location downstream from the City of Ann Arbor's water supply intake. A generalized figure of the DEQ's proposed remedial alternative is shown on Fig. 1. This is based on the configuration shown in PLS's Feasibility Study as Fig. 9. The location of the treatment system and the route of the pipeline depicted is for discussion purposes, and is not a determination that these are the most suitable locations.

Proposed Remedial Alternative: In summary, based on the DEQ's analysis to date of the relevant criteria and available information, the DEQ proposes a remedial alternative that combines Alternative 4a with additional interim responses. The additional interim responses are similar to that proposed by PLS, with the additional objective of cutting off the migration of groundwater contamination east of Wagner Road and east of Maple Road. This would effectively cut the plume into three sections, and significantly reduce the amount of time needed to clean up the contaminated aquifer, reducing the threat to public health, safety and welfare, and the environment. In addition, the reduction of time to remedy the contamination, in comparison to PLS's alternative, could offset the additional capital costs required for the DEQ's Proposed Remedial Alternative.

The DEQ also recommends that temporary use of the sanitary sewer for disposal of treated groundwater from the Maple Road area should be pursued, as there is some limited capacity in the sewer that is available during dry weather. This would serve to reduce the migration of higher concentrations to the east while the infrastructure necessary for the final remedy is put in place. This option should be pursued concurrently with determining the best location, and securing access for, a discharge pipeline, and investigation to better characterize the geology at the leading edge of the plume.

The DEQ's Proposed Remedial Alternative would require monitoring of the Montgomery well to ensure that the GRCC is not exceeded. Of the six conditions that would have to be met for PLS's alternative to be approved, the potential impact to the Montgomery well is the only one that would apply to the DEQ's Proposed Remedial Alternative. The DEQ's Proposed Remedial Alternative is preferable because it reduces technical uncertainties associated with other remedial alternatives, achieves cleanup objectives more quickly, and is more readily implementable than PLS's preferred alternative.

The DEQ has provided this information and analysis with the intent of generating a constructive dialogue with the community and all interested parties in an effort to select a remedial alternative that protects public health and the environment, complies with applicable law and is reasonably implementable and acceptable to the community.

Glossary

- 1,4-dioxane – the contaminant of concern at the Gelman Sciences site; a water soluble solvent; relevant criteria under the Part 201 Rules are the GRCC and the groundwater-surface water interface criterion
- Consent Judgment – 1992 settlement agreement entered in a lawsuit by the state against Gelman Sciences, *Attorney General v Gelman Sciences, Inc.* (Washtenaw County Circuit Court Case No. 88-34734-CE) that requires Gelman Sciences, and its successor, Pall Life Sciences, to perform a comprehensive, DEQ-approved cleanup of contamination emanating from the Gelman Sciences plant site
- Feasibility Study – PLS's Final Feasibility Study and Proposed Interim Response Plan, dated June 1, 2004, which evaluates and selects among various response activities
- GRCC – Part 201 generic residential and commercial I cleanup criterion for groundwater; the concentrations of a hazardous substance in groundwater that are protective for human consumption; for 1,4-dioxane, 85 ppb
- groundwater-surface water interface criterion – the concentrations of a hazardous substance in groundwater, per Part 201, that are protective of surface water to which the groundwater discharges; for 1,4-dioxane, 2,800 ppb
- institutional control – a legal means of restricting exposure to hazardous substances, usually through a deed restriction or local ordinance agreed to by a property owner or municipality
- Montgomery well – The City of Ann Arbor's municipal water supply well, located at Montgomery and Bemidji Streets, about 2,600 feet southeast of the leading edge of the Unit E plume; currently not in use
- NREPA – the Natural Resources and Environmental Protection Act , 1994 PA 451, as amended
- Part 201 – the Environmental Remediation section of the NREPA is the primary Michigan law governing cleanup of environmental contamination sites
- Part 201 Rules – the Part 201 Administrative Rules issued by DEQ under Part 201 establish standards and processes for remedying contamination intended to protect public health, safety and welfare, and the environment
- plume – groundwater contamination above the GRCC
- waiver - An exception that Part 201 allows DEQ to make, under certain conditions, from the general requirement of Part 201 Rule 5705(5) that the extent of groundwater contamination should not be allowed to increase after remediation of an aquifer begins

Information Available on DEQ's Gelman Sciences, Inc. Web Site

More detailed information about this site is available on the DEQ's Gelman Sciences, Inc. web site: www.michigan.gov/deqrrd, scroll to *What's New* and click on Gelman Sciences, Inc. or contact Sybil Kolon, the project manager, at 517-780-7937 or kolons@michigan.gov.

DEQ Information Repository Locations

Detailed information is available for review at the following locations, during regular business hours, and at the DEQ Jackson District Office by appointment.

Ann Arbor District Library
Westgate Shopping Center
2503 Jackson Road
734-994-1674

Scio Township Hall
827 North Zeeb Road, Ann Arbor
734-665-2123

City of Ann Arbor Water Utilities Department
100 North Fifth Avenue
Contact: Mary Gordon 734-994-8286

Washtenaw County Department of Environment and Infrastructure
705 North Zeeb Road, Ann Arbor
Contact: Michael Gebhard 734-222-3800, ext. 2385

The Department of Environmental Quality (DEQ) will not discriminate against any individual or group on the basis of race, sex, religion, age, national origin, color, marital status, disability, or political beliefs. Questions or comments should be directed to the DEQ Office of Personnel Services, P.O. Box 30473, Lansing, MI 48909.

TABLE 1

TOTAL COSTS FOR TEN REMEDIAL ALTERNATIVES FOR GELMAN SCIENCES, INC. SITE

(including capital, operation & maintenance (O&M) and post closure costs)

Alternative	Type of Treatment	PLS Costs[1] (current dollars)	Weston's Adjusted Costs[2] (current dollars)	Weston's Adjusted Costs (present worth[3])
2	none	*$ 6,578,650*	$ 4,000,000	- - -
3a-1	O_3/H_2O_2*	$28,581,242	- - -	- - -
3a-2	UV/ H_2O_2**	$43,298,826	- - -	- - -
3c-1	O_3/H_2O_2	$27,835,955	- - -	- - -
3c-2	UV/ H_2O_2	$42,566,179	- - -	- - -
3e-1	O_3/H_2O_2	$24,615,574	- - -	- - -
3e-2	UV/ H_2O_2	$39,374,422	- - -	- - -
4a	O_3/H_2O_2	$25,010,879	- - -	- - -
4c	O_3/H_2O_2	$30,495,958	- - -	- - -
5	none	$19,333,552	- - -	- - -
6	O_3/H_2O_2	*$37,716,979*	$25,000,000	- - -
6a[4]	O_3/H_2O_2	*$39,738,604*	$27,000,000	$ 8,000,000
DEQ[5]	O_3/H_2O_2	- - -	$20,000,000	$18,000,000

These costs represent estimates intended for comparison purposes.

The DEQ contracted with Weston Solutions, Inc. to provide technical and engineering review of the Pall Life Sciences (PLS) Feasibility Study & Proposed Interim Response Plan, dated June 1, 2004. Weston's report is available to the public at the Information Repositories and at the DEQ's Gelman Sciences, Inc. web site: www.michigan.gov/deqrrd (scroll to *What's New* and click on Gelman Sciences, Inc.)

* ozone and hydrogen peroxide
** ultra-violet light and hydrogen peroxide

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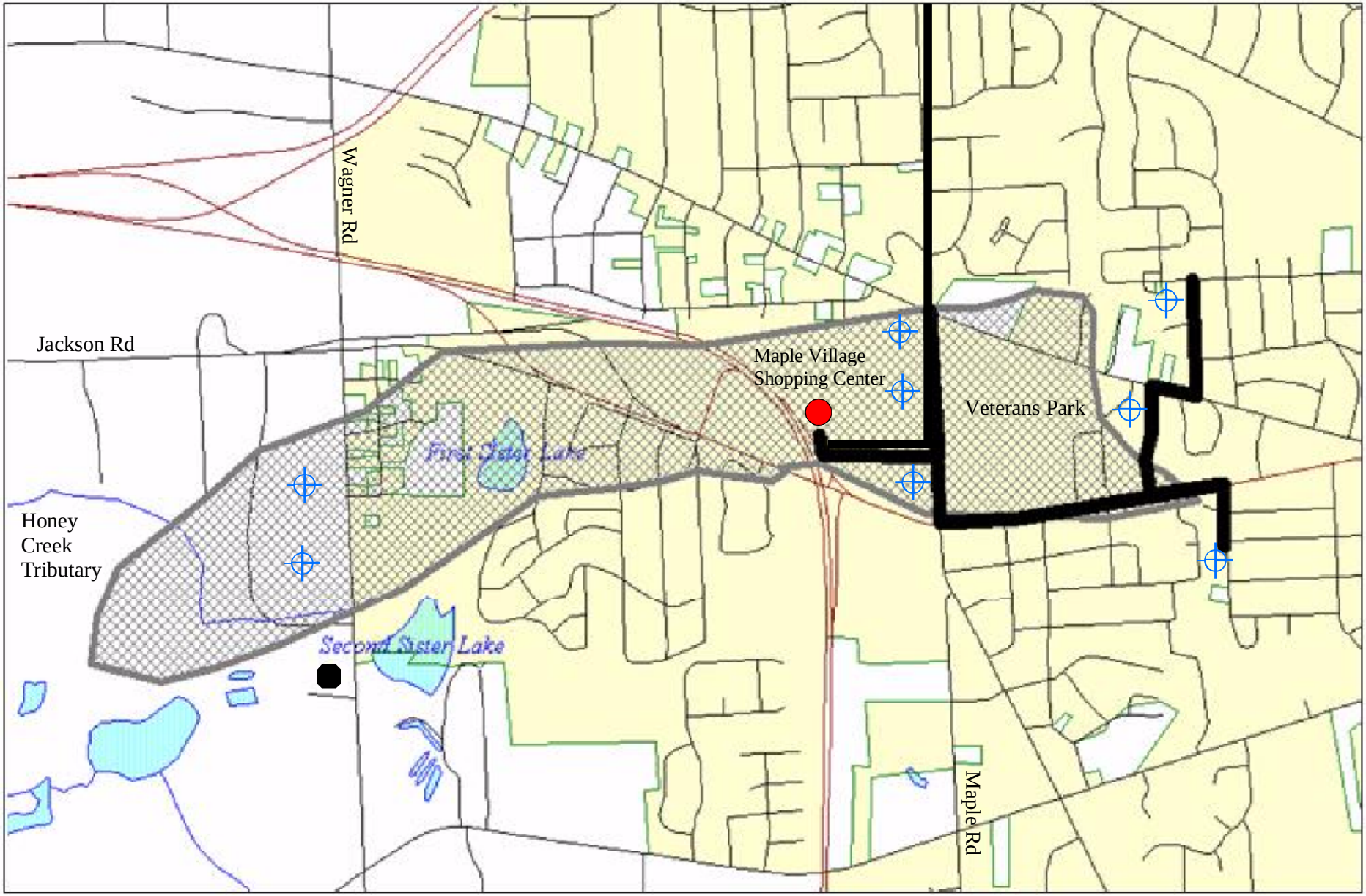
[1] from PLS's June 1, 2004 Final Feasibility Study (numbers in *italics* are corrected for math errors)

[2] Weston Solutions, Inc. generated their own costs for some items and relied on PLS's costs for others (the major difference being the cost of treatment per 1,000 gallons with O_3/H_2O_2**:** 15¢ used by Weston, 91¢ used by PLS); rounded to the nearest $1,000,000

[3] the amount of money that would have to be invested today to cover costs in the future (a 7% interest rate was assumed for these calculations); rounded to the nearest $1,000,000

[4] PLS's proposed remedial alternative with one year of interim response at Wagner and Maple Roads

[5] DEQ's Proposed Remedial Alternative, costs based on extraction at Wagner Road for 10 years, extraction at Maple Road for 20 years and leading edge extraction for 10 years, using some costs generated by Weston Solutions, Inc. and some by PLS



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LEGEND

- Pall Life Sciences Plant
- Pipeline
- Extraction Well
- Treatment System
- Unit E Plume with 1,4 - Dioxane Concentrations Exceeding 85 ug/L (ppb) January - March 2004

Figure 1:
DEQ's Proposed Remedial Alternative for the Gelman Sciences Inc. Unit E Plume

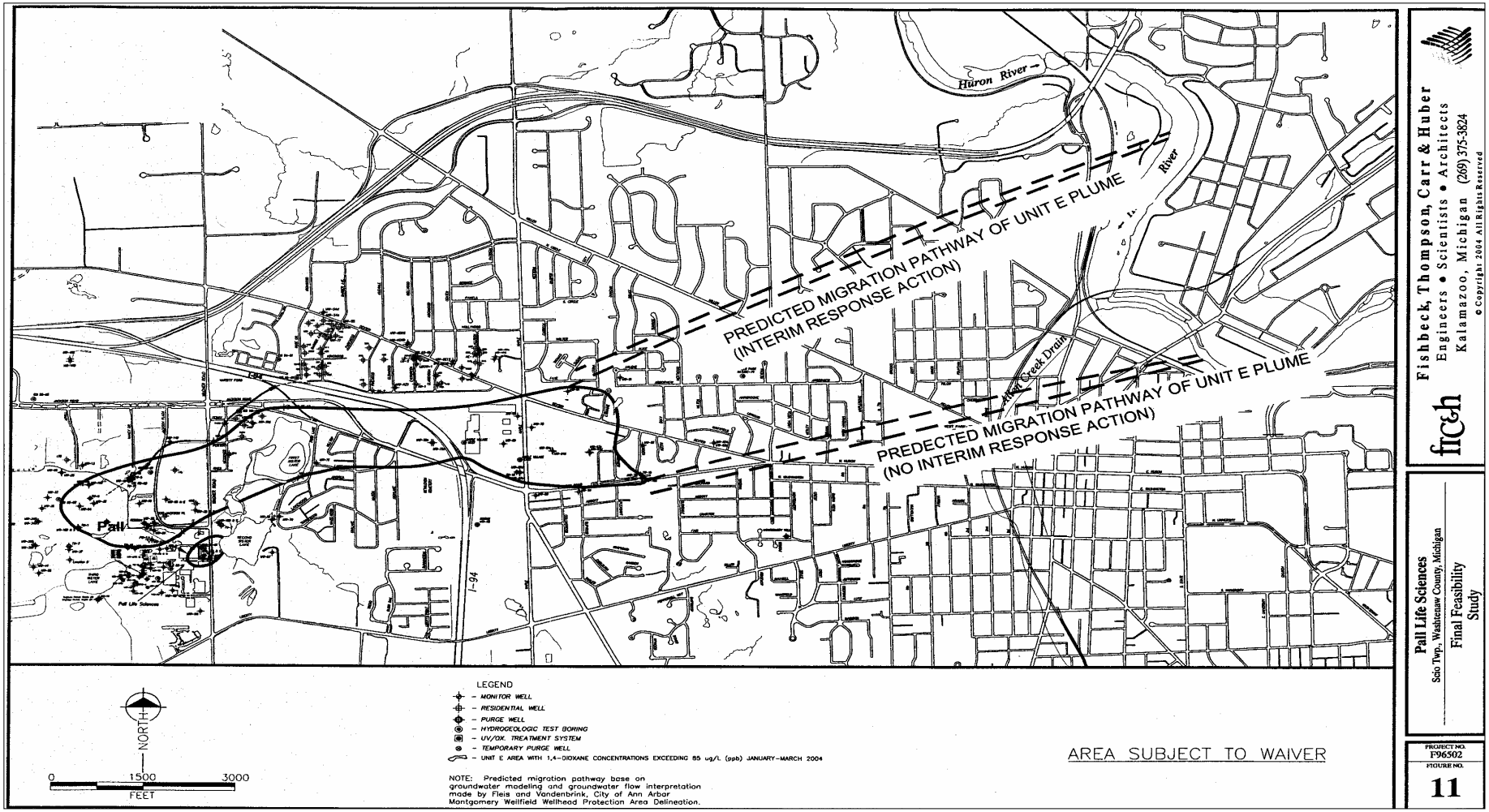

Figure 11 from PLS's Final Feasibility Study and Proposed Interim Response Plan, dated June 1, 2004

This figure shows the predicted migration pathway in the Unit E Aquifer of the 1,4-dioxane plume emanating from the PLS property, based on a PLS-generated groundwater model that the DEQ is currently reviewing.

Public Comment Information

The Remediation and Redevelopment Division of the DEQ will be accepting public comment on remedial alternatives for the Unit E Aquifer and its Proposed Remedial Alternative from July 7 to August 6, 2004. Comments can be made in writing, at the address indicated below, or at a public meeting to be held on Wednesday, July 28, 2004, from 7:00 p.m. to 9:00 p.m. at the Slauson Middle School, 1019 West Washington, Ann Arbor. All comments received will be considered and a Responsiveness Summary will be prepared and made available on the DEQ's Gelman web site, at the Information Repositories and by request.

Written comments should be sent by US Mail or E-mail to:
Sybil Kolon, Project Manager
DEQ-RRD
Jackson State Office Building
301 East Louis Glick Highway
Jackson, MI 49201

E-mail: kolons@michigan.gov
Telephone: 517-780-7937

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Public Comment on Gelman Sciences, Inc Site, Scio Township, Washtenaw County, Michigan
July 7 to August 9, 2004

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