



MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
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REMEDIATION AND REDEVELOPMENT DIVISION
INTERNET: <http://www.michigan.gov/deq>

INFORMATION BULLETIN

GELMAN SCIENCES, INC. SITE Scio Township, Washtenaw County March 2004

INTRODUCTION

The Department of Environmental Quality (DEQ) has prepared this update to keep community members informed of events surrounding the Gelman Sciences, Inc. (GSI), site of environmental contamination in Scio Township, Washtenaw County. General background information is also included for those who are not familiar with the project.

While restructuring of the DEQ in September 2002 resulted in the consolidation and renaming of several DEQ divisions, staff responsibilities for the GSI site remain essentially unchanged. The Remediation and Redevelopment Division (RRD) is responsible for oversight of the cleanup of the groundwater contamination. The Water Division (WD) regulates all surface water, groundwater and drinking water issues related to the site, in coordination with the RRD. A list of DEQ information contacts is provided at the end of this bulletin.

In February 1997, the Pall Corporation acquired GSI and the company was known as Pall/Gelman Sciences, Inc. until 2001, when the company changed its name to Pall Life Sciences (PLS). For simplicity, this bulletin will refer to PLS regarding all past and current actions of the company. The name of the site, Gelman Sciences, Inc. (GSI), will continue to be used to refer to all areas that have been impacted by the contamination.

For the most recent information, refer to "What's New - Summary of Recent Response Actions" on the DEQ's Gelman Sciences, Inc. web page: www.michigan.gov/deq/0,1607,7-135-3311_4109_9846_9847-71595--,00.html.

GENERAL SITE HISTORY

The GSI site is located on Wagner Road just south of Jackson Road in Scio Township. 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 widespread groundwater contamination. 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. To date, approximately 124 private water supply wells have been connected to the municipal water supply system as a result of groundwater contamination.

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Beginning in 1986, investigations by PLS identified soil contamination on the PLS property and four areas of groundwater contamination extending off the property. Three major aquifers were identified and designated as the Unit C₃ (includes the Core Area), Unit D₀ (includes the Western System), and Unit D₂ (includes the Evergreen System) aquifers. In June of 2001 the deeper Unit E Aquifer was also discovered to be contaminated. The complex geology in the vicinity of the PLS property contributed to the widespread nature of the contamination. The general layout of the GSI site (except the Units D₂ and E Aquifers) is shown in Figure 1. More detailed information is shown in Figure 2 and Figure 3 and under separate headings (see Pages 4-10).

PUBLIC HEALTH AND SAFETY

Remediation of the groundwater contamination is underway, as described in the following sections, and will continue until the cleanup is complete. Until that time, the DEQ will continue to monitor the data to ensure there are no exposures to contamination that would pose unacceptable risks to the public. PLS is required to clean up the contamination to the generic residential cleanup criteria, which is discussed in more detail under *What Is Dioxane*. The generic residential cleanup criteria are the most restrictive standards for site remediation, generally because it is assumed that there is the greatest opportunity for exposure to contamination in residential settings. When a facility is cleaned up to residential standards, it is considered safe for all uses.

Water Supply Monitoring: Thirty-four water supply wells that are still in use at the perimeter of the known contamination are being monitored quarterly by Washtenaw County staff, with oversight by the Water Division of the DEQ. This sampling shows ten of these water supply wells have levels of 1,4-dioxane from 2 to 42 ppb. Most of these wells are located in the Evergreen Subdivision and on Elizabeth Street; the remainder are near the Western System and immediately east of PLS on Wagner Road. If trends indicate that any of these water supply wells will eventually exceed the residential criterion of 85 ppb, PLS will be required to provide them with an alternate water supply.

WHAT IS 1,4-DIOXANE?

The compound of concern at the GSI site is 1,4-dioxane (C₄H₈O₂). It is an organic solvent that is most often used as a stabilizer in chlorinated solvents. In the case of PLS, pure 1,4-dioxane was used as a solvent for cellulose in the filter manufacturing process. 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. Toxicity testing has determined that high doses of 1,4-dioxane cause cancer in mice. It is presumed to be a human carcinogen through long-term exposure to low doses.

When the contamination was first discovered in late 1985, the generic residential cleanup criteria was 3 parts per billion (ppb) for groundwater and 60 ppb for soils. In June 1995, the state legislature amended Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451 (NREPA), resulting in an increase of the generic residential cleanup criteria to 77 ppb for groundwater and 1,500 ppb for soils. In June 2000, the MDEQ updated its risk based cleanup criteria, which resulted in the current generic residential cleanup criteria of 85 ppb for groundwater and 1,700 ppb for soils. The concentration in surface water considered safe for human contact and the environment is 2,800 ppb. However, if that surface water is used as a source of drinking water, the concentration considered safe is 34 ppb.

Common treatment systems are ineffective in removing 1,4-dioxane from water. Ultraviolet oxidation, which is currently being used at the GSI site, uses a combination of hydrogen peroxide (H₂O₂) and ultraviolet light to convert 1,4-dioxane to carbon dioxide and water.

PLS has tested a new treatment technology, using ozone and hydrogen peroxide, which we expect they will propose for use at future treatment locations, and to replace the existing treatment system. The DEQ has not yet approved the use of this new technology. One advantage of this treatment method would be that it eliminates the use of three hazardous chemicals required by the current treatment system.

The maximum concentration of 1,4-dioxane found in different areas of the site has changed over time, as

shown in Table 1.

**Table 1 - Concentrations of 1,4-Dioxane
Past and Recent**

| System | 1,4-dioxane (ppb) | Year | 1,4-dioxane (ppb) | Year | Applicable Standard |
|------------------|------------------------------|-------------|------------------------------|-------------|--------------------------------|
| Core | 212,000 | 1988 | 11,390 | 2003 | 85 ppb |
| Evergreen | 43 | 1990 | 3,031 | 2003 | 85 ppb |
| Western | 132 | 1986 | 175 | 2003 | 85 ppb |
| Marshy | 49,800 | 1994 | 14,300 | 2003 | 85 ppb |
| Soils | 2,400,000 | 1988 | 944,000 | 1998 | 1,700 ppb |

LEGAL ACTIONS

Legal actions between the state and PLS resulted in two separate Consent Judgments in October 1992 for cleanup actions and recovery of state response costs of \$1.1 million. In September 1996, the Consent Judgment for cleanup actions was amended to incorporate the cleanup criteria changes to Part 201 of the NREPA, and to establish new schedules where needed. In October 1999, the Consent Judgment was amended a second time to allow an additional discharge option (see Evergreen System). Because of the complexity of the site, the original Consent Judgment for cleanup actions divided the site into six separate systems (Core, Evergreen, Western, Marshy, Soils, Spray Irrigation Field) with specific requirements for each.

In February 2000, the Department of Attorney General (DAG) filed a motion in Washtenaw County Circuit Court (court) to enforce several provisions of the Consent Judgment with which PLS had not complied. A hearing on the motion was held in July 2000 regarding \$4.9 million in stipulated penalties through June 2000, and injunctive relief for additional response actions. During the hearing staff of PLS testified that they would have an additional treatment system added to their central treatment facility within ten weeks, after which accelerated extraction of contaminated groundwater would be initiated from the existing Evergreen extraction wells and the horizontal wells in the aquifer leading to the Evergreen subdivision area. PLS staff estimated that their plan for additional extraction would result in achieving the cleanup criteria within five years. On July 17, 2000, the court issued an Opinion and Remediation Enforcement Order (REO). The DEQ's request for penalties was taken under advisement. The court ordered PLS to perform most of the additional investigation requested by the DEQ. The court also ordered PLS to install the additional treatment equipment within 75 days and to submit a plan to the DEQ within 45 days to outline steps for achieving the cleanup criteria in all affected water supplies within five years.

The court continues to hold all penalties under advisement. Status conferences are being scheduled periodically, with the next one scheduled for 3:00 p.m. on September 8, 2004, at the Washtenaw County Circuit Court.

FIVE YEAR PLAN

The Five Year Plan (Plan), as revised to incorporate concerns raised by the DEQ, was adopted by the court in January 2001. The Plan covers the entire site (except the Unit E Aquifer) and generally replaces previously approved work plans for separate systems. The Plan allows PLS flexibility to adjust some components of the remediation systems, but requires minimum extraction rates at key locations until changes are approved by the DEQ. Monthly benchmarks, as required by the REO, have been incorporated into the Plan. These benchmarks require the removal of a specified number of pounds of 1,4-dioxane each month, and are revised annually. The most recent revision estimates that 6,787 pounds of 1,4-dioxane remain as of the end of May 2003. The Unit E Aquifer is not included in this estimate. The extraction and sampling data also indicates that 28,290 pounds of 1,4-dioxane have been removed from the Core and Evergreen Systems since August of 2000. The rate of mass removal decreases gradually over the life of the Plan as the concentration of 1,4-dioxane in the aquifers is reduced by cleanup actions.

PLS is submitting quarterly reports on the progress of the remedial actions. The DEQ is meeting quarterly with local officials and representatives of Scio Residents for Safe Water to receive their comments. The DEQ and PLS also meet regularly to discuss progress and determine what adjustments are needed.

CORE AREA SYSTEM (Unit C₃ Aquifer)

Location: The PLS property is situated over a portion of the Core Area. It is defined in the Consent Judgment as the area of the Unit C₃ aquifer with 1,4-dioxane in excess of 500 ppb (Figure 1). The Unit C₃ aquifer is connected to a deeper, channelized aquifer (Unit D₂), in which groundwater flows northeast to the Evergreen System. The Core Area is also the source of contamination in the Unit E aquifer.

Background: Following the discovery of groundwater contamination in late 1985, PLS utilized a single water supply well near the PLS property as an extraction well to remove over 15,000 pounds of 1,4-dioxane from the Core System over a seven year period (1987-1994). This untreated water was discharged into a deep injection well. This well was originally installed in 1981 for disposal of wastewater under a permit issued by the U.S. EPA. It was completed at a depth of nearly one mile after hydrogeological investigations verified there was no connection to the aquifers above the bedrock. In 1994, PLS decided not to renew the permit, as required for continued operation, due to the cost of upgrading and operating the well, and the well was sealed. From August 1994 until May 1997, there was no remediation of the Core Area, and contamination continued to migrate with the natural flow of the groundwater, away from PLS property.

The Consent Judgment required PLS to evaluate reinjection of treated groundwater back into the aquifer, but also gave PLS the option of a surface water discharge to the Honey Creek Tributary (HCT). While PLS generally pursued the surface water discharge option, the local community generally favored groundwater reinjection. The DEQ does not have the authority to require a particular method of cleanup, but must evaluate any work plan for effectiveness and ability to meet the requirements of the Consent Judgment and state environmental statutes.

In 1993 PLS proposed a work plan for surface water discharge that was approved by the RRD, but never implemented (see NPDES Permit Background). A second work plan was submitted by PLS in 1995 that accommodated local concerns and proposed groundwater reinjection, if feasible. This option was subsequently determined to be impractical by PLS, due to expected difficulties with reinjection and the inability to ensure that reinjection would not cause further movement of groundwater contamination.

System Status: In June 1997, the current work plan was implemented after approval by the RRD. The remediation involves extraction of groundwater followed by treatment and discharge to the HCT, as authorized under a DEQ-administered National Pollutant Discharge Elimination System (NPDES) permit. There were initially two extraction wells in the Core System aquifer, TW-1 and TW-2 (aka Dolph). Four additional extraction wells have been installed to reduce the migration of contamination into other areas, TW-3, TW-6, TW-10 and TW-14. As of December 2003, nearly 370 gallons per minute (gpm) of contaminated groundwater was being removed from these wells, and the concentration of 1,4-dioxane ranges from 250 to 9,030 ppb.

PLS's evaluation of the effectiveness of the cleanup in 1998 determined that the southern-most portion of the Core Area was not being captured. PLS has named this the Southwest Property Area (SWPA) and has elected to treat it separately. This area has been under investigation since 1999. Thirteen additional monitoring wells have been installed. The relatively fine-grained nature of the subsurface deposits in this area makes extraction and capture of the contamination more difficult.

At the request of the DEQ, PLS submitted a capture zone analysis (CZA) for the SWPA in October 2003. Although the CZA was inconclusive, the DEQ has determined that, based on other technical criteria, the current extraction from the SWPA and Core Area is adequate to contain the contamination in both areas. Three permanent and two seasonal extraction wells are extracting about 40 gpm of contaminated groundwater. In December 2003 the concentration of 1,4-dioxane in these wells ranged from 501 to 1,276 parts per billion (ppb).

Future: No changes are planned for the remediation of the Core System. Remediation of the entire Core Area will continue until the generic residential cleanup criterion is achieved. The effectiveness of the remedial actions will be determined by monitoring that is to continue for ten years after the criterion is achieved.

For the most recent information, refer to "What's New - Summary of Recent Response Actions" on the DEQ's Gelman Sciences, Inc. web page.

EVERGREEN SYSTEM (Unit D₂ Aquifer)

Location: The Evergreen System is defined in the Consent Judgment as being north of I-94, east of Rose Street and south of Dexter Road (Figure 1). This is a residential area where wells impacted with 1,4-dioxane were initially discovered in 1989. The plume of contamination has since migrated farther east, as explained below. This area of groundwater contamination is in the Unit D₂ aquifer, a channelized aquifer that originates in the Core Area (Figure 2).

Background: The Consent Judgment originally specified three options for discharge of treated groundwater: reinjection, surface water discharge to Allen Drain, or discharge to the city of Ann Arbor sanitary sewer. The work plan approved by the RRD was implemented in June 1993, when extraction of contaminated groundwater at the leading edge of the plume (on Evergreen Street) began. This water was piped to an adjacent treatment system and initially discharged to the sanitary sewer. In December 1993, reinjection into the deeper, clean Unit E aquifer began, with water treated to non-detectable limits (less than 1 ppb). There were some low-level exceedances (up to 4 ppb) of the limit until reinjection ended in November 1999.

By 1994, problems with reinjection became routine, as the reinjection well became plugged with minerals and bacteria. This resulted in frequent shutdowns of the extraction well (LB-1) on Evergreen Street while maintenance of the reinjection well (IW-1) was performed. In November 1996, monitoring determined that the plume of contamination had escaped the capture zone of the extraction well. The city of Ann Arbor then permitted PLS to again use its sanitary sewer, which allowed for continuous purging and discharge of treated groundwater.

PLS's work plan to capture the escaped plume proposed an additional extraction well (AE-1) on Allison Street and piping to connect the well to the treatment system. A new reinjection well was also proposed. Access to the right-of-way for installation of the wells and piping could not be resolved voluntarily between the city and PLS, and was eventually decided by court-ordered facilitation. An additional extraction well, LB-2, was also installed next to LB-1, in a shallower part of the aquifer where contamination is higher than at LB-1.

In July 1998, discharge to the sanitary sewer ceased, and use of the new reinjection well (IW-2) began. Operation of the system was continuous, with no recurrence of problems with the new reinjection well. However, due to the inability of the system to treat the increasing concentration of the influent to non-detectable limits, the volume of groundwater extracted was reduced. Data from wells downgradient of the original extraction well (LB-1) on Evergreen Street indicated that some contamination continued to migrate to the east during this period. The AE-1 extraction well appears to be preventing any further migration to the east. The highest concentration now measured is 2,729 ppb (Nov. 2003) at Pinewood Street, and is migrating towards the extraction wells.

Reinjection was not considered to be a dependable, long-term discharge option by PLS. Discharge to the city of Ann Arbor's Waste Water Treatment Plant or directly to Allen Drain did not appear to be viable alternatives. Therefore, PLS proposed a transmission pipeline from Evergreen back to the PLS property. This required an amendment of the Consent Judgment to allow for discharge to the Honey Creek Tributary (HCT). Additional access problems for use of the right-of-way had to be resolved in court for construction of the pipeline.

Amendment of the Consent Judgment, and the RRD's approval of an interim work plan, allowed PLS to transfer treated groundwater to the PLS property via the newly constructed pipeline for discharge to the HCT

pursuant to the limits of the NPDES permit in November 1999. This allowed the extraction rates to increase from 120 gpm to 145 gpm because the water did not have to be treated to non-detectable limits as required when they were reinjecting into the clean aquifer. In November 2000, after adding an additional treatment unit at its main property, PLS began transporting untreated groundwater from Evergreen through the pipeline. This allowed an increase in extraction to 200 gpm. In addition, two horizontal wells installed at the same time as the transmission pipeline, upgradient of the Evergreen subdivision, were put into operation. This helped to reduce the concentration of 1,4-dioxane in groundwater flowing toward the Evergreen subdivision. In 2001 PLS installed two additional extraction wells, TW-5 and TW-9, upgradient of the horizontal wells.

Prior to adoption of the Five-Year Plan, the DEQ required PLS to determine a minimum extraction rate from AE-1 to ensure that no groundwater contamination would get beyond that location, as had happened with LB-1. Based on an analysis done by PLS, the minimum rate was established at 35 gpm, and that rate was included as a requirement in the Five-Year Plan. PLS was not able to maintain this rate, apparently due to the decreasing water levels in the aquifer as a result of upgradient extraction. PLS did a more detailed analysis to show that 28 gpm was adequate to capture the contamination. The DEQ agreed with the analysis and that the minimum extraction rate could be reduced to 28 gpm. In an effort to ensure continual capture of the plume, PLS installed a second extraction well (AE-2) to the south. AE-2 was operated in the fall of 2001, but was taken off-line because the water it was intercepting was not contaminated and cleaning of the AE-1 extraction well screen allowed it to operate at or above the minimum extraction rate, with limited exceptions, until June 2003. Water levels have again fallen, resulting in a decrease in the extraction rate to 26 gpm. A new analysis by PLS indicates that 25 gpm is adequate, and is being reviewed by the DEQ. In January 2004, PLS adjusted the extraction rates and began extracting from AE-2 due to falling water levels and the inability to maintain previous extraction rates. The concentration of 1,4-dioxane in AE-1 was 11 ppb in January 2004.

Dupont Circle Area – In 1997 a residential well on Dupont Circle began showing low concentrations of 1,4-dioxane; and these levels continued to increase. This was unexpected because the well was believed to be screened in the deeper, uncontaminated Unit E aquifer. This residence was connected to the municipal water supply, at the expense of PLS, when levels exceeded the generic residential cleanup criteria in July 1999. Investigation by PLS indicates that this well is not in the Unit E aquifer, but is connected to the Unit D₂ aquifer. Additional monitoring wells were installed to define the extent of contamination. An aquifer test was performed that demonstrated that the contamination in this area would be captured by the existing Evergreen extraction wells.

System Status: As of December 2003, three extraction wells in the Evergreen subdivision and four upgradient extraction wells (including the two horizontal wells), closer to the source where contamination is higher, are removing about 540 gpm of contaminated groundwater. In December 2003, the concentration of 1,4-dioxane in these wells ranged from 94 to 2,266 ppb. The current extraction wells in the Evergreen System should prevent any further migration beyond the current extent of contamination.

Future: Remediation of the entire Evergreen System will continue until the generic residential cleanup criterion is achieved. The effectiveness of the remedial actions will be determined by monitoring that is to continue for ten years after the criterion is achieved.

For the most recent information, refer to “What’s New - Summary of Recent Response Actions” on the DEQ’s Gelman Sciences, Inc. web page.

WESTERN SYSTEM (Unit D₀ Aquifer)

Location: The Western System is defined in the Consent Judgment as any groundwater contamination northwest, west or southwest of the Core Area (Figure 2). The groundwater contamination in this area is part of the Unit D₀ aquifer, a relatively uniform, thick, sandy aquifer.

Background: Contamination in this area was discovered in 1986 and has remained relatively low (Table 1). It was previously believed that the Unit D₀ aquifer extended in a broad area from near the western edge of Third Sister Lake to Jackson Road near Myrtle Street. Our understanding of this area changed significantly with the installation of eight monitoring wells in 2000. These monitoring wells show that the geology

throughout this area varies considerably, and it now appears that contamination in the Unit D₀ aquifer exists as shown in Figure 2 (northwest of Little Lake), and is not directly connected to the contamination in the other aquifers. PLS has suggested that this contamination resulted from discharges of high levels of 1,4-dioxane into the Honey Creek Tributary in the years before the contamination was discovered. Only the extraction well northwest of Little Lake (A2 Cleaning Supply), exceeds the generic residential cleanup criterion of 85 ppb. The highest concentration ever detected in this well was 175 ppb in December 2003. Northwest of the plume are three artesian wells (Figure 1) where groundwater is venting to surface water. The concentration of 1,4-dioxane entering the Honey Creek Tributary at this location is in the range of 20-30 ppb.

System Status: In April 2002 PLS submitted a report and groundwater model that they believe demonstrates that the generic residential cleanup criterion will be achieved through natural processes by July 2005. The DEQ did not accept the conclusions of the report. In response to the DEQ's concerns, PLS installed an extraction well (A2 Cleaning Supply) near MW-53i, northwest of Little Lake, as a contingency. The concentration of 1,4-dioxane in MW-53i had slowly decreased to the 110 ppb range until the fall of 2002, when concentrations increased to the 150 ppb range. PLS then implemented its contingency plan of batch purging from the extraction well in February 2003. Concentrations in MW-53i have been decreasing since that time. The batch purging of about 30,000 gallons is now being done once per month, with the extracted groundwater being trucked to the PLS property for treatment.

Future: Due to the increasing concentration of 1,4-dioxane in the extraction well, PLS has agreed to submit a work plan for additional investigation by March 15, 2004. If the DEQ determines that the Western System will not reach the generic residential cleanup criterion by July 2005, additional remediation will be required. Once the generic residential cleanup criterion is achieved, monitoring will be required for ten years to verify that concentrations of 1,4-dioxane do not exceed the criterion.

For the most recent information, refer to "What's New - Summary of Recent Response Actions" on the DEQ's Gelman Sciences, Inc. web page.

UNIT E AQUIFER SYSTEM

Location: The Unit E aquifer is contaminated with 1,4-dioxane above the residential criterion in an area extending from Parkland Plaza to Worden Street, east of Veterans Park (Figure 3). 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.

Background: In the spring of 2001, during investigation of the Western System, it was discovered that there was no confining layer of clay separating the Unit D₂ aquifer 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, although one location of such a connection is near the western extent of contamination in the Unit D₂ and Unit E aquifers. Investigation to date has focused on defining the extent of contamination.

Since the contamination in the Unit E Aquifer was discovered in May 2001, 29 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 (MVSC). In March 2003 PLS proposed an interim response at the MVSC. Monitoring wells installed since that time determined that the width of the plume at that location was over 1,000 feet. After reviewing the data, PLS determined that the March 2003 proposal was not feasible due to the volume of water that would need to be extracted, treated and discharged.

In July 2003, Pall Life Sciences (PLS) drilled a test boring on the west side of the Maple Village Shopping Center (MVSC) as part of an effort to drill a test well for use as a potential extraction well. Sampling results obtained from the test boring determined that the highest concentration of 1,4-dioxane at that location was 282 parts per billion. Therefore, it was decided that the location of the test boring was not optimal for groundwater extraction. A new location for a test well was selected and has been installed (TW-16) near the intersection of Jackson and Maple Roads. PLS completed an aquifer performance test

of TW-16 in August 2003, and the results will be considered by the DEQ in its review of remedial options to be proposed by PLS.

In November 2003, PLS performed a series of tests to determine if *in situ* (in place) oxidation of groundwater with ozone and/or hydrogen peroxide is a feasible remedial option and determined the need to do additional testing. This has delayed the planned submittal date of a comprehensive Feasibility Study (FS) to examine options for addressing the entire Unit E Aquifer contamination. At the request of the DEQ, PLS submitted an interim FS in January to review remedial options considered to date. The DEQ will provide comments on the interim FS prior to submittal by PLS of a comprehensive FS that will also consider *in situ* remedial options.

System Status: Since May 2002, PLS has been operating two extraction wells (TW-11 and TW-12) in upgradient portions of the Unit E Aquifer on their property. As of December 2003, these extraction wells are removing about 150 gpm. The concentration of 1,4-dioxane in these wells ranges from 100 to 920 ppb.

Future: The DEQ has reviewed and approved, with conditions, PLS's *In Situ* Work Plan dated February 17, 2004. PLS expects to implement the work plan starting in March, and will evaluate the results for inclusion in the comprehensive FS, if applicable. The DEQ is also reviewing a Work Plan for the Installation of Two Extraction Wells on PLS property, dated February 24, 2004. These documents are available on the DEQ's Gelman Sciences Web Page.

At a status conference in Washtenaw County Circuit Court on February 25, 2004, the court ordered PLS to submit their comprehensive FS by June 1, 2004, and the DEQ to respond to the FS by September 1, 2004. The FS will examine options for addressing the entire Unit E Aquifer contamination, and will propose a preferred option.

The DEQ will establish a public comment period and date for a public meeting prior to responding to the comprehensive FS submittal. See the Public Comment/Meeting Schedule/Agenda on the DEQ's Gelman Sciences Web Page for schedule information as it becomes available.

For the most recent information, refer to "What's New - Summary of Recent Response Actions" on the DEQ's Gelman Sciences, Inc. web page.

MARSHY AREA SYSTEM

Location: The Marshy Area is a perched aquifer, north of Pond 2 (Figure 1), of approximately four acres that overlies the Core Area, on and adjacent to the northwest corner of the PLS property. It is too shallow for installation of water supply wells. An area of clay beneath the Marshy Area limits the movement of water to lower aquifers.

Background: The Marshy Area received run-off from a lagoon (Pond 2) into which wastewater was discharged until about 1973, when Pond 3 was constructed. Investigation and installation of a pilot test system as required by the Consent Judgment has been completed. Additional extraction wells were proposed as part of the final design, but did not yield enough water to be effective. Extraction from the original extraction well is continuing.

System Status: Contaminated groundwater in this area is being extracted at a rate of six gpm from one extraction well (PW-1). PLS is submitting annual reports to evaluate the status of the system and whether the Marshy System will continue to contribute to groundwater contamination in the Core Area after July 2005.

Future: Pursuant to the Consent Judgment, the system must be operated until all associated monitoring wells show concentrations of 1,4-dioxane less than 500 ppb. The effectiveness of the remedial action will be determined by monitoring that is to continue for five years after the criterion is achieved.

For the most recent information, refer to "What's New - Summary of Recent Response Actions" on the DEQ's Gelman Sciences, Inc. web page.

SOILS SYSTEM

This area is located in the immediate vicinity of the PLS building and was a source area for the groundwater contamination. The most highly contaminated soils were removed in 1979 and 1987. Additional investigation required by the Consent Judgment has been completed, and shows that the remaining contaminated soil is in a limited area below ground level. The RRD determined that direct cleanup of these soils is not necessary because as the 1,4-dioxane leaches into groundwater, it will be captured by the Core Area remediation. Further testing will be required prior to termination of the Core Area cleanup system to verify that the levels of 1,4-dioxane remaining in soil will not cause additional groundwater contamination.

SPRAY IRRIGATION FIELD SYSTEM

Fifteen acres of the PLS property was used for spray irrigation of process wastewater from 1976 to 1985. The Consent Judgment required investigation of soils in this area, which was completed in 1994. The highest concentration of 1,4-dioxane detected in soils at that time was 393 ppb. The amendments to the NREPA in 1995 (see *What Is 1,4-Dioxane*) changed the generic residential cleanup criterion for 1,4-dioxane in soils from 60 ppb to 1,500 ppb. The DEQ then determined that no remediation was required because the concentration of contamination now meets the current criterion.

NPDES PERMIT

Background: Any discharge of treated groundwater to surface water is regulated through the National Pollutant Discharge Elimination System (NPDES), as administered by the Water Division of the DEQ. The initial draft permit for cleanup of the Core Area had a limit of 60 ppb of 1,4-dioxane and a special condition to verify that no groundwater contamination (at that time any concentration above 3 ppb) would occur from the discharge. Several versions of work plans, to ensure protection of groundwater, were submitted to the RRD for review. The work plan approved in March 1994 was not implemented due to problems in obtaining access to install the required monitoring wells. When the generic residential cleanup criterion for groundwater changed in June 1995 (from 3 ppb to 77 ppb), the RRD informed PLS that the special condition was no longer required because the proposed discharge limit (60 ppb) was lower than the generic residential cleanup criterion for groundwater. Action on the permit by the Water Division then proceeded.

After public comment, the Water Division reduced the allowable limits for 1,4-dioxane. The NPDES permit was issued in May 1997 with a limit of 10 ppb as a monthly average, 30 ppb as a daily maximum with a maximum discharge volume of 300 gpm. PLS began treatment and discharge to the Honey Creek Tributary (HCT) in June 1997.

In November 1997, PLS contested the limits in the permit, and asked for the daily maximum to be increased to 100 ppb, with no monthly average. Local citizens then contested the permit, asking for the limit to be lowered to 3 ppb. The existing limits remained in effect during the contested case proceedings.

In September 1998, PLS requested an increase in the volume of the discharge from 300 gpm to 800 gpm to accommodate additional flow from the Evergreen System. In April 1999, after a public hearing, the DEQ modified the allowable discharge volume in the permit, as requested. Local citizens, the city of Ann Arbor, and Washtenaw County then contested the increased volume.

In September 1999, the contested cases relating to the volume and concentration of the discharge were combined and presented to an administrative law judge (ALJ). The Department of Attorney General represented the DEQ. PLS argued they could complete the cleanup more quickly with the higher rates, and that the current treatment requirements were too costly. The city, county, and the citizens argued that any increase in volume or concentration was a threat to the groundwater. The Water Division re-evaluated the limits in the permit and recommended that the monthly average remain at 10 ppb, the daily maximum be increased to 60 ppb, and the discharge volume remain at 800 gpm. Staff of the DEQ testified that movement of surface water to groundwater along Honey Creek is limited, and that a discharge to the HCT with a monthly average of 10 ppb is not a threat to groundwater.

The ALJ recommended that the monthly average be lowered to 5 ppb, with a daily maximum of 15 ppb and a maximum discharge volume of 800 gpm. The Director of the DEQ heard oral arguments on the case on June 5, 2000. On June 16, 2000, the Director issued his decision on the contested issues. The monthly average remained at 10 ppb, the daily maximum was increased to 60 ppb and the maximum volume of the discharge remained at 800 gpm. These limits were based on the best available technology economically achievable established by the best professional judgment of the Water Division, pursuant to the Federal Clean Water Act.

Current Status of Permit: In September 2001, PLS requested an increase in the volume of the discharge to 1,300 gpm. The reason for the increase was primarily to allow for remediation of newly discovered contamination in the Unit E Aquifer. The DEQ supported the increase to meet that objective. A public hearing was held in March 2002. The City of Ann Arbor and Scio Residents for Safe Water, among others, objected to the increase due to the potential for the increased volume to impact groundwater and surface water used for water supply, and to cause additional erosion in the HCT. In May 2002, the DEQ issued a modified permit authorizing the increased discharge volume. PLS then began increasing the volume of extraction and discharge.

In June 2002, the City of Ann Arbor and Scio Residents for Safe Water filed petitions contesting the Pall Life Sciences NPDES Permit No. MI0048453 (permit) and the increase in the authorized volume of the discharge. Washtenaw County subsequently filed a petition to join the contested case and is now a party to the case. PLS was temporarily required to decrease the maximum volume of the discharge back to the 800 gpm required by the previous permit. It was eventually decided that the contested case did not require a reversion to the earlier permit limit during the consideration of the contested case, and PLS resumed discharging up to 1,300 gpm in August 2002.

Preliminary hearings on the contested case have resulted in the scope of the contested case hearing being limited to the "increased use" and the effects of the increased use in PLS's modified permit. In August 2003, the parties initiated settlement negotiations in an attempt to resolve the remaining issues without a hearing. At the request of the parties, the ALJ for the case issued an Order that effectively adjourns the contested case hearing that had been scheduled for late September 2003.

On December 5, 2003, a Stipulated Order was entered, as agreed to by all parties to the Contested Case, dismissing all claims without prejudice. PLS agreed to limit the concentration of 1,4-dioxane in its daily maximum discharge to 30 parts per billion during the months of July, August, September and October. PLS also agreed to provide additional notices to the Petitioners.

The current NPDES permit will expire in October 2004. PLS is required to submit an application for a new NPDES permit by April 2004. During the DEQ's consideration of the conditions for the new permit, any affected parties will have the right to comment on the permit. After issuance of a new permit, any affected parties will then have the right to file a Contested Case.

Current Status of Discharge: Treated groundwater is currently being discharged to the HCT pursuant to the terms of the NPDES permit. The effluent from the treatment system must be sampled five times per week, prior to discharge. The monthly average cannot exceed 10 ppb, although the daily maximum allowed is 60 ppb of 1,4-dioxane (as modified by resolution of the contested case, as described above). The maximum volume of the discharge is 1,300 gpm. Approximately 1,200 gpm of treated groundwater from the Core, Evergreen and Marshy Areas and the Unit E Aquifer, is currently being discharged. There have been occasional exceedances of the daily maximum, ranging from 62 to 250 ppb. The monthly average of 10 ppb was exceeded in only one month; November 1999, 13.8 ppb. In 2003, the monthly average concentration of the discharge has ranged from 0 to 6 ppb. On July 8, 2003, 179 ppb was detected in the discharge due to malfunction of the hydrogen peroxide feed and a concurrent thunderstorm that interrupted communications that would have normally detected the problem. The discharge was stopped for part of the day until the problem was identified and corrected.

The modified permit also requires periodic chronic toxicity testing to determine if the treatment system effluent is toxic to aquatic invertebrates. One test in September 2002 indicated a low level of toxicity. The discharge was ceased for 11 days in October until the Water Division determined that the discharge could resume. Adjustments were made in the operation of the treatment system and no exceedances of the toxicity limit have occurred since that time.

INFORMATION CONTACTS

For the most recent information, refer to "What's New - Summary of Recent Response Actions" on the DEQ's Gelman Sciences, Inc. web page:

http://www.michigan.gov/deq/0,1607,7-135-3311_4109_9846_9847-71595--,00.html.

Questions or comments regarding specific program areas can be directed as follows:

General site issues;

Ms. Sybil Kolon, Project Coordinator
DEQ/RRD
301 East Louis Glick Highway
Jackson, MI 49201
517-780-7937 e-mail: kolons@michigan.gov

Health issues related to drinking water;

Ms. Lois Elliot-Graham, Environmental Sanitarian
DEQ/WD
P. O. Box 30035
Lansing, MI 48909
517-335-9175 e-mail: grahaml@michigan.gov

NPDES permit and surface water issues;

Ms. Deborah Snell
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301 East Louis Glick Highway
Jackson, MI 49201
517-780-7847 e-mail: snelld@michigan.gov

INFORMATION REPOSITORIES

A copy of all work plans, correspondence, and other submittals related to the cleanup are available for review at the Jackson District Office (by appointment) and at the following Ann Arbor area locations during their normal business hours:

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| Ann Arbor District Library Westgate Shopping Center 2503 Jackson Road 734-994-1674 | City of Ann Arbor Water Utilities Department 100 North Fifth Avenue Contact Mary Gordon 734-994-8286 |
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| Scio Township Hall 827 North Zeeb Road 734-665-2123 | Washtenaw County Department of Environment and Infrastructure 705 North Zeeb Road Contact Michael Gebhard 734-222-3800 ext. 23855 |
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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

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