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Gelman Sciences, Inc – Groundwater Issues

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United States Environmental Protection Agency - CERCLA/Superfund Background

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was enacted by Congress on December 11, 1980 to address the dangers of abandoned or uncontrolled toxic waste sites, which were not being properly managed by the States. This law created a tax on the chemical and petroleum industries and provided broad Federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment.

In 1986, Congress passes the Superfund Amendments and Reauthorization Act (SARA), which in part: strengthened CERCLA's enforcement provisions; and increased the focus on human-health problems posed by toxic waste sites.

In the President's Proposed 2020 Budget, there is \$1 billion in the Office of Superfund Budget, which is an increase of 14% from the final FY 2019 Budget.

There are two components to the Superfund Program: the side of the program which actually spends the "Superfund" on the clean-up of toxic waste sites where there is not a viable person who caused the contamination; and the side of the program which requires the viable polluters to remediate the site to CERCLA requirements – the Superfund Enforcement Program.

United States Environmental Protection Agency - CERCLA/Superfund Background

The Superfund Enforcement Program works with the US Department of Justice and USEPA - Office of Regional Counsel to compel the Potentially Responsible Parties (PRPs) who caused the pollution to enter into CERCLA Administrative Orders to perform the required work to USEPA requirements. The Superfund Enforcement Program's efforts to negotiate settlement agreements and issue orders for clean-up accounts for approximately 70 percent of all the remediation currently underway at USEPA Superfund Sites. Since 1980, the Superfund Enforcement Program has obtained over \$35.1 billion in Potentially Responsible Party/polluter commitments for remediation work.

If the PRP refuses to conduct the remediation, USEPA will expend the Superfund money on the clean-up. At the end of site remediation, USEPA will bring a CERCLA Cost Recovery action against the PRP in federal court to recover the spent Superfund money and the administrative costs incurred by USEPA and the US DOJ. As of 2018, USEPA has obtained over \$6.9 billion in cost recovery of past cleanup costs.

The Gelman Site has a viable PRP who can pay for the remediation to USEPA requirements under the Superfund Program. Gelman Sciences, Inc. was acquired by Pall Life Sciences, Inc. which is now a subsidiary of the Danaher Corporation. Danaher is a multi-billion dollar corporation. CERCLA holds current and past owners responsible for remediation of the site.

Property Value Impacts About a USEPA Superfund Site

The following entities researched the potential property value impacts due to a local contaminated site becoming a USEPA Superfund Site: Department of Economics – College of the Holy Cross; Department of Applied Economics and Management - Cornell University; Department of Economic - University of Oregon; University of Colorado; and Department of Economics - Massachusetts Institute of Technology. The main findings of these researchers was:

- “Price appreciation from remediation is strongest for the worst sites. This runs counter to the hypothesis that the worst sites suffer from stigma which prevents remediation from having any positive effect on price.”
- “The assumption that all Superfund sites negatively impact property values is not correct. Some sites have the expected negative impact, while other sites have either no impact or a positive impact on the local property values.”
- “If consumers value the clean-up, then the hedonic model predicts that it will lead to increases in local housing prices.”

A study by researchers at Duke and Pittsburgh Universities found that once a site has all remedies in place, nearby property values reflect a significant increase as compared to their values prior to the site being proposed for the National Priorities List.

On balance, they found that having a professional USEPA clean-up will increase property values over the long-term and over the short-term halt potential additional decreases in property values.

The following Michigan municipalities have a USEPA Superfund Site, which has not caused the community to bear a negative image: Charlevoix; Sault Ste. Marie; Grand Ledge; Petoskey; Torch Lake; Au Sable Township; Grand Traverse; and Rochester Hills.

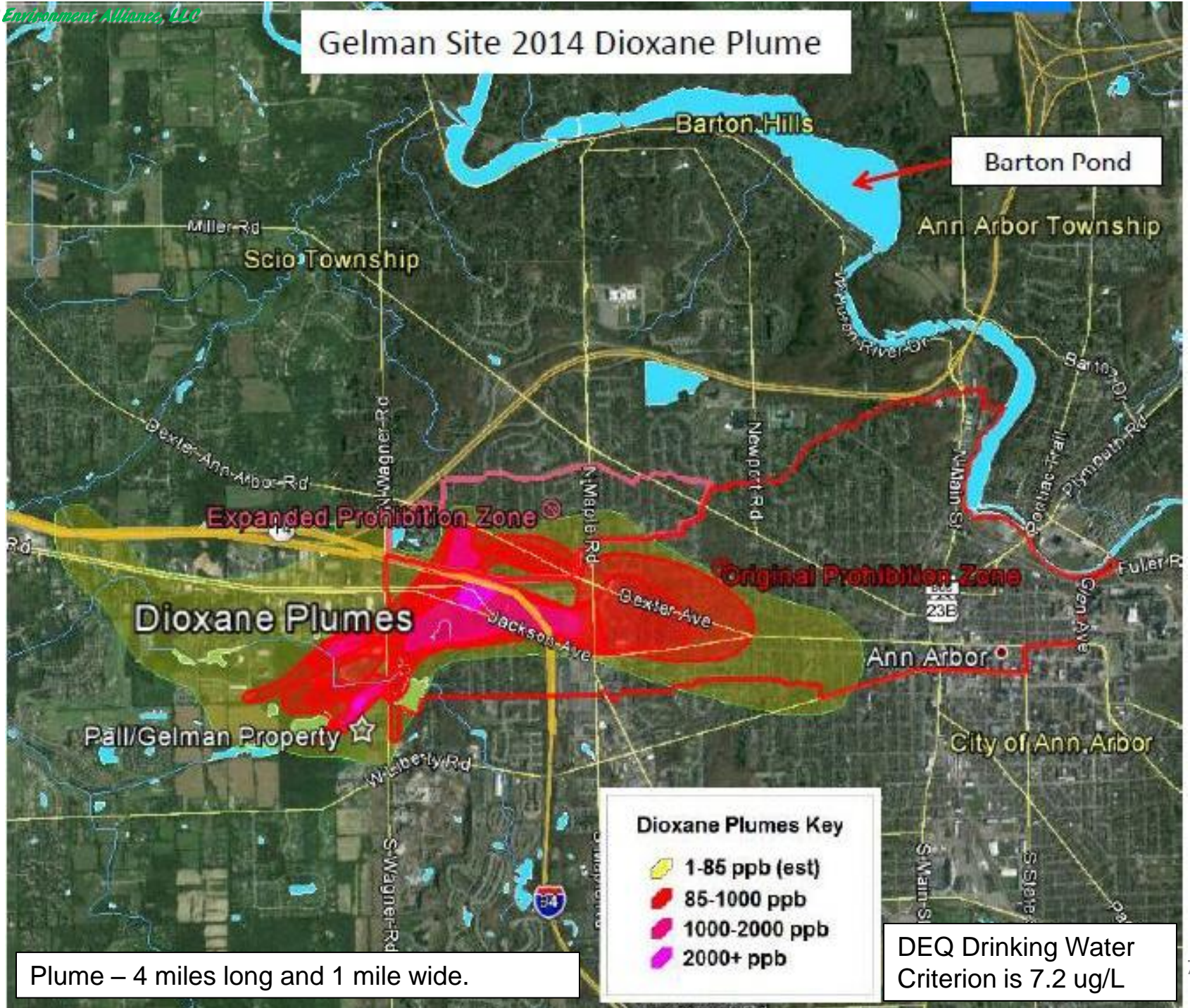
Gelman Site Background

The Gelman Sciences, Inc. Site (Gelman Site) has been a listed Michigan Contaminated Site since 1988. Currently, the 1,4-dioxane (dioxane) plume is migrating in northern, western, eastern and southern directions with no effective off-site hydraulic control. The dioxane plume is moving towards Scio Township residential wells, Ann Arbor Charter Township residential wells, the City Old West Side, the City West Park, and Barton Pond, see the following slides. The U.S. Environmental Protection Agency has deemed dioxane to be a probable human carcinogen.

A large portion of the off-site plume dioxane concentration is very high (e.g., greater than 1,000 ug/L). U.S. Environmental Protection Agency (USEPA) dioxane drinking water criterion is 3.5 ug/L at a 1 in 100,000 excess lifetime cancer risk level. The updated Michigan Department of Environmental Quality (DEQ) drinking water criterion is 7.2 ug/L dioxane at a 1 in 100,000 excess lifetime cancer risk level. The Virginia Department of Environmental Quality utility worker in a trench exposure criterion is 353 ug/L dioxane – Michigan DEQ has no such criterion protective of this pathway.

The original 1992 Court Judgment (CJ) between DEQ and Gelman objectives were to: 1) “remove, treat and dispose of contaminated groundwater”; and 2) “contain the plume and extract the contaminated groundwater from the aquifers”. In court actions since 1992, DEQ losses to Gelman resulted in a site remedy that is now “dilution/dispersion”– allowing the mixing of a pristine aquifer with the dioxane plume.

Gelman Site 2014 Dioxane Plume



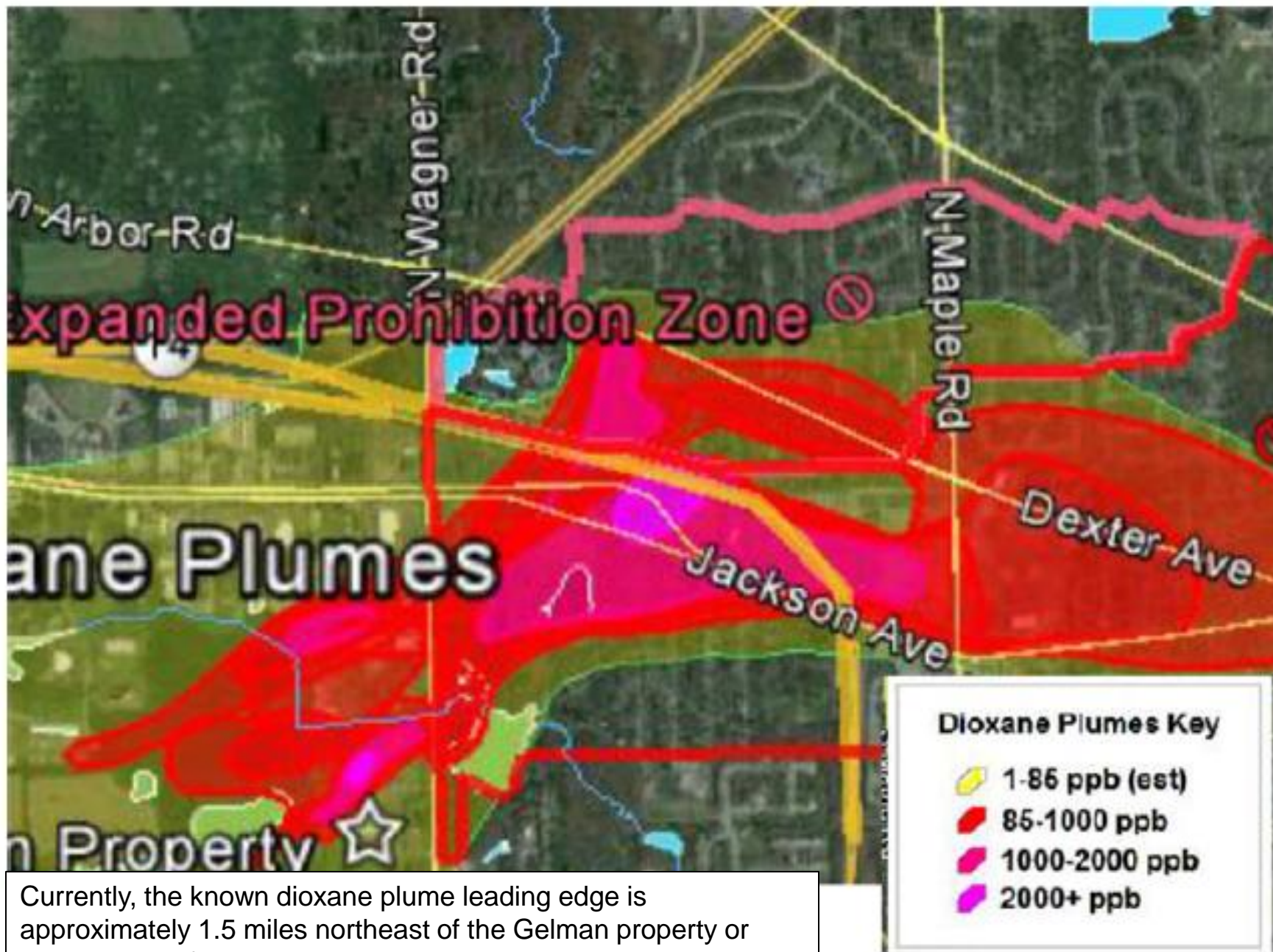
Plume – 4 miles long and 1 mile wide.

Dioxane Plumes Key

- 1-85 ppb (est)
- 85-1000 ppb
- 1000-2000 ppb
- 2000+ ppb

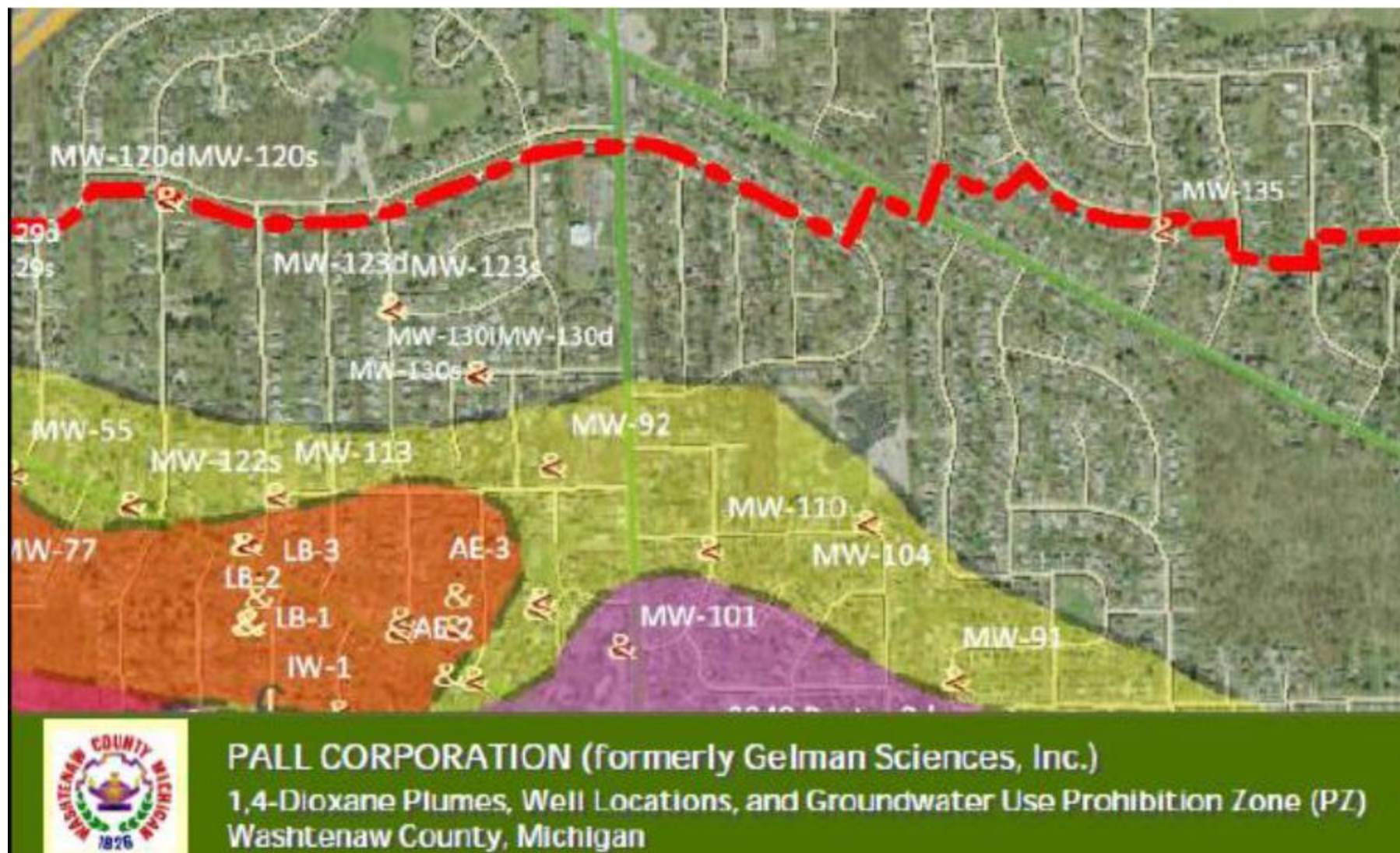
DEQ Drinking Water Criterion is 7.2 ug/L

Gelman Site Northern Plume Migration Element



Currently, the known dioxane plume leading edge is approximately 1.5 miles northeast of the Gelman property or about one-half way to Barton Pond.

Northern Boundary Monitoring Wells



The distance between Boundary Monitoring Well MW-120 cluster and MW-135 cluster along the northern EPZ boundary is approximately one mile. This distance is too large to detect and protect against the northern dioxane plume migration through glacial till channels.

Gelman Site Dioxane Plume Migration to Barton Pond



M-14

City WTP Intake

City WTP Impoundment

Dr. Lawrence Lemke, formerly with Wayne State University, indicated in 2016 that, if the dioxane plume made it past M-14 by the City WTP impoundment, it would likely follow the surface water drainage pattern and infiltrate into Barton Pond. This topographic drop is 150 feet. See figure blue lines of preferred flow. Currently, the known dioxane plume leading edge is approximately 0.65 miles from M-14 by the City WTP impoundment.

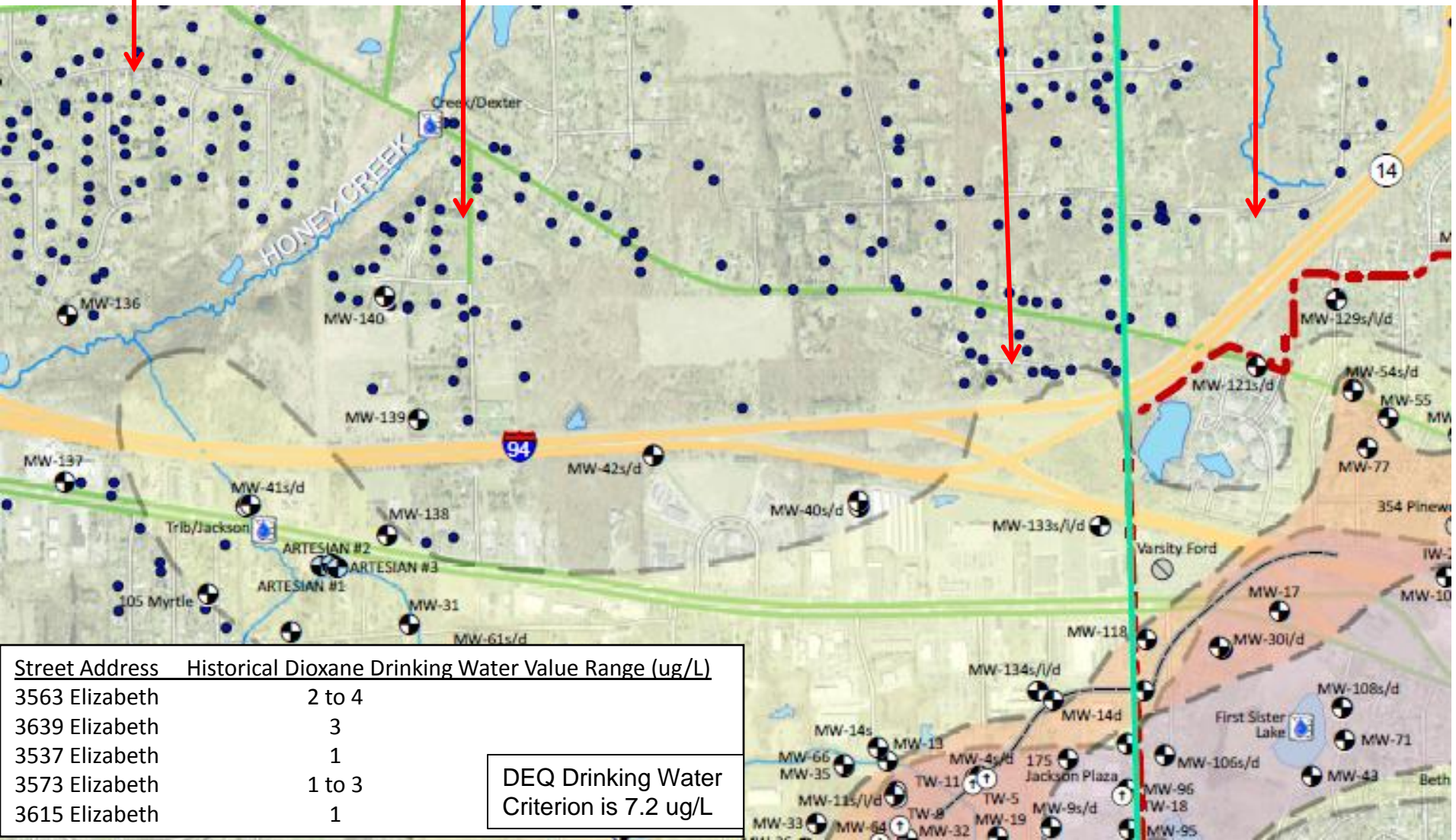
Gelman Site Dioxane Plume Migration to Scio Township Residential Wells

Hensley Road

West Delhi Road

Elizabeth Road

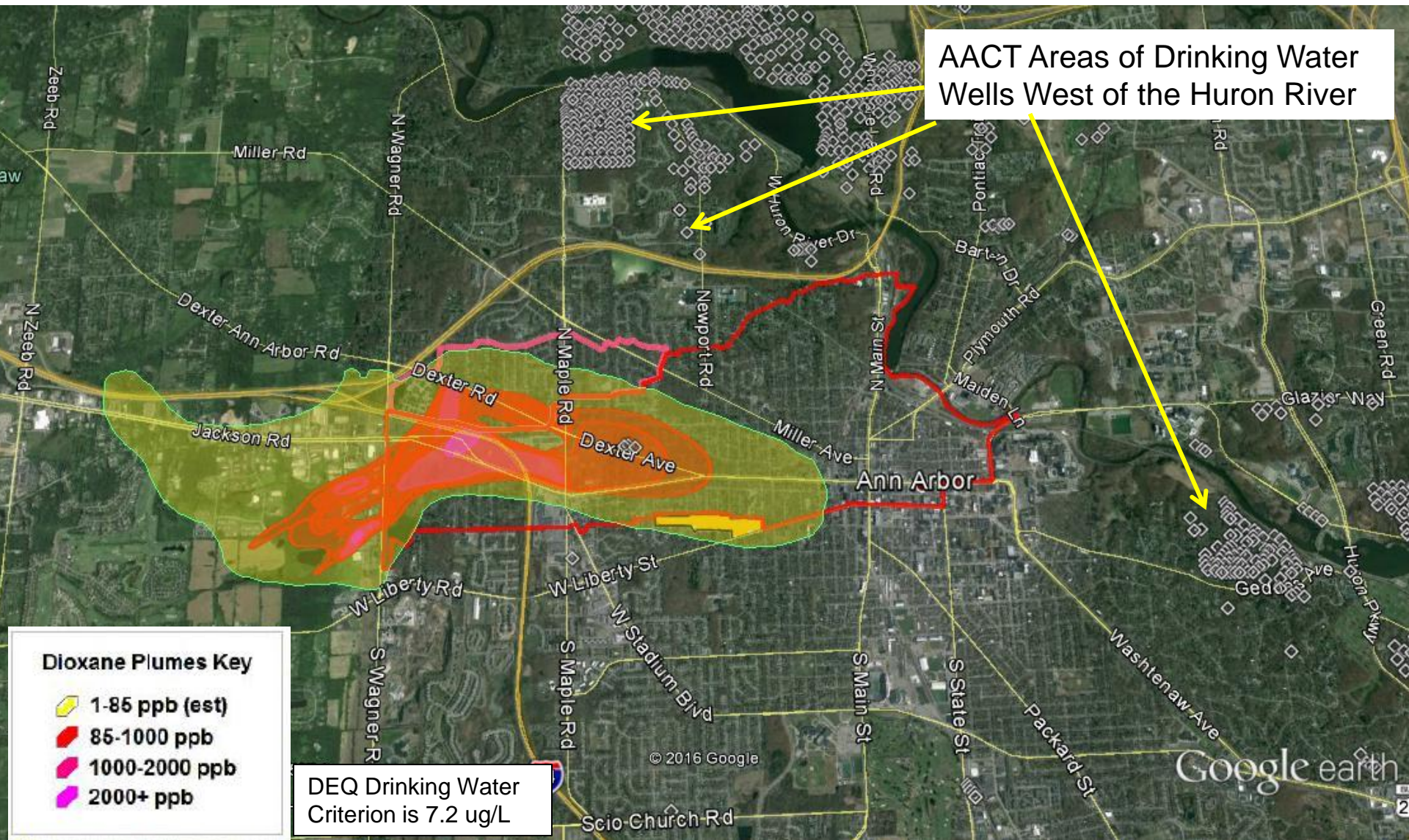
Rose Drive



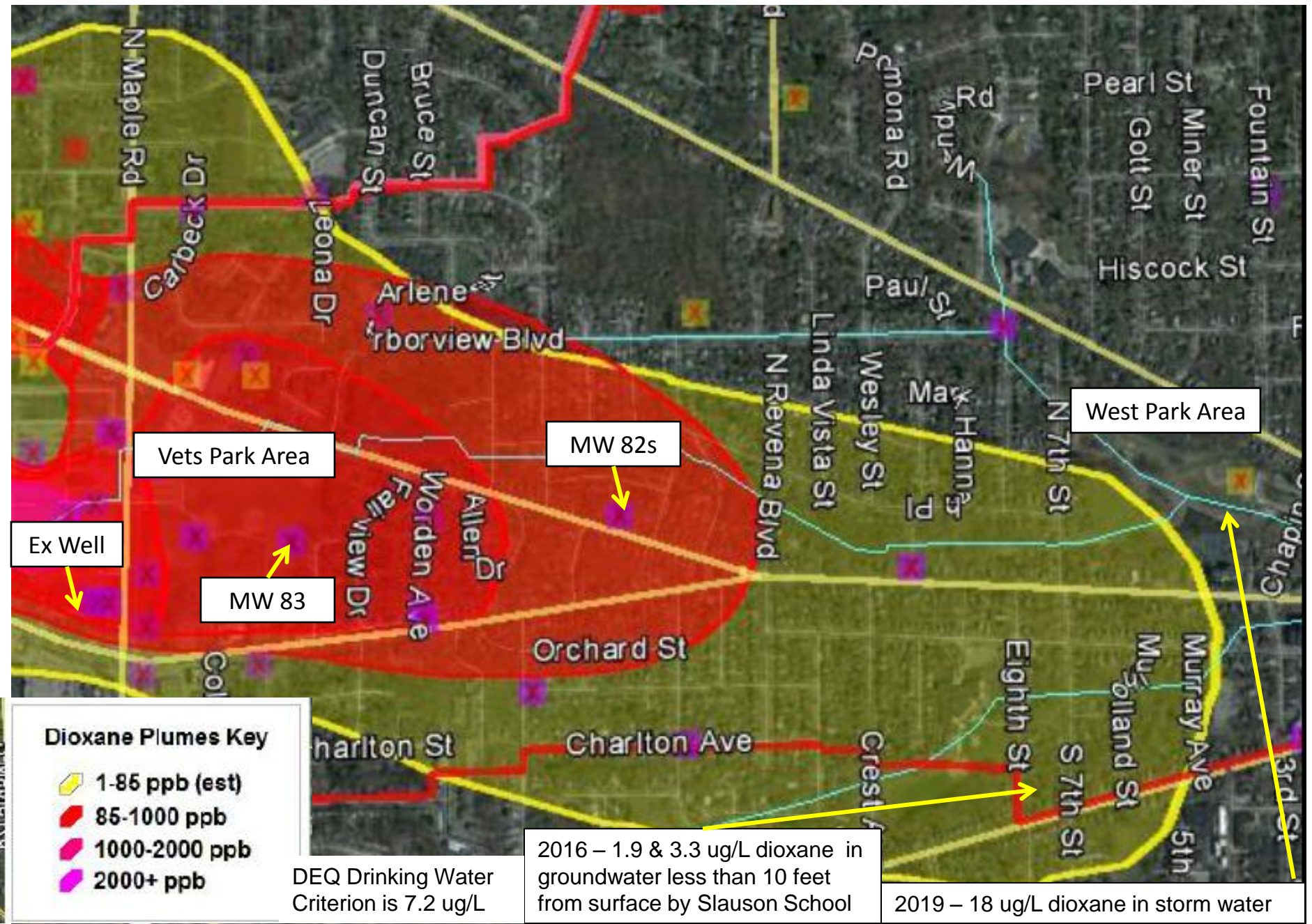
Street Address	Historical Dioxane Drinking Water Value Range (ug/L)
3563 Elizabeth	2 to 4
3639 Elizabeth	3
3537 Elizabeth	1
3573 Elizabeth	1 to 3
3615 Elizabeth	1

DEQ Drinking Water Criterion is 7.2 ug/L

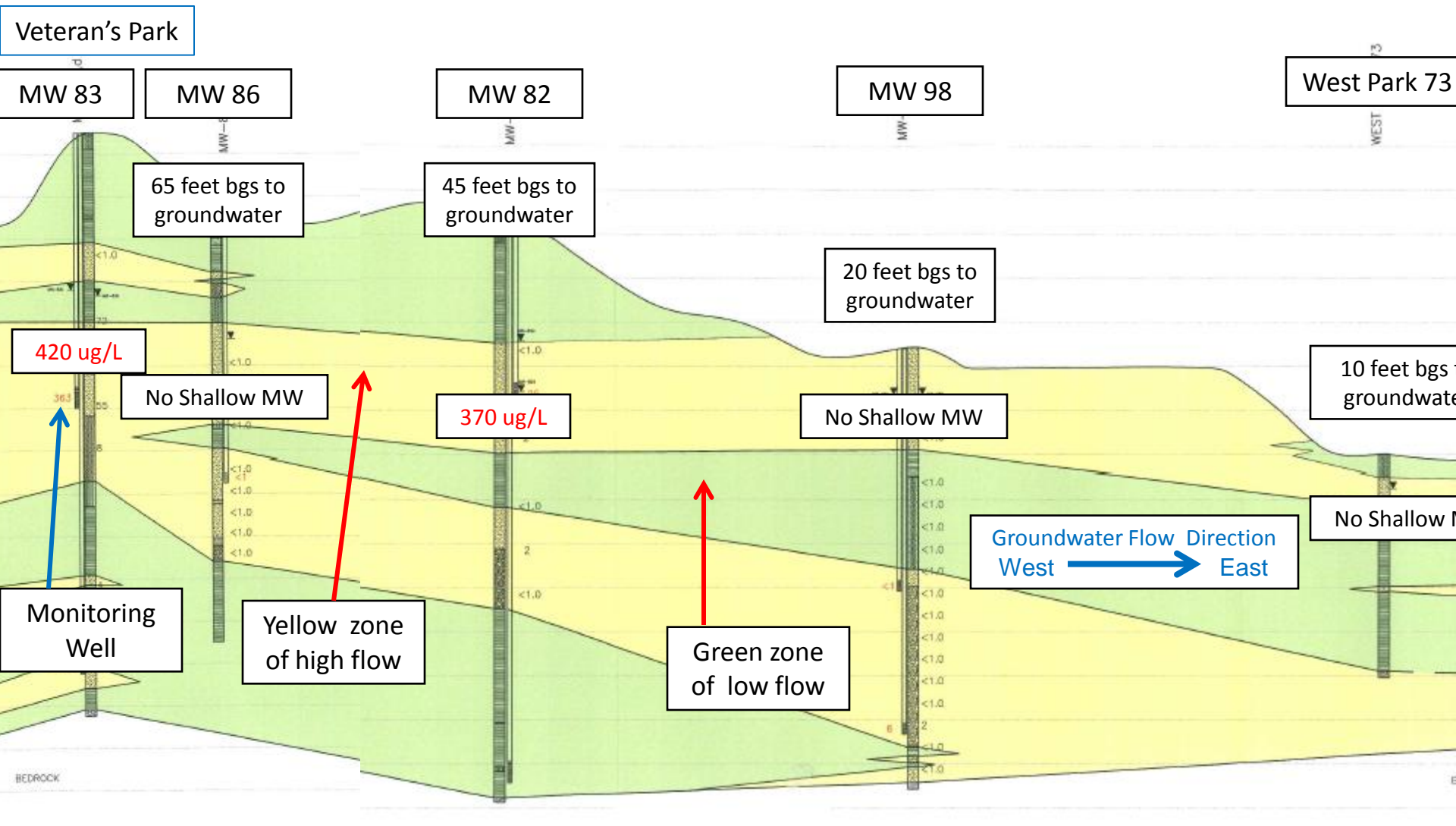
Gelman Site Dioxane Plume & Ann Arbor Charter Township Residential Well Areas



Gelman Site Dioxane Plume & City Old West Side and West Park Area



Gelman November 2007 Phase 2 Down-gradient Investigation Cross Section A-A' – Depth to Groundwater, Permeable Zones & Recent Dioxane Concentration



The dioxane plume is migrating in the shallow portion of the glacial till aquifer, see high concentrations in upper yellow colored zone. The approximate depth to groundwater decreases closer to the West Park 73 area. 14

Current Court Judgment Terms and Conditions

In court, DEQ has not been able to obtain CJ terms and conditions which are protective of public health, reasonable, or consistent with other remedial projects. For example, the CJ contains:

- Mainly a DEQ approved “dilution/dispersion” remedy off the Former Gelman Plant property. East of Wagner Road and extending into the City of Ann Arbor through the Prohibition Zone, the dioxane plume is migrating without impedance to Barton Pond and through residential neighborhoods where it is contaminating groundwater about utility lines and homes. This dioxane groundwater contamination presents a risk to: the municipal water supply; building occupants from dioxane vapor intrusion; and to workers in a trench who are in contact with the polluted groundwater. West of Wagner Road, the dioxane plume is moving freely towards Scio Township residential drinking water wells. There are a couple of Gelman groundwater extraction wells off-site, but they are not materially impacting the spread of the dioxane plume;
- Within the Prohibition Zone, the dioxane cleanup criterion is 2,800 ug/L, while the DEQ dioxane drinking water criterion is 7.2 ug/L and levels protective of utility workers in contact with the dioxane plume is approximately 353 ug/L. DEQ has no dioxane criterion protective of vapor intrusion;
- Unprotective and outdated DEQ Groundwater-Surface Water Interface (GSI) remedial criterion of 2,800 ug/L is being applied as a cleanup standard, while the updated 2018 DEQ GSI is 280 ug/L;
- Provision allowing Gelman to unilaterally expand the PZ in lieu of active remediation;
- No monitoring well system to properly delineate the extent and magnitude of the dioxane plume;
- No action protective of the Scio Township, Ann Arbor Charter Township or the City of Ann Arbor water supplies;
- No action protective of building vapor intrusion or utility workers in a trench; and
- No Gelman payment for residential well sampling.

With the Gelman Site becoming a USEPA Superfund Site, the current CJ will be replaced with a federal CERCLA Administrative Order.

Main Benefits of a Gelman USEPA Superfund Site

The main USEPA Superfund Site benefits were detailed by USEPA – Region V - Office Of Superfund in a July 25, 2016 meeting/call with the City, County and Townships representatives.

- Active restoration of the aquifer to a protective drinking water criterion, regardless of whether the plume is in a Prohibition Zone or not with Gelman paying the clean-up costs;
- As a first USEPA priority, extend the municipal drinking water supply to any resident who may be potentially adversely impacted by the dioxane contaminated groundwater at a Gelman cost;
- Halt the expansion of the dioxane plume and treat the source and outer margins of the dioxane plume with an active remedial technology like groundwater extraction and treatment;
- The active remedial action would prevent the potential dioxane contamination of Barton Pond, so no additional Contingency Plan would be required to protect Barton Pond.
- The USEPA will require that Gelman pay for residential well sampling and dioxane analysis at homes immediately down-gradient of the dioxane plume;
- The USEPA will require a monitoring well network which will establish the full extent and magnitude of the dioxane plume, including the Old West Side and West Park Area of the City;
- The USEPA offers Community Grants (e.g., \$50K) to support public input into the Superfund Site cleanup process; and
- The USEPA has the technical, administrative and legal resources to establish a protective Administrative Order and provide high quality oversight of Gelman in the clean-up with the backing of the US Department of Justice and USEPA Regional Counsel.

Interveners Progress on Amending the CJ

The City and County filed intervention petitions in December 2016. Together, all the Interveners have expended hundreds of internal Legal Staff and Technical Staff time and, as of March 2019, spent approximately \$800,000 on outside counsel and consultants to file motions and negotiate with Gelman and the DEQ to modify the CJ.

What occurred in 2017? City, County, Scio Township and Huron River Watershed Council approval by the Circuit Court as Interveners followed immediately by Gelman challenging the City, County and Scio Township intervention in the Appellate Court and then the Supreme Court. DEQ challenging the Huron River Watershed Council intervention in the Appellate Court and then the Supreme Court. Finally, they all obtained Intervener status by the courts in early 2018.

What have the Interveners received over 2018 and early 2019? A protracted negotiation to modify the unsound CJ terms and conditions. Likely, lengthy litigation in Circuit, Appellate and Supreme courts for any material change in the CJ.

DEQ has stated publically that the dilution/dispersion remedy is consistent with State environmental law, so the current remedy will not change in any negotiations or court actions.

Petitioners Progress on Attaining a Gelman USEPA Superfund Site

The Townships and Sierra Club filed a petition with USEPA to conduct a Preliminary Assessment to make the Gelman Site into a USEPA Superfund Site in November 2016. USEPA accepted the Petitioners request and completed the Preliminary Assessment (PA) in November 2017. The PA concluded that the Gelman Site does qualify for potential listing as a Superfund Site.

In a July 25, 2016 call with the City, County and Townships representatives, USEPA generically committed to a number of actions if the Gelman Site became a Superfund Site, including:

- Active restoration of the aquifer to a protective drinking water criterion;
- Extend the municipal drinking water supply to Scio and AAC Townships at a Gelman expense;
- Halt the expansion of the dioxane plume and treat the source and outer margins of the dioxane plume with an active remedial technology like groundwater extraction and treatment; and
- The active remedial action would prevent the potential dioxane contamination of Barton Pond, so no additional Contingency Plan would be required to protect Barton Pond.

These USEPA proactive actions will limit any future reductions in local property values.

Unfortunately, the USEPA has been persuaded to currently let the State of Michigan continue under the current State CJ mainly as the past Governor did not agree to make the Gelman Site into a federal Superfund Site.

USEPA reserves its enforcement rights and with an acceptance letter from the Governor can restart the Superfund designation process. There is no need to collect additional data.

Groundwater Issues Summary

The Gelman dioxane plume is migrating in northern, western, eastern and southern directions at significant levels with no effective off-site hydraulic control. The dioxane plume is moving towards Scio Township residential wells, Ann Arbor Charter Township residential wells, the Old West Side, West Park, and Barton Pond where the City obtains most of its water supply. Dioxane is a probable human carcinogen with a DEQ drinking water criterion of 7.2 ug/L.

High dioxane groundwater concentrations are moving into the lower topographic levels of the City about the Old West Side and West Park areas where the groundwater contamination is close to the ground surface and homes. There is no monitoring well network to detect or track the shallow groundwater pollution as it moves through the sensitive areas of the City.

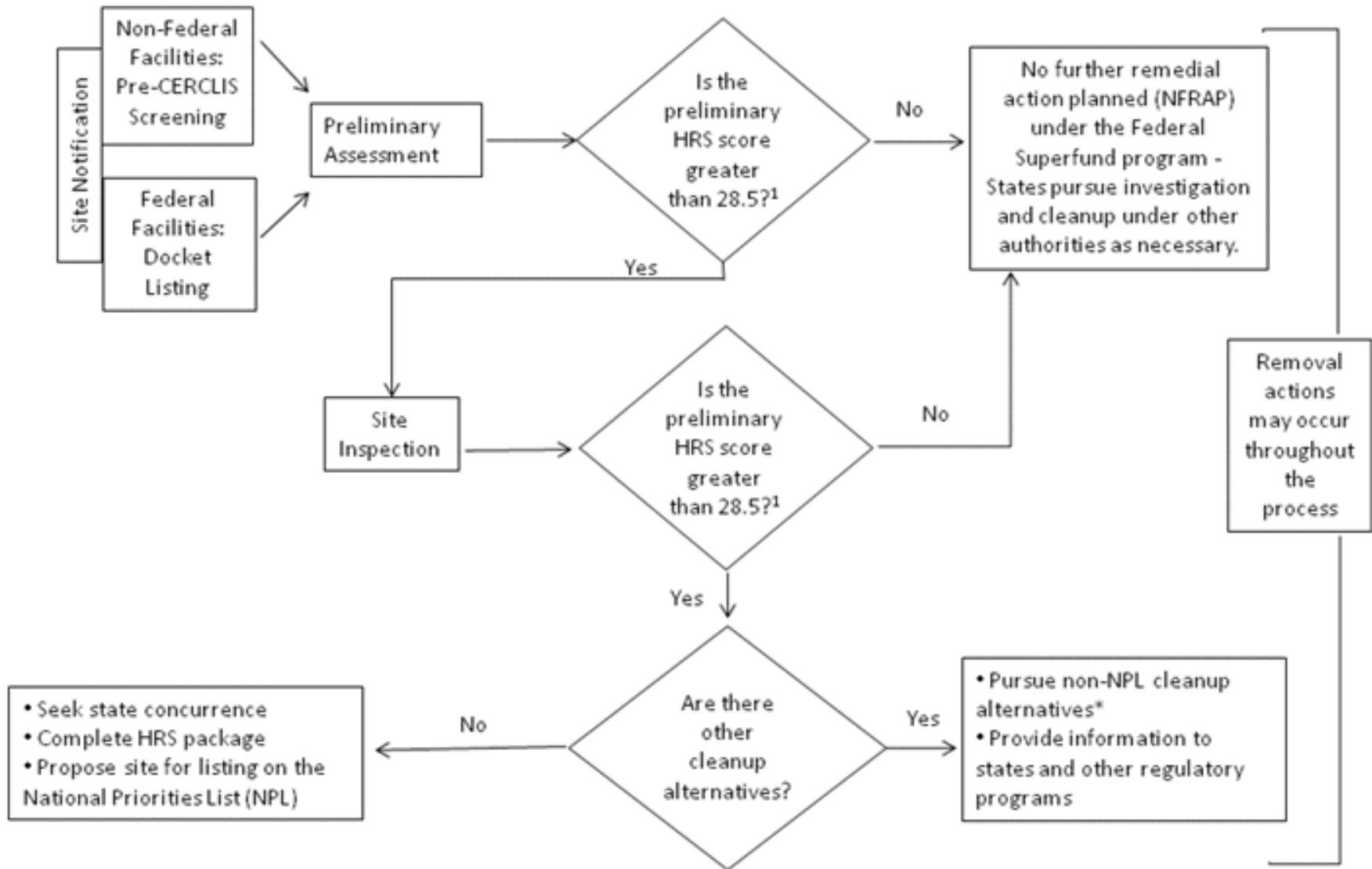
The dioxane groundwater contamination presents a risk to: the municipal water supply; homeowner private drinking water wells; building occupants from dioxane vapor intrusion; and to workers in a trench who are in contact with the polluted groundwater.

The current State regulatory framework in the CJ allows the dioxane plume to migrate freely through the City in a dilution/dispersion action.

The alternative Federal regulatory option is in the Superfund Enforcement Program which would issue an Administrative Order to Gelman compelling a halt in the plume movement and active remediation of the aquifer to drinking water quality. The federal Administrative Order would replace the state CJ.

The USEPA proactive actions will limit any reductions in local property values.

Superfund Site Assessment Flow Diagram



¹Preliminary HRS scores are further refined as sites progress through the process. Consequently, a preliminary HRS score greater than 28.5 does not mean that a site would ultimately qualify for the NPL.

* E.g., RCRA, state voluntary cleanup program.