1,4 Dioxane in Ann Arbor: October 27, 2016 Town Hall Meeting Questions & Answers

On October 27, 2016, City Council Member Chuck Warpehoski of Ann Arbor's 5th Ward organized a town hall meeting in Ann Arbor, Michigan, bringing together residents who are concerned about a plume of 1,4-dioxane and representatives from the Michigan Department of Environmental Quality (MDEQ) and the Michigan Department of Health and Human Services (MDHHS) to discuss the results of a study that had been recently completed by Gelman Services, Inc (Gelman) following a plan from the MDEQ to measure 1,4-dioxane in shallow groundwater and surface water in the plume area.

People had concerns about the risks of touching, breathing, and drinking the 1,4-dioxane. They also wondered what was being done to make sure people in the area were safe and continued to be safe.

After a few short presentations, people had the opportunity to ask questions via note card and Twitter. The questions on the following pages are from concerned citizens who attended that meeting or followed along via Twitter that night. The questions are mostly presented as they were written; however, a few were edited to provide context after the fact. We apologize for the delay in getting this information out, but the topics are complex, and the staff at MDEQ and MDHHS have been working to ensure the questions are answered as accurately and thoroughly as possible based on what is known at this time.

If, after reading the questions and answers on the following pages, you have additional questions, please feel free to contact any of the groups listed below, and they will do their best to get you answers.

Washtenaw County Public Health Environmental Health Division 734-222-3800	MDEQ Jackson District Office 517-780-7690	MDHHS Division of Environmental Health 1-800-648-6942

Terms As Used in These Documents

Surface Water & Seeps

Surface water and seeps make up the water that we can actually see - like ponds, lakes, streams and rivers.

Image courtesy of Environment Canada and USGS.

Groundwater

Groundwater is found deep underground. This is the layer of water that wells pull from for drinking water. This is also the area where the dioxane plume is moving under Ann Arbor.

Shallow Groundwater

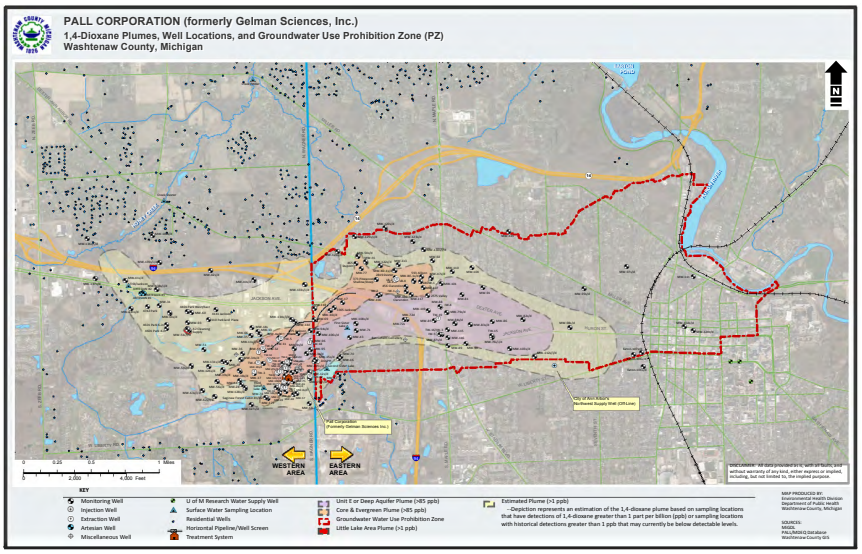
Shallow groundwater is water that is 20 feet or less below ground.

An Overview

What is the problem?

There is an area in Washtenaw County, which includes parts of Scio Township and western Ann Arbor, that has a plume of 1,4-dioxane (also known just as dioxane) underground. A plume happens when a chemical moves underground in water. In this case, the chemical dioxane is moving through groundwater in the Ann Arbor area. This is a concern because homes with wells use groundwater as their source of drinking water. This is why many homes have had to stop using wells and are now on city water. Homes that are still using wells, but are near the plume area, have their water tested on a regular basis to make sure that dioxane isn't getting into their water at harmful levels.

This plume is not a new problem. From 1966 until 1986, Gelman (now Pall Life Sciences) used dioxane in their manufacturing process. In 1985, dioxane was discovered in residential drinking water wells in the area.



Unfortunately, dioxane does not break down quickly in water. The plume still exists, even after all this time. The Michigan Department of Environmental Quality (MDEQ) and Washtenaw County Public Health have been tracking this plume for over 20 years and will continue to track it. Since it was discovered, environmental and public health officials have been working with people who live and work in the area of the plume to make sure they are informed about the situation and are aware of testing results.

This map shows the plume as it exists today.
To view this map in more detail, visit http://card.ewashtenaw.org.

What is dioxane?

Dioxane is a chemical that can be found in paint strippers, glues, pesticides, and many other things. It is also found in some makeup, lotions, detergents, bath products, shampoos, medicines, and foods and food additives.

Dioxane is not always added to these products on purpose, but it may show up in very small amounts in some of the things you use. Ingredients to look for include PEG, polyethylene, polyethylene glycol, and polyoxyethylene. Also, ingredients with the word or syllable "-eth," or "-oxynol" may contain dioxane. Based on current science, the amount of dioxane in these products is not likely to be harmful, even if you use them every day.

Dioxane is NOT Dioxin.

It is important to note that dioxane is **NOT** the same chemical as dioxin. Dioxin is a chemical that was found in Agent Orange and is created when chlorine chemicals are made or used. Dioxins are released into the environment when things that have chlorine in them - like paper or plastic - are burned. They're also found in the environment due to historical releases from factories or poorly contained waste sites. This is not a known chemical of concern in this area.

To view the MDEQ-designed study that led to this town hall meeting, please visit:

http://www.michigan.gov/documents/deq/deq-rrd-GS-GelmanShallowGWReport_538157_7.pdf

List of Questions

These questions were collected from concerned residents at the town hall meeting held in Ann Arbor and via Twitter during the livestreaming of the event on October 27, 2016. These questions have not been edited except to add context to the question after the fact. These questions have been generally grouped by topic.

Testing and Health

Surface Waters

Risks of Breathing in 1,4-Dioxane

Cancer Risks from 1,4-Dioxane

1,4-Dioxane in Ann Arbor: Shallow Groundwater Investigation

The MDEQ presented results that showed trace amounts of dioxane in the shallow groundwater near West Park. Are we sure this dioxane is from Gelman?

Currently, the MDEQ is not sure whether or not the dioxane found in shallow groundwater near West Park is definitely from the Gelman site. MDEQ is sure that the dioxane in deeper groundwater is from Gelman, though.

What are other possible sources of 1,4-dioxane?

Other places that dioxane could come from include factories that use certain types of chemicals. Dioxane is used as stabilizer for organic chemicals including 1,1,1-Tricloroethane (TCA), which can be used in glues and pesticides. Dioxane is also found as a by-product in many household cleaning products and cosmetic products that contain certain detergents, foaming agents, emulsifiers, and solvents. It won't be listed directly on the label, but it could still be mixed in with other chemicals.

Will the State ask the court to reopen the Consent Agreement to force stricter cleanup?

The MDEQ is working with Gelman (as the liable party) to amend the Consent Judgement to include the new cleanup criteria. In December 2016, the court allowed the City of Ann Arbor, Washtenaw County, the Huron River Watershed Council, and later, in February 2017, Scio Township, to join into the negotiations with Gelman to amend the Consent Judgement.

How was raising the exposure limit from 3 ppb to 77 ppb and then 85 ppb justified? Who raised it?

We are constantly learning and changing, and science is no different. As new discoveries are made, calculations and risk factors are updated.

In the 1990s, MDEQ's exposure limit of 3 ppb was based on a using a cancer risk of 1 in 1,000,000. This was the MDEQ assessment standard at the time. This number means that we'd see one extra case of cancer more than what was expected in a group of one million exposed people. This number did not include the amount of time over the life that a person was exposed, how long they were exposed each time they came into contact with the chemical, or how often they were exposed.

In 1995, the Legislature amended the environmental law in Michigan to use a 1 in 100,000 risk for cancer, which fell more in line with the nationwide standards. In fact, this is a generally accepted risk level used by most state and federal agencies – including the CDC and Michigan Department of Health and Human Services (MDHHS). The MDEQ eventually changed to the standard health risk calculations for cancer based on a risk of 1 in 100,000. A risk of 1 in 100,000 means that we'd see one extra case of cancer more than what was expected in a group of a hundred thousand exposed people.

When MDEQ changed the number to 77 ppb, it was because they used the then new cancer-based risk factor and started including the amount of time over the life that a person was exposed, how long they were exposed each time they came into contact with the chemical, or how often they were exposed.

Later, the MDEQ updated another part of the calculation - the cancer slope factor – and this resulted in the change from 77 ppb to 85 ppb.

How does the DEQ justify lowering the limit to 7.2 ppb instead of the EPA's 3.5 ppb?

- In order to assess risk on a population basis, scientists need to develop basic assumptions about age, exposure times, how people might be exposed, etc. in order to calculate what is safe on a general basis. The difference in amounts is due to the use of different assumptions and calculations for different reasons. To learn more about the assumptions used to develop these numbers, please read the ***Understanding Risk: What's Behind the Numbers: 1,4 Dioxane*** fact sheet at http://www.michigan.gov/documents/mdhhs/1-4_DIOXANE_RISK_VALUES_-_FINAL_534905_7.pdf.
- It's important to note, that as the screening levels and criteria get smaller, the margin of error for lab analysis stays the same. Because of variability in the lab analysis, differences between numbers that are very similar and small (such as 3.5, 4.6, and 7.2 ppb) may not be as certain as differences between larger numbers, like 85 ppb and 7.2 ppb, for example.
- The table below is adapted from the information in the fact sheet linked to above to provide a side-by-side comparison of the difference in assumptions and calculations:

3.5 ppb	**7.2 ppb**
EPA Drinking Water Concentration for 1 in 100,000 Risk Level (2012)	MDEQ Drinking Water Criterion (Adopted October 20, 2017)
Based on EPA Cancer Slope Factor (2013)	Based on EPA Cancer Slope Factor (2013)
Protective for adults	Protective for children and adults
Protective for 70 years, assumes continuous adult exposure	Protective for 32 years* of exposure, age-adjusted to account for child exposures (*average time a person lives in any given place)
Only considers drinking water ingestion pathway	Only considers drinking water ingestion pathway
Protects against potential cancer risk (1 in 100,000)	Protects against potential cancer risk (1 in 100,000)

Were there any proposed changes for the groundwater standards or only for drinking water?

The October 27, 2016 MDEQ Emergency Rule established a screening level for groundwater of 29 ppb 1,4-dioxane to make sure that it was protecting against issues with vapor intrusion – which is caused when a chemical that evaporates easily gets into the air of buildings.

However, although it's listed as a possible volatile organic compound or VOC, dioxane doesn't evaporate very easily out of water. Further investigation has shown the number could safely be much higher. In April 2017, MDEQ removed the Emergency Rule value of 29 ppb. Using the best-available science as a basis, MDEQ is proposing an update of the screening number to 1,900 ppb of dioxane in shallow groundwater, a value that will protect against vapor intrusion.

Updated Question: Why is the DEQ proposing a level of 1,900 ppb for shallow groundwater as a safe level to protect against vapor intrusion when last October, the Emergency Rule level was a much lower 29 ppb? How is that safe compared to the level before?

The Emergency Rule screening value for vapor intrusion was developed because of concerns voiced by local residents regarding standing water in their basements. The fear was that any dioxane in the shallow groundwater seeping into basements could maybe be evaporating into their home's air. This concern was the reason why the MDEQ requested that Gelman complete the ***Shallow Groundwater Investigation Study***. Dioxane was detected in two samples of shallow groundwater at concentrations ranging from approximately 1-3 parts per billion (ppb). At this time, it is not known if this dioxane is due to the Gelman plume.

In addition to the study, the MDEQ added dioxane very late in the State's criteria development process to quickly develop a number that would be protective of human health through breathing if the dioxane was found in shallow groundwater. Based on the information identified at the time, the MDEQ could only calculate a number for dioxane assuming that the entire floor (footprint) of the building had groundwater, therefore actually had contaminated groundwater inside people's basements with dioxane evaporating – not just as vapors seeping up from underground through the concrete and from cracks and unsealed sump pumps, as is typically happening in vapor intrusion cases.

However, beyond these values, the MDEQ had trouble finding strong data on the chemical and physical properties for dioxane to use in their equations. The numbers that they settled on – based on the limited data they could find and the effort to be very protective – resulted in a screening value of 29 ppb.

During the comment period for this ruling, an individual brought to the MDEQ's attention the US Environmental Protection Agency's (US EPA) Vapor Intrusion Screening Levels. The person noted that the difference in the US EPA's value and MDEQ's value was extremely large – more so than would be expected even considering that the US EPA's number was for deeper groundwater (29,000 ppb) and the MDEQ's was for shallow groundwater (originally 29 ppb).

This comment prompted the MDEQ to further review the data behind the US EPA's numbers. In those US EPA formulas, the MDEQ found the chemical and physical properties for dioxane that they were previously missing. MDEQ then plugged in those numbers into the formula for their shallow groundwater screening level – still taking into account sumps and cracks in basements but including dioxane volatilizing through concrete. The resulting number using the US EPA's data was 1,900 ppb, not 29 ppb as originally calculated.

In an effort to ensure the 7.2 ppb criterion for drinking water in the Emergency Rule was not held up by the lengthy process involved with the adoption of the entire draft Part 201 criteria package, 1,4-dioxane was selected to be processed through separate rulemaking procedure. The 1,900 ppb screening level for shallow groundwater will be included in the full Part 201 criteria package.

It's important to note that the separated rulemaking procedure, making 7.2 ppb the drinking water criterion, was completed on October 20, 2017. For more information about what this number means, see the ***Understanding Risk*** fact sheet linked in the question above.

The environmental persistence of 1,4 dioxane has not been discussed. Will the surface concentrations today go higher as the plume migrates? Will groundwater contamination spread with increasing migration?

Dioxane does not break down easily in groundwater. When dioxane is exposed to sunlight, it will break down somewhat faster. This is because the UV light from the sun causes the chemical to oxidize.

The MDEQ is trying to learn more about how the groundwater mixes with the surface water in the area. They have had surface waters tested in 2016 and will continue to test in 2017 and into the future to make sure that the levels of dioxane in the surface water are within the limits set by state law. No dioxane has been detected in the surface water during the 2016 and 2017 testing.

Community members are concerned because the plume is spreading. However, this isn't because of more chemicals being added to the plume, but because the same amount of chemicals are spreading out. This may be alarming to some, because the plume is covering a larger area. As it spreads out, though, the total levels of dioxane in the water will generally be diluted – meaning the levels of dioxane will go down. This is because a limited amount of dioxane is mixing with a lot more water over time. However, there may be some wells in the internal part of the plume that have higher levels of dioxane as the contamination migrates with the groundwater. Also, Gelman continues to pump and treat groundwater from areas with high concentrations of dioxane. And it's important to remember that based on a lot of monitoring of both residential drinking water wells and monitoring wells, the MDEQ is reasonably confident that people are not drinking water with dioxane above the enforceable criterion.

The level now may be low risk, but isn't the level likely to rise since they're not cleaning up the main source?

The release of dioxane happened a long time ago. Dioxane is no longer being used at the Gelman site. The same amount of chemicals that have been underground all along is just spreading out. Because dioxane likes to be in water more than in sandy soils under the Gelman site, some of the dioxane that is still underground at the plant site may still make its way from soil at the former plant into groundwater. This is yet another reason that long-term groundwater monitoring is necessary to assure that people remain safe.

The fact that the plume is spreading out and covering a larger area may seem alarming. As it spreads out, though, the total levels of dioxane in the water will generally be diluted – meaning the levels of dioxane will go down. This is because a limited amount of dioxane is mixing with a lot more water.

Gelman is also pumping and treating groundwater that is in the source area and other areas that have been found to have high concentrations of dioxane. When they put the water back into the environment, the dioxane levels are much lower and within limits of 7 ppb or less, which is safe for both humans and animals.

Also, since the higher levels of dioxane are found in the deep groundwater, the main way to be exposed is by pumping it up from a well. Tests do not show dioxane to be a problem in water above ground.

To the best of MDEQ's knowledge, all homes that had wells with levels of 1,4-dioxane above the 7.2 ppb criteria have been connected to city water. The MDEQ is monitoring many other wells to make sure they're

not being affected by the plume. You can check the Residential Drinking Water Monitoring Results here: http://www.michigan.gov/deq/0,4561,7-135-3311_4109_9846_30022-71616--,00.html.

If you still have a well, live in the area of the plume, and your well is not already being tested, but you are concerned that your water may be affected, call the Washtenaw County Public Health at (734) 222-3800. To find out if you live in the plume area, please check this map: http://www.ewashtenaw.org/government/departments/environmental_health/card/1-4-dioxane-plumes-and-well-locations-map-1

With new standard, will DEQ/state actively push for a better cleanup as residents and local officials are asking?

The state is working with Gelman (as the liable party) to amend the Consent Judgement to include the new cleanup criteria.

In December 2016 and February 2017, the court allowed the City of Ann Arbor, Washtenaw County, Scio Township, and the Huron River Watershed Council to join into the negotiations with Gelman to amend the Consent Judgement.

If Gelman plume is declared a superfund site, will the State and EPA share jurisdiction, or will one have primary lead?

As long as the Consent Judgement remains active, the State will make sure that the company continues to do what the Consent Judgement requires to clean up some dioxane, and make sure what remains does not pose unacceptable risks.

The MDEQ, MDHHS, and the EPA work together on many sites. How this collaboration will come together if Gelman becomes a Superfund site remains to be determined. However, no matter what, the MDEQ will continue to work on the site and make sure that the Consent Judgement is followed. A Superfund declaration would not make the Consent Judgement go away.

Please investigate biomedical remediation as a clean-up method.

Given the depth of the groundwater contamination and area of the plumes, use of bioremediation and other techniques would be difficult at this site. In 2004, a feasibility study about different ways to clean up the plume was done. To review this study, visit http://www.michigan.gov/deq/0,4561,7-135-3311_4109_9846_30022-72394--,00.html, under “PLS June 2004 Feasibility Study.”

1,4-Dioxane in Ann Arbor: Environmental Impact

Is there dioxane in Honey Creek?

As part of the process of getting the dioxane out of the ground, Gelman pumps up groundwater, and treats it to remove most of the dioxane. A discharge pipe near the southern end of April Drive adds the cleaner water back into a small unnamed tributary which flows into Honey Creek.

There are small amounts of dioxane still in the water put back into the Honey Creek tributary. However, the amount is limited by a National Pollutant Discharge Elimination System (NPDES) permit which allows for a monthly average of up to 7 µg/l (microgram per liter) which is the same as 7 parts per billion (ppb) of dioxane.

At these levels, the amount in the water will not be harmful to humans or animals.

To make sure Gelman does not go over the limit, the water coming from the pipe is tested 5 times each week. This is required by the permit. Each month, the dioxane levels have been between 4 to 5 ppb in the treated water. For example, in October 2016, the average was 4.5 ppb. In May 2017, the average was 4.2 ppb.

Gelman gives MDEQ the testing results every month and MDEQ posts them online. To see the results:

- Go to http://www.michigan.gov/deq/0,4561,7-135-3311_4109_9846_30022-72394--,00.html
- Look for **PLS 2017 NPDES Monthly** or **PLS 2016 NPDES Monthly** and click on any of the months below that header to see the data. At the bottom of the second column, you will find other years' records back to 2003.

If there is dioxane in Honey Creek, doesn't it flow to the Huron?

Yes, the water in Honey Creek does flow into the Huron River which flows into Barton Pond. The water intake on Barton Pond is approximately 8 miles away – following the creek and river – from the where the treated water is put into the tributary of Honey Creek. As long as the levels of dioxane stay below the amount that is allowed on average, it will not be harmful to humans or animals. In July 2017, the MDEQ sampled Honey Creek where it enters the Huron River. Dioxane was not detected.

The City of Ann Arbor's water is tested to make sure that dioxane is not getting into the drinking water supply. You can review the city's water report which is published each year through this link: http://www.a2gov.org/departments/water-treatment/Pages/default.aspx

For people who like to use the Huron River recreationally, including for fishing, it's important to note that dioxane does not build up in fish. The Michigan Department of Health and Human Services (MDHHS) does have Eat Safe Fish guidelines for the Huron River, but not because of dioxane.

In the stretch of the river downstream of Barton Pond, MDHHS has tested carp for chemicals. Although they aren't a very popular eating fish, carp are tested because they eat everything and are a good way to see what the worst case scenario might be. In that area of the river, PCBs are the chemical of concern, limiting consumption of carp to 2 servings a month. Further downstream, the chemicals of concern also include

mercury, in addition to PCBs. Even then, you can still eat up to 16 servings of bluegill a month from the river below Geddes Dam.

For more information on the MDHHS Eat Safe Fish guidelines in the Ann Arbor area, visit www.michigan.gov/eatsafefish or call 1-800-648-6942.

Given the new 7.2 ppb standard for drinking water, will remediation standards be updated so there is very little or no dioxane in the treated water that Gelman is releasing back into Honey Creek?

DEQ Water Resources is reviewing the requirements of the discharge identified in the current National Pollutant Discharge Elimination System (NPDES) permit with the change in the drinking water criteria.

The current NPDES permit allows for a monthly average of up to 7 µg/l which is the same as 7 ppb of dioxane. At these levels, the amount in the water will not be harmful to humans or animals.

To make sure Gelman does not go over the limit, the water coming from the pipe is tested 5 times each week. This is required by the permit. Each month, the dioxane levels have been between 4 to 5 ppb in the treated water. For example, in October 2016, the average was 4.5 ppb. In May 2017, the average was 4.2 ppb.

Gelman gives MDEQ the testing results every month and MDEQ posts them online. To see the results:

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- Look for **PLS 2017 NPDES Monthly** or **PLS 2016 NPDES Monthly** and click on any of the months below that header to see the data. At the bottom of the second column, you will find other years' records back to 2003.

1,4-Dioxane in Ann Arbor: Testing & Health

What is being done to ensure the public is safe? What are the plans for future shallow groundwater testing?

The MDEQ will make sure additional shallow groundwater testing is done - if and when data that is already being collected shows that there is a possible unacceptable risk from the shallow groundwater. In addition, using the best-available science as a basis, MDEQ is proposing an update of the screening number to 1,900 ppb of dioxane in shallow groundwater, a value that will protect against vapor intrusion.

Current data shows that shallow groundwater and surface water do not have dioxane levels that pose an unacceptable risk for dioxane exposure at all, meaning that levels of dioxane in those waters are not unsafe to touch or breathe in. You can view the full report at http://www.michigan.gov/documents/deq/deq-rrd-GS-GelmanShallowGWReport_538157_7.pdf.

Monitoring of the deeper groundwater for dioxane will continue as required by the Consent Judgement, and MDEQ will also periodically keep testing surface water locations, including areas where springs and seeps are known to be, and ponds and lakes.

Although some shallow groundwater samples showed low levels of dioxane, these were not levels of concern. In addition, the MDEQ is not sure that shallow groundwater contamination is from the Gelman site. MDEQ is looking for other sources of dioxane that may be adding the small amounts of the chemical to the area's shallow groundwater.

Why wasn't there testing of the lower elevation sections of West Park where water could be even closer to surface?

MDEQ had Gelman complete a shallow groundwater investigation in the fall of 2016. The investigation focused on areas where there were records of shallow groundwater and damp or wet basements in the likely path of the plume. If there were high levels of dioxane in the shallow groundwater in these areas that could mean that people could potentially be exposed if the groundwater got into their basements. Because the investigation was designed to quickly find out if there was a dioxane risk in shallow groundwater, the sampling was conducted using temporary wells in the right-of-ways of existing roads. This eliminated the need for lengthy permitting requirements. Utilities in the right-of way along Chaplin Street at the eastern and lower elevation of West Park made temporary well sampling in this area impossible. Also results of samples collected along the western entrance to West Park did not identify dioxane in the shallow groundwater.

Also in West Park, MDEQ sampled the West Park Pond, seep areas in West Park, and across the street to the west of the park. Dioxane was not detected at any of these surface water or seep locations.

More details about the areas that were sampled can be found in the "Shallow Groundwater Investigation Report (October 2016)" found here: http://www.michigan.gov/documents/deq/deq-rrd-GS-GelmanShallowGWReport_538157_7.pdf

Are there plans for permanent shallow groundwater wells?

A lot of data is already being collected around the Gelman plume area. The MDEQ will make sure additional shallow groundwater testing is done - if and when data that is already being collected ever shows that there is the potential for an unacceptable risk from levels of dioxane in shallow groundwater.

Are test wells put in to allow for retesting?

There are special wells called *monitoring wells* that can be permanently or temporarily put where the plume is known to be or could be moving. Monitoring wells are used to sample the groundwater elevations to help determine groundwater flow direction, and monitor the levels of dioxane in the water.

To see a map of the locations of all of the deep groundwater monitoring wells, visit http://www.michigan.gov/documents/deq/deq-rrd-GS-PLSMWBaseMapMay2015_491423_7.pdf.

Additional wells may be added in the future that will also test the shallow groundwater.

How often do you test the monitoring wells and who does the testing?

The monitoring wells at the Gelman site are tested monthly, quarterly, twice a year or once a year depending on their location.

Gelman conducts the sampling and testing of the approximately 250 monitoring wells following MDEQ approved sampling plans for the Little Lake Area, Western Area, and Eastern Area of the site. MDEQ samples selected wells with Gelman on a quarterly basis and submits the samples to the MDEQ Laboratory for analysis. To review the plans or see the MDEQ comment and approval letters, see the links below:

Eastern Area

- http://www.michigan.gov/documents/deq/deq-rrd-GS-DEQDec2011ApprovedEasternAreaMonitoringPlan_372311_7.pdf

Little Lake Area

- http://www.michigan.gov/documents/deq/deq-rrd-GS-LittleLakeAreaSystemMonitoring_351983_7.pdf

- http://www.michigan.gov/documents/deq/deq-rrd-GS-DEQJuly2011LLAMPResponse_359469_7.pdf

Western Area

- http://www.michigan.gov/documents/deq/deq-rrd-GS-PlsApril2011WesternAreaMonitoringPlan_351264_7.pdf

- http://www.michigan.gov/documents/deq/deq-rrd-GS-DEQMay2011WesternAreaMonitoringPlanResponse_354630_7.pdf

Who is monitoring the dioxane that was injected 1 mile underground at the Gelman site? Is this migrating up into drinking water?

The MDEQ is not currently aware of anyone monitoring the dioxane that was injected 1 mile underground. The water from that far down in the earth is not drinkable for reasons other than just dioxane. It is not a risk for public health based on a technical evaluation done by the MDEQ. They are and will continue to test and monitor wells that use groundwater for drinking.

Was the injection of dioxane into the ground permitted by EPA??

Yes.

The MDEQ mentioned testing on wells in Scio for the past 7 years. What have been the results?

You can view the results of all of the monitoring wells installed in the area at the following links:

- http://www.ewashtenaw.org/government/departments/public_health/news/2016-news-items/1-4-dioxane-and-washtenaw-county-groundwater
- http://www.michigan.gov/deq/0,4561,7-135-3311_4109_9846-71595--,00.html
- http://www.michigan.gov/deq/0,4561,7-135-3311_4109_9846_30022-71616--,00.html

1,4-Dioxane in Ann Arbor: Surface Waters

Are there any risks to pets that swim/drink from the Sister Lakes?

Since dioxane has not been recently detected in the lake water, pets who play or drink in the water should be safe. The Sister Lakes are not monitored for bacterial water quality, however. One always needs to consider the risk of parasites or bacteria that may be living in the water that could be unsafe to drink or touch, for animals and humans alike.

A summary of recent activities including surface water sampling activities for dioxane can be found here: http://www.michigan.gov/documents/deq/deq-rrd-GS-GelmanSummaryOfRecentActivitiesAndResponseActions_578219_7.pdf

Regarding the response that you'd have to stand in a puddle for 30 minutes in order to approach levels of concern: But kids' shoes can remain soaking wet for hours. Are you testing the water or wet shoes or clothes?

Since the investigation conducted in 2016 showed no dioxane found in surface water at all, this is not a known risk.

Using equations from the EPA Regional Screening Levels, a person would have to soak in water that has more than 2,300 ppb in it for 30 minutes a day for a total of 350 days over the time period of 26 years (which includes exposure during childhood) in order for them to have an increased risk of health effects from dioxane exposure through the skin. Sampling data indicates that the highest concentration of dioxane found in deep groundwater on the east side of Wagner Rd was 2,500 ppb in Monitoring Well 100 in March 2015. As we make sure that surface waters in places like West Park and Water Works Park are monitored, we will know if any dioxane is detected and act accordingly.

Have the creeks and water bodies that are connected to the plume been tested for dioxane? Are these bodies of water, especially small tributaries, safe to play in?

In 2016 and 2017, some creeks and water bodies were tested for dioxane. So far dioxane has not been detected in surface waters that have been sampled. A summary of recent activities including surface water sampling activities can be found at the link provided below:

http://www.michigan.gov/documents/deq/deq-rrd-GS-GelmanSummaryOfRecentActivitiesAndResponseActions_578219_7.pdf

Where can I find the map of temporary wells and data?

All of the data and maps are available in the "Shallow Groundwater Investigation Report (October 2016)." The report can be found here:

http://www.michigan.gov/documents/deq/deq-rrd-GS-GelmanShallowGWReport_538157_7.pdf

Should community members be concerned about using Ann Arbor Parks in the plume area?

Since there has been no dioxane found in surface water at all, this is not a known risk.

Using equations from the EPA Regional Screening Levels, a person would have to soak in water that has more than 2,300 ppb in it for 30 minutes a day for a total of 350 days over the time period of 26 years (which includes exposure during childhood) in order for them to have an increased risk of health effects from dioxane exposure through the skin. Sampling data indicates that the highest concentration of dioxane found in deep groundwater on the east side of Wagner Rd was 2,500 ppb in Monitoring Well 100 at a depth of 223 feet in March 2015. As we make sure that surface waters in places like West Park and Water Works Park are monitored, we will know if any dioxane is detected and act accordingly.

In addition, although dioxane is considered a VOC (a volatile organic chemical – meaning, it evaporates into the air), dioxane also mixes very well with water. This requires very, very high levels of dioxane in the water - much higher than levels that we're seeing in the area's shallow groundwater and surface water – for it to make its way back out into the air. Using the best-available science as a basis, MDEQ is proposing an update of the screening number to 1,900 ppb of dioxane in shallow groundwater, a value that will protect against vapor intrusion.

Of note, the surface water data collected so far in this area shows values of non-detect for dioxane and shallow groundwater levels ranged between non-detect and 3 ppb, meaning dioxane vapors escaping into the air is not a concern in this area at this time.

For perspective, data shows that the highest concentration of dioxane ever found in this deep groundwater plume was from Monitoring Well-100 in March 2015 (which is on the east side of Wagner Rd) was 2,500 ppb. These surface water and shallow groundwater levels are much lower than what is found deeper underground. However, the MDEQ will make sure that surface waters in places like West Park and Water Works Park continue to be monitored, and if any dioxane is detected at levels of concern, they will act accordingly.

I live in the plume area. Is the water collected in my dehumidifier safe to touch?

Water in a dehumidifier is likely due to humidity caused by rain, runoff, and evaporating surface waters. Dioxane is not likely to be in this type of water.

Even if it were, it's unlikely that dioxane levels would reach any level of concern in the water vapor/humidity collected by the dehumidifier, so the water collected by the dehumidifier poses no risk.

1,4-Dioxane in Ann Arbor: Risks of Breathing in 1,4-Dioxane

My question is about VOCs at well #ROL-2: This looks like it's by Ann Arbor Open School (920 Miller Ave), but that hasn't been mentioned. I haven't heard it from school administration either. There's a vegetable garden there. Should they be worried?

Although dioxane is considered a VOC (a volatile organic chemical – meaning, it evaporates into the air), dioxane also mixes very well with water and does not tend to evaporate back out unless the levels are very high. In fact, the MDEQ is in the process of updating the screening number that protects against vapor intrusion to 1,900 ppb of dioxane in groundwater based on best-available science. The surface water data collected so far in this area shows values of non-detect for dioxane and shallow groundwater levels ranged between non-detect and 3 ppb. This means dioxane vapors escaping into the air is not a concern in this area at this time. Sampling data indicates that the highest concentration of dioxane found in deep groundwater on the east side of Wagner Rd was 2,500 ppb in Monitoring Well 100 in March 2015. This water is much deeper than any water that may come into contact with a building's basement or subfloor. MDEQ will continue to monitor surface water and shallow groundwater and act accordingly if there are levels of concern detected.

Because dioxane mixes well with water, it is also not left behind in plants, fish, or animals. Dioxane does not build up in predators or the things they eat.

Studies that looked at ways that dioxane could be cleaned up included using plants to draw up the dioxane. Although the plants may draw up the dioxane-contaminated water, the CDC Agency for Toxic Substances and Disease Registry (ATSDR) says that plants will not build up dioxane in their tissues. In addition, most plants in a garden or yard are drawing moisture from rain or very shallow groundwater. The amounts of dioxane in local shallow groundwater vary from Non-Detect to numbers that are below any level of concern.

In addition, there has been a lot of soil testing directly at the Gelman site. Based on a recent baseline environmental assessment, dioxane was not detected in the upper layers of the soil, and this is where the dioxane was actually dumped. Based on this, it is not expected to be found in surface layers of soil far away from the former Gelman plant on Wagner Rd. at levels that are a concern.

The primary risk of dioxane on or in any local produce comes not from the groundwater, but from products you may use in or around the garden. Some pesticides and herbicides can contain dioxane as a by-product of the chemicals used to produce it. Always use these products per the instructions and be sure to wash all garden produce very well before eating.

There appears to be detections near the spot where the Scio Township sewer connection problems are. Could that be source of VOCs?

Although dioxane is considered a VOC (a volatile organic chemical – meaning, it evaporates into the air), dioxane also mixes very well with water and does not tend to evaporate back out unless the levels are very high. In fact, the MDEQ is in the process of updating the screening number that protects against vapor intrusion to 1,900 ppb of dioxane in groundwater based on best-available science.

The MDEQ has not detected any dioxane levels of concern in this area's water, so the sewer problems will not be cause for alarm regarding breathing in dioxane.

The MDEQ cannot confirm the sources of the other VOCs detected during the shallow groundwater investigation.

Sewer gas itself is a problem, and its best to avoid breathing it. For more information on this topic, please contact the Scio Township Utilities Department at (734) 369-9350.

Did you actually do the vapor intrusion testing and what was the results?

Although dioxane is considered a VOC (a volatile organic chemical – meaning, it evaporates into the air), dioxane also mixes very well with water. This requires very, very high levels of dioxane in the water - much higher than levels that we're seeing in the area's shallow groundwater and surface water – for it to make its way back out into the air. For vapor intrusion to occur, you need two things: a highly volatile chemical and it needs to be present at high enough concentrations to create vapors that can make their way into indoor air.

Using the best-available science as a basis, MDEQ is proposing an update of the screening number to 1,900 ppb of dioxane in shallow groundwater, a value that will protect against vapor intrusion. In this investigation, dioxane was not detected in Ann Arbor shallow groundwater (the waters that could possibly come into contact with a building) at levels higher than about 3 ppb; therefore, vapor intrusion is currently not a concern for this area.

Does a radon mitigation system reduce dioxane vapor intrusion risk?

There is currently no concern of vapor intrusion from dioxane in this area. The investigation shows non-detects or very, very low levels of dioxane in shallow groundwater and surface water in the area – much lower than any level that would cause vapor intrusion issues. However, systems that operate similarly to radon mitigation systems are used to combat issues with vapor intrusion problems with other chemicals when it is needed.

It's important to note that Washtenaw County does have a high number of homes that are affected by radon. If you haven't had your home tested for radon, it's recommended you do so. To learn more about radon and the health risks in your area, please call Washtenaw County Public Health at (734) 222-3800.

What are the long term effects (years/decades) of breathing vapor with lower levels of dioxane (1-5 ppb)?

Based on the chemical properties of dioxane, unless it's being used in a very pure form (most likely as part of a person's job making products that contain dioxane or use dioxane in the process), it is unlikely people will ever be exposed to vapors from dioxane.

MDHHS reviewed the CDC ATSDR toxicological data for risks of breathing in dioxane. Because it is uncommon for people to be exposed to dioxane via the air, there isn't a lot of information on this topic – especially when it comes to low levels of exposure. However, no health effects from breathing low levels of dioxane were identified in the MDHHS analysis of the limited data available.

Information from the ATSDR Toxicological Profile for dioxane: ATSDR evaluated the limited number of studies on chronic inhalation of 1,4-dioxane in humans and animals. Two occupational studies were available. One, a study with 74 German workers, found no "ill effects" after exposure to concentrations ranging from 0.006 to 14.3 ppm (22 to 51,470 micrograms per cubic meter [$\mu g/m^3$]) for an average of 25 years (Thiess et al.

1976). The second study evaluated mortality rates in workers exposed to 0.1–17 ppm (360 to 61,190 µg/m^3) 1,4-dioxane for up to 21 years. Buffler et al. (1978) found no difference between observed and expected incidences of cancer.

To read the whole profile, please visit https://www.atsdr.cdc.gov/toxprofiles/TP.asp?id=955&tid=199.

If you have additional questions about this topic, please contact MDHHS at 1-800-648-6942.

How will plume & gasses effect students, teachers, & staff who spend much of their day in lower levels of Ann Arbor schools?

For vapor intrusion (or chemical gasses getting into a building) to happen, you need two things: a highly volatile chemical and it needs to actually come into contact with a basement or subslab of a building.

Although dioxane is considered a VOC (a volatile organic compound – meaning, it evaporates into the air), dioxane also mixes very well with water. This requires very, very high levels of dioxane in the water - much higher than levels that we're seeing in the area's shallow groundwater and surface water – for it to make its way back out into the air. Using the best-available science as a basis, MDEQ is proposing an update of the screening number to 1,900 ppb of dioxane in shallow groundwater, a value that will protect against vapor intrusion.

Of note, the surface water data collected so far in this area shows values of non-detect for dioxane and shallow groundwater levels ranged between non-detect and 3 ppb. This means dioxane vapors escaping into the air is not a concern in this area at this time.

For perspective, data shows that the highest concentration of dioxane ever found in deep groundwater was from Monitoring Well-100 in March 2015 (which is on the east side of Wagner Rd) was 2,500 ppb. These surface water and shallow groundwater levels are much lower than what is found deeper underground. However, the MDEQ will make sure that surface waters in these areas continue to be monitored, and if any dioxane is detected at levels of concern, they will act accordingly.

In addition, Ann Arbor Public Schools are on city water. The city water is safe to drink. It is routinely tested for dioxane to make sure it's safe. In fact, the water plant has the ability to identify dioxane at very low levels ensuring that people are not exposed.

To the best of the knowledge of the MDEQ, all homes that had wells with levels of 1,4-dioxane above the 7.2 ppb criteria have been connected to city water. The MDEQ is monitoring many other wells to make sure they're not being affected by the plume. You can check the Residential Drinking Water Monitoring Results here: http://www.michigan.gov/deq/0,4561,7-135-3311_4109_9846_30022-71616--,00.html.

If you still have a well, live in the area of the plume, and your well is not already being tested, but you are concerned that your water may be affected, call the Washtenaw County Public Health at (734) 222-3800. To find out if you live in the plume area, please check this map: http://www.ewashtenaw.org/government/departments/environmental_health/card/1-4-dioxane-plumes-and-well-locations-map-1

1,4 Dioxane in Ann Arbor: Cancer Risks from 1,4-Dioxane

Can dioxane cause autoimmune disease?

There is not enough existing information to answer that question. Unfortunately, there is very little information about dioxane's effect on human or animal immune systems in both the CDC Agency for Toxic Substances and Disease Registry's Toxicological Profile for 1,4-Dioxane and the EPA Toxicological Review of 1,4-Dioxane.

CDC ATSDR Toxicological Profile for 1,4-Dioxane

- https://www.atsdr.cdc.gov/toxprofiles/TP.asp?id=955&tid=199

U.S. EPA Toxicological Review of 1,4-Dioxane

- https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0326tr.pdf

What about combined exposures - vapor, H2O contact and consumption? Can this contribute to the development of cancer?

In general, yes, combined exposures to a chemical can contribute to development of health effects, including cancer, if the chemical is a carcinogen. In the case of the Gelman plume, it is unlikely that people will be exposed at all – from skin contact, breathing, and drinking – because the city water is not affected and people who are on wells near the plume area are having their water tested to make sure it's safe.

Using equations from the EPA Regional Screening Levels, a person would have to soak in water that has more than 2,300 ppb in it for 30 minutes a day for a total of 350 days over the time period of 26 years (which includes exposure during childhood) in order for them to have an increased risk of health effects from dioxane exposure through the skin.

In addition, although dioxane is considered a VOC (a volatile organic compound – meaning, it evaporates into the air), dioxane also mixes very well with water. Using the best-available science as a basis, MDEQ is proposing an update of the screening number to 1,900 ppb of dioxane in shallow groundwater, a value that will protect against vapor intrusion. Of note, the surface water data collected so far in this area shows values of non-detect for dioxane and shallow groundwater levels ranged between non-detect and 3 ppb, meaning dioxane vapors escaping into the air is not a concern in this area at this time.

The primary way people could be exposed to dioxane in this area is through their drinking water. However, the city water is safe to drink. It is routinely tested for dioxane to make sure it's safe. In fact, the water plant has the special ability to identify dioxane at very low levels ensuring that people are not exposed.

Anyone who is in the Prohibition Zone or had elevated levels of dioxane in their well has been moved to city water. The monitoring wells are also keeping track of where the plume is spreading and residential well monitoring is on-going to make sure anyone else currently living outside the plume is not unknowingly exposed to dioxane through their well water.

If you still have a well, live in the area of the plume, and your well is not already being tested, but you are concerned that your water may be affected, call the Washtenaw County Public Health at (734) 222-3800. To find out if you live in the plume area, please check this map: http://www.ewashtenaw.org/government/departments/environmental_health/card/1-4-dioxane-plumes-and-well-locations-map-1

Question 1: On the Old West Side, 5 kids have had leukemia -- an environmentally triggered cancer. Who is studying incidents of cancer? Question 2: If dioxane can cause cancer, has anyone studied the numbers of people with cancer in the area over the plume?

The MDHHS Vital Records office reviews rates of illness in the state. As of August 2017, this office is in process of doing a thorough review of cancer rates and other adverse health outcomes at the request of the community. A report will be made available when they're done – likely in early 2018. It will be given to the City and Washtenaw County Public Health Department to be shared with the community at that time.

To be certain, leukemia is a terrible disease, and it's awful that the children and their families are suffering because of it. However, leukemia is not one of the cancers linked to dioxane exposure. The most common cancers caused by dioxane exposure and identified in animal studies are in the liver.

In rats and mice treated with dioxane either orally or by inhalation, statistically significant increases in the number of tumors of the nasal cavity, liver, peritoneal, kidney, mammary gland, and Zymbal gland occurred.

- Source: U.S. EPA Toxicological Review of 1,4-Dioxane https://cfpub.epa.gov/ncea/iris/iris_documents/documents/toxreviews/0326tr.pdf

Is there any plan for human biomonitoring, and is anyone looking at the epidemiology of cancer near the plume? Also, what follow-up studies have been done for people who were exposed through drinking water?

Although levels of dioxane in drinking water currently do not pose unacceptable risks for human exposures, from 1966 until 1986, when dioxane was first discovered in wells, people could have possibly been exposed to dioxane from their well water. It is not possible to say who or what areas of Ann Arbor and surrounding communities would have been at risk during that time, as the extent of the plume was unknown. However, there is a high probability that people who lived within a close distance of Gelman and had well water at that time were exposed – but to what levels of dioxane and for how long is unknown.

Last summer, the MDEQ received notice that researchers at the University of Michigan were looking into potential grant funding to do research into dioxane health effects in the local population. Unfortunately, the MDEQ recently learned that the grant wasn't funded, and it's currently unknown if future sources of funding will be sought out. Doing these sorts of studies cost a lot money. In addition, the results won't necessarily tell you if you, personally, will have future health problems or if any existing health problems you may currently have were actually caused by that exposure.

MDHHS Vital Records is also looking at trends of health problems related to dioxane exposures using the data they have available.