THE RISKS TO THE GREATER COLUMBUS WATER SUPPLY FROM OIL & GAS PRODUCTION

An Educational White Paper for City Leaders and the General Public

Presented by the Columbus Community Rights Coalition

February 19, 2023

SALT WATER INJECTION WELL (SWIW) #51, MORROW COUNTY, OHIO

COMMUNITIES RELIANT ON COLUMBUS WATER

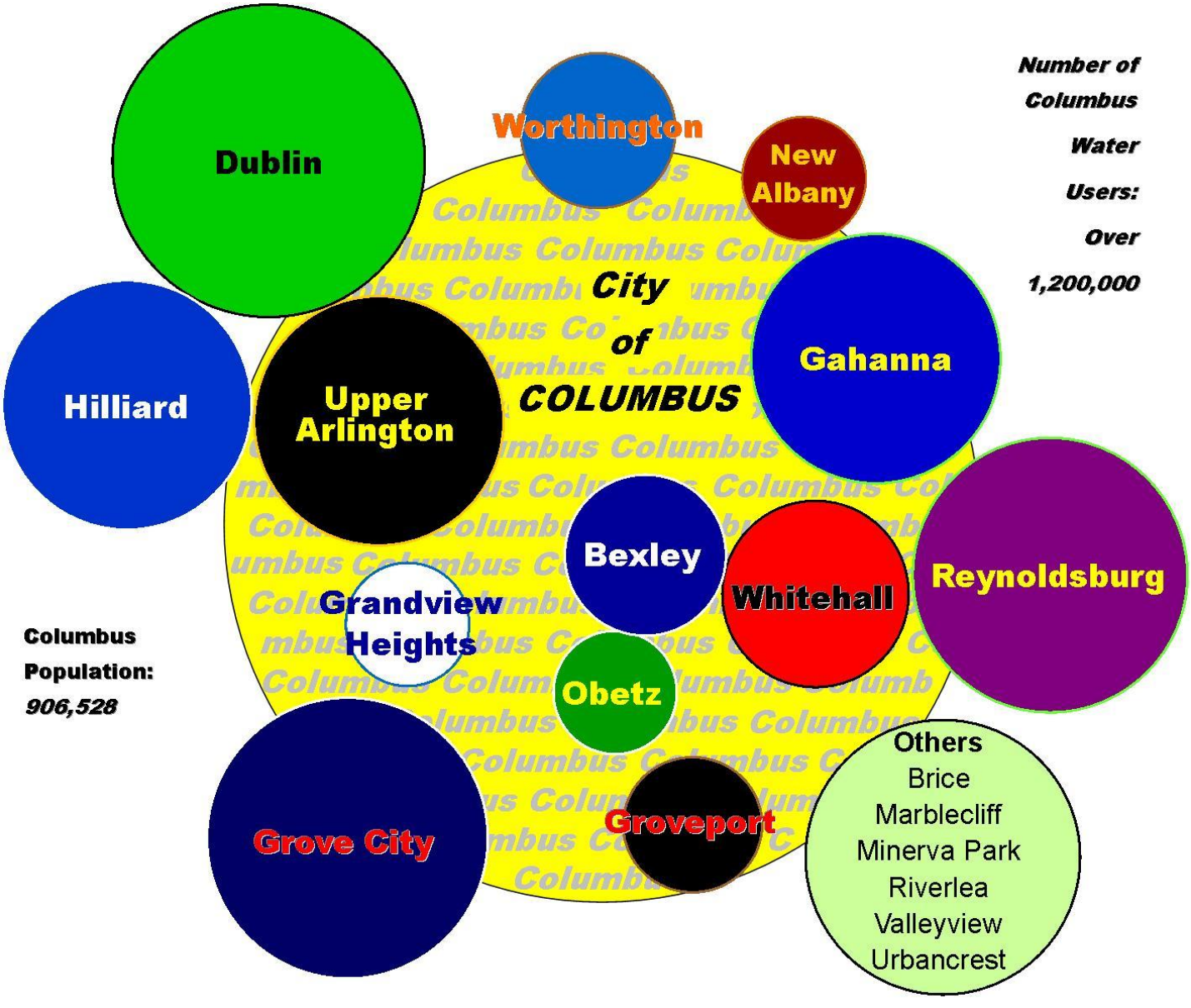

FIGURE 1: COMMUNITIES RELIANT ON COLUMBUS WATER

Design: Columbus Community Rights Coalition

Executive Summary

Chapter 1 The Columbus Community Bill of Rights (CCBOR) has met with the Department of Public Utilities, Division of Water, and City Council about protecting the City's water from oil & gas activities. Its educational arm, the Columbus Community Rights Coalition (CCRC), seeks to inform the public about the threats to Columbus water sources.

Chapter 2 Drinking water in the United States is managed on the federal level with additional inputs by the states. In Ohio, oversight for both the federal and state programs fall under the banner of the Ohio Environmental Protection Agency (OEPA). Groundwater and surface water related to drinking water are discussed.

Chapter 3 Primary, secondary, and emergency supplies of water for the City of Columbus are listed. Rivers, streams, wells, and reservoirs are the source water for Columbus and many communities in Central Ohio. The stakeholder groups and currently recognized specific threats to clean drinking water, along with management strategies, are presented.

Chapter 4 A short history of oil and gas production in Ohio and drinking water contamination, beginning in the 1860s, is presented. Gas and oil activities can cause unknown geological migration of hazards and affect the purity of water. Accidents cause unexpected and catastrophic assaults on the surface water.

Chapter 5 Ohio's responses to potential hazards from oil and gas production are uneven and complex. Legislation largely protects the oil & gas industry. Communities are unaware of potential and real threats.

Chapter 6 Attention is needed in the Columbus Source Water Protection Management Plan (SWPMP) pertaining to oil & gas activity. Investigation is needed to establish all the possible threats and to consider which stakeholders are the most knowledgeable about how to address these threats. Land uses, potential contamination sites, knowledgeable people, resolutions to threats, and continued monitoring need to be included in the SWPMP.

Chapter 7 On reviewing the Alum Creek and Hoover Reservoir/Alum and Big Walnut Creeks Management Plan, the authors found many questionable elements.

Chapter 8 This report indicates that the boundaries of the corridor and emergency management zones (CMZ and EMZ) for Columbus public water leading to the supply reservoirs leave the question as to whether they are broad enough to ensure the safety of our source water. Ohio rules that set boundaries to keep contamination threats at bay from source water seem very minimal. Oil & gas pipelines that are laid through tributaries and the EMZ for one of the Columbus water treatment plants do not seem to allow for a safe distance from our water if a pipeline breach were to occur. The oil & gas threat inventory for the Columbus Source Water Protection Master Plan (SWPMP) does not seem to take into account the Class II injection wells and oil & gas wells, both producing and abandoned, in the source water protection areas (SWPA) north of the reservoirs and mainly in Morrow County.

Chapter 9 What else is missing in the current Source Water Protection Plan?

1) A developed monitoring and water testing program for the current oil and gas production wells and Salt Water Injection Wells (SWIW) that are in or near CMZ or EMZ areas.

2) A current map with the number of active SWIWs within the Source Water Protection Area that have the potential to contaminate the water.

3) A record of historic accidental releases in the watershed, to include three recent cases documented in this paper.

4) A plan to determine the location of orphan wells of which there an estimated 150,000 or more in Ohio and seal them as soon as possible.

Chapter 10 Local zoning, resolutions and ordinances, and Ohio laws are needed to ensure safe drinking water. Action is needed to restrict oil & gas production "brine" from use in deicing and dust control.

Chapter 11 A potentially dangerous practice is the spreading of oil & gas production fluids, referred to as "brine," as a deicer and dust-suppressant of rural roads. It is an old practice in Ohio, going back to at least the 1930s, that the Ohio Department of Natural Resources Division of Oil & Gas Management (ODNR DOGRM) has been trying to stop since the mid-1980s. The Agency's original concern pertained to the Benzene-Toluene-Ethylbenzene-Xylene (BTEX) residuals in the fluids. In the 1990s, it was determined that there were significant levels of heavy metals in the fluids which have known human health impacts. Studies in the United States and beyond began finding significant volumes of cancer-causing radioactive metals in the fluids.

Chapter 12 The recommendations for the remediation practices needed for oil & gas production hazards are documented in this review as are the necessary steps to be taken for the safety of the Columbus drinking water supply.

Preface

During the years of 2010 and 2011, the first unconventional horizontal shale extraction well was drilled in Ohio employing the process of hydraulic fracturing, commonly known as "fracking." Prior to the event, the oil & gas industry, state agencies, and political operatives had taken actions to streamline permits, minimize regulations, and promote this new technology as a boon for cheap energy, energy independence, and jobs for Ohio. Soon after this drilling event, horizontal fracking began ramping up in Ohio followed by a concerning number of red flags from environmental scientists and concerned citizens across the State. This included the authors of this paper, members of the Columbus Community Rights Coalition (CCRC).

Alarmed by the massive waste stream that fracking produced, researchers questioned what was in this waste and where the companies were disposing of it. They learned that the oil & gas industry, assisted by regulatory and political allies, already had secured rights to withhold from the public information about the chemicals used in fracking operations. They also learned that the State permitted the oil & gas industry to dump its radioactive solid waste (drill cuttings) into municipal landfills and to inject its radioactive liquid waste into abandoned vertical oil wells.

Study after study has borne out environmentalists' and local affected residents' worst fears. Drill cuttings from the Marcellus and Utica shale are highly radioactive from Radium-226 and Radium-228. Both are linked to leukemia, bone, and breast cancers. In addition to radionuclides, fracking liquid waste contains chemicals, including neurotoxins, endocrine disruptors, and carcinogens. Research points to significantly higher disease rates among populations that live close to oil & gas activities. An August 2022 report from the Yale School of Public Health report found that children living within 2 km of at least one unconventional oil & gas well have almost twice the risk of developing acute lymphoblastic leukemia (ALL) as those living at further distances from these wells.

The explosion of fracking operations have galvanized efforts to raise awareness of fracking's threats to Ohio's water, air, and soil. Individuals and coalitions alerted their elected representatives to take action. However, the lack of effective responses led many of them to take on the matter themselves. In Central Ohio, a group of concerned citizens reached out to the Community Environmental Legal Defense Fund (celdf.org) to help draft a bill to ensure that Columbus voters had the right to say "no" to oil & gas waste in their community. These grassroots volunteers formed the Columbus Community Bill of Rights (CCBOR), ColumbusBillofRights.org, and later, its educational arm, CCRC.

CCBOR has worked on four initiative campaigns since 2014, encountering throughout this time stiff opposition to keep the initiative off the ballot. Undeterred, CCBOR continues to campaign for the local rights of people to live in safe and healthy communities while CCRC educates communities about the risks they face. With unwavering belief in participatory democracy, CCBOR and CCRC members remain committed to ensuring that the people of Columbus have a say on whether to permit oil & gas activities that impact them, their families, and their livelihoods.

Since CCBOR began its first initiative campaign, the risks to Columbus water sources have only increased. Thirteen active oil & gas production waste injection wells running through

the Upper Scioto watershed continue to take in millions of gallons of highly toxic and radioactive liquid waste. Oil & gas companies still have active permits to process drill cuttings within the City of Columbus along Alum Creek. In addition, the spreading of toxic and radioactive waste "brine" on roads in the Columbus Metro watershed has occurred.

Meanwhile, Central Ohio is expecting a massive increase in population that will further tax Columbus Metro's water sources. The reasons vary. For one, the city is fast becoming a magnet for climate refugees fleeing intensifying and ever more frequent droughts, fires, floods, tornadoes, and hurricanes. Another draw is the planned "Largest in the World" Intel development that will soon be straddling New Albany and Licking County. This enormous operation reportedly will require an estimated 5 million gallons of water a day from Columbus water sources. Given these additional pressures on Columbus's water sources, City authorities cannot sit back and wait for breaches, spills, or migrations of waste. They should instead be considering the impact on residents and businesses if toxic and radioactive waste contaminates our aquifers, groundwater, surface water, and drinking water, and they should be planning the immediate steps needed to avoid these catastrophes.

To aid this effort, CCRC has gathered historical and current information from peer-reviewed scientific studies, respected publications, and Ohio agencies. With this background, it reviewed the Columbus Source Water Protection Management Plan (SWPMP) regarding oil & gas development and waste to compile the White Paper now before you. CCRC respectfully requests that officials at the City of Columbus Public Utilities Division of Water commit to the following:

a) Read the White Paper and thoroughly examine its claims, referenced studies, and recommendations.
b) Consider what information CCRC may have missed or was not available during its review of the SWPMP regarding oil & gas development and waste.
c) Create a comprehensive, preventative, and sustainable plan of action to protect our water from oil & gas industry activities for today and for generations to come.

The risks to the Greater Columbus Water Supply from oil & gas production activities are monumental. Through this report, CCRC seeks to forge greater attention to the dangers Central Ohio faces from these activities and to encourage the bold initiatives needed to mitigate them if not avoid them altogether. Working together for the common goal of protecting our water sources, Central Ohioans can, and will, meet this challenge. As this paper documents, we have no choice. No one else will, so it is up to us.

The Columbus Community Rights Coalition submits for your review and consideration,

The Risks to the Greater Columbus Water Supply from Oil & Gas Production

Acronyms

AOC	Areas of Concern
BTEX	Benzene, Ethylbenzene, Toluene and Xylene
CCBOR	Columbus Community Bill of Rights
CCRC	Columbus Community Rights Coalition
CSO/SSO	Combined Sewer Overflows/Sanitary Sewer Overflows
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CMZ	Corridor Management Zone
CWA	Clean Water Act
DOGRM	Division of Oil & Gas Resources Management
DOGS	Division Ohio Geological Survey
DRWP	Dublin Road Water Plant
EMZ	Emergency Management Zone
EPA	Environmental Protection Agency
EPCRA	Emergency Planning & Community Right-to-Know Act
FERC	Federal Energy Regulatory Commission
HCWP	Hap Cremean Water Plant
HVAC	Heating, Ventilation & Air Conditioning
MCL	Maximum Contaminant Levels
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
OEPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Act
PAWP	Parsons Avenue Water Plant
POTW	Publicly Owned Treatment Works
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act

SDWA	Safe Drinking Water Act
SWIW	Salt Water Injection Well (Class II wells)
SWPMP	Source Water Protection Management Plan
TSCA	Toxic Substances Control Act
USGS	United States Geological Survey

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Chapter 1: Introduction

The Columbus Community Bill of Rights (CCBOR) and its educational arm, the Columbus Community Rights Coalition (CCRC), are local grassroots organizations dedicated to calling attention to the toxic and radioactive waste that threatens Central Ohio's water sources. Members have worked with the City of Columbus for nearly a decade, meeting with representatives of the Department of Public Utilities, Division of Water, and City Council to discuss the importance of protecting local water sources from contamination resulting from oil & gas production and related activities. They have shared data, conducted on-site field trips, and sought information about the City's plans to protect Columbus's water sources. Despite some positive feedback, CCBOR/CCRC has yet to gain the City's attention to the full magnitude of the threats.

Just before the March 2020 Covid-19 shutdown, CCRC volunteered to review the City's **Source Water Protection Management Plan (SWPMP)** for Hoover Reservoir (and Alum Creek Reservoir) to better understand how the City is addressing threats of spills and releases from oil & gas activities in the watershed. The reviewing team consisted of Greg Pace, Bob Krasen, and other CCRC citizen scientists. Julie Weatherington-Rice, Ph.D., served as the volunteer scientific advisor to the local group. Dr. Weatherington-Rice, a geologist of more than forty years, has a deep and wide knowledge of the geology of Central Ohio, the effects of the oil & gas industry on our region, and Ohio's regulatory system as it pertains to both.

Dr. Weatherington-Rice has had a positive working relationship with the Columbus Division of Water stretching back to 1980. At that time, she worked at the Franklin County Soil and Water Conservation District on early issues with nitrate exceedances in the Scioto River watershed. In addition to her professional concerns, Weatherington-Rice has a vested interest in this project. She and her family live in Worthington, where they depend on the public water supply from Hoover Reservoir.

The Columbus Source Water Protection Management Plan (SWPMP) includes plans on how the City is addressing threats of spills and releases from oil & gas activities in its watershed.

The Covid-19 lockdown severely impeded CCBOR/CCRC actions with the City. With officials discouraging in-person meetings and reviews, the authors of this paper could not be sure if they had received all portions of the SWPMP that they needed or even what to look for in the reports that the City agreed to send. In January of 2021, the City of Columbus delivered what appears to be part of the PDF of the Hoover SWPMP.

To avoid further delays in this report, CCRC decided to move forward with its review using the information they had received from the City. Members realize that it is possible that the missing data and documentation may already exist in the other sections or in other documents they have not yet received, but also that the urgency of the situation could ill afford another postponement in finalizing their report for City officials. The authors are confident that once officials understand the risks to Columbus's water sources, the City will provide additional materials for an update.

Another factor complicating the timely information flow to the CCRC reviewers was the revisions undertaken by the Ohio Department of Natural Resources Division of Oil & Gas Resources Management (ODNR DOGRM) of the sections of the Ohio Administrative Code addressing Class II injection wells and waste treatment facilities. As defined by the United States Environmental Protection Agency (US EPA), "Class II wells are used only to inject fluids associated with oil and natural gas production. Class II fluids are primarily brines (salt water) that are brought to the surface while producing oil and gas."[1] Because these revisions have direct bearing on public water supply source water protection areas, this review could not be completed until those administrative codes were finalized during the spring and summer of 2021.

"Class II wells are used only to inject fluids associated with oil and natural gas production. Class II fluids are primarily brines (salt water) that are brought to the surface while producing oil and gas." --*US EPA*

This White Paper is intended to alert readers to the risks to the Greater Columbus water sources related to oil & gas activities, provide information to enhance their understanding of them, and stimulate action to resolve them. Chapters 2 through 6 provide a backdrop for CCRC's findings. These include overviews of government regulations overseeing oil & gas operations in Ohio, maps of the region's water resources, a brief history of the industry's activities in the state, and the growing evidence of the risk these activities pose to the safety of local water sources. The second half, Chapters 6 through 12, discusses the expectations that CCRC has of Columbus's source water protection plan, an analysis of the Plan, and recommendations to address the related risks to Central Ohio's water sources.

SUMMARY

Nearly a decade ago, local citizens concerned about the safety of Central Ohio's water sources established the Columbus Community Bill of Rights (CCBOR) and later its educational arm, the Columbus Community Rights Coalition (CCRC). The mission of CCRC is to (a) alert City officials about the threats of contamination to local water sources resulting from oil & gas operations, (b) to work with them to take the necessary steps to safeguard this vital resource, and (c) to education the public about these threats to our water sources. CCRC members requested from the City its Source Water Protection Management Plan (SWPMP) as it pertains to the Hoover and Alum Creek Reservoirs. Though the City supplied important portions of the SWPMP, the team soon discovered that they would need additional sections to complete the review as intended. Given the urgency of protecting local water sources, the authors decided not to delay taking their findings to City officials and the general public. This White Paper is based on the material CCRC has to date and delivered with the understanding that it will be added to as more information becomes available.

FIGURE 2: CITY OF COLUMBUS

Source: CCBOR

Chapter 2: Public water source regulatory overview

In the United States, public water supply protection requirements of the federal Safe Drinking Water Act and Amendments, are managed on the Federal level with additional inputs by the states. In Ohio, oversight for both the federal and state programs falls under the banner of the Ohio Environmental Protection Agency (OEPA). Both programs are primarily driven by the Federal Safe Drinking Water Act (SDWA) and its amendments, especially those enacted in 1986 and 1996. This act and these amendments set up the requirements for the Source Water Protection Program. This included the designation of source water recharge areas, which it defined as the localized surface regions where water is allowed to seep into the ground to replenish a groundwater source (aquifer). They also called for the identification of potentially contaminating land uses in those areas of protection and the establishment of Source Water Protection Management Plans. *For a short explanation of the SDWA, see the US EPA websites, "Basic Information about Source Water Protection"*[2]*, and "Understanding the Safe Drinking Water Act"*[3]

In groundwater settings, the protection areas are established as the 1- and 5-Year Time-of-Travel zones. These zones indicate the areas where a single drop of water or contaminant falling to the ground can infiltrate the ground's surface before proceeding to a pumping well within one year and five years. These distances, established by computer modeling, are actually fuzzy boundaries. Once established, however, they become legal lines on a map and are used for inventorying and regulating land uses.

Surface water watersheds are far less controlled than groundwater settings. Though their recharge areas extend to the watershed ridge lines, the ability to regulate them is reduced. Surface water watersheds are usually restricted to the Emergency Management Zone (EMZ) and the Corridor Management Zone (CMZ). This process, of course, assumes that releases outside those areas will have room to dilute, attenuate, and/or be remediated before real damage is done to the water source. As communities have learned over the years, such assumptions do not always prove true.

SUMMARY

The drinking water in the United States is managed on the federal level with additional input by the states. In Ohio, oversight for both federal and state programs falls under the authority of the Ohio Environmental Protection Agency (OEPA). The federal Safe Drinking Water Acts instituted Source Water Protection Management Plans (SWPMPs) which differentiates between groundwater and surface water sources.

Chapter 3: Primary, secondary, and emergency water supplies for the City of Columbus

The City of Columbus is fortunate to have a variety of sources of drinking water, not all of which are necessarily in use. The majority of the drinking water comes from surface water sources in the Upper Scioto River Watershed. In the west, the Scioto River water is pumped into an upground reservoir in Delaware County, the John R. Doutt Reservoir, during periods of instream high flow. There are also two instream reservoirs, O'Shaughnessy and Griggs Reservoirs, which channel water to the Dublin Road Water Treatment Plant (DRWP). On the east, the metropolitan area is served by Hoover Reservoir which is fed by Big Walnut Creek. There is also a pipeline from the Alum Creek Reservoir to Hoover Reservoir that transfers water to use Alum Creek as a supplemental source during periods of lower flow. Alum Creek Reservoir is fed by Alum Creek. Water from both of these eastern watersheds is treated by the Hap Cremean Water Treatment Plant [Figure 3].

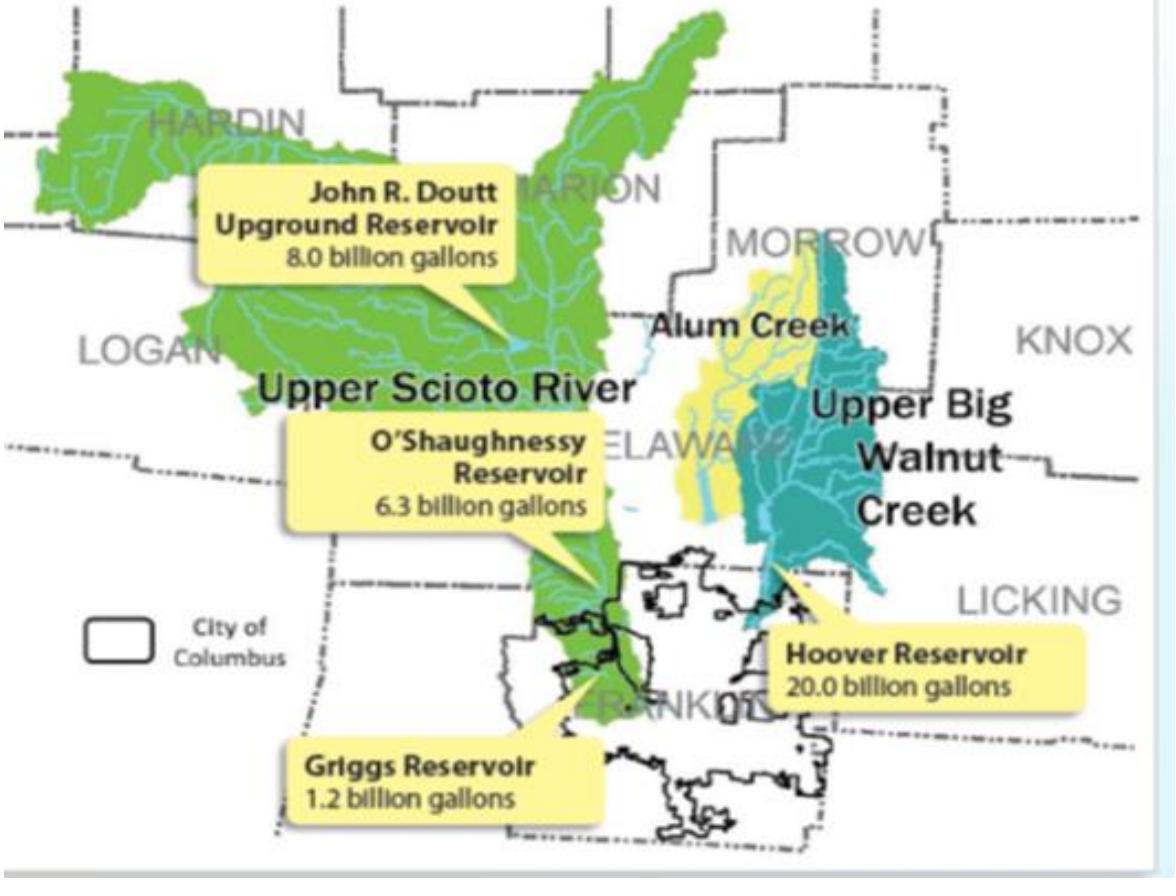

FIGURE 3: SOURCE WATER PROTECTION AREAS AND RESERVOIRS SUPPLYING DUBLIN ROAD WATER PLANT AND HAP CREMEAN WATER PLANT

Approximately 85% of the city's water is obtained from surface water supply sources.
Source: Executive Summary, City Of Columbus Watershed Master Plan [4]

In addition, the region is served by the Parsons Avenue Water Plant (PAWP) which is located on Alum Creek near its confluence with the Scioto River south of the city. That plant is a groundwater plant that treats the groundwater pumped from the South wellfields along Alum Creek and the Scioto River [Figure 4][5].

Columbus may also rely on backup emergency supplies that can be tapped in times of severe drought. During the drought of the late 1980s, hydrologist Truman Bennett and geologist Julie Weatherington-Rice conducted a windshield survey of all other reasonably assessable and treatable sources of water for the City of Columbus. They included, but were not limited to, the Olen Quarry on the Big Darby Creek in Hilliard, which could be treated at the mothballed Hilliard Water Treatment Plant.

Currently no facility treats the water from the two wellfields along the Olentangy River south of I-270. If that water was to be put into the City's water distribution, then it would be treated at the Dublin Road Water Plant (DRWP).

These two wellfields are located on the Olentangy River south of the northern loop of I-270 at the city of Worthington wellfield at Thomas Worthington High School and the wellfield at Battelle. Both of these wellfields continue to be operated for irrigation and heating, venting, and air conditioning (HVAC). If they were to be incorporated into the City's supply, there is an intake pipeline at the confluence of the Olentangy and Scioto Rivers that connects to the DRWP.

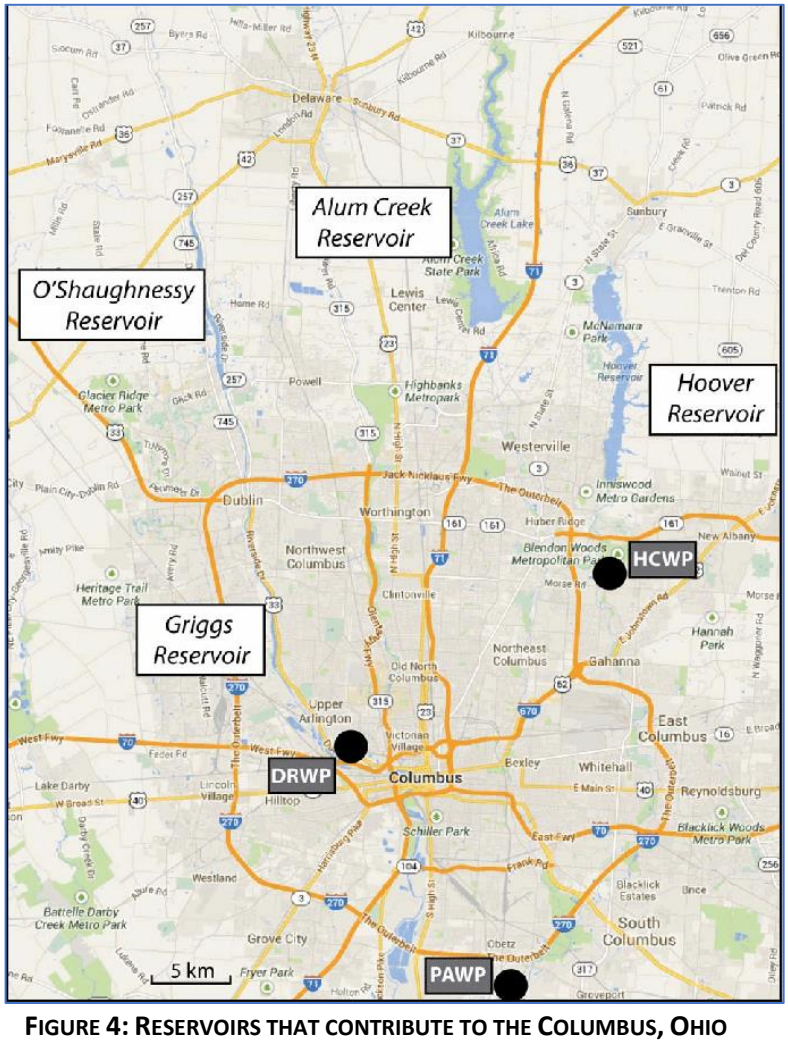

FIGURE 4: RESERVOIRS THAT CONTRIBUTE TO THE COLUMBUS, OHIO

"Reservoirs that contribute to the Columbus, Ohio water supply are Griggs, O'Shaughnessy, Alum Creek, and Hoover. The Dublin Road Water Plant (DRWP) extracts water from Griggs and O'Shaughnessy for water supply usage, while the Hap Cremean Water Plant (HCWP) utilizes water from Hoover Reservoir. Alum Creek Reservoir provides supplemental water to Hap Cremean Water Plant (adapted from Google maps). Parsons Avenue Water Plant (PAWP) distributes groundwater from wells." *As cited in Journal of Water Resource and Protection, (2014) https://www.scirp.org/pdf/JWARP_2014112810542519.pdf,*

There is also a series of limestone quarries both currently in operation and in close proximity to the Scioto River that are groundwater-fed but could be pumped towards the DRWP. The largest untapped source of water is the Route 104 quarry, just north of the southern I-270 loop on the Scioto River. The City does not dewater the 104 quarry but rather whoever is currently operating the quarry assumes this responsibility. The quarry has changed hands several times since American Aggregates started the dewatering operations. It appears to now be operated by the Shelly Company in Grove City, Ohio.

The quarry's dewatering effort removes a significant volume of groundwater from the quarry. When the South Wellfield on the Scioto River was designed, it was expected that the removed groundwater that is pumped back into the Scioto River would directly reinfiltrate into the underlying buried sand and gravel deposit under the Scioto River, to be removed again for usage by pumping at the South Wellfields. It turns out that much of the water that is captured by collectors and treated at the PAWP is supplied from the limestone bedrock underneath the region. For the sake of this review, the authors will restrict comments to the commonly used surface water systems north of the city.

When the City of Columbus established its Watershed Master Plan, it implemented a planning and monitoring program based on the following conceptual pattern [Figure 5].

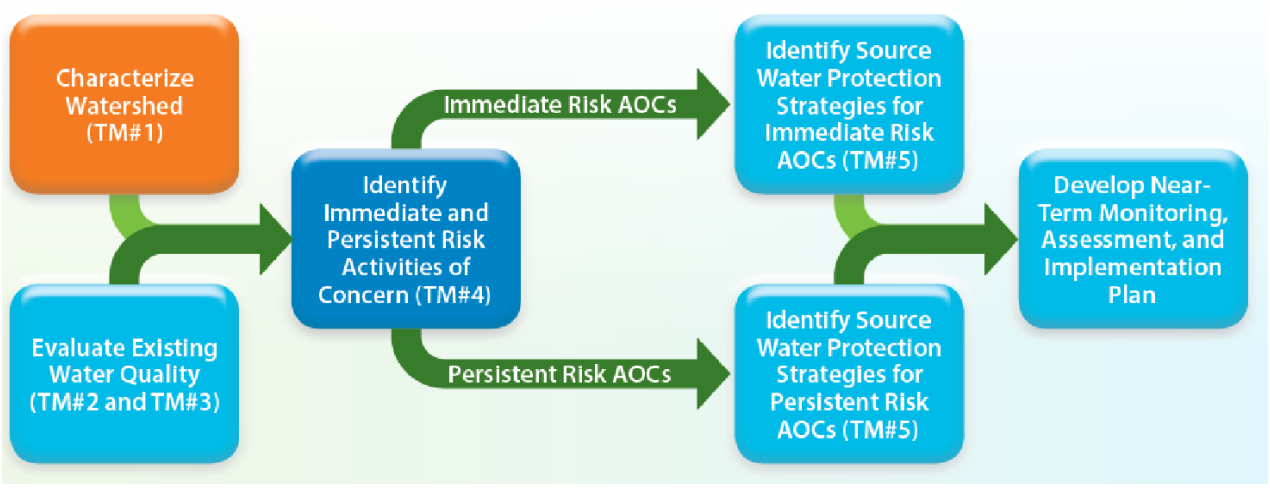

FIGURE 5: WATERSHED MASTER PLANNING PROCESS FLOW CHART

Source: Executive Summary, City of Columbus Watershed Master Plan[4]

As can be seen, the planning design process was based on the watershed approach. This is a logical process for land uses and sources of contamination that are watershed-wide in nature. On the other hand, it is a less perfect fit for land uses identified, rightly or wrongly, as point sources. The master plan also identified stakeholders in the watersheds and conducted extensive interviews with those groups. Those groups are listed on the following page [Table 1].

This list of stakeholders provides an excellent source of watershed partners if one is reviewing a mostly agricultural surface water system. The Columbus Division of Water project team was concerned about the most important agricultural pollutants and other pollutants found in rural communities as well as the few villages and cities in the watersheds.

Agricultural Research Service, USDA
American Rivers
Appalachian Ohio Alliance
Certified crop advisors
City of Dublin, OH
City of Hilliard, OH
City of Westerville, OH
Columbus Division of Sewerage and Drainage
Columbus Division of Water
Columbus Recreation and Parks Department
Delaware General Health District
Del-Co Water Company
Ducks Unlimited
Mid-Ohio Regional Planning Commission
Nutrient Stewardship Signature Program, OSU College of Food, Agriculture & Environmental Science
Ohio Corn and Wheat Growers Association
Ohio Department of Agriculture
Ohio Department of Natural Resources, Division of Forestry
Ohio Farm Bureau Federation
Ohio Soybean Council
Preservation Parks of Delaware County
Soil & Water Conservation Districts for Delaware, Franklin, Marion, Morrow, and Union Counties
The Nature Conservancy
Western Reserve Land Conservancy

TABLE 1: STAKEHOLDER GROUPS INTERVIEWED

Source: Executive Summary, City of Columbus Watershed Master Plan [4]

The problem is that properly gauging the effects of the oil & gas industry typically requires monitoring surface water contamination, yet the people who best understand the historical impacts to surface and groundwater in the region are not identified on the stakeholder list.

This was not unexpected. Identifying all the important stakeholders is often the most difficult part of creating any master plan. This happens for a number of reasons, the most common being that *the people organizing the master plan do not know what they do not know and, therefore, do not know who else they should be talking to.* The Columbus Division of Water might have had a better chance of inclusion had its team been studying a groundwater system, though not necessarily. Institutional memory is often very short. In this case, the worst documented oil & gas water contaminations in the region commonly occurred from the 1960s to the 1980s. This was long before the working lifetime of many of the people involved in the watershed planning process.

As part of the planning process in 1987, the City identified the following list of threats, both as they exist in the watershed and as they impact the reservoirs [Table 2].

Pollutants	Relative Threat to Source Water (1 to 5)	Relative Threat to Reservoirs (1 to 5)
Nitrates	5	5
Cryptosporidium	5	3
Phosphorus (HABs& taste/odor)	4	5
Synthetic organic chemicals	4	1
Volatile organic chemicals	4	1
Other Pathogens	3	3
TDS/Conductivity	3	2
TOC	3	2
Chlorides	3	2
Atrazine	3	1
Other Pesticides and Herbicides	3	1
Radioactive contaminants	3	1
Turbidity/TSS	1	3
Pharmaceutical and Personal Care Products (PPCP)	1	1
Endocrine Disruptors	1	1
Antimicrobials	1	1
Metals	1	1

TABLE 2: POLLUTANT CONSEQUENCES RATINGS
Source: Executive Summary, City of Columbus Watershed Master Plan [4]

While the above list of pollutants of concern does not directly spell out oil & gas production and management, it does identify several broad classifications that could signify oil & gas activities. These classifications include "chlorides," which also could be road salts or rural water softening flowback water. Oil & gas could also be included under the broader categories of radioactive contaminants or metals. Both oil and gas could also include other pollutants.

The problem is that properly gauging the effects of the oil & gas industry typically requires monitoring surface water contamination, yet the people who best understand the historical impacts to surface and groundwater in the region are not identified on the stakeholder list.

As seen in the following table concerning "Activities of Concern" [Table 3], the City did identify the specific categories of oil & gas wells and pipelines and gave them the following ranking of consideration.

Activity Group	Activities of Concern	DRWP Strategy Priorities		HCWP Strategy Priorities	
		Source Water	Reservoirs	Source Water	Reservoirs
Agriculture	Row crops	Persistent Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Manure application	Persistent Risk	Persistent Risk	Persistent Risk	Immediate Risk
	Tiling/drainage ditch construction	Persistent Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Pasture/grazing	Periodic Assessment	Persistent Risk	Persistent Risk	Persistent Risk
	Livestock stream access	Periodic Assessment	Persistent Risk	Monitor/Inspect	Persistent Risk
Urban	Yard/landscape	Persistent Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Development/untreated impervious cover	Persistent Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Street/pavement & deicing	Persistent Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Construction	Persistent Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Golf courses	Monitor/Inspect	Persistent Risk	Monitor/Inspect	Persistent Risk
Waste Disposal	Failing leach field/mound systems	Persistent Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Failing discharging/aerator systems	Immediate Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Solid waste (collection)	Persistent Risk	Persistent Risk	Persistent Risk	Monitor/Inspect
	Pet waste	Persistent Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Publicly Owned Treatment Works (POTWs)	Immediate Risk	Immediate Risk	Immediate Risk	Immediate Risk
	CSO/SSO	Immediate Risk	Monitor/Inspect	Monitor/Inspect	Monitor/Inspect
	Solid waste facilities (recycling/scrap yards)	Immediate Risk	Monitor/Inspect	Monitor/Inspect	Monitor/Inspect
Material Storage/ Transport	Commercial/industrial facilities	Immediate Risk	Monitor/Inspect	Immediate Risk	Monitor/Inspect
	Major roadways	Immediate Risk	Monitor/Inspect	Immediate Risk	Monitor/Inspect
	Railways	Immediate Risk	Monitor/Inspect	Monitor/Inspect	Monitor/Inspect
	Above ground material handling/storage	Immediate Risk	Monitor/Inspect	Monitor/Inspect	Monitor/Inspect
	Oil and gas wells and pipelines	Immediate Risk	Periodic Assessment	Immediate Risk	Monitor/Inspect
Degraded Natural Resources	Habitat loss	Immediate Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Streambank erosion/entrenchment	Persistent Risk	Persistent Risk	Persistent Risk	Persistent Risk
	Limited stewardship	Persistent Risk	Periodic Assessment	Persistent Risk	Persistent Risk
	Wildlife wastes (e.g., geese)	Periodic Assessment	Periodic Assessment	Persistent Risk	Persistent Risk
	Marinas & other leased activities	Monitor/Inspect	Periodic Assessment	Monitor/Inspect	Persistent Risk

TABLE 3: ACTIVITIES OF CONCERN TARGETED FOR ACTIVITY-SPECIFIC WATERSHED MANAGEMENT STRATEGIES

Summary of Columbus Dept. of Water AOC's posing the highest risks, representing a broad range of activities. *Source: Executive Summary, City of Columbus Watershed Master Plan* [4]

As noted above, in the Scioto River watershed, oil & gas was rated as an "Immediate Risk" priority but one needing only "Periodic Assessment." On the other hand, the Department of Water rated the Hap Cremean plant as "monitor and inspect." The authors of this paper expect that the difference in classification stems from the City's understanding that oil & gas activities are limited to the northeastern area of the watershed. This is how the City identifies risks as immediate:

- Immediate risk AOCs are typically episodic, unpredictable, and may have potentially high consequence. Therefore, immediate risk strategies should collaborate with relevant regulatory agencies to target specific AOCs in the Emergency Management Zone (EMZ) and Corridor Management Zone (CMZ), where there is less opportunity for dilution and for the water plants to be notified and react.

Source: Executive Summary, City of Columbus Watershed Master Plan[4]

Oil & gas activities are of greatest concern in the EMZ and CMZ because the assumption is that if there is a release elsewhere in the watershed, there will be the opportunity for dilution and time for remediation. This is true, but only to the extent that the release will always occur on the surface where it can be seen and therefore monitored and/or remediated. It also assumes that the levels of potential contamination occur in both reasonable volumes and toxicity. As the authors and many others have learned to their great dismay, this behavior does not always result in safe outcomes. Unseen contaminations, both surface and beneath the surface, also have ended up polluting water sources. *Additional graphics for this section may be found in the City of Columbus Watershed Plan.*[4]

SUMMARY

The City of Columbus is fortunate to have a variety of primary, secondary, and emergency supplies of drinking water. With its bounty of rivers, streams, wells, and reservoirs, the City adopted a watershed approach to monitor water safety with a focus on the region's surface rather than groundwater. This has proven problematic because the effects of oil & gas operations may appear in surface water and in groundwater. Moreover, with the emphasis on agriculture, the City failed to enjoin as stakeholders people who best understand oil & gas operations and their historical impacts on surface and groundwater in the region. As a result, a common misunderstanding among City officials and their partners is that oil & gas contaminants released beyond surface water areas have sufficient opportunities for harmful impacts to be diluted. In fact, unseen contaminations, both surface and beneath the surface, also pollute local water sources.

Chapter 4: A short history of oil & gas production and drinking water contamination in Ohio

Oil & gas production has a long and checkered history in Ohio. Though the first documented drilled wells date back to 1860, oil had been collected decades earlier by Ohio settlers and centuries earlier by Native Americans from seeps and springs. Over the last 160+ years of drilling and production activity, an estimated 300,000 wells have been drilled in the state.

Owing to records being very informally kept in the early decades, the State of Ohio cannot be certain of the location of approximately half of those drilled wells. On the other hand, the State does know that the vast majority of these wells were not adequately abandoned and properly capped when no longer producing. Early wells were fitted with wooden casings which have long since rotted away. Later operators fitted newly drilled wells with iron and then steel casings, yet these valuable metals were pulled during World Wars I & II as part of the nation's metal drives. Open holes were then plugged with Black Locust fence posts which typically survive 100 years and/or with large boulders placed into the wells at or near the surface.

Ohio's oil and gas production history was very active. In fact, during the late 1800s, the Rockefeller Standard Oil Lima-Findlay oil field, which extended from the Indiana state line to the Toledo area, could boast that it was the largest wellfield in the world. Today, most of those old Standard oil wells are lost. The same is true of most of the old wells in the eastern half of Ohio drilled by smaller but also robust operations.

While Ohio does not have an organized effort of locating old wells, its eastern neighbor does. In Pennsylvania, volunteers grid out properties and, through the use of methane sniffers, search them for abandoned wells. When abandoned wells are located and/or new areas found to be well-free, the volunteers submit their information to the State's official database. This effort is not significantly different from the searches for abandoned land mines in Europe and Asia that were left over from previous wars in the 20th and 21st centuries.

Fortunately, Ohio does maintain an online database of oil & gas wells at ODNR DOGRM. Figure 6 is an interactive map that provides a snapshot of oil & gas production and injection well activities around Sunbury, Ohio, above Hoover Reservoir. The blue dots are wells that were granted permits but were never drilled, and the green dots are oil & gas wells that were drilled and are in production. The magenta dot on the west side of Sunbury reveals a "Salt Water Injection Well" (SWIW), which is an oil & gas production water and development fluids injection well, currently in operation. This well was originally drilled in 1963 and then converted to an injection well in the 1980s.

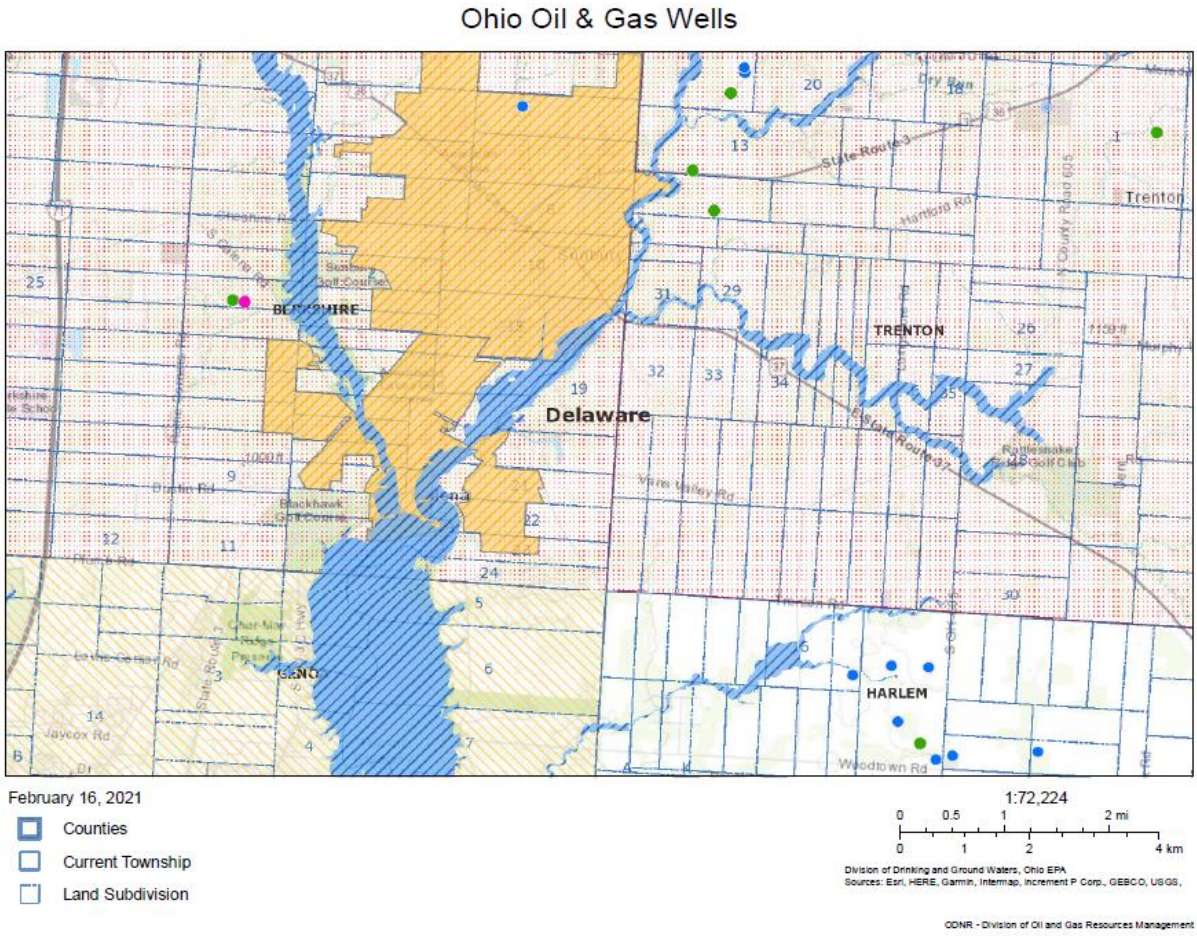

FIGURE 6: OIL & GAS ACTIVITIES IN BIG WALNUT CREEK WATERSHED ABOVE HOOVER RESERVOIR NEAR SUNBURY, OHIO

Source: ODNR DOGRM [6]

What could go wrong? What kinds of contaminating land uses can be expected from oil & gas production?

Over the last 160+ years, pretty much anything that could go wrong with oil and gas production, transportation, and disposal systems has gone wrong.

Typical contamination problems consist of leaks, spills, and broken transmission lines both onsite and off the drilling pad. A drilling pit will leak, a fire will break out, and problems with the transmission lines will occur. Given that these transmission lines run between a "brine" hauling truck and the on-site tank that holds the flowback production water, each mishap can trigger seriously dangerous situations.

Furthermore, in recent years, Ohio has experienced a series of even greater and more spectacular hazardous accidents than in the past. A major line will break, draining its toxic contents into a stream or river. The result: major fish kills in local areas. A train hauling oil & gas will derail, or a transmission pipeline will rupture and catch fire. The result: fireballs billowing 300-400 feet into the sky. There have also been incidents of "brine" hauling trucks

overturning into a stream or river and spilling their loads into the waterway, and of gas wells being drilled causing a blowout of raw methane that required the evacuation of those in the area. Here the concerns are not only soil and water contamination, but explosions, potential fire, and contaminated air quality as well. A typical evacuation zone is a radius of a mile or two, though occasionally the escaping methane or oil will ignite. The uncontrolled burning of the fuel creates a much more serious air quality issue in addition to the problems caused by just the blowout.

What could go wrong?

Over the last 160+ years, pretty much anything that could go wrong with oil & gas production, transportation, and disposal systems has gone wrong.

Wells sometimes hemorrhage development and production fluids. It is important to note therefore that all oil & gas wells produce more chemical laden production fluids than they do oil & gas. In fact, oil & gas is actually a byproduct of the drilling process. A typical oil well, for instance, may produce 7 to 10 barrels of production fluids to every barrel of oil that is pumped out of the well. That liquid material, euphemistically referred to as "brine," is highly toxic and hazardous, filled with poisonous chemicals from the well drilling activity and later production activity. Common toxic materials are BETX (Benzene, Ethylbenzene, Toluene and Xylene), heavy and radioactive metals as well as huge volumes of chlorides and sulfides, referred to as "salts." Oil & gas "brine" is typically *10 to 20 times saltier* than today's ocean water. It must be disposed of in a safe manner.

Historically, as a new well field was developed, this "brine" would be reinjected into the older wells as a source of fluids to keep the pressure up in the field so more oil & gas could be produced. This technique is referred to as "enhanced recovery" and was developed in the 1930s as a way to ensure maximum production of the oil & gas. Previous to this technique being available, well field operators just removed all the fluids. This quickly depressurized the formations, trapping much of the remaining oil & gas within the formation. It was this activity that led to the demise of the Lima-Findlay field in the early 20th century. It has been estimated that perhaps up to 90% of the initial volumes of oil & gas from that field are still trapped in the formation rock in the field.

Euphemistically referred to as "brine," this oil & gas liquid byproduct is highly toxic and hazardous, filled with poisonous chemicals from the well drilling activity and later production activity.

The development of enhanced recovery wells helped to remove more oil & gas from the field and limited the distance that the "brine" had to be hauled for disposal, a technological advancement that helped limit the amount of contamination that might occur in an oil & gas production area. Pipelines could break, but since transport trucks were not typically involved, the volumes of toxic "brine" that were "accidentally released" were much reduced unless the leaks continued for a period of time.

However, at some point during the second half of the 20th century, the industry decided that if old wells in a wellfield could take the "brine" being generated locally, they could also take "brine" from other fields. Perhaps it was just wishful thinking on the industry's part, but from the authors' perspective, this decision marks the first major breakdown in the understanding of basic physics by the industry and the regulators relating to SWIWs.

In the practice of enhanced recovery, a finite volume of fluid is removed from the wellfield and a smaller volume is reinjected so that, over time, there should be a reduction of total fluid by the amount of oil & gas removed and, therefore, a reduction of ancillary spills. With a SWIW, development fluids and production fluids from any well in any formation can be trucked to the well site and injected into the well. According to the industry, it all "magically" goes down the well, back into the formation and then simply disappears, never to return, rather like flowing down a black hole into a parallel universe, except that isn't what really happens. When "brine" is injected under pressure, as it is in SWIWs, it pushes out formational waters that are already naturally in place**.**

Readers should be aware that there are no big dry holes in the earth. Therefore, as production has increased around the world for the last decade, all that extra fluid has been "greasing" the joints and fault zones in the earth resulting in earthquakes. Because it is possible to distinguish injection well earthquakes from natural earthquakes by looking at their intensities, experts know that in a natural setting, the first quake will be the hardest followed by softer aftershocks. In contrast, in a man-made injection well-triggered earthquake, the aftershocks keep intensifying.

As production has increased around the world for the last decade, all that extra fluid has been "greasing" the joints and fault zones in the earth resulting in earthquakes.

In recent years, researchers have measured thousands of these man-made earthquakes from injection wells and from the development of production wells in the area around Youngstown and eastern Ohio. To the best of the authors' knowledge, the last tabulated record of events is dated July 21, 2017. At that time, Dr. Ray Beiersdorfer, Distinguished Professor of

Geology, listed 1,157 separate measured earthquake events (currently archived at Youngstown State University). Since then, Ohio news reports have brought additional earthquake events to the public's attention. Following the death of Beiersdorfer in 2018, no one locally has continued this documentation.

It would be possible to update the records by querying the databases of, among other locations, the U.S. Geological Survey Earthquake Hazards Program,[7] Columbia University Lamont-Doherty Cooperative Seismographic Network,[8] and Miami University of Ohio. Furthermore, a 2018 post on the Miami University website explains the relationship between fracking and earthquakes.[9]

Earthquakes have become a major problem in Ohio. Recently, injected fluids have been finding their way into the production fluids of nearby production wells. As a result, wells that have been producing fluids at a predictable rate for some time will occasionally begin producing vastly greater volumes of production water. In several cases, when new volumes of production fluids were fingerprinted, they were found to match the signatures of fluids being disposed of in nearby SWIWs. In other words, the disposed fluid was short circuiting and returning to the surface. This has happened at least twice in the last few years in Ohio, including in Washington County in 2020[10] and in Noble County in 2021.[11]

Disruptive migrations of fluid are the logical outcome of all fluids that are being injected into an already saturated system.

Such disruptive migrations of fluid are the logical outcome of all fluids that are being injected into an already saturated system. Oil & gas injection wells are termed Class II injection wells. The waste "brine" being injected into an already saturated system has to displace the pre-existing interstitial bedrock fluids in order to take in the new fluids. The new fluids will either travel along naturally occurring jointing and fracture pathways and/or flow into manmade systems such as old oil & gas wells or old underground coal mining workings. With almost 300,000 wells drilled over the last 160 years and only about 50,000 wells still in production, Ohio is dotted with approximately 200,000 abandoned wells that have not been grouted closed and therefore could carry "brine" back up to the fresh groundwater zone and/or to the surface.

When the number of abandoned wells are coupled with the number of abandoned underground coal mines that exist in eastern Ohio, the potential pathway routes are many and could easily go undetected for some time before surface/groundwater contamination is discovered. When field mapping the county, soil scientists estimated that perhaps 50 percent of Tuscarawas County is hollow from historic coal mining. The subsurface in Belmont County

may be even more impacted by underground mines [Figure 7]. *For readers interested in learning more about injection wells, the authors recommend the U.S. EPA web page on "General Information About Injection Wells"*[12].

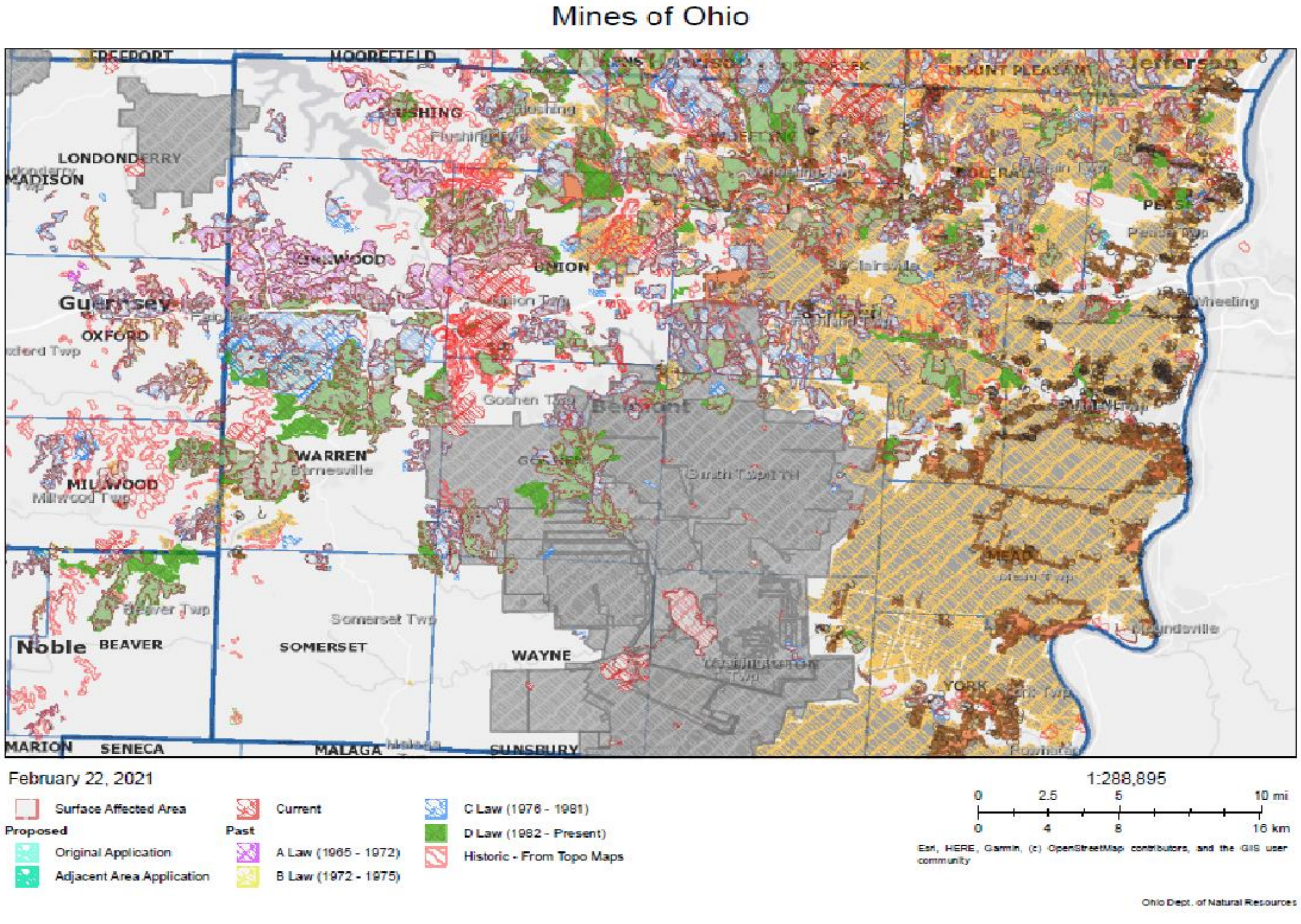

FIGURE 7: COAL MINING, BELMONT COUNTY, OHIO

Gray areas represent abandoned underground mine workings. *Source: ODNR website* [13]
https://gis.ohiodnr.gov/MapViewer/?config=OhioMines

Are there any records of catastrophic drinking water contamination cases as a result of oil & gas production activities?

Ohio agencies have long known that oil & gas production activities in the state have resulted in the contamination of Ohio's drinking water, in both public and private as well as surface and groundwater resources. The information is scattered through reports to the Ohio Department of Health, the Ohio Department of Natural Resources, and the U.S. Geological Survey. However, to the best of the authors' knowledge, the first "official" collection of contamination events was published fifty years ago, in the *Ohio Journal of Science*. This was in the groundbreaking article, "Water Pollution by Oil-Field Brines and Related Industrial Wastes in Ohio." Its author was the preeminent Professor Wayne Pettyjohn, Department of Geology and Mineralogy, the Ohio State University[14].

Professor Pettyjohn's paper is a summary of research conducted by Ohio State University students and other researchers across Ohio and of investigations undertaken by the then named U.S. Geological Survey Ohio Water Resources Division (now the United States Geological Survey, Ohio-Kentucky-Indiana Water Science Center) dating back to the 1940s.

The author's research findings on Morrow and Delaware counties were especially significant as they are the headwaters of Alum Creek which were contaminated. Pettyjohn was aware that the contamination reached further downstream than these affected counties. For example, the City of Westerville, which extends into Franklin County and is also supplied by water from Alum Creek, noted high chloride levels in the late 1960s and early 1970s. By 1977, when this paper's scientific advisor investigated the situation, Westerville's contamination levels had diminished, a result of the pool of the Alum Creek Reservoir filling and diluting the high chloride levels downstream of the reservoir after the Alum Creek Dam was completed in 1974. Pettyjohn's paper provided the scientific foundation for this and other incidents of contamination.

To understand the records of water contamination as a result of oil & gas activities, it is critical to recognize the importance of where Pettyjohn published his cutting-edge work. A well-known expert in the new field of hydrogeology, the professor regularly published in national and international scientific publications related to his fields of research. He could have submitted his paper to one of those journals, yet he decided to share his findings in the *Ohio Journal of Science*. With the hindsight of 50 years, this paper's scientific advisor, Dr. Julie Weatherington-Rice, believes that Pettyjohn chose the *Journal* for very important reasons.

When taking her first graduate-level hydrogeology class with Pettyjohn in the Spring of 1977, Weatherington-Rice quickly learned how adamant her professor was about protecting Ohio's water sources. Concerned especially with the Morrow County contamination study, Pettyjohn arranged for her to interview staff from the Westerville Department of Water as part of her thesis research. During this collaboration, she recalls him discussing at length the topics of his 1971 paper with her (so that she could carry on this work), introducing his contamination cases to his students during lectures, and bringing his concerns to the attention of any and all qualified audiences with whom he had contact.

Convinced of his study's significance, Pettyjohn knew that the *Journal* was central to the wide dissemination of "Water Pollution by Oil-Field Brines and Related Industrial Wastes in Ohio." For more than 120 years, the *Journal* has proven to be the best way to get important scientific, engineering, and medical information into the hands of those who need to make sound, defendable decisions for the protection, health, and welfare of the people of Ohio.

Professor Pettyjohn's paper sought to make sure that the State of Ohio was on notice that the environmental controls in place for oil & gas activities were not sufficient.

In partnership with The Ohio State University, the *Journal* is published by the Ohio Academy of Science, long considered one of the foremost state-level science organizations in the country. An interdisciplinary organization, the Ohio Academy of Science is connected to the National Academy of Science and its breathtaking scope of members. This includes all science, engineering, and medical departments of all the colleges and universities in the state; all state and federal agencies working in all fields of science, engineering, and medicine; representatives from the private sector; and many individuals interested in these matters.

It should be noted that Pettyjohn was also a fully credentialed attorney-at-law who routinely represented "public" clients who had had their water supplies contaminated or diminished. Today he would be considered an environmental attorney with a public practice. (Ohio has had a long history of truly gifted attorneys who have fulfilled this role over the decades.) With his dual background in science and law, Pettyjohn doubled-down on the demands of evidence-backed arguments. Once compiled, he made sure that the contamination and the proof of the contaminants' origins, which he had verified, were seen by those responsible for protecting Ohio's water sources. As a well-connected multifaceted publication, the *Journal* is sent to all its members and decision-makers who need to be aware of the information contained in its issues. The governor's office receives a copy, as does each Ohio senator, representative, county engineer's office, and related agencies.

Dr. Weatherington-Rice is therefore convinced that Pettyjohn's decision to publish his landmark paper in the *Journal* was a deliberate attempt to make sure that the State of Ohio was on notice that the environmental controls in place for oil & gas activities were not sufficient. Aware of the dangers, he was, Weatherington-Rice believes, "salting the record" so that Ohio officials could not claim that they did not know when contamination of water supplies was occurring under the practices at that time.

Though Pettyjohn's renowned piece is an academic paper, its arguments are highly accessible to the general public. The paper is of historical legal significance, underlining how

disingenuous the industry is when claiming that its practices have not impacted Ohio's waters. For instance, while the State has, over the years, upgraded the safety precautions it requires for oil & gas production activities, it remains woefully unsuccessful in preventing all current contamination events. To more fully understand how much was known about contamination events in the past, the authors strongly recommend that interested parties read through and digest Pettyjohn's research. His groundbreaking 1971 article is online at https://kb.osu.edu/bitstream/handle/1811/5637/V71N05_257.pdf?sequence=1&isAllowed=y

Pettyjohn's paper underlined how disingenuous the industry is when claiming that its practices have not impacted Ohio's waters.

Are contamination "accidental releases" still occurring?

"Accidental releases" continue to occur all along the oil & gas industrial chain, from production to distribution to waste disposal. For the sake of brevity, the authors will discuss just two different potentially catastrophic releases that have occurred in recent years here in Ohio.

The first happened in the pitch of night on March 5, 2016 when a "brine" truck hauling toxic waste, mislabeled "sweetwater" by the industry, was traveling from an unconventional shale oil & gas well in Noble County to a SWIW just off I-70 in the Belmont/Guernsey County area. On this rainy night, the driver decided to take a back road on State Route 800 that crossed the upper end of the City of Barnesville's main reservoir when his truck slid off the road, overturned, and dumped its load into the headwaters of the reservoir.

According to the Safety Data Sheet manifest that listed the contents of the spilled tanker, the truck was transporting approximately 4,600 gallons of "brine." Once this toxic fluid mixed with the waters in the reservoir, it rendered the waters unsafe for human consumption. The Ohio EPA took the reservoir off line for more than two months to allow time for spring rains to flush out the reservoir and bring contamination levels to below the Maximum Contaminant Levels (MCLs) for contaminants of concern. Though Barnesville hosts the only source of drinking water for an 80 square mile area in parts of four counties in eastern Ohio, a larger water crisis was averted due to two other reservoirs that were able to supply their system during these two months [Figure 8]. *For coverage of the accident, see Sean Eiler's report on WTOV Fox news*[15]*, and the article "Ohio EPA Not Sure What Gulfport Dumped into Barnesville Reservoir," published in The Intelligencer/Wheeling News Register*[16].

FIGURE 8: BARNESVILLE MAIN RESERVOIR, MARCH 9, 2016

Source: underlay, Google maps with graphics added by Columbus Community Rights Coalition

A completely different kind of potential catastrophe occurred in the spring of 2017. The Texas company responsible for constructing the Rover gas pipeline across Ohio spilled an estimated two million gallons of drilling muds into a Class III wetland along the Tuscarawas River in Stark County. Originally considered to be a simple mixture of bentonite clays to support the tunneling under the river, the drilling muds were later found to include illegal diesel fuel that the company had added to make the drilling muds slipperier. The diesel fuel transformed the muds from being basically harmless to highly toxic.

Initially unaware of the additive, the Ohio EPA required Rover to remove the drilling muds from the wetland and dispose of them safely, but it was the Federal Energy Regulatory Commission (FERC), the agency that governed the pipeline construction, which determined the disposal sites. FERC located old sand and gravel quarries for the disposal of the waste muds and, without checking with US or Ohio EPAs, ordered the use of two quarries that were part of the recharge network for the City of Canton's Sugar Creek wellfield and the City of Massillon's wellfield. As a result, millions of gallons of what was supposed to be non-toxic drilling muds were transported to the wellfields.

Fortunately, the Ohio EPA discovered what had happened and ordered the drilling muds be immediately removed from the quarries. It also ordered public water suppliers to install monitoring wells between the quarries and their production wells and to stop pumping those wells until the situation was safely resolved.

Nonetheless, the Rover incident represents one of the worst-case scenarios of the disasters Ohioans face when different agencies on the federal level are not properly communicating with each other. The two wellfields involved contain more than half the available drinking water in the Canton-North Canton-Massillon region and would have been incredibly expensive to replace—if replacing them was even a possibility. Ohioans need to understand how perilously close Canton came to losing its water supply.

Environmentalists and local reporters did their best to alert the public through extensive coverage of the ongoing disaster. In its 2018 update on the Rover's drilling muds fiasco, the Ohio Environmental Council reminded Ohioans that "those fluids have not yet surfaced, but they must go somewhere." Therefore, warned Melanie Houston, the Council's Managing Director of Water Policy & Chief of Organizational Planning, these dangerous fluids continue to "pose a serious risk to the river, groundwater, and a nearby Category III Wetland." Calling out the weaknesses of both federal and state laws, Houston urged state leaders to reconsider the sufficiency of their regulations to prevent another Rover-type disaster.[17] *For descriptions of the contaminants' effects on local wetlands and quarries, see Matt Reynolds's 2018 Mint Press News' article on the subsequent State of Ohio lawsuit against Rover Pipeline.*[18]

The Ohio Attorney General took Rover Pipeline to court in 2017, and the case was appealed to the Ohio Supreme Court in 2021. At this point, its outcome is not clear.[19]

What does all this mean for Central Ohio and the 20-plus communities that rely on Columbus's drinking water sources? See the Special Section, "What Happens in Morrow County Doesn't Stay in Morrow County," (page 34).

SUMMARY

Oil & gas production in Ohio has a long and checkered history that has left an estimated 300,000 drilled wells in the state. Today, agencies do not know the location of many of the older wells or have accurate records if they are properly capped. Over time, oil & gas production activities have led to the contamination of Ohio's drinking water due to well leaks, broken pipes, accidental spills, and fires. The industry's adoption of "enhanced recovery" methods to dispose of its chemical-laden liquid waste, or "brine," has greatly increased the risks to water sources and led to earthquakes in Ohio. In 1971, hydrogeology expert Professor Wayne Pettyjohn published his landmark article documenting the disingenuous nature of the industry's claims that its practices do not harm Ohio's waters. His purpose was to alert the State that its environmental controls for oil & gas activities were dangerously weak. Recent accidental releases of contaminants illustrate that Ohio authorities have failed to fully heed Pettyjohn's warnings.

SPECIAL SECTION : What Happens in Morrow County Doesn't Stay in Morrow County

Before the recent fracking boom in Ohio, two other oil & gas booms occurred in Morrow County, located just forty miles north of Columbus. The first hit the area around the turn of the last century and the second, sixty years later. As fracking activities do today in this third rendition, so did the frantic drilling for oil in the 1960s present risks to the Columbus watershed and the 20-plus downstream communities it serves.

The 1961 completion of a discovery well in Morrow County sparked, as geologist Wayne Pettyjohn later described it, a "flurry of wildcatting and speculation."[14] So dramatic was the transformation of rural communities into oil boomtowns that the story gained national coverage. *Time* magazine reported in 1964 that "derricks have sprung up in clusters on front lawns, in narrow alleys and in vegetable gardens," and one was even located on the "home plate on the baseball field at the Edison Junior High School." In a nod to the potential hazards of the industry, the February 21 article pointed out that the school's young students would not be hosting home games that season.[20]

Expectations of oil field-driven financial windfalls and faith that government officials were putting their safety first, many locals welcomed the development. Asked about the hundreds of oil rigs popping up, producing eerie orange skies, and emitting foul "acrid stench," one man declared these potential dangers as the "smell of wealth." Decades later, Evelyn Long, local columnist and long-time resident of Morrow County, shared her memories of those heady drilling days of the 1960s. Her recollections consisted not of sustainable prosperity (which remained elusive for most), but the spate of costly incidents—rigs toppling over, fires breaking out, and even explosions—that knocked down phone lines, destroyed buildings, and leaked gas into the air.[21]

Drawing fewer headlines at the time were the effects of this intense drilling (more than 2,000 oil wells) and disposal of the resulting toxic brine. In 1967, Ronald Boster presented his Master's thesis on ground water contamination caused by oil-field brine in Morrow and Delaware Counties. Boster's research found that because "few people took the necessary conservation measures to protect their ground-water resource" during the early 1960s, a considerable proportion of their aquifers suffered contamination. According to Boster, "millions of gallons of oil-field waters were disposed of in Morrow County through bulldozed unlined pits, while countless truckloads of brine were dumped into Shaw and Whetstone Creeks, the two main effluent streams traversing the main oil production area."[22]

Four years later, Pettyjohn's groundbreaking publication, "Water Pollution by Oil-Field Brines and Related Industrial Wastes in Ohio" (discussed on pages 29-31), provided additional data on the state of Morrow County's water sources following the 1960s oil boom. His paper revealed that once the effects of brine disposal began to appear in groundwater, especially during the height of the era's drilling and brine disposal years (1964-65), "many domestic and stock wells had to be abandoned." Consequently, communities that had once relied on their own wells for their water needs were forced to haul in water or have it "pumped from new and

deeper wells at considerable cost." Pettyjohn's data confirmed that by 1967, dilution had considerably decreased the concentration of chloride in most areas. In the others, however, chloride concentration remained above safe levels. Laying out the situation in clear terms, he advised authorities that "ground-water resources may be seriously and perhaps irreparably contaminated long before landowners are even aware that a problem exists"[14].

As had Boster, Pettyjohn detected contamination in surface water sources in and around Morrow County, although "generally to a lesser degree" than found in the groundwater. He then listed three causes of contamination: "(1) dumping of brine directly into water courses, (2) intentional draining of evaporation pits into streams, and (3) natural discharge of polluted ground water into stream channels." Drawing, in part, from a 1964-1966 study conducted by the Ohio Department of Health, Pettyjohn noted that "surface-water samples taken at time of low flow in Whetstone, Alum, and Blacklick Creeks as late as 1967 still contained above-normal concentrations of chloride"[14].

Boster's and Pettyjohn's prescient warnings hold even more import today when oil & gas activities are injecting ever greater volumes of toxic and radioactive fracking brine in old oil wells. Fifty years ago, Pettyjohn made sure to alert local authorities how the "utilization of salt-water disposal pits caused the ground water to become so severely contaminated locally that in many instances the chloride concentration in the ground water was greater than that of the brines discharged into the disposal pits." Furthermore, he cautioned, the effects may be far from temporary. Instead, "water-bearing strata contaminated by brines may remain unusable, depending on the degree of contamination and on hydrologic conditions, *for years, decades, or even millennia* (emphasis added)"[14].

Today, fracking and the disposal of its toxic and radioactive waste in Morrow County pose even greater threats to the Columbus watershed than did drilling for oil in the past. As the map [Figure 9[23]] indicates, there are 13 Class II injection wells (signified by red dots) positioned in watersheds (dark gray) upon which Columbus (in black) and adjacent communities rely for drinking water.

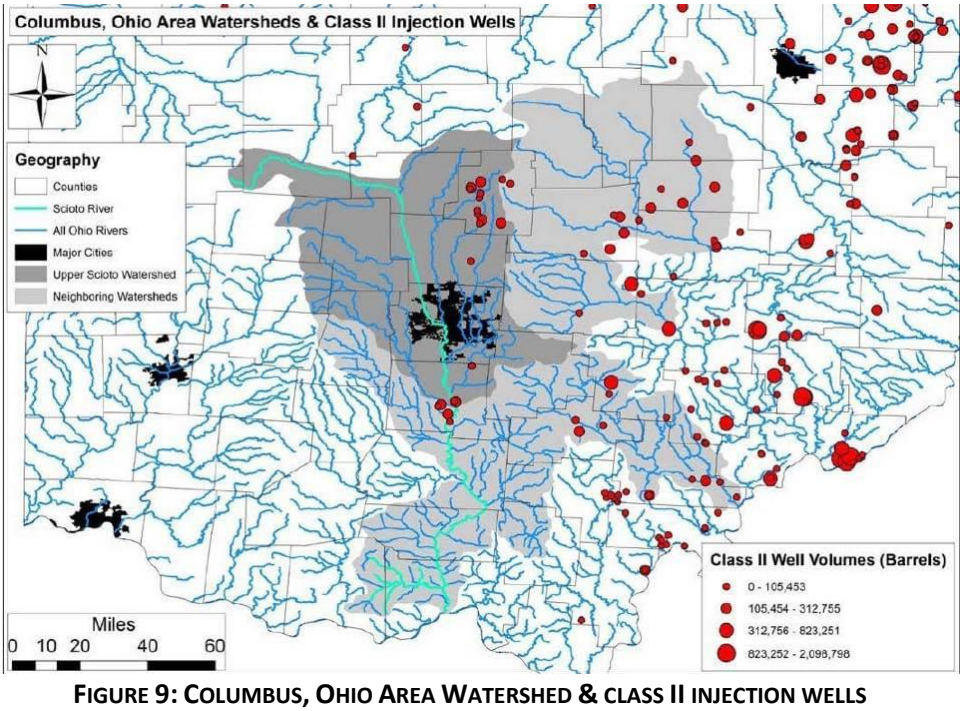

FIGURE 9: COLUMBUS, OHIO AREA WATERSHED & CLASS II INJECTION WELLS

While government assurances of the safety of these operations alleviate few concerns among those familiar with the industry's history in the area, they justify the permits that the state issues to the oil & gas industry to frack around Ohio. It also allows the industry to use Morrow County as one of its major toxic brine disposal sites. Readers should be aware that Ohio also takes in fracking waste from Pennsylvania and West Virginia.

Since the formation of the Division of Oil and Gas in the Ohio Department of Natural Resources in 1965, the agency has more regulations in place than during the first and second Morrow County oil booms. Now, our concerns are about over-pressurized injections wells forcing excess radioactive brine into faults and uncapped wells whose locations may have been forgotten. We have no idea how far this pollution may spread. Clearly, much bolder public policies are needed to effectively protect Columbus's water sources.

Recalling the 1960s oil boom, Pettyjohn observed that "the serious and widespread effects of brine pollution are rarely recognized by most individuals, including those in *state legislatures who formulate and pass into law the regulatory procedures* (emphasis added). Because contaminations in water recognize no boundaries, Central Ohioans today can no longer afford the same complacency.

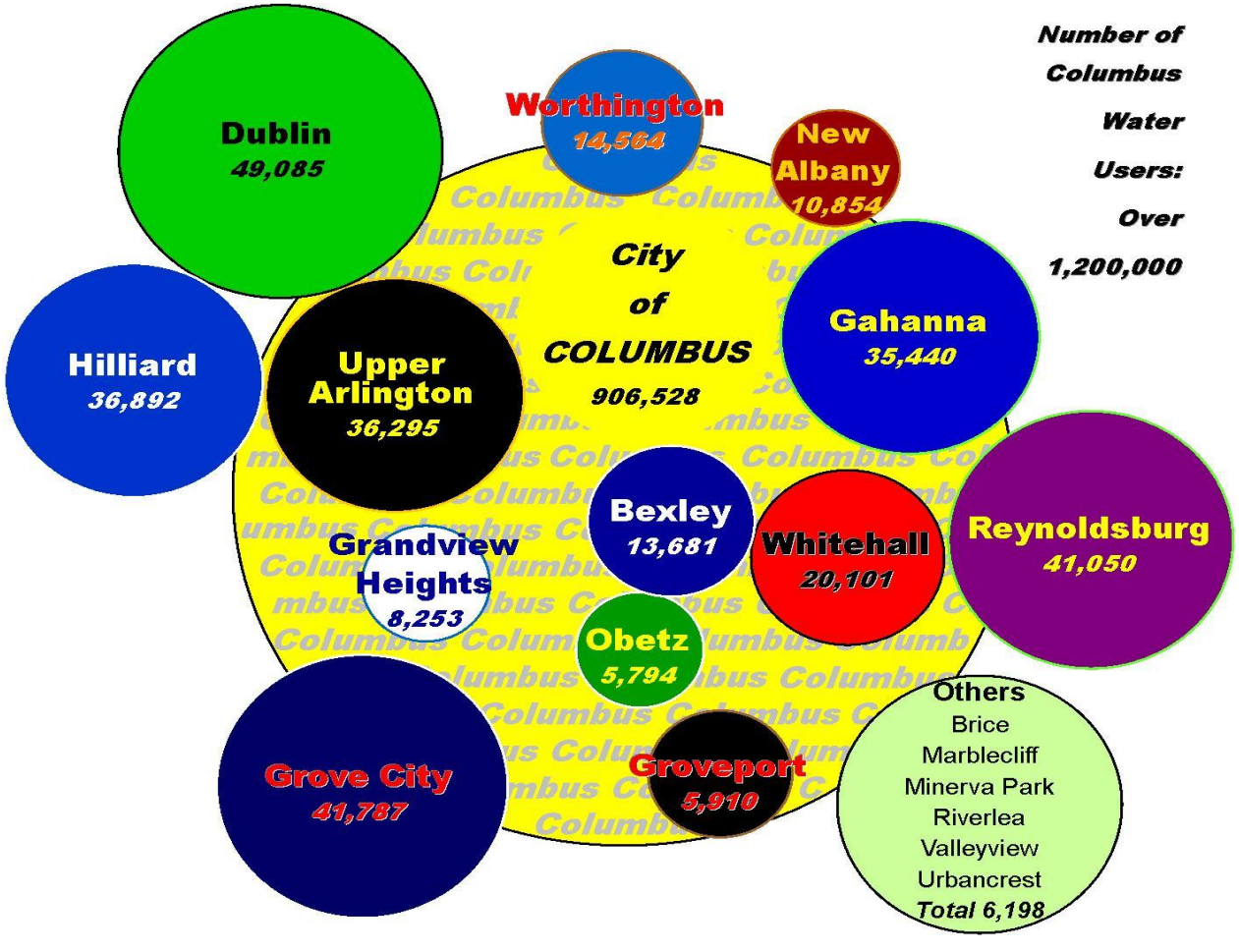

FIGURE 10: COMMUNITIES AND POPULATIONS RELIANT ON COLUMBUS WATER SOURCES

Source: Columbus Community Rights Coalition

Chapter 5: Is Ohio improving the contamination situation?

Two case studies, Barnesville Reservoir and Canton's Sugar Creek wellfield, provide cautionary tales on how much progress the State has made to protect drinking water from oil & gas contamination in the last 60 years. The reality is, not very much. On the surface, it may appear differently. After all, ODNR DOGRM now requires that all new well pad applications specify if they are within the 5-Year Time-of-Travel from a groundwater public water supply or outside the 100-year floodplain of a surface water stream. This rule also applies to Class II injection wells and Waste Treatment Facilities. As can be seen in Figure 11, those limitations are mapped on the interactive state oil & gas map. This clip from the statewide interactive map of the area around Mount Air, Ohio shows both the 100-year floodplain and the 1- and 5-Year Time-of-Travel zones for the Mount Air and the Worthington Hills wellfields.

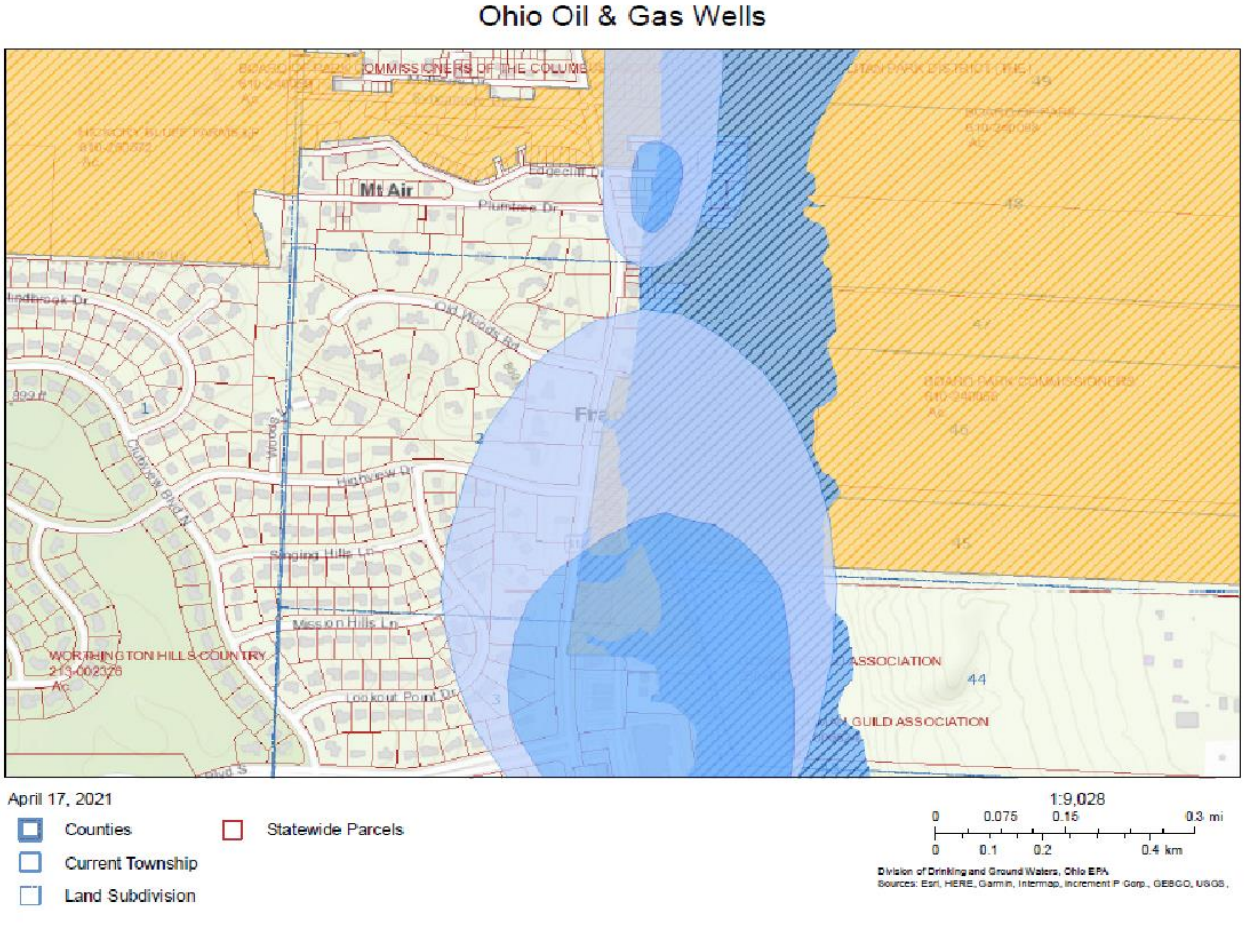

FIGURE 11: WORTHINGTON HILLS SWPA (FRANKLIN COUNTRY, OHIO)

Source: ODNR DOGRM [6]

A deeper dive into these reported progressive steps reveals that most groundwater sources and floodplains are narrow enough that with horizontal drilling, any resource under the protected water source can be reached from drill pads outside the boundaries. The protection for surface water source water protection areas, however, is much more limited. The placement of new wells is restricted to a location outside of the 100-year floodplain and 1000 feet upstream from the water intake point. The obvious reason for the lower level of protection is that in a surface water setting, the watershed extends to the ridgeline, marking a much larger area that would need to be off limits for modern drilling.

Since Ohio must reimburse the owner of the mineral rights for any resources that they cannot tap under its "lands unsuitable" criteria for drilling or mining, Ohio simply cannot afford to deny drilling permits for these larger areas. Ohio appears to have more discretion in the matter of locating SWIWs. Yet to be tested are the Ohio Constitution's 2008 revised rules governing the protection of groundwater resources which may trump access to mineral rights.[24] How this relates to Class II injection wells and waste treatment facilities will be discussed in Chapter 11.

Oil & gas (and coal) operators have received the majority of waivers from toxic and hazardous substances rules and regulations from the federal level. They are exempt from the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)[25], the Pollution Prevention Act, the Resource Conservation and Recovery Act (RCRA)[26], the Superfund Amendments and Reauthorization Act (SARA) [27], and the Toxic Substances Control Act (TSCA)[28]. The only two federal laws that apply to oil & gas are the Emergency Planning & Community Right to Know Act (EPCRA) [29], and the Occupational Safety and Health Act (OSHA)[30].

Oil & gas (and coal) operators have received the majority of waivers from toxic and hazardous substances rules and regulations from the federal level.

As we have seen, these exemptions have had devastating consequences for many Ohioans. For instance, because of exemptions, Barnesville could not prevent the tanker truck hauling "brine" from driving near the upper end of their reservoir. Had the truck been hauling sulfuric acid or bottles of concentrated Clorox bleach, which Ohio more strictly regulates, Barnesville authorities could have restricted its passage through their Source Water Protection Area, and the accident near the reservoir never would have happened.

The blunders that led to the Rover drilling muds release and contamination incident are even more convoluted. Pipeline construction is regulated on the federal level by FERC officials whose mandates concern pipelines and transmission. Waters of the state, including drinking

waters, however, do not come under their jurisdiction. Furthermore, the Trump administration at that time was aggressively pushing to deregulate activities and reduce coordination between sister agencies. Therefore, to the best of anyone's knowledge, FERC never checked with the US EPA, let alone the Ohio EPA. Had it checked, FERC would have learned that the Tuscarawas River and its associated Class III wetlands are waters of the State of Ohio, and, as the highest quality wetlands, are subject to Section 404 (US Army Corps of Engineers)[31] and Section 401 (US EPA through Ohio EPA) wetland restrictions.[32] In addition, FERC only authorized Rover Pipeline, L.L.C to use non-toxic bentonite and water in their drilling mud slurry, not diesel fuel which is highly toxic, so Rover violated the terms of their FERC permit. FERC further compounded the errors by not checking with US and Ohio EPAs as to the locations of public water supplies before granting Rover permission for disposing of the diesel contaminated drilling mud.

Even if Rover fully operated within the limits of its permit, adding non-toxic muds to the quarries next to the wellfields could still have resulted in a groundwater quantity impact because the quarries also serve as groundwater recharge basins. Therefore, both FERC and Rover caused potential harm to the public water supplies, yet under FERC, this harm was not a consideration or a question of liability.

Had the Ohio EPA and the City of Canton not been able to save the wellfield, replacing the water supply would have fallen completely to the residents of Canton. This is because the State of Ohio does not hold its EPA responsible for the cost of replacing water supplies. These costs—to be borne by the City of Canton alone—would have been enormous given that the only other source in the region that could quickly be developed is a surface water source from the reservoir miles away near Alliance. Developing that resource would require the construction of a pipeline from Alliance to Canton's water treatment plant, the upgrading of that plant to treat surface water, and, in the best of circumstances, 1.5- to 2 years [Figure 12].

Because there are no state or federal funds available for this purpose and because oil & gas companies typically carry low environmental impact bonds, the entire cost would have been borne by Canton's ratepayers.

Then there is the phenomenal cost of such a venture, approximately $130 million dollars at the time. Because there are no state or federal funds available for this purpose and because oil

& gas companies typically carry low environmental impact bonds, the entire cost would have been borne by Canton's ratepayers.

Clearly, the situation has not significantly improved since the Morrow County gas boom in the 1960s discussed earlier.

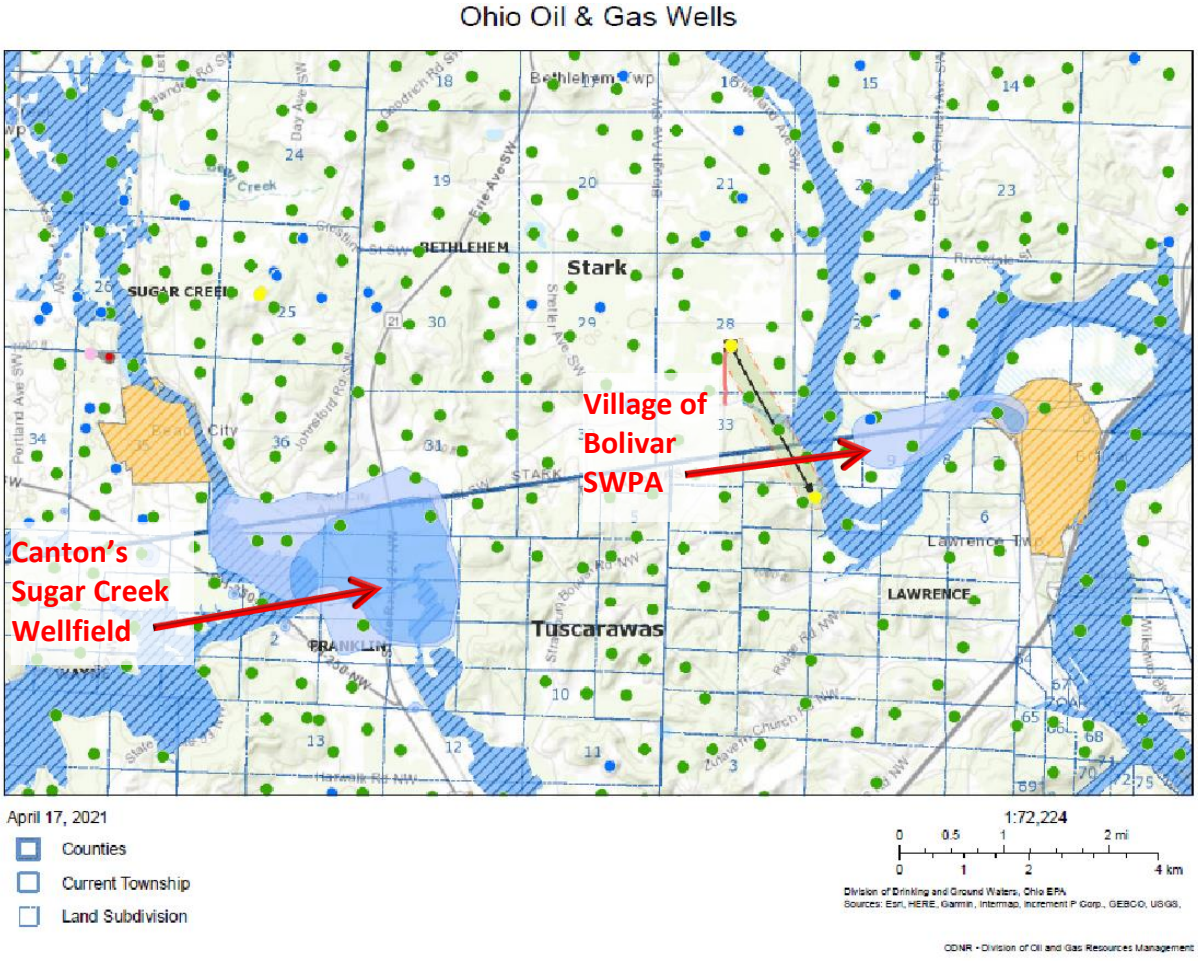

FIGURE 12: CANTON'S SUGAR CREEK WELLFIELD WITH HISTORICAL OIL & GAS WELLS LOCATED IN THE 1- AND 5-YEAR TIME-OF-TRAVEL

The quarries used to dump the Rover drilling muds are located along the Sugar Creek 100-year floodplain. *Source: ODNR Website – Well Locator* [6]

Note: *An interactive map of Oil Source Water and Oil, Gas and Waste Wells is available at fractracker.org.*[33]

SUMMARY

Ohio's responses to potential hazards from oil & gas production are as uneven as they are complex. Between federal exemptions and state legislation that largely protect the oil & gas industry, communities are usually unaware of the real threats they face from nearby oil & gas operations.

Chapter 6: Expectations of the City's Source Water Protection Management Plan pertaining to oil & gas activities

One of the biggest challenges in making a good source water protection plan is identifying everything that needs to be included, and then finding stakeholders who, collectively, are experts in all of those topics. The original team does not have to know about each facet; it just needs to find someone who does. If a team is too narrowly limited, topics are going to be misunderstood and/or missed altogether. That is what happened with the Columbus Master Plan on the topic of oil & gas. Team members did not have a geologist who knew about oil & gas, nor did they know that they needed one.

All that oil and gas needs to cause a problem IS a place to leak.

Stakeholder team members listed on the Columbus SWPMP did recognize that oil & gas posed a concern and designated it as a point-source issue—as opposed to an everywhere non-point source. In other words, they assumed that oil & gas problems were confined to wells, transmission lines, or spills. In fact, all that oil and gas needs to cause a problem IS a place to leak, a factor that may not involve human intervention at all.

The plan also needed to address the spreading of oil & gas production fluid "brine" for road deicing or dust control. Even though this is a factor in significant portions of Morrow County, the team failed to address it at all.

Another way to think about contamination from oil & gas is to think about how mushrooms grow in the woods. When a person goes for a walk in the woods, they often find clumps of mushrooms. The automatic assumption is that this is the location where mushrooms grow. In actuality, that is only where the fruiting body of the mushroom breaks through the surface [Figure 13[34]]. In its mycelium stage, that same mushroom can grow throughout the whole forest, including into the roots of trees, all the while acting as a nutrient transport and communication network for the whole forest. While the

FIGURE 13: MUSHROOMS BY A TREE STUMP

Courtesy of W.carter,https://commons.wikimedia.org/wiki/File:Mushrooms_by_a_tree_stump_5.jpg

mushroom is everywhere, an observer only sees the place where it fruits on the surface. Although it may not fruit there next year, it is still there, under the ground, and waiting to break out later somewhere else.

Likewise, oil & gas is everywhere in Ohio. It is formed in the black shales. The original hydrocarbon source falls as dead organic material into a sea that has little to no oxygen in the water, an anaerobic sea, much like the Black Sea today. When the dead organic matter is stockpiled in the black muds, it is stored as the muds become rock. More kinds of rock are formed on top of the now black shale, like limestone and sandstone which were laid down in a sea that had oxygen. Then the ocean becomes quiet again and fine-grained siltstones and more shales are laid down.

This occurred all over Ohio, over and over again, and over hundreds of millions of years. Slowly, that dead organic material in the black shale broke down to become oil & gas. Much of it stayed in the black shale while some migrated into the overlying limestones and sandstones where it was again trapped by an overlying fine-grained siltstone or shale where it remains until it can find its way up and out. Older formations moved up into younger formations.

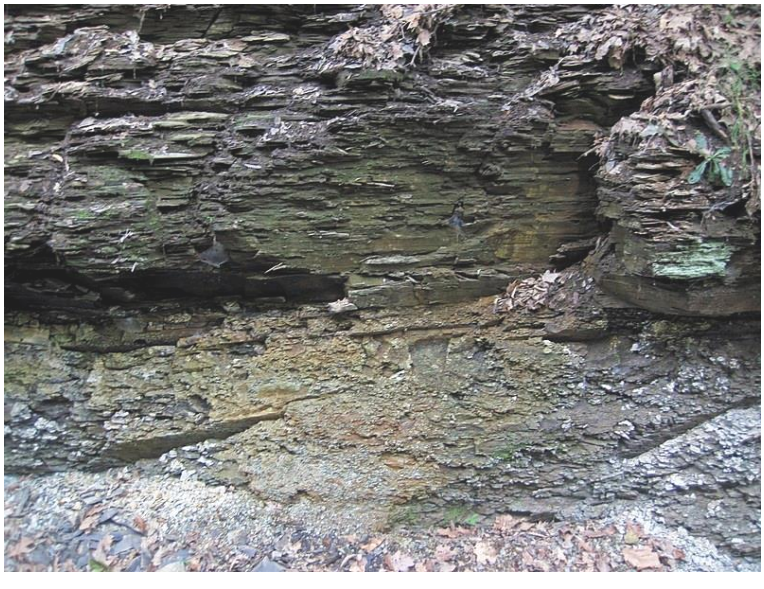

FIGURE 14: OHIO SHALE-OLENTANGY SHALE DISCONFORMITY (UPPER DEVONIAN; HIGHBANKS PARK, LEWIS CENTER, OHIO)

Source: J. St. John, Creative Commons 2.0 [35]

That is what happened to the oil & gas that was trapped in the Columbus and Delaware limestones on the west side of the Scioto River watershed underneath the Ohio Black Shale. When the Ohio Black Shale eroded away, the older oil & gas reserves were exposed to oxygen and turned to asphalt. An observer can still see remnants of those materials as natural asphalt in the rocks exposed in quarry walls in Delaware and Franklin counties [Figure 14]. Oil & gas remain in lower formations below the next trap rock. It is possible to identify deposits from the well summary cards from ODNR DOGRM. See Appendix A, Well Summary #1 for an example of a domestic gas well that was drilled in Radnor Twp., Delaware County. *For more information on this fascinating topic, visit the ODNR website page, "Petroleum Geology"*[35].

When determining possible pollution points for oil & gas in the watershed regions, the first question is: Where are the holes and the cracks? The second question is: Are the area's oil & gas wells taking oil & gas out or are they putting production waters in? For every identified and operating oil & gas well for which the State has records, there are three to four wells that

are old and abandoned and whose locations have been lost to time. These still may serve as conduits to the surface and will continue to do so until they are located and properly plugged. The identification of these routes of contamination becomes even more difficult in the western part of the watersheds because of the presence of sinkholes that can act as transport systems for old and abandoned wells or natural fracture routes. *Again, a visit to the ODNR DOGS website will provide an introductory education on the topic. Its 2011 leaflet summarizing the Delaware County Karst Mapping Project is a good place to start.*[36]

As Ohio public water suppliers are beginning to see in the eastern part of the state, when addressing potential contamination from a SWIW, all they need to establish is the transport route. The injection well will supply the product. This is what makes the careful monitoring of SWIWs so critical. Because the State does not require anyone else to monitor the directions and volumes of flow, it is imperative that the City conduct its own monitoring of where the injected fluids go. Anyone else discovering the exit point(s) for SWIWs and how they may intersect with surface water resources would be purely happenstance. The safety of the City's water supply ought not be left to chance.

SUMMARY

The CCRC reviewing team recognizes that one of the biggest challenges in formulating a water safety plan is identifying all the issues, concerns, and factors that need to be included, and then finding stakeholders who collectively are experts in all of those areas. The Columbus plan highlights a cautionary tale as to why these are important elements. Its stakeholders' insufficient knowledge of the industry's history in Ohio has contributed to the City's inattention to water safety as it pertains to oil & gas activity. Investigations are needed to enable the City to establish and monitor all possible threats to Ohio's water sources and to invite stakeholders who have the knowledge and expertise to address them.

Chapter 7: Authors' baseline expectations of initial report

Given the historical and geological background information laid out in the paper, the authors prepared to review the City of Columbus SWPMP. First, however, they considered their baseline expectations of the plan. The following were organized prior to reviewing the documents that the City sent in February 2021.

1. **A section in the report that discusses potentially contaminating land uses in the Source Water Protection Management Plan (SWPMP) zone.** This section should have described and discussed everything from warehouses to car repair shops and anything else that could potentially contaminate the watershed and/or the reservoirs. It should include oil & gas production wells, SWIWs, and areas of "brine" spreading on roads for deicing and dust control. It should also discuss how often each site is inspected, investigated and what data they collect on each one. The PDF document "Columbus Source Protection Report" has potential contamination sites, but only very close to the intake point in the City. It needs to be expanded to the entire watershed area, as stated below.

2. **A map that includes all potential contamination sites.** The oil & gas well location map should look like the ODNR DOGRM interactive maps that are online. Indeed, that should have been the source of their baseline information. The locations should have been field-verified. There should also be information on distribution pipelines and hauling routes to the SWIWs and from the production wells. There should be information on the surface/groundwater monitoring points around each of these locations. It is critical that Columbus conducts its own monitoring project because no one else is required to have an ongoing monitoring program. The well owners are only required to notify ODNR in case of an accidental release above a certain volume. The monitoring points could be a map and a set of tables. How often do they monitor? For what? What are they finding?

3. **Regular discussions with local authorities and stakeholders on the track record of these locations over time.** These scheduled discussions should address the problem of the underlying risks and the history of cleanups, cooperation, and related aspects. CCRC knows there have been accidental releases and fires at some of these sites in the last decade. Is that information captured?

4. **Definable and actionable resolutions when documentation reveals wells requiring remediation**. CCRC knows there are a multitude of ODNR well inspection reports discussing conditions that either have shut down operation of injection wells within the SWPA or identified problems that must be fixed.

5. **Periodic discussions of plans to find all other possible sources for release of pollutants in the watersheds.** Since no other official entity has searched for and found these sources, there is no ongoing monitoring. This is a potentially dangerous situation for Ohioans. Significant volumes of leaked materials can occur at these unidentified and located sites, especially from SWIWs. As has been seen, they can be many miles away from the injection well sites.

With the above objectives in mind, the authors began their review of the City of Columbus Source Water Protection Management Plan.

SUMMARY

With the essential background information regarding the safety of local water sources as it pertains to the oil & gas industry, the CCRC team of citizen scientists set a list of baseline expectations prior to conducting its review of the City's SWPMP. This included evidence of the City's direct attention to land uses, potential contamination sites, and resolutions to threats. The team also expected to see regularly scheduled meetings between City authorities and stakeholders for the purposes of evaluating risks, discussing continued monitoring, and organizing and taking steps to protect the City's water from oil & gas activities.

Chapter 8: Authors' findings when reviewing the city's SWPMP

What did the authors find when reviewing the City's Alum Creek & Hoover Reservoirs/Alum and Big Walnut Creeks Management Plan?

It is hard to determine just which areas are within the EMZ and CMZ zones on the large-scale map below [Figure 15]. However, it appears that the CMZ encompasses the area of Sunbury and a number of the streams entering Hoover Reservoir from the east. It is not clear from this scale if there is a buffer around each stream, perhaps the 100-year floodplain or wider, or not. Clearly any activity occurring near one of those streams could easily end up in the reservoir where dilution would be the only means of addressing contamination.

Only 100 feet of buffer around bodies of water and 100-year floodplains are recognized in the Ohio Administrative Code (OAC) by ODNR DOGRM. It does not appear that there are any designated EMZ or CMZ areas around Alum Creek. It is not clear from this section of the report if regulators had assumed that since Alum Creek Reservoir is a feeder to Hoover Reservoir, any contaminants entering Alum Creek would be diluted before becoming an issue in Hoover Reservoir.

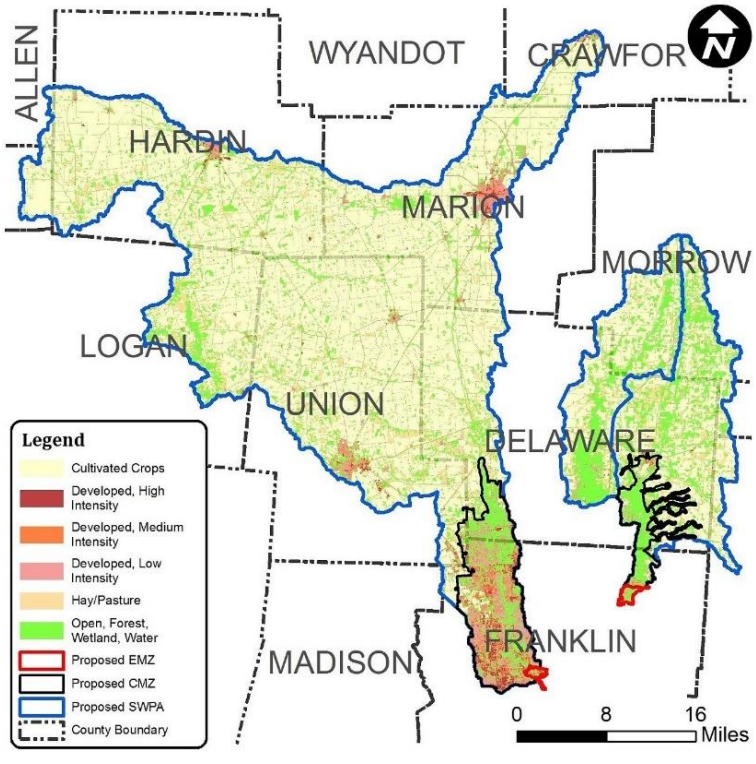

FIGURE 15: AGRICULTURAL AND DEVELOPED LAND USES IN THE SWPMP
Source: Source: City of Columbus Watershed Master Plan, Section 3

The following is copied from the City of Columbus Watershed Masterplan, Section 3.

3.3 CMZ-Scale Data Collection

To further characterize potential contamination threats within the proposed Corridor Management Zones (CMZs), the WMP team collected additional detailed information for these smaller areas. This data includes inventories of a broad range of potential commercial, industrial, waste, and transportation sources. In most cases, these data were not readily available at the watershed- or state-scale, and must be compiled by county or municipality.

Table 3-4 summarizes the data types collected to characterize the watersheds, the corresponding categories and codes from Ohio EPA guidance documents, and the data source. Table 3-4 only includes categories that pose a significant potential contaminant source for the DRWP and HCWP proposed CMZs, determined from the project team's engineering judgment and watershed land uses.

Table 3-4 CMZ-Scale Potential Source Data Collection

Category	OEPA SWAP Guidance Sources	Data Source
Oil and Gas Wells	Oil or Gas wells	ODNR
Oil and Gas pipelines		National Pipeline Mapping System, US DOT

TABLE 4: EXCERPT FROM THE PUBLISHED TABLE 3-4 THAT DISPLAYS THE ONLY LISTINGS OF O&G THREATS

Potential contamination sources are covered in section 3.3.1, reproduced below from the City of Columbus Watershed Master Plan [Table 5].

3.3.1 Oil and Gas Facilities

Oil and gas facilities are a potential contaminant source for drinking water sources because of potential spills. In addition to the toxicity of oil and gas themselves, the substance used to process and extract them are also often toxic.

An inventory of all oil and gas-related wells in Delaware and Franklin Counties resulted in 27 oil and gas-related wells in the proposed CMZs. Of these, none are currently active extraction wells; all are stratigraphy test wells, dry wells, or expired (no longer active) wells.

However, several oil and gas pipelines pass through the proposed CMZs. **Figures 3-14 and 3-15** show the approximate alignment of oil and gas pipelines in the proposed DRWP and HCWP CMZs, respectively. Some gaps in oil and gas pipelines exist in the maps; these gaps are artifacts of the original dataset obtained from the National Pipeline Mapping System (US DOT). The liquid petroleum pipeline crossing the proposed HCWP EMZ may be of particular concern from a source water protection perspective. There are also several pipeline crossings in both proposed CMZs: 3 pipelines crossing the Scioto River, 15 crossing Scioto River tributaries, 2 crossing Big Walnut Creek (1 in the proposed EMZ), and 12 crossing Big Walnut Creek tributaries.

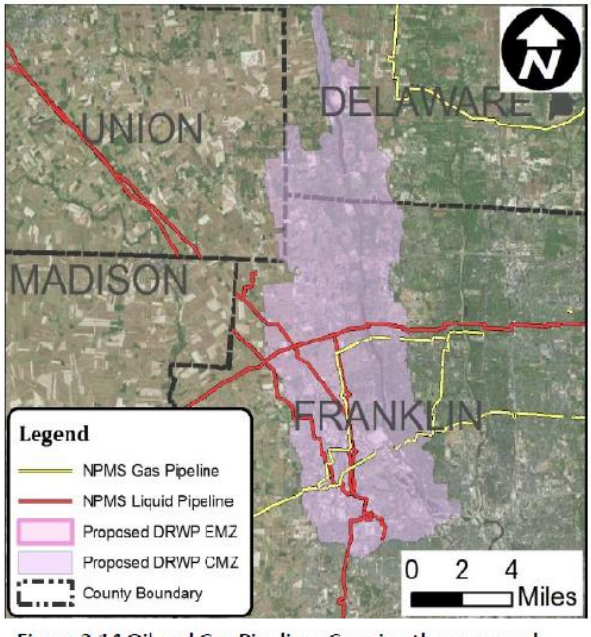

Figure 3-14 Oil and Gas Pipelines Crossing the proposed Dublin Road CMZ

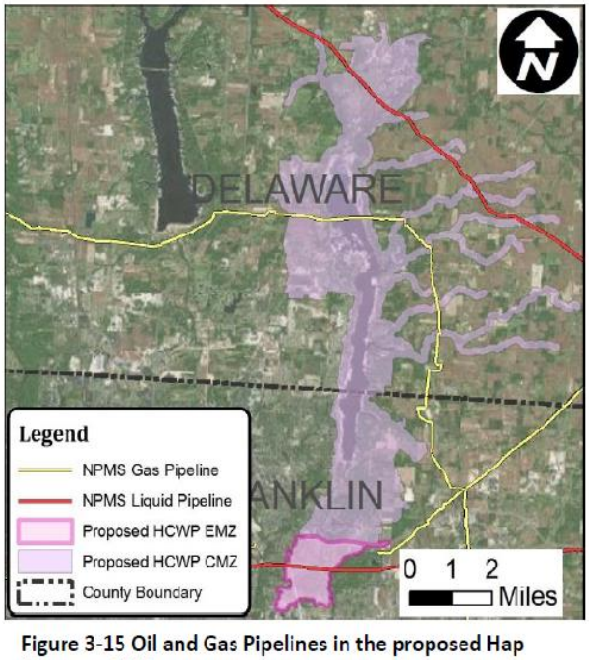

Figure 3-15 Oil and Gas Pipelines in the proposed Hap Cremean CMZ

TABLE 5: DISPLAY OF PAGE INFORMATION ABOUT OIL & GAS FACILITIES

Figure 16 includes locations of Columbus public water monitoring points and oil & gas waste injection wells. Dublin Road source water area in tan and Hap Cremean source water area in green.

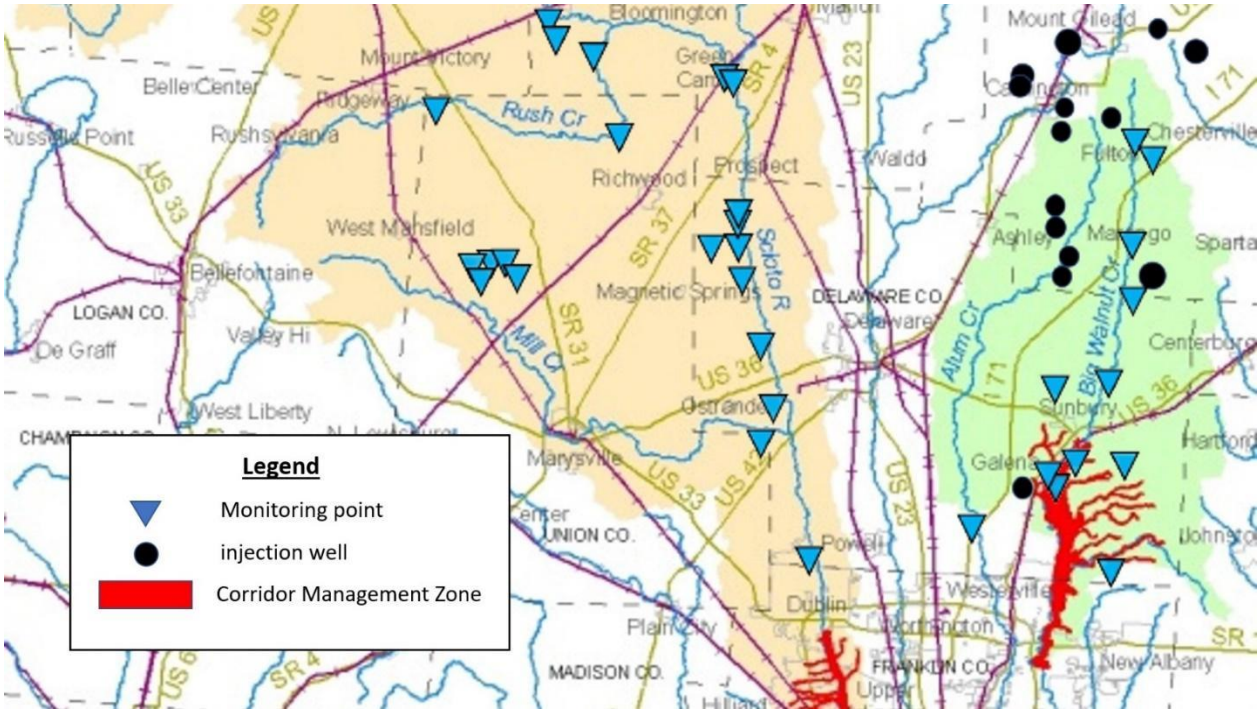

FIGURE 16: PORTION OF COLUMBUS PUBLIC WATERSHEDS WITH INJECTION WELLS AND MONITORING POINTS

Source: underlying map base: Ohio Environmental Protection Agency, 'Drinking Water Source Protection Report for the City of Columbus Public Water System,' 2003[37] *and graphic overlays: Columbus Community Rights Coalition*

SUMMARY

The Columbus SWPMP leaves its readers unconvinced that the boundaries of the management zones (CMZ and EMZ) for Columbus public water leading to the supply reservoirs are broad enough to ensure the safety of our source water. Ohio rules that set boundaries to keep contamination threats at bay from source water seem very minimal. Oil & gas pipelines exist that are laid through tributaries and an EMZ for one of the Columbus water treatment plants, which do not seem to allow for a safe distance from our water if a pipeline breach were to occur. The oil & gas threat inventory for the Columbus Watershed Master Plan does not appear to take into account the Class II injection wells and oil & gas wells, both producing and abandoned, in the source water protection area north of the reservoirs and mainly in Morrow County.

Chapter 9: What Is missing in the current Columbus Source Water Management Plan?

When reviewing Section 3.3.1 of the Columbus SWPMP [Table 5], the authors were struck by the disconnect between the statement in the second paragraph of the text and the data available on ODNR's Oil & Gas Well Locator map. The second paragraph states

> An inventory of all oil and gas-related wells in Delaware and Franklin Counties resulted in 27 oil and gas-related wells in the proposed CMZs. Of these, none are currently active extraction wells; all are stratigraphy test wells, dry wells, or expired (no longer active) wells.

Yet a review of a map of the area [Figure 16] clearly shows one SWIW and five oil & gas wells in the immediate vicinity of the CMZ that are either still actively being pumped and/or have never been properly abandoned.

Even if one of the wells falls within the "no longer active" classification, so long as it has not been properly abandoned, it remains a potential source of significant contamination to the surface or near surface of the reservoir. The reason for this situation is the lack of the series of steps that must be undertaken to properly abandon an oil & gas well or a SWIW. These are needed to make certain that a well can no longer create a conduit from the production/storage formation, up the well to the near surface/surface. Figure 17 is labeled with some of the identified well locations. *Appendix A provides well summary cards for each of these wells, nos. 1-7).*

Why are the summary cards important? The data on the cards show the dates they were brought on line, their production records except for the Alexander #6 SWIW, and, most importantly, that there are no abandonment dates. In other words, those well casings are STILL OPEN. *The Alexander #6 SWIW has its own set of complications as may be seen in Appendix A.*

What does it take to "abandon" a well? It is not just enough to shut in the well at the surface, where the pipe bringing the oil, gas, and production brine carries them to a local storage tank or a line. Rather, everything in the well must be removed and the entire length of the hole must be grouted shut with a "cement" grout.

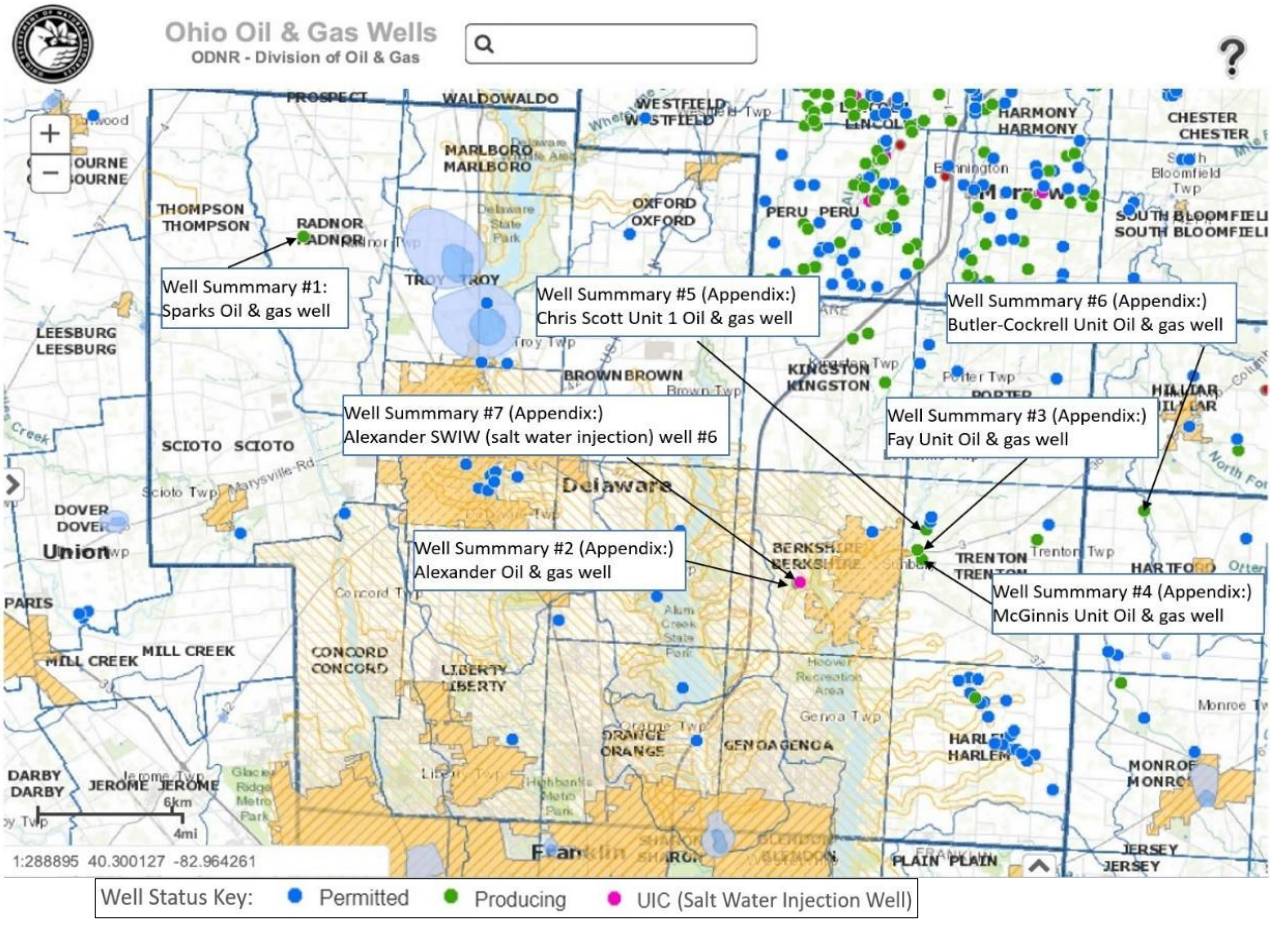

FIGURE 17: LOWER MORROW & DELAWARE COUNTY (INCLUDING SUNBURY REGION) OIL & GAS WELL MAP WITH THIS REPORT'S WELL SUMMARY SHEETS

Source: underlying well map: ODNR Website[6] *and labels: Columbus Community Rights Coalition*

The typical oil & gas well is made up of a series of casing strings. One of the casings extends well below the elevation of potable groundwater in the area to protect public and private water wells from contamination. In areas of coal mining, another casing string must be included to seal off the first level of subsurface coal mining. There must be a separate internal casing for each underground coal seam encountered. In eastern Ohio, there could be as many as three to four sets of casings just for underground coal mines.

If an area has historically been drilled at a shallower elevation, then that producing unit must be cased off with yet another string of casings if a deeper formation is scheduled to be developed. It is possible that up to five, six, seven, or more strings of casings have been set and cemented in the hole. There is also an internal pipe that is used to pump up the oil/gas/production "brine" or pump down the production water into a SWIW.

As can be expected, it is a time-consuming and expensive job to properly abandon a well before grouting it shut. However, if all necessary steps are not carried out, the potential for failure and leakage up or down the bore hole is very real, resulting in contamination of shallow drinking water sources and/or surface water sources and soils. Failures can occur for a variety

of reasons, from leakage from nearby SWIWs to gas buildups underground. Remember, the producing formations are all connected underground, even if they are only connected to the surface by bore holes and high angle/vertical faults, joints, and fractures.

Producing formations are all connected underground.

So why isn't simply shutting off the top pipe stem sufficient if all those casings are still in the ground? The answer can be easily visualized if observant homeowners think about the plumbing in their own houses. For instance, those who live in all-electric houses that have a guest bedroom and bathroom that is seldom used may decide to have the water taps turned off at the sink and shower and to check them once a month when they go in to give the room a dusting. Over time, they will discover that the packers in the faucet valves are breaking down and the valves developing little leaks. These are easily resolvable problems that homeowners may fix themselves or call in plumbers to replace the packing. If homeowners check on a regular basis, incumbent leaks should not be too bad and therefore easily repaired.

Now say that one of these homeowners decides to take the family to Florida for a month in winter. She duly stops the mail and newspaper deliveries and engages a friend to stop by once a week to check on the house. Though the homeowner remembers to set the furnace to 50 degrees, she neglects to turn off the water main to the house and drain the lines. While the family is away, a Polar Vortex hits Columbus. The electricity shuts off during the sudden wind chill of 20 degrees below zero. As temperatures within the house plummet, all of the water pipes freeze solid. With the taps closed, the house experiences a whole series of split pipes. Eventually the electricity comes back on, and the ice in the pipes melt, yet this marks the point in which the problems for this family are just beginning. Because the faucets were all shut, the water pressure, once resumed, blows out through the split pipes. The homeowner's erstwhile friend, unable to check on the house for more than a week during the vortex crisis, is unaware of the ensuing damages. Imagine the catastrophes awaiting the family upon its return because of the shut off faucets.

That is not exactly what happens underground, but the scenario does help envision why all the piping around wells has to come out of the hole. The hole must be completely cemented shut before anyone can assume there will be no migration up the bore hole to shallow potable water and/or the surface.

Columbus Dispatch reporter Anna Staver gives a glimpse of how the problems of improperly capped wells manifest themselves across the state in her September 2022 article, "Abandoned oil wells in your backyard? Ohio is searching for at least 36,000 of them." While interviewing Carroll County residents Dennis and Vicky Moore, she learned of their 16-year plight of living with an abandoned well on their property. Though they **"**could smell the oil that was still in the ground and had seeped up," recalled Ms. Moore, the company, which by then was defunct, refused to take responsibility. "They pretty much said 'tough. It's your headache,'" she added. Staver notes that until recently when the State stepped in to resolve the issue, the couple had constantly worried "about oil seeping into their drinking water or a sinkhole appearing or a leak that could have forced them to evacuate."[38]

The article included a host of other improperly capped orphan well incidents. Among them were a gas leak from under the gym floor of a Lorain County elementary school; a farmer's water source in Stark County contaminated with natural gas; a toxic leak into people's yards in the small town of Yorkville, and another two separate leaking events in Noble County. Other wells are situated in more populated urban areas. As senior researcher at the Ohio Valley River Institute Ted Boettner warned Staver, "What we're finding out is thousands of these orphaned wells are leaking," adding that "some of the volatile organic compounds (like methane) pose serious public safety concerns."[38]

It is up to the people of Columbus to address potential oil & gas contamination.

Probably the most important take-home message of this section is that no one is actively checking the down-hole situation when a well is no longer producing. There are thousands of wells all over Ohio in exactly this situation yet not enough staff or orphaned well funds available to properly abandon them. Due to the prohibitive costs, the well owners do not want to take the necessary measures if they do not have to. Furthermore, the well generally has not yielded enough products in recent times to pay for its closure expenses. To additionally complicate matters, for every known abandoned well in Ohio, there are three to four lost wells—and state authorities do not even know where to look for many of them. For all these reasons, if Columbus is going to address potential oil & gas contamination, it is up to our City, Watershed Volunteers, and Citizen Scientists to make sure that happens. Clearly, no one else is going to do it.

SUMMARY

Even if one well falls within the State's "no longer active" classification, so long as it has not been properly abandoned, it remains a potential source of significant contamination to the surface or near surface of reservoirs. Failures can occur for a variety of reasons ranging from leakage from nearby injection wells to gas buildups underground. Because producing formations are connected underground and liquid follows the path of least resistance, fracking waste can easily migrate to old unsealed wells and rise to the surface and into groundwater. Finding these wells and properly capping them is critical to preventing the transmission of fracking wastewater into groundwater. Therefore, the City's Water Management Plan must also include a map with all wells—from those used for tests to those marked as abandoned, still working, or sealed. This chapter also contains a description of how to properly seal a well and several examples of the consequences when these steps are not taken. It also recognizes that the prohibitive costs of doing so, coupled with weak legislation governing the industry, disincentivizes well owners from taking these measures. This chapter's most important message is that, with no other entities being held responsible for the dangers lurking underground, it is up to the City and Central Ohioans to step up to locate and secure these wells.

Chapter 10: Bringing the City of Columbus SWPMP up to standards

What is needed to bring the Columbus's Source Water Protection Management Plan up to standards that fully recognize the impact of oil & gas production in Ohio?

CCRC has identified four major components that should be added to the Columbus SWPMP to ensure that it meets the standards of management plans developed elsewhere. Eastern Ohio is a good example of public water supply management recognizing that oil & gas development is a major, non-conforming land use (i.e., a land use that is not within the allowable parameters) in the source water protection areas that can and has significantly contaminated the public water supply.

1. The first consideration is to develop a water monitoring and testing program for the current oil & gas production wells and SWIWs that are in or near CMZ or EMZ areas. Any well that has not been properly abandoned and grouted shut should be considered a source of near-surface and surface contamination. Since no other state or federal agency is charged with protecting Columbus's drinking water, it is up to Columbus to provide that oversight. Because the City may not have the necessary hydrogeological expertise on staff to undertake developing such a plan, CCRC is more than willing to work with the City to identify experts with federal and state agencies who could assist Columbus in creating such a monitoring and sampling plan.

2. The second major consideration not addressed in the document is the number of active SWIWs within the Source Water Protection Area. While these wells are not within the City's CMZ or EMZ, many of the highway routes traveled to reach them are. These are active wells which are injecting significant volumes of toxic production brines and fracking chemicals that would quickly contaminate raw drinking water resources if accidentally released into one of the reservoirs or a contributing stream.

   There are a variety of sources that identify and locate the SWIWs in the two watersheds; however, they do not agree. A public records request was made in January 2022 for an accurate listing of the active and pending SWIWs in the two watersheds. After an almost three-month wait, ODNR DOGRM denied the request. *(See Appendix C for the email denying the request for information and for the potential list of wells, location maps of these SWIWs, and the scope of these operations.)*

   Columbus needs to develop a database of these wells, including documentation of their typical truck transport routes, to determine where and how they intersect with the City's water resources. Because these operations are federally exempt, Columbus does not have the ability to reroute the tanker truck delivery routes to the SWIWs. Therefore, the City needs to monitor these routes at potential impact locations. Monitoring can include

truck traffic counts; field verifications of small and unreported seeps and spills from the trucks; and responses for any accidents that occur at potential contamination locations.

While ODNR DOGRM has an emergency management reporting system,[39] it is critical that Columbus understands that the City is NOT in the notification linkage if the emergency happens within their Source Water Protection Area. It is up to one of the notified agencies to let Columbus know, assuming that they know where the boundaries are. It is astounding that, while ODNR DOGRM can be told what was released, it is forbidden by Ohio law to pass that information on to the potentially affected public water suppliers so that they can test and monitor for the released chemicals.

There have been attempts to remove this prohibition. In 2015, Ohio EPA tried to get it removed from that year's Ohio Budget Bill, and, in 2017, the Ohio Environmental Council tried again. Both efforts failed. What this means for Ohioans is that when accidental releases occur in vulnerable portions of the watershed, the City is unlikely to know it happened, much less what was spilled. Columbus must develop community oversight observation and reporting teams.

While it may appear that residents who do not drink Columbus water have no vested interest in supporting this effort, they actually do. Local spills and accidental releases affect local private drinking water sources as well. If Columbus is willing to collect samples and test them to determine what contaminants are present, it will be able to share its findings with local communities whose drinking water is also impacted but who often do not have the financial resources to collect and test potentially contaminated releases.

3. The third critical missing component of the SWPMP that requires consideration is a database of historic accidental releases in the watershed. At this point, CCRC is aware of at least three accidental releases. Descriptions of each follow:

- **Accidental Release #1 (Holmes County, 2015) Big Walnut Creek Spill**
  Donna Carver of the *Galion Inquirer* reported on the first of these accidental releases that on the evening of April 15, "an observant passerby alerted authorities ... to a suspected crude oil spill in Mill Creek," located on Marengo's Bennington Township Road 213. Noting that it "runs through Fishburn Services property," Carver described the contents as having a "strong smell of crude and a dark black substance and oily sheen." Despite the efforts of Fishburn employees to contain the spill, much of it was left free to flow into a storm drain.[40] This paper's authors recognize that the Fishburn Services property, which was handling the crude oil, should be classified as a waste treatment facility. At this time, it is not clear if it is because ODNR DOGRM has refused to supply that information.

- **Accidental Release #2 (Morrow County, 2016) Truck and Train Collision** The second accident of note occurred on May 6, 2016 when a train traveling at 60 mph crashed into a brine tanker truck. The collision resulted in the spillage of 3,200 gallons of toxic waste water in Morrow County, just outside of Columbus. A local resident told Jen Miller, who at the time represented the Ohio Sierra Club, that the "fumes were horrible" and could be smelled from a distance. Recognizing the spill as yet another example of "the danger of dirty energy sources," Miller informed the *Columbus Dispatch* that "Ohio doesn't have a tracking system for accidents like this." If the State did have a tracking system, she said, it could "better protect our workers, residents and communities from tragic accidents like this one." The Director of Water Policy and Environmental Health for the Ohio Environmental Council, Melanie Houston, echoed Miller's concerns. Recalling the earlier Barnesville incident of the overturned tanker truck (discussed in Chapter 4) and its toxic content that "made its way to one of the village's reservoirs," Houston asserted that "both wrecks show Ohio needs stricter regulations over the oil and gas industry." As things stand, she added, the industry need not even disclose the chemical compounds it uses to drill"[17].
- **Accidental Release #3 (Morrow County) Tanker Truck Fire** The third accident occurred when a tanker truck caught fire at a SWIW, also in Morrow County, and burned until a hazardous materials-equipped fire truck located in Delaware County could reach the scene. Though several community members recall reports of this accident at the time, this paper's authors have been unable to find references to the event. This brings to light another obvious concern. The missing report on this incident may well signify the occurrence of other accidental releases that have not been properly reported.

While the City is not part of the official notification system for ODNR's Emergency Response Program, it is completely within its rights to request accident and incident reports from ODNR DOGRM and maintain its own database. Creating such a database would enable the City to observe repeated patterns of accidental releases that may have a negative impact on the City's water resources. Because knowledge is power, it is always wise to maintain internal records.

4. The fourth missing component is a determination to locate orphan wells. Ohio must adopt a process to locate its estimated 150,000 or more orphan wells and seal them as soon as possible. Considering the aforementioned orphan wells and the concerns over missing records, it is important to note that while people have been drilling for oil & gas in Ohio since 1860, the only available oil & gas records in this part of the state are from the 1960s and later.

The Morrow County oil & gas drilling boom centered on the Trempealeau formation which is fully four formations deeper than the Trenton Limestone [Figure 18].

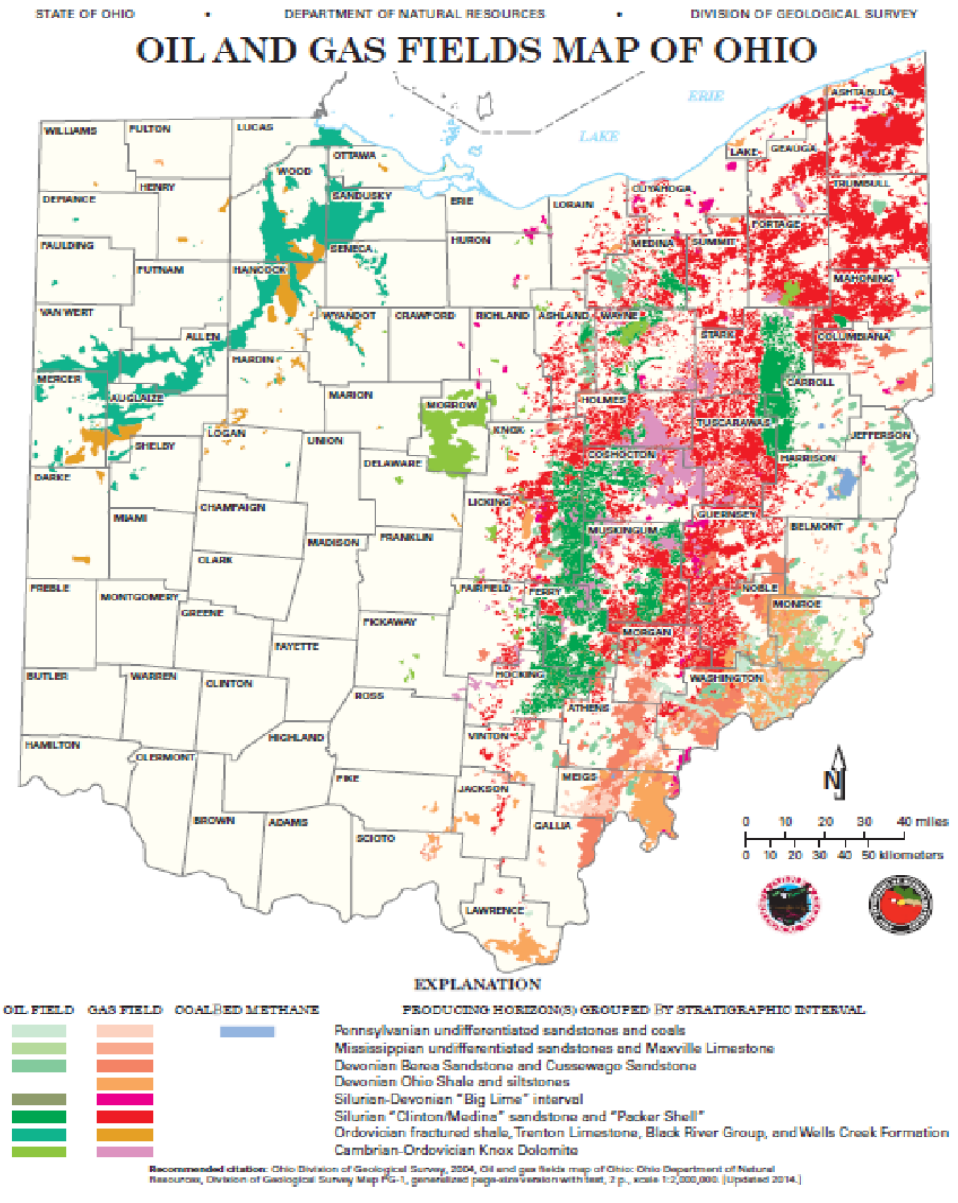

FIGURE 18: OIL & GAS FIELDS MAP OF OHIO
Source: ODNR Website[6]

This zone covers most of Morrow County, with a few small spots in the surrounding counties and significant areas of non-producing Ohio surrounding it. While not every well in the region for which there is a well completion card is producing from the Trempealeau formation (some are backed up to the Clinton Sands above the Trenton), they all appear to be drilled to the targeted Trempealeau formation. Additionally, all appear to have been drilled beginning around 1960, one hundred years after oil & gas drilling started in Ohio.

The lack of any documentation of earlier oil & gas activities begs the question: Where are all the other old wells? Ohio history shows that the oil & gas boom in the state began about 1880 in the Rockefeller Standard Oil Lima-Findlay oil field. The State knows that early drilling activities were virtually unregulated, and the major producing zone was the Trenton Limestone. This zone is still producing. In eastern Ohio it is the Utica black shale horizontal zone that is producing. The State is also aware that unregulated oil & gas drillers drilled all over Ohio in search of the Trenton, but it appears that the Trenton either does not yield oil & gas in the Morrow County general area, or it played out years ago.

This begs yet another question: Why, if the Trenton was not yielding in Ohio in the Morrow County area, did drillers suddenly, around 1960, begin drilling all the way down to the Trempealeau formation as indicated on this map to include the Cambrian-Ordovician Knox Dolomite? The answer is they didn't. Drillers instead were experimenting with deeper and deeper wells in the area until they hit the Trempealeau formation. Once a few test wells came in, the oil rush was on.

150,000 to 200,000 of Ohio's early wells

are lost in time.

But what happened to those 80+ years of abandoned test wells that were drilled and left long before Ohio developed an Orphan Well Program? In fact, nothing happened. They are still out there, possibly with casings pulled and perhaps with a black locust fence post shoved into the top of the hole or a big rock sitting on top of it. Because of their ages, no one knows where they are, and there is no way of ensuring that they are not open contaminant routes to the near surface and surface drinking water sources. They are part of those missing 150,000 to 200,000 early wells that are lost in time.

There is a way to try and recover the approximate locations of at least some of those old wells, and that is by searching old historical land records and local histories. This paper's scientific advisor knows from personal experience that Morrow County has a particularly fine Historical Society and Museum that has prided itself in documenting the industrial history of the region as well as other historical issues.

There may be records in the Morrow County and the Delaware County Historical Societies as well that would help to identify locations of earlier drilling activities. Local archives, the usual preserves of town newspapers, could prove useful in this regard while inquiries among multigenerational farming families may yield knowledge of where abandoned wells are located on their property. Once general locations are

identified, experts may be able to locate old, abandoned wells using a methane sniffer, a method that has proved quite successful in Pennsylvania. Searches for historical land records and local histories certainly would be worth exploring for areas around the CMZs and EMZs.

There is another way, although one strongly discouraged, to carry out local searches for abandoned wells. Considered in western Ohio before sounder thinking reigned, the plan was to simply create a series of SWIWs down to the Trenton and then pump production brine into them until the toxic fluid flowed to the surface. While this method may identify the location of missing abandoned wells which could then be grouted shut, it risk contaminating the region's drinking water in the process. For this reason, the authors do not recommend this approach.

While the City works to include these four missing components to the SWPMP, CCRC encourages it to urge ODNR DOGRM to insist on the proper abandonment of wells that are no longer producing. Leaving those wells open invites contamination to surface and near-surface drinking water. While owners and operators are responsible for the final proper closure of their wells, they often slip away and leave the orphaned wells behind. If Columbus takes the "squeaky wheel" approach and continues to make a case for properly abandoning wells within its Source Water Protection Area, the City stands a chance of having that happen. *For more information about orphan wells, see the ODNR website's Orphaned Well Program pages*.[41]

SUMMARY

The CCRC team identified the following four essential components that are missing in the current Source Water Protection Plan:

1) a monitoring and water testing program for the current oil and gas production wells and injection wells that are in or near corridor or emergency management zones,

2) a current map with the number of active injection wells located within the source water protection area that have the potential to contaminate the water,

3) a record of historic accidental releases in the watershed, and

4) a determination to locate the estimated 150,000 or more orphan wells in Ohio and seal them as soon as possible.

Chapter 11: Local zoning, resolutions, ordinances, and Ohio bills and laws have impacts

One potentially contaminating land use that **is** missing from the City of Columbus's report is the spreading of oil & gas production fluids, referred to as "brine," as a deicer and dust suppressant of rural roads. Supposedly limited to production fluids from traditional vertical wells, this is an old practice in Ohio that goes back at least to the 1930s and one that ODNR DOGRM has been trying to stop since the mid-1980s. The Agency's original concern pertained to the BTEX (Benzene-Toluene-Ethylbenzene-Xylene) residuals in the fluids[42].

With the advent of the horizontal drilling of black shale wells, studies in the U.S. and beyond began finding significant volumes of cancer-causing radioactive metals in the fluids.

In his 1986 *Akron Beacon Journal* article entitled "State Agencies to Push for Ban Against Oil-Well Brine on Roads," Jim Carney reported that health and environmental agencies were lobbying for legislation to outlaw the practice of spreading oil-well brine for ice and dust control on roads in Ohio and to ban the annular disposal of brine. "The decision to lobby to ban brine on roads," he explained, "comes in the wake of results of a chemical analysis of oil-well brine around the state that found high concentrations of the cancer-causing chemical benzene as well as concentrations of toluene and xylene." Quoting ODNR's Deputy Thomas Sherman, Carney wrote, "Until we do further research, we will not know whether benzene is entering the groundwater from oil-field brine." Until then, Sherman advised, Ohioans "must take action to ensure the safety of our drinking water supplies."[42] *See Appendix D for related articles.*

ODNR DOGRM's unsuccessful attempts to prevent "brine" spreading led to its gathering of additional data to support its case against the practice. In the 1990s, officials learned of the significant levels of heavy metals in the fluids which had known harmful human health impacts. The advent of the horizontal drilling of black shale wells generated studies in the United States and beyond that were discovering volumes of cancer-causing radioactive metals in the fluids. Back then, no one realized that the traditional vertical well production fluids also carried high volumes of radioactive metals as well. When ODNR DOGRM began its own testing of samples in 2017, it discovered that extremely high levels of radioactive elements,

such as water-soluble radium, were present in the fluids. *See excerpt from the Brine Fact Sheet in Appendix B of this report for radium levels in ODNR test samples.*

In April 2022, Ohio House Representative Mary Lightbody (District 19) introduced H.B. 579 to ban the spreading of oil & gas production fluids on Ohio's roadways. Not until December 6 did she have the opportunity to provide sponsor testimony to the House Committee on Energy and Natural Resources where her bill had been assigned. Delivered during the Legislature's end-of-year lame duck session, H.B. 579 died. Lightbody, now representing Ohio District 4, is currently gathering additional co-sponsors before she reintroduces the bill in 2023.

Currently, any municipality, township, or county can apply to have oil & gas production fluids spread on their roads. Local authorities need only to pass a resolution or ordinance to that effect, notify ODNR, and make arrangements with a brine hauler to spread the production waste across the surface of a region. According to state regulations, the fluid need not be tested for any harmful constituents. This is because state laws assume it to be safe despite current scientific testing that demonstrates it is not.

FIGURE 19: OIL & GAS BRINE ON ROAD, GUERNSEY COUNTY

Photo courtesy of Tim Kettler

Morrow County has made arrangements to spread "brine" as have seven townships, including ones in the City of Columbus's watershed. While Delaware County only uses the potentially toxic brine on its fairgrounds, this popular communal space is where many of its residents make contact with the now contaminated dust and gravel. Most of the spreading is contracted out to a private operator. Under current laws, there is no legal mechanism for

Columbus to stop this activity. Table 6 shows brine-spreading amounts in Morrow and Franklin Counties for the years 2019 through 2021. BBLs - Greg

BRINE SPREADING AMOUNTS - MORROW & FRANKLIN COUNTIES				
Data compiled from local spreading permit annual total reports				
MORROW CO				
YEAR:	**2019**	**2020**	**2021**	
Local permit	**BBLs**	**BBLs**	**BBLs**	**TOTALS:**
Bennington twp	270			**270**
Bennington twp	5,570			**5,570**
Bennington Twp-5012 SR229		190		**190**
Bennington twp-Cardinal Campground		12,855	12,335	**25,190**
Franklin Twp		2,375	2,415	**4,790**
Franklin Twp	1,420			**1,420**
Harmony Twp	2,195		5,070	**7,265**
Hidden Lakes	740		535	**1,275**
Lincoln twp	0	0	0	**0**
Mount Gilead	0			**0**
Ntal Lime & Stone-Chesterville	777	200	450	**1,427**
Perry Twp	0			
South Bloomfield twp	0		0	**0**
ANNUAL TOTALS:	**10,972**	**15,620**	**20,805**	**47,397**
FRANKLIN CO				
Suburban Steel-Gahanna	520	400	90	**1,010**
ANNUAL TOTALS:	**520**	**400**	**90**	**1,010**

TABLE 6: OIL & GAS BRINE SPREADING AMOUNTS UNDER COUNTY PERMITS

Permits issued by Morrow and Franklin Counties (2019-2021)
Sources – data courtesy of Teresa Mills, Buckeye Environmental Council, and graph courtesy of Columbus Community Rights Coalition

CCRC recommends that the City consider approaching Morrow County and its townships to see if they might be willing to forgo the practice. This is generally not a hard sell. As of this writing, both Athens County and Franklin County have passed resolutions banning the spreading of oil & gas production fluids in those counties. The City may want to talk to our Franklin County Commissioners to better understand why they thought this action was important. There is a considerable body of knowledge supporting such a ban. *For more information on this topic, visit the Ohio Brine Task Force web page.*[43]

In addition to the raw oil & gas production fluid, a filtered version produced by Duck Creek Energy was available for sale at hardware and home improvement stores, though in violation of Ohio Revised Code. The owner of the company, David Mansbury, is seeking to remedy this sticking point for his business. Three times now, he has requested that Ohio's

House and Senate pass legislation that would take his product out of the jurisdiction of ODNR and place it under the Department of Commerce. Under the latter's jurisdiction, no one would have any method of tracking its sale and use.

The 2022 term bills that would have allowed the commercial sale of Duck Energy's filtered version of brine were Ohio House Bill 282 and Senate Bill 171. Neither bill made it out of its respective committee in 2022. Though they have been introduced and failed to pass three times and face staunch opposition from state agencies—among them ODNR, the Ohio Department of Health, Ohio Department of Transportation, and Ohio Turnpike Commission—there is a very real possibility that their backers will reintroduced them under new numbers.

In the Spring of 2021, ODNR DOGRM began revising Ohio Administrative Codes 1501:9-3 (Class II Disposal Wells and Surface Facilities)[44] and 1501:9-4 (Oil & Gas Waste Facilities).[45] This legislative activity gave the Agency a chance to extend equal protection to surface water public water supplies that they saw fit to extend to groundwater resources. Over the objections of many Ohio citizens along with public water suppliers who petitioned to protect the surface water resources equally, the revisions passed through the Joint Committee for Agency Rules Review in January 2022.

Under the new rules, the only setbacks required for permanent facilities that are known polluters are a 100-foot setback from bodies of water (streams and lakes), a 100-foot setback from 100-year flood plains, and a 1000-foot setback from the emergency zone around the water intake. Since local zoning does not apply, that means that these facilities can be located anywhere else in the source water protection area, leaving the City of Columbus with no recourse to prevent their installation. Even if oil & gas facilities are listed as not being acceptable in the source water protection management plan and supporting ordinances, they may legally operate because ODNR does not review those documents before permitting the facilities.

Even if oil & gas facilities are listed as not being acceptable in the source water protection management plan and supporting ordinances, they may legally operate. ODNR does not review those documents before permitting facilities.

Local governments can request a public meeting before the permit is issued, but they cannot ask for a hearing. Since the watershed boundaries are in Morrow and Delaware Counties for the most part, the City of Columbus would not be viewed as a local government and would have to rely on other townships, municipalities, and counties to make the request. This is, of course, disheartening news.

SUMMARY

Spreading oil & gas production fluids, or "brine," on roads for the purpose of deicing and dust suppression puts Ohio's water sources at risk, in part, to the significant volumes of cancer-causing radioactive elements in the fluids. CCRC recommends a statewide ban of the spreading of oil & gas brine on roads, as Athens and Franklin counties have done. A filtered version of this brine poses another threat. CCRC expects that bills calling for the brine's release from regulations that track its use (similar to HB 282 and SB 171) will be reintroduced in the Ohio Legislature. Additionally, new ODNR DOGRM revisions to the Ohio Administrative Code governing oil & gas wells and facilities have approved the location of these facilities within the source water protection area.

FIGURE 20: OIL & GAS BRINE SPREADING, GUERNSEY COUNTY

Photo courtesy of CCBOR

Chapter 12: Summary, recommendations, and conclusion

Summary

Public awareness of contamination incidents from oil & gas production activity in Ohio has historically been suppressed. This is especially true regarding the content of highly carcinogenic and invisible radionuclides that exist and are deposited from the solid and liquid wastes.

CCRC Recommendations for the Columbus SWPMP

For the safety of and transparency towards our communities, the CCRC recommends the following:

Testing & Monitoring Programs

- Plan to closely monitor, as necessary, injection wells in regions with oversight by the Columbus Water Department with the goal of tracking migrating contamination. *Currently, there is no monitoring upstream near the injection wells, which could establish baselines for identifying contamination getting into groundwater as detected from downstream monitoring wells. Closing the emergency intakes at reservoirs is the only protection for the Columbus water supply when oil & gas are found within 1000 feet of the intakes.*

- Conduct regular soil and water testing near oil and gas production sites, and in areas where waste brine has been spread.

- Enhance City's water monitoring specific to areas where there are signs of oil & gas waste contamination, as there are no requirements for any agency in Ohio to do this.

Public Assess Documents and Alerts

- Provide a regular community report which specifically outlines risks to watershed from oil & gas production activities by the Columbus Water Department's Columbus Source Protection Report. *This report should use information that is already available, including information on production wells, injection wells (SWIWs), and areas of waste "brine" spreading for dust and ice control.*

- Map routes of tanker vehicle travel for brine waste disposals as well as distribution pipelines in the SWPA.

- Insist on follow-up remediation if leaks or contamination are detected within a SWPA. *The City should require that problems with wells documented through ODNR DOGRM inspection reports be remedied with definable and actionable resolutions, especially where well shutdowns are required.*

- Insist on an emergency notification system for toxic releases, including spill and leakage incidents in Columbus's SWPA. *As it stands, this region is not included in the notification network with agencies in Ohio, so authorities are not allowed to notify water suppliers of*

chemicals released in spills from oil & gas facilities. Public water users should not be kept in the dark about what contaminants are present when incidents occur.

- Maintain a database of incidents that have occurred within the source water protection areas and resulted in actual water contamination or risks of water contamination to the public water resources from oil & gas production facilities. *The historical legacy of regional contamination incidents, including the examples referred to in this paper, should be part of the database.*

Collaborative Discussions

- Upgrade the credentials of the staff of the Columbus Division of Water to include people with expertise in oil & gas production, and consult with outside water specialists, including the EPA, to ensure people with the proper expertise are involved.

- Organize discussions between local authorities and user/stakeholders to ascertain new risks to the SWPA when new facilities come into operation, and when contamination events/incidents occur.

- Schedule discussions between City authorities and Morrow and Delaware County officials over halting the practice of spreading oil & gas "brines" on road surfaces for dust and ice control that puts our watershed at long-term risk of contamination from residual heavy metals and radionuclides. Advise them of the urgency of this issue. *Since 2017, Ohio state legislators have repeatedly attempted to deregulate liquid oil & gas production wastes to the extent of allowing these brines to be commoditized, bottled, and sold in stores to the general public as home deicers*.

- Ensure that residents are fully informed regarding the purchase of products that contaminate their homes with radionuclides impacting their families' health and wellness potentially causing cancers and other health concerns. *Even as new studies indicate dangerously elevated levels of radionuclides in samples of the finished products to be sold, initiatives by the industry to deregulate oil & gas wastes are favored by many Ohio representatives. It is crucial that the public understands the risks as well as recognize its right to protect its homes and communities from these harms.*

Orphan Wells

- Create a process that ensures public notice of this issue to be circulated to all stakeholders. ODNR DOGRM must aggressively implement the Orphan Well Program to locate the probable 150,000+ abandoned oil & gas wells that have no documented history, many of which may be located in their source water protection area.

    - To this end, CCRC recommends the creation of a process that ensures public notice of this issue to be circulated among all stakeholders.
    - Volunteers should be recruited and trained to walk the areas where oil and gas drilling has been known to take place. They should be trained in the use of methane detectors and given the means to chart where they have detected methane leaks.

CCRC suggests contacting schools, civic organizations, scout troops, churches, and citizens of the counties to recruit volunteers for this purpose.

- Demand that State of Ohio authorities ensure that existing state-run well capping programs for orphaned/abandoned oil & gas wells use all funds available to plug the maximum number of wells annually.

- Work with the state legislature to require that funding for the capping of wells be included with the initial permitting process, and that this funding be held in escrow until such time that the capping is completed.

Drill Cuttings

- Prohibit the dumping of drill cuttings into existing public landfills. *Because batches of cuttings can differ widely in content, every batch must be tested for radiological levels (especially radium-226 & 228). It would be cost-prohibitive to properly test each batch of cuttings to ensure they fall within the EPA limits for radium levels.*

Conclusion

In 2021, the Columbus Community Rights Coalition conducted a thorough review of the Columbus Source Water Protection Management Plan (SWPMP). Having completed its review, the Coalition urges the City to take immediate action to revise the plan as related to oil & gas activities. To aid in this effort, it has provided the reasons for this urgent request, its recommendations, and its willingness to help out.

As documented in this White Paper, a revised City SWPMP is critical to the health, wealth, and future of Central Ohio. It is also long overdue. The 160+ year history of oil & gas activities in the state has understandably encouraged a sense of complacency over its harmful effects on our water sources. Looking at the many agencies tasked with safeguarding the state's land and people, Ohioans have had every right to expect that their state and local officials are regulating the industry to ensure the maximum protection of individuals and their communities. As each chapter unfolds, however, another reality emerges, one of insufficient oversight of the oil & gas industry and the risks this presents to the Greater Columbus water supply.

The Columbus Community Rights Coalition's review of the Columbus source water protection plan also recognizes the rights of people in regard to oil & gas operations. As enshrined in the U.S. and Ohio Constitutions, Americans have unalienable rights to life, liberty, and the pursuit of happiness. Local Ohioans therefore have rights to (a) know about the harms an operation may pose to their communities and (b) take the actions they deem necessary to protect their communities from these harms. Curiously, the increasing dangers of operations that the industry employs to extract, process, store, and dispose of its products coincides with the diminishing rights of local citizens to control these operations.

The increasing dangers of operations that the industry employs to extract, store, and dispose its products coincides with the diminishing rights of local citizens to know about and control these activities.

The authors have clearly shown that, as state and federal agencies fail to fully take steps to protect Columbus's drinking water from all threats, it is up to the City of Columbus to provide the necessary oversight. Working together, city authorities, citizen scientists, and concerned locals can—and must—safeguard our water resources on which all life in Greater Columbus and beyond depends. Many residents and citizen scientists are already on board and eager for action from city officials and experts who are likewise determined to make the necessary improvements to the Columbus Source Water Protection Management Plan.

The two most important messages of this review bear repeating. First, addressing potential oil & gas contaminations in the Columbus water protection plan is a necessary step toward ensuring a healthy and prosperous future. Second, it is up to our City to make this happen. Clearly, no one else is going to save our communities, so that task is on us, Central Ohioans. We must act on this Paper's recommendations, and, given the active risks to the Greater Columbus Water Supply, we must act now.

FIGURE 21: PRIDE PARADE (2015), COLUMBUS, OHIO

Photo courtesy of CCBOR

Acknowledgements

This White Paper is made possible by a network of Ohioans and Ohio allies who are dedicated to protecting the state's water sources. Working together for the health and future sustainability of our state, this network has inspired and supported members of the Columbus Community Rights Coalition (CCRC) through personal stories, organizational advice, and hard facts and data.

Connections with grassroots environmentalists have been the backbone of CCRC efforts. The staff and associates of the Community Environmental Defense Fund (CELDF), especially Tish O'Dell and attorney Terry Lodge, have been steadfast mentors and partners since the founding of CCBOR in 2014. CELDF's resolute claims of Americans' constitutional right to local control are imprinted on each page of this report. We are also grateful to Teresa Mills, an organizer with the Center for Health Environment and Justice (CHEJ). Ms. Mills is one of Ohio's most accomplished collectors of data relating to oil & gas well waste disposals. Many of the charts in this report were created directly from the data that she uncovered, organized, and made available to others. The authors are likewise indebted to Cleveland State University professor Ted Auch and his invaluable work at fractracker.org/. He and others at the FracTracker Alliance have for many years assembled and disseminated data on oil & gas activities that proved crucial to this report.

CCRC extends a special tribute to our White Paper's scientific consultant, Dr. Julie Weatherington-Rice. A geologist for more than forty years, Dr. Weatherington-Rice has a deep and wide knowledge of the geology of Central Ohio, the effects of the oil & gas industry on our region, and Ohio's regulatory system as it pertains to both. We appreciate her patient and clear explanations to CCRC's citizen scientists.

CCRC/CCBOR also appreciates the efforts of experts employed by the Ohio agencies responsible for safeguarding our water sources. This includes those in the Division of Water, whose watershed management plan we refer to extensively in our report, and the Ohio Department of Natural Resources for their collections of data of oil & gas operations. Wholly supportive of these agencies' mission to protect the people and natural resources of Ohio, we thank all of its contributors who are dedicated to fulfilling their agencies' stated goals for the public good.

Lastly, CCRC would like to acknowledge the hundreds of local persons who have committed their time, expertise, and the occasional donation in pursuit of our shared goals to protect our natural resources and our local rights to self-government. Beyond sustaining the cause all these years, this enthusiastic support has propelled core members toward ever more intensive initiatives to achieve success, culminating most recently in this White Paper. Additionally, by showing up as they do, CCRC/CCBOR volunteers showcase the widespread public interest among Ohioans to protect Central Ohio's water, air, and soil.

The selfless support, incredible knowledge, and shared values of those acknowledged above were essential to this endeavor. While the efforts to ensure the safety of Ohio's water sources have proved far more challenging than CCRC/CCBOR members had initially contemplated, they have led to invaluable collaborations and meaningful relationships. For this, we are grateful.

Appendixes

Appendix A: ODNR Well Summary cards from several wells north of Columbus

WELL SUMMARY #1

WELL SUMMARY — **ODNR DIVISION OF OIL & GAS RESOURCES MANAGEMENT**

API Well Number	34041201290000									Permit Issued	9/26/1966
Well Name	ALEXANDER BARNEY C			Acres	171	Well No.	1			Date Commenced	7/17/1964
Owner	J-N-J OIL LLC					Well No.				Date Completed	7/27/1964
Logging Co.	Schlumberger			Core No.		Sample No.	1492				
County	DELAWARE	Township	BERKSHIRE			Quadrangle	GALENA			Zone	N
Section	3	Lot	3	Tract		Twp. Qtr.	3	Surface X	1887050	Y	208100
								Surface Lon	-82.904436	Lat	40.237204
Measured								Surface X	1855580	Y	208126
								Prop TD		Class	POOL
GL	943	DF		KB	951	LTD		DTD	3019	PB Depth	
TD Form.	TREMPEALEAU FORMATION					Prod. Form.	GULL RIVER FORMATION			Status	Producing
IP Natural				IP AT	250 BO & 20 BW			Initial Rock Pressure			Date Abandoned

Bottom X		Y		NAD27							
Bottom Lon		Lat		NAD83							
Bottom X		Y		NAD83 SPS							
Tool	RT										

Perforations	PI: 2928-2931PI: 2926-2929
Stimulations	SI: 2928-2931, Fmtn Cd: 364045, Type: ACID, Vol: 2000 Gal
Casing Record	SURF 8.625 0-412, Comment: PROD 5.5 0-3019, Comment: , Sks: 50
Log Types	Gamma Ray, Neutron, Resistivity

Formations

Formation	Top	Bottom	Source	Prod.	Non-Standard	Remarks
BIG LIME	401		Driller	No		
QUEENSTON FORMATION	1270		Driller	No		
TRENTON LIMESTONE	2300		Driller	No		
BLACK RIVER GROUP	2526		Driller	No		
GULL RIVER FORMATION	2889		Driller	Yes		
GLENWOOD FORMATION	2938		Driller	No		
TREMPEALEAU FORMATION	2942		Driller	No		

Formations

Formation	Top	Bottom	Source	Prod.	Non-Standard	Remarks
BIG LIME	401		Driller	No		
QUEENSTON FORMATION	1270		Driller	No		
TRENTON LIMESTONE	2300		Driller	No		
BLACK RIVER GROUP	2526		Driller	No		
GULL RIVER FORMATION	2889		Driller	Yes		
GLENWOOD FORMATION	2938		Driller	No		
TREMPEALEAU FORMATION	2942		Driller	No		

Annual Production

Year	Quarter	Source	Oil (Barrels)	Gas (MCF)	Water (Barrels)	Remarks
1993	N\A	RBDMS	1092	0	4385	
1995	N\A	RBDMS	1457	0	4315	
1996	N\A	RBDMS	1512	0	4570	
1997	N\A	RBDMS	1662	0	5015	
1998	N\A	RBDMS	1580	0	4100	
1999	N\A	RBDMS	968	0	3940	
2000	N\A	RBDMS	1611	0	3940	
2001	N\A	RBDMS	1422	0	4210	
2002	N\A	RBDMS	1023	0	4550	
2003	N\A	RBDMS	1031	0	4550	
2004	N\A	RBDMS	1751	0	6305	
2005	N\A	RBDMS	1200	0	4845	
2006	N\A	RBDMS	10825	0	4505	
2009	N\A	RBDMS	1270	0	4820	
2010	N\A	RBDMS	1436	0	6230	
2012	N\A	RBDMS	1647	0	5770	
2013	N\A	RBDMS	1579	0	5980	
2014	N\A	RBDMS	1434	0	5860	
2015	N\A	RBDMS	850	0	3920	
2017	N\A	RBDMS	0	0	0	
2018	N\A	RBDMS	0	0	0	
2020	N\A	RBDMS	240	0	2760	
2021	N\A	RBDMS	2093	0	4565	

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https://gis.ohiodnr.gov/MapViewer/WellSummaryCard.asp?api=34041202940000

WELL SUMMARY #2

WELL SUMMARY — **ODNR DIVISION OF OIL & GAS RESOURCES MANAGEMENT**

API Well Number	34041201290000							Permit Issued	9/26/1966
Well Name	ALEXANDER BARNEY C		Acres	171	Well No.	1		Date Commenced	7/17/1964
Owner	J-N-J OIL LLC				Well No.			Date Completed	7/27/1964
Logging Co.	Schlumberger		Core No.		Sample No.	1492			
County	DELAWARE	Township	BERKSHIRE		Quadrangle	GALENA		Zone	N
Section	3	Lot 3	Tract		Twp. Qtr.	3	Surface X 1887050 Y 208100	Bottom X Y	NAD27
							Surface Lon -82.904436 Lat 40.237204	Bottom Lon Lat	NAD83
Measured							Surface X 1855580 Y 208126	Bottom X Y	NAD83 SPS
							Prop TD	Class POOL	Tool RT
GL	943	DF	KB	951	LTD		DTD 3019	PB Depth	Date PB
TD Form.	TREMPEALEAU FORMATION				Prod. Form.	GULL RIVER FORMATION		Status Producing	
IP Natural			IP AT	250 BO & 20 BW			Initial Rock Pressure		Date Abandoned
Perforations	PI: 2928-2931PI: 2926-2929								
Stimulations	SI: 2928-2931, Fmtn Cd: 364045, Type: ACID, Vol: 2000 Gal								
Casing Record	SURF 8.625 0-412, Comment: PROD 5.5 0-3019, Comment: , Sks: 50								
Log Types	Gamma Ray, Neutron, Resistivity								

Formations

Formation	Top	Bottom	Source	Prod.	Non-Standard	Remarks
BIG LIME	401		Driller	No		
QUEENSTON FORMATION	1270		Driller	No		
TRENTON LIMESTONE	2300		Driller	No		
BLACK RIVER GROUP	2526		Driller	No		
GULL RIVER FORMATION	2889		Driller	Yes		
GLENWOOD FORMATION	2938		Driller	No		
TREMPEALEAU FORMATION	2942		Driller	No		

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WELL SUMMARY #3

WELL SUMMARY — **ODNR DIVISION OF OIL & GAS RESOURCES MANAGEMENT**

API Well Number	34041203700000					Permit Issued	6/9/2021
Well Name	FAY UNIT	Acres	20	Well No.	1	Date Commenced	9/20/2006
Owner	MFC DRILLING INC			Well No.		Date Completed	9/26/2006
Logging Co.	Core Laboratories, Columbine, Completion Services, Inc., Ohio Division of Geological Survey, Renegade Services, Tally Drilling Services, Workover Solutions	Core No.		Sample No.			

County	DELAWARE	Township	TRENTON		Quadrangle	SUNBURY			Zone	N		
Section		Lot 6	Tract		Twp. Qtr.	2	Surface X	1905700	Y	211570	Bottom X	1905725
							Surface Lon	-82.837649	Lat	40.247031	Bottom Lon	-82.837600
Measured	2145'NL & 340'EL OF LOT 6, 2ND QTR TWP.						Surface X	1874231	Y	211596	Bottom X	1874256
	Target: 500'SL & 2120'ELOF LOT 6, 2ND QTR. TWP.						Prop TD	3200	Class		Tool	SERV

GL	1035	DF	1041	KB	1042	LTD	3393	DTD	3393	PB Depth		Date PB	
TD Form.	TREMPEALEAU FORMATION					Prod. Form.	TREMPEALEAU FORMATION			Status	Final Restoration	
IP Natural				IP AT	25 MCF & 10 BO		Initial Rock Pressure				Date Abandoned	5/19/2022

Perforations	PI: 3205-3215, # Shots: 40
Stimulations	SI: 3205-3215, Fmtn Cd: 371020, Stim In: CS, Type: ACID, Vol: 400 Gal, Acid%: 15, Cmmnt:
Casing Record	T1 2 0-0-0, Comment: CND* 11.75 0-42-0, Comment: , Sks: 65 SRF* 8.62 0-824-0, Comment: , Sks: 260 PROD 4.5 0-3366-0, Comment: , Sks: 100
Log Types	Not Logged

Formations

Formation	Top	Bottom	Source	Prod.	Non-Standard	Remarks
BIG LIME	643		Driller	No		
BASS ISLANDS DOLOMITE	722	761	Driller	No		
PACKER SHELL	1375		Driller	No		
QUEENSTON FORMATION	1516		Driller	No		
TRENTON LIMESTONE	2646		Driller	No		
GULL RIVER FORMATION	3163	3193	Driller	No		
TREMPEALEAU FORMATION	3194		Driller	Yes		

Annual Production						
Year	Quarter	Source	Oil (Barrels)	Gas (MCF)	Water (Barrels)	Remarks
2006	N\A	RBDMS	0	0	1350	
2007	N\A	RBDMS	10480	0	60	
2008	N\A	RBDMS	2154	0	90	
2009	N\A	RBDMS	1227	0	0	
2010	N\A	RBDMS	673	0	0	
2011	N\A	RBDMS	665	0	0	
2012	N\A	RBDMS	663	0	80	
2013	N\A	RBDMS	564	0	45	
2014	N\A	RBDMS	653	0	0	
2015	N\A	RBDMS	306	0	0	
2016	N\A	RBDMS	460	0	382	
2017	N\A	RBDMS	163	0	46	
2018	N\A	RBDMS	83	0	0	
2019	N\A	RBDMS	50	0	0	
2020	N\A	RBDMS	27	0	0	
2021	N\A	RBDMS	17	0	0	

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WELL SUMMARY #4

WELL SUMMARY — **ODNR DIVISION OF OIL & GAS RESOURCES MANAGEMENT**

API Well Number	34041203750000									Permit Issued	10/17/2008
Well Name	McGINNIS			Acres	40	Well No.	1			Date Commenced	10/19/2008
Owner	MFC DRILLING INC					Well No.				Date Completed	10/27/2008
Logging Co.	Appalachian Well Surveys		Core No.		Sample No.						
County	DELAWARE	Township	TRENTON		Quadrangle	OLIVE GREEN				Zone	N
Section		Lot 13	Tract		Twp. Qtr.	2	Surface X	1904882	Y 213159	Bottom X	Y NAD27
							Surface Lon	-82.840639	Lat 40.251299	Bottom Lon	Lat NAD83
Measured	195'SL & 2170'WL OF LOT 13, 2ND QTR. TWP.						Surface X	1873413	Y 213185	Bottom X	Y NAD83 SPS
							Prop TD	3200	Class POOL	Tool	RTAF
GL	1025	DF	KB	1031	LTD	3286	DTD	3285	PB Depth	Date PB	
TD Form.	TREMPEALEAU FORMATION				Prod. Form.	TREMPEALEAU FORMATION			Status	Producing	
IP Natural			IP AT	50 MCF & 5 BO & 5 BW			Initial Rock Pressure			Date Abandoned	

Perforations	PI: 3209-3222, # Shots: 20
Stimulations	SI: 3209-3222, Fmtn Cd: 371020, Stim In: CS, Type: ACID, Vol: 1200 Gal, Acid%: 15, MBP: 1215, MTP: 690, 5SIP: 650
Casing Record	COND 11.75 0-53-0, Comment: , Sks: 55 CND* 11.75 0-114-0, Comment: , Sks: 50 SRF* 8.62 0-807-0, Comment: , Sks: 100 SURF 8.625 0-807-0, Comment: , Sks: 275 PROD 5.5 0-3276-0, Comment: , Sks: 150
Log Types	Gamma Ray, Perforating Depth Control, Perforating, Casing collar locator/Gamma ray, Cement Bond, Cement Curve, Cement Quality, Cement

Formations

Formation	Top	Bottom	Source	Prod.	Non-Standard	Remarks
BIG LIME	625		Driller	No		
PACKER SHELL	1468		Driller	No		
TRENTON LIMESTONE	2631	2840	Log	No		
BLACK RIVER GROUP	2840	3174	Log	No		
GULL RIVER FORMATION	3174	3203	Log	No		
GLENWOOD FORMATION	3203	3205	Log	No		
TREMPEALEAU FORMATION	3205		Log	Yes		

Formations

Formation	Top	Bottom	Source	Prod.	Non-Standard	Remarks
BIG LIME	625		Driller	No		
PACKER SHELL	1468		Driller	No		
TRENTON LIMESTONE	2631	2840	Log	No		
BLACK RIVER GROUP	2840	3174	Log	No		
GULL RIVER FORMATION	3174	3203	Log	No		
GLENWOOD FORMATION	3203	3205	Log	No		
TREMPEALEAU FORMATION	3205		Log	Yes		

Annual Production

Year	Quarter	Source	Oil (Barrels)	Gas (MCF)	Water (Barrels)	Remarks
2008	N\A	RBDMS	0	0	1130	
2009	N\A	RBDMS	163	0	0	
2010	N\A	RBDMS	175	0	565	
2011	N\A	RBDMS	175	0	430	
2012	N\A	RBDMS	64	0	315	
2013	N\A	RBDMS	243	0	415	
2014	N\A	RBDMS	117	0	420	
2015	N\A	RBDMS	264	0	226	
2016	N\A	RBDMS	15	0	55	
2017	N\A	RBDMS	73	0	194	
2018	N\A	RBDMS	158	0	0	
2019	N\A	RBDMS	102	0	0	
2020	N\A	RBDMS	64	0	0	
2021	N\A	RBDMS	92	0	0	

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WELL SUMMARY #5

WELL SUMMARY										ODNR DIVISION OF OIL & GAS RESOURCES MANAGEMENT	
API Well Number	34041203770000									Permit Issued	12/21/2009
Well Name	CRIST SCOTT			Acres	40	Well No.	1			Date Commenced	8/6/2010
Owner	MFC DRILLING INC					Well No.				Date Completed	8/14/2010
Logging Co.	Appalachian Well Surveys		Core No.		Sample No.						
County	DELAWARE	Township	TRENTON		Quadrangle	OLIVE GREEN				Zone	N
Section	Lot 5	Tract		Twp. Qtr.	2	Surface X	1906380	Y	216210	Bottom X	Y NAD27
						Surface Lon	-82.835315	Lat	40.259690	Bottom Lon	Lat NAD83
Measured	725' SL & 840' EL OF LOT 5, 2ND QTR TWP					Surface X	1874911	Y	216236	Bottom X	Y NAD83 SPS
						Prop TD	3200	Class	POOL	Tool	RTAF
GL	1040	DF	KB	1044	LTD 3342	DTD	3343	PB Depth		Date PB	
TD Form.	TREMPEALEAU FORMATION				Prod. Form.	TREMPEALEAU FORMATION			Status	Producing	
IP Natural	6500 MCF		IP AT	100 MCF		Initial Rock Pressure				Date Abandoned	
Perforations	PI: 3237-3243, Date: 10/26/2010, # Shots: 29										
Stimulations	Date: 10/27/2010, SI: 3237-3243, Fmtn Cd: 371020, Stim In: CS, Type: ACID, Vol: 1125 Gal, Acid%: 15, MBP: 1025, MTP: 800, MISIP: 815, 5SIP: 575										
Casing Record	CND* 11.75 0-126-0, Comment: , Sks: 145 SRF* 8.62 0-1468-0, Comment: , Sks: 400 PROD 5.5 0-3333-0, Comment: , Sks: 115										
Log Types	Neutron, Density, Spectral density, Slim hole density, Vari, Resistivity, Gamma Ray										

Formations

Formation	Top	Bottom	Source	Prod.	Non-Standard	Remarks
BIG LIME	645		Driller	No		
PACKER SHELL	1642	1654	Log	No		
QUEENSTON FORMATION	1710		Log	No		
POINT PLEASANT FORMATION	2538	2652	Log	No		
UTICA SHALE	2592	2538	Log	No		
TRENTON LIMESTONE	2652	2772	Log	No		
BLACK RIVER GROUP	2772	3170	Log	No		
GULL RIVER FORMATION	3170	3218	Log	No		
GLENWOOD FORMATION	3218	3240	Log	No		
TREMPEALEAU FORMATION	3244		Log	Yes		

Annual Production

Year	Quarter	Source	Oil (Barrels)	Gas (MCF)	Water (Barrels)	Remarks
2010	N\A	RBDMS	0	0	935	
2011	N\A	RBDMS	338	0	0	
2012	N\A	RBDMS	118	0	95	
2013	N\A	RBDMS	64	0	120	
2014	N\A	RBDMS	73	0	105	
2015	N\A	RBDMS	49	0	89	
2016	N\A	RBDMS	49	0	73	
2017	N\A	RBDMS	80	0	71	
2018	N\A	RBDMS	42	0	0	
2019	N\A	RBDMS	0	0	0	
2020	N\A	RBDMS	26	0	0	
2021	N\A	RBDMS	20	0	0	

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WELL SUMMARY #6

WELL SUMMARY — **ODNR DIVISION OF OIL & GAS RESOURCES MANAGEMENT**

API Well Number	34041203500000							Permit Issued	8/15/1988
Well Name	BUTLER-COCKRELL UNIT		Acres	80	Well No.	J-1		Date Commenced	1/2/1989
Owner	LANE LARRY SHARON				Well No.			Date Completed	1/7/1989
Logging Co.	Schlumberger		Core No.		Sample No.	3941			
County	DELAWARE	Township	TRENTON		Quadrangle	OLIVE GREEN		Zone	N
Section	9	Lot		Tract		Twp. Qtr.	1	Surface X 1922870 Y 214580 Bottom X Y NAD27	
								Surface Lon -82.776215 Lat 40.255375 Bottom Lon Lat NAD83	
Measured	210'SL & 1120'EL OF NE QTR. SECTION 9							Surface X 1891401 Y 214606 Bottom X Y NAD83 SPS	
								Prop TD	Class EW Tool CRAF
GL	1095	DF	1103	KB		LTD	3604	DTD 3620	PB Depth Date PB
TD Form.	TREMPEALEAU FORMATION				Prod. Form.	TREMPEALEAU FORMATION		Status	Producing
IP Natural			IP AT	250 MCF & 1 BO				Initial Rock Pressure	Date Abandoned
Perforations	PI: 3458-3496, # Shots: 26PI: 3454-3599, Csg: COND, Cmmnt:								
Stimulations	SI: 0-0, Fmtn Cd: 371020, Type: ACID, Vol: 2000 Gal, Acid%: 15, Cmmnt:								
Casing Record	COND 12 0-120, Comment: SURF 8.625 0-310, Comment: I1 4.5 0-3590, Comment:								
Log Types	Caliper; Casing collar locator/Gamma ray, Density, Spectral density, Slim hole density, Vari, Gamma ray, Neutron, Induction, Phasor induction, Spherically Focused Log, Gamma Ray, Neutron, Gamma Ray								

Formations

Formation	Top	Bottom	Source	Prod.	Non-Standard	Remarks
BIG LIME	834	1520	Driller	No		
TRENTON LIMESTONE	2866	2988	Driller	No		
BLACK RIVER GROUP	2988	3392	Driller	No		
GULL RIVER FORMATION	3392	3443	Driller	No		
GLENWOOD FORMATION	3443	3454	Driller	No		
TREMPEALEAU FORMATION	3454	3599	Driller	Yes		

Annual Production

Year	Quarter	Source	Oil (Barrels)	Gas (MCF)	Water (Barrels)	Remarks
1988	N\A	RBDMS	0	0	0	
1989	N\A	RBDMS	0	0	0	
1990	N\A	RBDMS	0	2042	0	
1991	N\A	RBDMS	187	3012	0	
1992	N\A	RBDMS	74	0	0	
1993	N\A	RBDMS	63	0	45	
1995	N\A	RBDMS	78	0	0	

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WELL SUMMARY #7

WELL SUMMARY — **ODNR DIVISION OF OIL & GAS RESOURCES MANAGEMENT**

API Well Number	34041201600000											Permit Issued	2/11/1983
Well Name	ALEXANDER BARNEY C				Acres	171	Well No.	1				Date Commenced	10/20/1964
Owner	J-N-J OIL LLC						Well No.					Date Completed	10/31/1964
Logging Co.	Schlumberger, Star Jet Oil Well Services			Core No.		Sample No.							
County	DELAWARE		Township	BERKSHIRE		Quadrangle	GALENA				Zone	N	
Section	0	Lot 3	Tract		Twp. Qtr.	3	Surface X	1887510	Y	208050	Bottom X	Y	NAD27
							Surface Lon	-82.902724	Lat	40.237331	Bottom Lon	Lat	NAD83
Measured	3249.96'NL & 2275'ELOF 3RD QTR TWP						Surface X	1856040	Y	208076	Bottom X	Y	NAD83 SPS
							Prop TD		Class	S	Tool	CT	
GL	934	DF	KB	942	LTD	3004	DTD	3010	PB Depth		Date PB		
TD Form.	GULL RIVER FORMATION				Prod. Form.						Status	Active Injection	
IP Natural			IP AT				Initial Rock Pressure				Date Abandoned	11/13/1964	
Perforations	PI: 2937-2947, S/Ft: 2, # Shots: 2, Csg: T1, Comp: PF, Cmmnt:												
Stimulations	SI: 2937-2947, Fmtn Cd: 364045, Stim In: CS, Type: ACID, Vol: 150 Gal, Acid%: 28, Cmmnt:												
Casing Record	SURF 8.625 0-408-0, Comment: , Sks: 225 T1 2.375 0-2854, Comment: T1 2.375 0-2859, Comment: PROD 4.5 0-3005-0, Comment: , Sks: 80												
Log Types	Perforating Depth Control, Perforating, Gamma ray, Neutron, Neutron, Gamma Ray, Gamma Ray, Neutron												

Formations

Formation	Top	Bottom	Source	Prod.	Non-Standard	Remarks
BIG LIME	405	1072	Driller	No		
CLINTON SAND	1130	1170	Driller	No		
TRENTON LIMESTONE	2394	2538	Driller	No		
GULL RIVER FORMATION	2940	2947	Driller	No		
TREMPEALEAU FORMATION	2997	3044	Driller	No		

Annual Production

Year	Quarter	Source	Oil (Barrels)	Gas (MCF)	Water (Barrels)	Remarks

Links to scanned well documents:

WELLCARD (.pdf)
SCOUT (.Pdf)
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Permit (.PDF)
Microfilm (.PDF)

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https://gis.ohiodnr.gov/MapViewer/WellSummaryCard.asp?api=34041201600000

Appendix B: More Information on oil & gas waste disposal in Ohio

Annual Injection amounts for Salt Water Injection Wells that exist in Morrow County - many are within Columbus water's SWPA

Well Name	Baughman #33	Mosher #44	Fishburn #45	Clinger #46	Tretow #48	Power #51	Shaffer #54	Zeger #56	Shaver-neff #39	Shaver-neff #60	Clinger #61	McPeek-Rex #62	Dumbaugh #64
Year	Barrels	Barrels	Barrels	Barrels	Barrels	Barrels	Barrels	Barrels	Barrels	Barrels	Barrels	Barrels	Barrels
1982	75,080	66,485	95,650						4,852				
1983	155,800	81,954	265,400	24,618	211,600				8,192				
1984	87,000	62,742	396,700	54,772	256,400				3,590				
1985	175,000	54,637	272,202	50,926	337,000				3,290				
1986	42,650	52,840	190,266	60,185	139,900	6,340			2,585				
1987	200	43,745	230,049	67,969	53,000	27,048			6,114				
1988	0	48,185	186,351	70,248	39,000	40,491		19,631	3,753				
1989	17,170	56,690	199,425	67,818	8,042	31,988		44,537	11,239				
1990	15,450	50,430	194,720	79,548	3,260	25,215		61,466	9,925				
1991	9,765	39,455	223,536	83,528	2,900	22,610		62,197	8,861				
1992	15,850	24,838	200,556	91,850	138,900	28,543	9,220	41,939	7,810				
1993	24,795	36,745	132,159	64,447	82,700	33,070	9,600	28,443	6,540				
1994	1,520	27,090	136,723	62,249	68,700	29,160	7,200	27,493	4,880				
1995	0	25,159	145,689	68,111	39,600	25,215	7,000	43,379	11,075				
1996	20,720	34,360	139,451	62,157	73,200	28,615	4,750	30,335	11,078				
1997	16,240	19,915	71,155	70,398	46,400	22,110	9,150	23,390	12,206				
1998	14,640	15,661	100,118	57,465	44,800	12,010	8,700	13,272	1,522				
1999	240	5,985	61,275	33,080	42,300	5,750	2,845	19,858	4,800				
2000	4,880	17,362	76,508	31,120	24,400	0	9,150	20,691	6,000				
2001	14,480	34,557	87,900	52,378	59,688	690	9,400	21,363	14,462				
2002	39,462	28,724	112,870	48,022	61,295	3,361	2,430	11,542	39,351	4,773			
2003	38,128	34,744	95,827	51,655	52,450	0	7,050	10,468	22,560	43,798			
2004	40,014	37,596	126,187	53,190	17,591	0	8,100	9,138	5,408	53,603			
2005	47,900	35,019	134,545	48,820	2,320	3,585	7,200	14,949	25,850	25,850			
2006	42,606	22,836	113,020	36,915	2,790	13,033	6,100	8,476	50,231	50,231			
2007	45,456	18,674	114,100	27,590	41,605	21,675	2,900	0	5,937	53,429	7,550		
2008	20,412	11,570	101,355	38,315	41,100	24,086	21,130	10,026	6,689	60,231	29,377		
2009	0	11,585	90,739	47,250	36,816	20,853	15,760	21,943	4,529	40,759	27,172		
2010	30,820	15,724	84,120	58,740	41,734	21,030	0	11,401	3,700	65,631	39,550	31,930	
2011	19,575	8,611	85,100	21,270	51,997	28,640	0	43,183	11,900	36,886	30,979	82,055	
2012	13,725	5,677	66,060	21,210	76,392	33,995	0	41,996	11,880	32,544	39,293	102,065	
2013	12,748	3,462	84,535	18,590	71,550	23,051	200	32,765	2,840	21,707	38,452	129,850	
2014	14,230	0	92,475	31,195	26,050	27,010	0	27,981	880	21,910	44,565	93,545	41,941
2015	18,015	0	77,425	10,415	400	31,775	52	27,062	0	18,208	16,626	101,115	92,321
2016	19,120	0	66,120	12,505	3,000	43,280	0	26,910	0	26,314	14,777	91,920	62,787
2017	1,800	0	44,200	6,605	0	22,205	20	14,735	0	14,840	14,781	47,685	35,739
2018	0	0	97,791	7,925	0	22,205	82	40,095	0	29,630	29,824	107,310	36,423
2019	0	0	45,331	1,565	0	13,395	0	20,570	0	26,790	21,778	49,025	38,226
2020	0	0	98,725	2,120	0	12,000	0	21,815	0	33,310	28,761	106,285	25,457
TOTAL:	**1,095,491**	**1,033,057**	**5,136,358**	**1,696,764**	**2,198,880**	**704,034**	**148,039**	**853,049**	**334,529**	**660,504**	**384,085**	**942,785**	**332,894**
Gallons:	**46,010,622**	**43,388,394**	**215,727,036**	**71,264,088**	**92,352,960**	**29,569,428**	**6,217,638**	**35,828,058**	**14,050,218**	**27,741,168**	**16,131,570**	**39,596,970**	**13,981,548**

TOTAL ALL SWIW ALL YEARS: Barrels: 15,904,554

Gallons: 667,991,268

TABLE 8: ANNUAL BRINE SWIW INJECTION AMOUNTS IN MORROW COUNTY SINCE 1982

Source – Data: Teresa Mills, Buckeye Environmental Council / compiled graph: Columbus Community Rights Coalition

Excerpt from Buckeye Environmental Network Brine Fact Sheet (2020)

BRINE FACTSHEET

Radioactive Liquid Waste from Oil & Gas Production

By: Buckeye Environmental Network

Ohio Department of Natural Resources tests confirm dangerously high levels of radium 226 & 228 in brine from oil and gas production wells. Brine is used on some Ohio roads as a de-icer and dust suppressant, where it gets into soil, can be tracked into homes or become airborne as radioactive dust, and can contaminate drinking water sources and agricultural products.

SOURCES for brines used on Ohio roads
Brines from conventional, low-volume oil and gas extraction wells can legally be *and are* used on many Ohio roads by some ODOT districts (covering at least 28 counties as of 2019) and by many counties and townships.

Ohio Department of Natural Resources (ODNR) Oil and Gas Brine TEST RESULTS
Radioactive levels of **radium** 226 and 228 in brine from 151 oil & gas well samples.

Well Type	# Wells Sampled	Results*
Conventional (vertical, shallow) wells, the old mom & pop wells	118	66 to 9602 pCi/L**
Horizontal (deep) wells	25	173 to 3264 pCi/L
Out-of-state (brine disposed in OH)	8	54.6 to 9798 pCi/L

* Source: Tests completed for ODNR Radiation Safety Section, Division of Oil and Gas, cited in their memos of 1-23-18 and 7-2-18
** Picocuries: a measure of the intensity of radioactivity; piC/L reflects the intensity of radioactivity per liter of water.

Legal Exposure Limits

Ohio Administrative Code sets the legal limit for combined Radium-226 and Radium-228 discharge to the environment to 120 pCi/L. (OAC 3701:1-38-12, Appendix C, table II) US Environmental Protection Agency drinking water standard for combined Radium 226 and 228 is 5pCi/L. (40 CFR 141.66)

Health-based exposure limits: from *Radioactive elements most commonly detected in drinking water Environmental Working Group Tap Water Database 2019* ewg.org/tapwater/reviewed-radiological.php

Element	Primary health concern	Detection level, in picocuries per liter	Health-based limits (based on one-in-a-million cancer risk)	National Maximum Contaminant Level (MCL) in pCi/L	Cancer risk at legal limit
Radium-226 & -228	Bone cancer, other cancers	1	0.05 pCi/L	5 pCi/L for combined radium 226+228	7 cancer cases per 100,000 exposed

Health Effects and Dangers of Radium

U.S. EPA and the National Academy of Sciences Committee on Biological Effects of Ionizing Radiation list radium as a known human carcinogen. (ATSDR ToxFAQs) Human exposure results in an increased incidence of bone, liver, and breast cancer. Radium-226 is especially dangerous because, unlike many radioactive isotopes, it dissolves readily in water. When the contaminated water is ingested, the body mistakes Ra-226 for dissolved calcium and deposits it in bones. Radium-226 is thus called a bone seeker. Radium 226 and 228 are the parents of radon gas, a major cause of lung cancer.

For full sheet, see Brine-FACTSHEET-final.pdf (columbusbillofrights.org)

Appendix C: ODNR response to this report's scientific advisor's public records request seeking information on the locations of SWIWs in the region of the Columbus SWPA

Ohio Department of Natural Resources

MIKE DeWINE, GOVERNOR MARY MERTZ, DIRECTOR

Eric Vendel, Chief
Division of Oil and Gas Resources Management
2045 Morse Rd, Building F
Columbus, Ohio 43229
Phone: (614) 265-6922; Fax: (614) 265-6910

April 7, 2022

Julie Weatherington-Rice
Jweatherington.rice@gmail.com

RE: Public Records Request #5946

Dear Ms. Weatherington-Rice,

On January 16, 2022, the Ohio Department of Natural Resources, Division of Oil and Gas Resources Management ("Division") received an email from you requesting records pursuant to R.C. 149.43. In the email you included a list of questions and requests, some of which is captured below:

> "The question:
> How many Class II injection wells and waste treatment facilities are found in the Source Water Protection Zones for the Public Water Supplies in Ohio? For this I want all within the five-year time-of travel for ground water systems and within the watershed breaks for surface water systems. What are the percentages of those numbers vs. the total number of each classification in the state?
>
> If the Division does not have that information, it can be easily developed as a Geographic Information Systems (GIS) application.
>
> 1. The Division has a Latitude and Longitude assigned to each Class II injection well and waste management/treatment facility.
>
> 2. Ohio EPA has maps that document the source water protection zones for each public water supply. These protection zones go out to the five-year time-of-travel boundaries for ground water systems and to the watershed boundaries for the surface bodies of water for surface water systems.
>
> 3. If the Division does not have the ability to construct these overlays, there should be someone at ODNR that can perform this analysis. If there no longer are staff at ODNR that can do this analysis (the ability to perform this analysis has been available at ODNR since the 1970s), then the staff with those skill sets exist at Ohio EPA and, again, have since the 1970s.

4. It should be a simple process to create a count and compare them against the total numbers of Class II injection wells and waste management facilities. That information should be forwarded to the respective potentially impacted public water suppliers.

5. While this effort is underway, it would be helpful to also collect producing, closed, abandoned and standby oil/gas production wells so that the public water suppliers can compare these lists against their data base."

Unfortunately, your request is for "information," and as such, is not a proper public records request. *Wilhelm v. Jerusalem Twp. Zoning*, 2020-Ohio-5283, ¶¶9-11 (Ohio Ct. Cl. Oct. 1, 2020), adopted by *Wilhelm v. Jerusalem Twp. Zoning*, 2020-Ohio-5282, 2020 Ohio Misc. LEXIS (Ohio Ct. Cl., Oct. 20, 2020) (a public office has no duty to respond to a question or request for information and a court cannot compel a public office to do so). Accordingly, your request must be denied pursuant to Ohio Revised Code Section 149.43. A public office is under no obligation to search for records containing selected information. *State ex rel. Thomas v. Ohio State Univ.*, 71 Ohio St.3d 245 (1994).

Additionally, to the extent your request could be considered a records request, your request for records must be denied as overly broad and ambiguous pursuant to R.C. 149.43(B)(2). Public records requests that broadly seek a public agency to search for records containing selected information are appropriately denied as being overbroad. *See State ex rel. Thomas v. Ohio State Univ.*, 70 Ohio St.3d 1438, 638 N.E.2d 1041 (1994). A governmental office has no duty to "seek out and retrieve those records which would contain the information of interest to the requester." *State ex rel. Fant v. Tober*, No. 63737, 1993 Ohio App. LEXIS 2591 at *4 (8th Dist. Apr. 28, 1993); *aff'd* 68 Ohio St.3d 117 (1993). *see also State ex rel. Dillery v. Icsman*, 92 Ohio St.3d 312, 315 (2001) (finding a public records request for all records containing a particular name was overbroad); *Hicks v. Newtown*, Ct. of Cl. No. 2017-Ohio-00612-PQ, 2017-Ohio-8952, ¶ 8 ("A request to search for information 'regarding,' or 'relating' to, a topic is generally improper"); *State ex rel. Bristow v. Baxter*, 2018-Ohio-1973, ¶12 ("[R]equests for every email sent and received by respondents and their employees are overly broad.") A public office is under no obligation to search for records containing selected information. *State ex rel. Thomas v. Ohio State Univ.*, 71 Ohio St.3d 245 (1994).

Furthermore, your request is ambiguous. In your request you failed to identify any records and stated, "[i]f the Division does not have that information, it can be easily developed as a Geographic Information Systems (GIS) application," and "[i]f the Division does not have the ability to construct these overlays, there should be someone at ODNR that can perform this analysis," and "[i]t should be a simple process to create a count and compare them." It is unclear what records you are referencing and what records you may be requesting. *See State ex rel. Samara v. Byrd*, 8th Dist. No. 103621, 2016-Ohio-5518, ¶ 14 (finding a "request for qualifications is too vague and broad to be enforceable in mandamus[.]"). "[I]t is the responsibility of the person who wishes to inspect and/or copy records to identify with reasonable clarity the records at issue." *State ex rel. Morgan v. New Lexington*, 112 Ohio St.3d 33, 2006-Ohio-6365, ¶ 29, quoting *State ex rel. Fant v. Tobert*, 68 Ohio St.3d 117, 1993-Ohio-154, 623 N.E.2d 1202 (1993).

Finally, records that do not exist are not public records. *See State ex rel. Gambill v. Opperman*, 135 Ohio St.3d 298, 2013-Ohio-761, ¶ 16. A public office has no duty to furnish records that are not in its possession or control. *State ex rel. Striker v. Smith,*129 Ohio St.3d 168, 2011-Ohio-2878, ¶ 28. The Public Records Act does not require a public office to search a database for information and compile or summarize it to create new records. *State ex rel. White v. Goldsberry*, 85 Ohio St.3d 153, 154, 1999-Ohio-447, 707 N.E.2d 496, citing State ex rel. *Kerner v. State Teachers Retirement Bd.*, 82 Ohio St.3d 273, 1998-Ohio-242, 695 N.E.2d 256; see also *State ex rel. Margolius v. Cleveland*, 62 Ohio St.3d 456, 461, 584 N.E.2d 665 (1992); *Kovach v. Geauga Cty. Auditor's Office*, Ct. of Cl. No. 2019-00917PQ, 2019-Ohio-5455, ¶ 10 (holding that Auditor properly denied requests seeking explanations or reasons for the execution of public functions and asking for admissions or denials of certain facts); *Isreal v. Franklin Cty. Commrs., Ct. of Cl.* No. 2019-00548PQ, 2019-Ohio-5457, ¶ 8-9.

The Division is committed to providing access to public records in accordance with Ohio law. Therefore, as a courtesy to you, please be advised that the Division did perform a reasonable search of its records and did not find any records to be responsive to your request. The nature of your request would require the Division to create extensive records that do not exist. You may be interested in the well locater data on the Division website as well as the Ohio EPA website for the additional data or information that may assist you in creating your report. The Division's well locater data can be found at: https://ohiodnr.gov/discover-and-learn/safety-conservation/about-odnr/oil-gas/oil-gas-resources/well-locator.

Pursuant to R.C. 149.43(B)(2), the Division must provide you with an opportunity to revise your request by informing you of the manner in which records are maintained by the Division in the ordinary course of its duties. The Division maintains and accesses its records in the ordinary course of its duties based on function and use. For example, generally, the Division's Radiation Safety Section maintains its files by project.

If you wish to revise your request, you may also benefit from reviewing records retention schedules. You can access the Department of Administrative Services' general schedule list at https://apps.das.ohio.gov/RIMS/GeneralSchedule. Further, to locate department-specific schedules, use the "Agency Schedule Search" tab at the top of the page and select "DNR" from the drop-down list. To narrow to division-specific schedules, use the "agency/Division/Section List" tab located at the top of the page to choose the various divisions in which you are interested.

We appreciate your patience as the Division processed this request. If you require further assistance in clarifying your request, please feel free to contact our office. Thank you.

Sincerely,

Demitri Johnson

Demitri Johnson
Attorney
Division of Oil & Gas Resources Management

• Division of Oil & Gas Resources Management • 2045 Morse Rd, F-3 • Columbus, OH 43229 •
• oilandgas@dnr.state.oh.us •

It is critical to note that in further email discussions with the Agency, individuals continued to seek pertinent information in emails, carefully subscribing to the format requested while significantly narrowing their appeals. Nevertheless, DOGRM continued to deny their requests. After months of waiting for the Agency to honor hers, Dr. Weatherington-Rice consulted Dr. Ted Auch at the Ohio FracTracker Alliance to discuss if her requests for GIS overlays were even possible for DOGRM to fulfill. Could Ohio FracTracker create such coverage, she asked. Auch determined that not only was it possible, but it would be relatively simple to do using existing GIS databases that he already had on hand. After discussions with members of the Ohio Brine Task Force and CCRC to determine just what information they needed, Auch put together a map showing the locations of Ohio's source waters and known oil, gas, and waste wells. He also included an overlay of ODNR's Abandoned Mine maps to help identify possible subsurface connecting routes between abandoned and orphaned oil & gas wells, water wells, and SWIWs.

Auch managed to fulfill Weatherington-Rice's request, and then some, in less than a week with data drawn mostly from ODNR DOGRM. By doing so, in his spare time no less, it was clear that Dr. Weatherington-Rice's appeals for this information were reasonable and that ODNR DOGRM could have supplied it months earlier. Auch has made his maps publicly available here: https://ft.maps.arcgis.com/apps/webappviewer/index.html?appid=02a3baf4530b41e09f61c1c4490fcdc4&extent=-9875458.4395%2C4479073.0571%2C-8328372.987%2C5299700.9927%2C102100.

CCRC reviewers of the Columbus Water Resources report were also unable to obtain some of the information they needed from ODNR. Understanding the urgency of alerting officials and the public to the risks to local water sources, CCRC members elected to complete their report with the information they had. Below is the list of SWIWs *within the Columbus watershed* that have been identified from a variety of sources available to CCRC. According to the author's information, the list includes all wells that are currently in operation.

API number	Common local name & number	Owner/Operator
	Morrow County	
API 3411724222	Dumbaugh well SWIW #64	Houghton Investments LLC
API 3411722829	Baughman SWIW #33	Fishburn Producing Inc.
API 3411722109	Power SWIW #51	Fishburn Producing Inc.
API 3411721901	E. J. Tretow SWIW #48	George Woodcock
API 3411723020	Shaver-Neff SWIW #39	Maram Energy Inc.
API 3411721444	Shaver-Neff SWIW #60	Maram Energy Inc.
API 341172423	Pending well as of Apr 2020	Fishburn Producing Inc.
API 3411723388	Fishburn SWIW #45	Fishburn Producing Inc.
	Delaware County	
API 3404120160	Alexander SWIW #6	Patricia Harman, now listed J-N-J Oil LLC

TABLE 9: SWIW CLASS II INJECTION WELLS IN BIG WALNUT AND ALUM CREEK WATERSHEDS FROM NORTH TO SOUTH

Source: Courtesy of Julie Weatherington-Rice and Greg Pace

Appendix D: Two articles on brine disposal in Central Ohio

Alleging Continual Pollution, Advocates Ask U.S. EPA to Take Over Ohio Injection Well Permitting. David DeWitt, *Ohio Capitol Journal.com* (2022)[46]

Appalachian Ohio is a primary dumping ground for natural gas fracking waste. Nearly half of it is coming from neighboring states. A battle is underway to try to strip the Ohio Department of Natural Resources from its hold on the permitting process for these injection wells.

A coalition of environmental activists and community groups in Southeastern Ohio are calling on the U.S. EPA to take over oil and gas waste injection well permitting from the ODNR, pointing to the millions of barrels of fracking waste being injected into Ohio ground, and continual pollution incidents.

"Ohio's Class II well program contains numerous technical deficiencies that have allowed for underregulated oil and gas waste disposal which has resulted in serious consequences to human health and the environment," attorneys from EarthJustice, the Sierra Club of Ohio, and various community groups say in their petition to the EPA asking them to begin the rulemaking process to revoke Ohio's primacy over its Class II program "due to the longstanding and systemic failures."

Horizontal hydraulic fracturing, or fracking, is a method of oil-and-gas drilling that produces pressure fractures in rock formations that stimulate the flow of natural gas or oil. Due to big increases in natural gas production from fracking over the last 15 years, Ohio has become a hot spot for both the extraction of gas, and the injection of waste from the process back into the ground. Both are largely taking place in Ohio's eastern and southeastern counties.

Class II wells inject waste fluids that are brought to the surface during the fracking process. In Ohio, the ODNR Department of Mineral Resources Management has been given sole regulatory authority of oil and gas drilling disposal under Ohio Revised Code.

As a result of the exponential increase in natural gas production, operators produce billions of tons of waste annually in the United States. In Ohio, Pennsylvania, and West Virginia, gas production increased from 1.4 billion cubic feet per day in 2008 to nearly 24 billion cubic feet per day in 2017, according to the U.S. Energy Information Administration.

Ohio a hotbed for waste disposal

Ohio's existing and proposed fracking waste injection wells, as of a June 2021 report from FracTracker.

Since the fracking boom started in the Appalachian Basin, Ohio has been a standout for permitting waste injection wells.

For comparison, Ohio has 45 times the number of active Class II wells of New York, 15 times that of Pennsylvania, and 3.5 times that of West Virginia, the petition noted, pointing to figures from respective state sources.

As of May 2020, Ohio had 226 active injection wells, 57 additional wells permitted, and eight wells being drilled, according to ODNR figures in the petition.

Ohio receives much of its waste from out of state, primarily Pennsylvania and West Virginia. Based on operators' records, approximately 43-48% of the waste disposed of in Ohio comes from out-of-state oil and gas production, a June 2021 report from Ted Auch at the FracTracker Alliance said.

"(The national) EPA should be particularly concerned with waste handling and disposal in the state of Ohio because the state is responsible for the majority of liquid oil and gas waste disposal in the region," the petition says. The petition claims that toxic and radioactive organic and inorganic compounds are found in fracking injection waste, though the exact mixtures of oil and gas brine used by companies for fracking is generally protected by the industry as trade secrets. The petition also pointed to evidence from the group Physicians for Social Responsibility that per- and polyfluoroalkyl substances (PFAS) have been used in the hydraulic fracturing process in oil and gas wells in Ohio, and as a result oil and gas waste in Ohio could contain PFAS chemicals. These are known as "forever chemicals," and are widely used, long lasting chemicals found in water, air, fish, and soil at locations across the nation and the globe.

"Scientific studies have shown that exposure to some PFAS in the environment may be linked to harmful health effects in humans and animals," the U.S. EPA says on its website.

The group is alleging that ODNR has failed to prevent underground injection that endangers drinking water sources and fails to comply with the requirements of the national Safe Drinking Water Act.

Quarterly rate of change for fracking waste injection in Ohio. Graphic from FracTracker.

Surfacing waste

The petition points to a series of incidents over the past several years of waste migrating out of injection wells and surfacing. In 2019, oil and gas waste injected into the "Redbird #4" disposal well in Washington County surfaced through conventional oil and gas wells located five miles away from the injection site. The ODNR concluded in an investigation that injection well activity did allow waste to migrate between the formations and into the production wells, but said it was unlikely that waste would migrate farther as Redbird #4 injection of waste had stopped.

In a separate incident, in August of 2021, fluid identified as likely oil and gas waste spewed from an abandoned oil and gas well near the shore of Veto Lake in Washington County. ODNR's Division of Oil and Gas Resources Management responded to contain the "small amount of oil and remediate any impacts to the area," a spokesperson told the Columbus Dispatch at the time.

In January 2021, oil and gas waste surfaced through an idle production well owned by Genesis Resources in Noble County (the "Genesis Wells incident"). Containment measures were put in place to prevent the flow of fracking waste into a nearby tributary, an ODNR spokeswoman said at the time.

A review in the petition says contamination happened anyway.

"For four days, the idle production well spewed over 40,000 barrels of waste across the ground and into a nearby stream, killing approximately 500 fish and aquatic species," a review by the research group Physicians, Scientists, and Engineers for Healthy Energy said. "These incidents all could have seriously impacted Ohioans' drinking water," the petition said. "They are the consequences of a flawed regulatory program that every day endangers (underground sources of drinking water) and the environment."

Alleged ODNR deficiencies

EarthJustice Senior Attorney James Yskamp alleged in a press call announcing the petition this past Thursday that ODNR has "consistently failed to enforce violations of its program" and that it lacks tools necessary to bring violators into compliance, such as unilateral penalty authority. He alleged that technical deficiencies in the ODNR's injection well program have "allowed for underregulated oil and gas waste disposal, and have resulted in serious consequences to human health and the environment."

In addition to waste making its way to the surface miles from injection well sites and endangering underground sources of drinking water, Yskamp said Ohio had seen "an exponential increase in seismic activity in the state that has been linked to injection well activity." Yskamp said ODNR permitting fails to 1.) account for over-pressurization; 2.) locate migration pathways; and, 3.) to define the components of the waste being injected.

In January of this year, the ODNR formally adopted new rules for its Class II injection program around setback requirements and expanding the review radius for wells.

Nevertheless, the petition took issue with what it says are a lack of enforcement mechanisms and failure by the agency to practice enforcement, as well as alleged continued over-pressurization and failure to meet Safe Drinking Water Act technical standards.

ODNR spokeswoman Stephanie O'Grady said in a Wednesday morning email that the U.S. EPA delegated primacy of the regulation of Class II Disposal Wells to the ODNR Division of Oil and Gas Resources Management (Division) in 1983. "The federal agency has consistently reaffirmed that Ohio operates an effective regulatory program that meets federal standards and protects public health, safety, and the environment," she said. "The Division takes our responsibility to protect Ohio's groundwater, surface water, and environment seriously, as demonstrated by our rigorous permitting process, regular inspections, and enforcement."

Local reactions

In the press call, retired Youngstown Fire Battalion Chief Silverio Caggiano, a HazMat specialist, pointed to documents obtained through a public records request, saying they show the U.S. EPA has found many chemicals used by Ohio's oil and gas industry for fracking have

health risks. “They found that of 206 chemicals that they looked at, EPA had health concerns for about 109 of them, including irritation to eyes, mucus membranes, blood toxicity, developmental toxicity, kidney effects, liver toxicity, neurotoxicity, and mutinization from the radiation,” he said.

Caggiano especially highlighted dangers from radium and the development of cancers, specifically bone cancers in developing children. “They (state regulators) have no idea how much of these chemicals are actually being put in,” he said, pointing to industry confidentiality claims around fracking waste solutions. He called the ODNR’s recent attempts to revamp regulations “a joke.”

Athens County Commissioner Lenny Eliason was also on the call, and counted a win in local officials now being able to call upon the ODNR to hold public hearings for injection wells that were previously at the agency’s discretion.

“The problem with the hearing is that even though the public provides input on safety issues and concerns with injections, the ODNR director has no discretion. As long as the permit is correctly filled out, the permit gets granted,” he said. “Why involve the public in a sham process when you’re not going to do anything about acting on the information that’s provided during that public hearing?”

The other question Eliason said he had is why it’s so much easier to get an injection well permit in Ohio as compared to other states regulated by the national EPA.

“The third thing you deal with, with ODNR, is that enforcement is slow or non-existent,” he said. “We’ve had some open wells for a number of years that were supposed to be closed down and covered up, and they never got covered up because ODNR lacked inspectors.” Ohio has capped severance taxes, so ODNR is stretched thin and doesn’t have the funding to hire more inspectors, he said. Removing a 500,000 barrel cap on taxes collected would help fund the ODNR to do proper inspection and enforcement, he added.

Eliason further pointed to high trucking traffic from the injection, and wear and tear on township roads that strain county budgets.

Washington County resident George Banziger said his home county is first in the state for injection waste being put into its ground, with 8 million barrels injected just in 2019. “People in Washington County are frustrated, disappointed, and angry,” he said, and criticized ODNR as ignoring residents’ concerns while granting new well permits. Banziger also noted the irony of the destruction of oil and gas production wells due to excessive fracking waste injection.

Source: DeWitt, D. (2022, October 19). Alleging continual pollution, advocates ask U.S. EPA to take over Ohio injection well permitting. *Ohio Capital Journal.com, https://ohiocapitaljournal.com*. https://ohiocapitaljournal.com/2022/10/19/alleging-continual-pollution-advocates-ask-u-s-epa-to-take-over-ohio-injection-well-permitting/ https://ohiocapitaljournal.com/author/david-c-dewitt/

Oil and Gas Brine in Ohio Bill Lyons, *FracTracker Alliance* (2022)[47]

Overview

A major hazardous byproduct of oil and gas operations, called "brine," poses a pressing problem because of its long-term radioactivity and the extreme volumes produced each year. Billions of gallons of this waste have been injected into Class II injection wells throughout Ohio and millions of gallons have been spread on Ohio roads as a deicer and dust suppressant. Several activist groups in Ohio have been working to educate the public and elected officials about the dangers of spreading oil and gas waste brine and to ban this practice for the benefit of current and future generations, and nature.

Guest author, Bill Lyons, who lives in Columbus Ohio, is the president of the Ohio Community Rights Network and a member of the Ohio Brine Task Force. Both groups have been working to stop oil and gas brine spreading in Ohio for several years. He is also a co-organizer of Columbus Community Bill of Rights which has campaigned for four citizen initiatives to protect the Columbus watershed from frack waste and related fossil fuel activities.

Each year in Ohio, several billion gallons of a substance, called "brine", is produced from oil and gas wells. This byproduct, euphemistically called "brine", is actually toxic and radioactive waste. While it is true that it has a high concentration of salt, it is well known that oil and gas brine contains heavy metals including Cadmium, Arsenic, and Lead, and dangerous compounds such as Benzene. But most concerning are two isotopes of radium found in brine – Radium 226 and 228. We know this from the Ohio Division of Natural Resources (ODNR) actual tests in 2018 of brine from many conventional (vertical) and unconventional (horizontal) wells throughout Ohio (see the Brine Factsheet and ODNR Brine Study spreadsheet).

Some facts regarding the dangers of radium:

- Radium 226 is water soluble and bone-seeking
- The half-life of Radium 226 is 1600 years; thus, it will remain radioactive for thousands of years
- Exposure to even low levels of radium is known to cause bone, liver, and breast cancer
- Radium decays into radon gas which is the second leading cause of lung cancer in the United States.
- The US EPA has set a drinking water limit of 5 pCi/L (picocuries per liter) for Radium 226 and 228 combined
- The Ohio Administrative Code (OAC) has set environmental discharge limits for Radium 226 and 228 at 60 pCi/L each.

It is clear from ODNR's own data that brine from only one out of the 118 conventional wells sampled had met the OAC environmental discharge level. I am only mentioning the conventional wells because brine allowed for spreading must come from these wells. This is because brine from horizontal wells, which involves fracking, was thought to have a higher radium content. We now know this is not true – conventional-well brine can be just as radioactive as horizontal-well brine. If you look at the numbers, they are frightening. Combined Radium 226 and 228 brine levels from the conventional wells was as high as 9602 pCi/L, and

the average level for all 118 wells was 1182 pCi/L – nearly 10 times the allowed environmental discharge limit!

A Rolling Stone reporter, Justin Nobel, has been studying this issue and published a powerful and frightening article in Rolling Stone Magazine entitled, America's Radioactive Secret. He has uncovered documents from the American Petroleum Institute and others which reveal that the industry has known about this risk for decades.

So, since waste brine is so toxic and radioactive—and will remain radioactive for thousands of years—shouldn't it be treated as hazardous waste and not be spread into our environment? Well, the failure of regulatory agencies and our representatives, and their collusion with the oil and gas industry have jeopardized the health of the people, our environment, nature, and many future generations for the financial well-being of the industry. In addition, regulatory agencies, by their very nature, allow harm; they are just designed to regulate how much.

In 1988, due to industry pressure, the US EPA declared that oil and gas waste is non-hazardous. Industry was worried about the significant cost if their huge volumes of waste had to be treated as hazardous waste. Also, in 1985, Ohio legalized the practice of oil and gas brine spreading on roads as a deicer and dust suppressant but brine has likely been spread on Ohio road since the 1930s. In 1986, it was discovered that oil-well brine had high levels of benzene. Subsequently, ODNR, the Ohio EPA, and the Ohio Department of Health decided to lobby to outlaw oil-well brine spreading but the Ohio Legislature would not let that happen. Now that we know brine is even worse with a high radium content, where are those agencies now?

Also, in 2004, even though Ohio is supposed to be a Home Rule State, the legislature passed House Bill (HB) 278 which took away local control on oil and gas regulation and granted ODNR sole authority. This means that Ohioans cannot prevent injection wells in their communities due to state preemption. Of course, this was done after heavy lobbying from the oil and gas industry, a few years before the fracking boom.

Regarding local brine spreading, Section 1509.226 of the Ohio Revised Code grants a board of county commissioners, a board of township trustees, or the legislative authority of a municipal corporation the ability to permit surface application of brine to roads. Due to environmental and public health concerns, the commissioners of Athens County and Franklin County have adopted resolutions disapproving of brine spreading.

Ohio brine spreading in cities and townships

This a map of annual brine spreading by township and city in Ohio from 2005 to present as well as quarterly Class II Injection well volumes and ODNR Certified Brine Haulers.

View the map "Details" tab to learn more and access the data or click on the map to explore the dynamic version of this data. Data sources are also listed at the end of this article. In order to turn layers on and off in the map, use the Layers dropdown menu. (Items will activate in this map dependent on the scale. Zoom in to see all map layers.

View Full Size Map | Updated 5/1/2022 | Map Tutorial)

The Ohio Community Rights Network (OHCRN) and the Ohio Brine Task Force have been working to ban oil and gas waste brine spreading in Ohio. The OHCRN Toxic Trespass webpage has a lot of articles, media, and relevant information regarding brine spreading in Ohio and one can also find a great deal of resources on the Ohio Brine Task Force webpage.

Interestingly, Ohio has a law, ORC § 2927.24, enacted in 2002, shortly after the 9/11 attacks, that makes it a felony to "knowingly leave in any public place, or knowingly expose one or more persons to any hazardous chemical … or radioactive substance with the intent to … create a risk of … serious physical harm to any person." Elected officials and state agencies have long known about the radioactive content of brine and its risks but have allowed the public to be exposed to it anyway. OHCRN delivered a letter and documents in June 2021 calling on the Ohio Attorney General, Dave Yost, and 9 County Prosecutors to launch a criminal investigation into radioactive pollution of Ohio's waterways. The Attorney General's office and County Prosecutors have responded to this matter have with runaround replies to contact legislators or ODNR officials, but these are the very individuals that OHCRN has called on the Attorney General and County Prosecutors to investigate.

Another impetus for calling on a criminal investigation regarding brine spreading are two current bills in the state legislature, SB171 and HB 282, that seek to "establish conditions and requirements for the sale of brine as a commodity and to exempt that commodity from requirements otherwise applicable to brine." Astonishingly, these bills would authorize brine levels of up to 20,000 picocuries/liter for Radium 226 and 2,500 picocuries/liter for Radium 228 to be sold in stores without any radioactive warning and to be sprayed on Ohio's roads.

Pennsylvania ended brine spreading in 2018, as explained in this article entitled, Study finds health threats from oil and gas wastewater spread on roads. It states, "a new study *(from researchers at Penn State)* found the practice — which the state recently ended — could threaten environmental and public health by leaching metals, salts, and radioactive materials into surface or groundwater, nearby soil, and even the air."

In February 2022, Ohio Representative Mary Lightbody introduced HB 579 that would prohibit the surface application of oil and gas brine on Ohio roads. So far, there have been no hearings on the bill.

The long game of the oil and gas industry

The amount of oil and gas brine being produced has been increasing exponentially since 2010. How does the oil and gas industry plan to dispose of this increasing toxic and radioactive waste?

Ohio currently has 226 Class II Brine injection wells. How many more of these can and will be drilled? Also, how much more brine can be forced down these wells at high pressure and what are the consequences? In addition to disposing of fracking brine waste from Ohio operations, a great deal of brine from Pennsylvania and West Virginia is disposed of in Ohio.

We have seen that fracking waste brine injected into Class II Wells can migrate. This is not surprising given the high volumes of brine injected at high pressures and the permeability and fissures in the geology of the formations. In late 2019, it was discovered that brine from the

Redbird #4 Class II Injection Well in Washington County had migrated to 28 gas-producing wells at least 5 miles away. In an investigation by ODNR, it states, "Naturally occurring fissures exist between the Ohio Shale formation and Berea Sandstone formation, allowing wastewater to migrate between the formations and into the production wells." If brine can migrate to gas-producing wells miles away, it certainly can migrate to drinking water sources. Alarmingly, Ohio has no requirements for water monitoring wells near injection wells.

The oil and gas industry must be planning more ways of disposing its billions of gallons of toxic, radioactive waste in Ohio and externalizing the cost onto the public. More injection wells might be drilled but those are costly to the industry. More brine might be forced down the current injection wells but how many more Redbird #4-like incidents will occur given approximately 200,000 orphaned and abandoned, unplugged wells in Ohio, which are essentially open holes in the ground. "Orphaned wells" have no owner or operator who can be located, and "abandoned wells" are unproductive wells with a known owner or operator.

The industry could push for brine from horizontal, fracked wells to be allowed for surface application. They may argue that since the heavy metals and radium content is essentially the same for brine from vertical as it is for horizontal wells, and the state currently allows vertical well brine for spreading, why not allow it for horizontal well brine. They could also push legislators to further preempt townships, counties, and cities by taking away their authority to disapprove brine spreading.

Perhaps, the most beneficial option to the oil and gas industry regarding the disposal of its brine waste – but an atrocious scheme for all living things – is to have it commodified, thereby removing any accountability of its use, and even potentially making a profit over the poisoning of uninformed citizens, nature, the environment, and many future generations.

The take away

The people must decide what kind of environment they want to live in and push to have the authority to be able to decide, not only in their communities, but across the state because contaminated water does not obey our artificial local boundaries. Moreover, Ohioans should be able to travel anywhere in the state without the risk of toxic and radioactive waste. We must not depend on regulatory agencies to save us because the system is rigged and not really designed to protect us.

So, not only has the production and use of oil and gas played a big role in the acceleration of the climate crisis, but the disposal of its waste will present a problem for generations to come.

DATA SOURCES

The data used in the map above was compiled from FOIA requests to the Ohio Department of Transportation as well as the Ohio Department of Natural Resources (ODNR) Underground Injection Control (UIC) program.

FRACTRACKER ARTICLES

- "Fracking Wastewater Concerns Resurface on Pennsylvania Roads as the DEP Undergoes an Evaluation of Coproduct Determinations," – FracTracker Alliance, November 10, 2021
- "Ohio & Fracking Waste: The Case for Better Waste Management," – FracTracker Alliance, June 3, 2021

REFERENCES

- "Benzene in Brine Raises New Toxicity Questions," – The Columbus Dispatch (OH), April 17, 1986
- "Brine and Ground Water," The Columbus Dispatch (OH), April 28 , 1986
- "State Agencies to Push for Ban Against Oil-Well," Akron Beacon Journal (OH), April 17, 1986

GET INVOLVED

- Ohio Community Rights Network – https://www.ohiocrn.org/
- Ohio Brine Task Force – https://www.ohbrinetaskforce.org/
- Columbus Community Bill of Rights – https://columbusbillofrights.org/

Appendix E: Establish specifications for the sale of brine as a commodity (Testimony, 2018)

January 29, 2018

Dear Chairman Al Landis and members of this Committee:

My name is Dr. Julie Weatherington-Rice. I am an Earth Scientist. I am the Senior Scientist for the firm of Bennett & Williams Environmental Consultants Inc. in Westerville, Ohio. I serve as a scientific advisor to the Ohio Environmental Council, as a member of the National Advisory Board to the Southwest Pennsylvania Environmental Health Project and, in 1986-87, as a member of the Ohio Governor's Oil and Gas Regulatory Review Commission. I am a former Adjunct Professor to the Dept. of Food, Agricultural and Biological Engineering, The Ohio State University and have served on Advisory Boards to the Ohio Department of Health and the six state agencies charged with the protection of Ohio's water. I have spent my lifetime working to protect the air, soil and water of Ohio so that it is safe for the people of Ohio to use.

I first prepared this testimony last September (2017) for the Senate version of this bill. I am resubmitting it to this committee so there will be information in the record from a highly qualified scientist that not only is this use of conventional brine as a road deicer a really bad idea, but that we have known that it is a really bad idea for more than 30 years and therefore, by agreeing to this application, the State of Ohio opens itself up to being a party to any physical harm to humans and the environment that will occur from their exposure to these materials. We know the materials are toxic and hazardous. The State of Ohio paid for the initial risk analysis study in the mid-1980s. We know that it kills; the technical OSU Cooperative Extension resource engineer to the Ohio Dept. of Health died from his exposures to conventional brine used for deicing and dust control of his road. We understand that this version of the bill contains a section on page four that states:

"(9)(a) Brine processed to remove free oil, dissolved volatile organic compounds (VOCs), metals and other contaminants in accordance with an order or permit issued under division (C) of this section is a commodity".

I am well aware that people drafting Ohio legislation are not hired for their rigorous scientific training. If they were, they would never have crafted that statement. Not only do you have to be concerned with the VOCs, you probably should be even more concerned with the semi-volatile organic compounds because they are more likely to stay in the environment and cause harm. If these materials are going to be removed, how are they going to be removed?

How are those materials going to be disposed of? Will the methods of disposal put Ohioans and our environment in danger? And most importantly, removing metals? All metals? If that is the case, you have removed half the components that make up the salts which I am assuming are the product that you want to keep. Last time I checked, sodium and calcium, major cations in salt formation, are both metals. They combine with chlorine to form salts.

At this point, given more than 30 years of information created here, in Ohio, for anyone to assume that this use of traditional drilling brines is a good idea either has not been paying attention, has not bothered to look, is lying through their teeth or simply does not care about the health and welfare of the people and the environment of Ohio. Do not pass this bill.

Oil & Gas brines are toxic and hazardous

In 1986, the Oil & Gas Regulatory Review Commission arranged to have Dr. Gerald Poje, Environmental Toxicologist, conduct an evaluation of the heavy metal and hydrocarbon constituents of oil and gas drilling brines. Dr. Poje was living in Ohio at that time, teaching at Miami University at Oxford and working with the Ohio Environmental Council on soil, water and air contamination issues. The report was titled "Toxicological Analysis of Ohio Brine Constituents and their Potential Impact on Human Health". This review of then available toxicological data bases was an early version of a US EPA Risk Assessment, It reviewed each commonly noted hydrocarbon and heavy metal found in oil and gas brines, determined the various forms of toxicological impacts and the routes of exposures. It did not compare the synergistic impacts of the mixtures. Among other findings, the report noted that exposures to the oil and gas brines can trigger cancers over time. The entire report is available online at the Damascus (PA) Citizens for Sustainability's website:

http://www.damascuscitizensforsustainability.org/wp-content/uploads/2012/02/Tox-Analysis-Ohio-Brine-part-1.pdf, http://www.damascuscitizensforsustainability.org/wp-content/uploads/2012/02/Tox-Analysis-Ohio-Brine-part-2A.pdf

http://www.damascuscitizensforsustainability.org/wp-content/uploads/2012/02/Tox-Analysis-Ohio-Brine-part-3.pdf, http://www.damascuscitizensforsustainability.org/wp-content/uploads/2012/02/Tox-Analysis-Ohio-Brine-part-4.pdf

http://www.damascuscitizensforsustainability.org/wp-content/uploads/2012/02/Tox-Analysis-Ohio-Brine-part-5A.pdf

The document was contributed to their organization by James Cowden who taught and researched Public and Environmental Health at Kent State and then Hiram College for many years. Mr. Cowden was one of the individuals responsible for the convening of the Ohio Governor's Commission. He placed my name in nomination to the Commission.

The full Commission report can be found in the State Library of Ohio's collection at http://eds.a.ebscohost.com/eds/detail/detail?vid=4&sid=d928d969-e900-46aa-83c0-c600ba495689%40sessionmgr4009&bdata=JkF1dGhUeXBlPWlwLGNvb2tpZSZzaXRlPWVkcy1saXZl#AN=state.b1217553&db=cat02748a. A short biography of Dr. Gerald Poje can be found at The Grant Group's web site, http://www.thegrantgroup-llc.com/our-team/gerald-poje/. Please note, this report was produced in 1986, documenting the toxic and hazardous nature of oil and gas brine. To the best of my knowledge, no Ohio agency has ever used the information in this report to establish public health and safety exposure precautions for Ohio citizens. While many additional studies with similar findings have been completed since this one, this study, a generation old, was commissioned and paid for by the State of Ohio to protect the health and welfare of her citizens.

Brine exposure has killed Ohioans, Ohio does not track these deaths, other states do

In the 1990s, two neighbors living on a gravel township road in Licking County near Granville developed a rare form of lymphoma and both subsequently died. One of the neighbors was Dr. Melvin Palmer, Professor in the Department of Agricultural Engineering at The Ohio State University and OSU Extension appointment to the Ohio Department of Health, Private Water and Wastewater Section. Dr. Palmer was assigned to train staff from all the health departments in the State of Ohio on the best current technologies for assuring safe private water and wastewater systems and to further the research to improve Ohio's programs. As a dedicated advocate of Public Health, when his doctors at the James Cancer Hospital informed him that his cancer was environmentally triggered by long term exposures to heavy metals and hydrocarbons, Dr. Palmer set out to identify the source(s) and routes of exposure(s) to prevent anyone else in his family and community from also developing this life-ending cancer.

With assistance from his colleagues at The Ohio State University, he undertook the sampling and testing of all logical contaminated sources. This testing included the well water at his neighbor's home and his home, the water as it passed through the home plumbing, the soil in the vegetable gardens, the water in the nearby creek, etc. He finally found a reservoir of heavy metals and residual hydrocarbons in the dust of his gravel road in front of his house. The township had, for years, used oil and gas brine for deicing and dust control. Over time, the positively charged heavy metals had attached themselves to the negatively charged clay minerals which mixed into the gravel of the roadbed. Residual hydrocarbons were also bound into the dust. The route of exposure was air bourn. As traffic would travel along the gravel road, dust would rise up and be blown into the yards, fields, pastures, gardens and wood lots along the road.

The dust carried the heavy metals with it. Once airborne, the dust could come into skin contact, be breathed in or fall on garden plots to be taken up by vegetation and eaten by the families growing the produce. The common factor between Dr. Palmer and his neighbor, a woman at least ten years his junior, was that they both had the family chore of mowing their large rural yards. In the summer, they would come in covered with windblown dust on their bodies, having also breathed in some of the dust while mowing the yards.

They both died but not before Dr. Palmer had made certain to tell as many people as he could about his findings. I worked with him as he researched the exposure routes, providing him with a copy of Dr. Poje's report once Dr. Palmer suspected the brine spreading on his gravel road. How many other Ohioans have died from similar exposure? Tens, hundreds, thousands? We have no idea because Ohio does not track illnesses and deaths attributable to oil and gas exposures. Other states do, including our neighbor to the east, Pennsylvania.

The Pennsylvania and Ohio Public Health Partnership

As can be expected after more than 30 years, Ohioans have grown tired of waiting for the State of Ohio to decide to protect their public health from the toxic and hazardous nature of the production, transport and waste streams of the oil and gas industry. For whatever reasons, Ohio's State government has decided that it is more important to protect the oil and gas industry than it is to protect its citizens. Pennsylvania has taken a different position and through their Public

Health Districts, has set up a mechanism for collecting the health histories of individuals who have had their health impacted by the oil and gas industry. These health histories are collected into a database and are used to expand health surveys and outreach education in communities where impacts have been noted. The premise is that if one individual has been impacted, there may be more. Health Districts in Pennsylvania have the ability to reach out across state lines and work with regional partners assuming that there is a local organization willing to maintain day to day operations and that there are health professionals in the adjacent states to act as health history collectors.

Citizens in Ohio have formed such collaboration with the Southwest Pennsylvania Environmental Health Project. Day to day coordination in Ohio will be provided by the Ohio Environmental Council and Ohio health professionals have already received training at the Project headquarters in Pennsylvania. Minimal funding is being sought at this point in time in hopes that we can begin collecting health histories here in Ohio by 2018. The data will be stored in Pennsylvania as there is currently no interest to undertake such a study by any Ohio agencies.

Ohio oil and gas brine is toxic and hazardous in its raw state

There are possible commercial applications for oil and gas brine but it first must be stripped of its heavy metals and hydrocarbons to get to the basic salt water. That is not an inexpensive undertaking and it generates waste streams of heavy metals and hydrocarbons that must be safely disposed of. There are cheaper, easier ways to obtain basic sodium chloride in Ohio. Sodium chloride is not the best deicer and dust control measure available. Calcium chloride and sugar beet juice has far less environmental impacts. There is a serious question as to the economic viability of conversion of oil and gas brines to safe commercial uses, assuming careful and safe disposal of the processing waste products.

At this point in time, I cannot recommend the application of the toxic and hazardous oil and gas brine into Ohio's environment without extensive processing. To disregard the more than 30 years of information that has been gathered on the potential public and environmental health impacts of uncontrolled uses of oil and gas brine at this point in time is irresponsible.

If you need further information and/or have additional questions, please feel free to contact me by phone at 614-436-5248 or by email at jweatherington.rice@gmail.com. Thank you for this opportunity to document the history of oil and gas brine toxicological research here in Ohio.

Respectfully submitted,

Julie Weatherington-Rice, PhD, CPG, CPSS

Appendix F: Recommendations (2023)

Following the distribution of the 2023 version of this White Paper, the authors replaced our initial list of Chapter 12 recommendations with a revised list that, for ease of reading, groups the recommendations into five categories. Other than the reorganization and a few minor edits, the recommendations are the same. Below is the original list as published in the 2023 edition.

a. When updating the SWPMP, upgrade the staff of the Columbus Division of Water to include people with expertise in oil & gas production, and consult with outside water specialists, including the EPA, to enlist people with the proper expertise involved.
b. ODNR DOGRM must aggressively implement the Orphan Well Program to locate the probable 150,000+ abandoned oil & gas wells that have no documented history, many of which may be located in their source water protection area. To this end, CCRC recommends the creation of a process that ensures public notice of this issue to be circulated among all stakeholders. Volunteers should be recruited and trained to walk the areas where oil and gas drilling has been known to take place. They should be trained in the use of methane detectors and given the means to chart where they have detected methane leaks. CCRC suggests contacting schools, civic organizations, scout troops, churches, and citizens of the counties to recruit volunteers for this purpose.
c. Demand that State of Ohio authorities ensure that existing state-run well capping programs for orphaned/abandoned oil & gas wells use all funds available to plug the maximum number of wells annually.
d. Work with the state legislature to require that funding for the capping of wells be included with the initial permitting process, and that this funding be held in escrow until such time that the capping is completed.
e. The Columbus Water Department must plan and conduct necessary water monitoring as close to the injection wells as possible with the goal of tracking migrating contamination. Currently, there is no monitoring protection upstream, near the injection wells, which could locate contamination getting into groundwater. Closing the emergency intakes at reservoirs is the only protection for the Columbus water supply when oil & gas are found within 1000 feet of the intakes.
f. The Columbus Source Protection Report by the Columbus Water Department should be more specific in outlining contamination risks from oil & gas production activities throughout the watershed using information that is already available, including information on production wells, injection wells (SWIWs), and areas of waste "brine" spreading for dust and ice control.
g. Conduct regular soil and water testing near oil and gas production sites, and in areas where waste brine has been spread.
h. Do not permit drill cuttings to be dumped in existing public landfills.
i. Map routes of tanker vehicle travel for brine waste disposals as well as distribution pipelines in the SWPA.

j. Enhance City's water monitoring specific to areas where there are signs of oil & gas waste contamination, as there are no requirements for any agency in Ohio to do this.
k. Organize discussions between local authorities and user/stakeholders to ascertain new risks to the SWPA when new facilities come into operation, and when contamination events/incidents occur.
l. City authorities should insist on follow-up remediation if leaks or contamination are detected within a source water protection area. The City should require that problems with wells documented through ODNR DOGRM inspection reports be remedied with definable and actionable resolutions, especially where well shutdowns are required.
m. City authorities should insist on an emergency notification system for toxic releases, including spill and leakage incidents in Columbus's SWPA. As it stands, this region is not included in the notification network with agencies in Ohio, so authorities are not allowed to notify water suppliers of chemicals released in spills from oil & gas facilities. Public water users should not be kept in the dark about what contaminants are present when incidents occur.
n. Maintain a database of incidents that have occurred within the source water protection areas and resulted in actual water contamination or risks of water contamination to the public water resources from oil & gas production facilities. The historical legacy of regional contamination incidents, including the examples referred to in this paper, should be part of the database.
o. Schedule discussions between City authorities and Morrow and Delaware County officials over halting the practice of spreading oil & gas "brines" on road surfaces for dust and ice control that puts our watershed at long-term risk of contamination from residual heavy metals and radionuclides. Advise them of the urgency of this issue. Since 2017, Ohio state legislators have repeatedly attempted to deregulate liquid oil & gas production wastes to the extent of allowing these brines to be commoditized, bottled, and sold in stores to the general public as home deicers.

The City must ensure that residents are not unknowingly purchasing products that contaminate their homes with radionuclides that will always be present to work their way into their families' bodies and potentially cause cancers and other health concerns. Even as new studies indicate dangerously elevated levels of radionuclides in samples of the finished products to be sold, initiatives by the industry to deregulate oil & gas wastes are favored by many Ohio representatives. It is crucial that the public understand the risk as well as recognizing its right to protect its homes and communities from these harms.

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