Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well

Introduction

This response is issued in accordance with Section 124.17(a), (b), and (c) of Title 40 of the Code of Federal Regulations (40 C.F.R. § 124.17(a), (b), and (c)), which require that at the time any final United States Environmental Protection Agency (EPA) permit decision is issued, the Agency shall: (1) briefly describe and respond to all significant comments on the draft permit decision raised during the public comment period; (2) specify which provisions, if any, of the draft decision have been changed and the reasons for the change; (3) include in the administrative record any documents cited in the response to comments; and (4) make the response to comments available to the public.

Background

On February 10, 2017, EPA issued a draft Class II permit to inject fresh water for the purpose of enhanced oil recovery (Permit Number MI-035-2R-0034) to Muskegon Development Company for its Holcomb 1-22 well, and invited public comment. The public comment period ended March 15, 2017. Public comments were received indicative of significant interest in the draft permit, and EPA scheduled and held a public meeting and public hearing at Clare High School, in Clare, Michigan, on July 25, 2017. Following the public hearing, EPA extended the July 28 deadline for comments to August 18, 2017. The comments compiled include those received from the first comment period (February 10 to March 15, 2017), the July 25, 2017 public hearing (from the court reporter transcript), and the second comment period (June 21 to August 18, 2017). The first comment period lasted 34 days and the second comment period lasted 59 days, for a total of 93 days.

General and Out of Scope Comments

EPA regulations at 40 C.F.R. Parts 144 and 146 state the requirements and standards that a permit applicant must meet to have an Underground Injection Control (UIC) permit application approved. These regulations define the general scope of EPA's authority and review process, which include standards for geologic siting, well engineering, operation and monitoring, and plugging and abandonment of deep injection wells.

EPA received many comments directed at matters outside the scope of the UIC Program's purview. EPA is not responding to the following comments because they do not relate to the UIC permit process, or to geologic siting, well engineering, operation and monitoring standards, or plugging and abandonment of the proposed secondary recovery well. These general comments are listed below without response. Specific comments that address topics that are relevant to this permitting decision, with responses, follow in subsequent sections. Although EPA is not responding to general statements of support and opposition to the permit individually, it did consider them in making the decision to issue the final permit.

The comments in the "out of scope" category focus on topics including:

a. Fresh water should not be withdrawn at an unlimited rate because it may lower water levels in private wells
b. Fresh water should not be withdrawn at an unlimited rate because it may deplete the aquifer
c. Fresh water should not be withdrawn at an unlimited rate because it may cause earthquakes
d. Will Muskegon Development Company pay for regular water testing for nearby residents?
e. Will Muskegon Development Company pay for fair market compensation or purchase of polluted property?
f. Increased truck traffic associated with well operations
g. UIC regulations governing construction are insufficient to protect drinking water
h. The well is not needed; oil prices are cheap
i. Legal disputes involving other wells
j. Inaccuracies in the permit application (commenters confused the 2008 state oil well permit application with the federal injection well permit application)
k. Oil and gas wells have a history of failure in Pennsylvania
l. Gulf oil wells have a history of failure
m. Fracking wells can lead to contamination and earthquakes
n. Location of injection well in residential area is questionable
o. Hydrogen sulfide gas emissions

EPA received extensive comments that were "in scope" of the UIC Program's purview:

1. Request for public hearing
2. Public hearing notification procedures were flawed
3. Request for time extension for public comments following hearing
4. Request for a second public hearing
5. Ground water contamination
6. Leak accident response
7. Muskegon Development Company providing fresh water samples and any additives
8. Nature of chemicals in injected waste
9. Maximum injection pressure calculation
10. Well design and construction inadequate to protect Underground Sources of Drinking Water (USDW's)
11. Area of Review not sufficiently protective of USDW's
12. Surface casing is not deep enough to protect USDW's
13. Fresh water should not be used for injection in lieu of brine
14. Self-monitoring of injection wells is inadequate
15. Excessive injection into wells can cause earthquakes
16. Injection wells can drain the aquifer and cause earthquakes
17. Earthquake hazards from injection wells
18. EPA must address permitted and unmonitored injection wells
19. There may be orphaned wells within the Area of Review that were omitted from the permit application

20. Low income population of the well site area should be factored into permit decision
21. Risk of water pollution at the well
22. Radioactivity of injectate
23. Injection well failure rate
24. Well casing failures
25. Structural failures inside injection wells are common
26. Please protect the water supply
27. There is insufficient information in the permit application to support a permit decision

Request for public hearing

Comment #1: Our community would appreciate the questions we have, be directly answered by Muskegon in a public forum: that they will agree to have Muskegon Development Company, available to answer our questions/concerns, along with experts from the EPA. These are vital issues that could impact our community, our environment in the near future and in generations to come.

Response #1: A public meeting and public hearing regarding this proposed permit were held by EPA staff at Clare High School on July 25, 2017. EPA staff gave a presentation regarding the permit and answered questions during the public meeting, followed by the public hearing, where EPA received (but did not reply to) oral and written comments from the audience. Under the regulations governing public hearings for Underground Injection Control ('UIC') Permits (40 C.F.R. Part 124), the permit applicant, Muskegon Development Company, was not required to be present nor answer questions.

Public hearing notification procedures were flawed

Comment #2: This meeting would have had many more citizens attend if the EPA had released accurate date, time, and meeting location of this meeting, but the Clare County Review shared that it would be on Thursday (instead of Tuesday), at Clare Middle School (instead of the high school). Even the EPA web site and your handout at the meeting listed the wrong meeting date. The public deserves to know about this permit and be informed, but so do the people who depend on this aquifer, and those people reside more in northern Clare County and Gladwin County. The Township Supervisor stated the Township Hall would have been the perfect location. Why was the meeting held in the City of Clare, 26 miles away from the area affected by the injection well?

Response #2: EPA held a public hearing on July 25, 2017 for the draft permit for the proposed Holcomb 1-22 injection well. The public comment period that EPA established coincident with the public hearing was originally to conclude on Friday, July 28, 2017. EPA subsequently extended the public comment period on the draft permit to August 18, 2017. EPA took this action under 40 C.F.R. §§ 124.10 and 124.12(c) due to an error in the notice for the public hearing that certain parties received via the U.S. Postal Service. In that notice, EPA erroneously identified July 25, 2017 as a Thursday instead of a Tuesday. The hearing took place on Tuesday, July 25, 2017. The notice that

EPA published in the Clare County Review and on the EPA web site identified the correct day of the week for the hearing and Clare High School as the location. On the evening of the hearing, it was discovered that the address published in the Fact Sheet was the mailing address, which differed from the physical address of Clare High School; EPA placed signs outside to direct people to the proper location. EPA's selection of Clare High School as the venue was determined by the limited availability of a suitably large local meeting hall to hold the public hearing.

Request for time extension for public comments following hearing

Comment #3: I ask that you consider extending the public comment period, that you hold a public hearing at the Hamilton Township Hall, that you publish the correction information on the notice to citizens and publish it in the Clare County Cleaver as well as cc: to the Hamilton Township Board and Zoning & Coding Officer (he was not aware of this at all). Another paper "more local" is the Gladwin Record Eagle out of Gladwin, MI. I also ask that a representative specialized in water matters from our District DEQ office in Saginaw is present.

Response #3: Subsequent to the hearing, EPA extended the public comment period on the draft permit to August 18, 2017. EPA took this action under 40 C.F.R. §§ 124.10 and 124.12(c) due to an error in the notice for the public hearing that certain parties received via the U.S. Postal Service. In that notice, EPA erroneously identified July 25, 2017 as a Thursday instead of a Tuesday. The hearing took place on Tuesday, July 25, 2017. The notice that EPA published in the Clare County Review and on the EPA web site identified the correct day of the week for the hearing.

Request for a second public hearing

Comment #4: I demand a new public hearing on this matter on the grounds that the previous public hearing was improperly noticed and held at an inconvenient and at a location outside of Hamilton Township. I would like to also note that Hamilton Township is a rural community, one in which many residents lack reliable transportation or the ability or time to travel extra distance for a permit hearing. Therefore, I would like to request that the new public hearing be held in Hamilton Township.

Response #4: EPA held a public hearing on July 25, 2017 for the draft permit for the Holcomb 1-22 injection well. The public comment period that EPA established coincident with the public hearing was originally to conclude on Friday, July 28, 2017. EPA subsequently extended the public comment period on the draft permit to August 18, 2017. EPA took this action under 40 C.F.R. §§ 124.10 and 124.12(c) due to an error in the notice for the public hearing that certain parties received via the U.S. Postal Service. In that notice, EPA erroneously identified July 25, 2017 as a Thursday instead of a Tuesday. The hearing took place on Tuesday, July 25, 2017. The notice that EPA published in the Clare County Review and on the EPA web site identified the correct day of the week for the hearing. EPA's selection of Clare High School as the venue was determined by the limited availability of a suitably large local meeting hall to hold the public hearing.

Ground water contamination

Comment #5: Injection and waste migration: Once wastewater is underground, there are few ways to track how far it goes, how quickly, or where it winds up, raising concerns that it may migrate upward back to the surface. The hard data that does exist comes from well inspections conducted by federal and state regulators, who can issue citations to operators for injecting illegally, for not maintaining wells, or for operating wells at unsafe pressures, yet the EPA has acknowledged that it has done very little with the data it collects. A 1987 General Accountability Office review tallied ten cases in which waste had migrated from Class 1 hazardous waste wells into underground aquifers. Two of those aquifers were considered potential drinking water sources. In 1989, the GAO reported 23 more cases in seven states where oil and gas injection wells had failed and polluted aquifers. After the findings, the federal government drafted more rules aimed at strengthening the injection program. The government outlawed certain types of wells above or near drinking water aquifers, mandating that most industrial waste be injected deeper. In response, the energy industry lobbied and won a critical change in the federal government's legal definition of waste: Since 1988, all material resulting from the oil and gas drilling process is considered non-hazardous, regardless of its content or toxicity, making it subject to less strict standards than hazardous waste (Class I wells).

Response #5: The proposed permit allows only the injection of fresh water for enhanced oil recovery; injection of any wastes for disposal is prohibited. The proposed injection well will have multiple safeguards to prevent any leaks: multiple well casings (steel pipe), annulus fluid (surrounding the injection tubing), cement between the well casings, and a packer to seal off the well annulus. A thick (over 900 feet for this well) confining zone of impermeable rock lies above the injection zone. In the event of a well leak (loss of mechanical integrity), the permit specifies that Muskegon Development Company must cease injection to the well, and notify EPA within 24 hours of the incident. After repair of the leak(s), Muskegon Development Company must pressure test the well, pass a mechanical integrity test, transmit the test results to and request permission from EPA for written authorization to resume injection.

Leak accident response

Comment #6: In the event of a well leak or related accident, will Muskegon Development Company please outline the local safety procedures.

Response #6: In the event of a well leak, the permit specifies that Muskegon Development Company must cease injection to the well, and notify EPA within 24 hours of the incident. After repair of the leak(s), Muskegon must pressure test the well, pass a Mechanical Integrity Test, transmit the test results to and request permission from EPA for written authorization to resume injection.

Muskegon Development Company providing fresh water samples and any additives

Comment #7: Would Muskegon Development Company agree to provide "fresh water" samples used in the drilling process and disclose any additives?

Response #7: The Holcomb 1-22 well was drilled in 2008, and is still currently in use for oil production. After the well is converted for injection, the conditions of the permit take effect, and require Muskegon Development Company to inject only fresh water, drawn from the local aquifer, into the well; no additives or other fluids are allowed by the permit.

Nature of chemicals in injected waste

Comment #8: It is our understanding that the purpose of the permit is to inject fluid (displaced chemicals & brine waste) 2651 feet below the surface. Please disclose the "chemicals used and the effect of them being displaced" in the injection well waste disposal process.

Response #8: The proposed injection well permit only allows fresh water to be injected into the Holcomb 1-22 well for enhanced oil recovery, not for waste disposal. No chemicals, brine waste or any other substances are authorized for injection into the well.

Maximum injection pressure calculation

Comment #9: Explain how the injection pressure was selected, its depth into the rock and why it is safe. We have concerns that the injection pressure might induce formation fracturing and allow migration of the disposed waste into our aquifers and lakes.

Response #9: The limitation on wellhead pressure serves to prevent confining-formation fracturing, calculated using the following formula:

[{1.112 psi/ft. - (0.433 psi/ft.) x (specific gravity)} x depth] - 14.7 psi

Where psi = pounds/square inch

The maximum injection pressure is dependent upon depth and the specific gravity of the injected fluid. The Richfield Formation of the Detroit River Group at 4948 feet was used as the depth and a specific gravity of 1.05 was used for the injected fluid. The fracture gradient of 1.112 psi/ft. was determined from an acid-fracture job from a nearby well. The confining formations overlying the injection zone and underlying the underground source of drinking water consist of 922 feet of impermeable anydrite and salt. The maximum injection pressure was calculated to prevent the confining rock formation from fracturing.

Well design and construction inadequate to protect USDW's

Comment #10: The permit applicant, Muskegon Development Company, and the EPA, have not sufficiently demonstrated that the proposed injection well will not endanger Underground Sources of Drinking Water (USDW) and may likely present a public nuisance. The proposed injection well and any nearby offset wells are not properly designed and constructed and may endanger USDWs.

Response #10: EPA's technical review of the permit application included analysis of the engineering design of the injection well and cement plugs, evaluation of the site geology to determine the depth of the USDW and the suitability of the rock formation(s) for injection, calculation of the maximum injection pressure, and a search for and evaluation of any operating or plugged wells within the Area of Review (AOR) that penetrate the injection zone, to assure that USDWs are protected.

Area of Review not sufficiently protective of USDW's

Comment #11: The described Area of Review ("AoR") evaluation is not sufficient and neither the applicant nor EPA has demonstrated that the proposed fixed radius, assuming there is one, is appropriate to protect USDWs. The draft permit lists one (1) plugged and abandoned well within the 1/4-mile radius of the Area of Review (AOR). However, the MDEQ GeoWebFace map shows a plugged and abandoned well just north of the west edge of Decker Lake. This well appears to be within ¼ mile of the Holcomb 1-22 well. If it is not, it is beyond 1/4 mile by just a few feet, and given the extremely small radius of the area of review (AOR) that a permit applicant must address, it would be in keeping with the spirit of the law to include this well in the AOR as well.

Response #11: 40 C.F.R. § 147.1155 requires EPA to use a fixed radius AOR of no less than 1/4-mile for Class II wells in Michigan. EPA's technical review of the permit application included analysis of the engineering design of the injection well and cement plugs, evaluation of the site geology to determine the depth of the USDW and the suitability of the rock formation(s) for injection, calculation of the maximum injection pressure, and a search for and evaluation of any operating or plugged wells within the AOR that penetrate the injection zone, to assure that USDWs are protected.

Regarding the plugged and abandoned well just north of the west edge of Decker Lake, EPA has reviewed the available data on GeoWebFace and has identified the well to be the McKenna et al-4, a well drilled in 1944 to a depth of 3840 feet. The well proved to be a dry hole (non-oil producing) that was adequately plugged and abandoned. The McKenna et al-4 well did not penetrate the injection zone of the proposed Holcomb 1-22 well, and therefore would not serve as a conduit for the migration of fluids into the USDW.

Response to Comments on Draft Class II Permit in Clare County, Michigan, Issued to Muskegon Development Company (Permit No. MI-035-2R-0034), Holcomb 1-22 Well

Surface casing is not deep enough to protect USDW's

Comment #12: The draft permit should not be approved unless and until these deficiencies are addressed: Well Construction: Neither the applicant nor EPA has demonstrated that the surface casing extends below the base of the USDW and the production casing cement does not extend above the base of either the USDW or the surface casing. This means that a portion of the annular space adjacent to the USDW is uncemented. Leaving this annular space uncemented puts both the USDW and well integrity at risk. The top of the production casing cement does not appear to extend above the base of the surface casing. Failing to extend surface casing in any well to below the base of the lowest USDW puts those USDWs below the base of the surface casing at significant risk of contamination. Cross flow may occur between the USDW and other formations, potentially leading to contamination of the USDW. Leaving a potential flow zone uncemented can also result in over pressurization of the annulus and/or result in casing corrosion, both of which may lead to a well integrity failure, further putting drinking water at risk. Properly constructed wells typically have at least two barriers between USDWs and fluids contained in the well: 1) the surface casing and 2) the production casing. The American Petroleum Institute recommends that "surface casing be set at least 100 feet below the deepest USDW encountered while drilling the well. Both UIC Class I and Class VI well rules require surface casing to extend below the base of the lowest USDW, indicating that EPA clearly recognizes this as an important standard to protect ground water.

Response #12: Based upon the geological formation record obtained when the Holcomb 1-22 well was drilled for oil production, the USDW consists of the Glacial Drift, which extends from the surface to a depth of 464 feet. The surface casing and surface casing cement of the proposed injection well extends from the surface to 792 feet deep, which is 328 feet deeper than the bottom of the USDW, far exceeding 100 feet below the deepest USDW. The cemented portions of the annular space between the long string and intermediate well casings in the well extend from 2650' to 4082' – this cemented interval seals off the permeable rock formations known as the Traverse Formation (3034' to 3068'), Traverse Limestone (3068' to 3716') and Dundee Limestone (3782' to 4044'). Between 3034' and 1530', the formation record shows consecutive formations of impermeable shale, meaning that the depth interval between 2650' (top of the cement) and 1530' (top of the Coldwater Shale) consists of more than 1000 feet of impermeable rock acting as a barrier to potential upward migration of injected fluid. The depth interval between 1530' and 792' consists of shale and sandstone formations that are not USDWs. Underground injection wells are designed with multiple safeguards to prevent leaks from the well. Injection wells are constructed with multiple steel casings (pipe) cemented into place. Injection takes place through tubing located at the center of the innermost steel casing. A device called a packer seals off the bottom of the tubing, and the space between the innermost steel casing and tubing (annulus) is filled with a fluid containing a corrosion inhibitor. To assure that no leaking occurs in the well, the annulus space is tested after the well is completed and then re-tested periodically. If this test fails, the well is shut down immediately, and the cause of the leak is isolated and repaired. Once shut down, a successful pressure test must be demonstrated before EPA will allow the operator to resume well injection. Under the conditions of the permit, Muskegon Development is responsible for maintaining the well so that it works properly, and would be responsible for any contamination caused by any leaks. See 40 C.F.R. Part 146, Subpart C.

Fresh water should not be used for injection in lieu of brine

Comment #13: There is an issue regarding the level of ground water withdrawal for the purpose of oil production enhancement. Because there is no limitation, in essence there is no coordination with the aquifer that's going to provide the fresh water, so you basically are allowing the permittee to drain the aquifer. That shouldn't happen. That should be a violation of the Safe Water Drinking Act. The Safe Water Drinking Act says you are supposed to protect all of the aquifers from loss or contamination. In Michigan we have a little bit more than 4 million people who draw their water every day from an aquifer, and we need to protect them all as far as I'm concerned, and I know that's exactly what you want to do. So I do think you need to readjust the standard that you have for these -- this class of injection to consider the aquifer that is -- to consider where the fresh water is coming from. Well, frankly, you should not use fresh water. You should do what they do in EPA Region 10 or Region 9 or Region 8.

Response #13: There is no prohibition in the Safe Drinking Water Act (SDWA) or UIC regulations to using fresh water or ground water for injection to enhance recovery of oil or natural gas. The SDWA does not restrict the withdrawal of fresh water from an aquifer. The State of Michigan regulates ground water and the volume or rate of ground water withdrawal.

Self-monitoring of injection wells is inadequate

Comment #14: You are currently permitting wells, injection wells, in Michigan that you do not have a realistic expectation of being able to site monitor. We feel that is a violation of the Safe Drinking Water Act. We hope that EPA will suspend activities on permitting until such time as EPA has caught up with the backlog of unmonitored wells, which is quite substantial. The idea that a company would be allowed to provide its own data and studies for any part of the permit process is completely absurd. At no point in any permit application should a company be trusted to provide its own numbers. It is absurd to trust any business to self-regulate. Should problems occur, there is an obvious profit motive for negligence in monitoring, reporting, and even for taking corrective actions to address potential issues. It is appalling that the regulations of the permitting process leave the EPA and MDEQ to rely on data submitted by the permit applicant and that the EPA and MDEQ do not obtain and maintain their own data.

Response #14: Self-monitoring under permit conditions has been well-established for decades and is the basis of compliance with most federal and state environmental protection statutes. Periodic environmental compliance inspections supplement regular self-monitoring data; permit violations are subject to enforcement action. Under federal law, there are criminal penalties for falsification of data and reports. Congress enacted the SDWA to protect USDWs from endangerment from underground injection practices, thereby protecting human health and the environment. The UIC regulations at 40 C.F.R. Parts 144 and 146 specify the geological siting, engineering, construction, and operation and monitoring requirements which injection wells must meet in order to prevent contamination of USDWs. Parties that wish to use an injection well must obtain a UIC permit showing that they satisfy those requirements. For the Holcomb 1-22 well permit, EPA has determined that there will be no

impact to the drinking water aquifer as a result of injection into this well. The next step in the protection of a USDW is for the permit holder to be in compliance with the permit, which includes monitoring and reporting requirements. EPA reviews monthly operating reports and reports on periodic testing. EPA inspections and oversight verify the accuracy of the facility's self-monitoring and reporting, and the facility is subject to penalties and sanctions for failure to comply with its obligations. In federal fiscal year 2017, EPA inspected 518 wells, reviewed 13,560 monitoring reports, witnessed 226 mechanical integrity tests, reviewed reports from 32 well mechanical integrity or geologic reservoir tests, and issued four information collection orders. Failure to comply fully with permit conditions is a violation and may subject an owner/operator to an action under the enforcement provisions of the SDWA, 42 U.S.C. § 300h-2. Violations of the SDWA and UIC regulations are subject to Administrative Orders which may include penalties of up to $273,945, civil penalties of up to $54,789 per day of violation and criminal penalties of up to 3 years imprisonment and fines in accordance with Title 18 of the United States Code.

Excessive injection into wells can cause earthquakes

Comment #15: With an unlimited injection of ground water into your Class II wells, you have not adjusted the maximum limitation, and you are, in fact, permitting earthquakes by doing that. It may take 40 or 50 or 100 years, but infinity will catch up with whatever is there and physics will take over and you will have an earthquake. So, EPA must redo that standard so that disposal wells do not have infinity. In March of 2016, the United States Geological Survey issued a major finding that injection wells can cause earthquakes. The EPA has not incorporated that finding into its injection well permitting activities. Considering the USGS finding, infinity is not a realistic or safe limit on injection well permits. It is imperative the EPA develop a safe and realistic limit for the total amount of wastes injected allowed by EPA for each permit. Until the infinity limit problem is addressed, the EPA cannot legally issue injection well permits without violating both the letter and spirit of the Safe Drinking Water Act.

Response #15: The UIC permit limits the injection pressure that can be used. According to historical data compiled by the U.S. Geological Survey (USGS), the Clare County area is considered a low risk area regarding earthquakes, with no instances of property damage or fatalities due to earthquakes. Of the five historic earthquakes cited by the USGS in their web site report on Michigan earthquake history, none were located near Clare County. An earthquake in Michigan registered a Richter magnitude of 4.2 on May 2, 2015, but the epicenter was located 9 miles southeast of Kalamazoo, about 125 miles away from Hamilton Township, Clare County, Michigan, where the site of the proposed Holcomb 1-22 well is located. The depths of the earthquakes were determined by geologists to be more than 19,000 feet below ground, far deeper than any existing Class II injection wells. Based upon this data, and using the EPA Injection-Induced Seismicity Decision Model flow chart, no seismicity concerns related to proposed injection into the Holcomb 1-22 well were identified.

Injection wells can drain the aquifer and cause earthquakes

Comment #16: An earthquake of Richter Magnitude 4.2 occurred in Michigan during May of 2015. An earthquake easily can affect the confining strata within a 200 mile-plus area from the epicenter. Another problem with this well, and in particular, with the Class II wells, is that an infinity limitation on ground water withdrawal allows the permittee to drain the aquifer. The U.S. Geological Survey made a finding that injection wells do, in fact, cause earthquakes. If you live in Oklahoma, you don't have to wonder about that finding at all.

Response #16: EPA considered seismic risk as part of its technical review of the permit application. The May 2, 2015 earthquake epicenter was located about 125 miles away near Galesburg, Michigan, in Kalamazoo County with a Richter Magnitude of 4.2. News reports of surface damage were minimal. Upon technical review, no seismicity concerns related to proposed injection into the Holcomb 1-22 well were identified.

Studies have documented that certain injection wells in Oklahoma can cause earthquakes. However, there are a number of prerequisite factors that must exist: 1) excessively high injection pressures and fluid volumes, and 2) the existence of fault zones. The injection pressure and fluid volume for the proposed Holcomb 1-22 well, combined with the general lack of fault zones in the area, are an unlikely scenario for injection-induced earthquakes. Also, the geology of Michigan is very different than that of Oklahoma, and the studies from Oklahoma cannot reasonably be extrapolated to the proposed well site in Michigan.

Earthquake hazards from injection wells

Comment #17: Earthquakes in Michigan were felt in the past few years. Core samples of the Holcomb well need to be taken to determine if there was any effect on the well casing integrity due to this seismic activity. Given that the USGS has found that injection wells do in fact cause earthquakes, EPA needs to take the entirety of Michigan's existing oil and gas wells and injection wells into account, and do a complete survey of orphan wells and their conditions, before issuing any new injection well permits.

Response #17: EPA considered seismic risk as part of its technical review of the permit application. The May 2, 2015 earthquake epicenter was located about 125 miles away in Kalamazoo County with a Richter Magnitude of 4.2. News reports of surface damage were minimal. Upon technical review, no concerns related to the Holcomb 1-22 well and seismicity were identified. Studies have documented that certain injection wells in Oklahoma can cause earthquakes. However, there are a number of prerequisite factors that must exist: 1) excessively high injection pressures and fluid volumes, and 2) the existence of fault zones. The injection pressure and fluid volume for the proposed Holcomb 1-22 well in Michigan, combined with the general lack of fault zones, are an unlikely scenario for injection-induced earthquakes related to the Holcomb 1-22 well. Also, the geology of Michigan is very different than that of Oklahoma, and the studies from Oklahoma cannot reasonably be extrapolated to the proposed well site in Michigan. Under Part I 10(c) of the proposed permit, Muskegon Development cannot commence injection in the well until they demonstrate mechanical integrity, submit a report for EPA review, and receive a written authorization to inject from EPA.

EPA must address permitted and unmonitored injection wells

Comment #18: It is not legal for the EPA to issue any more Class II injection well permits in Michigan without a prior substantial EPA effort to address the existing permitted and unmonitored injection wells in Michigan. Permitting without a realistic expectation of the monitoring required by federal law is a violation of that same law.

Response #18: EPA expends effort to evaluate compliance by persons who own or operate injection wells. EPA inspects such wells, reviews monitoring reports submitted by owners or operators, witnesses well mechanical integrity and geologic reservoir tests performed by such persons, reviews reports from mechanical integrity and reservoir tests, and issues information collection orders to owners or operators under 42 U.S.C. § 300j-4. In federal fiscal year 2017, EPA inspected 518 wells, reviewed 13,560 monitoring reports, witnessed 226 mechanical integrity tests, reviewed reports from 32 well mechanical integrity or geologic reservoir tests, and issued four information collection orders. Neither the Safe Drinking Water Act nor regulations provide that a permit application should be denied on the basis of the scope of coverage of the compliance evaluation program administered by the permit-issuing agency.

There may be orphaned wells within the Area of Review that were omitted from the permit application; they are a hazard and should be factored into permit decision

Comment #19: Hamilton Township has a history with the oil and gas industry that goes back at least to the 1930s. This is a long and tumultuous history. Dangerous levels of methane have been found in homes in their drinking water; also, there are a number of incidents of exploding homes and basements due to old wells leaking methane and other gases. These wells were drilled in the 1930s and 1940s, a time when well drilling and closing standards were far from what is required today. We know that the DEQ has found ancient and improperly closed wells; wells plugged with garbage, timbers, whatever was available to fill the hole, rather than the cement and steel that is required today. Taking this into consideration along with well failure statistics of modern wells, leaves an alarming question as to whether or not this area is truly appropriate for injection wells and the high pressure used in such wells. That's what the area geologist for the Michigan Department of Environmental Quality tells us. Independent researchers have discovered a number of orphan wells NOT included in most of the archives, and there are orphan wells that are NOT included on the DEQ maps for Hamilton Township. Thus, it is very possible that Muskegon Development Company has failed to account for all the wells in the 1/4-mile AOR radius. Is there is a plan to locate these orphan wells before this permit is issued and the injection well becomes operational? There should be a full survey of the area be conducted to locate orphan wells and make sure that they are adequately plugged and if they are in fact leaking from well casing failure or other failure.

Response #19: During technical review of a UIC permit application, EPA evaluates the possible impact of abandoned wells if they are located within the 1/4-mile radius AOR, and if they are deep enough to penetrate the injection zone. If such wells are identified, a plan of corrective action to address these wells may be specified in the underground injection permit, to be implemented by the

permit holder to assure that injection operations do not cause ground water migration to spread contamination into the USDW. Underground injection wells that are abandoned must be plugged, as specified by regulation or permit; 40 C.F.R. §146.24 a (3) requires "a tabulation of data on all wells within the area of review which penetrate into the proposed injection zone. Such data shall include a description of each well's type, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Director may require." Within the Area of Review, EPA analysis of available information shows one active oil producing well that penetrates the injection zone, and two dry holes (non-oil producing wells that have been plugged and abandoned) that did not penetrate the injection zone of the proposed Holcomb 1-22 well.

Low income population of the well site area should be factored into permit decision

Comment #20: My hope is that EPA staff will understand the human condition that surrounds this well site and give due consideration to those concerns if any of the other conditions of approval are in question. If you look at the demographics of Michigan, you will note that Lake County and Clare County are the most impoverished area within our state. The northern half of Clare County is the most impoverished area within our county. The last numbers I saw the median income in that area was under $20,000 per household. The Dodge City area is likely the most impoverished area in northern Clare County and it is located 2 miles west of the Holcomb 1-22 well site. As a full time realtor in Clare, Gladwin and Isabella County for over 25 years, I have seen this poverty first hand. Last year (per the Clare/Gladwin MLS) there were 239 home sales in the Harrison Area. 105 of those sales were under $50,000. Most of these sales are in residential areas served by private well and septic systems. Most of the wells we see in that area are 1 or 1.5-inch diameter hand-driven wells that were put in prior to the health department permit requirements and they remain in use today because of the cost of upgrading and the homeowner's inability to fund improvements. While I understand that contamination from this project is unlikely, the unlimited use of excessive and unlimited quantities of water from the water table is a concern.

Response #20: EPA considers a number of factors in review of a permit application, including environmental justice (EJ) screening to identify areas where people are most vulnerable or may be exposed to different types of pollution, in order to assure that no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental and commercial operations or policies. One of those EJ screening factors identified by EPA was that 56% of the local population were in the low income level. Other factors include evaluation of the well design; plugging and abandonment plan; and, geological suitability of the rock formations for injection.

Risk of water pollution at the well

Comment #21: This appears to be a deep injection well in Clare County near the headwaters of the Middle Branch Tobacco River. I have not reviewed anything like this before and am not certain how to understand all the potential impacts. I went to the listed website and did look at that. I would have concerns over anything which could impact the ground water input to the Middle Branch Tobacco River as it is a designated trout stream. Any impacts that could possibly change the flows or temperatures would a problem and negatively impact the trout stream. I forwarded this to our habitat unit and they also were unsure of potential harmful impacts on fish in the nearby streams. My guess is the deep injection would mostly impact ground water and possibly drinking water for nearby wells. Thank you for my chance to comment and know about this application.

Response #21: Based upon EPA's technical review of the permit application, the well and plugging design, site geology, and endangered species review, the well will be protective of Underground Sources of Drinking Water (USDWs) and the environment, including surface water. EPA reviewed the permit application to determine that the geologic setting was appropriate for underground injection and that the proposed well, which already exists, was properly constructed. EPA evaluated the well's geological siting and construction, and established operating requirements in the permit that are protective of the USDW. EPA used several information sources in its review including the Michigan Hydrologic Atlas, the U.S. Geological Survey, and State of Michigan records of nearby injection wells. EPA's permit includes limits on the surface injection pressure to prevent the injected fluid from causing fractures in the rock, which could become conduits for the injected fluid to leave the injection zone. EPA calculated the surface injection pressure limit using conservative, site-specific figures for injected fluid, injection zone depth, and rock characteristics. EPA also reviewed all deep wells in the ¼-mile zone surrounding the well site, to assure that they do not act as potential conduits for injection fluids to move into the USDW. EPA determined that all other wells in the surrounding ¼-mile zone were either properly constructed or properly plugged and abandoned, and will not act as conduits for injection fluids under pressure to move into the USDW or surface water. In addition, the applicant is required to pass a mechanical integrity test, in accordance with 40 C.F.R. § 146.8, before authorization to inject is granted and after the well is completed. The operator is also required to repeat the test at least once every five years thereafter and to collect operating data and report to EPA monthly.

Radioactivity of injectate

Comment #22: EPA fails to analyze Class II injection wells' waste stream, including this one, for the radioactivity which permeates oil and gas drilling wastes. Regardless of whether an injection well's engineering allows it to leak, there is no safeguard against radioactive contamination. There is no showing of any scrutiny of the question of whether any drill wastes will be contaminated routinely with "radioactive waste," which is defined at 40 C.F.R. § 144.3 as "any waste which contains radioactive material in concentrations which exceed those listed in 10 C.F.R. part 20, appendix B, table II, column 2." The referenced table and column specify threshold contamination levels for Ra-226, Ra-228, several Uranium isotopes associated with drilling wastes, and Th-232. It is incumbent upon the EPA to require sourced, predictive information of the likely radiological characteristics of the

waste stream before a permit can even be considered for the proposed site. An entirely new permit must then be required of the operator, and the new process should afford the public the opportunity to scrutinize the underlying radioactive waste data along with another public hearing. Regarding geologic siting, what is the capacity of the targeted geologic formation for the Holcomb well to take radioactive waste from other formations and other drilling operations? Will the permit allow the operator to take such wastes in the future? Does EPA monitor the radioactivity of the injectates going into an injection well or the radioactivity of the injection well site?

Response #22: This permit only authorizes injection of fresh water for enhanced recovery of oil into the well. The proposed injection well will be a conversion of an existing oil production well that was permitted by the State of Michigan during 2008. No brine or any other wastes are allowed to be injected for disposal under this permit.

Injection well failure rate

Comment #23: Injection well integrity does fail and the toxic materials inside the wells do reach and contaminate the water supply. I put the following studies by Dr. Ingraffea and others into the record on this topic: Regarding well engineering in Michigan: EPA monitors injection wells throughout the state. What is the likelihood based on EPA's monitoring of Michigan injection wells that the proposed Holcomb injection well will fail in 10 years? In 20 years? In 100 years? Forever? EPA should require the operator to post a bond high enough that if contamination happens, ever, that will pay to clean up contaminations. I urge EPA to reject the permit well because of the known rates of well-casing failures. Because all well casings of injection wells (and frack wells) eventually fail--some right away, some in a few years, and all eventually--this guarantees that the toxic waste in the injection well will eventually endanger drinking water and aquifers. I put the following scientific study by Anthony Ingraffea, Ph.D., P.E., into the record: "Fluid Migration Mechanisms Due to Faulty Well Design and/or Construction: An Overview and Recent Experiences in the Pennsylvania Marcellus Play," January 2013. Physicians, Scientists & Engineers for Healthy Energy. A ProPublica review of well records, case histories, and government summaries of more than 220,000 well inspections from October 2007 to October 2010 found that structural failures inside injection wells are routine. From late 2007 to late 2010, one well integrity violation was issued for every six deep injection wells examined — more than 17,000 violations nationally. More than 7,000 wells showed signs that their walls were leaking. Records also showed wells are frequently operated in violation of safety regulations and under conditions that greatly increase the risk of fluid leakage and the threat of water contamination. ProPublica's analysis showed that, when an injection well fails, it is most often because of holes or cracks in the well structure itself. Once wastewater is underground, there are few ways to track how far it goes, how quickly, or where it winds up, raising concerns that it may migrate upward back to the surface. The hard data that does exist comes from well inspections conducted by federal and state regulators, who can issue citations to operators for injecting illegally, for not maintaining wells, or for operating wells at unsafe pressures, yet the EPA has acknowledged that it has done very little with the data it collects.

Response #23: The permit requires that the well will inject only fresh water, not wastewater. The permit requires that "the permittee must establish (prior to receiving authorization to inject), and shall maintain mechanical integrity of this well, in accordance with 40 C.F.R. § 146.8," and specifies monitoring requirements designed to detect conditions that indicate possible loss of mechanical integrity, and procedures for restoring mechanical integrity. In the event of a well leak (loss of mechanical integrity), the permit specifies that the permittee (Muskegon Development Company) must shut-in (cease injection to) the well, and notify EPA within 24 hours of the incident. After repair of the leak(s), Muskegon must pressure test the well, pass a mechanical integrity test, transmit the test results to and request permission from EPA for written authorization to resume injection.

There is insufficient information in the permit application to support a permit decision

Comment #24: I am writing to oppose the issuance of a Class II Injection Permit to Muskegon Development Company (Holcomb 1-22 well, #MI-035-2R-0034). I would also like to request new surveys and studies be done where and when appropriate, new permit applications required, and that this process be generally reset to the starting point, which should include a new Public Hearing Transcript, as there have been problems throughout the application process.

Response #24: EPA has reviewed the technical information of record, and the comments received during the two public comment periods, and determined the permit application to be complete, with enough data and information to support a permit decision. The basis of the permit decision relies primarily upon assessment of the local geology, well design and the plugging and abandonment plan of the existing well. EPA considers the impact of other wells within the ¼ mile radius area of review that are deep enough to penetrate the proposed injection zone. Please see the responses to comments 1-4 for information about the process for public participation on the draft permit decision.

Determination

After consideration of all public comments, EPA has determined that none of the comments submitted have raised issues which would alter EPA's basis for determining that it is appropriate to issue Muskegon Development a permit to operate the Holcomb 1-22 injection well. Therefore, EPA is issuing a final permit to Muskegon Development. No changes will be made to the final permit from the draft permit.

Appeal

In accordance with 40 C.F.R. § 124.19(a), any person who filed comments on the draft permit or participated in the public hearing may petition the Environmental Appeals Board (EAB) to review any condition of the final permit decision. Additionally, any person who failed to file comments on the draft permit may petition the EAB for administrative review of any permit conditions set forth in the final permit decision, but only to the extent that those final permit conditions reflect changes from the proposed draft permit. Any petition shall identify the contested permit condition or other specific

challenge to the permit decision and clearly set forth, with legal and factual support, petitioner's contentions for why the permit decision should be reviewed, as well as a demonstration that any issue raised in the petition was raised previously during the public comment period (to the extent required), if the permit issuer has responded to an issue previously raised, and an explanation of why the permit issuer's response to comments was inadequate as required by 40 C.F.R. § 124.19(a)(4). If you wish to request an administrative review, documents in EAB proceedings may be filed by mail (either through the U.S. Postal Service ("USPS") or a non-USPS carrier), hand-delivery, or electronically. The EAB does not accept notices of appeal, petitions for review, or briefs submitted by facsimile. All submissions in proceedings before the EAB may be filed electronically, subject to any appropriate conditions and limitations imposed by the EAB. To view the Board's Standing Orders concerning electronic filing, click on the "Standing Orders" link on the Board's website at www.epa.gov/eab. All documents that are sent through the USPS, except by USPS Express Mail, must be addressed to the EAB's mailing address, which is: Clerk of the Board, U.S. Environmental Protection Agency, Environmental Appeals Board, 1200 Pennsylvania Avenue, NW, Mail Code 1103M, Washington, DC 20460-0001. Documents that are hand-carried in person, delivered via courier, mailed by Express Mail, or delivered by a non-USPS carrier such as UPS or Federal Express must be delivered to: Clerk of the Board, U.S. Environmental Protection Agency, Environmental Appeals Board, 1201 Constitution Avenue, NW, WJC East Building, Room 3332, Washington, D.C. 20004.

A petition for review of any condition of a UIC permit decision must be filed with the EAB within 30 days after EPA serves notice of the issuance of the final permit decision. 40 C.F.R.§ 124.19(a)(3). When EPA serves the notice by mail, service is deemed to be completed when the notice is placed in the mail, not when it is received. However, to compensate for the delay caused by mailing, the 30-day deadline for filing a petition is extended by three days if the final permit decision being appealed was served on the petitioner by mail. 40 C.F.R.§ 124.20(d). Petitions are deemed filed when they are received by the Clerk of the Board at the address specified for the appropriate method of delivery. 40 C.F.R.§ 124.19(a)(3) and 40 C.F.R. § 124.19(i). The request will be timely if received within the time period described above. For this request to be valid, it must conform to the requirements of 40 C.F.R. § 124.19. This request for review must be made prior to seeking judicial review of any permit decision. Additional information regarding petitions for review may be found in the Environmental Appeals Board Practice Manual (August 2013) and A Citizen's Guide to EPA's Environmental Appeals Board, both of which are available at:

http://yosemite.epa. gov/oa/EAB_Web_Docket.nsf/General+Information/
Environmental+Appeals+Board+Guidance+Documents?OpenDocument

The EAB may also decide on its own initiative to review any condition of any UIC final permit decision. The EAB must act within 30 days of the service date of notice of the Regional Administrator's action. Within a reasonable time following the filing of the petition for review, the EAB shall issue an order either granting or denying the petition for review. To the extent review is denied, the conditions of the final permit decision become final agency action when a final permit decision is issued by the EPA pursuant to 40 C.F.R. § 124.19(l).

Final Permit

The final permit and Response to Comments document are available for viewing at the Harrison District Library, 105 East Main Street, Harrison, MI 48625; Phone: (989) 539-6711.

Please contact William Tong of my staff at (312) 886-9380, or via email at tong.william@epa.gov if you have any questions about the Muskegon Development Company, Holcomb 1-22 Class II injection well permit.

Linda Holst Date 7/3/18

Linda Holst
Acting Director, Water Division
U. S. Environmental Protection Agency
Region 5