EXHIBIT B-23

EPA Response to Public Comment Document

West Bay Exploration Company (WBEC), Haystead #9 SWD
(Permit #MI-079-2D-0010**)**

Administrative Record
Item # 68

April 9, 2014

Tinka G. Hyde, EPA

RESPONSE TO PUBLIC COMMENTS

U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA)
UNDERGROUND INJECTION CONTROL (UIC) PERMIT # MI-075-2D-0010,
WEST BAY EXPLORATION COMPANY, HAYSTEAD #9 SWD WELL
JACKSON COUNTY, MICHIGAN

Introduction **Date:** APR 0 9 2014

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 requires that at the time any final EPA permit decision is issued, the Agency shall: (1) describe and respond to all significant comments 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

A public comment period for this permitting decision began on March 29, 2013, and ended on May 14, 2013, for a total of 46 days. Under 40 C.F.R. § 124.10(b), EPA shall allow at least 30 days for public comment. Public notices were published on March 30, 2013, in a local newspaper, the Jackson Citizen Patriot, and additionally mailed on March 27, 2013 to: (1) interested parties who had contacted EPA to be placed on the mailing list; (2) people who had made comments during a previous public comment period for a nearby proposed well, the West Bay #22, in 2012; and (3) residents within a ¼ mile radius of the proposed Haystead #9 SWD injection well. EPA also provided the Haystead #9 SWD draft permit to the Jackson Public Library for public viewing.

During the comment period, an informational session and public hearing were held at Columbia Central High School in Brooklyn, Michigan, on April 30, 2013. Approximately 30 members of the public attended, with 16 participants providing verbal comments and 2 attendees submitting written comments. Over the course of the comment period, 5 letters were received via U.S. Postal Service Standard Mail, and 5 commenters contacted EPA with comments via email. EPA also notified the U.S. Department of Interior, Fish and Wildlife Service (U.S. FWS) of the Agency's draft decision to issue a permit for the Haystead #9 SWD well and provided 30 days for the U.S. FWS to comment on the draft permit. Subsequently, EPA reviewed the comments made by the public as well as the U.S. FWS, documented information necessary to clarify those issues, and developed this response to comments document.

Final Determination

EPA greatly values all public participation and appreciates the time all commenters took to express their concerns related to the proposed Class II permit for the Haystead #9 SWD well. Many commenters were concerned about the potential for the well to contaminate their present and future sources of drinking water, and frequently asked how the aquifer will be protected. The purpose of the UIC program is to protect Underground Sources of Drinking Water (USDWs) from endangerment by underground injection practices. The UIC regulations are designed to protect USDWs from contamination by: (1) identifying drinking water sources for protection; (2) making sure the geological siting is suitable for injection; and (3) applying standards for well construction, operation, and reporting. The permit application and the conditions in the Haystead #9 SWD permit are consistent with those regulations.

The UIC program protects current and future sources of drinking water by defining a USDW broadly. USDWs, by definition, include fresh water aquifers in current use as well as those that meet certain criteria indicating they could be used as drinking water, even if they aren't currently used. USDWs are defined based on quantity, current usage, and the concentration of dissolved solids in the aquifer. The concentration of dissolved solids is an indicator as to whether an aquifer has the potential to be potable, even if it is not currently used for drinking water. Specifically, UIC regulations (40 C.F.R. §§ 144.3 and 146.3) define a USDW as any aquifer which is currently being used as a drinking water source or which is of sufficient volume and adequate quality to be a source for a public water system. An aquifer or portion of an aquifer which contains less than 10,000 milligrams per liter (mg/L) of total dissolved solids is considered a potential drinking water source and is therefore protected even if it is not in use (potable water generally contains less than 500 mg/L of total dissolved solids). By protecting water supplies that have more dissolved solids than normal drinking water, the UIC program also protects USDWs that could be used in the future. Based on the Michigan Hydrogeologic Atlas (1981), and drilling and formation records (i.e. Michigan Department of Environmental Quality permitted wells #60076 and #60078) in the vicinity of the Haystead #9 SWD, the lowermost USDW has been identified as the Marshall Sandstone. The base of the Marshall Sandstone is located approximately 217 feet below ground surface. According to the United States Geologic Survey (USGS) Summary of Hydrogeologic Conditions by County for the State of Michigan (2007), the Marshall aquifer ranges in thickness from 75 feet to more than 200 feet within the State of Michigan. Based on drilling records referenced above, the Marshall Sandstone is topped by unconsolidated glacial drift at a depth of approximately 88 feet to the ground surface. These formations, the Marshall Sandstone and the unconsolidated glacial drift are considered USDWs in Jackson County, Michigan, because they are aquifers which contain less than 10,000 milligrams per liter (mg/L) of total dissolved solids and are considered potential drinking water sources.

The UIC program also determined that the geologic siting of the Haystead #9 SWD well is suitable for underground injection. Injection will occur in the Niagaran within the interval between 2,870 and 3,100 feet below ground surface. The top of the injection zone is separated from the bottom of the USDW by approximately 2,653 feet of rock formations layers. The Niagaran, or Niagaran Group, is a vast limestone and dolomite rock structure underlying Michigan and parts of Illinois, Indiana, Ohio, and New York. The Michigan Hydrogeologic Atlas (1981) describes the Niagaran rock group as generally very porous and permeable, and will readily accept a wide range of fluids. The injection zone is topped by the Salina Group, an approximately 430 foot thick sequence of carbonate, anhydrite, shale, and salt, which will act as a confining layer to prevent flow out of the injection zone. This sequence of rock blocks the passage of water and is considered a confining unit, due to poor water transmitting rates, as described in the Michigan Hydrogeologic Atlas (1981). Furthermore, many of the rock layers between the confining zone and the base of the USDW are impermeable shales and evaporites which will prevent injection fluid from moving upward to enter the USDW. These shale layers include the Antrim Formation, Bedford Shale, Bell Shale, Sunbury Shale, and Coldwater Shale. Formation and drilling records for nearby wells, including wells MDEQ #60076 and #60078, indicate that the Coldwater Shale is nearly 1000 feet thick, and is present below the lowest USDW (i.e. Marshall Sandstone) from approximately 217 to 1,200 feet below ground surface.

In addition to the Haystead #9 SWD being sited in an area in which the geological formations are appropriate for injection, injection wells must be constructed and operated to prevent the injection fluid from contaminating a USDW. The Haystead #9 SWD well will be drilled to 3,100 feet below surface, and will be constructed with three casing strings (steel pipe), set to 350, 930, and 2,780 feet respectively. All steel casing strings will be cemented over their entire length to preclude the movement of fluids into

and between USDWs due to injection operations. Injection will take place through steel tubing which is set within the long-string casing. A packer set at the bottom of the tubing will seal off the space between the casing and tubing. This space, called the annulus, will be filled with a liquid mixture containing a corrosion inhibitor, and the pressure of the annulus liquid will be monitored to detect changes in pressure which indicate a leak. The pressure in the space between the tubing and casing (annulus) will be tested initially after the completion of the well to ensure that the well has mechanical integrity and monitored weekly thereafter to ensure that the well maintains mechanical integrity. Any loss of annulus fluid is reported at least quarterly. If monitoring indicates a leak or if the well should fail a mechanical integrity demonstration, then the well will be shut down until corrective actions have been taken and the well has been brought back into compliance. Any work performed on the well that requires the moving and/or removal of the tubing or packer must be followed by a mechanical integrity test before authorization to resume injection will be given. Under permit conditions, the injection pressure will be limited to ensure the safe operation of the well and monthly reports of pressure and flow rates must be submitted to our office for review.

EPA regulations at 40 C.F.R. Parts 144 and 146 set the requirements and standards that a permit applicant must meet to have a UIC permit application approved. These regulations deal primarily with the geologic siting, well engineering, operating, and monitoring standards for deep injection wells. These are the only things that the UIC program can take into consideration. EPA's Environmental Appeals Board has confirmed this view in other UIC permit cases. Two cases where the board addressed other factors in the decision making process are *In re Envotech*, L.P., 6 E.A.D. 260 (EAB 1996) and *In re Beckman Production Services*, 5 E.A.D. 10 (EAB 1994). The Environmental Appeals Board in Envotech stated: "…the Region has a narrow and clearly defined responsibility in this matter. It is charged with implementing the UIC regulations promulgated by EPA in accordance with the mandate of Congress in the Safe Drinking Water Act…" In Beckman, the Environmental Appeals Board stated: "EPA's inquiry in issuing a UIC permit is limited solely to whether the permit applicant has demonstrated that it has complied with the federal regulatory standards for issuance of the permit."

Following review of the permit application, EPA has determined that there should be no impact to the drinking water supplies as a result of injection into this well. The geologic siting, engineering and construction, and operating and monitoring standards applied to the Haystead #9 SWD well are sufficient to protect the USDW. The Agency has determined that the public comments submitted did not demonstrate deficiency of the application based on UIC Program requirements for approval, and did not raise issues which would alter EPA's basis for determining that it is appropriate to issue West Bay Exploration Company a permit to construct and operate the proposed injection well. Therefore, EPA plans to issue a final permit for the Haystead #9 SWD well to West Bay Exploration Company.

RESPONSE TO COMMENTS

The section below lists all written and verbal comments received by EPA during the public comment period and at the public hearing held on April 30, 2013. All comments have been expressed in italics and EPA's responses are listed below each comment or subset of comments. The written and verbal comments have been duplicated as close as possible to how they were received, and the content has not been altered. To view the full transcript of the public hearing, please visit our website at http://www.epa.gov/r5water/uic/haystead/index.htm.

EMAILED COMMENTS:

1. **Timothy Porter, via email, Sat 3/30/2013 6:03 PM**
   Thanks for the info may show up just for a good laugh no matter the questions you will find nothing wrong with it and just rubber stamp it . Have a great easter weekend .

   RESPONSE 1:
   Only after a thorough review of the permit application, public comments, and any other additional information received, did EPA determine that the Haystead #9 SWD injection well met all federal UIC requirements for geological siting, construction, and operation of the well. EPA prepared a draft permit for public review and comment, and held a public hearing for the proposed well on April 30, 2013. The public comment period, the public hearing, and consideration of all comments sent to EPA are part of the process for making a final determination. EPA takes all comments and concerns seriously, and only a final permit conveys EPA's final decision on the proposed project.

   The Michigan Department of Environmental Quality (MDEQ) issued its permit for the well prior to EPA's draft permit. The federal and state permit processes are separate, and EPA was not involved with the State permit for this site. The UIC program does not regulate the operation of surface facilities, or surface activities such as the construction of roads, pads, tanks, pipelines, or other surface facilities. These activities are regulated by MDEQ. Questions about surface activities should be directed to:

   Lansing District Office
   Office of Oil, Gas, and Minerals
   Louis Schineman, Environmental Manager
   Constitution Hall, 1st Floor, South East
   525 W. Allegan Street, P.O. Box 30242
   Lansing, MI 48909-7742

   phone: (517) 284-6651
   fax: (517) 241-3571

   Additionally, you can find MDEQ's website and the Office of Oil, Gas, and Minerals page at http://www.michigan.gov/deq/0,4561,7-135-3306_57064---,00.html

2. **Peter Bormuth, via email, Tue April 16, 2013 8:57 PM**
   Please be informed that i will comment on Haystead #9 permit (Permit No. MI-075-2D-0010) and that i will file a petition for review. I seriously suggest you delay holding a hearing and issuing this permit until the Petition For Review of West Bay #22 is resolved by the EAB. All of the same comments on contaminents and geology will be inserted into the record, as well as a charge of fraud.

   I am not pleased with the actions of the EPA with regard to these wells, nor with West Bay Oil Exploration. If this indicates that you are, and have been, permitting this anhydrite strata for injection across Southern Michigan - you are in for a fight.

   My review shows that there might be a strata suitable for injection - over 1500 feet below where you have placed it. I am not a geologist or a expert witness. However i am a Druid with 19 years of training so please don't come Jackson County and the State of Michigan cutting corners. I can

read geological strata maps, scientific studies, and drilling logs. In Michigan we live in the middle of 1/5 of the Earth's fresh water and the MDEQ is leasing tracts for fracking and permitting oil waste injection technologies on an unprecedented scale. These technologies have already caused problems in our Southwestern and Great Plains arid lands and they do not belong in Michigan, certainly not without far more stringent safety requirments. This christian Republican push to extract the last resouces of our State for pennies on the dollar while threatening our future is a tragedy.

Here in Michigan we look to the EPA for help in this situation, not for complaince and hindrence of legitimate opposition. The responsibility of the EPA is to acknowledge regional differences and to vary regulations accordingly. In this case they should be protecting the Great Lakes watershed as one of our country's most valuable resources - instead of selling out for one last oil and gas rush that will very conceivably threaten our underground sources of drinking water in this State. The EPA's actions in this case suggest a need for reappraisal and i will do what i can to see that reappraisal is publicly undertaken.

RESPONSE 2:

The EPA reviews all UIC permit applications on a case-by-case basis. EPA regulations detailed in 40 C.F.R. Parts 144 and 146 state the requirements and standards that a permit applicant must meet to have a UIC permit application approved. These regulations deal primarily with the geologic siting, well engineering, operating, and monitoring standards for deep injection wells. The application for the proposed West Bay #22 Class II brine injection well is still under review by EPA at this time. Any decisions on the proposed West Bay #22 well will undergo a separate public notice and comment period. EPA cannot consider comments on the proposed West Bay #22 well as a part of the decision-making process for the Haystead #9 SWD well. Per 40 C.F.R. § 144.31(d), "the completeness of any application for a permit shall be judged independently of the status of any other permit application or permit for the same facility or activity". Comments on another well outside of the area of review (AOR) are outside the scope of this permit action.

In the case of the Haystead #9 SWD, the well is to be drilled to a total depth of 3,100 feet below ground surface (bgs). The injection zone where the waste will be disposed of is limited to the Niagaran formations at depths between 2,870 feet and 3,100 feet bgs. According to the Michigan Hydrogeologic Atlas (1981) this structure of rock is capable of receiving the injected fluid. The proposed injection zone is confined by the Salina Group. This group of rock is a thick sequence of carbonate, anhydrite, shale, and salt. Based on drilling and formation records of nearby wells, including the Haystead #1-9 (MDEQ Permit #60076) and Haystead #3-9 (MDEQ Permit #60078), the Salina Group has been observed at the interval between approximately 2,352 to 2,782 feet bgs. The Salina Group is considered a confining unit because it has poor water transmitting rates and blocks the passage of water. The confining zone will act as a barrier to fluid migrating out of the injection zone, making it unlikely that injected fluid will leave the injection zone.

Additionally, and based on the drilling and formation records referenced in the paragraph above, the injection zone is separated and confined from the lowermost underground source of drinking water by a total of approximately 2,653 feet of rock strata, containing mainly shale, limestone, and various other rock types. Because fluids cannot move easily through these formations, the confining layers will prevent the injected fluids from migrating upward out of the injection zone. If injected fluid were to exit the confining zone, it would migrate up into the next rock unit capable of accepting fluid. Aside from the confining zone, many of the formations between the injection

zone and the USDW are layered with impermeable shale and other rock types which will prevent movement of the injected fluid into the USDW.

Again, the purpose of the UIC program is to protect USDWs from being contaminated by underground injection practices. The construction, operation, and geological siting criteria, which prevent USDW contamination, do so in part by requiring the fluid to be injected into zones that will accept and retain the fluid and be underneath formations that will prevent the fluid from moving into USDWs. The Haystead #9 SWD permit meets these conditions.

EPA does not have regulatory authority for oil and gas production in the State of Michigan, except when fuels are used in hydraulic fracturing fluids. Questions about the regulation of oil and gas production in Michigan should be referred to the MDEQ (See EPA Response 1 for MDEQ contact information).

3. **Douglas (D.M.) Hutchins, via email, Tue 4/30/2013 4:07 PM**
Please refrain from granting West Bay Exploration a permit to dispose of salt water at the Haystead #9 site. I live in the section that Haystead #9 is located. The current water table level is so high that it has over run the banks of all the ponds in this section and has encroached on my yard already. Adding more water to this section will only lead to a higher water table. Please see the picture attached. The picture was taken today 4-30-2013. Again please keep the water away from this section. Thanks.

RESPONSE 3:
Groundwater in the unconsolidated glacial drift in the vicinity of the Haystead #9 well is much shallower than the base of the lowest USDW (i.e. Marshall Sandstone). MDEQ water well drilling records for private water wells in the area of review (found at http://wellviewer.rsgis.msu.edu/) reflects the depth to water, or water table in this area. Specifically, EPA reviewed well logs for private water wells MDEQ ID's #38000003131, #38000003132, #38000003133, #38000003138, #38000003139, #38000003140, #38000003141, #38000006820, #38000008330, #38000008691, #38000009984, and #38000010797. These private water supply wells range in depths from approximately 46 feet to 121 feet deep, and the lowest USDW has been identified as the Marshal Sandstone at approximately 217 feet. Both the lowest USDW and water table are not deep enough to encounter injected fluids, which will be injected more than 2,870 feet deep. Although most drinking water wells are completed in aquifers with waters of 500 mg/l of total dissolved solids (TDS) or less, the UIC program protects USDWs of up to 10,000 mg/l TDS.

EPA also reviewed the geology of the area and determined that the base of the lowermost USDW is separated from the injection zone by approximately 2,653 feet of rock layers that include low permeability shales and a confining zone of carbonate, anhydrite, shale, and salt, which will prevent the injected brine from reaching the USDW. The water table or depth to water will not be affected by the injection well because the injected fluids will not be injected into, and are unlikely to migrate to the USDW. For additional details on the geologic siting of the Haystead #9 SWD well, please see pages 1- 3 of this document and EPA Response 2. The Salina Group confining zone, as well as approximately 2,653 feet of total rock layers between the injection zone and base of the USDW, is expected to provide sufficient protection to prevent any hydrologic connectivity between injected fluids and the water in the USDW.

Please also see EPA Response 6 for more information regarding the protection of surface water, as well as underground sources of drinking water.

4. Peter Bormuth, via email, Tue 4/30/2013 10:21 PM

During your preliminary introduction you stated that the ultimate confining zone protecting the USDW (not the permitted confining zone) for this well (West Bay Haystead #9) is the Coldwater shale strata and you stated that it was 1000 feet thick.

I would like it entered into the record that the Stratigraphic Succession Map of the Lower Peninsula published by the MDEQ and the Michigan Basin Geological Society in 2000 shows the Coldwater shale to be only 250 feet thick and also shows the inclusion of a significant volume of Berea Sandstone in the shale. As you know Berea Sandstone is porous and permeable.

RESPONSE 4:

The UIC program uses multiple resources to determine that the geologic siting of any proposed injection well is appropriate for injection. These resources include but are not limited to drilling and formation records, any available geophysical well logs, the Michigan Hydrologic Atlas, Part I (Hydrology for Underground Injection Control in Michigan) and Part II (atlas maps) (1981), and the Stratigraphic Nomenclature for Michigan, Michigan Stratigraphic Column (2000).

At the informational meeting held on April 30, 2013, EPA staff described the geologic siting of the proposed Haystead #9 SWD well in Jackson County, Michigan. During EPA's presentation, staff expressed that the base of the lowermost USDW is separated from the injection zone by approximately 2,653 feet of rock layers that include low permeability shales, including the nearly 1,000 feet of Coldwater Shale found directly below the base of the Marshal Sandstone (i.e. USDW). This statement is based on drilling and formation records for wells nearby the Haystead #9 SWD well and within the area of review. Specifically, during review of the proposed Haystead #9 SWD well application, the UIC permit writer utilized drilling and formation records from the Haystead #1-9 (MDEQ Permit #60076) and Haystead #3-9 (MDEQ Permit #60078) wells. The surface hole location of these wells are less than 200 feet from the proposed location of the Haystead #9 SWD and currently provide the most accurate representation of the local geology. These formation records show that the Coldwater Shale was observed in the Haystead #1-9 (MDEQ #60076) well between 271 to 1,217 feet below surface, and between 219 to 1,174 feet below surface in the Haystead #3-9 (MDEQ #60078).

Berea Sandstone was not observed in the formation record for the Haystead #1-9 (MDEQ #60076) well; however, the formation record for the Haystead #3-9 (MDEQ #60078) reported Berea Sandstone - Bedford Shale below the Coldwater Shale, at the interval from 1,174 to 1,184 feet below ground surface. Once drilled, the drilling report and formation record for the Haystead #9 SWD well will serve as the ultimate geologic record for the well. Nonetheless, the potential inclusion of layers of sandstone within the Coldwater Shale does not present a threat to USDWs. The base of the lowermost USDW is separated from the injection zone by approximately 2,653 feet of rock layers, and based on seismic data (seismic cross section entitled "Perspective Salt Water Disposal Wells, Napoleon Field, Jackson County, Michigan" in the Haystead #9 SWD Administrative Record) submitted by West Bay Exploration Company, the Salina Group confining zone at the Haystead #9 SWD appears free of fractures and faults.

The UIC program does commonly reference the Stratigraphic Nomenclature for Michigan (MDEQ, 2000) (i.e. Michigan Stratigraphic Column) and the Stratigraphic Succession in Lower Peninsula of Michigan (2000) when reviewing injection well permit applications. These stratigraphic columns are very similar; however, neither figure includes depths of formations or thickness of rock. While both stratigraphic columns are valuable tools for understanding the geology of Michigan; neither of these figures is represented to scale nor do they represent actual depths of specific formations. In response to the commenter's request, EPA searched for previous versions of the Stratigraphic Succession in Lower Peninsula of Michigan published by the State of Michigan Geologic Survey. This search resulted in the identification of several publications of the Michigan stratigraphic succession document, including publication dates in 1964, 1977, 1982, 1984, and 2000. EPA found that the 1964 publication of the Stratigraphic Succession in Lower Peninsula included "approximate maximum thickness" of subsurface rock units. In the 1964 stratigraphic column, the approximate maximum thickness of the Coldwater Shale is listed as 1,300 feet thick.

EPA has not received any further documentation from the commenter to otherwise demonstrate the thickness of the Coldwater Shale near the Haystead #9 SWD well location. While these stratigraphic columns of Michigan both indicate that the Coldwater Shale could potentially include sand and limestone bedding, they are general references for the State of Michigan and do not provide local and site specific geologic findings. Based on the drilling and formation records of the Haystead #1-9 (MDEQ #60076) and the Haystead #3-9 (MDEQ #60078) used during review of the Haystead #9 SWD well permit application, approximately 2,653 feet of rock separates the injection zone from the lowest USDW and includes nearly 1,000 feet of Coldwater Shale, which should be more than sufficient to prevent the upward flow of fluid from the injection zone into the USDW.

5. Peter Bormuth, via email, Thu 5/2/2013 9:08 AM

i (sic) would like the EPA to consider the recent experience of the Ohio Department of Natural Resources with regard to Class II oil waste injection wells in the Youngstown area. Since March 2011 the Youngstown area experienced 12 low magnitude seismic events along a previously unknown fault line. These events ranged from a 2.1 to 4.0 magnitude events on the Richter scale and were recorded by the Ohio Seismic Network. In their Preliminary Report on the Northstar Class II Injection Well in March 2012 (see Appendix F) the Ohio DNR concluded that "all of the events were clustered less than a mile around the well."

The report indicates that to induce an earthquake a number of circumstances must be met:

- *A fault must already exist within the crystalline basement rock*
- *That fault must be in a near-failure state*
- *An injection well must be drilled deep enough and near enough to the fault and have a path of communication to the fault; and*
- *The injection well must inject a sufficient quantity of fluids at a high enough pressure and for an adequate period of time to cause failure, or movement, along that fault (or system of faults).*

The Ohio DNR report, after concluding that the Northstar Class II Injection Well had caused the earthquakes in the Youngstown area called for a number of reforms to the permitting process including the requirement of "a complete suite of geophysical logs (including, at a minimum,

gamma ray, compensated density-neutron, and resistivity logs) to be run on newly drilled Class II disposal wells."

I request that these logs be required in Michigan as well "to ensure the health, safety, and general welfare" of the people to protect them from induced seismicity. The possibility of course exists that there might be a previously unknown fault line here in Jackson County.

RESPONSE 5:

The Region 5 UIC program utilized several sources of geologic and seismic data during its evaluation of the Haystead #9 SWD permit application, and determined that the geologic siting of the well is suitable for underground injection. The commenter pointed to Ohio Department of Natural Resources (ODNR) reports on seismic events in Youngstown, Ohio (found at http://oilandgas.ohiodnr.gov/resources/investigations-reports-violations-reforms). EPA is very familiar with these reports, which discuss conditions that could lead to induced seismic activity, including existing faults and the proximity of an injection well to such faults. These reports note that geologists believe it is very difficult for all conditions to be met to induce seismic events. The geologic setting of the Haystead #9 SWD well is also different than those in Youngstown, Ohio, which were drilled into deeper, crystalline rock. Michigan geology has been well documented in the Michigan Hydrogeologic Atlas (1981), and the proposed injection zone for this well is not known to have fractures or other faults. In addition, on August 27, 2013, EPA staff who are experienced in reviewing seismic data, analyzed high quality seismic data (seismic cross section entitled "Perspective Salt Water Disposal Wells, Napoleon Field, Jackson County, Michigan" in the Haystead #9 SWD Administrative Record) and geophysical profiles submitted by West Bay Exploration Company. These seismic data demonstrate that there are no known fractures or faults present in the Niagaran injection zone within the vicinity of the Haystead #9 SWD well.

Furthermore, the UIC Branch used USGS on-line tools to evaluate both the seismic history and probability of earthquakes within the area of the proposed well location. More specifically, a search of historic seismic activity of the area using USGS's Global Earthquake Search Application (http://earthquake.usgs.gov/earthquakes/search/) revealed only one observed earthquake within 80 km (approximately 50 miles) of the proposed Haystead #9 SWD during the last 200 years. Exclusively, the only known seismic activity within the region of the proposed well was a 3.5 magnitude earthquake on September 2, 1994, in Lansing, MI, nearly 50 miles away. This earthquake was recorded to have originated at a depth of approximately 5 km (16,404 feet), much deeper than proposed Haystead #9 SWD injection interval of 2,870 feet to 3,100 feet. Knowledge of seismic events that originated in the vicinity of the proposed well can be informative about whether faults exist in that location. Faults that commonly cause earthquakes are often in crystalline formations (deeper geological formations of igneous or metamorphic rock that underlie layers of sedimentary rock) in the basement rock. In this case, the proposed injection zone is much shallower than the basement rock, and is not in a crystalline formation. The USGS data referenced above documents that the Haystead #9 SWD site is not seismically active. This evidence supports the determination that geologic siting is appropriate for injection, and demonstrates that there are not faults in a stressed state in the area; a common criteria taken under consideration when evaluating the potential for seismic activity and induce seismicity. Because earthquakes can be felt miles from their epicenter, earthquakes are not always indicative of faults in all the areas where they are registered; however recorded earthquakes serve as a general indicator of seismic activity and the potential existence of a stressed fault.

UIC staff also utilized the USGS's Earthquake Probability Mapping Application (http://geohazards.usgs.gov/eqprob/2009/index.php) to map the probability of an earthquake within 50 km (31.06 miles) of the Haystead #9 SWD location. The results of this query indicate that there is less than a 3% chance of a 5.0 magnitude earthquake or greater occurring within 50 km of the proposed well during the next 250 years. Based on the absence of faults and fractures under stress in the injection zone, review of site specific seismic data, small earthquake probability and a history of low seismic activity, it is very unlikely that a seismic event would occur related to this disposal well.

Increasing formation pressure or pressure build up is also an important factor when considering the potential to induce seismicity. EPA limits maximum injection pressure (MIP) by calculating MIP with conservative values (Attachment A of EPA Permit# MI-075-2D-0010). In particular, EPA adds a safety factor of .05 to the Specify Gravity of West Bay Exploration representative brine analysis, when calculating MIP. This not only prevents formations from fracturing and creating migration pathways, but generally minimizes injection pressures. The Haystead #9 SWD well is expected to require very little pressure to operate because the Niagaran has been documented in the Michigan Hydrologic Atlas (1981) to be permeable and very capable of accepting fluid. EPA also requires injection pressure monitoring and reporting in our Class II permits. If there was concern about increasing pressure, Region 5 could further limit operational injection pressure or request testing to ensure pressures are not increasing in the injection formation. A further discussion regarding induced seismicity phenomenon is detailed below.

Scientists have long recognized that human activities, such as construction of dams and water reservoirs, mining, and oil and gas production, can trigger seismic events, including those that are felt by humans. Under certain conditions, disposal of fluids through injection wells has the potential to cause human-induced seismicity. However, induced seismicity associated with fluid injection is uncommon, as additional conditions necessary to cause seismicity often are not present. Seismic activity induced by Class II wells is likely to occur only where all of the following conditions are present: (1) there is a fault in a near-failure state of stress; (2) the fluid injected has a path of communication to the fault; and (3) the pressure exerted by the fluid is high enough and lasts long enough to cause movement along the fault line. *Induced Seismicity Potential in Energy Technologies*, National Academy Press, 2013, at p. 10-11.

The presence of a fault in a stressed state within a receiving formation potentially creates a more vulnerable condition for a future seismic event. A fault is a fracture or a crack in the rocks that make up the Earth's crust, along which displacement has occurred. During an earthquake, energy is radiated away from the area of the fault in the form of seismic waves. This causes the ground to move as the seismic waves travel away from the fault. Depending on the force of an earthquake, seismic waves can travel far away from the epicenter, and thus be felt far from where the fault is located. The USGS tracks, records, and maps earthquake epicenters and faults in certain areas throughout the United States. Scientists believe that injection can cause seismicity when the pore pressure (i.e., pressure of fluid in the pores of the subsurface rocks) in the formation increases to such levels as to overcome the friction force that keeps a fault stable. Pore pressure increases with increases in the volume and rate of injected fluid. Thus, the probability of triggering a significant seismic event during injection, where a stressed fault exists in the receiving formation, increases with the pressure of fluid injected. At high enough pore pressure, a formation could shift along the fault line, resulting in a seismic event. Therefore, limiting injection pressure limits the rate and volume of the fluids injected, and minimizes the potential for induced seismicity.

Because increases in pore pressure due to injected pressure can act on existing faults and provide a mechanism for induced seismicity, most examples of injection-induced seismicity are in cases where the receiving formation has low permeability and/or the pressure or volume of fluid injected over time is quite large. Formations such as crystalline basement rock have very low permeability. Permeability is the ease with which a fluid can flow through the pores in a rock layer. For example, in the case of the Northstar 1 injection well in Youngstown, Ohio, injection occurred into very low permeability, crystalline bedrock. Where permeability is low, injected fluid cannot flow easily through the pores in this rock and therefore flow is oriented mainly through existing fractures or faults in the rock. These kinds of rock formations have high transmissivity and low storability. This means that the formation cannot store a lot of fluid; rather fluid moves farther and faster in these formations than in more porous formations. Because of the high transmissivity and low storativity of these kinds of rocks, the potential exists to induce pore pressure increases at considerable distances away from the injection well. Injection into a more permeable sedimentary formation, such as the Niagaran, is much less likely to induce seismicity.

Because of the likelihood of greater permeability and the reduction in pore pressure, injecting into formations with a significant history of oil and gas production is unlikely to cause seismicity. The production of oil and gas, with the accompanying brine produced during such operations, results in the removal of large amounts of fluid from the formation. That means there has been a corresponding decrease in pore pressure in the formation. If injection occurs into these depleted reservoirs, pore pressure may not reach the original levels, or in some cases, may not increase at all due to the relative volumes of injection versus extraction. For this same reason, injection for the purpose of enhanced recovery has very low potential to induce seismicity. In such cases there is little total change in formation pressure as the injection fluid replaces the volume of oil and gas extracted. Also, in formations with a long-term history of oil and gas production, more information is generally available about the geology of the formation, such as well drilling records that can provide information about injection and extraction rates and displacement of geologic formations.

Further, history of past, as well as currently active, injection for disposal and enhanced recovery wells (as opposed to production wells) into a formation without induced seismicity is also supporting evidence that seismicity is unlikely, either because no faults are present or because increases in formation pore pressure due to injection have not caused sufficient pressure changes for movement to occur along potential faults. For example, active injection that has been occurring for decades into a formation without triggering a seismic event, indicates that the formation has high permeability and that formation pore pressure is not very responsive to injection at the existing rates.

Finally, to minimize conduits for fluid to potentially contaminate USDWs, operating conditions in an injection well permit can expressly limit the injection pressure to prevent fracturing (or cracking of the rock) of the injection zone. Limiting injection pressure provides the secondary benefit of preventing fractures that also could act as conduits through which fluid could flow and act upon an existing fault. In order to induce seismicity, pressure from the fluid injection first would have to be great enough to create or reopen fractures that would act as conduits for the fluid to reach the fault and second would have to exert enough pressure and flow to destabilize the fault. During the permit application evaluation, EPA conservatively establishes the pressure necessary to fracture the injection formation, and includes a safety factor added to the equation. This conservative calculation is used as the permitted maximum injection pressure and thereby prevents the fracturing of the receiving formation.

Of the hundreds of thousands of injection wells operating in the United States, EPA is not aware of any case where a seismic event, whether naturally occurring or induced, caused an injection well to contaminate a USDW. EPA is also unaware of any studies that have been done specifically to determine whether injection wells have caused contamination of a USDW during a seismic event. In the suspected cases of induced-seismicity in Ohio, Texas, West Virginia, and Colorado, there have not been any reports of earthquakes causing leaks in the injection wells that cause fluid to migrate to a USDW. The Region found no example of contamination from injection wells due to an earthquake.

A number of factors help to prevent injection wells from failing as a result of a seismic event and contributing to the contamination of a USDW. Most deep injection wells, or those that are classified as Class I or Class II injection wells, are constructed to withstand significant amounts of pressure. They are typically constructed with multiple steel strings of casings that are cemented in place. Deep injection wells are typically designed, using casing and cement standards developed by the American Petroleum Institute (API) and oil field service companies, such as Halliburton Services, to withstand significant internal and external pressure (See API website at http://www.api.org/ Halliburton Cementing Tables, Halliburton Services, 1980, for the industry standards in casing and cementing wells). Furthermore, injection well permits require mechanical testing to ensure integrity before they are operated and many are continuously monitored after testing to ensure that mechanical integrity is maintained.

For a more extensive discussion on injection-induced seismicity, see the report by the National Academy of Sciences, *Induced Seismicity Potential in Energy Technologies*, National Academy Press, 2013, in particular Chapters 2 and 3. See also *A White Paper Summarizing a Special Session on Induced Seismicity*, Ground Water Research & Education Foundation, February 2013; *Preliminary Report on the Northstar1 Class II Injection Well and the Seismic Events in Youngstown, Ohio Area*, Ohio Department of Natural Resources, March 2012; *Final Report and Recommendations*, Workshop on Induced Seismicity Due to Fluid Injection/Production From Energy-Related Applications, Lawrence Berkeley National Laboratory, February 4, 2012; "*Managing the seismic risk posed by wastewater disposal*", Earth, April 17, 2012.

The commenter also requests that a complete suite of geophysical logs, including gamma ray, compensated density-neutron, and resistivity logs, be required on newly drilled Class II wells in Michigan. The 2D seismic data submitted by West Bay Exploration Company referenced above sufficiently demonstrates that there are no fractures or faults within the injection zone (i.e. Niagaran) or confining zone (Salina Group) at the Haystead #9 SWD site. During the evaluation of the Haystead #9 SWD permit application, EPA reviewed driller's logs and formation records from nearby wells (see EPA Response 2). Additional geophysical logs are not required by the Haystead #9 SWD permit or UIC regulations. Based on the Michigan Hydrogeologic Atlas (1981), the geology of Michigan is generally well known and rock strata are relatively consistent over large areas. Based on the current geologic data referenced above, additional data from a suite of geophysical logs is not required to understand the geology at the Haystead #9 SWD site and will have little, if any, benefit. As discussed above, the Region 5 UIC Program has sufficiently evaluated the potential for injection at the Haystead #9 SWD to induce seismicity, and determined that the geologic siting is appropriate for injection, and induced seismicity should not occur. Furthermore, after construction of the well has been completed, West Bay Exploration Company must submit EPA Form 7520-10, Completion Report for Brine Disposal, Hydrocarbon Storage or Enhanced Recovery Well, to the Permit Writer by certified mail with return receipt requested, as

well as a copy of the results of the mechanical integrity test witnessed by our field inspectors, and all cementing records or cementing tickets.

MDEQ may have additional requirements for wells in Michigan. Please contact MDEQ regarding the State's requirements for drilling and constructing new wells in Michigan (see EPA Response 1 for MDEQ's contact information).

6. Nancy Witter, via email, Mon 5/6/2013 5:12 PM

I'm a resident of Ann Arbor, Michigan and a volunteer with the Committee to Ban Fracking in Michigan, a statewide grassroots ballot question committee circulating a legislative petition which will be on the ballot in the 2014 state election. Full text of petition is at www.letsbanfracking.org.

Legislative petition text includes banning horizontal hydraulic fracturing and banning the storage of waste products in Michigan that are produced anywhere by horizontal hydraulic fracturing. The petition also amends P.A. 451, Michigan Natural Resources Protection Act by deleting language that fosters most favorable conditions for the oil and gas industry for maximum recovery of these products. In addition to existing MNRPA language giving effect to sound policies of conservation and prevention of waste, this petition adds TO PROTECT HUMAN HEALTH AND WATER.

I was present at the EPA public hearing in Brooklyn, Michigan on April 30. I did not comment during the formal hearing but I listened to all of the comments. I was especially interested in the comments about amphibians, prairie fens along the River Raisin, and geological analysis of rock in the area. As you know, prairie fens occur where groundwater moves slowly up through peaty and alkaline soils. The soils are waterlogged and low in oxygen. If a industrial accident occurred below or on the surface of an area that supports a prairie fen, it seems that it would be impossible to mitigate the damage caused by exposure to salt water waste products on such a unique and diverse ecosystem.

When I drove back to Ann Arbor on Hwy 12, I could hear choruses of amphibians in wet areas alongside of the roadway even though my car windows were closed. I urge you to make the environmentally and ethically right decision. I urge you to reject West Bay Exploration Company's Haystead #9 SWD permit application. My request is the same as Mr. Eric Johnson, supervisor of Norvell Township, "We want you to do the right thing."

RESPONSE 6:

The purpose of the UIC program is to protect USDWs from being contaminated by underground injection practices. As described in greater detail on page 2, UIC regulations (40 C.F.R. §§ 144.3 and 146.3) define a USDW as any aquifer which is currently being used as a drinking water source or which is of sufficient volume and adequate quality to be a source for a public water system. Based on the Michigan Hydrogeologic Atlas (1981), and drilling and formation records (i.e. MDEQ #60076 and #60078) in the vicinity of the Haystead #9 SWD, the lowermost USDW has been identified as the Marshall Sandstone. The base of the Marshall Sandstone formation is located approximately 217 feet below ground surface. According to the USGS Summary of Hydrogeologic Conditions by County for the State of Michigan (2007), the Marshall Sandstone aquifer ranges in thickness from 75 feet to more than 200 feet within the State of Michigan. The Marshall Sandstone is topped by unconsolidated glacial drift at a depth of approximately 88 feet to the ground surface. These formations, the Marshall Sandstone and the unconsolidated glacial drift are considered USDWs in Jackson County, Michigan, because they are aquifers which contain less than 10,000

milligrams per liter (mg/L) of total dissolved solids and are considered a potential drinking water source. These USDWs are generally recharged with freshwater from the infiltration of surface precipitation, and not from deeper rock formation fluids. While rock formations other than the Marshall Sandstone and unconsolidated glacial drift may contain some water or formation fluids, they are not considered sources of drinking water because they do not meet the definition described above. Formation and drilling records for nearby wells (e.g. MDEQ #60076 and #60078) indicate that the Coldwater Shale below the lowest USDW (i.e. Marshall Sandstone) is nearly 1000 feet thick, and provides a sufficient lower confining unit, or aquiclude. The Marshall Sandstone and unconsolidated glacial drift are also much shallower than the Niagaran injection zone, permitted at 2,870 to 3,100 feet below surface. The injection zone at the Haystead #9 SWD well is topped by the Salina Group, an approximately 430 foot thick sequence of carbonate, anhydrite, shale, and salt, which will act as a confining layer to prevent flow out of the injection zone. This sequence of rock blocks the passage of water and is considered an excellent confining unit, due to poor water transmitting rates, as described in the Michigan Hydrogeologic Atlas (1981). The Salina Group, as well as many rock layers between the confining zone and the base of the USDW, prevents any hydrologic connectivity between the injection zone and the Marshall Sandstone and unconsolidated glacial drift. This means, that the deep brine or injected fluid from the Haystead #9 SWD well cannot migrate upward to the underground sources of drinking water.

The Final UIC Permit requires the geologic siting of the proposed well, and its proposed construction and operation, to be sufficient to prevent upward movement of the injected fluid into USDWs. As a result, operations of this injection well and the injection of waste 2,870 feet below surface should also not affect surface water. UIC permit requirements will help protect surface water indirectly through protecting the USDW or groundwater aquifers (i.e. freshwater in the Marshall Sandstone and unconsolidated glacial drift USDWs) to which they are connected, and preventing upward movement of injected fluids 2,870 feet below surface. A watershed's connection with aquifers is limited to the aquifers that have connections with surface bodies of water like rivers. While area lakes and streams, including the River Raisin, may be in hydraulic communication with shallow groundwater or depend on shallow groundwater for flow, they are not deeper than the base of the lowermost USDW and there is no hydrologic connection with the injection zone. For example, the maximum depth of nearby Wamplers Lake is approximately 40 feet. Similarly, wetlands such as nearby prairie fens are also shallower than the lowermost USDW. Because the lowermost USDW (i.e. Marshall Sandstone) will be protected, prairie fens that are fed by the subsurface groundwater will also be protected.

As described in Response 3, EPA reviewed the geology of the area and determined that the base of the lowermost USDW is separated from the injection zone by approximately 2,653 feet of rock layers that include low permeability shales and a confining zone of carbonate, anhydrite, shale, and salt, which will prevent the injected brine from reaching the USDW. The depth to groundwater in the unconsolidated glacial drift and the water quality of USDWs will not be affected by the proposed injection well because the injected fluids will not be injected into the USDW, and approximately 2,653 feet of rock layers between the injection zone and base of the USDW will help prevent any hydrologic connectivity between injected fluids and the lowermost USDW.

Surface spills at the facility or in the course of transportation to the site, are addressed under State regulations and are the responsibility of the transporter. Management of surface facilities is not addressed by the UIC regulations and is outside the scope of the UIC permit process. However, the State of Michigan does have oil and gas regulations which specifically address the supervision of

wells, surface facilities, and secondary containment requirements. Oil and Gas exploration, drilling, and operating is regulated under the Michigan's Natural Resources and Environmental Protection Act, Act No. 451 of the Public Acts of 1994, as amended (last amended 9/10/2004). Information related to Michigan's Oil and Gas regulations can be found at http://www.michigan.gov/deq/0,1607,7-135-3311_4111_4231-9245--,00.html. Additional concerns about the potential for surface spill should be further directed to MDEQ (see contact information in EPA Response 1).

7. Linda Britt, via email, Sat 5/11/2013 9:39 PM

Please, please do NOT approve this permit request. The EPA is supposed to protect our precious environment NOT the profits of utility companies. Injection wells, as well as Fracking, are not safe for our environment and, therefore, for us.

We need to develop safe, renewable, sustainable energy sources and wean ourselves from overconsumption of energy. Please, please think of the impact this well - and all such wells - will have on our health and the health of our children, grandchildren, and so on.

RESPONSE 7:

As explained on page 1 – 3 of this document, the purpose of EPA's UIC program is to protect USDWs from endangerment by underground injection practices. The UIC regulations are designed to protect USDWs from contamination by: (1) identifying drinking water sources for protection; (2) making sure the geological siting is suitable for injection; and (3) applying standards for well construction, operation, and reporting. EPA regulations at 40 C.F.R. Parts 144 and 146 set the requirements and standards that a permit applicant must meet to have a UIC permit application approved. Again, these regulations deal primarily with the geologic siting, well engineering, operating, and monitoring standards for deep injection wells. These are the only things that the UIC program can take into consideration. The permit application and the conditions in the Haystead #9 SWD permit are consistent with these EPA regulations.

EPA's Environmental Appeals Board has confirmed the requirements that the UIC program can take into consideration in other UIC permit cases. Two cases where the board addressed other factors in the decision making process are *In re Envotech*, L.P., 6 E.A.D. 260 (EAB 1996) and *In re Beckman Production Services*, 5 E.A.D. 10 (EAB 1994). The Environmental Appeals Board in Envotech stated: "…the Region has a narrow and clearly defined responsibility in this matter. It is charged with implementing the UIC regulations promulgated by EPA in accordance with the mandate of Congress in the Safe Drinking Water Act…" In Beckman, the Environmental Appeals Board stated: "EPA's inquiry in issuing a UIC permit is limited solely to whether the permit applicant has demonstrated that it has complied with the federal regulatory standards for issuance of the permit."

Since EPA began regulating injection wells, there has not been a documented case of an injection well contaminating an underground source of drinking water. Returning the brine to a confined formation below the lowermost underground source of drinking water through a properly constructed and operated injection well is an environmentally sound procedure. Several decades of experience regulating similar Class II wells have shown that injection, under the proper conditions, is safe and protective of fresh groundwater supplies EPA determined that the construction, geologic siting, and monitoring requirements of the Haystead #9 SWD are sufficient to keep injected brine isolated from sources of drinking water.

The permit for this well limits 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. In this case, the permit limits the surface injection to 737 pounds per square inch, which EPA calculated using site-specific but conservative figures for waste and rock characteristics. The depth at which injection occurs in this well, 2,653 feet below the deepest source of drinking water in the area, provides another margin of safety as does the confining layer and other geologic layers of impermeable shales and other rock formations. EPA also reviewed the deep wells in the ¼ mile AOR surrounding the Haystead #9 SWD and determined that these wells are properly constructed or properly plugged and abandoned and will not act as conduits for injection fluids under pressure to move into the USDW. EPA therefore anticipates that injection at this site will not present unacceptable risks to human health or the environment.

8. Nancy Shiffler, Sierra Club Michigan Chapter, via email Mon 5/13/2013 12:18 PM
I am writing on behalf of the Michigan Chapter of the Sierra Club to express our concerns about some aspects of the draft permit for the West Bay Haystead #9 Class II Underground Injection Well. We believe the permit should not be approved due to the following:

1) *This area of southern Michigan is in the high risk area for the presence of radon in its geologic formations. However, the draft permit makes no mention of this. The monitoring and reporting requirements should require regular sampling for NORMs and TENORMs in the injection fluids and on the equipment and surface area of the site.*

2) *The application indicates drilling through a Coldwater Shale formation. The MDEQ has indicated some general concerns with fault lines in Coldwater Shale, but the draft permit makes no mention of seismic testing or monitoring.*

3) *West Bay provided a chemical analysis of fluids from only one of the forty source wells for this injection well. A larger sample should have been included.*

4) *Access to documentation was too limited to allow proper review by the public. On a visit to the Jackson Public Library on April 26, I found that copies of the draft permit were not available as had been promised in your hearing announcement. Also, in order for adequate public review of relevant information, copies of the actual permit application and documentation should also be readily available.*

RESPONSE 8:
With regard to naturally-occurring radioactive materials (NORM) and technologically-enhanced naturally-occurring radioactive materials (TENORM) concerns about radionuclides in oil and gas production wastes and produced fluids, EPA considers Class II injection wells a safe method for brine and produced water disposal. To prevent surface water contamination from radionuclides, produced waters are now generally reinjected into deep wells. No added radiological risks appear to be associated with this disposal method as long as the radioactive material carried by the produced water is returned in the same or lower concentration to the formations it was derived from (http://www.epa.gov/radiation/tenorm/oilandgas.html). Radon is not mentioned in the permit because it is not part of the UIC program's regulatory criteria or standards at 40 C.F.R. Parts 144 and 146. The geologic siting and the well construction and operation are sufficient to prevent upward movement of the injected fluid into USDWs. EPA therefore anticipates that injection at this site will not pose unacceptable risks to human health or the environment. The UIC permit for the Haystead #9 SWD protects USDWs from being contaminated by underground injection practices by regulating the construction, operation, and geological siting criteria, and by requiring

the fluid to be injected into zones that will accept and retain the fluid and be underneath formations that will prevent the fluid from moving into USDWs. In the State of Michigan, a few cases have been reported of radioactive scale occurring on the outside of drill casing. The primary source of radiation is naturally occurring radium in formation water, primarily from the Berea and Antrim Formations. The radium is a decay product of naturally occurring uranium found in the rock formations. When this formation water mixes with fresher water, minerals (scale) can form on the outside of exposed casing. These minerals can contain radium as one of their constituents. In the case of the Haystead #9 SWD, there is cement between the outside of the casing and the hole, therefore, radioactive scale will not be able to precipitate on the outside of the casing of the Haystead #9 SWD well. Additionally, known problems with radioactive scale have occurred because the casing or pipes were removed from the well and then found to have elevated radioactivity. Since all casings of the Haystead #9 SWD well will be adequately cemented in the hole, the casing cannot be removed. Furthermore, the cement between the casing and the hole will restrict contact of the casing with the water of the Berea and/or Antrim Formations, and from mixing with other formation water and precipitating radium bearing minerals. To address the problem of radioactive scale, the State of Michigan requires that operators use new casing when drilling new wells. Oil companies also survey casing and pipe for radioactivity, and if any casing or pipes are found to have elevated radioactivity, the company is required to handle the material in an appropriate manner. Concerns about NORM and TENORM on surface equipment and in other wastes should be directed to MDEQ (see contact information in EPA Response 1).

The commenter also expresses concerns related to potential fault lines in the Coldwater Shale formation, and seismic testing or monitoring. As detailed in EPA Response 5, EPA utilized several sources of geologic data during its evaluation of the Haystead #9 SWD permit application, and determined that the geologic siting of the proposed well is suitable for underground injection. These resources include but are not limited to drilling and formation records (e.g. MDEQ Permit #60076, #60078), available geophysical well logs, the Michigan Hydrologic Atlas, Parts I (Hydrology for Underground Injection Control in Michigan) and Part II (atlas maps) (1981), and the Stratigraphic Nomenclature for Michigan, Michigan Stratigraphic Column (2000). In addition, EPA staff, who are experienced in reviewing seismic data, have analyzed high quality seismic data and geophysical profiles submitted by West Bay Exploration Company. These seismic data demonstrate the absence of faults in Coldwater Shale within the vicinity and drill path of the Haystead #9 SWD well. Please refer to EPA Response 5 for additional information related to induced seismicity. The UIC regulations do not require seismic testing or monitoring, and EPA has determined that the geologic siting of the Haystead #9 SWD well is sufficient for underground injection. Therefore, additional seismic data is not required to protect USDWs. EPA has imposed standard requirements on the permittee for testing the mechanical integrity of a well. EPA requires well casings to be cemented to the surface. Injection takes place through tubing set within the casing. Further, the applicant is required to conduct and pass a Mechanical Integrity Test (MIT), in accordance with 40 C.F.R. § 146.8, before authorization to inject is granted, and after the well is completed. The applicant is also required to repeat the MIT at least once every five years thereafter. The UIC monitoring and testing requirements are designed to detect pressure changes between the tubing and annulus, thereby promptly detecting a leak. If a leak is detected, the UIC regulations require the operator to immediately cease operating the well until the leak is fixed and the repair is confirmed through testing.

Regarding the chemical analysis of proposed injection fluids at the Haystead #9 SWD well, a representative brine sample submitted by West Bay Exploration Company meets the UIC

regulation requirements at 40 C.F.R. § 146.24 (a)(4)(iii). These regulations require a fluid analysis but do not include a list of chemicals to be analyzed for Class II wells. EPA Region 5's permitting tool entitled Example: Underground Injection Control Class II Permit Application instructs applicants to provide a fluid analysis that includes concentrations of, but is not limited to the following: Sodium, Calcium, Magnesium, Barium, Total Iron, Chloride, Sulfate, Carbonate, Bicarbonate, Sulfide, Total Dissolved Solids, pH, Resistivity (ohm-meters), and Specific Gravity. EPA has determined that the applicant has provided sufficient information about the injection fluid. The Region 5 guidance list contains analytes that help verify that the fluid is oil or gas-production related brine. EPA has determined that the applicant has provided sufficient information, including a representative brine analysis, to allow EPA to make a permitting decision.

EPA published a public notice in The Jackson Citizen Patriot, a newspaper serving Jackson County, Michigan to reach people who might have an interest in the draft permit. EPA also mailed public notices to residents within the ¼-mile area of review and to State and local officials. In addition, EPA sent public notice to all commenters who commented on recent UIC public hearings in Jackson County. These materials contained website addresses for the draft permit to be viewed on-line and for EPA's UIC website which contains in-depth information about SDWA, the UIC program, and Class II wells. The permit writer's name, e-mail address, and phone number were also included, and questions were invited. EPA also confirmed copies of the Haystead #9 SWD draft permit were delivered via the United States Postal Service (Tracking # 7009 1680 0000 7644 2305) to the Jackson Public Library Reference Department for public viewing on April 1, 2013, at 10:06 am (Eastern Time).

On the morning of Thursday, April 25, 2013, an employee of the Jackson Public Library notified EPA by telephone that they were aware the Library had previously received the draft permit, but were currently unaware of where the Library had the public records displayed. Upon notification, EPA staff immediately resent the draft permit electronically to the Jackson Public Library Reference Department (reference@mydl.com) at 10:41 am (Central Time). The Jackson Public Library again displayed the public documents in the Reference Department, and forwarded the Haystead #9 SWD draft permit to the commenter via email on April 25, 2013, at 11:12 am (Central Time). At 11:20 am (Central Time), Jackson Public Library staff confirmed via email that they had previously displayed the Haystead #9 SWD draft permit, and it had disappeared. Additionally, upon request of the commenter, UIC staff scanned and electronically sent the Haystead #9 SWD permit application in its entirety to the commenter on April 26, 2013, and April 29, 2013. EPA also provided viewing opportunity of the permit application and complete draft Administrative Record at the informational meeting and public hearing of the Haystead #9 SWD, held on April 30, 2013, at Columbia Central High School, in Brooklyn, Michigan. EPA took significant measures to ensure the Haystead #9 SWD draft permit, Fact Sheet, and requested documents were made available for public review.

EPA published notice, extended the public comment period, posted the draft permit on the UIC website (http://www.epa.gov/r5water/uic/haystead/index.htm), displayed copies of the draft permit at the Jackson Public Library, and held an informational session and public hearing in order to provide several opportunities to access information and make public comments. UIC regulations do not require that the draft application or administrative record be placed online. Requests for copies of any documents that are public records should be made through the Freedom of Information Act (FOIA). There are four options as to how to make a request. The first option is by making a request on-line at http://www.epa.gov/region5/answers/foia/efoia-form.htm. The second

option is by email at r5foia@epa.gov. The third option is to send a fax. The fax number is 312-886-1515. The last option is to mail the request. Send the request to:

Freedom of Information Officer
U.S. EPA Region 5 (MI-9J)
77 West Jackson Blvd.
Chicago, Illinois 60604-3590

Further detailed information regarding the FOIA process and requesting public documents can be found at the website above.

LETTERS AND MAILED COMMENTS:

9. **Norm Yassay, letter received Mon 5/6/2013**
An underground raw sewage holding tank large enough to contain 3 or more houses is locate at Riverside Rd. and Peterson Rd., Brooklyn, MI. The vibration from oil drilling in this area could crack the walls of the holding tank releasing thousands of gallons of raw sewage contaminating the ground and water wells. The EPA should be aware of this situation.

RESPONSE 9:
One injection well has a very small footprint (typically several hundred square feet including any access road, or less) and will have no impact on the shallow groundwater (i.e. unconsolidated glacial drift or Marshall Sandstone) or surface water in the area. The UIC program does not have authority to consider local zoning ordinances, odor, noise, traffic, and the physical siting of the well in a residential area when issuing permit decisions. The UIC program only has authority over the injection activity itself. An EPA permit for an injection well conveys permission to inject produced fluids based on EPA's finding that the construction and operation details of the well are protective of USDWs. For more information on Michigan policies and requirements, including sewage holding tanks and drilling processes, we suggest that you contact the MDEQ Lansing District (see Response 1 for MDEQ contact information).

10. **Fred Marsh, letter received Mon 5/13/2013**
I am not anti gas & oil drilling!

I believe that gas and oil are natural resources that need to be extracted safely. But I think that we may be forgetting the most important resource of all ... WATER. Every living thing needs water! Of all the water on earth only .77 % is fresh water usable by humans. According to the U.S. Geological Survey report as of May 15, 2012 the glaciers, ice caps and permanent snow equal 1.74 % that is not accessible or usable.

To find out more for yourself Google the following: Romulus injection well, propublica injection wells, and Chico Texas injection well. The information is out there, you just have to take the time to investigate for yourself.

Statistics; there are 680,000 injection wells in the U.S. A. The records show that

220,000 inspections found structural failures inside the wells are routine. From 2007 to

2010 for every six injection wells drilled one integrity violation was issued, with more than 17,000 violations nationally. Seven thousand wells showed signs that their walls were leaking.

There are 10,470 injection wells in Michigan alone. According to the hearing held for the West Bay permit #9, EPA told us that they have one EPA inspector for all the injection wells here in Michigan and it is impossible for one person to get to each well and there are many never visited. This is a scary thought that there is no one keeping an eye on these gas and oil companies.

The world population will be more than seven billion by 2013. Now keep in mind the water it takes to water our crops, live stock, laundry, pets, lawns and landscapes. Do you understand what I am saying?

Lets become aware of our surroundings and become pro-active for life in general.

RESPONSE 10:

EPA is not aware of data that support the commenter's statement that half of all well casings fail over time. Before EPA regulated underground injection wells, there were incidents where injection wells leaked. A review of well failures that EPA conducted during development of the regulations showed that the federal UIC regulations, as are now enforced, would have prevented these failures. Since EPA began regulating injection wells, there has not been a documented case of an injection well contaminating an underground source of drinking water.

EPA has imposed requirements on the permittee for testing the mechanical integrity of a well. Under the regulations. "…an injection well has mechanical integrity if: (1) there is no significant leak in the casing, tubing, or packer; and (2) there is no significant fluid movement into a USDW through vertical channels adjacent to the injection well bore" [40 C.F.R. § 146.8(a)]. When a well loses mechanical integrity, it is usually because of an internal leak in the tubing or the packer. With this kind of leak, fluid could leak from the tubing but would still be within the well casing. In most instances, the tubing and packer can be repaired or replaced. A review of EPA Region 5 records indicates that instances where mechanical integrity was lost were the result of tubing or packer leaks. EPA Region 5 has had no incidents where loss of mechanical integrity was traced to leaks in well casings or faulty cement surrounding the casing.

The geology of Michigan is relatively consistent across the state, meaning that rock strata are consistent over a large area. Driller's logs or formation records from nearby wells were used to review geologic data from the area (see EPA Response 2). EPA has data gathered from the hundreds of wells that have been permitted by our office, together with technical studies of the geology of Michigan, such as The Hydrogeologic Atlas of Michigan. EPA has found this well site to be geologically suited for Class II disposal wells. EPA also determined that the wells within the area of review are properly constructed or plugged. Furthermore, the well will be constructed, maintained, and operated to confine the injected fluids to the permitted interval and prevent the migration of any fluids into and between USDWs. As a result, there should be no effect on nearby drinking water wells or USDWs from the operations of this injection well.

EPA is also not aware of data that support the commenter's statements regarding the number of injection well inspections in the United States, or reported structural failures and violations found by inspectors nationally. Currently, Class I, II, III, and V injection wells can be found in Michigan. There are approximately 30 Class I wells, 1,460 Class II wells, 46 Class III wells (5 Sites), and 8,934 Class V wells in Michigan. The Haystead #9 SWD injection well is proposed and permitted as a Class II well because it will be used to dispose fluids brought to the surface in connection with conventional oil and natural gas production. The Region 5 UIC program conducts more than 200 Class II inspections per year. EPA considers Class II injection wells a safe method for brine

disposal. Self-monitoring and self-reporting are also fundamental elements of the UIC permit program and other regulatory programs. Agency 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. Self monitoring is consistent with the SDWA. The UIC regulations deal primarily with the geologic suitability, well engineering, operating, and monitoring standards for deep injection wells. In this case, the geologic siting of the well and the well construction and operation are sufficient to prevent upward movement of the injected fluid into USDWs. The commenter references thousands of injection wells in Michigan. Most of the injection wells in Michigan are Class V wells. Class V wells are commonly shallow disposal systems that depend on gravity to drain fluids directly in the ground. A majority of these Class V wells are unsophisticated shallow disposal systems that include storm water drainage wells and septic system leach fields. There are over 20 well subtypes that fall into the Class V category and these wells are used by individuals and businesses to inject a variety of non-hazardous fluids underground. Class V well regulations are vastly different from Class II regulations. Concerns related to other well Classes, such as Class V wells, and requirements not related to Class II regulations are outside the scope of EPA's consideration for the Haystead #9 SWD well.

There are several safeguards established to prevent the Haystead #9 SWD well from contaminating an underground source of drinking water. EPA requires Class II well casings to be cemented to the surface. Injection takes place through tubing set within the casing. In addition, the applicant is required to conduct and pass a Mechanical Integrity Test (MIT), in accordance with 40 C.F.R. § 146.8, before authorization to inject is granted, and after the well is completed. The applicant is also required to repeat the MIT, at least once every five years thereafter. The UIC monitoring and testing requirements are designed to detect pressure changes between the tubing and annulus, thereby promptly detecting a leak. If a leak is detected, the UIC regulations require the operator to immediately cease operating the well until the leak is fixed and the repair is confirmed through testing.

11. Donna Marsh, letter received Mon 5/13/2013

I say! "Wake-up people"!

I promised to give a list of deadly toxins & gases that were checked for in our special independent water test dated Nov. 16, 2010. There are twenty-nine chemical names that end in thane. Here are a few others; Hexachlorocyclopentadiene, Methoxychlor, Simazine, Endosulfan 1, Chlordane, Toxaphene, Chloroacetontrile, Nitrobenzene, 2-Nitroproropane, Vinyl Chloride, Bromomethane, Trichlorofluoromethane, Methylene Chloride, Chlorobenzene, Ethylbenzene, Bromobenzene and Chlorotoluene-2 &4. See attached report. We have to pay for these water test out of pocket. The gas and oil companies should bond each well that they drill for a million dollars to pay for any contamination of our water and they should also pay for and run these special water test on the residents wells twice a year. After all if they say they are drilling safely this would protect us and them too.

The disposal of gas & oil waste that will be injected into the earth at 3100 feet is the so called Brine which may contain the some of the above chemicals. But when you look at the "Halliburton Loop Hole" which means the gas and oil companies are not required to disclose the chemical list that can be hauled in tanker-trucks up and down our local roads and so who really knows?

The EPA says, "The companies do everything as safe and clean as possible and they have been permitting injection wells for 40 years." And they can only assures us of $25,000. to cover a

closing/capping of a well. The EPA says "in a possible accident to our drinking water they will hold the gas and oil company's accountable to provide us with a clean up plan for a surface spill or a contamination to the aquifer. But history has proved that in these wells gone bad the communities are tied up in the court system for years before anyone is compensated and in most cases the plaintive dies before a settlement has been reached.

For instance just Google the Gelman Property, Ann Arbor, Mi. This is about 20 miles from

Brooklyn. This is not an injection well but is an issue of contamination of local groundwater. The violations started in 1964 and are on-going court battles. Last reports Jan. 2004; PLS claims to have removed and treated over 2.2 billion gallons of groundwater and removed over 56,000 pounds of 1,4 Dioxane from the contaminated aquifers since 1997. Now this is just one catastrophe close to home. There are many others and now with internet you can easily research other contamination sites around the U.S.

I don't believe that there has been enough research done on the life of these wells to assure that the groundwater and aquifers won't become contaminated. Most people do not know this fact; There is . 77% pure drinking water on the planet.

Mother Earth is alive and breathing BEING providing everything we need to survive and flourish. I believe that humanity are the guardians of the earth and needs to focus our intellect to engineer ideas for safer energy that can provide good health for all life on the planet. I believe that we are blessed to live on the surface and leave the underground ECO system alone, because at the rate of contamination being done to the earth has proved many animal and plant species are extinct...so how long before humanity is extinct?

The following is shared wisdom from the Indian Wisdom-Keepers by;Nancy Red Star, Destiny Books, Rochester, Vt. C 2000 ... This writing seems to sum it up beautifully.

The New Elders -Principles of Environmental Justice;

The new elders- the watchers- Children s eternal fire, honoring Mind, Heart, Spirit voices in the wilderness.
The Fire Keepers, Warming the Children s Eternal Life. A drum Circle -A Blanket
Dance -A Round Dance -Disarming for Peace.
Environmental Justice -For Generations to come
Mother Earth- Father Sun
Sister Moon - Oneness - Cyclical Spiritual flow
Children of all Nations- Protect Mother Earth
All Her Life - Will balance the World-
Toxins- Hazardous waste- Radioactive Material Poisons
Nuclear testing - Contaminant Storage -Extraction -
Production disposal- Plutonium Chemical Warfare- Chemical Choices -
Are we honoring our youth? Honoring our future? Global sisterhood- Global brotherhood-
The watchers- Watching us?
Mother Earth has been consumed- How will she replenish? As the veins of her rivers swell
Turning inside-out- Collapse and disappear- Has she been honored?
As She cracks -Dry and brittle -An unquenchable thirst- Sucking life s juices -from her womb - Oils and minerals -
Metals and Ores - Elements of nature-
Earth changes will restore her - Washing inside-out -Mother Earth is purification - Calling a cleansing for all beings. (pg. 53)

I honor and appreciate this shared wisdom. My hope is that all of humanity will honor and change before it is too late! Peace and God Bless

RESPONSE 11:
EPA staff reviewed the private drinking water well laboratory test results, dated November 16, 2010, submitted with the commenter's public comments. EPA received the commenter's letter and water well laboratory test results on May 13, 2013. The submitted test results indicate that the commenter's samples were analyzed by Water Test America LLC for purge-able organic compounds (i.e. volatile organic compounds or VOCs), organohalide pesticides, and commercial polychlorinated biphenyl (PCB) products in water. The commenter's laboratory analysis demonstrates that there is no sign of contamination in the commenter's water sample. In particular, the commenter's laboratory analysis indicates that the parameters analyzed for (i.e. parameter groups listed above) are all reported as "nd" for "none detected" (ND). This specifically means that constituents that had ND for a result were below laboratory detection limits. Laboratory detection limits are the lowest limits that can be measured by the lab. An analysis result of ND demonstrates that the contaminant could not be detected by the lab. The commenter may have incorrectly interpreted the minimum detection level (MDL) column (i.e. laboratory detection limits) within their water well laboratory test results, for an actual measurement, or presence of, specific parameters in the water sample. Based on the water well laboratory test results submitted by the commenter, none of the parameter groups listed above has been detected.

The report submitted by the commenter also shows samples were analyzed for bacteria species, common metals (e.g. iron, manganese, lead, mercury, sodium, and arsenic), pH, nitrate, and hardness ($CaCO_3$). These laboratory test results from Water Test America LLC also demonstrate that the commenter's drinking water does not exceed any National Primary or Secondary Drinking Water Regulation standards. Specifically, the "Result (milligrams per liter, or mg/ L)" column on the commenter's laboratory analyses indicate that the parameters analyzed for are either reported as "nd" for "none detected" (ND), or are significantly below the maximum contaminant level (MCL) designated by EPA. MCLs are the highest level of a contaminant that is allowed in drinking water. Again, these contaminants were either not detected in the water sample, or they do not exceed the drinking water standards set forth by SDWA. National Primary Drinking Water Regulations protect public health by limiting the levels of contaminants in drinking water. These limits are legally enforceable standards that apply to public water systems (PWS). A PWS is defined as a system for the provision to the public of water for human consumption through pipes or other constructed conveyances, if such system has at least fifteen service connections or regularly serves at least twenty-five individuals (http://water.epa.gov/infrastructure/drinkingwater/pws/pwsdef2.cfm). National Secondary Drinking Water Regulations are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. Although the EPA does not have established primary or secondary standards for hardness ($CaCO_3$), the commenter's water well laboratory report includes a result of 288.4 mg/ L for hardness ($CaCO_3$). Generally hardness is an aesthetic effect; and hardness (often measured as mg/L $CaCO_3$) of 150 - 300 mg/ L is commonly considered "hard" water (http://water.epa.gov/scitech/swguidance/standards/criteria/aqlife/upload/2009_01_13_criteria_goldbook.pdf). The concept of hardness comes from water supply practice. It is measured by soap requirements for adequate lather formation and as an indicator of the rate of scale formation in hot water heaters and low pressure boilers. Elevated hardness, or hard water, therefore may result in the formation of scum when soap is added, or cause deposition of scale in boilers, water heaters,

and pipes, but is not considered an endangerment. Hardness in water can be removed with treatment by such processes as lime-soda softening and zeolite or ion exchange systems, such as common domestic water softeners. EPA recommends secondary standards to water systems but does not require systems to comply. Nonetheless, States may choose to adopt secondary standards as enforceable standards. Please visit EPA's private drinking water well website at http://water.epa.gov/drink/info/well/index.cfm for more information on how to take special precautions to ensure the protection and maintenance of private drinking water supplies. Additionally, information regarding drinking water contaminants and primary standards can be found at http://water.epa.gov/drink/contaminants/index.cfm. You may also contact MDEQ (see EPA Response 1) for additional questions related to the regulation of drinking water in the State of Michigan, or visit their website at http://www.michigan.gov/deq/0,1607,7-135-3313_3675---,00.html.

The UIC Class II regulations require the permittee to provide financial assurance of the permittee's ability to properly plug the well at any time, should plugging be necessary. There are no provisions under the SDWA which would allow the EPA to require Class II well owners/operators to be bonded for other reasons, including the cleanup costs of any potential contamination. The Class II well owner/operator is responsible for any potential contamination which occurs on or from the site. Under the SDWA Section 1431, EPA can require operators to clean up any contamination of a USDW due to injection and/or supply alternative water supplies to affected parties. An operator is required to do what any reasonable person would do to prevent or correct environmental damage. A reasonable action might be to prevent and contain any surface spills, remediate groundwater contamination, replace any degraded component of the well, and so forth. West Bay Exploration Company will remain responsible for ensuring that the groundwater is protected from contamination due to injection. MDEQ, under Act 307, can also require operators to clean up any contamination due to injection, and/or supply alternative water supplies to affected parties. Again, West Bay Exploration Company will be required to plug the well with multiple cement plugs when it is no longer used, and the Company has secured a Surety Bond that will provide the funds to properly plug the well in the event they fail to do so. Furthermore, EPA has additional Programs that could utilize regulatory tools (e.g. the Comprehensive Environmental Response, Compensation and Liability Act of 1980 or "CERCLA", and the Resource Conservation and Recovery Act, or "RCRA") to clean up sites in an emergency and to compel responsible parties to perform cleanups or reimburse the government for EPA-lead cleanups.

EPA regulations at 40 C.F.R. Parts 144 and 146 include standards that a permit applicant must meet to have a UIC permit application approved. These regulations deal primarily with the geologic siting, well engineering, operating, and monitoring standards for deep injection wells. Currently, the federal UIC regulations for Class II wells do not require EPA to request that the owner/operator performs any baseline analyses of groundwater or other resources.

EPA regulations at 40 C.F.R. § 146.24(a)(4)(iii) state that applicants will submit "… an analysis of the physical and chemical characteristics of the injection fluid." The regulation does not include a list of chemicals to be analyzed for Class II wells. The most common constituents found in fluids brought to the surface during the production of oil and gas is: sodium, calcium, magnesium, barium, total iron, chloride, sulfate, carbonate, bicarbonate, sulfide, and total dissolved solids. Prior to receiving authorization to commence injection, the permittee is required to submit the actual injection fluid analysis under Part I (E)(10)(a) of the Haystead #9 SWD permit. EPA Region 5's permitting tool entitled Example: Underground Injection Control Class II Permit Application

instructs applicants to provide a fluid analysis that includes concentrations of, but is not limited to the following: sodium, calcium, magnesium, barium, total iron, chloride, sulfate, carbonate, bicarbonate, sulfide, total dissolved solids, pH, resistivity (ohm-meters), and Specific Gravity. EPA has determined that the applicant has provided sufficient information about the injection fluid. The geologic siting of the well and the well construction and operation are sufficient to prevent upward movement of the injected fluid into USDWs. EPA therefore anticipates that injection at this site will not pose unacceptable risks to human health or the environment. Several decades of experience regulating similar wells have shown that injection, under the proper conditions, can be safe and protective of fresh groundwater supplies and USDWs.

At Gelman Sciences, waste was stored in unlined surface lagoons and spread on the ground for disposal. Groundwater was contaminated by these surface activities, not by injection underground, though Gelman Sciences did operate a deep injection well in the early 1980s. The UIC program does not regulate the operation of surface facilities. These activities are regulated by MDEQ (see EPA Response 1 for contact information). These issues do not impact any technical or operational requirements of the Haystead #9 SWD well and so are outside the scope of this permit action.

The Haystead #9 SWD EPA permit for underground injection conveys permission to inject waste water based on EPA's finding that the geologic siting, construction, and operation of the well are such that injection will be environmentally safe. Returning waste fluids to a confined formation below the lowermost USDW through a properly constructed and operated injection well is an environmentally sound and permitted procedure.

12. Mike Stein, letter received Mon 5/13/2013

1) *Would you like your beautiful, serene, tranquil, wildlife rich living surroundings transformed into a nightmare of trucks, noise, smells, destruction of non-renewable habitats, and plummeting property values? Would you? I doubt it but this is exactly what is happening across our wonderful nation as a result of all the oil & natural gas drilling that you, our government has foolishly allowed to slither into private and public land everywhere. I thought the land of the free meant free to make your own choices not freedom for the big oil companies to deceive tax payers and exploit the natural resources on our property. How close would you like to live near a drilling pad or waste disposal well? Would you like your children to practice soccer 100 yards from an oil pad like kids in Adrian, Michigan?*

2) *Why haven't citizens been better informed of the massive number of oil pads and injection wells that are in service or being considered? Why hasn't a study been conducted to determine how aware the general public is on the topic of fracking? This is why the waste injection well is needed in the first place. I've been asking almost everyone I meet if they know what fracking is and the majority of the people don't have a clue. With all the media coverage on every topic imaginable, why aren't we better informed on such an important vital issue? What is the big secret? When informed, why do most people immediately not like the idea of injecting millions of gallons of POTENTIALLY SCARCE fresh water that includes a cocktail of harmless and known carcinogenic substances into the earth below us? Because it makes no sense!! The Great Lakes has almost 21% of the fresh water- in the world, no amount of money to any land owner, CEO, or government employee should be worth risking the health of the water in the Great Lakes basin or anywhere in the*

United States. Please make sure all tax payers are better informed of the intentions of the oil companies and the potential risk that is involved when the oil industry puts a drilling pad or injection well near your neighborhood. We also have a right to know when there are oil pipelines flowing literally beneath us. The majority of residents in Mayflower, Arkansas didn't know tar sands from Canada on their way to Texas for processing were flowing beneath them, why not? If fracking is such a great thing, why isn't it talked about more, why we don't see more ads, more media coverage? Because, except for those that are currently or potentially gaining monetary benefit, the majority of the general public, once informed, do not like the control the oil companies are gaining over our government and environment. You would find this to be true if you were to ask more people. We have a right to know.

3) *How can the EPA even consider allowing construction of more injection wells when studies are still being conducted to determine the environmental impact of the fracking industry? The recent State Department Report that claimed no adverse effects to drinking water is now in question. Your branch of government, the Environmental Protection Agency has found potential corruption and insufficient evidence to conclude there is no harm. Your agency is therefore going to extend studies to reject or support the results of the State Department. The University of Michigan is conducting cross-discipline studies to determine the effects of fracking. In the geology department, they are trying to determine the exact fate of the fracking solutions in terms of interactive effects, radioactive decay, and degradation byproducts. Therefore, in the result of a fracking related oil spill (ie. Kalamazoo River and Marshal, Michigan still a mess) it is impossible to effectively clean it up because it is not known what the solution now consists of. How can you possible move forward with permits and approvals when there are still so many unanswered questions? At least New York has realized the need for more research and was very smart in putting a moratorium on fracking until studies are complete. Why aren't you doing the same across the whole country? Why is any fracking related infrastructure being allowed to move forward when the environmental impact studies have not been completed? How much pressure are you under by the oil companies to get their proposals approved?*

4) *How much control does the oil industry really have over our government and therefore our environment? How did Exxon Oil get a no fly zone over Mayflower, Arkansas following the huge oil spill March 30, 2013? Why has the media been kept out of the effected neighborhoods? Don't we have a right as citizens to be informed of the fracking related tragedies that are occurring across our nation? With the 16 or more oil related spills that have occurred since Mayflower, isn't it time to slow down with the approvals, clean the messes around the nation (the residents of the Gulf of Mexico are still having problems 3 years later), and stop putting the health of our environment and hence citizens at such unnecessary risk. We want to take back our country from the oil industry. Aren't many of the wells on land zoned for agriculture? How can the oil industry do industrial operations on land that is not zoned for industry? People live in the country to get away for industry, it's not right that it can be shoved down their throats without them even having a say. The oil industry really has a lot of control over our everyday lives and environment. Why? Because you, our government, lets them.*

5) *Michigan already has 12,000 disposal wells, almost 10% of the total in the nation. The oil industry admits Michigan is "blessed" with injections wells. If we already have twelve*

thousand, why do you need more to be constructed? And how are you ever going to be able to properly inspect these wells when there is only 1 EPA inspector for the whole state of Michigan. It seems ridiculous to even imagine how neglected these wells must be. Does that 1 person have time to inspect another well? What else makes no sense is all the self-reporting by the oil companies. That is the "fox watching the hen house". It's no secret that industry often pays fmes rather than adhere to environmental regulations. Also, concerning these 12,000 wells, who inspects them when they are full and capped or closed? Who is going to go back in 10, 15, or 25 years and make sure there haven't been any leaks. Cement Cracks! Metal Corrodes! Mayflower, Arkansas learned the hard way. What are all these drilling and disposal wells and pipelines going to look like in 40 years? Please let the long-term studies be completed and the current spills cleaned up before you risk more tragedies occurring by allowing more wells. It doesn't seem too much to ask, you are the ENVIRONMENTAL PROTECTION AGENCY. You are paid by the tax payers to protect us, not the profit margin of the oil industry.

6) *Every cent the oil companies spend on development, construction, operation, and clean-up for toxic spills hinders our country from moving in the direction of sustainable clean energy. Just think of the wind, solar, geothermal, and wave motion technology that could be developed with the money it is taking to clean up the Gulf of Mexico, Marshall Michigan, and Mayflower Arkansas. Clean energy has been blocked by oil investors for decades. President Carter realized our energy needs and installed solar panels on the White House when he was in office. President Regan paid twice the installation amount to have them removed! Why? The only explanation can be to keep us dependent on oil. We should be giving subsidies to all companies that promote truly clean sustainable energy.*

7) *Scientists agree based on evidence that greenhouse gases are increasing and our climate is warming. Permitting more drilling and wells will have the effect of releasing more greenhouse gases. We have been experiencing extreme weather patterns for several years now, exactly what was predicted a few decades ago. How can you be protecting our environment when you are going to allow fracking that will increase greenhouse gases? To truly protect our environment you should be promoting businesses that invest in clean energy technology.*

8) *"Nestled within wet depressions among the rolling hills of southern Lower Michigan, prairie fen wetlands are one of Michigan's biological treasures. These globally rare wetlands are dominated by sedges and grasses and provide habitat to hundreds of native plants and animals. In addition to being incredibly rich in biological diversity, prairie fens form the pristine headwaters of many of the region's rivers and lakes. The streams and lakes that emanate from prairie fens sustain countless species and provide recreational activities cherished by swimmers, boaters and anglers. These wetland communities serve as a rich biological reservoir and form a critical component of the natural landscape of southern Michigan." This is a quote from Exploring the Prairie Fen Wetlands of Michigan byMichael A. Kost and Daria A. Hyde published in Michigan State University Extension 12/09. BIOLOGICALLY IMPORTANT GLOBALLY RARE WETLANDS that you seem to want to risk damaging forever. WHY? Please tell me.*

9) *It will be all risk and no reward if you allow the disposal well to be constructed. Please, please do what is right and disapprove this site for construction of an injection well. Michigan doesn't need it and concerned citizens don't want it.*

RESPONSE 12:
EPA regulations at 40 C.F.R. Parts 144 and 146 set the requirements and standards that a permit applicant must meet to have a UIC permit application approved. These regulations deal primarily with the geologic siting, well engineering, operating, and monitoring standards for deep injection wells. Real estate values of surrounding properties are not addressed by the UIC regulations and so are outside the scope of the UIC permit process. Truck traffic and roads may be regulated by MDEQ and the Michigan Department of Transportation. Further, MDEQ regulates surface activities, such as pad construction, waste storage, and waste transportation, and surface water runoff. Concerns about these activities should be directed to MDEQ (see contact information in Response 1).

States are generally the primary regulators of onshore oil and gas activities, and the federal Government mostly regulates oil and gas activities on public and Indian trust lands. However, the federal Government also conducts research aimed at improving safety, and setting public health and environmental standards. Currently, EPA is conducting an extensive study of the potential impacts of hydraulic fracturing. The most recent progress report of EPA's study can be found at http://www.epa.gov/hfstudy/pdfs/hf-report20121214.pdf. For MDEQ information related specifically to the oil and gas industry, see the Michigan Online Oil and Gas Information System at http://ww2.deq.state.mi.us/mir/ or the Michigan Oil and Gas Database at http://www.michigan.gov/deq/0,1607,7-135-6132_6828-98518--,00.html.

As you may know, the federal Energy Policy Act of 2005 excluded underground injection of fluids or propping agents (other than diesel fuels) used in hydraulic fracturing from the definition of "underground injection" under the SDWA. Information on the Energy Policy Act of 2005 can be found at https://www.fedcenter.gov/Documents/index.cfm?id=2969. EPA has developed a Class II permitting guidance that provides information useful in permitting underground injection activities for oil and gas hydraulic fracturing activities using diesel fuels. In its role as the authority of permitting of Class II underground injection wells, EPA's goal is to improve compliance with the SDWA requirements and strengthen environmental protections consistent with existing law. Additional information regarding hydraulic fracturing can also be found on the EPA's website at http://www2.epa.gov/hydraulicfracturing.

With regard to produced fluids, EPA considers Class II injection wells a safe method for brine disposal. No added risks have been associated with this disposal method, so long as the injected fluid does not migrate to a USDW. The geologic siting of this particular well and the plans for well construction and operation are sufficient to prevent upward movement of the injected fluid into USDWs. EPA therefore anticipates that injection at this site will not affect human health or the environment.

Within the federal government, EPA has played a lead role in conducting stakeholder outreach to individual citizens, communities, tribes, state and federal partners, industry, trade associations, and environmental organizations that have a strong interest in the Agency's work and policies related to hydraulic fracturing and shale gas extraction. EPA is committed to full transparency and providing opportunities for stakeholder input on all agency actions. EPA promotes transparency by consulting with the public, posting draft and final permitting materials on our website, and by holding public informational sessions. Facts regarding UIC wells, as well as information on current UIC permit applications can be found on our website at http://www.epa.gov/r5water/uic/. From this page of our website, you can find links to news about UIC permits applications received,

recent injection well actions, injection well practices, and many other informational resources. However, please note the applications themselves are not posted on the website.

EPA reviews each injection well permit application on a case-by-case basis. After a thorough review of the permit application and additional other information received, EPA determined that the proposed Haystead #9 SWD injection well met all federal UIC requirements for geological siting, construction, and operation.

The commenter also references an ExxonMobil pipeline oil spill in Mayflower, Arkansas. EPA Region 6 was heavily involved in the emergency clean up of the site, and the United States and the State of Arkansas have subsequently filed a joint enforcement action against ExxonMobil Pipeline Company and Mobil Pipe Line Company (ExxonMobil) in federal district court in Little Rock, Arkansas. The complaint addresses ExxonMobil's unlawful discharge of heavy crude oil from a 20-inch-diameter interstate pipeline – the Pegasus Pipeline – that ruptured in Mayflower, Arkansas, on March 29, 2013. As alleged in the complaint, a segment of the Pegasus Pipeline ruptured in a residential neighborhood in the town of Mayflower. The pipe was buried approximately two feet below the ground at that location. The United States, on behalf of the U.S. Environmental Protection Agency (EPA), seeks civil penalties and injunctive relief under the federal Clean Water Act for the oil spill. The state of Arkansas, on behalf of the Arkansas Department of Environmental Quality (ADEQ) by the authority of the Arkansas Attorney General, seeks civil penalties for violations of the Arkansas Hazardous Waste Management Act and the Arkansas Water and Air Pollution Control Act. The State also seeks a declaratory judgment on ExxonMobil's liability for payment of removal costs and damages related to the spill pursuant to the federal Oil Pollution Act. Water contamination in Mayflower was caused by surface activities and a pipeline spill, not by underground injection wells. The UIC program does not regulate the operation of surface facilities. These activities are regulated by the MDEQ (see contact information in Response 1) in Michigan. These issues do not impact any technical or operational requirements of the Haystead #9 SWD well and so are outside the scope of this permit action. For further information on the Mayflower Oil Spill please contact the Arkansas Department of Environmental Quality at 501-682-0880 or:

Arkansas Department of Environmental Quality
Hazardous Waste Division
5301 Northshore Drive
North Little Rock, AR 72118-5317

The UIC program does not have authority to consider local zoning ordinances, odor, noise, traffic, and the physical siting of the well in a residential area when issuing permit decisions. The UIC program only has authority over the injection activity itself. An EPA permit for an injection well conveys permission to inject produced fluids based on EPA's finding that the construction and operation details of the well are protective of USDWs. For more information on Michigan policies and requirements, please contact the MDEQ (see contact information in Response 1).
For information on the number of injection wells and EPA inspections of Class II wells in Michigan, please see EPA Response 10 above.

The Haystead #9 SWD well permit includes a plugging and abandonment plan that meets UIC regulatory requirements. Before plugging and abandoning the well, the operator must notify EPA and submit a plugging and abandonment plan for approval. Following well closure, the operator

must submit a cementing record for EPA review. Well closure does not relieve the owner/operator of any liability should an endangerment to the USDWs occur due to some defect in quantities, methods, or quality of materials used during plugging and abandonment. An owner/operator may still be held liable for such endangerment under provisions in the SDWA. The UIC regulations do not give EPA authority to require post-closure monitoring for Class II injection wells. Questions or concerns about post-closure monitoring should be directed to MDEQ (see contact information in Response 1) or the local health department.

The purpose of the UIC program is to protect USDWs from being contaminated by underground injection practices. As previously stated, there are several safeguards established to prevent the well from contaminating a USDW. Some of these features would also help to prevent the well from becoming a conduit for fluid to move between layers of underground rock. For example, as explained on Page 2, EPA requires well casings be adequately cemented. In addition, the well will be open at the bottom to only the injection zone. This zone, the Niagaran Formation, is not known to have quantities of natural gas or hazardous chemicals that vent to the surface.

For information on how prairie fens will be protected, see EPA Responses 6 and 15.

13. Sandra Yerman, letter via fax on 5/10/13 and by U.S. Mail 5/16/2013

1) *If West Bay reinjects fracturing fluids into its Class II disposal well, will the sand inherent in fracturing fluids, reinjected under pressure, hold open any fissures in the rock layer of the confining zone, and eventually allow injectate to migrate up into the USDWs? If so – explain; if not – why not & explain.*

RESPONSE 13.1:

The purpose of sand and other proppants in a hydraulic fracturing completion is to prop open artificially created or enhanced fractures. When an oil or gas production well is fractured, "…an operator pumps a mixture of water, sand and a small amount of chemicals into an oil or gas formation deep underground and applies pressure. The pressure fractures rock layers, releasing oil or gas reserves. The sand holds the fractures open to continue allowing the oil or gas to flow into the well. As gas or oil comes to the wellhead under pressure, it brings with it the fracturing water that was pumped, along with natural brines that are present in the deeper layers. That "flowback" water is separated from the gas and oil at the surface, contained in steel tanks, and sent to deep injection wells for disposal (MDEQ, 2013, http://www.michigan.gov/documents/deq/deq-FINAL-frack-QA_384089_7.pdf)."

The injected fluid may potentially contain small amounts of other material coming from oil production wells, such as drilling fluids or acid used to clean or complete production wells. These materials, including proppants or sand, are part of the allowable waste fluid, as long as they are produced from the company's oil or gas production wells. Nonetheless, West Bay Exploration has stated that they are not hydraulically fracturing their production wells in Jackson County, Michigan, and EPA does not anticipate large amounts of sand or proppants to be injected into the Haystead #9 SWD. Injection of any fluid at the Haystead #9 SWD is limited to only the Niagaran between the depths of 2,870 and 3,100 feet below surface. No fluid may be injected into the confining zone (i.e. Salina Group). The Haystead #9 SWD well will also be constructed with a long string

casing (steel pipe), set to 2,780 feet, and through the entire confining zone. All steel casing strings will also be cemented over their entire length to preclude the movement of fluids into and between USDWs due to injection operations. Furthermore, West Bay Exploration Company has submitted 2D seismic data to further demonstrate the Salina Group confining zone is free of fractures and faults. EPA has evaluated the Company's seismic data and confirms that the Salina Group at the Haystead #9 SWD site appears to be free of fractures and faults (Please see EPA Response 5).

It is unlikely that injected fluid will leave the injection zone of the Haystead #9 SWD. The Niagaran is capable of receiving the injected fluid, and based on seismic data submitted by West Bay Exploration Company, EPA has determined that the confining zone (i.e. Salina Group) is free of faults and fractures. Further, the injection pressure limit in the Haystead #9 SWD permit is calculated to be below the fracture pressure of the injection zone, meaning that the injected fluid should not cause fractures in the Niagaran or the confining zone. The purpose of the UIC program is to protect USDWs from being contaminated by underground injection practices. The construction, operation, and geological siting criteria, which prevent USDW contamination, do so in part by requiring the fluid to be injected into zones that will accept and retain the fluid and be underneath formations that will prevent the fluid from moving into USDWs.

If injected fluid were to exit the confining zone, it would migrate up into the next rock unit capable of accepting fluid. At the Haystead #9 SWD site, the injection zone is separated from the lowest USDW by 2,653 feet of geologic strata. Aside from the confining zone, many of the groups between the injection zone and the USDW are layered with impermeable shale and other rock types which will prevent movement of the injected fluid into the USDW.

2) *What is the Halliburton loophole, that I believe Congress mandated in (fill in date), which I believe prevents the USEPA from applying & monitoring the SDWA if oil and/or gas operations are involved? Explain definition.*

RESPONSE 13.2:

It is unclear, but the commenter may be referring to the federal Energy Policy Act of 2005. The federal Energy Policy Act of 2005 excluded underground injection of fluids or propping agents (other than diesel fuels) used in hydraulic fracturing from the definition of "underground injection" under SDWA. Please see EPA Response 12 for additional information regarding the federal Energy Policy Act of 2005.

3) *Will the Halliburton loophole, in any way, shape, or form prevent the U.S. EPA from applying or monitoring the SDWA in re: West Bay's Haystead No. 9 Class II injection well if that well ever accepts spent fracturing fluids for injection – whether right away under this permit – or decades later under a modification to this permit or a new permit?*

RESPONSE 13.3:

The Haystead #9 SWD permit allows the West Bay Exploration Company to inject brine related to oil production generated by only their own production wells, including hydraulic fracturing-related fluids, for the life of the well. "Brine" is a commonly used term in industry and environmental regulations to describe fluids brought to the surface

during the production of oil and gas. When used in context with a Class II permit, the term indicates the source of the fluid – an oil or gas production well – and a generalized chemical identity: water, dissolved constituents such as sodium, magnesium, and chlorides, and a usually small concentration of metals and hydrocarbons. It does not imply specific chemical contents or concentrations, however. EPA has used several terms in its Class II well materials over time; brine, oil-production related fluids, and salt water are some of the terms used in EPA documents. Regardless of the terms used, the regulations and UIC permits pertain to oil and gas production-related fluids that come from production wells, whatever the specific composition of these production-related fluids are.

At all times West Bay Exploration Company must comply with all aspects of the Haystead #9 SWD permit, including monitoring and reporting requirements. The UIC monitoring and testing requirements are designed to detect pressure changes between the tubing and annulus, thereby promptly detecting a leak. If a leak is detected, the UIC regulations require the operator to immediately cease operating the well until the leak is fixed and the repair is confirmed through testing.

4) *What is the difference re: the confining zone(s) "The Niagara Group" and "Niagaran"? West Bay #22 St. of Basis/Haystead No. 9 St. of Basis, respectively. Explain. Why did the U.S. EPA change the "wording" between 2 almost UIC permits of West Bay's? (Re: the confining zone)*

RESPONSE 13.4:

"A formation is a rock unit that is distinctive enough in appearance that a geologic mapper can tell it apart from the surrounding rock layers. It must also be thick enough and extensive enough to plot on a map. Formations are given names that include the geographic name of a permanent feature near the location where the rocks are well exposed. If the formation consists of a single or dominant rock type, such as shale or sandstone, then the rock type is included in the name. Formations often contain a variety of related or interlayered rock types, and in these cases the word 'formation' is used instead of a single rock type. Formations can be lumped together into larger rock units called groups, and divided into smaller units called members. Groups are useful rock units for small-scale mapping and regional studies, and members are useful where it is important to study or keep track of a particular subdivision of a formation. (Utah Geologic Survey, http://geology.utah.gov/surveynotes/gladasked/gladformation.htm)."

The Haystead #9 SWD permit limits injection into the Niagaran at depths between 2,870 and 3,100 feet (i.e. injection zone). The Niagaran Group, or Niagaran, includes multiple formations, including the Gray Niagaran, White Niagaran, Manistique Limestone, and Burnt Bluff Formation. The terms Niagara, Niagaran, and Niagaran Group are all acceptable stratigraphic nomenclature used synonymously to describe the formations listed above. The Michigan Hydrogeologic Atlas (1981) describes this group of rock as generally very porous and permeable, and will readily accept a wide range of fluids. The EPA reviews all UIC permit applications on a case-by-case basis. Two different permit writers have reviewed the Haystead #9 SWD and the West Bay #22 applications, however in this case there is no geophysical distinction between the groups of rock described as the Niagaran and the Niagaran Group.

The UIC regulations define confining zone in 40 C.F.R. § 146.3 to mean "a geological formation, group of formations, or part of a formation that is capable of limiting fluid movement above an injection zone."As detailed on page 2 of this document, the Salina Group (i.e. confining zone) is an approximately 430 foot thick sequence of carbonate, anhydrite, shale, and salt which will act as a confining layer to prevent flow out of the injection zone. This sequence of rock blocks the passage of water and is considered a confining unit, due to poor water transmitting rates, as described in the Michigan Hydrogeologic Atlas (1981). Please see EPA Response 28 for more information on the Salina Group and the regulatory requirements of confining zones.

5) *What is "permit by rule," explain, w/definition under 40 C.F.R..*

RESPONSE 13.5:

Rule authorization means the well must comply with all the requirements of the UIC program but does not require an actual UIC permit. The Haystead #9 SWD well is not authorized by rule and requires an actual EPA permit. More specifically, rule authorization most commonly applies to injection wells that were constructed prior to the promulgation of the UIC regulations. With certain exceptions, Class V injection wells are "authorized by rule" rather than by permit. Links to the UIC regulations may be found on our website at http://www.epa.gov/r5water/uic/glossary.htm, or alternatively the Electronic Code of Federal Regulations may be found at http://www.eCFR.gov/cgi-bin/text-idx?c=eCFR&tpl=%2Findex.tpl. Please see 40 CFR § 144.21 below:

§144.21 Existing Class I, II (except enhanced recovery and hydrocarbon storage) and III wells.

(a) An existing Class I, II (except enhanced recovery and hydrocarbon storage) and III injection well is authorized by rule if the owner or operator injects into the existing well within one year after the date at which a UIC program authorized under the SDWA becomes effective for the first time or inventories the well pursuant to the requirements of §144.26. An owner or operator of a well which is authorized by rule pursuant to this section shall rework, operate, maintain, convert, plug, abandon or inject into the well in compliance with applicable regulations.

(b) *Duration of well authorization by rule.* Well authorization under this section expires upon the effective date of a permit issued pursuant to §§144.25, 144.31, 144.33 or 144.34; after plugging and abandonment in accordance with an approved plugging and abandonment plan pursuant to §§144.28(c) and 146.10, and upon submission of a plugging and abandonment report pursuant to §144.28(k); or upon conversion in compliance with §144.28(j).

(c) *Prohibitions on injection.* An owner or operator of a well authorized by rule pursuant to this section is prohibited from injecting into the well:

(1) Upon the effective date of an applicable permit denial;

(2) Upon failure to submit a permit application in a timely manner pursuant to §§144.25 or 144.31;

(3) Upon failure to submit inventory information in a timely manner pursuant to §144.26;

(4) Upon failure to comply with a request for information in a timely manner pursuant to §144.27;

(5) Upon failure to provide alternative financial assurance pursuant to §144.28(d)(7);
(6) Forty-eight hours after receipt of a determination by the Director pursuant to §144.28(f)(3) that the well lacks mechanical integrity, unless the Director requires immediate cessation;
(7) Upon receipt of notification from the Director pursuant to §144.28(l) that the transferee has not demonstrated financial responsibility pursuant to §144.28(d);
(8) For Class I and III wells:
(i) In States with approved programs, five years after the effective date of the UIC program unless a timely and complete permit application is pending the Director's decision; or
(ii) In States with programs administered by EPA, one year after the effective date of the UIC program unless a timely and complete permit application is pending the Director's decision; or
(9) For Class II wells (except enhanced recovery and hydrocarbon storage), five years after the effective date of the UIC program unless a timely and complete permit application is pending the Director's decision.

(d) *Class II and III wells in existing fields or projects.* Notwithstanding the prohibition in §144.11, this section authorizes Class II and Class III wells or projects in existing fields or projects to continue normal operations until permitted, including construction, operation, and plugging and abandonment of wells as part of the operation, provided the owner or operator maintains compliance with all applicable requirements.

(e) *Requirements.* The owner or operator of a well authorized under this section shall comply with the applicable requirements of §144.28 and part 147 of this chapter no later than one year after authorization.

[48 FR 14189, Apr. 1, 1983, as amended at 49 FR 20181, May 11, 1984; 58 FR 63895, Dec. 3, 1993]

6) *Would "permit by rule" allow the U.S. EPA to (somehow) apply the decision-making/permit approval(s) from the Haystead No. 9 well to the West Bay #22 well, since both well permits are almost identical? Could the West Bay #22 well be issued draft/final permits under "permit by rule," thus depriving citizens of a public comment period/appeal opportunity for the West Bay #22? This is a two part question.*

RESPONSE 13.6:

EPA directly implements the UIC program in the State of Michigan. All new Class II injection wells must be permitted through the EPA, including the Haystead #9 SWD and the West Bay #22 wells. These wells will not be authorized by rule. Please see EPA Response 13.5 for a definition of rule authorization. EPA treats all injection well permit applications on a case-by-case basis, and primarily makes permitting decisions based on the geologic siting, well engineering, operating, and monitoring standards for deep injection wells.

7) *Has the U.S. EPA ever issued a UIC permit to any facility/injection well of any class under "permit by rule?"*

RESPONSE 13.7:

The terms "authorized by rule" and "authorized by permit" are two different methods by which injection well operators must meet the UIC regulatory requirements. EPA and certain state agencies issue permits to owners and operators of injection wells to implement the requirements of the UIC program. UIC permits are documents which detail the responsibilities and requirements related to the operation of UIC wells. Rule authorization or "authorized by rule" means the well must comply with all the requirements of the UIC program but does not require an actual UIC permit. Rule authorization applies to existing Class I, II, and III wells if the operator injected into the existing well within one year after the date at which the UIC program, authorized under the SDWA, became effective for the first time or inventoried the well pursuant to the requirements of 40 C.F.R. § 144.26. EPA does not issue "permits" to wells that are authorized by rule, however these wells must still meet the UIC regulatory requirements. There are numerous rule authorized wells in the State of Michigan. New injection wells in Michigan must be permitted by the EPA Region 5.

8) *Under Part I.B permit actions ie revocation/termination. What is required of a commenter/interested person to make a request under 40 C.F.R. 124.5 to the Regional Administrator? Explain, including time period required.*

RESPONSE 13.8:

EPA UIC permits may only be modified, revoked and reissued, or terminated for reasons specified in 40 C.F.R. §§ 144.39 or 144.40. These regulations are quoted below:

§144.39 Modification or revocation and reissuance of permits.

When the Director receives any information (for example, inspects the facility, receives information submitted by the permittee as required in the permit (see §144.51 of this chapter), receives a request for modification or revocation and reissuance under §124.5, or conducts a review of the permit file) he or she may determine whether or not one or more of the causes listed in paragraphs (a) and (b) of this section for modification or revocation and reissuance or both exist. If cause exists, the Director may modify or revoke and reissue the permit accordingly, subject to the limitations of paragraph (c) of this section, and may request an updated application if necessary. When a permit is modified, only the conditions subject to modification are reopened. If a permit is revoked and reissued, the entire permit is reopened and subject to revision and the permit is reissued for a new term. See §124.5(c)(2) of this chapter. If cause does not exist under this section or §144.41 of this chapter, the Director shall not modify or revoke and reissue the permit. If a permit modification satisfies the criteria in §144.41 for "minor modifications" the permit may be modified without a draft permit or public review. Otherwise, a draft permit must be prepared and other procedures in part 124 must be followed.

(a) *Causes for modification.* The following are causes for modification. For Class I hazardous waste injection wells, Class II, Class III or Class VI wells the following may be causes for revocation and reissuance as well as modification; and for all other wells the following may be cause for revocation or reissuance as well as modification when the permittee requests or agrees.

(1) *Alterations.* There are material and substantial alterations or additions to the permitted facility or activity which occurred after permit issuance which

justify the application of permit conditions that are different or absent in the existing permit.

(2) *Information.* The Director has received information. Permits other than for Class II and III wells may be modified during their terms for this cause only if the information was not available at the time of permit issuance (other than revised regulations, guidance, or test methods) and would have justified the application of different permit conditions at the time of issuance. For UIC area permits (§144.33), this cause shall include any information indicating that cumulative effects on the environment are unacceptable.

(3) *New regulations.* The standards or regulations on which the permit was based have been changed by promulgation of new or amended standards or regulations or by judicial decision after the permit was issued. Permits other than for Class I hazardous waste injection wells, Class II, Class III or Class VI wells may be modified during their permit terms for this cause only as follows:

(i) For promulgation of amended standards or regulations, when:

(A) The permit condition requested to be modified was based on a promulgated part 146 regulation; and

(B) EPA has revised, withdrawn, or modified that portion of the regulation on which the permit condition was based, and

(C) A permittee requests modification in accordance with §124.5 within ninety (90) days after FEDERAL REGISTER notice of the action on which the request is based.

(ii) For judicial decisions, a court of competent jurisdiction has remanded and stayed EPA promulgated regulations if the remand and stay concern that portion of the regulations on which the permit condition was based and a request is filed by the permittee in accordance with §124.5 within ninety (90) days of judicial remand.

(4) *Compliance schedules.* The Director determines good cause exists for modification of a compliance schedule, such as an act of God, strike, flood, or materials shortage or other events over which the permittee has little or no control and for which there is no reasonably available remedy. See also §144.41(c) (minor modifications).

(5) *Basis for modification of Class VI permits.* Additionally, for Class VI wells, whenever the Director determines that permit changes are necessary based on:

(i) Area of review reevaluations under §146.84(e)(1) of this chapter;

(ii) Any amendments to the testing and monitoring plan under §146.90(j) of this chapter;

(iii) Any amendments to the injection well plugging plan under §146.92(c) of this chapter;

(iv) Any amendments to the post-injection site care and site closure plan under §146.93(a)(3) of this chapter;

(v) Any amendments to the emergency and remedial response plan under §146.94(d) of this chapter; or

(vi) A review of monitoring and/or testing results conducted in accordance with permit requirements.

(b) *Causes for modification or revocation and reissuance.* The following are causes to modify or, alternatively, revoke and reissue a permit:

(1) Cause exists for termination under §144.40, and the Director determines that modification or revocation and reissuance is appropriate.
(2) The Director has received notification (as required in the permit, see §144.41(d)) of a proposed transfer of the permit. A permit also may be modified to reflect a transfer after the effective date of an automatic transfer (§144.38(b)) but will not be revoked and reissued after the effective date of the transfer except upon the request of the new permittee.
(3) A determination that the waste being injected is a hazardous waste as defined in §261.3 either because the definition has been revised, or because a previous determination has been changed.

(c) *Facility siting.* Suitability of the facility location will not be considered at the time of permit modification or revocation and reissuance unless new information or standards indicate that a threat to human health or the environment exists which was unknown at the time of permit issuance.

[48 FR 14189, Apr. 1, 1983, as amended at 53 FR 28147, July 26, 1988; 75 FR 77288, Dec. 10, 2010]

§144.40 Termination of permits.

(a) The Director may terminate a permit during its term, or deny a permit renewal application for the following causes:
(1) Noncompliance by the permittee with any condition of the permit;
(2) The permittee's failure in the application or during the permit issuance process to disclose fully all relevant facts, or the permittee's misrepresentation of any relevant facts at any time; or
(3) A determination that the permitted activity endangers human health or the environment and can only be regulated to acceptable levels by permit modification or termination;

(b) The Director shall follow the applicable procedures in part 124 in terminating any permit under this section.

9) *Comment under Part IB permit actions has there ever been a successful part 124.5 request done by a commenter/person for "revocation and reissuance" or "termination" of a UIC permit of any class? Explain.*

RESPONSE 13.9:

EPA Region 5's UIC program is unaware of any permits that have been "revoked and reissued" or "terminated" due to a commenter's request.

10) *Under Part ID confidentiality, I believe at least six items need to be added, i.e. these six items should not be confidential. Part ID. Confidentiality –(Not!) six items: 1. Part I.D. (3) info. Which deals with the existence, absence, or level of fractures or fissures in the confining zone layer of rock. (Note: From I.D. (3) to I.D. (8), these are my additions to, after ID (2)) 2. Part I.D. (4) Information which deals with an increase in the maximum injection pressure. 3. Part I.D. (5) info. Which deals with non-compliance by the permmittee. 4. Part I.D. (6) info. which deals with a transfer of ownership. 5. Part I.D. (7) info. Which deals with a modification to the permit for enhanced oil recovery. 6. Part*

I.D. (8) info. which deals with all other modifications to the permit. (All 6 could be FOIA'd!)

RESPONSE 13.10:

Part I (D) of the Haystead #9 SWD permit is in accordance with 40 C.F.R. Part 2 (Public Information) and 40 C.F.R. §144.5. No part of West Bay Exploration Company's Haystead #9 SWD permit application or additionally submitted materials have been claimed as "confidential business information". Validity of any claims of "confidential business information" are assessed by EPA in accordance with procedures in 40 C.F.R. Part 2 (Public Information).

11) *What is "enhanced oil recovery?" Explain fully.*

RESPONSE 13.11:

As described on EPA's website, enhanced recovery wells inject brine, water, steam, polymers, or carbon dioxide into oil-bearing formations to recover residual oil and—in some limited applications—natural gas. This is also known as secondary or tertiary recovery. The injected fluid thins (decreases the viscosity) or displaces small amounts of extractable oil and gas, which is then available for recovery. Production wells bring oil and gas to the surface; the UIC Program does not regulate wells that are solely used for production. However, EPA does have authority to regulate hydraulic fracturing when diesel fuels are used in fluids or propping agents. During hydraulic fracturing, another enhanced recovery process, a viscous fluid is injected under high pressure until the desired fracturing is achieved, followed by a proppant such as sand. The pressure is then released and the proppant holding the fractures open allows fluid to return to the well. Enhanced recovery wells are the most numerous type of Class II wells, representing as much as 80 percent of the approximately 151,000 Class II wells. Please see EPA's website at http://water.epa.gov/type/groundwater/uic/class2/ for more information on Class II wells, including enhanced recovery wells. The Haystead #9 SWD permit is limited to noncommercial brine disposal, not enhanced recovery.

12) *Does enhanced oil recovery involve fracturing fluids – whether spent fluids, or pre-injection? Explain.*

RESPONSE 13.12

Enhanced recovery wells may inject brine or production fluids (i.e. Class II fluids) into oil-bearing formations to recover residual oil. Please see EPA Response 21 for more information about Class II fluids, and how they are defined. EPA considers Class II disposal and enhanced recovery injection wells a safe method for the disposal of brine and production fluids.

Please also see EPA Response 13.11 above for a description of enhanced recovery wells.

13) *Part I.E. (2) penalties for violations of permit conditions – put last sentence in bold type. Ie "Any person who willfully violates a permit condition is subject to criminal prosecution." (A warning!)*

RESPONSE 13.13

EPA Region 5's UIC program requires written notification from operators stating that they have read, and are familiar with conditions of its injection well permit as required by the permit, within 30 days of the receipt of a final UIC permit. There is no need to additionally bold type any aspect of the Haystead #9 SWD well permit.

14) *Part I.E. (3) need to halt or reduce activity not a defense. Add this: Part I.E. (3)(a): "It shall not be a defense for a permittee in an enforcement action to state that they (permittee) were only following orders of the Regional Administrator/Director if the permittee knows said activity violates any condition of this permit." (Another warning!)*

RESPONSE 13.14

Part I (E)(3) "Need to Halt or Reduce Activity not a Defense" of the Haystead #9 SWD permit is directly in accordance with 40 C.F.R. § 144.51 Conditions applicable to all permits. As this section of the Haystead #9 SWD well is written "word for word" from the federal UIC regulations in 40 C.F.R. § 144.51(c), there is no latitude to amend the language of this section of the permit.

If the well remains in compliance but environmental damage occurs due to the injection, Part I(A) of the permit states that, regardless of compliance with the terms of the permit, contamination to a USDW may not result from underground injection. If that happens, it is a violation of the SDWA. That section also clearly states that compliance with the permit does not constitute a defense to any action brought under the authority of the SDWA.

15) *Part I.E(8) Records, strike: At 3rd sentence down from the top "At least three years" thru "report." Add: "The life of the well," after "period of" ie "the permittee shall retain records of all monitoring information, including all calibration and maintenance records, and copies of all records required bt this permit for a period of the life of the well." (Institutes full responsibility!)*

RESPONSE 13.15

Part I (E)(8) "Records" is directly in accordance with 40 C.F.R. §§ 144.31 and 144.51. These sections of the UIC regulations describe the "record keeping" and "monitoring and records" requirements for an injection well operator. As this section of the Haystead #9 SWD well is written based on the federal UIC regulations in 40 C.F.R. §§ 144.31(f) and 144.51(j), there is no latitude to amend the language of this section of the permit.

16) *Part I.E. (9)(b) anticipated non-compliance, strike: the whole permit condition – Part I.E. (9)(b). (non-compliance should not be allowed!)*

RESPONSE 13.16

The language in Part I (E)(9)(b) "Anticipated Noncompliance" of the Haystead #9 SWD permit is directly in accordance with 40 C.F.R. § 144.51(l)(2) Reporting Requirements. This section of the UIC regulations describes reporting procedures in which an operator must notify the EPA of expected changes in the operation of the injection well. Planned changes in the permitted facility or activity which may result in noncompliance with permit requirements may include necessary maintenance, well work over, and re-seating

of the packer. Reporting requirements, such as those listed in Part I (E)(9)(b), ensure that planned changes in the Haystead #9 SWD must be reported to EPA. As this section of the Haystead #9 SWD well is written based on the federal UIC regulations in 40 C.F.R. § 144.51(l)(2), there is no latitude to amend the language of this section of the permit.

17) *Part II correction action plan, add: Ohio DNR (ODNR) injection well reforms – highlighted portions only, from pg. 1 and pg. 2. Ie from permit 1501: 9-3-06 from 9-21-2012. Substitute director for "chief" 7x, leave the word proposed x2, copy word-for-word-beginning (c) then (1.)(2.)(3.)(4.)(5.)(6.)(7.) then (D.) then (E.) stop after E. (list corr. action(s) before problem happens!)*

RESPONSE 13.17

EPA has determined that there should be no impact to the drinking water supplies as a result of injection into this well. The geologic siting, engineering and construction, and operating and monitoring standards applied to the Haystead #9 SWD well meet the federal UIC regulatory requirements and are sufficient to protect the USDW. EPA has determined that no corrective action is required for the Haystead #9 SWD.

18) *Add to the administrative record: ODNR permit 1501: 9-3-06; prelim. rpt Northstar 1 Class II inj. well & seismic events – Youngstown, Ohio area, March 2012.*

RESPONSE 13.18

ODNR's *Preliminary Report on the Northstar 1 Class II Injection Well and the Seismic Events in the Youngstown, Ohio, Area* (March, 2012) is included in the Haystead #9 SWD Administrative Record.

14. Sandra Yerman, "Addendum to faxed comments" letter received 5/16/2013

1) *To my Q.1 re: sand in fracturing fluids, please apply the Theis equation/computer modeling etc. to vertical (zone to USDW) fissures created by max inj. pressure, and/or increase in max. inj. press. Give me print-out.*

RESPONSE 14.1

At the request of the commenter, EPA used the modified version of the Theis equation found in the UIC regulations at 40 C.F.R. § 146.6 to model the zone of influence. The Theis equation is a way to calculate fluid movement in a porous medium. EPA used conservative values for the injection zone's physical characteristics, with the intent of maximizing the result. The maximum injection rate used, 1200 barrels per day, is from the company's permit application. According to EPA's calculations, injected fluid could travel a radius of 894 feet from the well in 20 years, if operated continuously (24 hours per day) at the maximum injection rate 1200 barrels per day. This is the largest radius yielded by our calculations (entitled "EPA Calculation of Injection Induced Pressure Effects Report" in the Haystead #9 SWD Administrative Record). The area of review EPA used to evaluate the Haystead #9 SWD well is a ¼ mile radius (i.e. 1,320 feet), which is larger than the maximum calculated distance fluid is expected to travel if injected into the Haystead #9 SWD continuously for 20 years.

2) *To corrective action plain, 17Q add: 20Q: Require $5 M Bond for clean-ups & water substitute wells; regardless that the SDWA does not require this.*

RESPONSE 14.2

Please see EPA Response 11 for EPA financial assurance requirements for properly plugging the injection well. The well owner/operator is responsible for any potential contamination which occurs on or from the site.

If the well remains in compliance but environmental damage occurs due to the injection, Part I(A) of the permit states that, regardless of compliance with the terms of the permit, contamination to a USDW may not result from underground injection. If that were to happen, it is a violation of the SDWA. Violations of the SDWA and UIC regulations are subject to Administrative Orders which may include penalties of up to $187,500, civil penalties of up to $37,500 per day of violation and criminal penalties of up to three years imprisonment and fines in accordance with Title 18 of the United States Code.

EPA has determined that no corrective action is required for the Haystead #9 SWD.

3) *What is conventional oil & gas production exactly? What does hydraulic fracturing fall under? Explain.*

RESPONSE 14.3:

Commonly, conventional oil and gas production is associated with vertical wells drilled into highly permeable reservoirs or formations. Generally, hydrocarbons flow to a conventional production well without the use of extensive stimulation practices, such as hydraulic fracturing. Traditionally conventional oil and gas wells are drilled into sandstone and carbonate reservoirs.

In contrast, unconventional production wells are often deeper and/or more difficult to recover hydrocarbons from. Unconventional production includes wells that are directionally or horizontally drilled into geologic formations to overcome technical challenges associated with the physical properties of the reservoir. Some hydrocarbon-bearing rock formations must also be hydraulically fractured or stimulated to allow hydrocarbons to flow freely to the wellhead. As a result, producing unconventional oil and gas resources may require more energy and water consumption. Unconventional natural gas resources include tight gas sands, shale gas, and coal bed methane (CBM).

4) *Note that, in Youngstown, Ohio, there were no existing fissures/fractures/seismic events for any Class II injection until the Northstar Brine Disposal well, in March 2011. (See admin record – Q. 18 for reference).*

RESPONSE 14.4:

EPA has determined that the geologic siting, engineering and construction, and operating and monitoring standards applied to the Haystead #9 SWD well meet the federal UIC regulatory requirements and are sufficient to protect the USDW. Region 5's UIC program utilized several sources of geologic and seismic data during its evaluation of the Haystead #9 SWD permit application, and determined that the geologic siting of the proposed well

is suitable for underground injection. Please refer to EPA Response 5 for EPA's evaluation of the Haystead #9 SWD and the potential for seismic events.

5) *Does brine exemption, under RCRA 40 C.F.R. 261.4(b)(5) have anything to do with Halliburton loophole?*

RESPONSE 14.5:

Class II disposal injection wells are defined by regulation in 40 § C.F.R. 146.5(b)(1) as "wells which inject fluids which are brought to the surface in connection with conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection." Brine has been exempted from the definition of hazardous waste under the Resource Conservation and Recovery Act under 40 C.F.R. § 261.4(b)(5), which specifically exempts "drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil, natural gas or geothermal energy." This means that the fluid coming out of the production well, which is called brine but may also include drilling fluids among other things, can be injected into a Class II well, regardless of its constituents.

15. U.S. Department of Interior, Fish and Wildlife Service" letter received 9/10/2013

We agree with your conclusion that there are no federally listed species in the action area that would be impacted from the proposed project. However, there are several sensitive and vulnerable wetland communities within Jackson County that could potentially be impacted as a result of the proposed action. Prairie fens are globally rare groundwater-dependent wetlands that provide habitat to many rare species, including several federal and state protected species in Michigan. 'These systems form the headwaters of many of the region's rivers and lakes, supporting valuable fish and wildlife habitat. They also serve as biological reservoirs, provide clean water for lakes and streams, and the slow release of storm and floodwaters. Michigan State University has developed a groundwater flow model for many fens in southern Michigan. According to the model, the Fay Lake Fen is directly down gradient of the proposed project site. Furthermore, the groundwater in both the shallow and bedrock aquifers flow toward the fen. If the injection well should become compromised and there are leaks, spills, or leeching into the groundwater from the operations, the Fay Lake Fen and other nearby wetlands or waterways could be negatively affected.

RESPONSE 15:

The commenter concurs with EPA's conclusion that no federally listed species in the action area will be impacted by the Haystead #9 SWD well project, but expressed concerns for vulnerable wetland communities within Jackson County, Michigan. EPA recognizes the value of prairie fens, and is aware of wetlands within the ¼ AOR of the Haystead #9 SWD well. However, the commenter specifically references concern for the Fay Lake Fen, a prairie fen approximately 1.7 miles southeast of the Haystead #9 SWD well site, and outside of the area of review. The potential for the migration of injectate into a USDW or a surface water body is extremely small to nonexistent. The purpose of the UIC program is to protect USDWs from being contaminated by underground injection practices. The Final UIC Permit requires the geologic siting of the proposed well, and its proposed construction and operation, to be sufficient to prevent upward movement of the injected fluid into USDWs. Three solid steel casings, all of which will be completely cemented to the surface, and the tubing/packer assembly through which injection takes place, prevent

injectate from leaking out into an unintended formation. The depth of the well provides another measure of safety, as the brine will be injected far below the USDW. The construction of the well is such that the brine will enter the injection formation (Niagaran) at 2,870 feet below ground surface. These formations were selected for the injection zone because they accept fluid well without a pressure increase. Approximately 2,563 feet of sedimentary rock strata, much of which consists of impermeable shales, separate the USDW from the injection zone. Furthermore, the injection pressure, in this case 737 pounds per square inch, is limited by the permit. This prevents the injected fluid from creating fractures in the rock through which it could migrate.

As discussed in EPA Response 14.1, EPA also used the modified version of the Theis equation found in the UIC regulations at 40 § C.F.R. 146.6 to model the zone of influence. According to EPA calculations, injected fluid could travel a horizontal radius of 894 feet from the well in 20 years, if operated continuously (24 hours per day) at the maximum injection rate 1200 barrels per day. The area of review EPA used to evaluate the Haystead #9 SWD well is a ¼ mile radius (1,320 feet), which is larger than the maximum calculated distance fluid is expected to travel if injected into the Haystead #9 SWD continuously for 20 years. The UIC regulations mandate that the permit applicant must conduct a search for any other potential hydrologic conduits located within the area of review and submit data which describes the geologic units involved in the injection well operations, characteristics of the injected waste, and operation of the injection well. The submitted information allows EPA to make an informed decision about the adequacy of the siting, construction, and operation of the injection well. In this case, the applicant satisfied all requirements that ensure that no significant environmental impact will result from the proposed operation of this well.

To further evaluate the commenters concern, EPA used the MDEQ's Groundwater Mapping Project - Interactive Map Viewer tool (http://gwmap.rsgis.msu.edu/) to identify groundwater dependent resources (e.g. prairie fens) and groundwater table contour lines. The online interactive map viewer was created by Michigan State University's (MSU) Remote Sensing & GIS Research and Outreach Services (RS&GIS), as mandated by Michigan Public Act 148 of 2003, which requires that a groundwater inventory and map be generated for the state. Funding was provided by the State of Michigan through cooperative agreement with the U.S. Geological Survey (USGS) and the MSU Institute of Water Research. As the commenter suggested, the Fay Lake Fen was identified approximately 1.7 miles southeast of the Haystead #9 SWD well site, outside of the ¼ mile AOR. Water table contour lines are commonly used to show the direction of groundwater flow, and are based on the elevation of the water table throughout the area of interest. Groundwater flows down gradient and perpendicular to water table contours, from higher to lower elevations. In this case, the MDEQ Interactive Map Viewer shows the groundwater table contour elevations decreasing in a northern direction from the vicinity of the Haystead #9 SWD well site and within the ¼ mile AOR. Specifically, these water table contours decrease from 960, 950, and 940 feet in a north to northeast direction from the Haystead #9 SWD (see Direction of Groundwater Flow map in the Haystead #9 SWD Administrative Record). Perpendicular flow lines (arrows drawn perpendicular to contours) demonstrate that the direction of groundwater (i.e. freshwater in the Marshall Sandstone and unconsolidated glacial drift USDWs) flow from the Haystead #9 SWD site is generally north, and not in the direction of the Fay Lake Fen (southeast) as the commenter suggests was possible. Again, as described above and on page 2, the Haystead #9 SWD well will be constructed with three casing strings (steel pipe), and all steel casing strings will be cemented over their entire length (i.e. to the surface) to preclude the movement of fluids into and between USDWs due to injection operations. EPA Region 5 has never had an incident where a USDW was

impacted from loss of mechanical integrity, traced to leaks in well casings or faulty cement surrounding the casing. Additionally, 2,653 feet of rock strata separate the injection zone from the base of the lowest USDW (i.e. Marshall Sandstone), or groundwater. Further, based on MDEQ's Groundwater Mapping Project - Interactive Map Viewer tool, if all layers of protection in the Haystead #9 SWD were somehow to fail under the most extreme, catastrophic circumstances, groundwater flow would not move in the direction of the Fay Lake Fen, and therefore would not negatively affect the prairie fen wetlands.

As a result, operations of this injection well and the injection of waste 2,870 feet below surface should not affect USDWs or surface water because there is no hydrologic connection between the injection zone (i.e. Niagaran) and the USDWs (i.e. Marshall Sandstone and unconsolidated glacial drift) or nearby surface water. The UIC permit will protect surface water indirectly through protecting the Marshall Sandstone or unconsolidated glacial drift groundwater aquifers to which they are connected. A watershed's connection with aquifers is limited to the aquifers that have connections with surface bodies of water, like rivers. While area lakes and streams, including the River Raisin, may be in hydrologic communication with groundwater or depend on groundwater for flow, they are not deeper than the base of the lowermost USDW. For example, the maximum depth of Wamplers Lake is approximately 40 feet. Similarly, wetlands such as nearby prairie fens are also shallower than the lowermost USDW. Because the lowermost USDW will be protected, prairie fens that are fed by the subsurface groundwater will also be protected.

As detailed in EPA Response 3, surface spills at the facility or in the course of transportation to the site are addressed under State regulations and are the responsibility of the operator or transporter. Management of surface facilities are not addressed by the UIC regulations and so are outside the scope of the UIC permit process. However, the State of Michigan does have oil and gas regulations which specifically address the supervision of wells, surface facilities, and secondary containment requirements. Oil and Gas exploration, drilling, and operating is regulated under the Michigan's Natural Resources and Environmental Protection Act, Act No. 451 of the Public Acts of 1994, as amended (last amended 9/10/2004). Information related to Michigan's Oil and Gas regulations can be found at http://www.michigan.gov/deq/0,1607,7-135-3311_4111_4231-9245--,00.html. Additional concerns about the potential for surface spill should be further directed to MDEQ (see contact information in EPA Response 1).

Again, as also described in EPA Response 3, during EPA's review of the permit application the Agency determined that the base of the lowermost USDW is separated from the injection zone by approximately 2,653 feet of rock layers that include low permeability shales and a confining zone of carbonate, anhydrite, shale, and salt, which will prevent the injected brine from reaching the USDW. The water table or depth to water, and the water quality of USDWs will not be affected by the proposed injection well because the injected fluids will not be injected into the USDW, and approximately 2,653 feet of rock layers between the injection zone and base of the USDW will help prevent any hydrologic connectivity between injected fluids and the USDW.

WRITTEN COMMENTS RECEIVED AT THE PUBLIC HEARING:

16. David Lamb, index card received Tue 4/30/2013

Why!? To drill for oil, mineral rights are obtained. Injection wells are permitted under a wide vast area far from the drill sight (sic), and isn't asked of property owners object.

RESPONSE 16:

Issues relating to property ownership, lessee rights, or unitization are legal issues beyond the scope of this permit action. Issuance of a Class II injection well permit by the EPA is based on consideration of siting, construction, and proposed operation of the well. Under federal UIC regulations, a permittee is not required to demonstrate ownership or legal access to all properties, only that the operation will not allow contaminants into a USDW. Issuance of a permit neither confers the right to trespass nor conveys property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations.

The issue of trespass has been addressed by the Environmental Appeals Board of the U.S. EPA in Washington D.C. within their decision made on July 22, 1993. The appeal decision was in the matter of the brine disposal well Permit #MI-119-2D-0029 in Montmorency County, Michigan, UIC Appeal Nos. 92-4, 92-5, 92-6 and 92-6A. On page 6 of the appeal decision under Section B, The Merits, Part 1 Subsurface trespass, "We first address the most pervasive of the issues raised by the various petitioners, concerning the rights of neighboring landowners under State property law and their alleged entitlement to compensation in the event of a subsurface "trespass". We must deny review with respect to this issue, because resolution of State property-law issues such as this is beyond the scope of EPA's role in reviewing an injection well permit application. As we recently reaffirmed in In re Suckla Farms, Inc., UIC Appeal No. 92-7 (EAB, June 7, 1993), EPA is simply not the proper forum for litigating contract- or property-law disputes that may happen to arise in the context of waste disposal activity for which a federal permit is required. These disputes properly belong in a court of competent jurisdiction."

17. Lisa Downey, index card received Tue 4/30/2013

How many Class II injection wells are located in Michigan?
How long has the oldest one been in use?
Have there been any problems with any of the wells in use now?

RESPONSE 17:

There are approximately 1,460 Class II injection wells in Michigan.

Historically, injection wells have been in use in the United States since the 1930s. However, EPA did not begin regulating injection wells until federal regulations were passed in the 1980s. These regulations defined the five classes of injection wells and set minimum standards that state programs must meet to receive primary enforcement responsibility (primacy) of the UIC Program.

Since EPA began regulating injection wells, there has not been a documented case of an injection well contaminating an underground source of drinking water. Before EPA regulated underground injection wells there were several incidents where injection wells leaked. A review of well failures that EPA conducted during development of the regulations showed that the federal UIC regulations, as are now enforced, would have prevented these failures. Modern injection wells in Michigan are extremely safe and protective of USDWs because they are constructed and operated to high standards, set by the federal UIC regulations. Historically, problems with Class II wells have occurred from old, abandoned wells in old oil fields which were not constructed or plugged to the current standards. Those substandard wells (called "orphan" wells) can occasionally leak brine, gas, or oil into a USDW. In Michigan, MDEQ keeps detailed records of all known wells, including orphan wells, and has a fund to plug them. EPA has searched for historical well records within the

¼ mile AOR using MDEQ's GeoWebFace Mapping Application (http://ww2.deq.state.mi.us/GeoWebFace/#) and have not found any improperly plug wells. It is very unlikely that there is an unknown orphan well in the area of the proposed well, and even less likely that it would serve as a conduit for brine to move upwards. However, if that were to occur, West Bay Exploration Company would be required to plug the old well and remediate the surface.

VERBAL COMMENTS RECEIVED AT THE PUBLIC HEARING, ARIL 30, 2013:

18. MR. GILLMORE

I have a couple of comments, I guess. I found out about this meeting tonight so I didn't have any time to prepare anything formally, but my understanding is that the role of your organization deals primarily with the well itself, how the well is constructed, how it will operate, and I haven't heard anything in the earlier session tonight that would lead me to believe that you're going to do anything specific other than what deals with the well itself. Specifically, I guess, based on information that we heard earlier, the company is going to be pumping some 22 million gallons of fluid, brine, you call it, into the well on an annual basis, and I understand, based on information that you've presented, it's going to be 3,000 feet below the ground. I think your introduction material stated that the composition down there was shale and limestone, and earlier tonight I think it was discussed that limestone is porous and fluids can go through it.

Is there any organization that is monitoring where all of this fluid is going to go if the life of this well is 10 years, or 20 years, or 50 years at, pick a number, 22 million gallons a year, how big of an area will be covered in this pool of material that is pumped down there, and what is, what is the structure of the rock and the shale and the limestone in that broader geographic area, and to what extent has research and analysis been done in that broader area to make sure that the limestone that apparently is down in there is not going to leak and allow for some of this material, which possibly is lighter, to come back up to the surface?

I grew up in a little town in Ohio called Lima. They have a, back in the '50s, they had a refinery down there owned by Standard Ohio. It was later sold to BP, and I think is still operational. And they have been pumping millions of gallons of refinery waste in the soil down there for 50 years, or so. And if you talk to a doctor that practices in that area, they will agree that it is properly called goiter capital of the United States. However, no politician or administrator from the refinery will acknowledge any of that, will talk to you about it. So I guess the bottom line is, I understand that you can very competently construct the well, and you can monitor pressure to make sure things are going down there correctly and, whatever, but once it goes down there, what's the geographic area that's going to be covered by it over the life of the well and what analysis has been done above that, that expanded geographic area to assure that there will be no leaks up into the water table?

RESPONSE 18:

Injection will occur in the Niagaran within the interval between 2,870 and 3,100 feet below ground surface. As described on page 2 of this document, based on the geologic descriptions in the Michigan Hydrogeologic Atlas (1981) and formation and drilling records for nearby wells (e.g. MDEQ #60076 and #60078), the Niagaran is a vast limestone and dolomite rock structure underlying Michigan and parts of Illinois, Indiana, Ohio, and New York. The injection zone (i.e. Niagaran) is topped by the Salina Group, an approximately 430 foot thick sequence of carbonate, anhydrite, shale, and salt, which will act as a confining layer to prevent flow out of the injection

zone. This sequence of rock blocks the passage of water and is considered a confining unit, due to poor water transmitting rates (Michigan Hydrogeologic Atlas, 1981). Furthermore, many of the rock layers between the confining zone and the base of the USDW are impermeable shales and evaporites which will prevent injection fluid from moving upward to enter the USDW. These shale layers include the Antrim Formation, Bedford Shale, Bell Shale, Sunbury Shale, and Coldwater Shale. Further, formation and drilling records for nearby wells (e.g. MDEQ #60076 and #60078) demonstrate that the Coldwater Shale is nearly 1000 feet thick in the ¼ mile area of review of the Haystead #9 SWD well.

Federal regulations require that the area of review for the permit be no less than ¼ mile in radius. At the request of the commenters, EPA used the modified version of the Theis equation found in the UIC regulations at 40 C.F.R. § 146.6 to model the zone of influence. The Theis equation is a way to calculate fluid movement in a porous medium. EPA used conservative values for the injection zone's physical characteristics, with the intent of maximizing the result. The maximum injection rate EPA used, 1200 barrels per day, is from the company's permit application. According to EPA calculations, injected fluid could travel a radius of 894 feet from the well in 20 years, if operated continuously (24 hours per day) at the maximum injection rate of 1200 barrels per day. This is the largest radius yielded by our calculations ("EPA Calculation of Injection Induced Pressure Effects Report", in the Haystead #9 SWD Administrative Record). The area of review EPA used to evaluate the Haystead #9 SWD well is a ¼ mile radius (i.e. 1,320 feet), which is larger than the maximum calculated distance fluid is expected to travel if injected into the Haystead #9 SWD continuously for 20 years.
There are several safeguards established to prevent the well from contaminating an underground source of drinking water. EPA requires well casings to be cemented to the ground surface. Injection takes place through tubing set within the casing. In addition, the applicant is required to conduct and pass a Mechanical Integrity Test (MIT), in accordance with 40 C.F.R. § 146.8, before authorization to inject is granted, and after the well is completed. The applicant is also required to repeat the MIT, at least once every five years thereafter. The UIC monitoring and testing requirements are designed to detect pressure changes between the tubing and annulus, thereby promptly detecting a leak. If a leak is detected, the UIC regulations require the operator to immediately cease operating the well until the leak is fixed and the repair is confirmed through testing.

At the Haystead #9 SWD site, it is unlikely that injected fluid will leave the injection zone. The Niagaran Group is capable of receiving the injected fluid and is used as an injection zone elsewhere. There is no guarantee that injected fluid will not leave the injection zone. However, the purpose of the UIC program is to protect USDWs from being contaminated by underground injection practices. The construction, operation, and geological siting criteria, which prevent USDW contamination, do so in part by requiring the fluid to be injected into zones that will accept and retain the fluid and be underneath formations that will prevent the fluid from moving into USDWs. If injected fluid were to exit the injection zone, it would migrate up into the next rock unit capable of accepting fluid. Further, the injection zone is separated from the lowest USDW by 2,653 feet of geologic strata. Aside from the Salina Group confining zone, many of the formations between the injection zone and the USDW are layered with impermeable shale and other rock types which will prevent movement of the injected fluid into the USDW.

A representative brine sample for the proposed injection fluids at the Haystead#9 SWD was submitted by West Bay Exploration Company, and meets the UIC regulation requirements at

40 C.F.R. § 146.24 (a)(4)(iii). EPA has determined that the applicant has provided sufficient information, to allow EPA to determine that the representative sample (Appendix 5 of the Haystead #9 SWD application) is consistent with produced water or "brine". Additionally, the Specific Gravity for the representative sample was reported at 1.193 (unit-less ratio of density). Specific Gravity is often used for describing the concentration of solutions of various materials, such as brine. In this case, the Specific Gravity of 1.193 indicates the solution is much denser than fresh water, which has a Specific Gravity of approximately 1. Substances with a Specific Gravity of greater than 1, such as the proposed injection fluid (1.193), are denser than fresh water and more likely to sink rather than come back to the surface.

19. DR. PATRICIA MACK

While I listened carefully to Mr. Elkins' explanation of the safeguards to be set in place for the Haystead #9 SWD injection well, I am still concerned that this poses a huge environmental threat to Jackson County, specifically the Raisin River. Much was said about protection through layers and layers of rock and shale downward over 2600 feet, but little assurance was given about the leaking and leeching outward toward the river, so that's my concern.

RESPONSE 19:

As described in EPA Responses 6 and 15, the UIC permit for the Haystead #9 SWD will protect surface water indirectly through protecting the USDWs to which they are connected. A watershed's connection with aquifers is limited to the aquifers that have connections with surface bodies of water, like rivers. While area lakes and streams, including the River Raisin, may be in hydrologic communication with groundwater or depend on groundwater for flow, they are not deeper than the base of the lowermost USDW. For example, the maximum depth of nearby Wamplers Lake is approximately 40 feet below ground. Similarly, wetlands such as nearby prairie fens are also shallower than the lowermost USDW. Because the lowermost USDW will be protected, prairie fens that are fed by the subsurface groundwater (i.e. freshwater in the Marshall Sandstone and unconsolidated glacial drift USDWs) will also be protected.

Further, as detailed in EPA Response 18, the Niagaran is a vast limestone and dolomite rock structure underlying Michigan and parts of Illinois, Indiana, Ohio, and New York, and is capable of receiving the injected fluid. As discussed in EPA Responses 14.1 and 18, EPA used the modified version of the Theis equation found in the UIC regulations at 40 § C.F.R. 146.6 to model the zone of influence. According to EPA calculations, injected fluid could travel a horizontal radius of 894 feet from the well in 20 years, if operated continuously (24 hours per day) at the maximum injection rate 1200 barrels per day. The area of review EPA used to evaluate the Haystead #9 SWD well is a ¼ mile radius (1,320 feet), which is larger than the maximum calculated distance fluid is expected to travel if injected into the Haystead #9 SWD continuously for 20 years. The UIC regulations mandate that the permit applicant must conduct a search for any other potential hydrologic conduits located within the area of review and submit data which describes the geologic units involved in the injection well operations, characteristics of the injected waste, and operation of the injection well. The submitted information allows the EPA to make an informed decision about the adequacy of the siting, construction, and operation of the injection well. In this case, the applicant satisfied all requirements that ensure that no significant environmental impact will result from the proposed operation of this well.

20. MR. MARK MUHICH

I'm a conservation chair for the Central Michigan Group of the Sierra Club. I have some concerns about the endangered species essays that were done in preparation for this permit.

First thing I would like to recommend is that the EPA require this area of review to be expanded. I see in the maps that were contained in the permit application that the quarter-mile radius extends down the hill within 200 feet of the Raisin River, and that seems to me to be an arbitrary distinction, because if anything were to happen within that quarter-mile area of review, is obviously going to wash into the river, anything that's in that marsh between your perimeter and the river is going to be damaged.

I find it hard to believe that there is only four species of concern here. I know each of these species that, I haven't seen this skipperling, but I'd like to refer you to this book "Amphibians and Retiles of the Great Lakes Region", by James Harding. He goes through this book giving a very detailed analysis of turtles, salamanders, skinks, snakes and amphibians. There are hundreds of species here. Many of them are in Michigan and many of them are listed as habitat for this particular region. Many of them are in decline, some of them are threatened and some of them are endangered far beyond the numbers that are listed in this permit.

I'd also like you to look at we call the Herp Atlas for Michigan. That's specifically for Michigan. There are 76 species of reptiles in Michigan, 22 of which are threatened or endangered, and many of those, whose habitats could be found in this region, so I find it hard to believe that there is only four species here.

I'd like you to ask the permit team to go back and analyze that habitat, including the animals that are included in this Amphibians and Reptiles, by James Harding, and also the lists that are online for the Michigan Herp Atlas.

I would go ahead and read you the scientific names of a lot of these animals but my Latin is terrible and in deference to our court reporter, I won't. One last thing, I was surprised and heartened to hear the permit for this previous well, which we talked about here a year ago, has been withdrawn, one account, at least, being the endangered species, but in the announcement, it only says it's been withdrawn. And I could not find out until tonight until what, so I'm glad it was, but perhaps in the future, we could be a little more forthcoming about the information.

RESPONSE 20:

EPA used a ¼-mile radius area of review as proscribed by regulations under 40 C.F.R. § 147.1155(a), which pertain to Michigan. "Notwithstanding the alternatives presented in § 146.6 of this chapter, the area of review for Class II wells shall be a fixed radius as described in § 146.6(b) of this chapter." 40 C.F.R. § 146.6(b) describes a ¼-mile area of review.

The purpose of the UIC program is to protect USDWs from being contaminated by underground injection practices. The geologic siting of the proposed well and its proposed construction and operation are sufficient to prevent upward movement of the injected fluid into USDWs. Because injection in Haystead #9 SWD will not affect the USDW, injected fluid will not affect wildlife and threatened and endangered species. As a federal agency, EPA must comply with the Endangered Species Act. During the evaluation of the Haystead #9 SWD permit application, EPA identified two federally-designated threatened or endangered species and two candidate species (which are species that are not yet listed, but are proposed to be listed) that may potentially be found in Jackson County. Those species are, respectively: the Indiana bat, Mitchell's satyr butterfly, the

Eastern massasauga (a rattlesnake), and the Poweshiek skipperling (a butterfly). Subsequently on October 2, 2013, the U.S. Fish and Wildlife Service proposed the Northern long-eared bat be listed as a federally-designated endangered species throughout its range, including Jackson County, Michigan.

EPA determined that the immediate well area will not affect habitat for these species, including the Northern long-eared bat. Briefly, the well site or "action area" is located entirely within a plowed field, upland, agricultural field (corn field) and will be a western extension of an existing well site. Specifically, the Haystead #9 SWD well will be constructed 90 feet away from the Haystead 1-9A HD1(MDEQ #60076) and Haystead 3-9 HD1 (MDEQ# 60078) existing well pad, and will only require minor clearing of agricultural fields. EPA further reviewed the historical land use of the Haystead # 9 SWD well through an examination of aerial images, and found the proposed site to be historically consistent with agricultural fields. Access roads to the Haystead #9 SWD well site also already exist, and further road construction is not required, thus minimizing any potential disruption to endangered species. Pipeline installation, although not a UIC permit consideration, will use directional boring methods to avoid impacting any nearby wetlands. Furthermore, well construction is proposed to occur prior to the onset of summer days and prior to the migration of the Indiana bat. EPA also provided the U.S. Fish and Wildlife Service with an opportunity to review the Haystead #9 SWD project and draft decision. In a letter to EPA dated September 4, 2013, the U.S. Fish and Wildlife Service concurred with EPA, stating that, "We agree with your conclusion that there are no federally listed species in the action area that would be impacted from the proposed project."

As detailed in EPA Response 15, EPA recognizes the value of prairie fens and species diversity, and is aware of the wetlands within the ¼ AOR of the Haystead #9 SWD well. However, the potential for the migration of injectate into a USDW or a surface water body is extremely small to nonexistent. The UIC permit will protect surface water indirectly through protecting the groundwater aquifers (i.e. freshwater in the Marshall Sandstone and unconsolidated glacial drift USDWs) to which they are connected. A watershed's connection with aquifers is limited to the aquifers that have connections with surface bodies of water, like rivers. While area lakes and streams, including the River Raisin, may be in hydrologic communication with groundwater or depend on groundwater for flow, they are not deeper than the base of the lowermost USDW. Again, the action area and area around the well is also mostly farmland, which generally provides little habitat for these species. The Haystead #9 SWD injection well has a very small proposed footprint and will have no impact on the shallow groundwater (i.e. USDWs) or surface water in the area. As also mentioned in EPA Response 6, nearby water bodies and wetlands in the surrounding farmland and in the county will not be affected by the well, and therefore, the well will not have adverse effects on threatened and endangered species.

The U.S. Fish and Wildlife Service do not list any threatened or endangered turtle species for Jackson County. The Spotted turtle (Clemmys guttata) is a State-endangered species in Michigan, but is not federally protected. MDEQ, not EPA, is responsible for protecting state endangered species. The Spotted turtle inhabits wet bogs, streams, and marshes – none of which will be affected in the immediate area, or "action area", of the well. The Blanding's turtle is neither a federally listed or candidate threatened or endangered species, nor a State-listed species.

MDEQ regulates surface activities, such as pad construction, waste storage, waste transportation, and surface runoff. Surface spills at the facility, or in the course of transportation to the site, are

addressed under State regulations and are the responsibility of the transporter. Management of surface facilities are not addressed by the UIC regulations and so are outside the scope of the UIC permit process. However, the State of Michigan does have oil and gas regulations which specifically address the supervision of wells, surface facilities, and secondary containment requirements. Oil and Gas exploration, drilling, and operating is regulated under the Michigan's Natural Resources and Environmental Protection Act, Act No. 451 of the Public Acts of 1994, as amended (last amended 9/10/2004). Information related to Michigan's Oil and Gas regulations can be found at http://www.michigan.gov/deq/0,1607,7-135-3311_4111_4231-9245--,00.html. Additional concerns about the potential for surface spill should be further directed to MDEQ (see contact information in EPA Response 1).

21. MR. JOHN BANCROFT

Tim, thank you for the presentation. It was informative, and your team.

I would like to go on the record here to make sure that I say West Bay, I find personally, is a credible company and their people do a good job. And I'd like to also say that I have no feelings of negativity toward the owners of this property where this injection well is going in. They're basically our neighbors and they're doing what they think is right.

I have talked to a lot already but, for the record, this area also is known as a prairie fen, too, one of the largest prairie fens existing in the world, or the last ones.

Prairie fen is where the water goes into the ground, hits the clay, ultimately comes up under the marsh and feeds the marsh from under the marsh instead of from on top, and it creates a whole different type of habitat, it's very unique, and we have not only Raisin River that's very close to the site, we have the Grand River, Kalamazoo River, the St. Joseph River, the Tiffin River, all that come out of this area that is now in the midst of being developed for oil. So all of those watersheds are potentially in danger from the industrialization of this rural area.

All the areas that have been in our township, that have been developed, I believe, are zoned agriculture. Many of the people that have moved here, came here, too, and took that into consideration when they moved here, that they didn't want to move in an industrial site. Many inhabitants have always lived here, farmed land and lived here for a long time, but it seems like, kind of, going back on their word when you have something zoned agricultural and all of a sudden, it pretty much is going to be industrial for a long, long time. And you are going to deal with all the industrial things. And the site where the injection well is is a pretty big focus on that. I hope that you get an opportunity to actually physically visit the site and look around, and see, especially now the bird migration season, the place is packed with birds. The water, I would say, is going by out there probably five to eight miles an hour, just downstream within site is Norvell Lake. There's probably 30 homes on that lake, they're within minutes from that site, and I think my last statement would be our state DEQ does a lot of bragging about how good their rules are and, I believe, their rules are decent, but there are certain things that I just can't find any regulation for, for instance, as materials that are coming up out of the ground there, which you would call fluids, you mentioned the word benzine, I don't know if there is a rule anywhere that says they can't put benzine down in the ground in an injection well. I don't know if there is anywhere where there's a place where the state says you can't burn benzine in the air out of a flare, okay, and I would think that any physician that would be here right now would tell you that any amount of benzine isn't allowed, is deadly, so I think that's an issue.

And then, lastly, this whole issue of sizing (sic), we have earthquakes here, periodically, we have earthquakes in southern Michigan, and they shake things, and that means whatever is going down in the ground, which will be ultimately your injection well, and hundred of other pipes, are all in danger of being damaged, so if this wasn't the single most valuable, greatest freshwater resource in the universe, there is nowhere in the universe where they have freshwater like we have here.

If we were out there in the middle of Wyoming, it would not be such a big deal, this just is tough. Thank you.

RESPONSE 21:

As detailed in EPA Responses 15 and 20, EPA recognizes the unique value of prairie fens, and is aware of the wetlands within the ¼ mile AOR of the Haystead #9 SWD well. Three solid steel casings, all of which will be completely cemented to the surface, and the tubing/packer assembly through which injection takes place, prevent injectate from leaking out into an unintended formation. The depth of the well provides another measure of safety, as the brine will be injected far below the USDW. The construction of the well is such that the brine will enter the injection formation (Niagaran) at 2,870 feet below ground surface. The State of Michigan also has oil and gas regulations which specifically address the supervision of wells, surface facilities, and secondary containment requirements. Additional concerns about the potential for surface spills should be further directed to MDEQ (see contact information in EPA Response 1).
The UIC program does not have authority to consider local zoning ordinances, odor, noise, traffic, and the siting of the well in a residential area when issuing permit decisions. The UIC program only has authority over the injection activity itself. An EPA permit for an injection well conveys permission to inject produced fluids based on EPA's finding that the construction and operation details of the well are protective of USDWs. For more information on Michigan policies and requirements, including sewage holding tanks and drilling processes, and flare considerations, please contact the MDEQ (see EPA Response 1).

Oilfield brines, or "produced water," may commonly contain various amounts of hydrocarbons, such as benzene, ethylbenzene, toluene, xylene, naphthalene, and polycyclic aromatic hydrocarbons. These compounds occur naturally in fluids that are separated from the oil and/or gas. The permit allows the owner/operator to dispose of any fluid produced from oil and gas production wells, including the constituents listed above. More specifically, Haystead #9 SWD well is permitted as a Class II well because it will be used to dispose fluids brought to the surface in connection with oil and natural gas production. Class II disposal injection wells are defined by regulation in 40 C.F.R. § 146.5(b) as "Wells which inject fluids: (1) which are brought to the surface in connection with conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection, [and] (2) For enhanced recovery of oil or natural gas...." Brine has been exempted from the definition of hazardous waste under the Resource Conservation and Recovery Act under 40 C.F.R. § 261.4(b)(5), which specifically exempts "drilling fluids, produced waters, and other wastes associated with the exploration, development, or production of crude oil, natural gas or geothermal energy." This means that the fluid coming out of the production well, which is called brine but may also include drilling fluids among other things, can be injected into a Class II well, regardless of its constituents.

Please see EPA Response 5 for details regarding EPA's geologic and seismic evaluation of the Haystead #9 SWD.

22. MR. DAVID LAMB

I'm a Norvell Township resident, in fact, I live on tranquil little private lake called Fay Lake, which is within a mile-and-a-half of your injection well.

My question is, how can you guarantee, like the other subjects that have been up here, how can you absolutely guarantee there isn't any fracturing in any of your granite or limestone base that will, that fluids might gradually migrate to the surface?

Like I said I live on a tranquil little lake. I've lived there within a quarter mile where I live now all my life. Been a farmer, you've turned us farmers into investigators. We love our property, that's why farmers farm. They appreciate getting out this time of the year, and we love, love the crops that are growing, wildflowers, whatever, we just don't want to have any mistakes to ruin our tranquil habitat in our great River Raisin watershed area.

I can carry on more, but I'm not a public speaker. Like I said, I was raised as a farmer, but thank you for being here, the EPA people, thank you very much.

RESPONSE 22:

As described in EPA Response 5, the Region 5 UIC program utilized several sources of geologic and seismic data during its evaluation of the Haystead #9 SWD permit application, and determined that the geologic siting of the proposed well is suitable for underground injection. Michigan geology has been well documented in the Michigan Hydrogeologic Atlas (1981), and the proposed injection zone for this well is not known to have fractures or other faults. In addition, EPA staff experienced in reviewing seismic data has analyzed high quality seismic data and geophysical profiles submitted by West Bay Exploration Company. These seismic data demonstrate that there are no fractures or faults present in the proposed Niagaran injection zone within the vicinity of the Haystead #9 SWD.

The risk of a leak from this well is very small, and the risk of contaminating a USDW is even smaller. This conclusion is based both on the protectiveness provided when the UIC requirements are applied to a particular well application, and the real-world information generated for many years from wells injecting brine. Beyond the data from the existing brine wells, the design, engineering, construction, operation, and maintenance requirements provide a high level of confidence that a leak will not occur.

There are several safeguards established to prevent the well from contaminating an underground source of drinking water. Specifically, EPA requires well casings to be cemented to the ground surface and injection takes place through tubing set within the casing. In addition, the applicant is required to conduct and pass a Mechanical Integrity Test (MIT), in accordance with 40 C.F.R. § 146.8, before authorization to inject is granted, and after the well is completed. The applicant is also required to repeat the MIT, at least once every five years thereafter. The UIC monitoring and testing requirements are designed to detect pressure changes between the tubing and annulus, thereby promptly detecting a leak. If a leak is detected, the UIC regulations require the operator to immediately cease operating the well until the leak is fixed and the repair is confirmed through testing.

23. MR. FRED MARSH

First, I'd like to ask if any of you live in this area? I don't care. Do you live in the area? Lansing maybe?

I did a little bit of homework today. In the past three years, fountains of gas and oil drill waste have been appearing in Oklahoma and Louisiana. In south Florida, 20 of the most stringently regulated disposal wells in southern Florida have failed, 20.

And I was shocked to find out that there is 680,000 injection wells of some sort in this country,680,000, and scientists and federal regulators don't know how many are leaking.

I've lived here my whole life. I played in the creek that empties out of Clark Lake. I played in the creek that empties the lake in Cement City.

Before Lake Columbia was built, and there is a few other people in here that was here before Lake Columbia was built, and that all empty into the River Raisin, and this well is right next door to the River Raisin, and it's, I just have not come to grips of putting a well that close to a tributary like that that ends up in the Great Lakes.

Let's see, I got here, the Great Lakes is the largest freshwater on earth, in the universe, like John says, 84 percent is in North America, 21 percent is in the world, is right here in the Great Lakes.

The State of Michigan, guess how many acres they own? 4.1 million. They want to buy the Trolls Farm and they want to shut down the state park, don't understand it. The shoreline in Michigan is 3,288 miles, in the U.S. around the Great Lakes is 5,241. Between the U.S. and Canada is 10,368 miles of shoreline in the Great Lakes. The freshest water in the world is here, and we have things that are almost extinct and you guys can't guarantee that the cement won't crack, because I'm worked in cement almost my whole life, cement cracks. We're in Michigan, temperature changes, ground heaves, cements cracks.

I've welded pipe, and one more very important thing I have is, the driver when he pulls his truck in there and starts unloading his truck, the company I work for was a cement hauling company who hauled to Ready Mix, and what happened was while the driver was unloading the tank, he walked around thumped the tires, took a pee, or whatever, he blew the lid, or the top, off the bag house, which if he would have been standing there, paying attention, looking up to see if the light was on or not, or watching his gauges, he would have known that.

It's going to be human error that screws this up. That's all I got to say, and thanks for coming.

RESPONSE 23:

EPA is not aware of data that support the commenter's statement that fountains of gas and oil waste have been appearing in Oklahoma and Louisiana, or of 20 disposal well failures in the State of Florida. Before EPA regulated underground injection wells, there were several incidents where injection wells leaked. A review of well failures that EPA conducted during development of the regulations showed that the federal UIC regulations, as are now enforced, would have prevented these failures. Since EPA began regulating them, there has not been a documented case of an injection well contaminating an underground source of drinking water.

EPA is not aware of data that support the commenter's statement that there are 680,000 injection wells and that Federal regulators do not know how many are leaking. There are approximately 172,068 Class II injection wells in the United States, of which approximately 1,460 are in Michigan (http://water.epa.gov/type/groundwater/uic/wells.cfm). The commenter may have been referencing the estimated number of Class V wells in the United States. Most Class V wells are shallow disposal systems that depend on gravity to drain fluids directly in the ground. There are over 20 well subtypes that fall into the Class V category and these wells are used by individuals

and businesses to inject a variety of non-hazardous fluids underground. EPA estimates that there are more than 650,000 Class V wells in operation nationwide. Most of these Class V wells are unsophisticated, shallow disposal systems that include storm water drainage wells, cesspools, and septic system leach fields. However, the Class V well category also includes more complex wells that are typically deeper and often used at commercial or industrial facilities (http://water.epa.gov/type/groundwater/uic/class5/index.cfm). The Haystead #9 SWD injection well is proposed and permitted as a Class II well because it will be used to dispose fluids brought to the surface in connection with conventional oil and natural gas production. Class V wells, or the number of total wells in the United States, is not pertinent to EPA's evaluation of the Haystead #9 SWD. Again, Since EPA began regulating Class II injection wells, there has not been a documented case of an injection well contaminating an underground source of drinking water.

The UIC permit for the Haystead #9 SWD well will protect surface water indirectly through protecting the groundwater aquifers (i.e. USDWs) to which they are connected. Please see EPA Responses 2, 3, and 6 for a more detailed explanation of how the geologic siting of the well, the well construction, and well operation are sufficient to prevent upward movement of the injected fluid into USDWs and protect surface water.

Please see EPA Response 20 for details regarding EPA's consideration of endangered species. The commenter also expressed concern about the integrity of cement. As described on page 2, the Haystead #9 SWD well will be drilled to 3,100 feet below surface, and will be constructed with three casing strings (steel pipe), set to 350, 930, and 2,780 feet respectively. All steel casing strings will be cemented over their entire length (i.e. to the surface) to preclude the movement of fluids into and between USDWs due to injection operations. Region 5 has never had an incidence where loss of mechanical integrity was traced to leaks in well casings or faulty cement surrounding the casing. There are several UIC safeguards established to prevent the Haystead #9 SWD well from contaminating an underground source of drinking water, including construction and cementing requirements, as well as mechanical integrity testing and monitoring. These permit requirements would also help to avoid any potential construction and cement deficiencies, and prevent the well from becoming a conduit for fluid to move between layers of underground rock. Please see page 2 as well as EPA Response 10 of this document for additional mechanical integrity requirements.

24. MRS. DONNA MARSH

I have here a water test that we spent $300 to have our water checked November 2010, and the name of the company was Water Test America, LLC.

Your regular county water tests for ten chemicals, most of them I can pronounce, E. Coli, bacteria, iron, magnesium, lead, mercury, sodium, arsenic, pH, nitrate and hardness.

We paid extra money two years, three years ago now, to have them test for a numerous amount of chemicals, that I can't even pronounce most of their names. There is four pages here. I plan on getting to... and giving him this list so you can all see. These are the types of chemicals and hazardous materials that have been pulled out of the earth and injected back into the earth. However they're going to do it, however deep they're going to do it, who knows what, they don't, they do not know what they're doing. They do not know what happens when it gets down that many feet into our ground. You don't even know if there is life under the ground. All you know that is there is a gas and there is oil and it means this, money, money, money. You can't drink it, folks. When our water is gone, we're gone, all life on this planet is gone.

I'm emotional, I have every right to be emotional, damn it. We're all going to die if we keep this kind of crap up. Get our heads out of the sand. It doesn't take a brain to figure this out. We're human beings, do we want to continue this way? We can't. We cannot continue to do this kind of, this is total chaos, it's insanity.

I'm trying to find a couple names of these chemicals that I can pronounce just to give you an idea.

First page, I can't pronounce one, there's a pageful.

Acetone, ladies, fingernail polish remover, that's acetone, I do know that. I don't think I want to drink it. I don't even want to smell it.

There's all these carbon stuff I can't pronounce, like I said, nitrobenzene, that doesn't sound very cool. Nitrobenzene, chlorothane, whatever that is, I don't know.

There was a gentleman here a year ago, he named every one of these and it went in the record. They have it. Chlorides, like I said, I'll print it, I'll have it printed and I'll also have the name, address, phone number, of the Water Test America so you all can get a baseline of your water now. We should get ours done again immediately. It's been three years.

Folks, we just got to wake up. We got to wake up. We got to start changing things.

Start paying attention, start coming to these meetings, start speaking up. I'm not one to speak up, this is the first time I've done this. I was here last year.

I turned my in writing. I planned on turning this in writing.

Do I have to stick to a four-by-four index card? You will be getting eight...Whether you do anything with it or not, I care less, but we have to speak up, we have to take a minute and come to these things. Our word does count, eventually, it does count, but we have to pull together, folks, we have to. This is life or death of us and this planet, we can no longer continue this way. It's going to go up and it's gone.

God bless.

RESPONSE 24:

Please see EPA Response 11 regarding the commenter's water well laboratory test results, and base-line water testing.

Please see EPA Response 21 for information about Class II fluids, and how they are defined. EPA considers Class II injection wells a safe method for the disposal of brine and production fluids. Specifically, the Haystead #9 SWD EPA permit for underground injection conveys permission to inject waste water based on EPA's finding that the geologic siting, construction, and operation of the well are such that injection will be environmentally safe. Returning waste fluids to a confined formation below the lowermost USDW through a properly constructed and operated injection well is an environmentally sound and permitted procedure.

As further detailed on page 2 of this document, the UIC program determined that the geologic siting of the Haystead #9 SWD well is suitable for underground injection. Technical studies of the geology of Michigan, such as The Hydrogeologic Atlas of Michigan, indicate the injection zone is capable of receiving injected brine and that the confining zone and overlying strata will effectively prevent injected fluid from contaminating USDWs. The Niagaran (i.e. injection zone) is a vast limestone and dolomite rock structure underlying Michigan, and is topped by the Salina Group (i.e.

confining zone), an approximately 430 foot thick sequence of carbonate, anhydrite, shale, and salt, which will act as a confining layer to prevent flow out of the injection zone.

25. MR. BOB ELROD

I can guarantee you that I will not get an applause like Donna Marsh did, my friend, Donna Marsh.

I had the pleasure of part of my career working for Consumers Energy, and I was a gas steel technician and worked in the gas and oil feeds for 15, 20 years.

In fields where we, I know we're not talking about it tonight, where we fracked every well in the field over around Holland, and I haven't heard of anybody in the last 50 years saying the water is no good in Holland. Like I say, I think – (UNIDENTIFIED SPEAKER: "Horizontal fracking").

I think we've got to develop some type of trust. I know that we had to meet, not only Consumers' specifications, but then it was DNR, now it's DEQ, and we had to meet EPA rules, and if you didn't, they were crawling up your backside. And if any of you keep track in the papers, you see where there has been oil spills and those people are fined a horrendous amount, so I think money, money makes operators operate a little better because they know what the end result could be.

But I think, as regards to these two wells, I live about a mile from both of them as the crow flies. I think if West Bay has got everything put together properly, and done their homework, and if the EPA agrees with that, I would hope that they could move in a timely fashion.

I know we complained that the governments are always slow, but in a timely fashion because if any of you have looked at our roads, how bad they are, and I think part of that we can blame on the people that are hauling the brine and the oil away from these locations.

So, again, we've got the police here in case any of you want to attack me, I hopefully have some friends back there to protect me, don't you trip me.

Again, thank you, and thank you for your presentation.

RESPONSE 25:

EPA has determined that there should be no impact to the drinking water supplies as a result of injection into this well. The geologic siting, engineering and construction, and operating and monitoring standards applied to the Haystead #9 SWD well are sufficient to protect the USDW. Only after a thorough review of the permit application, public comments, and any other additional information received, did EPA determined that the proposed Haystead #9 injection well met all federal UIC requirements.

26. MS. PAM ANDERSON

My question tonight is, no one really knows the life expectancy of casings on the injection wells, so that's my question, I would like to know exactly how long those casings are going to last. I'd also like to know how many have failed, if any have failed, what have they contaminated so far if there had been failures on the casings on the wells?

Also, once the oil companies are gone and these injection wells are abandoned, who is going to monitor them then?

Does the EPA monitor wells, and then, how many years will that be monitored? Will it be 20, 30, 40, or a lifetime? So I would really like to know these questions. Thank you.

RESPONSE 26:

As explained in EPA Response 7, since EPA began regulating underground injection wells, there has not been a documented case of an injection well contaminating an underground source of drinking water. EPA Region 5 has had no incidences where loss of mechanical integrity was traced to leaks in well casings or faulty cement surrounding the casing. If a leak is detected, the UIC regulations require the operator to immediately cease operating the well until the leak is fixed and the repair is confirmed through testing. Several decades of experience regulating similar wells have shown that injection, under the proper operational conditions, can be safe and protective of fresh groundwater supplies.

In accordance with 40 C.F.R. §§ 144.54 and 146.23, the applicant will be responsible for observing and recording injection pressure, flow rate, annulus pressure, and cumulative volume on a weekly basis and reporting this to the EPA on a monthly basis. The applicant will also be responsible for observing, recording, and reporting annulus liquid loss on a quarterly basis. An analysis of the injected fluid must be submitted on an annual basis. The applicant is required to repeat a mechanical integrity test at least once every five (5) years. These documents must be certified by the operator.

The Haystead #9 SWD well permit includes a plugging and abandonment plan that meets UIC regulatory requirements. Before the well can be plugged and abandoned, the operator must notify EPA and submit a plugging and abandonment plan for approval. Following well closure, the operator must further submit a cementing record for EPA review to determine if the well was sufficiently closed. Well closure does not relieve the owner/operator of any liability should an endangerment to the USDWs occur due to some defect in quantities, methods, or quality of materials used during plugging and abandonment. An owner/operator may still be held liable for such endangerment under provisions in the Safe Drinking Water Act. The UIC regulations do not give EPA authority to require post-closure monitoring for Class II injection wells.

27. MS. SUSAN STEWART

A few reasons I'm here tonight, one I'm part of the committee to ban fracking, which is a petition drive that is going through October 1st in order to let the individuals of Michigan decide November 2013 if we want fracking and horizontal fracking and all of this disposal in our state or not.

The State of Vermont has been able to ban it, so there is hope it can be done but it's this a grassroots effort.

Also, I am a community college biology professor. I also teach environmental science, so I do know a lot about the environment. I know a lot about big companies, so I've made my list.

One thing, as I mentioned earlier, just a couple weeks ago in Ann Arbor, I went to a town hall meeting. There is a video out call Fracktopia you can view on YouTube. The panel consisted of an environmental engineer from U of M doing studies, I'll talk about it in a minute. It also consisted of an oil industry representative. There was an individual from the Michigan Environmental Council, and then there was a representative from the EPA, or DEQ, DEQ, okay, and the individual from the oil industry said, quote/unquote, Michigan is blessed because we have so many injection wells. Of course, I thought, what, is there a fracking God that now we're blessed?

And so I guess my first question is, if we have so many wells, deep injection wells, already here in Michigan, we're blessed, i.e., meaning as the law states, other states, may not be around here, but other states that fracking is going on, Pennsylvania, Ohio, New York, they can bring all of their waste over our roads and into our wells. And so, why do we need it?

Also, we hear about this brine, brine, it's considered saltwater. As was mentioned, ma'am, if I had your list, I'd probably be able to read a lot of those. And they are carcinogenic. Not only that, are they, many of them carcinogenic, and remember they say it's .1 percent of 1 percent, when we're talking about thousands of millions of gallons of fluid, 1 percent is a huge amount.

The environmental engineer from U of M, as we speak, U of M has a huge study going on to see the impact of the fracking, and all.

He said, what his study is doing is looking what's going on down there when all these chemicals are put down there, and they don't want to tell you, right, that there is also radiation, there's radium, there is strontium, there is heavy metals, there is leads, they're going to be released when these fluids go down there. They're going to bring a portion of that back up.

They're doing studies as we speak to see the interactions because they don't know what is going to happen. They don't know how harmful it's go to be over time and how it's going to be detrimental to our kids.

Also, brought up, too, and I was very alarmed to learn tonight that 12,000 wells, and we have one inspector and he mentioned every five years they'll be inspected. To me something seems wrong with that picture.

Now, it was stated very clearly how often the oil company is going to send its records in, what they're doing, what they're doing. As an educator, I know it is cheaper for these big companies to pay these fines than it is to regulate it and keep it cleaned up. They will mess it and they will pay the fine, so not much inspection there.

U of M is doing studies to see the effects. Why are we moving forward with any of this if there have not been comprehensive studies done.

I recently got an e-mail from the Sierra Club, now the state department has put out a report all the fracking, and this injection, is all part of it, so they frack it and then they have to get rid of the waste, so this is where we're at here. They put out a report. It just so happens, hopefully, I don't know if you guys know about it, the EPA is very upset with their report. It appears that their maybe a little corruption, oh my, it just so happens that the individual that wrote the report is very affiliated with the oil industry, and so the EPA is not happy with the state department's report. If it's true, which I'm really hoping it is, from the Sierra Club, I hoping it's reputable, they said that they're going to, the EPA is going to do more studies on the effects of it, on the environmental effects, not only our water, greenhouse gases, some places they're digging for the oil and they're burning off the natural gas. Now, granted it's 50 percent cleaner than coal but oh, my gosh, that's just a waste of energy doing absolutely nothing.

So until the EPA has concluded its studies, why are not we like New York, why isn't there a moratorium everywhere in the U.S. until we know the effects?

With the fracking, and we talked about transporting it in the pipes, I recently learned that all of our lovely tarsands that sits, so it doesn't float, to be cleaned up that comes down from Canada, Alberta, all the way through our states to Texas, 60 percent of that is exported, that means it goes through all of our states, through our land, risking spills, risking leaks, like what is

in Kalamazoo River; Marshall, Michigan. They're still not cleaned up from two years ago, and who makes the money? BP. And who pays?

And as far as cleaning up, remember, they are exempt from from the Safe Drinking Water Act, and so they don't have to clean it up.

Regular reporting, insignificant leaks. Well, they said only significant leaks. I'm just curious about insignificant leaks. I guess, those get to go by, and also mentioned..

I really hope that the EPA has enough commonsense for all of the concerned citizens across the United States to put a halt on this. Thanks for coming.

RESPONSE 27:

The UIC Class II regulations and permits pertain to oil and gas production-related fluids that come from production wells, whatever the specific composition. The Safe Drinking Water Act and Regulations at 40 C.F.R. §§ 144 and 146 do not restrict the total number of injection wells for any State. EPA has a responsibility to review all Class II applications independently, regardless of the status of any other permit applications or permits for the same facility or activity. As explained in greater detail in EPA Response 13.3, the Haystead #9 SWD permit only allows the West Bay Exploration Company to inject brine related to oil production generated by their own production wells, including hydraulic fracturing-related fluids, for the life of the well. "Brine" is a commonly used term in industry and environmental regulation to describe fluids brought to the surface during the production of oil and gas. The injected fluid may potentially contain small amounts of other material coming from oil production wells, such as drilling fluids or acid used to clean or complete production wells. These materials are part of the allowable waste fluid, as long as they are produced from the company's oil or gas production wells.

Please see EPA Response 8 with regard to NORM, TENORM, and concerns about radionuclides in oil and gas production wastes and produced fluids.

There are approximately 30 Class I wells and 1,460 Class II wells in Michigan. As described in EPA Responses 5 and 10, the Region 5 UIC program conducts more than 200 Class II inspections per year. EPA considers Class II injection wells a safe method for brine disposal. Self-monitoring and self-reporting are fundamental elements of the UIC permit program and other regulatory programs, and is consistent with SDWA requirements. 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. 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 $187,500, civil penalties of up to $37,500 per day of violation and criminal penalties of up to three years imprisonment and fines in accordance with Title 18 of the United States Code.

The commenter also references a hydraulic fracturing study being conducted by the University of Michigan. This study consists of a partnership involving several University of Michigan units, industry representatives, environmental organizations, and state regulators, aimed at examining aspects of gas extraction, with an emphasis on impacts and issues related to the State of Michigan. EPA considers hydraulic fracturing a well stimulation process used to maximize the extraction of underground resources including oil, natural gas, geothermal energy, and even water. The oil and

gas industry uses hydraulic fracturing to enhance subsurface fracture systems to allow oil or natural gas to move more freely from the rock pores to production wells that bring the oil or gas to the surface. EPA is currently conducting its own extensive study of the potential impacts of hydraulic fracturing; and the most recent progress report of EPA's study can be found at http://www.epa.gov/hfstudy/pdfs/hf-report20121214.pdf. While EPA's study is aimed at improving safety and setting public health and environmental standards, the Haystead #9 SWD is permitted as a Class II injection well for the disposal of fluids associated with oil and natural gas production. The Haystead #9 SWD well is not proposed to be hydraulically fractured, and the focus of the academic study referenced by the commenter is beyond the scope of the Haystead #9 SWD permitting decision. EPA considers Class II injection wells a safe method for the disposal of oil and gas production fluids, including hydraulic fracturing waste fluids. The Haystead #9 SWD permit allows the West Bay Exploration Company to inject brine and waste fluids related to oil production generated by their own production wells only, including hydraulic fracturing-related fluids, for the life of the well. Additionally, and as illustrated in EPA Response 12, the federal Energy Policy Act of 2005 excluded underground injection of fluids or propping agents (other than diesel fuels) used in hydraulic fracturing from the definition of "underground injection" under the SDWA.

As stated above, the Haystead #9 SWD well is permitted as a Class II injection well, and is not exempt from the requirements under SDWA or the UIC regulations. EPA regulations at 40 C.F.R. Parts 144 and 146 state the requirements and standards that a permit applicant must meet to have a UIC permit application approved. These regulations deal primarily with the geologic siting, well engineering, operating, and monitoring standards for deep injection wells.

Per 40 C.F.R. § 146.8(b) "Mechanical Integrity", an injection well has mechanical integrity if there is no significant leak in the casing, tubing or packer; and there is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the injection well bore. Mechanical integrity test (MIT) failures (i.e. tubing or casing leaks) are considered significant non-compliance if there is a USDW present throughout the horizons penetrated by the injection well, if one or less layers of protection are present (i.e. cement or casing), and if the location of any leaks could be in the proximity of a USDW or pathway between which a leak could communicate with a USDW (http://www.epa.gov/ogwdw/uic/pdfs/guidance/guide-memo_guidance-58_determ_snc.pdf). If the Haystead #9 SWD should fail any mechanical integrity demonstration or if monitoring indicates a leak, then the well will be shut down until corrective actions have been taken and the well has been brought back into compliance. Any work performed on the well that requires the moving and/or removal of the tubing or packer must be followed by a mechanical integrity test before authorization to resume injection will be given.

28. MR. PETER BORMUTH

My name is Peter Bormuth and I am a pagan druid.

I note that the EPA lists these common components of oil field brines, benzine is a conclusively known human carcinogen and a notorious cause of bone marrow failure... epidemiological clinical and laboratory data link benzine to aplastic anemia, acute leukemia, cancer and bone marrow abnormalities.

Benzine exposure has been linked directly to neural birth defects and spinal bifida.

Ethyl benzine exposure can irritate the eyes, nose and throat, very high levels can cause paralysis, trouble breathing and death.

High exposure may also damage the liver and chronic long-terms effects can last for months or years.

Toralyne exposure is associated with effects such as psychoorganic syndrome, visual evoke potential, toxic polyneuroapathy, optic atrophy, brain lesions and... dysfunctions. Low to moderate levels can cause tiredness, weakness, drunken-type actions, memory loss, nausea and loss of appetite hearing and color vision.

Xylene is an irritant of the eyes, mucus membrane at concentrations below 200 PPM. Ingestion of xylene causes gastrointestinal distress, disturbances of liver and kidney functions and may cause toxic hepatitis.

Chronic exposure may cause central nervous system depression, anemia, mucosal hemorrhage, bone marrow hyperplasia, liver enlargement and liver necrosis.

Naphthalene is classified as possibly carcinogenic to humans and may damage or destroy red blood cells. Exposure may cause confusion, nausea, vomiting, diarrhea, cataracts, blood in the urine and jaundice.

Under California's proposition 65, naphthalene is listed and known to the state to cause cancer.

Polycyclic aroma hydrocarbons are known for carcinogen, mutagenic and teratogenic properties. Prenatal exposure is associated with lower IQ and childhood asthma. The Center For Children's Environmental Health reports that exposure to PAH during pregnancy is related to adverse birth outcomes, including low birth weight, premature delivery and heart malformations.

Obviously, if these natural occurring toxic chemicals reached our USDW, a serious hazard to human health would result.

40 C.F.R., Section 146.62 (C)(1)(2), specifically states that the injection zone must have, quote, sufficient permeability, porosity, thickness and aerial extent to prevent migration of fluids into the USDWs and be free of faults and fractures that might allow fluid movement.

West Bay proposes to use salinic grade niagaran 40 feet thick, at a depth of 2830 feet to 2870 feet as upper confining zone, will prevent migration of this injected fluid.

West Bay's lithologic description of this clay stone is argillaceous carbonate dense hard gray excellent barrier to flow.

West Bay proposes that salina A1 white niagaran in the depth of 2870 feet to 3100 feet at the injection zone in their lithologic description of this rock is dolomite, hard, sucrosemic, vogular, porous and permeable, brown and gray. The reality, of course, differs from these descriptions.

This commentator observes that in West Bay's attachment for the proposed West Bay #22 well, they suggested salina A1 white niagaran extended from 2662 feet to 3032 feet, a convenient and possibly fraudulent new strata had been inserted into the lithography for well #9, salina gray niagaran.

I note that Ronald C. Olowski, of Petroleum Geological Survey Division of the Michigan Department of Natural Resources and report of investigation number 25 states that, quote, in the subsurface, the formal outcrop terminology is not used. Instead, the series of informal and poorly defined terms has evolved based on driller's descriptions and, to a minor extent, geophysical log

responses. Such in formal terms is brown niagaran, gray niagaran and white niagaran are based mainly on color, while the informal term clinton may, or may not, be related to clinton shale in New York State.

This commentator notes that gray Niagaran is every bit as porous and permeable as white and brown. It may be helpful to define argillaceous rocks and their properties for the audience.

Argillaceous refers to a group of sedimentary rocks commonly clays, shales, mudstones, siltstones and marls. Two grades of particle size are recognized silt grade, in which the particles range in size from 1/16 to 1/256 millimeter and the clay grade with particles less than 1/256 millimeter.

In addition to the clay minerals, argillaceous rocks may contain colloidal material, very finely divided quartz, carbonate dust, finely divided carbone and iron pyrite. Argillaceous rocks are almost always laid down in water and their mineralogy is to some extent controlled by their environment of deposition.

...interactions with water can be destructive if shale, siltstones and argillaceous carbonate rocks.

Argillaceous carbonates, in particular, presents a durability problem upon exposure to water. Unlike sandstones, carbonates are subject to <u>extreme variabilities and porosity</u>.

Porosity shows covariation of three main factors, the abundance of calcite cement, the presence of argillaceous carbonate composition and the abundance of anhydrite cement.

Anhydrite and argillaceous carbonates ranges from patches -- I'm not done with five minutes yet, Honey -- range to nodular and distribution and may include intervals of primary depositional calcium sulfate, probably formed as gypsum, and subsequently converted to anhydrite.

Cement morphologies range from finely felding (phon) to course prismatic pristles (phon) with each type... poor filling to replacement relationship to the host carbonate.

Timing of anhydrite... may range from early, late. Course anhydrite commonly appears to be among the latest digenetic products and is associated in many samples with the last carbonate cement type...

This commentator adds that his readin shows its solutions of salt are also destructive of argillaceous carbonates.

West Bay will be injecting 1,200 barrels of liquid brine a day with a sodium content of 37,600 milligrams per liter in the strata.

Immediately above the proposed injection zone is a bed of salina A2 evaporite 28 feet thick.

Given the close proximity of this pure anhydrite in the injection zone, it can be assumed that the salina gray niagaran contains anhydrite....

Laboratory experiments show that anhydrite readily converts to gypsum when brought into contact with water.

Jaworski claims this can happen within a few years, or even one year. She notes that the process takes place in the presence of water at temperatures below 40 celsius.

The temperature 3,000 feet deep in the Michigan basin is approximately 85 degrees Fahrenheit, so it is a safe assumption this fraction will occur.

Many researchers are reporting evidence of this conversion at shallower depths, Murray reporting it a depth of 3500 feet below the surface.

Other researchers note that the solubility of anhydrite increases sharply within an increase in pressure. Each .01 PA increase in pressure results in 3 to 5 times increase in solubility.

The average pressure gradient in the Michigan basin is approximately .43 pounds per foot, meaning the pressure, in the absence of any additional compression, is roughly 1,290 PSI.

Anhydrite rock layer is similar to this 28 foot thick cabinet, been observed to swell and increase in volume up to 60 percent upon exposure to water.

When such swelling is prevented due to confining conditions, immense swelling pressures from 1.7 to 4.7 MPA have been monitored and recorded.

Salinic pressures as high as 10,000 PSI, 70 MPA were reported by Brune in 1965 for anhydrite deposits in Texas.

This pressure will rapidly cause a conversion and breaching of the anhydrite cap, sodium also accelerates conversion of anhydrite.

Anhydrite reacts very rapidly with brines to form double sulfates. These double sulfates are unstable and dilute solutions and decompose to gypsum, and this process can occur very quickly, even at depths.

Other studies show that even massive anhydrite with small fissures will be dissolved, produce hallowed out cavens (phon) and runway seepage flows within 13 years.

Some researchers predict vertical uplift of portions of the horizontal bed due to the converse pressures. Given the normal chemical reactions that can be expected to occur with both the salina gray niagaran and the salina A2 evaporite, these layers will both be breached within 20 years. This poses a definite threat to our underground sources of drinking water and potentially to the Raisin River and Norvell Lake, which are located within a half mile of injection site.

This commentator also claims that the Indiana bat will be endangered by this activity within its known habitat.

40 C.F.R., Section 144.4 (c), specifically states the Endangered Species Act, 16 USC 1531, Section 70 Act, and implementing regulations, 50 C.F.R., Part 402, require the regional administrator to ensure, in consultation with the Secretary of the Interior of Commerce, that any action authorized by the EPA is not likely to jeopardize the continued existence of any endangered or threatened species.

The Indiana bat was listed as endangered species by the U.S. Forest Service on March 11th, 1967.

While the injection site itself is located on a plowed agricultural feed, it is within a quarter mile of the Raisin River. The field borders a small creek and two marshes, one of which has a significant wooden component, making it a primary candidate for Indiana bat maturity or...

The United States Forest Service notes that the India (sic) bat depended on well developed woodlots located approximately one to three miles away from small to median rivers and stream corridors. Both woodlot and river exist directly adjacent to this proposed well site. Alan Curd (phon) and Susanne Murray are two scientists who have done significant research on the Indiana bat. Curd found that in southern Michigan, the general landscape occupied by Indiana bats consist of open fields and agriculture lands 55 percent, wetlands and lowland forests 19 percent, other forest inhabitats (sic) 17 percent, developed areas 6 percent, and perennial water sources, such as ponds and streams, 3 percent.

Curd found in southern Michigan forest, woodland, marsh edge, a lowland hardwood forest, small wetlands, a shrub wetland, cornfield edge and small woodlot.

Murray and Curd have made some qualitative assessments in the bat-foraging habit in Michigan. The majority of bats were found foraging in forests and wetlands, and other woodlands, while one bat foraged in an area around a small lake and another in an area with 50 percent woodland and 50 percent open fields.

Another Indiana bat foraged over a river, about ten others foraged in areas greater that .06 miles from the Sand River.

The woodland wooded marsh, small creek Raisin River corridor adjacent to this well site are, therefore, foraging sites of significance and cannot be dismissed by the EPA.

Spills associated within these injection well are frequent and insects will exposed to and absorbed toxic contaminants contained in these brines, which the bats will then absorb while feeding.

The EPA Michigan and the Michigan Department Of Environmental Quality are making fraudulent geological assessments and they are ignoring the danger this poses to Michigan's most value nature resource, water.

Water is life. Jesus is not life. Jesus is just an evil myth and his followers are ignorant and diluted human beings.

Oil is not life. Oil is just a form of stored energy, and we can find alternative energy sources and technologies, but water, water is sacred, water is the blood stream of the mother earth. Water is life. Thank you.

RESPONSE 28:

The commenter lists several potential components of oil field brines or produced water. Further, the commenter describes potential human health effects from these components, due to high levels of human consumption or exposure. The fundamental purpose of EPA's UIC program is to protect USDWs from endangerment from underground injection. The UIC regulations are designed to protect USDWs from contamination by (1) identifying drinking water sources for protection, (2) making sure the geological siting is suitable for injection, and (3) applying standards for well construction, operation, and reporting. The permit application and the conditions in the Haystead #9 SWD permit are consistent with those regulations.

The commenter also references 40 C.F.R. § 146.62(c)(1) and (2). This section of the UIC regulations describes the "Minimum criteria for siting" in Subpart G – Criteria and Standards Applicable to *Class I* Hazardous Waste Injection Wells. The Haystead # 9 SWD is permitted as a Class II injection well, and the criteria referenced by the commenter do not apply to this injection well. The criteria and standards applicable to Class II wells can be found beginning at 40 C.F.R. § 146.21. Class II requirements state that new wells shall be sited in such a fashion that they inject into a formation which is separated from any USDW by a confining *zone* that is free of known open faults or fractures within the area of review (i.e. ¼ mile), and that the well be cased and cemented to prevent movement of fluids into or between underground sources of drinking water. The UIC regulations define confining zone in 40 C.F.R. § 146.3 to mean "a geological formation, group of formations, or part of a formation that is capable of limiting fluid movement above an injection zone." EPA Region 5's UIC program determined that an appropriate confining zone for the Haystead #9 SWD well is the Salina Group. As detailed on page 2 of this document, the Salina

Group is an approximately 430 foot thick sequence of carbonate, anhydrite, shale, and salt which will act as a confining layer to prevent flow out of the injection zone. This sequence of rock blocks the passage of water and is considered a confining unit, due to poor water transmitting rates, as described in the Michigan Hydrogeologic Atlas (1981). West Bay Exploration Company has submitted 2D seismic data to further demonstrate the Salina Group is free of fractures and faults. EPA has evaluated the Company's seismic data and confirms that the Salina Group at the Haystead #9 SWD site appears to be free of fractures and faults. Furthermore, the Haystead #9 SWD well will be constructed with three casing strings (steel pipe), set to 350, 930, and 2,780 feet respectively. All steel casing strings will be cemented over their entire length to preclude the movement of fluids into and between USDWs due to injection operations. The Haystead #9 SWD meets all applicable construction requirements for new Class II wells at 40 C.F.R. §§ 146.21 – 146.22.

The UIC program in Region 5 also determined that an appropriate injection zone for the Haystead #9 SWD well is the Niagaran. The Niagaran, or Niagaran Group, is a vast limestone and dolomite rock structure underlying Michigan and parts of Illinois, Indiana, Ohio, and New York. The UIC regulations define "injection zone" in 40 C.F.R. § 146.3 to mean "a geological formation, group of formations, or part of a formation receiving fluids through a well." The Michigan Hydrogeologic Atlas (1981) describes this group of rock as generally very porous and permeable, and will readily accept a wide range of fluids. Please see EPA Response 13.4 for an additional explanation of rock formations and groups. The Niagaran Group (i.e. Niagaran), includes multiple formations, including the Gray Niagaran, White Niagaran, Manistique Limestone, and Burnt Bluff Formation. However, the Haystead #9 SWD permit limits injection into the Niagaran at depths between 2,870 and 3,100 feet.

The commenter also reference's another Class II application submitted by West Bay Exploration Company, the proposed West Bay #22 well. The commenter suggests that geologic siting and specific geologic formation depths, for both the Haystead #9 and the West Bay #22, should be identical and EPA has "fraudulently" inserted geologic layers of rock into formation records. However, the commenter fails to recognize that underlying geology in Michigan is a basin, and stratigraphic layers vary in depth due to regional geologic dip. In simple terms, the Michigan basin could be compared to a bowl, which is deeper in the center. The proposed Haystead #9 SWD and the West Bay #22 wells are approximately 2.5 miles apart, in a southeast to northwest direction. In this case, due to the regional dip, the underlying geologic rock structures at the West Bay #22 site will have a shallower depth below ground surface, than the Haystead #9 SWD. Following a direct line in a southeast to northwest direction from the West Bay #22 site to the Haystead #9 SWD, many deep rock groups (e.g. Niagaran Group, Salina Group) will be found at greater depths below surface when compared to the West Bay #22 site surface location. Again, this phenomenon is explained by the regional dip, in which formations on the edge of a basin will dip towards the center or lower portion of the basin. This is demonstrated in the Haystead #9 SWD well Administrative Record in the geologic cross section entitled "Perspective Salt Water Disposal Wells, Napoleon Field, Jackson County, Michigan." Additionally, surface topography or different surface elevations at individual well sites can also affect the depth below ground elevation to which specific geologic layers are referenced. For example, the West Bay #22 site surface location is 1,016 feet above mean sea level (AMSL); while the Haystead #9 SWD well site is only 947 feet AMSL. EPA cannot consider comments on the proposed West Bay #22 well as a part of the decision-making process for the Haystead #9 SWD well. Per 40 C.F.R. § 144.31(d), "the completeness of any application for a permit shall be judged independently of the status of any

other permit application or permit for the same facility or activity." During EPA's review of the proposed Haystead #9 SWD well application, the UIC permit writer utilized drilling and formation records from the Haystead #1-9 (MDEQ Permit #60076) and Haystead #3-9 (MDEQ Permit #60078) wells. The surface hole location of these wells are less than 200 feet from the proposed surface location of the Haystead #9 SWD and currently provide the most accurate representation of the local geology. The commenter's statements regarding the geologic siting of the Haystead #9 SWD are inaccurate and are not based on site specific data or geologic records.

The commenter also argues that anhydrite layers of rock in the confining zone (i.e. Salina Group) are not adequate confining layers. Specifically the commenter states that anhydrite will dissolve when in contact with the injected fluid, or transform into less competent minerals, and otherwise let injected fluid out of the injection zone, and into contact with ground and possibly surface water. The commenter references laboratory experiments for the basis of his argument. EPA contests the commenter's statements regarding the confining zone of the Haystead #9 SWD well and anhydrite. Generally massive anhydrite, including layers such as the Salina A-2 Evaporite (a common formation in the Salina Group), is impermeable. In geology, the term *massive* means homogeneous and crystalline. Anhydrite layers, such as the Salina A-2 Evaporite, are well-documented in the Michigan Hydrogeologic Atlas (1981) as geologic barriers to fluid flow. Specifically the Michigan Hydrogeologic Atlas (1981) describes the Salina Group as "essentially an aquiclude", or structure preventing the passage of water. Additionally, the Salina A-2 Evaporite is described to often be found as a cap rock or salt dome, trapping oil or natural gas in subsurface reservoirs. EPA Region 5 has permitted many wells across Michigan with the same injection and confining zone as the Haystead #9 SWD. The behavior of a rock layer depends on many factors, such as its thickness, flexibility, and chemical composition, as well as the pressure it is under. Individual factors are not a sole determining factor of a rock group's suitability as a confining zone. Based on technical studies of the geology of Michigan, such as the Hydrogeologic Atlas of Michigan, EPA has determined the Salina Group, including anhydrite layers (e.g. Salina A-2 Evaporite), is a suitable confining zone.

The commenter cited several sources for anhydrite information in the comment, but did not provide the cited materials. These comments do not support findings of evidence that the Salina Group is a poor confining zone or that operation of the Haystead #9 SWD well would dissolve anhydrite layers to create a pathway into a USDW. EPA believes the research cited by the commenter concerns mineral reactions in situations that are not analogous or relevant to the Salina Group below the Haystead #9 SWD well site. For example, the commenter mentions research experiments that investigate chemical reactions at surface conditions or evaluate anhydrite as it is used in cement and concrete. EPA believes the experiments referenced are concerned with investigating the formational origin of evaporite minerals, not their behavior at depth with respect to fluids. Such work is not relevant to gauging the behavior of the anhydrite layers at approximately 2,600 feet below the surface, where the pressure and temperature regime is much different and influences mineral reactions and rock behavior.

Other research referenced by the commenter describes anhydrite zone failure beneath a town in Germany. The paper attributes the 2007 event to the drilling of geothermal heat exchange boreholes into an anhydrite layer approximately 195 feet below the surface. The situation described in this paper is not relevant to the permit decision, because the geologic setting of the German town is very different from the geologic regime at the Haystead #9 SWD well site, and

geothermal heat exchange technology is not consistent with Class II injection well construction technology and federal requirements.

Finally, lithologic composition of the confining zone would not automatically disqualify the geologic siting of the Haystead #9 SWD well. If brine fluid were to interact with the anhydrite layers in the confining zone, including the Salina A-2 Evaporite, and somehow breach the confining zone as the commenter describes, fluid would migrate up into the next rock unit that would accept fluid. The injection zone is separated from the lowest USDW by 2,653 feet of geologic strata. Many of the formations between the injection zone and the USDW are layered with impermeable shale and other rock types which will also prevent movement of the injected fluid into the USDW. These shale layers include the Antrim Formation, Bedford Shale, Bell Shale, Sunbury Shale, and Coldwater Shale. Formation and drilling records for nearby wells, including well MDEQ #60076 and #60078, indicate that the Coldwater Shale is nearly 1000 feet thick, and is present below the lowest USDW from approximately 217 to 1,200 feet below ground surface. The geology at the well site is sufficient to prevent upward movement of the injected fluid into USDWs.

The commenter also argued that the Indiana Bat will be endangered by the activity of the Haystead #9 SWD well. Please see EPA Response 20 for EPA's consideration of the Endangered Species Act during the evaluation of the Haystead #9 SWD Class II permit application. EPA determined that the Haystead #9 SWD well will not impact these species. Briefly, the well site, or "action area," is located entirely within a plowed field, upland, agricultural field (corn field) and will be a western extension of an existing well site. Specifically, the Haystead #9 SWD well will be constructed 90 feet away from the Haystead 1-9A HD1(MDEQ #60076) and Haystead 3-9 HD1 (MDEQ# 60078) existing well pad, and will only require minor clearing of agricultural fields. The Haystead #9 SWD injection well has a very small proposed footprint and will have no impact on the shallow groundwater (i.e. Marshall Sandstone and unconsolidated glacial drift) or surface water in the area. As also mentioned in EPA Response 6, nearby water bodies and wetlands in the surrounding farmland and in the county will not be impacted by the well, and therefore, the well will not have adverse effects on threatened and endangered species.

29. MS. VICTORIA POWELL

I'm going to quote from an article in September from "ProPublica" entitled, the Trillion Gallon Loophole Lax Rules For Drillers That Inject Pollutants Into The Earth, backing up on injection wells, which seems to be the subject tonight.

It was a year ago when I was here. It turns out that since 1980, the oil industry has received loopholes that have enabled them to produce this greater than 200,000 injection wells in our country, and also enabling them to be excluded from revealing what they are actually injecting.

I get a kick out of listening to you speak of brine as being the solution that is actually going down into these injection wells, and I do because I'm a physician, I'm an ER physician and also a pediatrician and I taken have care of people who have benefitted from the horrible chemicals that have been implemented and produced by this industry in this country through no fault of their own.

Just to say this, there have been at least, since -- in 1980, 1988 and the wonderful Halliburton loophole law in 2005, the oil and gas industry has been exempt from revealing what

they put down these wells, whether they're going to irrigate them in the well, whether they're going to reopen, whether they're going to put water, and, quote, chemicals down horizontal piping, which is a precursor to fracking, or if they're going to frack these wells.

No matter what they are going to do, they are exempt from revealing the horrible toxic waste fluids that they put down the wells and are doing harm to both people and to the environment.

I notice that last year, and again you said this year, that is the, excuse me just a second, the pressure monitoring, which actually will allow you, the EPA, and the state DEQ government representatives to determine when enough fluid or volume has gone down, and it's a pressure monitoring, as I understand it, pressure monitoring, excuse me, also determines the integrity of the casing that you've spoken so eloquently about for the wells, and it just turns out that people can, you know, they can actually bypass the reliability of the pressure monitoring.

And I just want to read this one thing to you again from ProPublica, which you might want to look at, propublica.org is an absolutely wonderful, incredibly honest presentation of the industry, fracking, what's going on in all states, including Michigan.

But here's what I wanted say about it, it says, unlike, oh, I'm sorry, an EPA inspector, injection inspector went on to do his annual inspection of an injection well in Kentucky in 2007, and they were required about every three years. He was digging down beneath the top of the well, and this is what he found, he unearthed a steel tubing near the surface. A few inches down he came across an apparatus he had never seen before. This is man, an injection well inspector for more than 13 years for the EPA, and this is what he found, a section of high-pressure tubing ran out of the wellbore and connected to a three-foot long section of steel pipe sealed at both ends. The apparatus appeared designed to divert air pumped into the well in the pipe instead, making the well test as if it were airtight and, of course, reliable.

The only reason that I know of that device would be, and here's what he said, "the only reason that I know of that device being placed before being installed would be to perform a false mechanical integrity test, more than likely because the well itself would not pass."

This person was a defendant speaking against the well operator. This happened in 2007.

So, the other point that someone made was that, you know, you rely on the pressure measures that are reported to you from, you know, obviously the industry, right, the industry does these and they report them to you.

Lest you not forget, 33 months ago over a million of gallons of oil spilled in the Kalamazoo River, and it was not reported for 17 hours. It is still being cleaned up; that is, that followed one month after the BP disaster in the Gulf.

This is a small area but it is enormously wealthy with water, and water is the essence of all life. The risk of contamination to our water source in this state is great. It happens, over 1,000,000 violations have been elicited, according to this paper, from late September, and only one criminal charge was made, one.

One of the things I really wanted to addresses as a physician is this, you know, you're just going to allow or disallow a permit. We asked this of you last year, last year I was here speaking the same thing, we had a hundred people here last year, we're not giving up. You know, this is our life, our lives, this is our country. The industry is now in Adrian, Michigan, where I live. They want to put in an oil processing and separation plant in our park.

Last weekend there was, there is a well there, and last weekend there was a petroleum smell for one week in the air, and 20 yards from where this well is, children were playing soccer. Are you kidding me?

We went to the city commission, do you think they're doing anything about it? They are doing nothing about it. I would ask you, please, to examine and insist on, sample wastewater that these people are wanting or are already putting in these injection wells, monitor them, confirm that there are pollutants there. There are, there are. You heard two people read them out.

Finally, I would have to say, you know, as one of my friends said last year, and this is meant in all sincerity, I'm sure that you approached your career choice, just as I did, wanting to help people, keep them healthy, keep us healthy, you know, maybe you lost track along the way, but you represent us, you represent us, you're our spokesmen. This has got to stop. The industry, we have something they want at all costs, the cheaper the better. Don't give it to them. Don't give it to them.

We have asked our commissioners down in Adrian to forbid a separation and oil plant in the city limits, the only one I know of in the entire state, the only one I know of, and they took $80,000 of it, they could have it. So, please, you know, remember what, what you started out as younger persons in your career, as I do, people depend on us to make the best judgment, but you got to listen to us, and please, just think twice, you know, we don't need another injection well.

The River Raisin starts in Manchester, it goes all the way down to Monroe, out Lake Erie. I live right by it in Adrian, Michigan, by the south branch of the Raisin River. Contamination will happen, if it hasn't already. Thank you.

RESPONSE 29:

Please see EPA Response 21 for information about Class II fluids and oilfield brines, and how they are defined. Class II disposal wells can only be used to dispose of fluids associated with oil and gas production. There are approximately 144,000 Class II wells in operation in the United States. EPA considers Class II injection wells a safe method for the disposal of brine and production fluids. Specifically, the Haystead #9 SWD EPA permit for underground injection conveys permission to inject wastewater based on EPA's finding that the geologic siting, construction, and operation of the well are such that injection will be environmentally safe. Returning waste fluids to a confined formation below the lowermost USDW through a properly constructed and operated injection well is an environmentally sound procedure.

Please see EPA Response 8 regarding the chemical analysis of proposed injection fluids at the Haystead #9 SWD well. A representative brine sample submitted by West Bay Exploration Company meets the UIC regulation requirements at 40 C.F.R. § 146.24(a)(4)(iii), and EPA has determined that the applicant has provided sufficient information about the injection fluid. The Haystead #9 SWD well has not been proposed to be hydraulically fractured.

As stated in EPA Response 27, the Haystead #9 SWD well is permitted as a Class II injection well, and is not exempted of the requirement under SDWA or the UIC regulations. Violations of the SDWA and UIC regulations are subject to Administrative Orders which may include penalties of up to $187,500, civil penalties of up to $37,500 per day of violation.

EPA requires Class II monitoring and reporting of injection pressure as well as annulus pressure. As discussed in EPA Response 5, EPA limits maximum injection pressure (MIP) by calculating

MIP with conservative values (Attachment A of EPA Permit# MI-075-2D-0010). In particular, EPA adds a safety factor of .05 to the Specify Gravity of West Bay Exploration representative brine analysis, when calculating MIP. This limitation on wellhead pressure serves to prevent confining-formation fracturing. EPA also requires annulus pressure monitoring and mechanical integrity testing, which are designed to detect pressure changes between the tubing and annulus, thereby promptly detecting a leak. If a leak is detected, the UIC regulations require the operator to immediately cease operating the well until the leak is fixed and the repair is confirmed through testing. The operating, monitoring, and reporting requirements incorporated in the Haystead #9 SWD permit are in accordance with 40 C.F.R. §§ 144.54 and 146.23. Agency 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. Self monitoring is consistent with the SDWA.

The commenter also referenced SDWA and UIC violations occurring in the State of Kentucky in 2004 and 2007. In this case, the *United States of America vs. Daniel B. Lewis* (Case 4:09-cr-00002-JHM, Western District of Kentucky, 2009), the operator of Roseclare Oil Kentucky, Lewis, was responsible for the installation of a device on several injection wells he operated that falsely indicated that they had passed a mechanical integrity test, when in fact they had not. Lewis further submitted certification to the EPA that the wells had passed the mechanical integrity testing. Testimony at trial revealed that Roseclare officials rigged the wells by installing an empty piece of pipe in the ground next to the well, which was connected to the wellhead. Lewis was sentenced on November 18, 2009, to pay fines and a three-year term of probation after he was convicted of conspiracy to violate SDWA, and for making false statements to defraud an agency of the United States government. EPA cannot consider the violations committed by Roseclare Oil Kentucky as a part of the decision-making process for West Bay Exploration Company's Haystead #9 SWD well.

The commenter also references oil and gas production spills in the Gulf of Mexico and a pipeline spill in Michigan. Surface spills at the facility or in the course of transportation to the site, are addressed under State regulations and are the responsibility of the transporter and operator. Management of surface facilities is not addressed by the UIC regulations and is outside the scope of the UIC permit process. Please see EPA Response 6; we suggest you contact MDEQ regarding concerns about surface spills and potential spills from oil and gas production in Michigan (see contact information in EPA Response 1).

EPA is also not aware of data that support the commenter's statements regarding the number of violations found by inspectors nationally, or the number of civil or criminal violations issued to operators.

The commenter also discusses an oil processing and separation plant, and petroleum odors in the City of Adrian, Lenawee County, Michigan. These comments are outside the scope of the permitting decision of the Haystead #9 SWD well, in Jackson County, Michigan. The UIC program does not have authority to consider odor of oil processing plants, and only has authority over the injection activity itself. EPA suggests that you contact the MDEQ Lansing District (see Response 1 for MDEQ contact information).

The commenter also expresses concern for surface waters, including the River Raisin and Lake Erie. The Final UIC Permit for the Haystead #9 SWD requires that the well construction, operation, and geologic siting be sufficient to prevent upward movement of the injected fluid into

USDWs. As a result, operations of this injection well or injected waste should not affect surface water, whether in Jackson County, in bordering counties and States, or in the Great Lakes. Please see EPA Responses 3, 6, and 7 for EPA's consideration of protecting surface waters and USDWs.

30. MR. JOHN KUSCHELL

I wasn't going to speak, but Victoria brought up something I'd like to add on.

I live in Adrian, I'm a liberal arts teacher so I know nothing about science, I just know that oil and water don't mix. My car mechanic told me that 20 years ago when I blew a gasket.

I live in Michigan, I've lived in Michigan all my life. I'm from Detroit, where industry obviously made that city once famous, and now you know what's happened to them.

I moved to Adrian for a job opportunity, knew nothing about agriculture, but I knew it was a good place to raise a family.

Just 20 years ago we had an argument about whether we should sell our water to Texas and California, and now we're having this discussion. And I find it ironic tonight, there is, what, 25 people out here, and everyone is older than you. Don't take this personally, I'm sure this is happening all over the country, and as Victoria said, you do represent us. Most of us are probably the same age, and EPA, and DEQ, or DNR, Food and Drug Administration, Department Of Agriculture used to mean something. It used to mean that these agencies would defend what your name says, the Environmental Protection Agency, the Department of Environmental Quality, is that what DEQ stands for. I just wish they'd do these jobs and, you know, a lot of people still believe that you are protecting them, and when you talk to some residents, if there are a problem, they'll take care of it. I think the people that are here tonight are frustrated with talking to commissions and, you know, Victoria brought up about the Adrian City Commission.

In Lenawee County, we have had two boards, or two members, two commissions that have voted down leases, you know, I don't know what the count is, but only two, and yet the people that either have their head in the sand or believe that your agency, and others, will take care of them are, you're vital, you're important to us, so I echo the statement, that please, I know it's difficult to bite the hand that feeds you, but, you know, Michigan, especially this area, with the high groundwater, is not a place for this industry. Thank you.

RESPONSE 30:

The mission of the EPA is to protect human health and the environment. The UIC regulations are designed to protect USDWs from contamination by: (1) identifying drinking water sources for protection; (2) making sure the geological siting is suitable for injection; and (3) applying standards for well construction, operation, and reporting. As specifically described in pages 1 – 3 of this document, the permit application and the conditions in the Haystead #9 SWD permit are consistent with those regulations.

The commenter also states concerns regarding leases and issues brought to the Adrian City Commission, in Lenawee County, Michigan. These comments are outside of the scope of the permitting decision of the Haystead #9 SWD well, in Jackson County, Michigan. The UIC program does not have authority to consider lease agreements, and only has authority over the injection activity itself. EPA suggests that you contact the MDEQ Lansing District (see EPA Response 1 for MDEQ contact information) regarding leases and concerns brought to the Adrian City Commission, in Lenawee County, Michigan.

Please see EPA Response 3, 6, and 7 for EPA's consideration of "high groundwater", and protecting surface waters and USDWs.

31. MR. ERIC JOHNSON

My name is Eric Johnson. I'm the supervisor in Norvell Township, which is where this is going to be.

I may repeat some things other people have said, I got in here a little late but the lady who was speaking about, I've heard the oil representatives say how blessed we are to have these wells here and we're blessed in Norvell Township for, or have been blessed to have the water we have. We have some really, there are some people who are much more eloquent than I, what they've said well, or better than I, but that's all we have, we don't have businesses, we don't have a commercial strip. We have maybe five storefronts in the whole township.

All we have is water. That's why people come here to live. That's why people come here to visit and recreate.

I don't know if you been out to the site for where this is being proposed, but it's on a road that was dirt road, that is paved, right off of a east-west artery in our township, but I've gone out there, and I haven't walked the land or anything, but it appears -- I'm not a small guy, but I can, when I turn, you can see the map here, it's about here, and I can turn in the driveway and I can look and there's the river, the Raisin River, it's right there. I don't have to get on my tiptoes, or anything, it's just right here.

And it appears where they want to put the well up in the property, the property seems to slope upward, it's on high ground, so if anything were bad to happen, where's it going to go? It's going to go right down that hill and it's going to go right in the river.

So you have to be sure here that this is done right. I mean, you said that at the last hearing, your people said, that the regulations prohibit you from telling the oil company where to put these wells. I read the regulations, and I saw that section in there, but I was looking for something else, and I didn't see it, and I addressed this to you before, and I don't know if it ever really got answered. It didn't really say you can't, you can't not tell them where not to put it, in other words, if they want to put it in the worst possible place, you have, you could construe that to say, you have the authority to say, don't put it in the worst possible place, don't put it where it's bad, there is plenty of places where it can go, and no one ever seemed to address that. And I think there is a fine point there that really should be addressed.

You guys' hands are tied, it seems like we're going back to the 1890s, a lot of arguments that were put out there to cause you to not regulate, if that can be said here, it seems like it's back to that again, the same arguments were made, don't break up the trust, don't break up the banking industry, and now it's the oil companies. And that was addressed years ago. It took courage, and it takes political courage, and we have to get a hold of people to address this.

The government does have authority. If it didn't have authority, there would be a pipeline right now coming down from Canada right now right through the middle of the country, it's not there. It's a hot issue but obviously something's standing in the way of that, and I don't, I've read regulations for years, and I think there has to be more leeway in what I read, anyway, to what you can do, that it's not just, there is s noose around your neck stopping you from doing what many will say is the right thing, and that's what we all want you to do, we want you to do the right thing.

Frankly, there is a, it hits you in your gut. There is a nagging thing in your gut that seems to be there all the time, that we can't do anything about this, and they're going to be here, and we hope you're going to be there if something goes wrong, or somebody is going to be there if something goes wrong, but we fear that's not the case and there needs to be a message sent, I guess right now this is another opportunity to do it, and we want you to do the right thing.

RESPONSE 31:

The commenter expresses concern for surface waters, including the River Raisin. The Final UIC Permit for the Haystead #9 SWD requires that the well construction, operation, and geologic siting be sufficient to prevent upward movement of the injected fluid into USDWs. As a result, operations of this injection well or injected waste should not affect surface water. Please see EPA Responses 3, 6, and 7 for EPA's consideration of protecting surface waters and USDWs.

Surface spills at the facility or in the course of transportation to the site, are addressed under State regulations and are the responsibility of the transporter and operator. The State of Michigan does have oil and gas regulations which specifically address the supervision of wells, surface facilities, and secondary containment requirements. Oil and Gas exploration, drilling, and operating is regulated under the Michigan's Natural Resources and Environmental Protection Act, Act No. 451 of the Public Acts of 1994, as amended (last amended 9/10/2004). Additional concerns about surface topography and the potential for surface spills should be directed to MDEQ (see contact information in EPA Response 1).

As stated on page 3, EPA regulations at 40 C.F.R. Parts 144 and 146 state the requirements and standards that a permit applicant must meet to have a UIC permit application approved. These regulations deal primarily with the geologic siting, well engineering, operating, and monitoring standards for deep injection wells. These are the only things that the UIC program can take into consideration. EPA's Environmental Appeals Board has confirmed this view in *In re Envotech*, L.P., 6 E.A.D. 260 (EAB 1996) and *In re Beckman Production Services*, 5 E.A.D. 10 (EAB 1994). In regards to the Haystead #9 SWD well, West Bay Exploration Company has demonstrated that it has complied with the federal regulatory standards for issuance of a Class II disposal well permit. EPA cannot require the applicant to move the surface location of the Haystead #9 SWD.

As described in greater detail in EPA Responses 8 and 11, EPA has imposed standard requirements on the permittee for testing the mechanical integrity of a well. The UIC monitoring and testing requirements are designed to detect pressure changes between the tubing and annulus, thereby promptly detecting a leak. If a leak is detected, the UIC regulations require the operator to immediately cease operating the well until the leak is fixed and the repair is confirmed through testing. In addition, the well owner/operator is responsible for any potential contamination which occurs on or from the site. Under the SDWA Section 1431, EPA can require operators to clean up any contamination of a USDW due to injection and/or supply alternative water supplies to affected parties. West Bay Exploration Company will remain responsible for ensuring that the USDWs are protected from contamination due to injection. MDEQ, under Act 307, can also require operators to clean up any contamination due to injection, and/or supply alternative water supplies to affected parties. Furthermore, EPA has additional Programs that could utilize regulatory tools (e.g. the Comprehensive Environmental Response, Compensation and Liability Act of 1980 or "CERCLA", and the Resource Conservation and Recovery Act, or "RCRA") to clean up sites in an emergency and to compel responsible parties to perform cleanups or reimburse the government for EPA-lead cleanups.

32. MS. VICTORIA POWELL

I just wanted to comment again about the water testing. I have had the water testing done on my property, and I know a couple of other people, and Mrs. Marsh, I believe, has.

We have requested from our, I'm from Lenawee County, Adrian, Michigan. We have requested repeatedly to have public forums so that we could come and ask and get answers to the questions. We have yet, after three months, had any reply.

And the second part I wanted to mention about the testing is, we asked if this is going to be a new subject, a new lease, some kind of new contract, a permit given, why is it never included that the company, this enormously wealthy company, oil industry, why don't they do the water testing before they do anything, and do it periodically? It cost me 200 bucks, it cost my friend $600, it's worth it to us to know what we're doing right now is okay, and we will, we will monitor it ourselves, but why isn't this industry monitoring safety of water, soil, perhaps, definitely air, if there are players available, this should be provided, this should be a given.

What I have noticed is the response seems to be, oh, well, we haven't really thought of it, well, they didn't, they could probably, maybe we'll discuss it. But, I mean, come on, you know, 40 percent of the United States gets fresh water from Michigan. You know there are 45, I believe, wells around this county, Jackson County, which was the top oil producing county two years ago, excuse me, last, two years ago.

Last year Lenawee County was the top oil producing county, 1.7 million gallons of oil came out of Lenawee County, and they are no way near done.

I mean, I saw wells get erected from 9, up to 17, in just one section, and now they're marching through our town and around our town and down south.

So the point is, please, you know, institute this, you can't do this, I mean, the EPA should be able to say, hey, you know, we want safety for our people, for myself, my neighbors, my community, my country, and we want safety for our environment. We're not going to be here forever but our children and grandchildren, our great grandchildren are. Is this what we really want to leave them? The water testing is critical, please consider that.

RESPONSE 32:

Currently, the federal UIC regulations for Class II wells do not require EPA to request that the owner/operator performs any baseline analyses of groundwater or other resources. EPA has determined that the construction, monitoring, and geologic siting of the Haystead #9 SWD well is sufficient for underground injection and the protection of USDWs. Therefore, additional groundwater data is not required to protect USDWs at the Haystead #9 SWD well site. The UIC monitoring and testing requirements are designed to detect pressure changes between the tubing and annulus, thereby promptly detecting a leak. If a leak is detected, the UIC regulations require the operator to immediately cease operating the well until the leak is fixed and the repair is confirmed through mechanical integrity testing. Please see EPA Response 11 regarding private drinking water well testing, and base-line water testing. The UIC Regulations also do not require soil and air monitoring. However, the State of Michigan does have oil and gas regulations which specifically address the supervision of wells, surface facilities, secondary containment, and groundwater monitoring requirements. Oil and Gas exploration, drilling, and operating is regulated under the Michigan's Natural Resources and Environmental Protection Act, Act No. 451 of the Public Acts of 1994, as amended (last amended 9/10/2004). Information related to Michigan's Oil and Gas regulations can be found at http://www.michigan.gov/deq/0,1607,7-135-

3311_4111_4231-9245--,00.html. Please contact MDEQ (see EPA Response 1) for additional questions related to the regulation of drinking water in the State of Michigan, or visit their website at http://www.michigan.gov/deq/0,1607,7-135-3313_3675---,00.html.

33. MR. DUSLAK

I'm just sitting here listening, I'm thinking to myself, I've been a mechanic for 43 years. I've yet to see a piece of steel tubing that won't rust out or a piece of concrete that won't crack.

Maybe you guys haven't been around long enough to see that, but everything breaks, everything rusts, until you're putting stainless steel tubing down there.

Anyways, my thought.

RESPONSE 33:

As describe in greater detail on page 2 of this document, the Haystead #9 SWD well will be constructed with three steel casing strings (steel pipe). All steel casing strings will be cemented over their entire length (i.e. from the base of each casing to the surface) to preclude the movement of fluids into and between USDWs due to injection operations. In addition, the top of the injection zone is separated from the bottom of the USDW by approximately 2,653 feet of rock formation layers. Furthermore, many of the rock layers between the confining zone and the base of the USDW are impermeable shales and evaporites which will prevent injection fluid from moving upward to enter the USDW. These shale layers include the Antrim Formation, Bedford Shale, Bell Shale, Sunbury Shale, and Coldwater Shale. As another added layer of protection, injection will take place through steel tubing which is set within the long-string casing. A packer set at the bottom of the tubing will seal off the space between the casing and tubing. This space, called the annulus, will be filled with a liquid mixture containing a corrosion inhibitor to protect the inside of the long string casing from determination, such as rust. The pressure of the annulus liquid will be monitored to detect changes in pressure which indicate a leak. The pressure in the space between the tubing and casing (annulus) will be tested initially after the completion of the well to ensure that the well has mechanical integrity and monitored thereafter to ensure that the well maintains mechanical integrity. If monitoring indicates a leak or if the well should fail a mechanical integrity demonstration, then the well will be shut down until corrective actions have been taken and the well has been brought back into compliance. Any work performed on the well that requires the moving and/or removal of the tubing or packer must be followed by a mechanical integrity test before authorization to resume injection will be given.

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 to review any condition of the final permit decision. Such a petition shall include a statement of the reasons supporting review of the decision, including a demonstration that the issue(s) being raised for review were raised during the public comment period (including the public hearing) to the extent required by these regulations. The petition should, when appropriate, show that the permit condition(s) being appealed are based upon either, (1) a finding of fact or conclusion of law which is clearly erroneous, or (2) an exercise of discretion or an important policy consideration which the Environmental Appeals Board should, in its discretion, review.

If you wish to request an administrative review, you must submit such a request by regular mail to the Clerk of the Board, United States Environmental Protection Agency, Environmental Appeals Board, 1200 Pennsylvania Avenue, N.W., Mail Code 1103M, Washington, D.C. 20460-0001. Requests sent by express mail or hand-delivered must be sent to the Clerk of the Board, United States Environmental Protection Agency, Environmental Appeals Board, 1201 Constitution Avenue, NW, WJC East, Room 3332, Washington, DC 20004.

A petition for review of any condition of a UIC permit decision must be filed with the Environmental Appeals Board 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. A copy of these requirements is enclosed. 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

Final Permit

The final permit and response to comments is available for viewing in the "Reference Department" at: Jackson District Library, Carnegie Branch, 244 W. Michigan; Monday - Thursday 9 a.m. to 9 p.m., Friday 9 a.m. to 6 p.m., and Saturday 10 a.m. to 5 p.m.

Please contact Tim Elkins of my staff at (312) 886-0263, or via email at elkins.timothy@epa.gov if you have any questions about the Haystead #9 SWD permit.

Tinka G. Hyde

Date April 9, 2014

Tinka G. Hyde
Director, Water Division
U.S. Environmental Protection Agency
Region 5