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Aquifer Exemptions:

A first-ever look at the regulatory program that writes off drinking water resources for oil, gas and uranium profits

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Executive Summary

A little known provision of the Safe Drinking Water Act (SDWA) Underground Injection Control (UIC) program allows certain oil and gas and mining activity to occur in groundwater that would otherwise be protected as a drinking water source. U.S. Environmental Protection Agency (EPA) developed the program in the early days of SDWA implementation to respond to oil and gas interests who cited SDWA language which states that EPA "may not prescribe requirements for state UIC programs which interfere with or impede"[1] the injection of fluids associated with oil and gas production. Extraction proponents argued that certain energy extraction activities would not be able to continue if all underground sources of drinking water everywhere were protected. As a result, an aquifer is now eligible for an exemption if it meets certain regulatory criteria.

The Aquifer Exemption program allows injection directly into once protected aquifers and essentially "writes off" potential groundwater sources.

Underground injection of oil and gas wastewater has been a public health and environmental concern since the practice was first popularized in the 1930s. This is precisely why the SDWA mandated creation of a program designed to safeguard underground sources of drinking water from these injection wells. Yet Aquifer Exemptions provide a way around these protections and contradict the original Congressional intent for the program. Exemptions can potentially destroy groundwater while providing a false sense of security to residents who believe their water is protected from industrial development.

Groundwater is the primary drinking water source for forty-four percent of the US population and accounts for forty-two percent of all irrigation withdrawals.[2] The Aquifer Exemption program allows injection directly into once protected aquifers and essentially "writes off" potential groundwater sources. It is not clear that its provisions and implementation are rigorous enough to meet today's water challenges, including increased oil and gas development, regional water shortages, population shifts and 21st century water treatment technologies.

In light of recent developments in California and new understanding of how the program is implemented, scrutiny of the Aquifer Ex-

Old pump jacks in the Kern River Oil Field outside of Bakersfield CA. *Photo Credit: Sarah Craig*

emption program is warranted. Clean Water Action is calling on EPA to undertake a number of actions:

- Disclose a full inventory of all current and past aquifer exemption decisions
- Update the regulatory exemption criteria and required analysis to reflect changing circumstances
- Conduct an investigation into whether injection is occurring into non-exempt aquifers
- Initiate an inquiry into whether a streamlined approval process for states to implement UIC programs related to oil and gas activity has played a role in the Aquifer Exemption program oversight and management problems.

Oil field infrastructure in Shafter CA.
Photo Credit: Andrew Grinberg

The UIC program is included in the nation's landmark drinking water law because its purpose is to prevent endangerment of underground sources of drinking water. While SDWA mandated that UIC program activities shall not "interfere with or impede" injection associated with oil and gas production, it also notes that this is true "unless such requirements are essential to assure that underground sources of drinking water will not be endangered by such injection." Implementation and oversight of the Aquifer Exemption program does not provide assurance that underground sources of drinking water are indeed being protected.

Flexible SDWA Programs for Oil & Gas Activities

The UIC program includes six classes of injection wells with protection regimes to correspond with the type of fluids injected. Each class of well has a set of minimum technical requirements to protect USDWs. Class II wells were specifically designed to manage activities related to oil and gas development — mainly the injection of fluids for enhanced recovery of oil and natural gas and the disposal of wastewater associated with oil and natural gas production. The majority of Aquifer Exemptions to date are related to these Class II oil and gas activities. [See Clean Water Action's paper *Regulating Oil & Gas Activities to Protect Drinking Water: The Safe Drinking Water Act's Underground Injection Control Program Overview and Concerns*].

As the UIC program was being implemented, including the first Aquifer Exemption applications, states were applying to EPA for primary management and enforcement authority over the UIC programs. Section 1422 of the SDWA outlines the "primacy" process for the UIC program which allows for states to take primary enforcement authority over the UIC program for some or all well classes, provided that the state regulations mirror those of the federal EPA and meet the requirements for protecting USDWs.

After states began applying for primacy under Section 1422 in 1980, certain states and the oil and gas industry proposed to add a less stringent method of obtaining primacy approval, based merely on states demonstrating their effectiveness in meeting UIC federal criteria for preventing endangerment of underground sources of drinking water. This lobbying was successful and in 1980 the U.S. Congress amended the SDWA to include a more flexible method of granting states authority to run the SDWA UIC program. This new primacy approval method, codified under Section 1425 of SDWA, applied only

to Class II wells. It allowed states to operate their programs under a new set of criteria rather than following EPA regulations. This is in contrast to the primacy approval process for all other well classes. Primacy was granted to a state if its existing permitting process "represents an effective program (including adequate recordkeeping and reporting) to prevent underground injection which endangers underground sources of drinking water."[3]

According to *EPA Guidance for State Submissions Under Section 1425 of SDWA #19*, primacy submissions under section 1425 are allowed to "meet a different legal standard" than what was originally intended in the SDWA. This is apparent in the process for what meets an "effective program" and the lack of a standard application process because "a State may choose to apply in a different form and make demonstrations different from those suggested" in the original 1425 primacy guidance.[4]

Most of the states which received primacy to run UIC Class II programs under the more flexible approach in SDWA Section 1425 have substantial oil and gas production activity. Furthermore, investigative reporting by ProPublica indicated that oil companies were most likely to secure Aquifer Exemptions, mainly for small independent companies but also many for multinational corporations like Chevron, Exxon, and EnCana.[5]

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Origin of the Aquifer Exemption Program

When Congress passed the SDWA in 1974, it required EPA to develop regulations preventing endangerment of groundwater resources. The UIC regulations, initially published in 1980, included EPA's first definition of an Underground Source of Drinking Water (USDW).

The first UIC regulations also included criteria for exempting an aquifer* from the UIC program's protections intended for all USDWs. EPA proposed to exempt some aquifers from protection in light of SDWA language stating that no UIC regulations may "interfere or impede" oil and gas activities. EPA determined that in some cases certain activities including oil and gas wastewater disposal and enhanced recovery techniques could be limited without aquifer exemptions.[6]

The Aquifer Exemption provisions in the 1980 UIC regulations stated that in order to qualify for the exemption an aquifer could not currently be used as source of drinking water and included criteria which the aquifer must meet to demonstrate that it cannot and would not serve as a source of drinking water in the future.

After the 1980 UIC regulations were published, the American Petroleum Institute (API) filed a lawsuit against EPA, arguing that the USDW definition was too broad and outside the intent of the SDWA. API also argued that the criteria to exempt an aquifer from protection were "unduly stringent."[7] API recommended EPA insert another criterion stating that an aquifer is eligible for an exemption if it "will not reasonably be expected to serve as a source of drinking water," compared with the EPA language which allowed exemptions only if the USDW could never be used as a source of drinking water.[8] EPA incorporated this flexibility in a fourth criterion with a reduced water quality

*According to EPA, an aquifer is a geological formation or group of formations or part of a formation that is capable of yielding a significant amount of water to a drinking water well or spring.

threshold. It stated that an aquifer was eligible for an exemption if it was between 3,000 and 10,000 mg/l TDS in addition to not being "reasonably expected to supply a public water system."

EPA pushed back on another industry-proposed revision of the exemption criteria, which stated "that mineral, hydrocarbon, or geothermal energy aquifers may be exempted…" arguing that this would lead to large areas of the country being given blanket exemptions simply for containing minerals.[9] As a compromise, EPA's final criteria stated that an aquifer can be granted an exemption if "it is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible."[10] EPA reached a settlement with API and published final regulations in 1982 with revisions to the USDW definition and Aquifer Exemption criteria which remain unchanged today.[11*] At the time of passage of the SDWA in 1974, a 10,000 mg/l Total Dissolved Solids (TDS) level was thought to be a reasonable guide to the likelihood of water being able to be treated for consumption. Since that time, water treatment technology has advanced significantly and it is possible that water with TDS of over 10,000 mg/l can be considered a drinking water source in the future. This is a particularly important consideration in arid regions of the US where freshwater resources are becoming increasingly difficult to find and municipalities are searching for alternatives. Desalination of sea water with around 30,000 mg/l TDS is already occurring in regions with depleted freshwater resources.

The Aquifer Exemption program waives this prohibition on direct injection for energy extraction related activities and allows wastewater injection directly into USDWs.

Activities Associated with Aquifer Exemptions

The SDWA prohibits fluid injection into USDWs. Injection wells are often drilled through aquifers in order to reach the injection zone below the usable water. However, the Aquifer Exemption program waives this prohibition on direct injection for energy extraction related activities, and allows wastewater injection directly into USDWs. While the most common oil and gas activities fall under the UIC Class II program, exemptions can in theory be granted for any UIC well class. The regulations describe activities associated with exemptions; these include Class II regulated practices like wastewater disposal and enhanced recovery techniques, but also Class III mining practices. In cases where injection is happening directly into a USDW, these activities would not be legal under the SDWA without an Aquifer Exemption. The following are the most frequent type of activities to receive an exemption. Table 1 shows data from an EPA presentation indicating that disposal (Class II D) and enhanced recovery wells (Class II R) account for the majority of exemptions.

Wastewater Disposal

The most common wastewater disposal option, and currently the least expensive, for oil and gas wastewater disposal is underground injection.[12, 13] Oil and gas wastewater is injected into depleted wells and reservoirs for permanent storage. Because capacity for the billions of gallons of wastewater is finite and disposal can be an onerous process, industry occasionally looks to existing freshwater aquifers as areas to inject its waste. If the target formation includes a USDW, operators can apply for an exemption

*EPA defines a USDW as an aquifer which supplies any public water system, or contains a sufficient quantity of ground water to supply a public water system and currently supplies drinking water for human consumption or contains fewer than 10,000 milligrams/liter of Total Dissolved Solids and is not an exempted aquifer.

Table 1: **EPA Exemption Data as of May 29, 2014**

CLASS	Aquifer Exemptions
CLASS I	140
CLASS II	4,614 – II Disposal: 1,251 – II Recovery: 3,037 – II Other: 326
CLASS III	120
CLASS V	2
UNKNOWN	61
TOTAL	**4,937**

to lift the federal pollution projections given to drinking water resources and inject directly into the once protected aquifer. Around 4 percent of the over 30,000 Class II disposal wells are injecting directly into exempted aquifers.* The balance of these wells are drilled through aquifers down to the injection zone which is usually sandstone or similar porous rock formations conducive to accepting large amounts of fluids.

Enhanced Recovery

Eighty percent of all Class II wells are for enhanced recovery, which is the most common activity associated with aquifer exemptions. As oil production from existing wells plateaus, industry seeks methods of increasing production. In the enhanced recovery (ER) process, injection wells are used to pump water, steam, polymers, or carbon dioxide into already tapped oil-bearing formations occasionally located in USDWs or in formations with aquifer connectivity, in order to recover the remaining oil. The newly introduced fluids help free the residual oil and the surrounding production wells pump it to the surface.[14] Hydraulic fracturing is a form of enhanced recovery because water, sand, and chemicals are injected at high pressures to fracture the source rock and free the remaining oil. However, EPA only regulates this process if diesel fuels are used as part of the fracture fluid. It is unclear if any aquifers have been granted exemptions for hydraulic fracturing activities.

AQUIFER EXEMPTION CRITERIA 40 CFR § 146.4

An aquifer can be exempted from pollution protection if:

a. It does not currently serve as a source of drinking water, and

b. It cannot now and will not in the future serve as a source of drinking water because:

   (1) It is mineral, hydrocarbon or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or III operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible.

   (2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical;

   (3) It is so contaminated that it would be economically or technologically impractical to render that water fit got human consumption; or

   (4) It is located over a Class III well mining area subject to subsidence or catastrophic collapse; or

c. The total dissolved solids content of the ground water is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system

d. The areal extent of an aquifer exemption for a Class II enhanced oil recovery or enhanced gas recovery well may be expanded for the exclusive purpose of Class VI injection for geologic sequestration under §144.7(d) of this chapter if it meets the following criteria:

   (1) It does not currently serve as a source of drinking water; and

   (2) The total dissolved solids content of the ground water is more than 3,000 mg/l and less than 10,000 mg/l; and

   3) It is not reasonably expected to supply a public water system.[15]

*Of 30,200 Class II Disposal wells, 1250 have exemptions (according to existing data) = 4.14%. Of 137,000 Class II Recovery wells, 3037 have exemptions = 2.2% [GAO Report: ~80% of 172,000 of Class II are for enhanced recovery = 137,000]

TOTAL DISSOLVED SOLIDS

Total Dissolved Solids (TDS) is the measured content of organic and inorganic substances in dissolved form. As water travels through rock formations and other strata, it picks up substances over time. This can include any minerals, metals or salts "such as calcium, magnesium, potassium, sodium, bicarbonates, chlorides and sulfates."[17] These are natural sources of TDS but industrial practices such as wastewater discharge and agriculture run off also contribute to TDS levels.

Table 2: **Water Quality Parameters**

Water Quality	TDS Content
Fresh Water	<1,000 mg/L
Treatable Brackish	1,000 -5,000 mg/L
Highly Brackish	5,000-15,000 mg/L
Saline	15,00 – 30,000 mg/L
Sea Water	30,000 – 40,000 mg/L

Source: Nicholas P. Cheremisinoff, *Handbook of Water and Wastewater Treatment Technologies*.

Uranium Mining

Aquifer Exemptions are also commonly sought for uranium mining. Conventional uranium mining includes extracting rock from the ground and then separating uranium from the mined rock. However, the majority of uranium mining in the United States uses in situ leach mining (ISL). During the ISL process a chemical leaching solution is pumped underground, via injection wells, into uranium bearing sandstone and rock formations. There the solution oxidizes and mobilizes the uranium. The solution now containing oxidized uranium is then pumped to the surface through production wells and sent through additional refining processes. An aquifer exemption is almost always required for this process because the native groundwater contained in the uranium orebody is used (and polluted as a result) to leech the chemical solution to the uranium.[16] The remaining waste from this process is then usually disposed of by returning the wastewater back underground via Class I non hazardous wells.

Process for Receiving an Exemption

EPA has discretion in determining whether an Aquifer Exemption is classified as either a "substantial" or "non-substantial" program revision. This determination is done on a case-by-case basis. There are circumstances when EPA considers an exemption application a "substantial" case. In a "substantial" review scenario the aquifer could potentially be suitable to drink with normal treatment (those under 3,000 mg/l TDS), related to Class I well injection activity or wells that are rule authorized.*

If an exemption were determined to be a substantial case the applicant still has to prove that it met one of the four criteria in 40 CFR parts 146.4(b) *[See Sidebar]*. If the USDW contains hydrocarbons or minerals in producible quantities and the applicant can prove its viability, the USDW is at a depth deemed economically or technically unreachable for drinking water purposes, the USDW is contaminated to a point where it is too expensive to treat, or if it is above a Class III mining operation, the USDW is eligible for an exemption.

However, EPA has discretion in determining what is a substantial exemption. A description of what could qualify as a substantial case is only outlined in Guidance and does not include Class II and Class III permit activity which is the majority of exemptions. As a result very few substantial cases have been identified even though injection activity is occurring in high quality drinking water.

The Aquifer Exemption process begins when an energy production or waste disposal com-

*EPA Class I wells inject hazardous wastes, industrial non-hazardous liquids, or municipal wastewater beneath the lowermost USDW.

pany recognizes the need for an exemption in order to begin injection activity and submits the required information to the appropriate primacy agency. In states with primacy for the UIC well class, the state agency reviews the initial application. Next, a public participation process is initiated, and then a determination is forwarded to the relevant EPA regional office for final approval. In cases where EPA is the primacy authority, the company submits an application directly to the regional EPA office for review and approval.

Information submitted as part of the exemption application must demonstrate that the aquifer is not currently a source of drinking water and meets the criteria establishing it will not serve as a source of drinking water in the future.

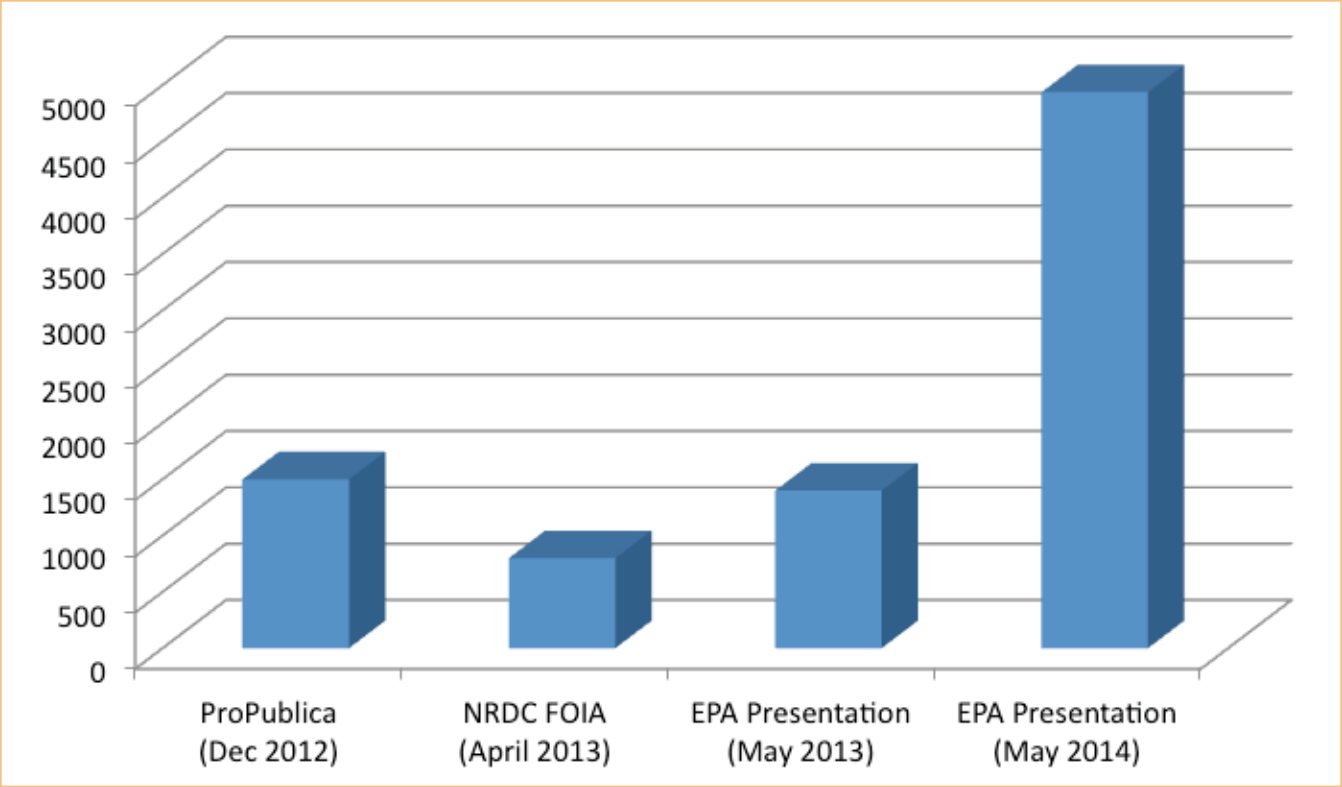
All substantial cases are referred to the EPA Administrator for final approval. Notice of approval of a substantial program revision is published in the *Federal Register* after EPA provides opportunity for public comment and a public hearing. However, the majority of exemptions to date are designated non-substantial. This type of exemption goes through a state-driven public comment process and the appropriate EPA Region responds with an approval letter to the primacy state or where EPA is the primacy authority, the Agency responds by letter directly to the company.

Information submitted as part of the exemption application must demonstrate that the aquifer is not currently a source of drinking water and meets the criteria establishing it will not serve as a source of drinking water in the future. The regulations do not elaborate on the data and analysis necessary to evaluate an exemption request. Instead EPA published a document in 1984 titled, *Guidance for Review and Approval of state UIC Programs and Revisions to Approved State Programs #34*, which expanded on what information should be included in the application order to make an exemption determination. This detailed information includes: topographic map of proposed exempted area with the boundaries clearly indicated, subsurface depth of aquifer and the vertical distance from other USDWs, area of exempted aquifer (acres or feet) and water quality analysis. In order to demonstrate that the aquifer does not currently serve as a source of drinking water, the company must survey the area to make sure no water supply wells exist in or around the proposed exempted area. The survey should include a buffer zone of at least ¼ mile from the boundary of the exemption zone.

EPA suggests more specific information for exempting an aquifer under section 146.4(b). This information varies for each sub-category but includes production history of wells in the vicinity of the aquifer, availability of alternative water supplies, ability of current supplies in the area to meet future needs, costs of treatment, and cost of developing the water supply from the proposed exemption area. This *Statement of Basis* is essential to approving any exemption. After an exemption is approved the operator may begin injection activity into the once protected USDW.

If the exemption request is only for a portion of an aquifer the company must submit similar documentation but is not required to submit migration modeling data to prove that the injected waste will not migrate out of the injection zone into non-exempt parts of the aquifer. EPA Guidance 34 states that "a demonstration must be made that the waste will remain in the exempted aquifer." The factors considered for this are pressure and volumes of injected fluid, but modeling the behavior of the injected fluids is not required.

Figure 1: **Number of Exemptions Reported Nationwide**



Emerging Concerns about Implementation of the Aquifer Exemption Program

National Program Oversight

There is currently no national inventory of Aquifer Exemptions and quantification of exemptions has been a moving target. A groundbreaking report by ProPublica in December 2012 put the number of exemptions at "more than 1,500." A Freedom of Information Act request from the Natural Resources Defense Council a few months later yielded largely incomplete results from EPA headquarters and catalogued the number of exemptions at around 800 nationwide. An EPA presentation in May 2013 at a uranium recovery workshop stated there were "approximately 1400." In May 2014 at a presentation to the Association of Public Health Laboratories, EPA stated that there are 4,937 Aquifer Exemptions. *[See Figure 1]*

There is currently no national inventory of Aquifer Exemptions and quantification of exemptions has been a moving target.

Most Aquifer Exemptions appear to have been granted during the primacy approval process in the early 1980s when states were granted authority to run the UIC program through the SDWA section 1425. This led to an inability for EPA Headquarters to obtain complete records of exemptions granted and the Statement of Basis for those exemptions. For example, recent investigations in California suggest that Statements of Basis are not available for blanket exemptions granted during the primacy approval process. Oversight agreements between California's UIC program, run by the Department of Oil, Gas and Geothermal Resources and Region IX EPA are unclear and illegal injection into non-exempt aquifers has been documented. Similar scrutiny has not

A tank of drilling fluids in Lost Hills CA. *Photo Credit: Sarah Craig*

been applied to the Aquifer Exemption process in other states.

Federal officials have recently acknowledged the need for a full accounting of exemptions granted and for improvement in the review and determination process. A July 24, 2014 memo from EPA headquarters to regional Water Division Directors directed EPA regional offices to ensure a "consistent and predictable process for the review of Aquifer Exemption requests." The letter notes that there are "other technical and policy issues associated with aquifer exemptions that are not addressed by this memorandum."[18] The nature of these "technical and policy" issues is still unknown.

California: The Exemption State

Recent events in California have exposed a lack of oversight in the Aquifer Exemption program. In the summer of 2014 the California Division of Oil, Gas, and Geothermal Resources (DOGGR) directed the operators of 13 disposal wells to cease injection activities under suspicion that the wells had been injecting into non-exempt USDWs. For years the program operated under loose exemption oversight with poor record-keeping and mapping of aquifers, and inadequate communication between stakeholders.

Senate Bill 4, which required California to regulate hydraulic fracturing, mandated new authority to the State Water Resources Control Board (SWRCB) to monitor groundwater in oil fields. Engagement by the SWRCB in oil field operations led to the revelation that injection was occurring in non exempt aquifers, which led to the shutdowns. This apparent failure of enforcement, as well as the 2011 EPA critique of DOGGR's class II program has led to the California Department of Conservation undertaking a review of the entire UIC program. As part of this review the Department is focusing on the implementation and oversight of the Aquifer Exemption program and its initial findings have confirmed that DOGGR improperly permitted illegal injection of oil and gas wastewater into non exempt aquifers.

The SWRCB, in its role assisting DOGGR's investigation, has identified 108 public water supply wells within one-mile radius of the recently closed waste disposal wells. The Board has not attempted to investigate private water wells, for which data is not publicly available. DOGGR's and EPA's failure to implement SDWA has directly resulted in the injection of roughly 3 billion gallons of wastewater into underground sources of drinking water that

An oil drilling tower sits among celery plants near Santa Maria CA. *Photo Credit: Sarah Craig*

an unknown yet significant number of Californians rely on for their drinking and irrigation water.

Limited testing of 8 of the 108 water wells identified elevated salinity and detected levels of nitrates, arsenic and thallium. Further testing and investigation is needed to determine the impacts of the illegal injection. In addition to the handful of wells already shut down, according to the SWRCB, injection into aquifers "whose exempt status is uncertain" has occurred in 88 waste disposal wells. DOGGR and EPA's failure to keep adequate records, maps and public information on aquifer exemptions has resulted in regulatory and public confusion surrounding numerous aquifers and whether injection is occurring into USDWs.

EPA Overstep in Texas

An ongoing case in Goliad, Texas highlights questionable exemption approval and inconsistencies in EPA oversight. In 2009 Goliad County filed a lawsuit against Uranium Energy Corporations (UEC) under the SDWA citizen suit provision. The suit argued that the Texas Commission on Environmental Quality (TCEQ) should deny UEC's pending aquifer exemption application because the company's previous operations polluted the proposed aquifer for exemption. Goliad County alleged that UEC was taking samples of the aquifer it already contaminated in order to demonstrate the aquifer was unsuitable as a underground source of drinking water.[19] The court eventually dismissed the lawsuit but EPA agreed that further analysis of the aquifer was necessary before an exemption could be granted.

Communications between EPA Region 6 and TCEQ showed that EPA believed that "the criteria for exempting an aquifer had not yet been met," namely because UEC failed to demonstrate that the fluid would not migrate out of the exemption zone and because the groundwater well survey identified a number of wells which were likely to draw drinking water from the aquifer.[20]

However, when it became clear that the exemption did not meet the regulatory criteria, high-level EPA officials intervened in the case after intense industry lobbying. In December

2012, EPA relaxed the type of monitoring and analysis necessary for the mining company to prove it was eligible for an exemption and approved the application.[21] In 2013, local opposition was able to convince EPA to revisit the application and EPA reopened the case for public comment. The Agency eventually reduced the size of the exempted area but confirmed the aquifers eligibility and approval.[22]

Several factors around water resource management suggest that conditions have changed since the Aquifer Exemption program was originally developed.

SDWA at 40: 21st Century Water Conditions

Several factors around water resource management suggest that conditions have changed since the Aquifer Exemption program was originally developed. As a result of climate change, precipitation patterns are shifting and creating drought conditions across large swaths of the country, including states with oil and gas production.[23] Population centers are growing in ways unimagined in the 1980s, when the aquifer exemption program was first implemented.[24] Developments in water treatment technology can transform once low quality aquifers into viable sources of drinking water for parched towns across America. This is already happening in counties in Texas and New Mexico, where the alternative to finding new supplies is treating brackish aquifers.[25, 26] Increased demand for water and new treatment technologies suggest that aquifers that were at one point not considered for human consumption are now needed and able to become viable drinking water sources.

While water treatment technology continues to evolve there has been a steep increase in oil and gas production across the country.[27] The Energy Information Agency predicts 410,722 wells are required to produce the current US shale gas reserves.[28] Consequently, the need to manage wastewater created in the process will only become more important. A unconventional shale gas well can require up to 8 million gallons of water.[29] Nearly eighty percent of this water can return to the surface as flowback water.[30] This flowback and produced water that returns to the surface is usually high in salinity, can contain radioactive materials such as radium, and dissolved hydrocarbons like methane, ethane and propane. The Groundwater Protection Council reports that the oil and gas industry produces 52 million barrels of flowback water per day.[31] EPA has already seen an increase in exemption applications consistent with growth in energy extraction activities and the increased need for oil and gas wastewater management will continue this trend.[32]

Fundamental Concerns with the Aquifer Exemption Program

Rapid growth in unconventional oil and gas activity, water stresses from a changing climate, controversial exemption requests, and revelations of inadequate oversight have put aquifer exemptions in the public eye and raised critical questions about protecting USDWs. Several aspects of the Aquifer Exemption program raise particular concern.

➔ EPA and at least one state program have admitted to serious documentation problems related to Aquifer Exemptions. These include the lack of a complete national list of all exempted aquifers, the Statement of Basis for those decisions, and ill-defined boundaries of the exempted aquifers.

In a 2014 report, the Government Accountability Office estimated that over 2 billion gallons of fluid are injected *every day* into over

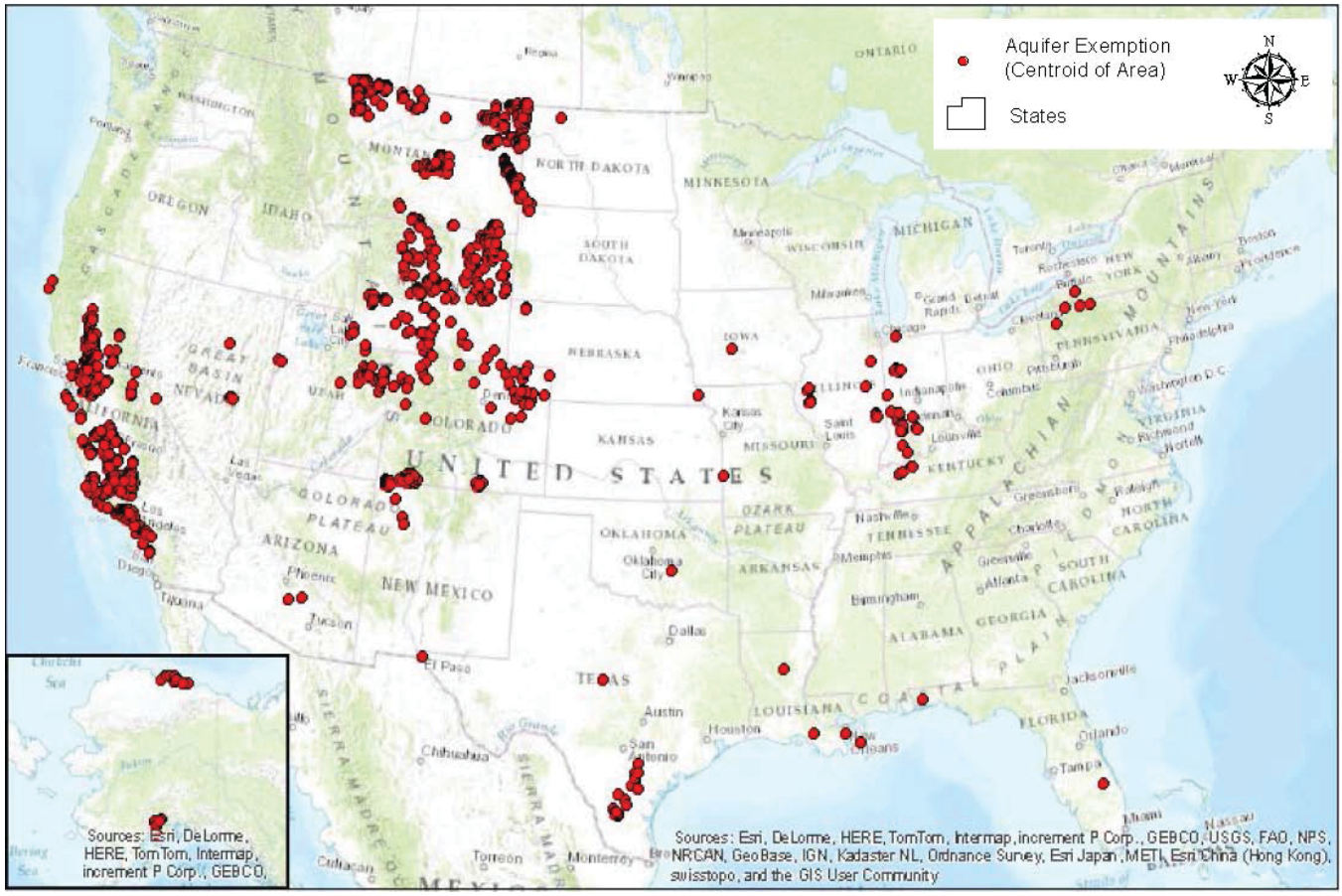
172,000 Class II wells throughout the country, either for disposal or for enhanced production techniques.[33] Current data suggests that around 4 percent of oil and gas waste disposal wells received an exemption. These injection volumes suggest that potentially large amounts of fluids are injected into exempted aquifers.

EPA reported recently that there are over 1,000 exemptions for wastewater disposal, over 3,000 for ER, and close to 5,000 exemptions overall. This is a steep increase in the exemptions reported by EPA just one year ago and the number has grown significantly since a ProPublica investigation in late 2012, reported that there were just over 1,500 exemptions in place.[34] *[See Figure 1]*

It is also unclear whether there is sufficient documentation to determine if all Aquifer Exemptions were granted legally. Recent revelations in California suggest that the necessary Statement of Basis for some exemptions is missing or does not exist. Lacking a full list and a rationale for each exemption, it is impossible to tell if the exemption process was followed and the regulatory criteria were interpreted correctly. A full picture of the Aquifer Exemption program is needed to evaluate how to update it for modern environmental and social concerns.

➔ The criteria for granting aquifer exemptions raise concern in light of changes in water supply and demand, new treatment technologies and the impacts of a changing climate.

"Substantial" Cases: The "substantial" exemption cases arguably need the highest level of scrutiny, given that they involve water quali-



Spatial interpretation of known Aquifer Exemptions nationwide (still being updated by EPA as of May 29, 2014).

ty under 3,000 TDS and thus more likely to be able to be used as USDWs. However, even in the 1984 EPA UIC Guidance 34, EPA noted that "varying situations from State to State makes it impossible to establish a firm definition of what constitutes a 'substantial' program revision."[35]

➔ The criteria is especially ambiguous in determining if water over 3000mg/l TDS will not serve as a USDW in the future.

Determining if Water Needed for Future Uses: Criteria 146.4(b)(c) require extensive analysis and data to prove that any USDW may not be a source of drinking water in the future. However, it does not appear that the level of analysis is standardized or consistent to make this determination. An internal memo confirmed that the Agency acknowledged this, stating that they created a workgroup, "to better define and communicate the type of data and analyses used to support those determinations."[36]

The depth and quality of an aquifer which could potentially serve as a USDW is far different from when the program was first developed over thirty years ago. EPA officials recognize that "advancing technology and climate change have made water sources once deemed inaccessible more likely to be needed — and used — in the future."[37]

➔ Industry influence on development of the UIC program, including Aquifer Exemptions and Section 1425 primacy approval has contributed to a regulatory environment which risks prioritizing energy extraction over protection of USDWs.

The statutory and regulatory history demonstrates significant industry influence during the early days of SDWA/UIC implementation. Industry's success in pushing for a looser primacy approval process and litigation to amend the USDW definition and aquifer exemption criteria have combined to leave USDWs vulnerable and to keep the public in the dark. In California for example, "all existing hydrocarbon bearing formations were exempted in the approval of the original 1983 Primacy Application, regardless of TDS concentrations."[38] Operating in an industry influenced exemption environment, as seen in the 1425 program, there was and continues to be potential for abuse of the Aquifer Exemption policy.

Improving Protection of Drinking Water Sources for Future Generations

The fundamental premise of the Aquifer Exemption program — that there are circumstances when EPA believes other interests are paramount to USDW protection — begs for rigorous review and oversight. The parameters were set early in the SDWA development process, but were always predicated on robust enforcement and clear regulatory responsibility. No Aquifer Exemption has ever been rescinded and restoring an aquifer after millions of gallons of oil and gas waste are injected into it is highly unlikely. Exempting an aquifer is to sacrifice it forever.

While SDWA includes language prohibiting UIC regulations that "interfere or impede" with oil and gas related activities, the rest of the provision states, "unless such requirements are essential to assure that underground sources of drinking water will not be endangered by such injection." In light of changing circumstances and evidence of inadequate oversight of the program, **EPA should take the below steps to ensure that energy extraction is not being prioritized over protecting valuable groundwater resources:**

1. Expedite development and disclosure of a national inventory of all current and past Aquifer Exemptions, in list and spatial format with the corresponding Statement of Basis for each determination.
2. Reassess the Underground Source of Drinking Water definition and Aquifer Exemption criteria and update regulations and guidance to reflect modern environmental challenges, water demands and technical advances.
3. Investigate whether all USDWs are being adequately protected, including determining whether injection is occurring into non-exempt aquifers and requiring migration modeling for exemptions pertaining to a portion of an aquifer to ensure that injected fluid does not migrate outside the injection zone.
4. Document injection activity in exempt aquifers to date and where exemptions have been granted but not utilized. Document if exemptions were granted for other activities outside of waste disposal and enhanced recovery, including hydraulic fracturing, coalbed methane production and other unconventional extraction activities in USDWs.
5. Initiate an inquiry into whether primacy approval under SDWA Section 1425 and shared implementation among state agencies and Regional EPA offices have contributed to problems in the Aquifer Exemption program.

Appendix: **Aquifer Exemption Chronology**

Year(s)	Action
1974	Safe Drinking Water Act passed
1976	First proposed UIC regulations
1980	Final UIC regulations
1980	SDWA amended to include alternate state primacy path under Section 1425 • Oil and gas industry successfully lobbied to include alternate primacy authority based on states demonstrating their UIC regulations constitute an "effective program." This is in contrast to the original primacy pathway under Section 1422 which requires states to mirror the federal UIC regulations.
1981	American Petroleum Institute Lawsuit • API argued that subjecting "every water source to the UIC regulations without regard to location, depth, size, function, endangerment, or likelihood of supplying a public water system was unduly burdensome and outside the intent of the SDWA."
1982	EPA proposed amendments to the UIC regulations and published final definition and exemption criteria
1982–1990	20 oil producing states applied for and received primacy from EPA to administer the program under Section 1425 of SDWA.
2009	Goliad County, Texas lawsuit against Uranium Energy Corp.
2012	EPA approves Goliad exemption application
2013	Public pressure leads EPA to reopen Goliad application for public comment. An exemption for a reduced area of the aquifer is eventually approved
May 2014	EPA releases most recent count of aquifer exemptions nationwide
June 2014	EPA headquarters sends memo to regional Water Division Directors in an effort to establish a "consistent and predictable process" for reviewing aquifer exemption applications
Summer 2014	California Division of Oil and Gas and Geothermal Resources shuts down 13 UIC injection wells under suspicion they have been injecting into non-exempt aquifers
September 2014	California State Water Board releases letter listing 108 water wells within a one mile radius of the shuttered injection wells. The water wells are flagged for water quality monitoring.

NOTES

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