



**REPORT**

# WEST VIRGINIA'S GROUNDWATER IS NOT ADEQUATELY PROTECTED FROM UNDERGROUND INJECTION

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# *West Virginia's groundwater is not adequately protected from underground injection control pollution*

Many public water systems and most self-supplied families rely on groundwater as a source of drinking water—in fact, more than 42 percent of Americans do.<sup>1</sup> This critical resource is stressed by drought, climate change effects, and excessive withdrawal for human consumption and agricultural use.

More recently, groundwater sources have also been stressed by a dramatic increase in oil and gas production using hydraulic fracturing, or fracking, technologies. Fracking is a practice of injecting water, chemicals, and sand at high pressure into an oil or gas well to facilitate extraction of deposits that are often deeply buried. Some of the fluids used in fracking return to the surface as “flowback,” and sometimes the well has naturally occurring fluids that are brought to the surface as “produced water” with the produced oil and gas.

In the United States in 2012 alone (the latest year for which data are available), onshore wells created approximately 860 billion gallons of wastewater (flowback and produced water). That’s more than 2.3 billion gallons—the equivalent of 3,500 Olympic-size swimming pools—per day.<sup>2</sup> More than 90 percent of these wastewaters were then injected underground, either into disposal wells or into injection wells as part of an extraction technique called enhanced oil recovery.<sup>3</sup> Both underground injection programs threaten to contaminate groundwater. As oil and gas production continues to expand around the country, so

will the amount of wastewater generated by the industry, exacerbating the need for safe waste-management practices. It is crucial that underground injection wells be properly designed, constructed, operated, and maintained—and eventually plugged and abandoned—to ensure that they do not threaten underground sources of drinking water protected by federal and state statutes.

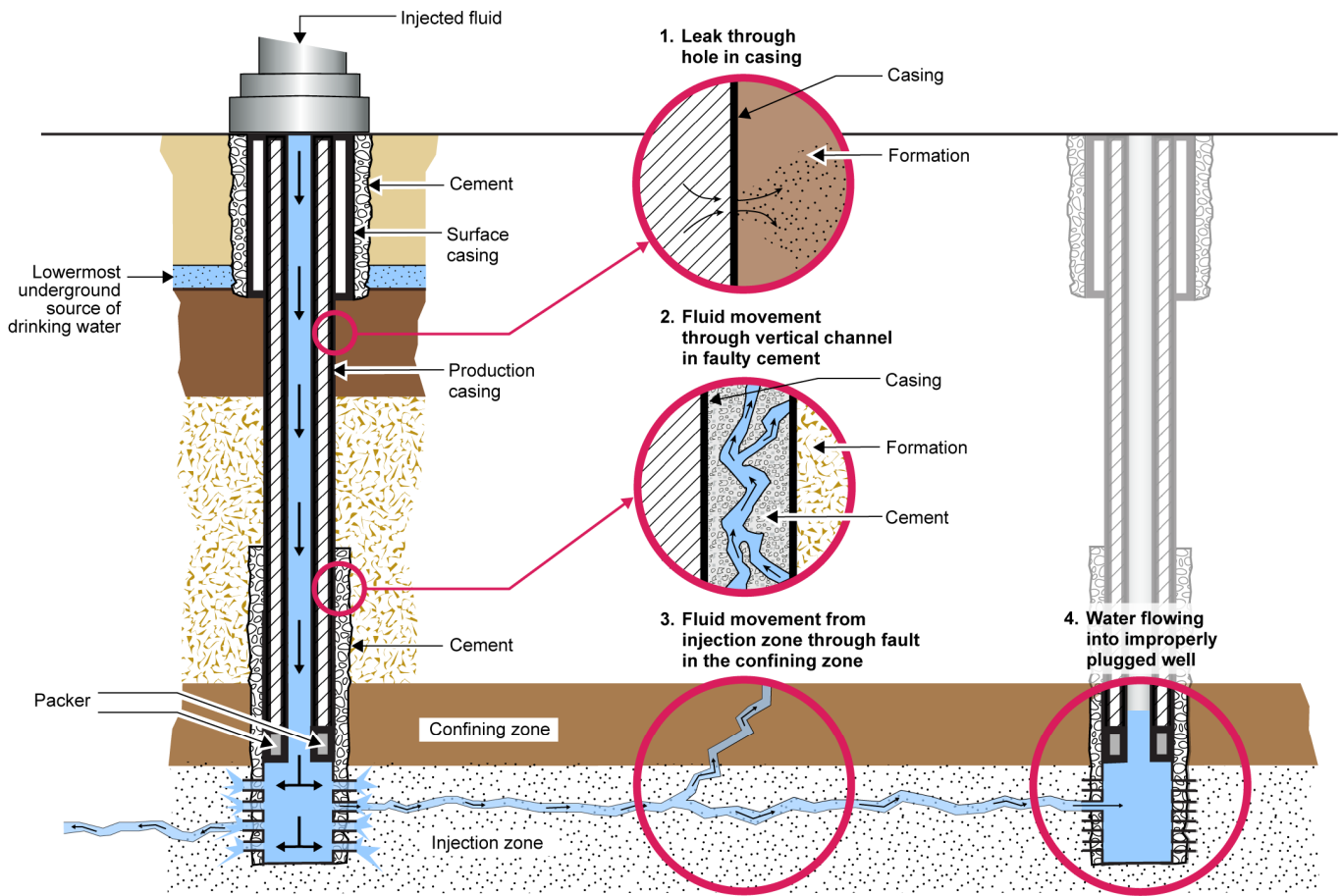
This paper provides an overview of how the Safe Drinking Water Act’s Underground Injection Control program regulates oil and gas underground injection activities. It then examines aspects of the program that are out of date and ineffective at meeting the statutory goal of protecting underground sources of drinking water. In particular, the paper analyzes the status of the underground injection control program in West Virginia, where the U.S. Environmental Protection Agency (EPA) has failed to incorporate any state requirements under EPA authority for federal enforcement. The paper also provides recommendations for improvements in the policies of both the West Virginia Department of Environmental Protection and the EPA.

## **THE RISKS TO DRINKING WATER FROM UNDERGROUND INJECTION**

The exact chemical composition of oil and gas wastewater can vary greatly but often includes contaminants that pose serious threats to human health. It can contain chemical constituents used by well operators during drilling, fracking, or maintenance. There may also be naturally occurring constituents such as salt, which may be present in concentrations many times higher than that of seawater; hydrocarbons, including known carcinogens like benzene; toxic metals such as mercury; and naturally occurring radioactive material (NORM). In 2016, the EPA summarized numerous sources and studies that characterized the composition of wastewater from oil and gas operations in unconventional formations such as shale. The EPA described the wastewater constituents in five categories: classical and conventional (e.g., total dissolved solids, total suspended solids, chloride, oil and grease), organics (e.g., benzene, toluene, ethylbenzene, and xylenes), metals (e.g., barium, strontium, and magnesium), radioactive constituents (e.g., radium-226 and -228), and other (e.g., guar gum and microorganisms).<sup>4</sup>

The U.S. Government Accountability Office reported in 2014 that the EPA has identified six “major pathways of contamination” of underground sources of drinking water associated with the underground injection of oil and gas wastewater.<sup>5</sup> For example, there may be a hole or other fault in the steel pipe inside a well, or wastewater could migrate from a well that is no longer active but has not been properly plugged. If a well has not been designed, constructed, and maintained in accordance with strict regulations, drinking water is at risk. Figure I shows four of the six pathways.

**FIGURE I: PATHWAYS OF CONTAMINATION OF UNDERGROUND SOURCES OF DRINKING WATER FROM A UIC WELL**



Source: GAO analysis of EPA information. | GAO-14-555

## SAFE DRINKING WATER ACT AND ITS REGULATION OF UNDERGROUND INJECTION CONTROL IS FAILING

The Safe Drinking Water Act (SDWA), Title XIV of the Public Health Service Act, is the key federal law for protecting drinking water supplies from harmful contaminants. Among other critical provisions, this law prohibits underground injection that endangers aquifers that are current sources of drinking water or that have the quality and quantity of water to serve as future sources. When the U.S. Congress passed the SDWA in 1974, it authorized the EPA to develop a program to protect vital underground drinking water resources from the risks of industrial activities that inject fluid into the ground. The EPA therefore established the SDWA's underground injection control (UIC) program, with regulations to protect aquifers of sufficient quality to provide drinking water, also called underground sources of drinking water (USDWs).<sup>6</sup> However, Congress included language

mandating that EPA regulations not “interfere with or impede” oil and gas production unless such regulations are “essential to assure that underground sources of drinking water will not be endangered by such injection.”<sup>7</sup>

To implement this program, the EPA established six classes of UIC wells based on the fluids injected, injection depth, purpose, and operating techniques and issued regulations that establish performance criteria for each class. These six classes include Class II wells, which are used by the oil and gas industry either to increase the production of oil and gas by increasing pressure for enhanced oil recovery in underground formations, or to dispose of wastewater generated by oil and gas exploration and production.<sup>8</sup> Nationwide, there are more than 180,000 Class II underground injection wells that the U.S. Government Accountability Office (GAO) has confirmed collectively accept at least two billion gallons of fluid from oil and gas production every day.<sup>9,10</sup> About 20 percent

of these wells are known as Class IID wells, or disposal wells, and are used exclusively to dispose of oil and gas wastewater.<sup>11</sup> Class IIR wells, or recovery wells, are used to enhance oil or gas production. If proper practices are not followed, the injection of this wastewater can threaten aquifers that provide drinking water now or that could in the future.<sup>12</sup>

Section 1421 of the SDWA called for the EPA to develop rules for state programs that “shall contain minimum requirements for effective programs to prevent underground injection which endangers drinking water sources.”<sup>13</sup> After the EPA adopted those rules, the Act required that either the federal government or a state, tribal, or territorial government have primary regulatory authority, also known as primacy. A state, tribe, or territory may apply to the EPA for primacy, and if its application is approved, it must establish a UIC program that prevents the endangerment of aquifers within its borders. In any state that does not have primacy, the EPA directly implements the UIC program. A state may apply for primacy for some or all classes of well.

The three possible scenarios for operation of UIC programs in each state are:

**1. STATE PRIMACY UNDER SECTION 1422:** The state has primacy and administers a UIC program that meets the same minimum requirements of federal rules under Section 1421.<sup>14</sup>

**2. STATE PRIMACY UNDER SECTION 1425:** For Class II UIC programs only (i.e., those relating to oil and natural gas), a state may choose a less prescriptive option of establishing primacy and administering a UIC program that “represents an effective program . . . to prevent underground injection which endangers drinking water sources.”<sup>15</sup> A Section 1425 program does not have to meet the same minimum regulatory standards as a Section 1422 program.<sup>16</sup> In fact, it must conform to just four statutory requirements.<sup>17</sup> Because Section 1425 programs do not have to include the specific protections mandated under Sections 1421 and 1422, in some cases they may be weaker than those required by the EPA’s more specific rules.

**3. EPA PRIMACY (DIRECT IMPLEMENTATION):** Under this third scenario, established under Section 1422(c), the EPA has primacy when a state does not apply for it, or a state’s application is denied, or the EPA withdraws its approval of a state program.<sup>18</sup> To our knowledge, the EPA has never issued a final order refusing to approve a state program or withdrawing approval of one. However, some states and territories have failed to apply for approval so the EPA has primacy in them.

## **How implementation and enforcement of the UIC program is failing**

The regulatory and legislative history of the UIC program’s oversight of oil and gas underground injection activities is characterized by a pattern of exemptions, exceptions, and lack of transparency resulting from the effort not to “interfere with or impede” oil and gas activities. Combined with “flexible” regulatory oversight added by Congress in 1980 and a record of dramatic underfunding, this raises questions about whether underground sources of drinking water are being adequately protected. Given changing circumstances in the industry and the environment, a review of the UIC program’s regulation of oil and gas underground injection activities is merited.

In particular, Section 1423 of the SDWA empowers and obligates the EPA to exercise its enforcement authority to protect citizens and their drinking water sources when primacy states fail to do so.<sup>19</sup> When the EPA finds a violation occurring in a primacy state, the EPA must notify the state and the alleged violator.<sup>20</sup> If, after 30 days, the state has not initiated an enforcement action, the EPA must issue an order requiring compliance or commence a civil action.<sup>21</sup> But the rules are unclear on how the EPA will implement this authority. If a state does not enforce its own regulations when they are violated by a well operator, the EPA rules under Section 1422 state: “Regulatory provisions incorporated by reference (in the case of approved State or Tribal programs) or promulgated by EPA (in the case of EPA-administered programs), and all permit conditions or permit denials issued pursuant to such regulations, are enforceable by the Administrator pursuant to section 1423 of the SDWA.” This could be read to imply that the agency can take enforcement action only if the EPA has approved the state regulations being violated and has incorporated those rules by reference into federal regulations.<sup>22</sup> The rules are silent with respect to whether EPA must incorporate state rules by reference under Section 1425 to enforce them.

The statute, however, includes no incorporation by reference requirement for enforcement of either Section 1422 or Section 1425 programs.<sup>23</sup> Indeed, the Public Water Supply Supervision program under a different section of the same statute (section 1413 of the Safe Drinking Water Act) does not include an incorporation by reference requirement for EPA adoption of state rules prior to EPA enforcement, even though the statutory language in the two sections is almost the same. Thus, it would seem that the incorporation by reference provision in the UIC rules creates what could be construed as an unnecessary self-imposed encumbrance. We believe that EPA should clarify that it has authority to enforce approved primacy state UIC rules whether EPA has gone through the formality of incorporating those rules by reference or not.



An investigation by the GAO found that the EPA has not incorporated by reference all state program requirements, or changes to state program requirements, into federal regulations (we will refer to the legal term “incorporation by reference” as simply “incorporation” from now on).<sup>24</sup> Indeed, the GAO found that the EPA has not made a concerted effort to identify and incorporate changes to state program requirements into federal regulations since 1991, with EPA officials saying such a task would be burdensome, time-consuming, and resource-intensive.<sup>25</sup> Of the 40 states that have approved primacy programs for Class II wells, the EPA has failed to incorporate any of the state requirements for two states: Arkansas and West Virginia.<sup>26</sup> For other states, some rules are incorporated by reference while others are not.

Therefore, it is currently unclear how the EPA intends to enforce state program requirements as mandated by SDWA in the event a state does not take action or requests the EPA’s assistance to take action when operators violate state law.<sup>27</sup> Fortunately, the EPA is not without recourse to ensure that underground injection does not harm the people of West Virginia or Arkansas or their sources of clean drinking water. The EPA can and should clarify its interpretation of the rules implementing the SDWA to say that it believes that it can take enforcement actions against any violator of any approved primacy state UIC rules whether they have been incorporated by reference or not. The agency also should ideally issue a technical correction to its rules eliminating the ambiguous, unnecessary, and cumbersome incorporation by reference provision. At a minimum, the agency should make clear whether and how state rules should be incorporated by reference into federal regulation (and should do so for states where it hasn’t) to ensure that federal enforcement is available in the event primacy states fail to fulfill their obligations under the law. For example, the agency could issue a single rule incorporating by reference every primacy state regulation in every state programs approved to date to eliminate any ambiguity. The SDWA does not limit federal enforcement to cases in which the EPA has explicitly incorporated state rules by reference into federal regulations. The EPA’s primacy rules shouldn’t create ambiguities about the agency’s statutory enforcement authorities.

## INADEQUATE REGULATION OF UNDERGROUND INJECTION IN WEST VIRGINIA

This section of the report analyzes the status of the UIC program in West Virginia. When West Virginia applied for primacy in 1983, it chose to apply for Class II primacy under Section 1425 and for other classes under Section 1422. The EPA granted West Virginia primacy for all Class II wells, including Class IID wells, that same year, when the parties signed a memorandum of agreement (MOA).

## The methodology used to review West Virginia’s UIC regulations

To assess West Virginia’s oversight and enforcement of UIC regulations, we analyzed the regulatory records of the West Virginia Department of Environmental Protection (DEP) and online database records of the West Virginia Geological and Economic Survey (GES). On November 15, 2015, West Virginia had 67 active, abandoned, or shut-in Class IID wells listed in the DEP’s online oil and gas database.<sup>28</sup> We selected a sample of 19 of these Class IID wells that were examples of wells with notices of violations or other causes for concern regarding compliance, as seen in Table 1. These wells are not necessarily representative of all UIC wells in West Virginia. We analyzed their regulatory records from January 2000 to May 2016. Some of these records were available in online databases and some required a visit to DEP offices.

COUNTY	WELL NUMBER	API NUMBER*
Kanawha	Jones I	47-039-00798
Pleasants	BW 4	47-073-02523
Ritchie	Andrews I	47-085-05076
Ritchie	M.E. Elder I	47-085-05151
Ritchie	Lowther 2	47-085-07652
Ritchie	Frew 3	47-085-08350
Ritchie	Haught 2	47-085-09159
Roane	I85	47-087-00658
Roane	W-19	47-087-01056
Roane	Paxton 7	47-087-01572
Roane	Conley 3	47-087-01578
Roane	Schoolcraft I63	47-087-01591
Roane	Summers 7	47-087-01623
Roane	Harper I	47-087-01926
Wetzel	Woods 3	47-103-01415
Wood	Drilco I**	47-107-00819
Wyoming	Loup Creek I9	47-109-01433
Wyoming	WP-400 WIW	47-109-02703
Wyoming	WP-40I WIW	47-109-02795

\* The API (American Petroleum Institute) number is a unique number assigned to every oil and gas well in the country and remains the same even if the well operator or lease owner changes. The Well Number is assigned by the well operator to each of its wells.

\*\* This well is called simply “I” by its operator, Drilco. For the purposes of this report we are calling it Drilco I.

At the time of our research, the online DEP databases included UIC permits, UIC mechanical integrity test (MIT) results, UIC inspections, and notices of violations (NOVs).<sup>29</sup> In-person examination of DEP paper files found additional documents that were not usually available in the online databases, such as full inspection reports, prior permits, correspondence, compliance documents, and monthly operator monitoring reports known as WR-40s. In some instances, in-person file research found NOVs that were not included in the online database.<sup>30</sup> The GES online database included geographic locations, dates of initial drilling (known as spudding), depth of wells, depth of fresh water and formation water (brine or salt water), and producing formations.

The West Virginia DEP revised its permitting process in 2015 and now requires the depths of USDWs to be identified and documented on applications for new UIC wells under the jurisdiction of the Office of Oil and Gas. The depths of USDWs may come from a variety of sources, such as records for local domestic or municipal water supply wells or drilling records for nearby oil and gas wells. Drillers of new wells are required to record the depths at which they find fresh or formation water and to measure resistivity or use some other means to determine whether the water encountered qualifies as a USDW. In addition, the DEP instituted a public comment opportunity in the UIC permitting process. Notices of new permits are posted on the DEP website, and the public can easily view applications and draft permits.

## Records show West Virginia failed to meet UIC program standards

Although our review of DEP records found that they are not always clear or consistent, they are adequate to determine that West Virginia has failed to meet all of the standards it agreed to uphold in the MOA and to effectively administer its UIC program in accordance with the SDWA's requirements and the state's own regulations. Our analysis revealed that a significant number of Class IID disposal wells have ongoing or past issues that raise concerns about compliance, including many that do not appear to have been addressed by state regulators. Each is discussed in detail below.

The most serious of our concerns are these:

- Roughly one-quarter of the wells submitted reports indicating continued injection under an expired permit.<sup>31</sup>
- Mechanical integrity tests (MITs) were often not conducted as frequently as required, and far fewer operators than required conducted their mandatory MITs in the presence of a qualified state witness.<sup>32,33</sup>
- More than half of the wells appear to have been abandoned without being plugged as required, some for more than 10 years.<sup>34</sup>

## *Injecting without a permit*

Under state and federal law, operators are not allowed to inject waste underground without a permit. Permits specify what kind of activity may occur, important safety requirements such as maximum injection pressure and plugging plans, financial assurances demonstrating that operators can properly plug a well and reclaim a site once a well reaches the end of its productive life, and other important conditions designed to protect aquifers. Because the permit process is so important, courts have long treated permit violations as a breach of a state's UIC program, even if there is no proof that the operation in question has contaminated an aquifer.<sup>35</sup> More specifically, "The government need only show the absence of a permit under [a state's] UIC program."<sup>36</sup>

Our analysis found documents that raise concerns about permit-related compliance at seven wells, including: injecting without a permit, continuing to operate while failing to apply for a permit renewal before the permit has expired, submitting an incomplete permit application and continuing to operate, and continuing to inject despite a DEP order to the contrary. Our file reviews as of May 2016 found:

1. **PAXTON 7:** The permit expired in November 2013, and a NOV for injecting without a permit was issued in January 2014.<sup>37</sup> In May 2014 DEP issued an order to cease operations until the violation had been fully abated.<sup>38</sup> Records indicate that the operator continued to inject through at least June 2014. This same well had an expired permit in 2004, but its operator filed monthly reports showing injection through 2008, when a new permit was issued.

2. **SUMMERS 7:** After the permit expired in November 2013, the operator submitted a deficient permit application in July 2014. In January 2015, DEP issued an order instructing the well's operator that "further injection without prior authorization is prohibited." The operator filed monthly reports indicating continued injection through December 2015, without any evidence of additional enforcement in the records, before receiving a new permit.<sup>39</sup>

3. **FREW 3:** The operator reported injection in 2007 after its permit expired. A new permit took effect in 2008. This permit expired in November 2013, just one month after the operator submitted an incomplete permit application. DEP issued an order in February 2014 allowing continued operation under the terms of the expired permit, even though uninterrupted injection is allowed only when a new application arrives at least 180 days prior to expiration of the permit.<sup>40</sup>

4. **CONLEY 3:** A NOV was issued in January 2014 for operating without a permit.<sup>41</sup> This same well had a permit that expired in 2004, yet the operator filed monthly reports showing daily injection through 2007.

5. **DRILCO I:** A NOV was issued in March 2010 for operating without a permit.<sup>42</sup> This same well had a permit that expired in 2001; the operator filed an incomplete application for a new permit in 2009.

6. **JONES I:** The permit expired in October 2013, but the operator did not apply for a renewal until January 2014. DEP issued an order in February 2014 allowing continued operation under the terms of the expired permit.<sup>43</sup> Previously, this well had a permit that expired in December 2003, but the operator reported injection through July 2004 and in November 2007.

7. **HARPER I:** The permit expired in 2002, but the operator filed monthly reports showing injection in 2008.

Allowing operators to continue to inject after an existing permit has expired is a significant threat to the clean water resources of West Virginia because it allows operation of waste disposal sites without confirmation of the necessary safeguards established in permits to protect aquifers.

### ***Inadequate or faulty mechanical integrity tests***

MITs are used to determine if there are leaks in an injection well. Leaks in well construction materials such as the casing or cement can allow injected or displaced fluids to migrate out of the intended injection zone and into an unauthorized zone, including an aquifer. In West Virginia, a well passes an MIT if the test results demonstrate that “[t]here is no significant leak in the casing, tubing, or packer,” known as the Part I MIT, and “[t]here is no significant fluid movement into an underground source of drinking water through vertical channels adjacent to the injection well bore,” known as the Part II MIT.<sup>44</sup> The absence of a significant leak in the casing, tubing, or packer is demonstrated by continuous monitoring of annulus pressure or periodic pressure testing.<sup>45</sup> The absence of significant fluid movement from the UIC well to an aquifer is demonstrated by a study of cementing and other records for the well.<sup>46</sup>

Under West Virginia law, operators must conduct MITs on each Class II well once every five years.<sup>47</sup> But West Virginia has allowed wells to go far longer without the required MITs. Our review found five wells that appear to have more than 10 years between MITs. In total, we found evidence indicating that 13 of the 19 wells did not have timely MITs. Our file reviews as of May 2016 found the following examples:

1. **PAXTON 7:** The last MIT in the files was in 1995, yet there is evidence of the well being operated as recently as 2014, when it received a NOV for operating without a permit.<sup>48</sup>

2. **DRILCO I:** Received a NOV in 2010 for not having had a MIT within the past five years.<sup>49</sup> There is no record of the well ever having a MIT during its years of operation from the 1990s until a 2011 MIT, which it failed.

3. **CONLEY 3:** The last MIT included in the files was in 1998, but there is evidence that the operator reported injection as recently as 2010; a NOV was issued in January 2014 for operating without a permit.<sup>50</sup>

4. **SCHOOLCRAFT I63:** Received a NOV in 2008 for not having had a MIT within the past five years. There is no record of the well having a MIT between 1997 and 2009.<sup>51</sup>

5. **WOODS 3:** The most recent MIT found in the files was from 2009, and the previous one was from 1997.

6. **JONES I:** Received a NOV in 2009 for not having had a MIT since 1994.<sup>52</sup> It received another NOV in 2015 for not having had a MIT within the past five years.<sup>53</sup>

7. **LOWTHER 2:** The last MIT found in the files was from 2008, with the previous one in 2002, a gap of more than five years.

8. **FREW 3:** Received a NOV in 2010 for not having had a MIT within the past five years.<sup>54</sup> The previous one in the files was from 2002.

9. **HARPER I:** The last MIT found in the files was from 1994; the permit expired in 2002, more than five years later.

Even when MITs are conducted and witnessed by a state inspector at the appropriate interval, the DEP has accepted MITs that do not appear to conform to all legal requirements. At times, for example, the DEP accepted MITs that reported only the height of fluid in the annulus between the tubing and casing during injection, instead of the results of the required pressure testing.<sup>55</sup>

To ensure that MITs were performed correctly, West Virginia’s primacy application and MOA with the EPA promised that at least 25 percent of all MITs performed each year would be witnessed by an agency inspector and indicated that the agency intended to have as many as possible witnessed.<sup>56</sup> However, between 2010 and 2014, records show that the proportion of MITs witnessed at all UIC IID wells in West Virginia never exceeded 15 percent and dropped as low as 7 percent in 2012. Although state witnesses observed 50 percent of MITs conducted in 2015, potentially signaling a renewed commitment to this requirement, the fact that this number dropped so low for so long is concerning.<sup>57</sup>

### ***Operating with potentially dangerous pressure***

West Virginia permits stipulate a maximum injection pressure (MIP) at waste disposal wells and require wells to be equipped with pressure gauges to ensure compliance. An inspection document from 2009 indicates that the operator of the Lowther 2 well had injected waste at twice



the permitted MIP, yet no evidence was found in the files that a violation notice was issued.<sup>58</sup> A well inspection at the Harper 1 well reported a broken pressure gauge and reported that its operator was estimating the MIP instead of taking actual measurements, yet we found no evidence indicating that DEP issued a violation notice to the operator.<sup>59</sup>

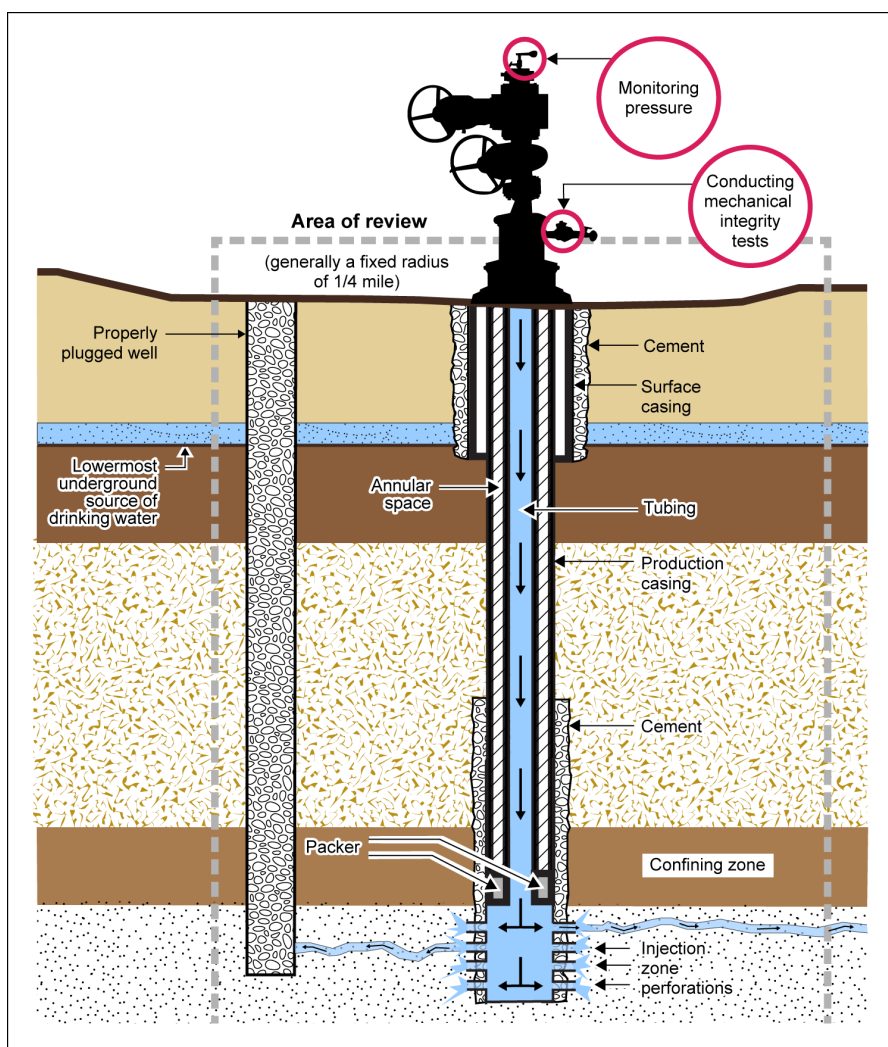
Allowing wells to operate beyond agency-mandated pressure limitations can lead to potentially dangerous conditions that may endanger groundwater. High pressures can damage the well components, which may compromise mechanical integrity. Exceeding the approved injection pressure may also result in fracturing of either or both of the injection and confining formations, which may lead to a loss of containment. Maximum injection pressure limitations should be strictly enforced, and wells operating near this limit should be subject to enhanced monitoring.

### *Injecting into uncemented wells*

To construct the well, steel pipe, called casing, is inserted into the well. Wells typically contain multiple concentric layers of casing, which extend to various depths in the well. The outermost layer of pipe, known as conductor casing, is typically very shallow, and its function is to stabilize loose soil for deeper drilling. The next layer, called surface casing, is intended to isolate protected sources of groundwater from contaminants in the wastewater being pumped into the well. The space between the surface casing and the rock formation is known as an annulus. Cement is used to seal the annulus and protect groundwater from contaminants. Figure 2 shows a Class II well with these safeguards.

Industry best practice and most state regulations require the annulus behind the surface casing to be completely filled with cement. This is essential to ensure that wastewater cannot escape the well and contaminate an

**FIGURE 2: CLASS II INJECTION WELL WITH SAFEGUARDS**



Sources: GAO analysis of EPA and Ohio's information. | GAO-14-555



Figure 3: October 2010 image of site for well I85 showing tanks near road.



Figure 4: March 2012 view of site for well I85 showing the tanks removed.

aquifer. Under West Virginia law, Class IID well operators must “permanently cement a string of casing in the hole through the fresh water bearing strata” in order to prevent fluid migration into aquifers.<sup>60</sup>

Of the 19 wells we reviewed, records indicate that two appear to lack this important safety feature. Records indicate that the Jones 1 well, constructed in 1941, was built using drilling fluid behind the surface casing instead of cement.<sup>61</sup> Nevertheless, a new permit to inject was granted in 2016.<sup>62</sup> The Conley 3 well, drilled in 1967, had an inspection in 2011 that reported a lack of cement, yet it has continued operating.<sup>63</sup>

### ***Allowing abandoned wells to remain unplugged***

Once a well is abandoned (i.e., no longer in use), it must be properly plugged to help ensure that it cannot act as a pathway for any oil or gas wastewater or other fluids to migrate into and contaminate protected groundwater.<sup>64</sup> Plugging a well involves sealing it with an impervious substance such as cement, clay, or grout and/or with a mechanical barrier like cast-iron plugs.

Under West Virginia law, any well that remains unused for 12 consecutive months is presumed abandoned and must promptly be plugged by the operator unless it is proved to have a bona fide future use.<sup>65</sup> However, the law does not define “promptly.” While an abandoned well must be plugged within 30 days of a DEP order to do so, the DEP has not been issuing such orders for all abandoned wells.<sup>66</sup>

A 2012 performance evaluation conducted by the West Virginia Legislative Auditor found that the West Virginia Office of Oil and Gas was not enforcing statutory requirements for abandoned oil and gas wells, and that this had caused the number of abandoned wells to increase in the state.<sup>67</sup> Our review of 19 wells found evidence indicating that 15 were abandoned but unplugged.<sup>68</sup> These included three that appeared to have been unplugged

for more than 10 years.<sup>69</sup> As of May 2016, only one of those 15 wells had been granted a “bona fide future use” exemption.<sup>70</sup> In some cases, based on analysis of Google Earth aerial imagery on different dates such as the images above, it appears that operators removed equipment and structures from the well site, but records indicate that they still had not plugged the well.<sup>71</sup>

Records in the files indicate that DEP issued NOVs to operators of only four of these unplugged wells, and our investigation found no evidence of any action to ensure that alleged violations were remedied.<sup>72</sup> Absent appropriate monitoring and maintenance, inactive and unplugged wells could pose a serious threat to the aquifers they penetrate.

In addition, we identified two instances in which the operators of apparently abandoned and unplugged UIC wells were issued permits for new production wells at other locations.<sup>73</sup> West Virginia law requires that a permit be denied if the secretary of the Department of Environmental Protection or a designee determines that an applicant has committed a substantial violation of a previously issued permit—even if it is a permit for a different well—and has failed to abate or seek review of the violation in the time prescribed by the director.<sup>74</sup>

## **WEST VIRGINIA’S DEP HAS FAILED TO ADEQUATELY ENFORCE THE APPLICABLE UIC LAW**

As mentioned earlier, in 2015, there were 67 active, abandoned, or shut-in UIC Class IID wells in West Virginia. Our analysis of 19 wells found that 17 had at least one issue of concern. Our review of well records revealed cases where enforcement action was taken by the state as well as cases where that did not occur. However, it is important to note that our study was only able to identify concerns that were apparent from reviewing well records. West Virginia law requires inspectors to note, describe,

and report all violations.<sup>75</sup> However, there may also be circumstances where an operator commits a violation that is never witnessed by an inspector, or where the inspector discovers a problem but doesn't document it in a written record. The concerns we did discover were serious:

- 15 wells that appeared abandoned remained unplugged;
- 7 wells had recent permit-related issues;
- 13 wells had evidence of procedural problems with MITs;
- 1 well was reported to have exceeded its maximum injection pressure on at least one occasion but was allowed to continue to operate; and
- 2 did not have evidence of cement behind surface casing.

These 17 wells represent a substantial number of West Virginia's UIC wells and, taken together, reveal a pattern of unsafe practices and lax enforcement over the years. Any improperly operated well has the potential to cause environmental problems, and potential violations should be taken seriously.

Despite the commitments in its primacy application to monitor Class IID wells within its borders and carry out enforcement whenever violations make that a necessity, the West Virginia DEP has a record of failing to take adequate action in the face of safety concerns or to establish robust monitoring practices.<sup>76</sup> Our review of information available to the public did not identify a single instance from 2000 to 2015 in which the DEP imposed a fine on operators of any of the wells for violating state underground injection control laws. Other than one order to halt injection (which was apparently ignored without any evidence of repercussions), the DEP did not take any enforcement measures stronger than issuing a notice of violation.<sup>77</sup> Additionally, out of 21 NOVs from 2006 to 2015, six violations, or 29 percent, were not abated and were still outstanding as of 2016.

## **NRDC RECOMMENDS THE FOLLOWING ACTIONS FOR STATE AND FEDERAL REGULATORS:**

### **Recommendations for the West Virginia Department of Environmental Protection (DEP)**

#### **I. THE WEST VIRGINIA DEP MUST ESTABLISH STRONGER OPERATING STANDARDS.**

The department should take the following steps to strengthen standards:

- Conduct, at least once a year, physical inspections of all Class IID wells to ensure compliance with permit conditions and other program requirements, and verify the accuracy and adequacy of self-reported sampling, monitoring, and other data. The DEP should issue a report to the public with its findings each year.

- Closely monitor the monthly WR-40 reports submitted by well operators to the state, and respond immediately whenever an operator: reports injection where there is no active permit, misses a report, does not provide actual injection volumes, reports injection pressure above levels allowed by its permit, fails to report actual annulus pressure, or commits any other actions that may indicate violations.
- Maintain a 24-hour, toll-free telephone hotline as well as an online reporting website to allow citizens and workers to report complaints and possible violations and track their status, including any enforcement actions. This hotline should allow anonymous reporting to provide whistle-blower protection for workers.
- Require proof of an adequate financial bond or other assurance that an operator will have the financial means to properly plug a well and reclaim a disposal site, as stipulated under state law, rather than current practice, which allows an operator to merely assert that it "will maintain financial responsibility and resources to close, plug, and abandon underground injection wells(s) in a manner prescribed by the Chief of the Office of Oil and Gas" without providing evidence that it has done so.<sup>78</sup>
- Ensure that qualified state representatives witness at least 25 percent of mechanical integrity tests conducted by well operators.

#### **2. THE WEST VIRGINIA DEP MUST ENSURE ROBUST ENFORCEMENT.**

The DEP's failure to fully enforce West Virginia laws violates its primacy agreement, allows operators to endanger aquifers in apparent violation of the SDWA, and abdicates its responsibility to protect the citizens and communities of the state. Effective enforcement of the state's program is one of the fundamental requirements for a state Section 1425 program.

The DEP should take the following steps to ensure compliance:

- Hold violators accountable through strong and consistent enforcement and a clear and meaningful penalty structure that imposes minimum, mandatory fines (as well as nonmonetary consequences) that escalate based on the significance and pattern of noncompliance. Penalties must be greater than the potential maximum cost of compliance to deter violations.
- Promptly issue notices of violation upon receiving evidence that an operator has failed to follow the law or its permit conditions.
- Conduct return inspections for operators issued a notice of violation to verify that the operator has come into and remains in compliance.



- Automatically reject permit applications from operators with a pattern of noncompliance, and institute nondiscretionary standards for shutting down repeat offenders.
- Issue injection permits only to wells with proven cemented surface casing, and require immediate remediation—or if remediation is not possible, plugging and abandonment—of all wells that are known to lack cemented surface casing.
- Eliminate agency officials’ (or staff’s) discretion to reduce penalties or decline to issue notices of violation, and establish an ethic of robust enforcement within the agency.
- Ensure adequate staffing level of inspectors specifically trained to inspect UIC wells and enforce West Virginia law and the SDWA.

### 3. THE WEST VIRGINIA DEP MUST ENSURE TRANSPARENCY OF ALL INFORMATION TO THE PUBLIC.

The DEP currently maintains publicly accessible online databases of wells and permitting data as well as a separate web page announcing when proposed Class IID permits are open to public comment. However, it remains difficult for citizens to access the information they need to protect their drinking water sources and communities. The UIC and violations databases have not been available to the public online since 2017, when changes were made to the databases. Public access to information about wells, including permits, MIT results, inspections, violations, and compliance records, is critical. These wells often operate in residential, rural, and agricultural areas close to sources of drinking water. The DEP must disclose all nonconfidential information to the public using an easily accessible and centralized database. There are several additional steps the agency should take to improve public access to information:

- Restore the UIC and violations databases to public access as soon as possible.
- Require operators to proactively notify local communities whenever there are alleged violations or incidents on or near their property or water sources. Make it easy for citizens to sign up for instant notification of any incidents reported in their community using a variety of methods (e.g., email, text messaging, voicemail, postal mail), track complaints and subsequent enforcement actions, and obtain the aggregate data needed for public health and environmental analysis.
- Publicize all DEP enforcement activities in the centralized database, including inspections, violation notices, and penalties issued, as well as some record of subsequent operator compliance or noncompliance.

The database should also record all incidents, including spills, leaks, blowouts, and worker injuries. It should be easily accessible on a public, searchable website managed by the state. Information should be posted immediately and include scanned copies of compliance enforcement documentation. Members of the public should not be required, as is currently the case, to travel to the DEP Office of Oil and Gas in Charleston to gather certain information about the UIC program.

- Specify whether “inspections” documented in the database are on-site physical inspections or an in-office review of documents submitted by operators. Currently, in-office reviews of documents are categorized as “inspections” in the database.

## Recommendations for the Environmental Protection Agency:

### I. THE EPA MUST ENSURE ENFORCEMENT OF THE SDWA IN WEST VIRGINIA.

Although West Virginia has UIC primacy, the EPA maintains supervisory oversight responsibilities for the state’s program, including responsibilities for enforcement if the state fails to act. According to the state’s primacy application, the “EPA shall oversee the State’s administration of the UIC program on a continuing basis to assure that such administration is consistent with this MOA, the State UIC grant application, and all applicable requirements embodied in current regulations, policies and Federal law.”<sup>79</sup> The application also states, “When the State has a fully approved program the EPA will not take enforcement actions without providing prior notice to the State and otherwise complying with Section 1423 of the SDWA.”<sup>80</sup>

Section 1423 outlines how the EPA administrator must respond whenever “any person who is subject to a requirement of an applicable underground injection control program in [a primacy state] is violating such requirement.”<sup>81</sup> The EPA must notify the state and the alleged violator when it finds a violation is occurring in a primacy state, such as West Virginia. If, after 30 days, the state has not commenced an “appropriate enforcement action,” the EPA “shall” file a civil lawsuit or issue an enforcement order directly, state primacy notwithstanding.<sup>82</sup> West Virginia’s failure to enforce its own laws is precisely the sort of deficiency that would ordinarily trigger federal enforcement under the state’s primacy application and SDWA Section 1423.

### 2. THE EPA MUST ELIMINATE THE INCORPORATION REQUIREMENT.

Despite its regulatory provision stating that state laws should be incorporated by reference into the federal regulations, the EPA has not incorporated any state laws

into its regulations since 1991, and even then, the GAO reported that “the revisions did not codify all of the programs approved to date.”<sup>83</sup> The EPA has neglected to incorporate any laws at all for two of the 40 states that currently exercise primacy for Class II wells.<sup>84</sup> One of those states happens to be West Virginia.<sup>85</sup> As a consequence, in the event that the EPA becomes aware of a violation in West Virginia (or Arkansas), the agency’s failure to incorporate the applicable state rules into its regulations makes it unclear whether and how the EPA will exercise its statutory duty to take enforcement action under Section 1423 of the SDWA in the event these states fail to resolve violations.<sup>86</sup> Such ambiguity also exists for certain violations in states where the EPA has incorporated only some of the rules.

It is not apparent why the EPA adopted this requirement in the first place. When asked by the GAO, the agency claimed that “[w]ithout codification, it would not be possible to find a complete set of EPA-approved rules for a state in one place.”<sup>87</sup> However, even if compiling all state program requirements in one place is helpful, it is unacceptable (and arguably contrary to the obligation the statute imposes upon EPA to take enforcement action when the state fails to do so) for the EPA to establish rules that were interpreted to prevent it from enforcing federal law to protect drinking water sources. The GAO has stated that, despite the EPA’s suggestion that the incorporation requirement was useful, it “continue[s] to believe that the EPA should explore alternative methods.”<sup>88</sup> The GAO therefore recommended that the EPA evaluate and consider alternatives to the current incorporation process.<sup>89</sup>

As noted earlier, the EPA’s rules are silent about such a requirement for state 1425 programs. However, there is no incorporation by reference requirement anywhere in SDWA. In fact, this provision appears to run counter to what Congress intended. The GAO has noted that, in creating this novel obligation, the EPA inhibited proper enforcement of federal and state laws.<sup>90</sup> As discussed above, Section 1423 of SDWA obligates the EPA to take enforcement action where state program requirements are being violated and a state fails to do so. The EPA regulations that could be read to imply that the agency may do so only where the state rule has been incorporated into the EPA’s own regulations not only are unnecessary but are likely contrary to law and create uncertainty about the EPA’s authority to enforce important drinking water protections.

The EPA should move forward with clarifying its interpretation of its rules as not mandating incorporation by reference to allow EPA to enforce primacy state UIC rules, and should issue a technical amendment to its rules eliminating the incorporation requirement and clarifying

that there is no limitation on its authority to enforce SDWA. The repeal of the incorporation requirement could also include a new requirement that each primacy state submit to the EPA a list of all existing and effective rules. The EPA could make this nationwide list publicly available in one place and require states to submit updates when any rules are changed so that the EPA can keep the national database up to date.

### 3. THE EPA SHOULD TEMPORARILY SUSPEND WEST VIRGINIA’S UIC PRIMACY.

As long as there is uncertainty around the EPA’s enforcement authority, and until West Virginia takes steps like those outlined above to rectify alleged violations and inadequate enforcement, the EPA should temporarily suspend its approval of West Virginia’s UIC primacy. The EPA has clear authority to withdraw primacy under the terms of the SDWA.<sup>91</sup> Agency regulations further elaborate the conditions necessary for it to undertake such a step. According to 40 CFR § 145.33, the EPA “Administrator may withdraw program approval when a State program no longer complies with the [applicable] requirements . . . and the State fails to take corrective action,”<sup>92</sup> including failure to “act on violations of permits or other program requirements,”<sup>93</sup> “seek adequate enforcement penalties or to collect administrative fines when imposed,”<sup>94</sup> or “comply with the terms of the Memorandum of Agreement.”<sup>95</sup> The EPA can initiate proceedings to take such action immediately to provide the protection that West Virginia’s citizens deserve and so urgently need.

Notification of its intent to withdraw West Virginia’s current primacy approval under Section 1425 does not mean the EPA would be obligated to directly administer the state’s entire program immediately. Instead, the EPA could provide the state with time to either demonstrate its ability to implement and enforce the law as required under Section 1425, or to apply for primacy under Section 1422. A similar situation occurred in 2014, when the EPA requested that the California Division of Oil, Gas, and Geothermal Resources take a series of actions to administer its UIC program in accordance with approved statute and regulation in order to “enable the State to maintain primacy.”<sup>96,97</sup> Under 1422, the West Virginia DEP would retain primary UIC enforcement responsibility, and the state’s program would conform to all the federal minimum standards enumerated in Section 1421—not just the four required under Section 1425. Therefore, the EPA would have an unambiguous legal basis for stepping in to enforce when the state could not or would not, and enforcement would no longer be contingent on incorporation of state requirements into federal law.



ENDNOTES

- 1 Molly A. Maupin et al., *Estimated Use of Water in the United States in 2010*, U.S. Geological Survey Circular 1405, at pages 18-19, 22, 2014, <http://pubs.usgs.gov/circ/1405/pdf/circ1405.pdf>.
- 2 John Veil, *U.S. Produced Water Volumes and Management Practices in 2012*, Ground Water Protection Council, page 112, April 2015, [http://www.gwpc.org/sites/default/files/Produced%20Water%20Report%202014-GWPC\\_0.pdf](http://www.gwpc.org/sites/default/files/Produced%20Water%20Report%202014-GWPC_0.pdf).
- 3 *Ibid.*, at page 113.
- 4 US Environmental Protection Agency (hereinafter EPA), *Technical Development Document for the Effluent Limitations Guidelines and Standards for the Oil and Gas Extraction Point Source Category*, pages 59-80, June 2016, [https://www.epa.gov/sites/production/files/2016-06/documents/uog\\_oil-and-gas-extraction\\_tdd\\_2016.pdf](https://www.epa.gov/sites/production/files/2016-06/documents/uog_oil-and-gas-extraction_tdd_2016.pdf).
- 5 US Government Accountability Office (hereinafter GAO), *Drinking Water: EPA Program to Protect Underground Sources From Injection of Fluids Associated With Oil and Gas Production Needs Improvement*, pages 21-25, June 2014, <http://www.gao.gov/assets/670/664499.pdf>.
- 6 Discussions of SDWA generally utilize the original section numbers (e.g., Section 1422). For ease of reference, this report generally provides parallel citations of the current section of the U.S. Code. However, a full list of cross-references can be found in: Congressional Research Service, “Safe Drinking Water Act (SDWA): A Summary of the Act and Its Major Requirements” at table 2, pages 20-22, March 1, 2017, <https://fas.org/sgp/crs/misc/RL31243.pdf>.
- 7 42 U.S.C. § 300h(b)(2).
- 8 Or, rarely, to store liquid hydrocarbons.
- 9 EPA, “National Underground Injection Control Inventory—Federal Fiscal Year 2015 State and Tribal Summary,” 2016, [https://www.epa.gov/sites/production/files/2016-10/documents/underground\\_injection\\_control\\_inventory\\_fy\\_2015\\_0.pdf](https://www.epa.gov/sites/production/files/2016-10/documents/underground_injection_control_inventory_fy_2015_0.pdf).
- 10 GAO, *Drinking Water: EPA Program to Protect Underground Sources*, page 1.
- 11 EPA, “National Underground Injection Control Inventory.”
- 12 GAO, *EPA Needs to Collect Information and Consistently Conduct Activities to Protect Underground Sources of Drinking Water*, February 2016, <https://www.gao.gov/assets/680/675439.pdf>.
- 13 42 U.S.C. § 300h(b)(1).
- 14 42 U.S.C. § 300h-1(b).
- 15 42 U.S.C. § 300h-4(a).
- 16 GAO, *Drinking Water: EPA Program to Protect Underground Sources*, page 63.
- 17 These requirements are rudimentary and provide a wide degree of latitude to states to determine when underground injection “endangers drinking water sources.” Specifically, the four requirements are: (1) that the state program shall not allow underground injection other than by permit or rule, (2) that no injection shall be permitted by permit or rule if it would “endanger drinking water sources,” (3) that the state program shall “include inspection, monitoring, recordkeeping, and reporting requirements” (though there are no requirements regarding the strength or effectiveness of these requirements), and (4) shall apply to any underground injection, whether by government agencies or any other person. SDWA Section 1421 (b)(1); 42 U.S.C. § 300h (b)(1).
- 18 42 U.S.C. § 300h(c).
- 19 42 U.S.C. § 300h-2(a)(1); *see also* 40 C.F.R. § 145.33.
- 20 42 U.S.C. § 300h-2(a)(1).
- 21 *Ibid.*
- 22 *See* 40 C.F.R. § 147.1(e). However, the rules leave open the possible interpretation that the EPA may enforce even if it has not incorporated the state program by reference.
- 23 *See* 42 U.S.C. § 300h-2.
- 24 GAO, *Drinking Water: EPA Program to Protect Underground Sources*, page 41.
- 25 *Ibid.* page 44.
- 26 *Ibid.* page 69.
- 27 *Ibid.* at 41-45.
- 28 West Virginia Department of Environmental Protection, Oil and Gas Database, <http://dep.wv.gov/OIL-AND-GAS/DATABASEINFO/Pages/default.aspx>.
- 29 In 2017, the DEP removed this information from its online system. In a 2015 report, the Natural Resources Defense Council and FracTracker Alliance named West Virginia as one of only three states nationwide that provided easily accessible public oil and gas violation data (“Fracking’s Most Wanted: Lifting the Veil on Oil and Gas Company Spills and Violations,” April 2015, [www.nrdc.org/sites/default/files/fracking-company-violations-IP.pdf](http://www.nrdc.org/sites/default/files/fracking-company-violations-IP.pdf)). When asked why the files were removed from public online access, agency officials reported to us that they had upgraded their public online databases and were in the process of completing changes. Public online access, they say, will be restored before “too much longer” (personal communication from John Kearney, Environmental Resource Analyst, West Virginia Department of Environmental Protection, to Amy Mall, October 12, 2018).
- 30 State documents referenced in this report can be found at: [www.wvso.org/uic-report-documents/](http://www.wvso.org/uic-report-documents/).
- 31 W. Va. CSR §47-13-13.12.b. *See also*: W. Va. CSR § 47-13-13.10.c.
- 32 W. Va. CSR § 35-4-7.7.b (requiring an MIT at least every five years).
- 33 West Virginia Office of Oil and Gas of the Department of Mines and the Oil and Gas Conservation Commission, Application for Program Authorization for Class II Wells Under Section 1425 of the Safe Drinking Water Act, Section D.2: “A qualified engineer, geologist, or inspector will inspect and witness at least twenty-five percent (25%) of mechanical integrity tests per year.” *See also*: Underground Injection Control Program Memorandum of Agreement Between the State of West Virginia and the United States Environmental Protection Agency Region III (hereinafter MOA), Section III.D.
- 34 W. Va. CSR § 47-13-9.1.a and W. Va. Code §§ 22-6-19, 22-6-23, and 22-6-24. West Virginia explicitly incorporated the standards found today at W. Va. CSR § 47-13 into its primacy application, and § 47-13-9.1.a extends the law in turn to include the relevant state laws and regulations: “The criteria and standards applicable to Class 2 wells shall be those which are required pursuant to W. Va. Code §§22-6 et seq. and 22C-9-1 et seq. and the rules thereunder.”
- 35 *U.S. v. King*, 660 F.3d 1071, 1077-78 (9th Cir. 2011).

36 Ibid. at page 1076. In this case, the state was Idaho.

37 State of West Virginia, Department of Environmental Protection (hereinafter West Virginia DEP), Office of Oil and Gas, Notice of Violation, Violation No. 8963, January 22, 2014.

38 West Virginia DEP, Office of Oil and Gas, Order to Cease Operations for Failure to Abate Violation, Violation No. 8963, May 1, 2014.

39 West Virginia DEP, Office of Oil and Gas, Order No. 2015-UIC-1, January 30, 2015. *See*: W. Va. CSR § 47-13-13.12.b; § 47-9-3.5.

40 West Virginia DEP, Order No. 2014-UIC-6, February 7, 2014. According to W. Va. CSR § 47-9-3.5, “If a permittee wishes to continue an activity pursuant to [W. Va. CSR § 47-13-13.12.b] the permittee must apply for a permit renewal at least one hundred eighty (180) days prior to expiration of the permit.” *See also*: W. Va. CSR § 47-13-13.10.c (“The Director shall not issue a permit . . . before receiving a complete application”).

41 State of West Virginia DEP, Office of Oil and Gas, Notice of Violation, Violation No. 8962, January 22, 2014.

42 West Virginia DEP, Office of Oil and Gas, Notice of Violation, Violation No. 1-8332, March 1, 2010. *See*: W. Va. CSR § 47-13-13.1.a.

43 West Virginia DEP, Order No. 2014-UIC-4, February 7, 2014. According to W. Va. CSR § 47-13-13.12.b, any operator who “wishes to continue activity regulated by this permit . . . must apply for *and obtain* a new permit” (emphasis added) and must therefore halt injection until it has been issued.

44 W. Va. CSR § 47-13-6.2.a.

45 *See*: Ibid. § 47-13-6.2.b.

46 *See*: Ibid., § 47-13-9.1.a. *See also*: Ibid., § 35-4-7.3.b.6 (requiring the submission to W. Va. DEP of the “entire casing and cementing record, any packers and other special downhole equipment, and cement bond logs”).

47 W. Va. CSR § 35-4-7.7.b. (“The mechanical integrity of a liquid injection or waste disposal well must be demonstrated to the approval of the Chief again within five (5) years from the last test date in order for injection to continue”).

48 West Virginia DEP, Office of Oil and Gas, Notice of Violation, Violation No. 8963, January 22, 2014.

49 West Virginia DEP, Office of Oil and Gas, Notice of Violation, Violation No. 2-8333, March 1, 2010.

50 West Virginia DEP, Office of Oil and Gas, Notice of Violation, Violation No. 8962, January 22, 2014.

51 West Virginia DEP, Office of Oil and Gas, Notice of Violation, Violation No. 18, December 4, 2008.

52 West Virginia DEP, Office of Oil and Gas, Notice of Violation, Violation No. 1-8291, October 9, 2009.

53 West Virginia DEP, Office of Oil and Gas, Notice of Violation, Violation No. 9160, January 6, 2015.

54 West Virginia DEP, Office of Oil and Gas, Notice of Violation, Violation No. 8356, April 1, 2010.

55 W. Va. CSR § 47-13-6.2.d allows the director of the DEP to authorize the use of “a test to demonstrate mechanical integrity other than those listed in subdivisions 6.2.b and 6.2.c of this section,” but the DEP must first obtain EPA consent in writing—and we can find no evidence that such approval was ever granted.

56 West Virginia Office of Oil and Gas of the Department of Mines and the Oil and Gas Conservation Commission, Application for Program Authorization for Class II Wells Under Section 1425 of the Safe Drinking Water Act, Section D.2, 1982: “A qualified engineer, geologist, or inspector will inspect and witness at least twenty-five percent (25%) of mechanical integrity tests per year.”

57 In 2012, it appears that 14 MITs were conducted and only one was witnessed, based on an August 2016 review of online UIC inspection and MIT databases. These databases are currently not available online to the public.

58 UIC Inspection Report, October 15, 2009. “Injection pressure must not exceed 603 psi,” yet observed shut-in well pressure was 1225 psi.

59 This was revealed during a 2002 inspection of the Harper 1 well: “Gauge connection still bad 200 PSI estimated well in operation.” Inspections at Lowther 2 found no gauge on the well in 2003 and 2004.

60 W. Va. Code, § 22-6-21.

61 W. Va. Dept. of Mines, Oil & Gas Division, Well record: Permit No. Kan-798 (“Cement Record: 4-26-41 Aquagelled 13-3/8” Casing, Ran 12 sacks Aquagel and 30# Fibrotex. Aquagel mixed 6%.” Aquagel is a bentonite product used in drilling fluid.) <http://downloads.wvgs.wvnet.edu/BatchInfo/kanawha/4703900798compO.tif>.

62 New permit for Jones 1, issued April 11, 2016.

63 “No cement on surface string . . . UIC permit needs cancelled.” UIC Inspection Report, November 9, 2011.

64 Theodore F. Buckwalter, et al., “Ground-Water Resources and the Hydrologic Effects of Petroleum Occurrence and Development, Warren County, Northwestern Pennsylvania,” U.S. Geological Survey, page 62, 2007; EPA Region III, “Response to Comments for the Issuance of an Underground Injection Control (UIC) Permit for Windfall Oil and Gas, Inc.,” page 10, 2014, [https://yosemite.epa.gov/oa/eab\\_web\\_docket.nsf/Attachments%20By%20ParentFilingId/34D8B9DEDA47583A85257C9F0061DFE6/\\$FILE/Exhibit%20Y%20EPA%20Response%20To%20Comment.pdf](https://yosemite.epa.gov/oa/eab_web_docket.nsf/Attachments%20By%20ParentFilingId/34D8B9DEDA47583A85257C9F0061DFE6/$FILE/Exhibit%20Y%20EPA%20Response%20To%20Comment.pdf).

65 W. Va. Code § 22-6-19: “Any well which is completed as a dry hole or which is not in use for a period of twelve consecutive months shall be presumed to have been abandoned and shall promptly be plugged by the operator.”

66 Ibid., §22-10-9.

67 West Virginia Legislative Auditor, Performance Evaluation & Research Division, “Agency Review: Office of Oil and Gas, Department of Environmental Protection,” page 5, September 2012, [http://www.legis.state.wv.us/Joint/PERD/perdrep/Oilgas\\_9\\_2012.pdf](http://www.legis.state.wv.us/Joint/PERD/perdrep/Oilgas_9_2012.pdf).

68 These wells are Andrews 1, M.E. Elder 1, Lowther 2, Frew 3, Haight 2, 185, W-19, Paxton 7, Conley 3, Schoolcraft 163, Harper 1, Woods 3, Drilco 1, Loup Creek 19, and WP-401 WIW. For all wells reviewed, status was obtained from DEP records in 2016. Abandoned status is usually determined by lack of use for 12 months, though some wells not injecting are considered active by DEP.

69 These wells are 185, Harper 1, and Drilco 1. Haight 2 and WP-401 WIW appear to have never been used for injection.

70 Well WP-401 WIW.

71 This appears to be the case at Andrews 1, Lowther 2, and 185.

72 DEP issued a notice of violation to the operators of one well in 2013, Drilco 1 (Violation No. 8949, November 4, 2013), and three wells in 2014: Conley 3 (Violation No. 8980, February 11, 2014), Andrews 1 (Violation No. 9065, June 25, 2014), and WP-401 WIW (Violation No. 9109, August 12, 2014). Only the last appears to have resolved its violation and received an exemption for future use. DEP issued orders to plug two wells, Schoolcraft 163 and Harper 1, after they were purchased by a new operator in 2015.

73 This is the case at Lowther 2 and W-19.

74 W. Va. Code § 22-6-6 (h). “The director shall deny the issuance of a permit if the director determines that the applicant has committed a substantial violation of a previously issued permit, including the erosion and sediment control plan, or a substantial violation of one or more of the rules promulgated hereunder, and has failed to abate or seek review of the violation within the time prescribed [by law].”

75 W. Va. Code § 22-6-2(d)

76 “The state shall operate a timely and effective compliance monitoring system to track compliance with permit conditions and program requirements.” MOA, Section III.A. The application goes on to detail specific steps West Virginia will take in order to determine which operators remain in compliance with applicable requirements, and which do not. And in those instances when compliance monitoring reveals an operator who is not in compliance, West Virginia agreed to be “responsible for taking timely and appropriate enforcement action against persons in violation of program requirements, compliance schedules, technical requirements, permit conditions, and other UIC program requirements.” MOA, Section IV.A.

77 This was the Summers 7 well. The operator received Order No. 2015-UIC-1, January 30, 2015, yet continued to inject even though it did not receive a new permit for more than a year after that.

78 West Virginia DEP, “Requirement for Financial Responsibility to Plug/Abandon an Injection Well,” Appendix I of DEP UIC Permit. By way of comparison, federal regulation 40 C.F.R. § 144.52 requires operators “to demonstrate and maintain financial responsibility and resources to close, plug, and abandon the underground injection operation in a manner prescribed by the Director,” and EPA Region III, which covers West Virginia, has implemented this by requiring the permittee to maintain financial responsibility and resources “in the amount of at least \$30,000.” See: EPA, Region III, “Underground Injection Control Permit Number PAS2D020BCLE Authorization to Operate a Class IID Injection Well,” February 14, 2014, <http://sootyapaws.net/uic/files/documents/WindfallFinalPermit.pdf>, page 13.

79 MOA, Section V.A.

80 MOA, IV.D.

81 42 U.S.C. § 300h-2(a)(1)

82 Ibid. (“If beyond the thirtieth day after the Administrator’s notification the State has not commenced appropriate enforcement action, the Administrator shall issue an order under subsection (c) of this section requiring the person to comply with such requirement or the Administrator shall commence a civil action under subsection (b) of this section”).

83 GAO, *Drinking Water: EPA Program to Protect Underground Sources*, page 69.

84 Ibid.

85 Ibid. (“EPA officials are aware that part 147 is out of date with respect to state program revisions, as well as these two state programs missing in their entirety.” However, when pressed by GAO, “EPA officials could not explain why these state programs were not codified, noting that these events predated their tenure at the agency.”)

86 See: GAO, *Drinking Water: EPA Program to Protect Underground Sources*, page 69 (noting that “by the terms of section 147.1 in conjunction with the act, EPA is unable to enforce those state program requirements that are not contained in part 147”).

87 Ibid. at Appendix V (“Comment Letter from the EPA on GAO Study”), page 95.

88 Ibid. at page 57.

89 Ibid. at page 54.)

90 Ibid. at pages 67-69 (noting that EPA has established in regulation “an obligation not found in the act: that state programs must be codified into the part 147 regulations to be enforceable by EPA”).

91 The EPA administrator has authority to withdraw primacy under Section 1425 (c)(2), which provides that “the State shall have primary enforcement responsibility . . . until such time as the Administrator determines, by rule, that such demonstration is no longer valid. Following such a determination, the Administrator may exercise the authority of subsection (c) of section 1422 in the same manner as provided in such subsection with respect to a determination described in such subsection.” 42 U.S.C. § 300h-4 (c)(2). Section 1422 (c) states that the administrator shall prescribe a program applicable to the state where a state program does not meet the minimum necessary requirements. 42 U.S.C. § 300h-1 (c).

92 40 C.F.R. § 145.33 (a).

93 Ibid. § 145.33 (a)(3)(i).

94 Ibid. § 145.33 (a)(3)(ii).

95 Ibid. §145.33 (a)(4).

96 Letter from Jared Blumenthal, EPA Region IX, to Matt Rodriguez, California Environmental Protection Agency, and John Laird, California Natural Resources Agency, July 17, 2014, <https://www.epa.gov/sites/production/files/2015-07/documents/epa-letter-doggr-rodriguez-laird-2014-07-17.pdf>.

97 Letter from Jane Diamon, EPA Region IX, to Jonathan Bishop, California State Water Resources Control Board, and Steven Bohlen, Division of Oil, Gas and Geothermal Resources, December 22, 2014 (noting that this letter was “to follow up” on the July 17, 2014 letter and that it “provides direction for the State’s submittal of a program revision plan”), <ftp://ftp.consrv.ca.gov/pub/oil/UIC%20Files/CA%20Class%20II%20UIC%20letter%20December%202014.docx.pdf>.