

## Technical and Scientific Resources Regarding Matrix Acidizing



Well stimulation is an umbrella term that captures any operation at an oil or gas well whereby fluids are injected into the rock formation in order to increase the production or recovery of oil or gas. Matrix acidizing is a form of advanced well stimulation which uses methods similar to “fracking.” This technique involves a lower pressure than acid or hydraulic fracturing. It dissolves the rock, rather than fractures it. Matrix acidizing treatments can have the same effect on geology as small hydraulic fracturing treatments – creating wormholes up to 20 feet in carbonate formations.

Although the idea of using acids for oil well stimulation is an old concept, “the chemicals, volumes, and techniques used in acidizing have evolved”<sup>1</sup> and pose unacceptable risks to Florida.

### **PUBLIC HEALTH ISSUES**

- The chemical concentrations used in matrix acidizing are high – even higher than found in hydraulic fracturing. Injected fluids for matrix acidizing are typically between 6 to 18% chemicals, whereas chemicals in hydraulic fracturing operations make up only about 0.5% of the fluids used.<sup>2</sup>
- There are about 200 specific chemicals used in matrix acidizing treatments, “with at least 28 of them being F-graded hazardous chemicals, which are known carcinogens, mutagens, reproductive toxins, developmental toxins, endocrine disruptors, or high acute toxicity chemicals.”<sup>3</sup> Most of the chemicals used in acidizing are similar to hydraulic fracking.<sup>4</sup>

<sup>1</sup> Abdullah, 2016. Toxicity of Acidizing Fluids Used in California Oil Exploration. Toxicological and Environmental Chemistry, 2016. <http://dx.doi.org/10.1080/02772248.2016.1160285>. University of California, Los Angeles.

<sup>2</sup> *Ibid.*

<sup>3</sup> *Ibid.*

<sup>4</sup> Abdullah, 2016. Acidizing Oil Wells, a Sister Technology to Hydraulic Fracturing: Risks, Chemicals, and Regulations.

- A 20,000 gallon mixture of 10% hydrochloric acid was utilized in the matrix acidizing operation at the Collier Hogan well<sup>5</sup>. Hydrochloric acid is, “corrosive to the eyes, skin, and mucous membranes. Acute (short-term) inhalation exposure may cause eye, nose, and respiratory tract irritation and inflammation and pulmonary edema in humans. Acute oral exposure may cause corrosion of mucous membranes, esophagus, and stomach and dermal contact may produce severe burns, ulceration, and scarring in humans. Chronic (long-term) occupational exposure to hydrochloric acid has been reported to cause gastritis, chronic bronchitis, dermatitis, and photosensitization in workers. Prolonged exposure to low concentrations may also cause dental discoloration and erosion.”<sup>6</sup>
  - “No information is available on the reproductive or developmental effects of hydrochloric acid in humans. In rats exposed to hydrochloric acid by inhalation, severe dyspnea, cyanosis, and altered estrus cycles have been reported in dams, and increased fetal mortality and decreased fetal weight have been reported in the offspring.”<sup>7</sup>

### **CONTAMINATION RISK TO WATER SUPPLIES**

- A UCLA study found that the chemicals used in matrix acidizing are similar to those used in hydraulic fracturing and that use of this treatment comes with similar pathways for contamination.<sup>8</sup> For more information on pathways to contamination, see the Conservancy’s Technical and Scientific Resources Regarding Well stimulation Treatments” handout.
- The acid used in matrix acidizing can corrode metal, and place oil well casings at further risk of failure.

### **WASTE OF DRINKING WATER SUPPLY**

- In Collier County, the Collier Hogan well was permitted to use 280.32 millions of gallons of fresh water each year for 5 years from the lower Tamiami aquifer, which is easily accessible potable water through shallow wells.<sup>9</sup> This water is cheaper to access and treat than water located in the brackish or salty aquifers found deeper underground.<sup>10</sup> Yet Collier County obtains 59% of its drinking water from deeper, more expensive, and harder to access saltier/brackish aquifers to meet its needs.<sup>11</sup> Both hydraulic fracturing and matrix acidizing occurred at the Collier Hogan well in 2013.
- When this fresh water is used in well stimulation projects, it is injected below ground and only a small percentage is returned. This water cannot be recycled back into drinking water due to use of toxic chemicals, presence of naturally-occurring radioactive materials from deep underground, and the resulting saltiness of the wastewater.

<sup>5</sup> Dan. A. Hughes Company. Completion Procedure. Collier-Hogan #20-3H, Sunniland Field, Collier county, Florida. September 16, 2013.

<sup>6</sup> US Environmental Protection Agency. Hydrochloric Acid (Hydrogen Chloride): Hazard Summary – Created in April 1992; Revised in January 2000. Available at <https://www.epa.gov/sites/production/files/2016-09/documents/hydrochloric-acid.pdf>. P. 1

<sup>7</sup> *Ibid.* P. 2.

<sup>8</sup> Abdullah, 2016. Acidizing Oil Wells, a Sister Technology to Hydraulic Fracturing: Risks, Chemicals, and Regulations.

<sup>9</sup> South Florida Water Management District, 2017. Water Use Permit NO. 11-03415-W. Collier County.

<sup>10</sup> South Florida Water Management District, 2007. Water Supply Cost Estimation Study.

<sup>11</sup> South Florida Water Management District, 2012. Lower West Coast Water Supply Plan Update

- Waste water returns from matrix acidizing can be highly acidic, in the range of pH 0-3.<sup>12</sup> Thus, the limestone and sandstone geologies do not completely neutralize the acids being applied.

## **ECONOMIC IMPACTS**

- **Tourism:** Environmental disasters have an enormous impact on Florida's tourism-based economy. There are a total of 1.4 million jobs in Florida that depend on the tourism industry.<sup>13</sup> This is easy to see from the most recent algal bloom in the Caloosahatchee - the entire state is impacted economically, not just in the local or regional area of the ecological disaster. In the 4 counties that were placed under a state of emergency in 2016 due to this algal bloom, there was four billion dollars of economic impact to marine industries and 37,000 individual employees were directly impacted.<sup>14</sup>
- **Energy Reserves:** The oil obtained from Florida accounts for less than 1/10<sup>th</sup> of 1% of all of the United States oil reserves.<sup>15</sup> Given the potential environmental impacts that could impact our tourism- and real estate-based economy, well stimulation is not worth the risk to public resources for such little return.

## **Banning Matrix Acidizing Will Still Allow for Conventional Oil and Gas Production**

Routine oil well cleaning can also involve the injection of acid into a well. However, the intent of such cleaning is to remove scale and other debris built up in the wellbore.

Unlike matrix acidizing treatments, cleaning operations do not target deep into the rock formation and acid does not stray far from the well. By rule, cleaning operations could be distinguished from matrix acidizing stimulation if the amount of acid used does not dissolve the rock formation more than 3 feet beyond the well bore (in either direction). Treatments that fall below this acid volume threshold can be defined as routine cleaning operations; those that are above this threshold are well stimulation treatments that should be banned. The farther acid moves from the well, the greater the risk posed to Florida's water resources.

Banning matrix acidizing will still allow for regular well cleaning and conventional oil and gas drilling.

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<sup>12</sup> Abdullah, 2016. Toxicity of Acidizing Fluids Used in California Oil Exploration. Toxicological and Environmental Chemistry, 2016. <http://dx.doi.org/10.1080/02772248.2016.1160285>. University of California, Los Angeles. Citing Schuchart, 1995; Gdanski and Peavy, 1986; and Taylor et al, 1999.

<sup>13</sup> Employment data from the Florida Department of Economic Opportunity (as reported by Visit Florida.org) <http://www.visitflorida.org/about-us/what-we-do/>

<sup>14</sup> These are Florida's Waters. This is Their Destruction. Everglades Coalition Fact Sheet. 23 February 2017.

<sup>15</sup> Hernandez, 2015. "Energy Pro: Florida Is Not A Big Oil State. So Why Drill?" Wlrn.org, 17 Aug 2015.