



Dirty Dozen: The 12 Most Commonly Used Air Toxics in Unconventional Oil Development in the Los Angeles Basin

A Report from the Center for Biological Diversity

INTRODUCTION

For the first time in California, operators of oil and gas wells have been forced to disclose some of the chemicals they use in extreme oil and gas production techniques. These reports confirm that dangerous extraction methods are using harmful and toxic chemicals and exposing Californians to unacceptable risks.

Starting June 4, 2013, the South Coast Air Quality Management District (“SCAQMD”) began requiring oil and gas well operators to submit reports (“Event Reports”) that disclose where and when they plan to use unconventional recovery techniques such as acidization, gravel packing and hydraulic fracturing (“fracking”). The same rule — Rule 1148.2 of SCAQMD’s regulations¹ — requires operators to disclose the chemicals used in their operations in a publicly available chemical report within 60 days of completion (“Chemical Reports”). In early August operators started disclosing many of the chemicals being used.

These disclosures demonstrate that air toxics — chemicals considered among the most dangerous air pollutants because they can cause illness and death — are being used routinely in extreme energy-recovery techniques in Southern California. This report demonstrates the need for a prohibition on these activities, as well as full disclosure of all chemicals used in all phases of oil and gas production.

FINDINGS

Approximately one month’s worth of Chemical Reports is now available on the SCAQMD website. A review of the first month’s Chemical Reports, made available through the website’s online search function,² showed that oil and gas well operators are using many harmful chemicals in their acidization, gravel packing and fracking operations. Operators must also clearly indicate any chemical considered an air toxic by SCAQMD, whose jurisdiction includes Los Angeles and Orange counties.

The 12 most commonly used air toxics in recent months are:

¹ SCAQMD Rules and Regulations, Rule 1148.2, available at <http://www.aqmd.gov/rules/reg/reg11/r1148-2.pdf>

² Available at <http://xappprod.aqmd.gov/r1148pubaccessportal/>

The 12 Most Commonly Used Air Toxics in Unconventional Oil Production in the L.A. Basin			
Rank	Chemical	Number of Times Used³	Known Health Effects⁴
1	Crystalline Silica	117	Harmful to skin, eyes and other sensory organs, respiratory system, immune system and kidneys; mutagen. Known human carcinogen. ⁵
2	Methanol	85	Harmful to skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys, reproductive and cardiovascular system; mutagen, developmental inhibitor and endocrine disruptor.
3	Hydrochloric Acid	43	Harmful to skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, immune system, cardiovascular system and blood.
4	Hydrofluoric Acid	16	Harmful to skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys, reproductive system and cardiovascular system; mutagen, developmental inhibitor.
5	2-Butoxy Ethanol	13	Harmful to skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys, reproductive system and cardiovascular system; mutagen, developmental inhibitor and endocrine disruptor; linked to liver cancer. Also linked to adrenal tumors. ⁶
6	Ethyl Glycol (Monobutyl Ether)	11	Harmful to skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys, reproductive system and cardiovascular

³ In some cases, the same chemical ingredient was listed as being used multiple times in the same Chemical Report for different purposes. In such cases, each use is counted separately.

⁴ Unless otherwise noted, health effects are documented by TEDX Endocrine Disruptor Exchange. Spreadsheet of health effects listed by chemical is available at <http://www.endocrinedisruption.com/chemicals.multistate.php>.

⁵ SCAQMD Staff Report for Proposed Rule 1148.2 – Notification and Reporting Requirements for Oil and Gas Well Chemical Suppliers (April 2013) Appendix A, p. A-14, available at <http://www.aqmd.gov/hb/attachments/2011-2015/2013Apr/2013-Apr5-031.pdf>.

⁶ U.S. EPA Integrated Risk Information System, Ethylene glycol monobutyl ether (EGBE)(2-Butoxyethanol) (CASRN 111-76-2), available at <http://www.epa.gov/iris/subst/0500.htm>; See also Abraham Lustgarten, ProPublica, Buried Secrets: Is Natural Gas Drilling Endangering US Water Supplies?

			system; mutagen, developmental inhibitor, and endocrine disruptor; linked to liver cancer.
7	Xylene	10	Harmful to skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys, reproductive and cardiovascular system; developmental inhibitor and endocrine disruptor.
8	Amorphous Silica Fume	7	Harmful to skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver; linked to lung cancer.
9	Aluminum Oxide	7	Harmful to skin, eyes and other sensory organs, respiratory system, and brain and nervous system.
10	Acrylic Polymer (Acid)	6	Harmful to skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys and cardiovascular system; mutagen and developmental inhibitor.
11	Acetophenone	6	Causes skin irritation, corneal injury, hematological effects; possible damage to lung, kidney and liver. ⁷
12	Ethylbenzene	6	Harmful to skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, kidneys, reproductive system and cardiovascular system; mutagen, developmental inhibitor and endocrine disruptor.

BACKGROUND

There has been a growing controversy over unconventional oil development in California. New and dangerous techniques tied to oil production, including fracking, acidization and gravel packing, have been used increasingly in California, with little or no oversight by the state.

Recently, however, SCAQMD began requiring operators to disclose what chemicals they use in these unconventional and extreme methods of oil extraction. Operators must first file an Event Report, which discloses where the well is located, what method will be used for extraction and other basic information. Within 60 days of the operation, operators must also submit a Chemical Report, which identifies all the substances used during the extraction process, with key exceptions.

Approximately one month has elapsed since operators submitted the first Chemical Reports. The SCAQMD posts the reports online and allows the public to search and download the information in a variety of ways.

⁷ U.S. EPA Technology Transfer Network Air Toxics Website, Acetophenone, available at <http://www.epa.gov/ttnatw01/hlthef/acetophe.html>

The SCAQMD requires reporting for three types of unconventional oil extraction — acidization, gravel packing and fracking. Each method carries significant risks to public health, safety and the environment. The number of Event Reports submitted for each method is summarized in the table below:

Month	Acidization	Gravel Packing	Fracking
June	35	22	4
July	54	32	6
August	81	41	1
Total⁸	170	95	11

Acidization

Acidization is a process in which a combination of hydrochloric acid and other acids are mixed with brine and other chemicals and injected underground to dissolve oil-bearing formations. Once the surrounding rock is dissolved, oil flows to the well more freely. Since event reporting began in early June 2013, operators have filed at least 170 Event Reports pertaining to acidization in SCAQMD jurisdiction.

Gravel Packing

In gravel packing, gravel is injected with a chemical mixture into the well to form filters that help prevent the buildup of sand inside the well. Minimizing sand buildup increases the flow of oil to the surface. At least 95 Event Reports pertaining to gravel packing have been submitted to SCAQMD since June 2013.

Fracking

Fracking is a recovery method in which large amounts of water, sand and harmful chemicals are injected under extremely high pressures into a rock formation to create fractures in the oil-bearing rock and allow oil to flow to the surface. At least 11 Event Reports pertaining to fracking have been submitted to SCAQMD since June 2013.

“Trade Secrets” Claims Conceal Key Information

The full extent of the risks of unconventional oil recovery techniques is still unknown, in part because SCAQMD allows oil companies to keep the identity of certain chemicals hidden from the public if the companies claim it is a trade secret.⁹ Instead of disclosing what chemicals are used, the company merely submits a vague description, which SCAQMD substitutes for the real chemical information when the reports are posted online.

These descriptions are often so vague that they do not provide the public with any information about what chemicals might be used. For example, some “trade secret” chemicals are described as a “lubricant,” “surfactant,” or simply “mixture.”

⁸ The numbers include original Event Reports as well as revisions (49 for acidization, 45 for gravel packing, 0 for fracking) and cancellations (11 for acidization, 4 for gravel packing, 0 for fracking). Thus the number of times each practice has actually occurred will be slightly lower than the number of reports submitted to SCAQMD.

⁹ Rule 1148.2(f)(2)

Extremely Dangerous Chemicals Used Routinely

The chemical information that is disclosed provides valuable information about the names and types of chemicals used in unconventional oil recovery. Operators must also clearly indicate chemicals considered an air toxic by SCAQMD. Air toxics include toxic air contaminants and hazardous air pollutants and are considered among the most dangerous types of air pollutants because they can cause illness and death.¹⁰ The most commonly used air toxics in the reports are listed below:

Crystalline Silica:

- Reported use in 127 instances.
- Used for many purposes, including as a proppant, cement extender, bonding agent or gelling agent.
- A known mutagen. Health effects include damage to the skin, eyes and other sensory organs, respiratory system, immune system and kidneys. Exposure can result in silicosis.
- Known human carcinogen.

Methanol:

- Reported use in 85 instances.
- Used for many purposes, including as a non-emulsifier, corrosion inhibitor, wetting agent, bonding agent, surfactant and clay stabilizer.
- Health effects include damage to the skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys, cardiovascular system and reproductive system; a mutagen, developmental inhibitor and endocrine disruptor.

Hydrochloric Acid:

- Reported use in 43 instances.
- Used to dissolve underground rock formations; extremely dangerous and can become flammable or even explosive. Direct contact can cause severe burns.
- Health effects include damage to the skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, immune system, cardiovascular system and blood.

Hydrofluoric Acid:

- Reported use in 16 instances.
- Used to dissolve underground rock formations; extremely dangerous and an acutely toxic chemical.
- Health effects include damage to the skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys, cardiovascular system and reproductive system; mutagen and developmental inhibitor.

¹⁰ Toxic air contaminants are those that “may cause or contribute to an increase in mortality or in serious illness, or which may pose a present or potential hazard to human health.” California Health and Safety Code § 39655.

2-Butoxy Ethanol:

- Reported in 13 instances.
- Used as a cleaning agent and solvent.
- Health effects include damage to the skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys, cardiovascular system and reproductive system; mutagen, developmental inhibitor and endocrine disruptor; linked to liver cancer. Also linked to adrenal tumors.¹¹

Ethyl Glycol (Monobutyl Ether):

- Reported in 11 instances.
- Used as a weighted spacer blend, crosslinker and solvent.
- Health effects include damage to the skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys, reproductive system and cardiovascular system; also a mutagen, developmental inhibitor and endocrine disruptor; linked to liver cancer.

Xylene:

- Reported in 10 instances.
- Used as a cleaner and solvent.
- Health effects include damage to the skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, immune system, kidneys, cardiovascular system and reproductive system; a developmental inhibitor and endocrine disruptor.

Amorphous Silica Fume:

- Reported in 7 instances.
- Used as a bonding agent.
- Health effects include damage to the skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver; linked to lung cancer.

Aluminum Oxide:

- Reported in 7 instances.
- Used as a cement extender.
- Health effects include damage to the skin, eyes and other sensory organs, respiratory system, and brain and nervous system.

Acrylic Polymer:

- Reported in 6 instances.
- Used to prevent fluid loss.
- Health effects include damage to the skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system,

¹¹ U.S. EPA Integrated Risk Information System, Ethylene glycol monobutyl ether (EGBE)(2-Butoxyethanol) (CASRN 111-76-2), available at <http://www.epa.gov/iris/subst/0500.htm>; See also Abraham Lustgarten, ProPublica, Buried Secrets: Is Natural Gas Drilling Endangering U.S. Water Supplies?

immune system, kidneys and cardiovascular system; mutagen and developmental inhibitor.

Acetophenone:

- Reported in 6 instances.
- Used as a cleaner and corrosion inhibitor.
- Health effects include skin irritation, corneal injury, hematological effects and possible damage to the lung, kidney and liver.

Ethylbenzene:

- Reported in 6 instances.
- Used as a wellbore cleaner and solvent.
- Health effects include damage to the skin, eyes and other sensory organs, respiratory system, gastrointestinal system and liver, brain and nervous system, kidneys, reproductive system and cardiovascular system; a mutagen and endocrine disruptor.

Conclusion

The information that has become publicly available from SCAQMD's Rule 1148.2 has confirmed that unconventional oil recovery methods use numerous harmful air toxics that pose a threat to public health, safety and the environment. These inherently dangerous techniques pose an unacceptable risk to public health and should not be allowed in California.

In addition, the practice of hiding the identity of chemicals that pollute our air and water under claims of trade secrecy should be discontinued, and SCAQMD and other state and federal agencies should disclose to the public the full range of chemicals being used in all phases of oil and gas development.

The Center for Biological Diversity is a national, nonprofit conservation organization with more than 625,000 members and online activists dedicated to the protection of endangered species and wild places.