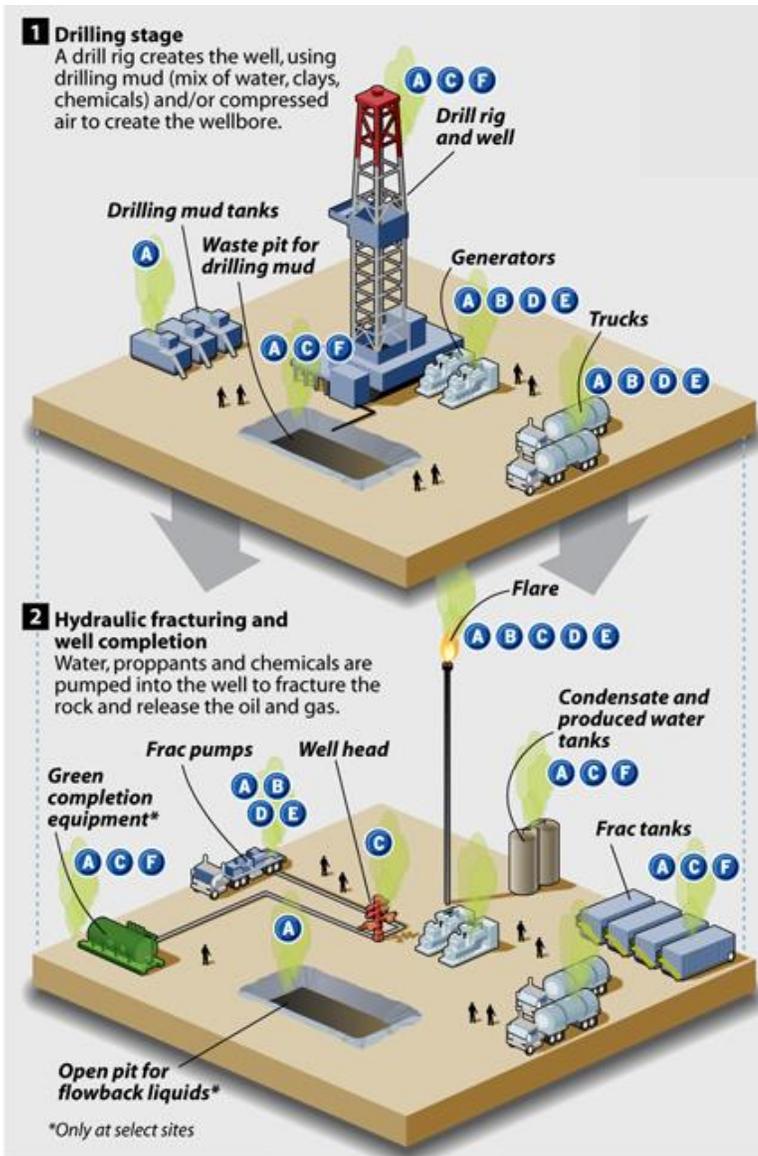


Wastes Produced During Stages or Processes of Oil & Gas Extraction

Hydraulic Fracturing & Conventional Extraction*

1. Drilling fluids, drill cuttings, chemicals used on pad surface, servicing fluids, naturally-occurring toxins, etc
2. Liquids & solids that return to surface (Fracturing solution, brine, drill cuttings, naturally-occurring toxins, etc
3. Brine, condensate, residual fracturing solution & naturally-occurring toxins removed from gas
4. Brine, condensate, residual & naturally-occurring impurities
- 6-7. Residual toxins, brine & contaminated leachate



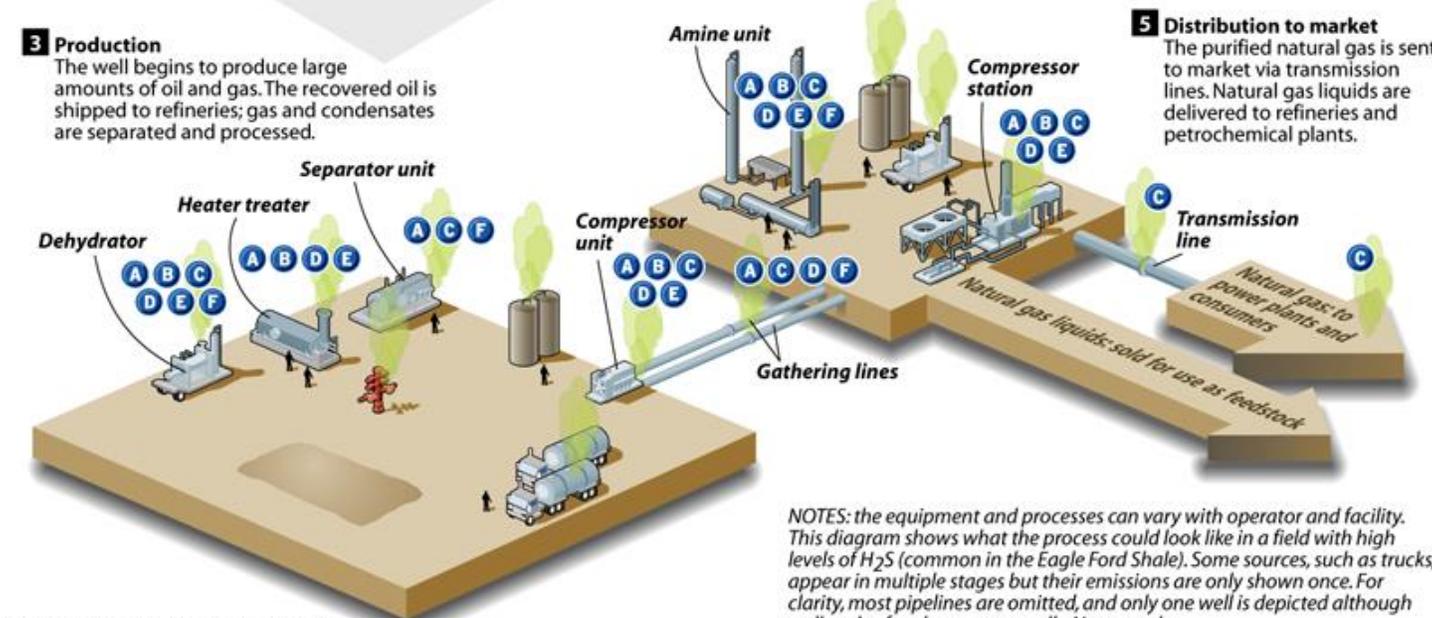
Quantities of Waste Produced in Pennsylvania alone*
PADEP Data Jan-Jun 2015 (half year reported totals)

Waste Type	Barrels	Tons
Basic Sediment	13,385	
Drill Cuttings		596,068
Drilling Fluid Waste	568,103	
Flowback Fracturing Sand		44,913
Fracing Fluid Waste	3,963,864	
General O&G Waste		6,210
Produced Fluid	16,374,609	
Servicing Fluid	1,815	
Grand Total	20,921,776	647,192

Barrels = 42 gallons

Basic Sediment	562,170
Drilling Fluid Waste	23,860,326
Fracing Fluid Waste	166,482,288
Produced Fluid	687,733,578
Servicing Fluid	76,230
Grand Total	878,714,592

4 Dehydration, treatment and processing
Water, condensate, H₂S and other impurities are taken out of the raw natural gas. This can occur on or near the well pad or at a centralized processing facility. Additional equipment used to purify and process natural gas liquids is not shown here.



NOTES: the equipment and processes can vary with operator and facility. This diagram shows what the process could look like in a field with high levels of H₂S (common in the Eagle Ford Shale). Some sources, such as trucks, appear in multiple stages but their emissions are only shown once. For clarity, most pipelines are omitted, and only one well is depicted although well pads often have many wells. Not to scale.

SOURCES: EPA and Schlumberger publications; experts consulted for various aspects of the diagram include Ramón Alvarez (EDF), Richard Haut and Jay Olaguer (HARC), Alisa Rich (UNT), Jim Tarr (Stone Lions Env. Corp), engineers from industry and Cardno Entrix.

Research by LISA SONG / InsideClimate News Graphic by PAUL HORN / InsideClimate News

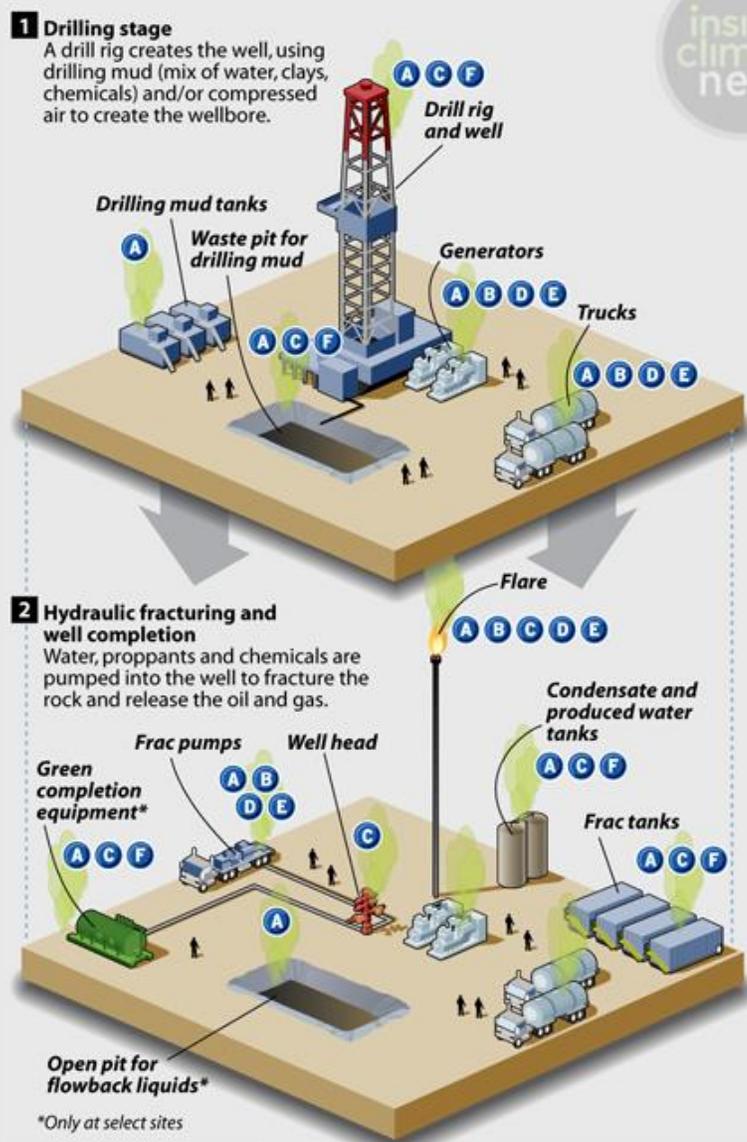
- 6 Storage Waste***
Waste that comes from industrial underground & LPG storage (brine, any chemicals or servicing fluids used on-site).
- 7 Landfill Leachate***
Drainage from landfills accepting oil & gas extraction wastes
*Added note to graphic: Additional prohibitions in local ordinances using Riverkeeper model language (JS-FWW) and waste from stages 1, 3, 4. HB 6329 includes waste from stage 2 only.

Air Emissions from Oil and Gas Development in the Eagle Ford

There are more than 7,000 oil and gas wells in the Eagle Ford Shale, and Texas regulators have approved another 5,500. Most of them, like the one shown here, are oil wells that also produce condensate and natural gas. Developing these resources releases various air pollutants, some of which are shown in this simplified diagram.



inside climate news

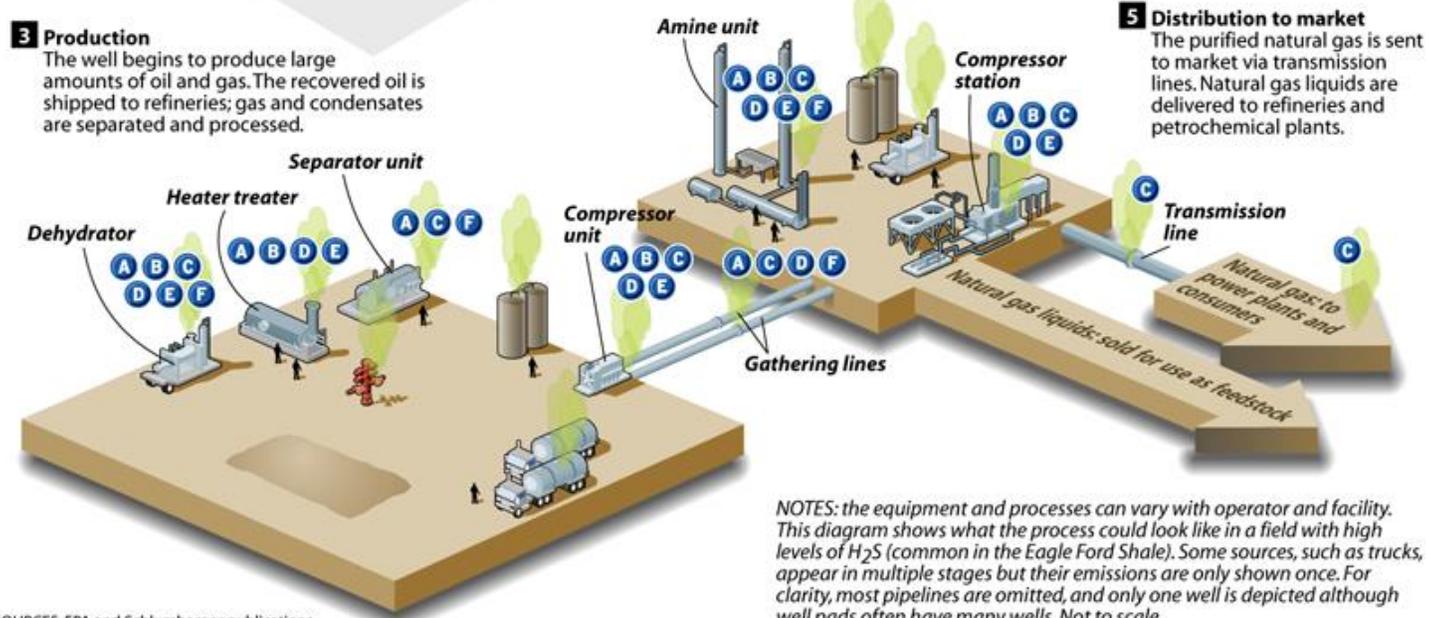


Emission Sources

The pollutants come from a number of sources, including the diesel- or natural gas-fueled equipment, the oil and gas itself, and leaks from storage devices. The emissions' actual and relative amounts vary widely based on operator practices and local geology. The emissions occur regularly in some cases, but are intermittent in others.

CHEMICAL	WHAT IT IS	WHAT IT DOES
A VOCs	Volatile organic compounds including benzene, formaldehyde	There are dozens of VOCs that make people sick. Some can cause cancer. VOCs react with benzene to form ozone, a respiratory irritant and greenhouse gas.
B PM	Particulate matter	Affects the heart and lungs.
C CH ₄	Methane	Main component of natural gas. Much more powerful than CO ₂ as a greenhouse gas.
D CO ₂	Carbon dioxide	Major greenhouse gas.
E NO _x	Nitrogen oxides	Reacts with VOCs to create ozone.
F H ₂ S	Hydrogen sulfide	Toxic gas found in some gas fields. Causes illness and death at certain concentrations.

Fugitive emissions: pipelines, valves, pneumatic devices etc. leak methane, VOCs, H₂S and CO₂ throughout the entire process.



NOTES: the equipment and processes can vary with operator and facility. This diagram shows what the process could look like in a field with high levels of H₂S (common in the Eagle Ford Shale). Some sources, such as trucks, appear in multiple stages but their emissions are only shown once. For clarity, most pipelines are omitted, and only one well is depicted although well pads often have many wells. Not to scale.

SOURCES: EPA and Schlumberger publications; experts consulted for various aspects of the diagram include Ramón Alvarez (EDF), Richard Haut and Jay Olaguer (HARC), Alisa Rich (UNT), Jim Tarr (Stone Lions Env. Corp), engineers from industry and Cardno Entrix.