

**Environmental Health Project
Shale Gas & Oil Health Impact Assessment
Template for Well Pad Site**

This Health Impact Assessment revolves around one central question: Do you have enough information to determine that it is safe to have the well pad in your community?

The Shale Health Impact Assessment (HIA) Template is designed to give you a structured way to bring together data on your community, the expected emissions from shale gas or oil development, and the potential health risks posed to residents in the immediate area. It can provide decision-makers with a comprehensive perspective on the siting, expanding, or maintaining of a shale gas or oil well pad. The HIA will aid in informed health-based decision-making. It can be used to support testimony at hearings, to educate residents and public officials, and to provide concrete data in meetings with companies and state or local agencies.

For an introduction to the drilling process, see FrackTracker's *Oil & Gas Drilling 101* at www.fracktracker.org/resources/oil-and-gas-101/

For a "virtual tour" of a well pad site, see FrackTracker's *Explore a Fracking Operation - Virtually*. www.fracktracker.org/resources/oil-and-gas-101/explore/

In addition, many industry websites describe the structures and activity at a well pad.

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Points to keep in mind:

- Well pads are more than just drilling rigs and wells. They include multiple pieces of machinery and a variety of processes and opportunities for leaks and venting. See above for a list of online sites that provide information on well pads.
- Emissions from well pads are significant.
- Exposures to emissions do not occur evenly over time. They vary by stages of development and, within stages, spike in intensity periodically.
- The extent to which people are exposed to air toxics is determined by the concentrations of emissions vented and leaked, distance from well pads and weather conditions.
- The extent to which people are exposed to water contamination is determined by the integrity of the well casing or impoundment pit, leaks or spills, hydrogeology of their area, and use of groundwater.
- There is now an abundance of information about shale gas site emissions and their potential to do harm.

Medical and Public Health professionals understand that:

- Certain types of particles and chemicals have well known health effects.
- Chemical toxicity in the human body can – but doesn't always – occur within minutes or hours of exposure.
- Repeated episodes of exposures can increase the potential and degree of harm.
- High exposures to chemicals and mixtures of chemicals can increase the seriousness of the damage.
- Understanding the changes in exposures is essential to understanding the health risks

Well Pad Health Impact Assessment Checklist

Have you been provided the information you need (from the company or public officials)?

This is best filled out once you've gone through the whole assessment.

	NOT PROVIDED	INCOMPLETELY ADDRESSED	ADDRESSED WELL*
Attention to concerns of residents			
Schedule of activities – when will each phase begin and end			
Listing of chemicals emitted and at what concentrations			
What emissions will occur for each stage of well development			
Projected exposure within a ½ mile of site – including peak levels			
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Radioactive material present			
Air monitoring plan specified			
Water monitoring plan specified			
Plan for wastewater			
Warning system in place for high releases or emergencies			
Emissions from flares estimated			
Sufficient distance from schools, day cares and other sensitive locations			
HEALTH IMPACTS			
Health effects of PM2.5 addressed			
Health effects of VOCs addressed			
Chronic and episodic exposure effects on children addressed			

Health risks to fetal development addressed			
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* By adequately, we mean you have been given concrete information and you feel confident that the information is accurate. But you may have other standards that you would use to judge the information provided.

QUESTIONS OFFICIALS MIGHT CONSIDER BEFORE MAKING SHALE GAS/OIL DECISIONS

To protect public health, it is necessary to know whether dangerous baseline or spikes in pollutants will occur at this well pad, how often, and what health effects may result in the short- and long-term. The Well Pad HIA can help you organize the information which will shape informed decision-making.

Completing the Assessment will allow you to start answering three critical questions:

- 1) What is being emitted or leaked?
- 2) Are people being exposed to emissions?
- 3) What are the health risks from exposures and who will bear those risks?

I. INTRODUCTION

1. WHAT IS THE PRIMARY ISSUE?

New well pad being constructed _____

Existing well pad being expanded _____

Concerned about existing well pad _____

2. WHY DOES THIS CALL FOR AN HIA?

Here you might list community concerns, especially health or safety concerns, nearby sensitive sites like homes, schools, day care centers, or nursing homes. If you know of them, you might talk about changes in regulations or ordinances that might be up for discussion or that should (or should not) be up for discussion.

3. WHO IS RAISING THE HEALTH IMPACT CONCERN? WHO IS PREPARING OR COMMISSIONING THE HIA?

(Health department, other public officials, community members, local, regional, or national organization)

4. WHO WILL BE AFFECTED BY A DECISION ON THE WELL PAD?

You could consider benefits as well as risks.

Could be

- *Individuals and families*
- *School children*
- *Local businesses*
- *The company seeking a permit*
- *Whole town/municipality (which would benefit from influx of funds/jobs)*
- _____
- _____

FACILITY OR FACILITIES OF CONCERN

5. BRIEFLY, WHAT DO YOU KNOW ABOUT THE WELL PAD? AND IF IT ALREADY EXISTS, WHEN WAS IT DEVELOPED? INCLUDE INFORMATION YOU MAY HAVE ON WASTEWATER.

A typical well pad can include road access, truck traffic, drill rig, fracking chemical tanks, fracturing pumps, sand storage, flowback storage, well pad compressor engines, separators (processing units), dehydrators, condensate and brine tanks, flaring apparatus, and vapor recovery unit.

CONCERNS OF RESIDENTS

7. Examples of concerns (you can rank them or not):

- Personal health and safety*
- Air contamination*
- Well water contamination*
- Soil contamination*
- Loss of property values near shale sites*
- Risks to wildlife and local habitat*
- Concern about accidents, emergency response, safety records*
- Health and wellbeing of the local community*
- _____
- _____

Resources for this section
Community hearing, neighborhood meeting, interviews, formal or informal discussion or survey

II. COMMUNITY CONTEXT

8. WHAT IS IN THE IMMEDIATE AREA: ½ MILE RADIUS, 1 MILE, 2 MILES

Land parcels within two miles of well pad

Check the ones that describe the area around the site – you can also put numbers or notes in:

Parcel Category	1/2 Mile Radius	1 Mile Radius	2 Mile Radius
Agricultural Land			
Residential			
Publically-owned park			
Schools or day cares			
Hospital			
Water reservoir			
Others....			
Residents			
Total # of adults			
Total # of children (17 and younger)			
Total # of elderly			
# of people on groundwater/well water			

8a) The closest residence is _____ miles (or yards or feet) from the site.

8b) Anything else you want to say about the immediate community?

Resources for this section

Your town hall may be able to help with this section – maybe the taxing or zoning office. Google Earth can help to identify structures at the various distances from the site.

9. A WELL PAD WILL ADD TO WHATEVER AIR POLLUTION IS ALREADY PRESENT. IT SHOULD BE EVALUATED BY WHAT IT ADDS TO YOUR AIR QUALITY, NOT ONLY WHAT IT PRODUCES ITSELF.

9a) Are there other polluters already in the area? Shale or non-shale?

9b) Are there plans for additional build-out of these sources?

9c) Is there anything you can say about your current air quality?

Examples include:

- *EPA Attainment vs Non-attainment designation*
- *Industry pollution already*
- *# of bad air quality days*
- *Summary of regional air quality*
- *Community members in a valley or other topographical feature that traps air contaminants*

Resources for this section

Go to www.airnow.gov to find the number of bad air days in your county over the last few years and how it could impact health. The National Environmental Public Health Tracking (www.cdc.gov/nceh/tracking/) is another good source for state- and county-level information.

9d) Is there anything you can say about water quality in your area?

10. ARE THERE ANY RELEVANT STATE OR LOCAL ENVIRONMENTAL OR PUBLIC HEALTH LAWS, REGULATIONS, ORDINANCES, THAT YOU KNOW ABOUT AND WOULD LIKE TO HIGHLIGHT?

COMMUNITY HEALTH

11. RELEVANT COMMUNITY HEALTH INFORMATION

For instance, many of the chemicals released at well pads can have respiratory effects. If you could locate asthma rates for adults and children, that could be useful. Some chemicals emitted can affect reproduction, if you have data on births (even just the number of births), that could be useful. The same would be true of cancer rates. You might include any health conditions your community is worried about.

Your state or local health department may be able to provide you with some information. The American Lung Assn has information on respiratory illnesses by zip code at www.lung.org/our-initiatives/healthy-air/sota/

III. WELL SITE EMISSIONS

This section reviews company projections or reports and provides perspective on the adequacy of the method of estimation and completeness of characterization of emissions.

12. WHAT TO DO IF NO EMISSIONS WERE PROJECTED/AVAILABLE?

If no emissions estimates or measurements are provided, there is no way to determine what pollution the community will be subjected to and whether the well pad is safe. This should be noted in the HIA. If there are no emissions estimates, it may be useful to draw on emissions documented at other well pads and the research on well pad emissions. It would be reasonable to stop activity on the permit or project until the site-specific information is provided.

WELL SITE AIR EMISSIONS

14. OPERATIONAL EMISSIONS, IF KNOWN (OR ESTIMATED).

Points of emission at a well site include: glycol dehydrators, combustion engines, reciprocating compressors, storage vessels, tanker truck load-out operations, fugitive emissions components, natural gas-driven pneumatic controllers, natural gas-driven pneumatic pumps, enclosed flares and other emission control devices, wellbore liquids unloading operations.

The site addressed by this HIA has the following estimated emissions.

Substance	Amount
NOx	
CO	
SOx	
PM ₁₀	
PM _{2.5}	
VOCs	
Any individual HAP	
Total HAP	

Resource for this section
State agency that permits oil & gas – often a Department of Environmental Protection or a Department of Natural Resources – may provide the maximum allowable emissions. A permit or permit application should include the estimate of the emissions for a particular site.

Hazardous Air Pollutants (HAPs) that state agencies might single out for monitoring include: benzene, ethylbenzene, formaldehyde, n-hexane, toluene, xylenes, acetaldehyde, acrolein, and 2,2,4-trimethylpentane [Colorado and Pennsylvania].

16. FLARES CONSIDERED TO YOUR SATISFACTION?

17. ACCIDENTS CONSIDERED TO YOUR SATISFACTION?

18. FUGITIVES OR LEAKS TO YOUR SATISFACTION? Fugitive emissions are releases that do not come from vents as part of normal operations. They include the emissions from valves, connectors, pressure relief devices, meters, and flanges, etc.

19. LIGHT & NOISE PRODUCTION TO YOUR SATISFACTION?

20. TRUCK TRAFFIC TO YOUR SATISFACTION?

WATER CONTAMINATION

People can potentially come into contact with water by ingestion, skin contact, soil/plant contamination, and inhalation in the form of steam.

Pathways of groundwater and surface water contamination from UOGD activities include leaks from deteriorating or improperly constructed wells, surface spills, and improper wastewater use, storage and disposal. Water can become contaminated with substances originating in the shale itself and from the chemical content of the fracturing fluid. Classes of constituents in this “produced water” include: a) inorganic substances and metals; b) volatile organic gases; c) hydrocarbons; and d) naturally occurring radioactive materials.

21. WAS A LIST OF THE CHEMICALS USED (OR EXPECTED TO BE USED) AVAILABLE? IF SO, WHAT WERE THEY?

22. WERE THERE ANY PRE-DRILL WATER TESTS DONE IN THE IMMEDIATE AREA?

This can include a variety of scenarios: Residential monitoring at the request of the resident, property line of the site at the request of the contractor/company, monitoring at the request, or conducted by, the state or local government.

22a) Where was the water sampled?

22b) What were the findings? Who was responsible for the sampling and analysis?

23. HAVE THERE BEEN ANY WATER TESTS CONDUCTED SINCE THE WELL PAD WAS DEVELOPED?

FracFocus is a national hydraulic fracturing chemical registry, which is used by more than 20 states. It presents many of the more common chemicals used in hydraulic fracturing. It does not present all of them. Individual wells can be searched. FracFocus is at www.fracfocus.org.

23a) Where was the water sampled?

23b) What were the findings? Who was responsible for the sampling and analysis?

24) WHAT IS THE WATER MONITORING PLAN GOING FORWARD?

SUMMARY AND PERSPECTIVE ABOUT EMISSIONS FROM YOUR SITE

21. THIS IS AN AREA WHERE YOU COULD PROVIDE ANY OTHER INFORMATION ABOUT THE WELL PAD AND NEARBY SITES, IF YOU THINK SOMETHING WAS NOT ALREADY ADDRESSED.

IV. HEALTH RISKS FROM AIR AND WATER CONTAMINANTS

CHILDREN, BIRTH OUTCOMES AND EXPOSURE TO SHALE GAS DEVELOPMENT

Children and pregnant women are especially sensitive to pollution and are at higher risk than other health adults. Exposing them to well pad emissions puts them at risk for both short- and potentially long-term health effects. Six large, well-conducted studies have been published on the effects of shale development activity and birth outcomes. The studies found a range of overlapping outcomes associated with exposure to well pads, including low birth weight, low APGAR scores, prematurity, and neural tube defects.

Children do not respond to emissions as though they are little adults; they are especially vulnerable:

- Children have higher respiratory rates and as a result children exposed to air contaminants breathe in more toxics per pound of body weight than adults.
- Children accumulate more toxics in their bodies than adults. They don't detoxify as efficiently.
- Children spend more time engaged in vigorous activity outside, increasing their air and potentially soil exposures.
- Children's brains are still developing. Many toxic agents are known to interfere with developmental processes within the brain.

HEALTH EFFECTS FROM EXPOSURES TO VOLATILE ORGANIC COMPOUNDS (VOCs)

VOCs, present at well sites, are a varied group of compounds which can range from having no known health effects to being highly toxic. Short-term exposure to some VOCs can cause eye and respiratory tract irritation, headaches, dizziness, visual disorders, fatigue, loss of coordination, allergic skin reaction, nausea, and memory impairment. Long-term effects can

include loss of coordination and damage to the liver, kidney, and central nervous system. For more information, see National Institutes of Health:

www.toxtown.nlm.nih.gov/text_version/chemicals.php?id=31

HEALTH EFFECTS FROM EXPOSURES TO PARTICULATE MATTER

Particulate Matter (PM), is the term for a mixture of particles and liquid droplets. PM_{2.5} are very fine particles; thirty times smaller than the diameter of a single hair. Because it is composed of such tiny components, it can reach deep into the lungs. Exposure to PM_{2.5} can also affect the heart. Health effects include: heart attacks, irregular heartbeat, asthma attacks; and respiratory symptoms such as irritation of airways, coughing, and difficulty breathing. See the EPA's website for additional information on PM: www.epa.gov/pm-pollution

NOISE-RELATED HEALTH EFFECTS

Research has demonstrated that chronic noise exposure can cause a wide array of health effects, including sleep disturbance, annoyance, noise-induced hearing loss, cardiovascular disease and endocrine effects. The cardiovascular and endocrine effects appear to be associated with the sleep disruption and psychosocial stress of the chronic noise. For additional information on noise, go to www.ehp.niehs.nih.gov/1307272/

POTENTIAL HEALTH EFFECTS FROM EXPOSURE TO WATER CONTAMINANTS

FracFocus presents an extensive list of hydraulic fracturing chemicals that are used at well pads. They include chemicals serving as biocides, friction reducers, scale inhibitors, and surfactants. Chemicals often documented are: ethylene glycol, naphthalene, xylene, toluene, ethylbenzene, formaldehyde. Studies have found increases in organics

Shale gas development uses fracturing fluids that contain organic and inorganic chemicals.... Chemicals are used as corrosion inhibitors, biocides, surfactants, friction reducers, gels and scale inhibitors, among others. In addition to the chemicals forced into the shale, flowback water includes a brine of salts, radioactive elements and metals such as Barium and Strontium, which are brought to the surface at the well site. Research has found in examining potential short term health effects from fracturing chemicals: skin, eyes, respiratory, gastro-intestinal, and liver. Brain and nervous system. Long-term organ and system damage can occur in the nervous system, immune system, kidney, and cardiovascular, also cancer. Also naturally occurring substances are being brought up to the surface with produced water or could be migrating through subsurface channels. These natural occurring substances include chloride, bromide, arsenic, strontium, and heavy metals.

V. RECOMMENDATIONS/REQUESTS FROM THE COMMUNITY IF A NEW WELL PAD (OR EXPANSION OF EXISTING PAD) IS PROPOSED

RECOMMENDATIONS AND MITIGATION (IF PERMIT GRANTED)

You could make any or all of the following recommendations so that the public's health can be adequately addressed. Other recommendations you have should be spelled out in this section as well.

- ◆ Perform a baseline health study to establish population health status before the compressor station is built.
- ◆ Require best practices to ensure that effective emissions control measures are kept up to date.
- ◆ Establish an alert system for water risks, large emissions and/or noise events.
- ◆ Put emergency plans in place.
- ◆ Institute a monitoring strategy at the well pad and surrounding locations and make the data public.
- ◆ Note times when it's just too dangerous to emit; for instance, when air is still and the sky is overcast, and children are likely to be outside.