

SHELL ONSHORE TIGHT/SHALE OIL & GAS OPERATING PRINCIPLES



DOING THINGS RIGHT

We are sharing our global onshore principles to address concerns around the development of onshore tight/shale oil and gas specifically with regard to the practice of hydraulic fracturing. If Shell weren't confident we could explore, develop and produce these resources safely and responsibly, we wouldn't be doing it.

Shell has a set of five global onshore tight/shale oil and gas operating principles that provide a tested framework for protecting water, air, wildlife and the communities in which we operate. We require all Shell-operated projects where hydraulic fracturing is used to adhere to these principles, but we also consider each project independently – from the geology to the surrounding environment and communities – and design our activities using state-of-the-art technology and innovative approaches that make the most sense for local conditions. We will report our performance against these principles.

Our principles are underpinned by a deliberate focus on safety, continuous improvement, collaboration with regulators and engagement with local residents where we strive to be open and transparent about how we operate and the impacts of our activities. We support regulation consistent with these principles, which are designed to reduce risks to the environment and keep those living near our operations safe.

Following are the five principles and examples of how we deliver on them.

1 Shell designs, constructs and operates wells and facilities in a safe and responsible way.

We have strict company standards for our well and facility designs and operating procedures around the world. Before we even begin to drill a well, we use a set of practices, called a "safety case," to analyze risks and develop protective barriers for the life of the well. For example:

- Worldwide, we use the Shell Global Drilling and Completion Standards.
- We build in two or more barrier layers in all oil and gas wells and for surface storage of fluids produced from our wells.
- We design steel casing and cement to protect and isolate the potable groundwater zone from the production stream, as well as hydraulic fracturing fluids, in the wellbore.

- We do not hydraulically fracture wells unless we have pressure tested the wellbore for integrity.
- We have eliminated the use of pit systems for primary containment of produced and drilling fluids in several operating areas. We will remove such pits in remaining operating areas over time.
- We release information about chemicals used in our hydraulic fracturing operations (to the extent allowed by our suppliers) and support regulation to require suppliers to release such information.
- We run and maintain our operations with trained personnel and conduct monthly safety reviews of our processes.
- We have emergency response plans for Shell-operated locations that take into account the local surroundings and we are prepared to respond quickly and effectively in the unlikely event that anything unplanned should happen.

GOAL ZERO

The company-wide "Goal Zero" program captures our aim to operate with no harm to people and no significant incidents. Our safety record is built on strict company standards, multiple required safety barriers, rigorous training and competency assurance, adherence to proven operating methods and a culture that requires workers, contractors and visitors to stop any unsafe activity.

2 Shell conducts its operations to protect groundwater and reduce water use as reasonably practicable.

We will not operate wells where isolation of our completion and production activities from potable groundwater cannot be achieved. For example:

- We design our completion and production activities in order to isolate them from potable groundwater aquifers.
- We use only air, water, or water-based drilling mud through and to at least 500 feet (150 meters) below the potable groundwater aquifer and case and cement that zone before drilling further or hydraulic fracturing.
- We keep well construction and producing activities no less than 1500 feet (457 meters) away from legally protected surface water bodies within the same watershed.
- For development projects in new areas, we test potable groundwater before and after we drill to help determine whether changes have occurred as a result of our activity.

- We design our operations to reduce use of potable water and to use non-potable water as reasonably practicable.
- We flow back hydraulic fracturing and completion fluids to closed systems or tanks.
- We work with local water boards and other agencies to identify suitable water sources.
- We recycle fracturing fluid and produced water (which exists naturally in the oil and gas zones) that comes out of the well to the extent reasonably practicable in the field and store, treat and dispose of it in an environmentally responsible manner, in accordance with regulatory requirements.

REUSING WATER

At Groundbirch in Canada, we are investing in the construction of a reclaimed water plant for the City of Dawson Creek. The plant will treat sewage and other waste water to be re-used in our operations and by the local government to, for example, clean roads and water sports fields.

3 Shell conducts its operations in order to protect air quality and control its fugitive emissions.

We develop a plan for each development and production well site we operate to reduce emissions as much as reasonably practicable. For example:

- We measure, catalog and report emissions to appropriate regulatory authorities.
- We will work toward testing our facilities for fugitive emissions by visual observation and infrared testing.
- Where permitted, we will eliminate routine venting; where venting is required by regulation, we will use

vapor recovery units or similar equipment as reasonably practicable at the wellhead.

- We will work toward using equipment that reduces emissions and/or clean fuels such as natural gas engines for our rig operations.

REDUCING EMISSIONS

At Pinedale in Wyoming, we have taken a number of steps to lower emissions from our operations. Shell was one of the first to adapt catalyst technology used in diesel cars and power plants to work efficiently on a drilling rig in the harsh Wyoming winters. The catalyst reduces local emissions from the drill rig engines by more than 90 percent.

4 Shell works to reduce its operational footprint.

We design our facilities and use technology to limit disturbance, including roads, well pad locations, noise and light. For example:

- We work to understand and reduce the impact from our operations on wildlife and livestock. This includes limiting activities during specific time periods.
- We will work toward installing gathering systems and pipelines where reasonably practicable and feasible during the development stage to eliminate trucking of produced fluids.
- We use best practices (such as using native plants and monitoring) in reclaiming sites.

RECLAMATION

At Pinedale, we take steps to restore the land once a drilling location is complete. We worked with the Bureau of Land Management to improve restoration practices. This included planting a mix of seed to match the surroundings and more quickly reintroduce sage brush, the staple diet of sage grouse, pronghorn and mule deer.

5 Shell engages with local communities regarding socio-economic impacts that may arise from our operations.

We work with communities to help develop local economies and improve how we operate. Listening to and engaging with our neighbors helps us identify and respond to concerns. For example:

- We meet with local communities to answer questions and share what we are doing.
- We assess the impacts of our operations on the social and economic life of the community and look for ways to reduce the consequences and strengthen the opportunities.
- We will create and share local socio-economic reports where helpful and reasonably practicable.
- We pursue opportunities to train and hire staff locally.
- We will identify local opportunities for strategic social investment contributions and partnerships.

LOCAL PARTNERSHIPS

In China's Shanxi Province, where we are developing the Changbei field, we funded the construction of 240 underground water-storage tanks and 12 water-pumping stations, providing some 3,000 people better access to drinking water.

“At Shell, we believe onshore exploration and production can and must occur in an environmentally responsible manner. Anything less is unacceptable.”

— Marvin E. Odum,
President, Shell Oil Company