



A Cleaner Path for Oil in Texas

**Recommendations to Protect our
Environment and Health**



FRONTIER GROUP

A Cleaner Path for Oil in Texas

Recommendations to Protect
our Environment and Health



FRONTIER GROUP

Written by:

Elizabeth Ridlington and RJ Cross, Frontier Group

Emma Pabst, Environment Texas Research & Policy Center

June 2020

Acknowledgments

Environment Texas Research & Policy Center sincerely thanks Environmental Defense Fund and Sharon Wilson and Lori Glover with Earthworks for reviewing this report. Thank you to John Beaubouef, London Diller and Kate Moffatt who provided research assistance. Thanks also to Tony Dutzik, Susan Rakov and Adrian Pforzheimer of Frontier Group for editorial support.

The authors bear responsibility for any factual errors. The recommendations are those of Environment Texas Research & Policy Center. The views expressed in this report are those of the authors and do not necessarily reflect the views of our funders or those who provided review.

© 2020 Environment Texas Research & Policy Center. Some Rights Reserved. This work is licensed under a Creative Commons Attribution Noncommercial NoDerivatives 3.0 Unported License. To view the terms of this license, visit creativecommons.org/licenses/by-nc-nd/3.0.



Environment Texas Research & Policy Center is a 501(c)(3) organization. We are dedicated to protecting our air, water and open spaces. We investigate problems, craft solutions, educate decision makers, and help the public make their voices heard in local, state, and national discussions about the quality of our environment and our lives. For more information about Environment Texas Research & Policy Center or for additional copies of this report, please visit www.environmenttexascenter.org.

FRONTIER GROUP Frontier Group provides information and ideas to help citizens build a cleaner, healthier and more democratic America. Our experts and writers deliver timely research and analysis that is accessible to the public, applying insights gleaned from a variety of disciplines to arrive at new ideas for solving pressing problems. For more information about Frontier Group, please visit www.frontiergroup.org.

Layout: To The Point Collaborative, tothepointcollaborative.com

Cover photo: A flare burns near Pecos, TX, in the Permian Basin, on March 6, 2020. Photo: Earthworks.

Table of contents

- Executive summary 4**
- Introduction: The oil industry has long-standing financial and environmental problems 6**
- Pressing environmental and health threats from oil and gas production 8**
 - Increased flaring and methane venting 8
 - More orphan wells that require plugging 9
 - Risky oil storage. 11
 - Expansion of unnecessary oil and gas infrastructure 13
- Policy recommendations 15**
- Notes. 18**

Executive summary

The global oil price war, demand reductions resulting from the coronavirus outbreak, and the industry's mountain of debt have left Texas oil and gas companies in crisis. But even before the crisis, oil and gas drilling in Texas posed dangers to the environment and public health. Any response to the current crisis by the Railroad Commission (RRC) and other state leaders should recognize the underlying risks created by oil and gas production and move toward correcting them.

The RRC's Blue Ribbon Task Force for Oil Economic Recovery is ill-suited to respond to the full range of problems involving the oil and gas industry in Texas because the task force is focused on the industry's short-term financial challenges. The task force is ignoring the industry's long-term financial challenges and the environmental and public health harm it causes the state and its residents. It is in the best long-term interest of Texas for the RRC to recognize these problems and begin to create a plan to address them. That means the RRC should seek to design a managed decline for the industry that helps transition the state to clean energy sources and reduces environmental and health damage from the remaining activities of the petroleum industry.

Existing environmental and public health threats from oil and gas production, transportation and storage may be exacerbated by the current crisis.

Already, flaring and venting of natural gas add to global warming pollution and waste the state's valuable energy resources.

- Burning or venting natural gas, which consists primarily of the powerful climate pollutant methane, contributes to global warming.
- Flaring has increased four-fold since 2010 in the U.S. due to the shale boom.¹
- More than 10 percent of flares in the Permian Basin were malfunctioning during a recent survey, including 5 percent of flares that were not even lit, resulting in direct releases of methane to the atmosphere.²
- The price of gas has been so low that some producers have been reluctant to pay pipeline operators to carry gas to market.³ Instead, they have flared and vented gas. If energy demand remains weak over a prolonged period, low gas prices may lead more operators to prefer flaring.

Texas' existing backlog of orphan wells creates a risk to the environment. A potential wave of oil company bankruptcies could swell the number of wells the state needs to deal with, without providing adequate funds for cleanup.

- Wells that are no longer producing are supposed to be plugged. If an operator goes bankrupt, its wells become orphans and the responsibility falls to the state to plug them.

- Unplugged wells leak methane, adding to climate pollution, and can pollute groundwater.⁴
- Though Texas has more than 6,000 orphan wells, the state plugged only 1,700 wells in 2019.⁵ The RRC acknowledges that the number of orphan wells may increase as oil companies fail, as has happened in past downturns.⁶
- The bonds obtained by well operators to cover the cost of plugging wells in case they go bankrupt fall far short of covering the state's costs. In fiscal year 2015, bond money from oil and gas companies that went bankrupt covered less than 16 percent of what the RRC spent plugging wells.⁷

Texas oil producers are pumping more oil than they can sell and the state's major storage facilities are close to full.⁸ New storage options are risky because they could lead to water pollution.

- Until recently, the only legal way to store large volumes of oil underground in Texas was in salt formations, which are unlikely to pollute groundwater.⁹
- The RRC recently decided to allow oil storage underground in locations other than salt formations, such as productive or depleted oil or gas reservoirs.¹⁰
- Many of these untested storage options overlap with aquifers that provide drinking water.¹¹

The environmental damage, threats to public health and economic vulnerability of the oil industry mean that new infrastructure projects make little sense.

- Texas began the year with more than 200 fossil fuel projects planned or under construction, including projects that would build or expand 17 oil and gas terminals, 20 refineries and 73 pipelines.¹²
- The state's planned, under construction or recently completed oil and gas infrastructure projects would result in an emissions increase of at least 179 million tons of carbon dioxide equivalent (CO₂e) by 2030, according to a 2020 University of Texas study.¹³

- Oil and gas infrastructure threatens Texas' wilderness and wildlife. For example, the currently under-construction Permian Highway Pipeline cuts through the habitat of the golden-cheeked warbler, an endangered songbird species that nests only in Central Texas' oak-juniper woodlands.¹⁴
- Other threats include oil spills from pipeline ruptures or storage facilities that can significantly damage aquatic ecosystems.

It is in the best long-term interest of Texas for the RRC to begin to create a plan to address these problems. The RRC should not use the current crisis as a reason to extend or expand damaging practices and infrastructure. The RRC should:

- Stop granting flaring permits except for health and safety reasons, stop granting exceptions that extend existing flaring permits, improve monitoring of flaring and methane pollution to ensure that a crackdown on flaring does not lead to more venting, improve flaring data collection and separate out data on flaring and venting, enforce existing permits on flaring, and adopt a formal policy goal to end routine flaring by 2025.
- Reduce the problem of orphan wells by ensuring that companies plug wells promptly after they quit producing, tightening the standards that define what constitutes an "inactive" well, and accelerating the rate at which orphaned wells are plugged. To help accomplish this, the RRC should increase permitting fees. The legislature should increase bonding requirements and transfer existing RRC appropriations to supplement the RRC's cleanup fund.
- Reverse its earlier decision on oil storage and prohibit oil storage in locations that were previously deemed unacceptable.
- Work with other state agencies to halt construction on infrastructure projects currently underway and reject all new proposed projects.

Introduction: The oil industry has long-standing financial and environmental problems

Long before a recent international price war and the coronavirus pandemic caused the bottom to fall out of the oil and gas market, the oil industry was creating a financially precarious situation for itself.

Oil and gas infrastructure has high up-front capital costs, which producers have financed with borrowed money. Relying heavily on debt as a part of their business model, fossil fuel companies put themselves in an unsustainable

Photo: Robin Michals



Flares burn near homes in Cayanosa, Pecos County, in January 2020.

financial position even before the recent crisis.¹⁵ A March 2020 report by the Institute for Energy Economics and Financial Analysis found North American shale companies held at least \$106 billion in long-term debt at the end of 2019 and had lost \$2.1 billion in free cash flow that year alone.¹⁶ Payments for that debt are now coming due: North American oil exploration and production companies have \$86 billion in debt payments that will be due from 2020-2024.¹⁷ Pipeline companies will own \$123 billion more.¹⁸ From 2015 to April 1, 2020, 215 North American oil companies filed for bankruptcy. Seven filed in 2020 alone, with many more claims expected to come.¹⁹

Even as companies were taking on debt, oil prices were falling. Prices collapsed in 2016.²⁰

This spring, Russia and Saudi Arabia engaged in a price war that caused prices to fall even further. Shortly thereafter, the coronavirus pandemic started, demand for oil plummeted, and prices dropped below \$0 in April for the first time in history.²¹ Producers are losing billions in income, as turning a profit requires oil prices above \$40 a barrel.²²

In addition, investors are beginning to show concern about the environmental impacts of the oil industry. In the past 12 months, multiple leading investors and firms such as BlackRock, Goldman Sachs and the European Investment Bank have announced their move away from fossil fuels as demand for clean energy continues to rise across the country and the fight against global warming continues to grow more urgent.²³

The industry's financial troubles aren't the only long-term problem. The oil industry also damages the climate, pollutes water, creates air pollution, and destroys Texas' beautiful places. Many of the costs created by the industry are borne by the public, and cleanup expenses are often shifted to taxpayers.

The oil industry struggled financially long before this spring; oil and gas development faces long-term problems unrelated to the latest global negotiations or disease. The industry is clearly broken. The state should not use this current crisis to prop up a fiscally and environmentally unsustainable business. Now is the time for bold action to address not just the financial problems facing the industry, as the RRC is seeking to do, but also the environmental and public health aspects.

Pressing environmental and health threats from oil and gas production

Oil and gas drilling, production and transportation create a host of environmental and public health problems. The current challenges of low demand, low prices and the coronavirus pandemic may increase the industry's negative impacts in Texas.

Increased flaring and methane venting

Wells typically produce both oil and gas. If the company operating the well is interested only in producing oil, the gas is an unwanted byproduct to be dealt with. Well operators can send this gas into a pipeline to send to market, or burn it off onsite through a flare if pipeline infrastructure is not available. Too often in Texas, however, operators rely on flares despite the

availability of pipelines, use flares that only partially burn the gas before releasing it, or directly vent uncombusted methane to the atmosphere. This is bad for the climate and public health, and is a wasteful use of Texas' fossil fuel resources.

Methane, the primary component of natural gas, is a powerful greenhouse gas that causes 84 times more warming over 20 years than the same amount of carbon dioxide.²⁴ Burning methane in a flare reduces its global warming impact because the combustion byproducts are primarily carbon dioxide and water vapor, which contribute to climate change, but less powerfully. This means that the climate damage from oil production is much higher when companies vent methane.

Flaring natural gas also creates air pollution. Flaring releases volatile organic compounds, carbon monoxide, sulfur dioxide, nitrogen oxides and other pollutants.²⁵ Flaring from shale wells in Texas produces as much nitrogen oxide pollution as three coal-fired power plants.²⁶ This pollution contributes to smog, which can make it harder to breathe, trigger asthma attacks and cause chronic lung problems.²⁷

The practice of flaring also wastes the state's fossil fuel resources. Gas that is flared or vented is lost to the atmosphere and cannot be used for energy. Historically, the RRC's concern about waste led it to severely limit flaring.²⁸

However, the amount of flaring has increased four-fold in the U.S. since 2010 due to the shale boom.²⁹

Photo: Sean Hannon via Shutterstock



Natural gas flaring is widespread in the Permian Basin, damaging the environment and public health.



The image on the right shows methane spewing from an unlit flare, which is invisible to the naked eye, in Reeves County.

Natural gas flaring and venting is especially common in the Permian Basin. There, oil companies burned nearly 300 million cubic feet of methane in 2019.³⁰ That much gas could provide electricity to 7 million homes for a year.³¹ Worse, many companies in the Permian Basin operate faulty flares that only partially burn natural gas and release methane directly into the atmosphere.³² Surveys of flares in February and March 2020 found that more than 10 percent of flares were malfunctioning, including 5 percent of flares that were not even lit.³³

Several factors contribute to the problem:

- Gas production has increased faster than demand, driving down prices.
- Low gas prices leave some producers reluctant to pay pipeline operators to carry gas to market.³⁴ Instead, they have flared gas and continued drilling for oil, despite a supply glut.
- As energy demand weakens due to the coronavirus-related economic crisis, low gas prices may lead more operators to prefer flaring or venting – even, in some cases, when those wells are connected to a gas pipeline.³⁵ If, however, oil production declines due to a prolonged period of low demand, as projected by one analysis, then less gas would be produced as a byproduct and flaring and venting could also decline.³⁶

- The RRC approved 27,000 permits for flaring from 2012 to 2019, even though state law discourages flaring.³⁷
- The RRC has also extended permits for flaring beyond their original six-month period.³⁸ Some permit extensions have been for as long as two years.
- A subset of oil producers is responsible for a disproportionate share of flaring. For example, in the Permian Basin a few relatively small producers flare a large share of their gas, while 13 of the 15 largest producers flare less than 5 percent.³⁹

The result of these influences is that Texas oil producers are flaring and venting large amounts of gas, adding to climate pollution, increasing air pollution and wasting a valuable state resource.

More orphan wells that require plugging

When a well no longer produces sufficient oil or gas, the well operator is supposed to permanently plug it to prevent methane leaks and to protect groundwater. However, wells become orphaned when operators go bankrupt and walk away, leaving them for the state to plug. Texas already has thousands of orphaned wells that need to be plugged, and if the current crisis forces hundreds of oil and gas operators into bankruptcy, as one study predicts, many more wells may

soon become the state's responsibility.⁴⁰ In past downturns, the RRC has had to deal with a surge of orphan wells.⁴¹

Orphan wells add to climate pollution and are a threat to water quality as both gases and liquids can escape through faulty well casings and through fissures in rock. They can also reach the surface through the borehole. Unplugged wells leak methane, a major contributor to global warming, at 5,000 times the rate of plugged wells.⁴² Wells that have not been properly closed can pollute both groundwater and surface water. From 1993 to 2008, orphaned wells contaminated groundwater at 30 sites in Texas.⁴³ Often, such contamination can be hard to detect. For example, a well in Scurry County leaked brine into the region's aquifer for 22 years before being discovered.⁴⁴ Unplugged wells can also pollute surface water. For example, the brackish water that flows from an orphaned well to create Boehmer Lake in West Texas contains toxic levels of salt, killing all vegetation it comes into contact with.⁴⁵ An artificial water body like this can create a sinkhole, threatening groundwater supplies below and creating a threat to public safety by undermining seemingly solid ground.

Photo: Ray Bodden via Flickr, CC BY 2.0



Thousands of inactive wells could require plugging by the state if the companies that own them go bankrupt.

Although Texas has more than 6,000 orphan wells, the state plugged only 1,700 wells in 2019.⁴⁶ In addition to orphan wells, there are more than 130,000 inactive wells in the state.⁴⁷ The RRC recently allowed companies to delay plugging nonproducing wells, a move that it hopes will help financially struggling companies – but could also increase the subsequent wave of orphan wells.⁴⁸ As oil and gas companies go bankrupt from the current crisis, thousands more wells could be orphaned and require state-funded cleanup. According to one estimate, low oil prices could cause hundreds of companies to declare bankruptcy by the end of 2021.⁴⁹

Texas spent an average of \$20,000 on each well it plugged in fiscal year 2019.⁵⁰ In addition, it spent tens of millions more cleaning up pollution at abandoned sites.

However, the state lacks sufficient funds to clean up existing orphan wells, much less a wave of new orphan wells. Cleanup of orphan wells is paid for through the RRC's Oil and Gas Regulation and Cleanup Fund (OGRC). The OGRC receives financing from bonds paid for by oil companies to cover the cost of plugging a company's wells in case of bankruptcy, and also from some regulatory and permitting fees and enforcement penalties levied on oil and gas companies.⁵¹ These revenue streams were inadequate before the current crisis, and are likely to decline as oil company activity slows.

A review by the state's Sunset Commission in 2017 found that bonds paid by oil and gas companies covered less than 16 percent of what the RRC spent plugging wells in fiscal year 2015.⁵² That year, the 94 well operators who abandoned their wells paid the RRC an average of just \$2,700 per well, though the RRC spent \$17,000 per well it plugged that year.⁵³ The current crisis may worsen the funding shortfall for the OGRC as drilling declines and companies pay fewer regulatory fees in support of the fund. Recent reductions in fees by the RRC will exacerbate the shortfall.⁵⁴



Storage facilities in Texas are close to full, and oil companies are looking for new places to store their product.

Risky oil storage

With the collapse in demand for oil, Texas is producing oil faster than consumers wish to buy it.⁵⁵ Storage capacity is close to full, and oil companies are looking for new places to store their product.⁵⁶ Newly proposed storage options risk water pollution and add to the threat to public safety.

Until recently, the only acceptable way to store large volumes of oil underground in Texas was in salt formations, while natural gas has been stored in salt formations or depleted or productive underground reservoirs.⁵⁷ Naturally occurring salt deposits can be hollowed out using water and then filled with liquid hydrocarbons. Salt in these large underground formations is “plastic,” meaning the salt moves slightly to fill in cracks and holes.⁵⁸ As a result, oil stored in salt formations is unlikely to leak out and pollute groundwater. However, these underground storage facilities are close to full, as are aboveground storage tanks.⁵⁹

In early May, the RRC approved a request from industry to allow oil storage underground in locations other than salt formations.⁶⁰ This means oil could be stored in productive or depleted oil or gas reservoirs. This creates a threat of water pollution and may increase the risk to public safety.

As of June 1, no oil producer had submitted an application to the RRC to use an unconventional underground storage reservoir and thus it is not clear where in the state such facilities might be located.⁶¹ Oil companies might look to reservoirs in major oil fields or to depleted reservoirs that are already used for gas storage. Many of these options are likely to overlap with aquifers. Nine major aquifers lie beneath Texas, meaning that almost every oil producing region that might have a storage reservoir also overlaps with an aquifer.⁶² The extensively drilled Permian Basin overlaps with the Edwards Aquifer, which provides drinking water for nearly 2 million Texans.⁶³ The Eagle Ford shale play overlaps with multiple aquifers.⁶⁴

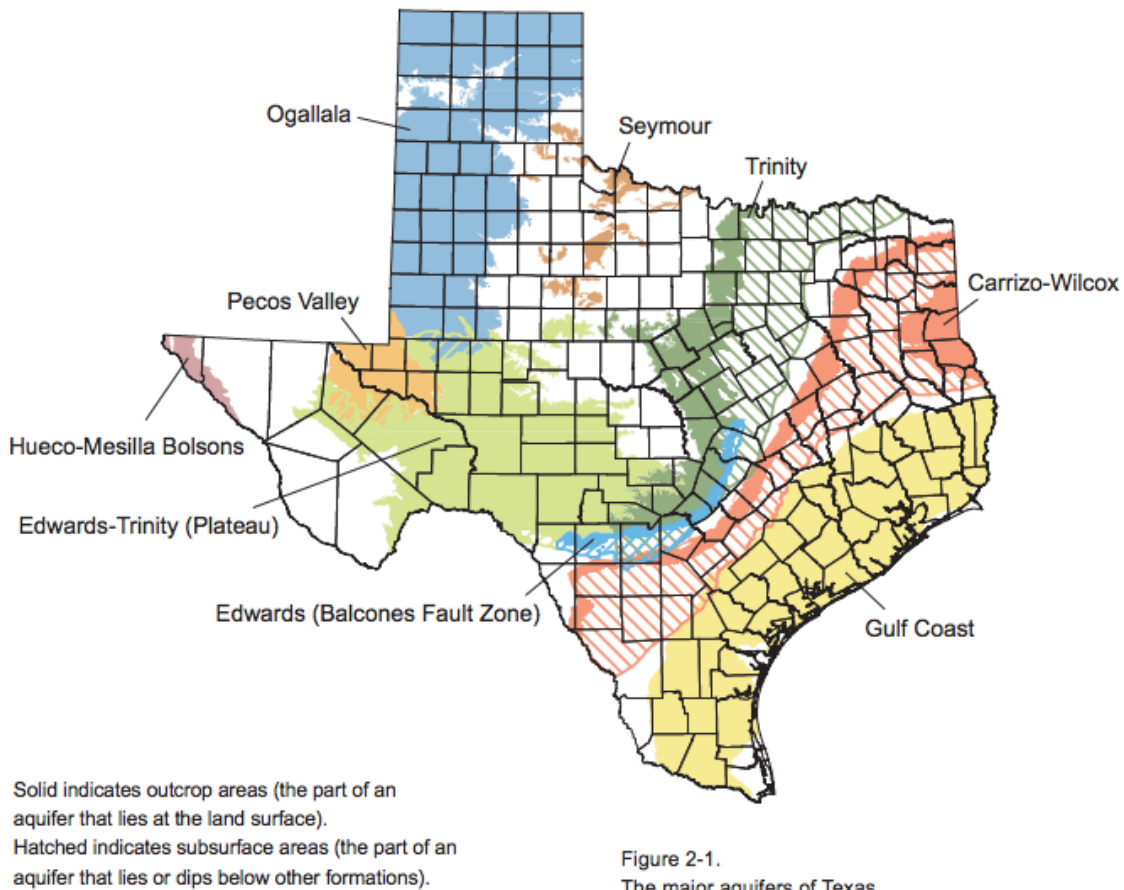


Figure 2-1.
The major aquifers of Texas

New underground oil storage facilities pose a risk of contamination for Texas' many aquifers. Credit: Texas Water Development Board

Another potential target for oil storage might be depleted gas fields that are already used for gas storage, such as a facility located in Harris County, where aquifers supply water for municipal, commercial and industrial use.⁶⁵ Other depleted reservoirs already used for gas storage are located in the Dallas/Fort Worth region.⁶⁶

Oil stored in underground oil or gas reservoirs could escape into the water supply. Though oil and gas boreholes are lined with sealed well casings, hydrocarbons sometimes nonetheless escape into the surrounding rock as oil is removed. Pumping oil back into the ground creates another opportunity for water contamination. This is of particular concern in areas with karst rock formations, which are porous

networks of passageways through limestone, dolomite, and other permeable rocks that hold much of Texas' groundwater. These complex formations allow water and other substances to flow freely through the ground, a process which supplies Texas' springs. However, this trait also increases aquifers' susceptibility to pollution from hydrocarbons or other hazardous substances. The Edwards Aquifer, for example, is a karst formation.⁶⁷

Storing oil creates a risk to public safety, regardless of where it occurs, and expanding oil storage options increases the overall risk. For example, pipelines that lead to storage facilities can leak and explode, as happened in 1992 near Brenham. That incident killed a 6-year-old boy.⁶⁸

Some in the industry have also suggested that excess oil could be stored in pipelines. Energy Transfer LP estimates that it could store 2 million barrels of oil in two of its pipelines in Texas, and in April indicated it would ask the RRC for permission to do so.⁶⁹ Using pipelines for oil storage presents many of the same threats as using the pipeline to move oil. The risk is higher, however, because it is a new use for which the pipeline was not designed.



Expansion of unnecessary oil and gas infrastructure

Before the current crisis began, Texas was considering a number of new oil and gas infrastructure projects. These future projects included new deepwater drilling ports in the Gulf of Mexico with accompanying onshore storage facilities, over 50 miles of pipeline for transporting crude oil across Aransas and Calhoun counties, and multiple liquified natural gas plants adding more than 1 trillion cubic feet of natural gas production every year.⁷⁰ Texas began the year with more than 200 fossil fuel projects planned or under construction, including projects to build or expand 17 oil and gas terminals, 20 refineries and 73 pipelines.⁷¹

The environmental damage, threats to public health and economic risks of oil and gas infrastructure meant these proposed projects made little sense even before prices and demand collapsed. Completing them makes even less sense now.

Construction of these projects would cause significant environmental damage. According to a 2020 University of Texas study, building the state's planned, under construction and recently completed projects – including refineries, petrochemical facilities, oil and liquified natural gas terminals, and other infrastructure – would result in an emissions increase of at least 179 million tons of CO₂ equivalent (CO₂e) by 2030.⁷² That's equal



Construction of a pipeline in Central Texas' Hill Country created erosion and runoff in May 2020.



A golden-cheeked warbler.

to the annual emissions from 46 coal-fired power plants.⁷³

In addition to causing climate pollution, oil and gas infrastructure presents a threat to Texas' wilderness and wildlife. For example, the currently under-construction Permian Highway Pipeline is routed through the habitat of the golden-cheeked warbler, an endangered songbird species that nests only in Central Texas' oak-juniper woodlands and numbers fewer than 30,000 in the wild.⁷⁴ Infrastructure construction risks destroying landscapes and species that have been appreciated by Texans for generations and are a key part of the state's identity.

Oil and gas infrastructure also threatens the state's water. Erosion during construction can pollute ground or surface water.⁷⁵ Construction of the Permian Highway Pipeline contaminated drinking wells in Blanco County after crews likely hit a karst formation.⁷⁶

Oil spills from pipeline ruptures or storage facilities can significantly damage aquatic ecosystems. Oil's toxicity can kill algae, seaweed and other plant life; lower the

reproductive ability of fish; and impact sea turtles' nesting activities on the shore.⁷⁷ When a bird gets oil on its feathers, it can lose the ability to fly or even float on water's surface, leading to drowning, and the ingestion of oil by birds and other animals can result in immediate death or long-term lung, kidney or liver damage.⁷⁸ Oil also contains known human carcinogens like benzene and polycyclic aromatic hydrocarbons that are linked to skin and stomach cancers.⁷⁹

Building more infrastructure to enable the production of more oil and gas makes no sense in a market seeing historically low demand and an uncertain recovery.⁸⁰ Investments in infrastructure for an industry that is in a weak financial position may leave Texas taxpayers on the hook for cleaning up any negative impacts that may arise, such as cleaning up spills or decommissioning abandoned infrastructure.

In addition, new oil and gas infrastructure simply doesn't make sense in light of the threat of global warming. In order to avoid the worst impacts of global warming, the nation will need to dramatically reduce its use of fossil fuels, and any project built now will need to be abandoned before the end of its useful life. Using the current global crisis as an excuse to speed construction by lifting oversight, or giving any kind of financial assistance to oil and gas producers, runs counter to the priorities of all Texans who breathe air, drink water or pay taxes.

Multiple agencies have the opportunity to address the threat of new infrastructure projects because local, state and federal agencies can be involved in the permitting and construction process for new infrastructure projects. For example, the Federal Energy Regulatory Commission is the lead agency for any new liquefied natural gas terminal.⁸¹ An LNG facility must also obtain an air pollution permit from the Texas Commission on Environmental Quality, while the RRC provides certification of companies and individuals who work with liquefied natural gas.⁸²

Policy recommendations

The problems of Texas' oil and gas industry pre-date the Russia-Saudi Arabia price war and the coronavirus pandemic. The industry's profitability has been declining as production has increased and prices have fallen in recent years.⁸³ Fracked well operators have failed to demonstrate that they have a viable long-term business model and continue to burn gas that has little market value.⁸⁴ For the past decade, oil and gas companies have performed worse than the stock market.

Even worse, this is an industry that is causing severe damage to our planet's climate. It also pollutes the air that Texans breathe and the water we drink, and destroys the state's natural landscapes.

It is in the best long-term interest of Texas for the RRC to recognize these problems and begin to create a plan to address them. That means the RRC should seek to design a managed decline for the industry that helps transition the state to clean energy sources and reduces environmental and health damage from the remaining activities of the petroleum industry. As a first step, the RRC should seek to hear from all voices, including Texans concerned about the environment, instead of turning only to the oil and gas industry for input.

Furthermore, the RRC should not use the coronavirus pandemic as a reason to extend or expand damaging practices and infrastructure. Below are specific recommendations.

Texas should reduce flaring of natural gas and curb methane leaks from oil and gas production. The RRC should:

- Stop granting flaring permits except for health and safety reasons.
- End the practice of granting extensions to existing flaring permits, which turns temporary permits into long-term permits.
- Enforce existing permits on flaring. The RRC should issue fines to companies that violate their permits by engaging in excessive flaring, operating faulty flares, or venting gas. Fines should be high enough to more than offset any economic value a company may have earned from non-compliance with its permit.
- Adopt a formal policy goal to end routine flaring by 2025.
- Improve monitoring of flaring and methane pollution so that regulators can understand the extent of the problem. If the RRC limits flaring, some companies may try to comply by venting instead, which isn't visible without special imaging equipment. This will make increased monitoring especially critical and thus the state should improve collection of flaring data and separate out information about flaring versus venting.



A home in West Odessa sits near a pumpjack and a flare, January 2020.

- The state legislature should eliminate the exemption of flared gas from the state's existing gas production tax. Currently, the statutory tax rate for gas that is produced and sold into the market is 7.5 percent.⁸⁵ Gas that is burned off through flaring is currently exempt from taxation which results in lost state revenue that would otherwise be funding schools and roads. Importantly, if oil and gas companies were required to pay a tax on flared gas, they would have a greater incentive to reduce flaring.

A number of policy changes would help address the growing problem of orphaned wells in Texas that require costly plugging operations.

- The RRC should:
 - Increase permitting fees. In early May, however, the RRC waived some routine fees paid by oil companies.⁸⁶ Texas taxpayers should not be on the hook for the weak financial position of oil and gas companies.

- Actively monitor the status of wells to ensure that companies are plugging wells promptly after they quit producing.
- Tighten the standards that define what constitutes an “inactive” well. The RRC adopted rules in 2016 that make it easier for a company to classify a barely producing well as active and thereby avoid triggering requirements to plug and clean it up.⁸⁷ This means that there are thousands of wells in Texas that previously would have required closure and potentially remediation that now may be sitting idle, posing a risk to groundwater. These wells could become orphan wells if the operators go bankrupt.
- Accelerate the rate at which orphaned wells are plugged. This will help avoid the environmental and public health risks of leaving wells unplugged for years.
- The legislature should transfer existing RRC appropriations to the OGRC as needed to boost funding.
- The legislature should increase bond amounts for all new wells and also change its blanket bonding policies to require operators with large numbers of wells to bond for a greater share of the likely cost of cleaning up their wells. Currently, blanket bonds allow operators with many wells to pay less on a per-well basis than operators with fewer wells. Reforming blanket bonding will help ensure the state has sufficient remediation funds if those wells are orphaned.
- Orphan wells are a problem on federal land, too, and federal bonding requirements are too low, according to a recent Government Accountability Office analysis.⁸⁸ To protect federal public land in Texas, the federal government should increase its bonding requirements.

Texas should not allow oil storage in locations that were previously deemed unacceptable.

- Novel storage options create a substantial risk to public health and the environment, and opening them in a rush compounds the risk. Had the RRC instituted production cuts as considered in May 2020, it would not need to consider these new, risky options.
- If the RRC approves any unconventional storage proposals, it must require frequent and extensive monitoring for pollution of nearby groundwater.

New oil and gas infrastructure will have negative consequences for Texas’ environment and public health. The RRC and other regulatory agencies should:

- Halt construction on projects currently underway.
- Reject all proposed infrastructure projects. Demand for the state’s oil and gas products has dropped dramatically and it is not clear when, if ever, national and global consumption will increase. The state should not approve projects that damage the environment and threaten public health to serve demand that might never materialize.

Notes

1. Raphael Calel and Paasha Mahdavi, "Opinion: The unintended consequences of anti-flaring policies - and measures for mitigation," *Proceedings of the National Academy of Sciences*, 20 May 2020, <https://doi.org/10.1073/pnas.2006774117>.

2. Environmental Defense Fund, "Flaring aerial survey results," *Permian Map*, accessed 28 May 2020, available at <https://www.permianmap.org/flaring-emissions/>.

3. Kiah Collier, "Pipeline giant sues Railroad Commission, alleging lax oversight of natural gas flaring," *The Texas Tribune*, 3 December 2019, archived at <https://web.archive.org/web/20200528054123/https://www.texastribune.org/web/20200528054123/https://www.texastribune.org/2019/12/03/railroad-commission-sued-lax-oversight-natural-gas-flaring/>.

4. See Table 2, mean leakage rate from plugged versus unplugged wells, in U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2016: Abandoned Oil and Gas Wells*, April 2018, archived at https://web.archive.org/web/20200516200400/https://www.epa.gov/sites/production/files/2018-04/documents/ghgemissions_abandoned_wells.pdf; Scott Kell, for the Ground Water Protection Council, *State Oil and Gas Agency Groundwater Investigations and Their Role in Advancing Regulator Reforms*, August 2011, archived at <https://web.archive.org/web/20200517095217/http://www.gwpc.org/sites/default/files/State%20Oil%20%26%20Gas%20Agency%20Groundwater%20Investigations.pdf>, p. 75.

5. 6,000 orphan wells: Railroad Commission of Texas, *2019 Oilfield Cleanup Program Annual Report*, 17 December 2019, archived at <https://web.archive.org/web/20200307160157/https://www.rrc.state.tx.us/media/55505/ofcu-2019.pdf>; 1,700:

Rep. Rafael Anchia, *Letter to The Honorable Greg Abbott, Re: Request for Texas to affirmatively mitigate oil patch job loss and protect the environment by authorization of increased plugging of orphaned wells*, 6 May 2020.

6. Stephen Rassenfoss, "Texas says no to oil production quotas, yes to well-plugging and pit-cleanup delays," *JPT*, 5 May 2020, archived at <https://web.archive.org/save/https://pubs.spe.org/en/jpt/jpt-article-detail/?art=7004>.

7. Sunset Advisory Commission, *Staff Report with Final Results, Railroad Commission of Texas, 2016-2017*, June 2017, archived at https://web.archive.org/web/20200305122400/https://www.sunset.texas.gov/public/uploads/files/reports/Railroad%20Commissio%20of%20Texas%20Staff%20Report%20with%20Final%20Results_6-21-17.pdf, p. 4.

8. Railroad Commission, *Open Meeting Notice for Tuesday, May 5, 2020*, no date, archived at <https://web.archive.org/web/20200509211616/https://www.rrc.state.tx.us/media/57506/final-conference-agenda-for-may-5-2020.pdf>, p. 19.

9. Railroad Commission, *Hydrocarbon Storage*, 19 May 2020, archived at <https://web.archive.org/web/20200527205405/https://www.rrc.state.tx.us/oil-gas/applications-and-permits/injection-permit-types-and-information/hydrocarbon-storage/>; 16 Tex. Admin. Code § 3.95.

10. Christopher Collins, "With storage space evaporating, the oil and gas industry will get to put its products back underground," *Texas Observer*, 20 May 2020, archived at <https://web.archive.org/web/20200528011229/https://www.texasobserver.org/underground-storage-oil-rule-rollback/>.

11. Texas Water Development Board, *Major Aquifers*, accessed 28 May 2020, archived at <https://web.archive.org/web/20200512224633/https://www.twdb.texas.gov/groundwater/aquifer/major.asp>.

12. Andrew Waxman et al., "Emissions in the stream: estimating the greenhouse gas impacts of an oil and gas boom," *Environmental Research Letters*, January 2020, <https://iopscience.iop.org/article/10.1088/1748-9326/ab5e6f/pdf>, Table 2.

13. *Ibid.*, Table 4.

14. Sergio Chapa, "Hill Country pipeline opponents threaten lawsuit over golden-cheeked warbler habitat," *The Houston Chronicle*, 16 July 2019, archived at <https://web.archive.org/web/20190716195722/https://www.houstonchronicle.com/business/energy/article/Hill-Country-pipeline-opponents-threaten-lawsuit-14099574.php>.

15. Matt Phillips and Clifford Krauss, "American oil drillers were hanging on by a thread. Then came the virus," *The New York Times*, 20 March 2020, archived at <https://web.archive.org/web/20200527123221/https://www.nytimes.com/2020/03/20/business/energy-environment/coronavirus-oil-companies-debt.html>.

16. Clark Williams-Derry et al., Institute for Energy Economics and Financial Analysis, *Shale Producers Spilled \$2.1 Billion in Red Ink Last Year: Disappointing 2019 Results Cap a Decade of Losses for North America's Shale Industry*, March 2020, archived at https://web.archive.org/web/20200527152621/https://ieefa.org/wp-content/uploads/2020/03/Shale-Producers-Spilled-2.1-Billion-in-Red-Ink-Last-Year_March-2020.pdf.

17. See note 15.

18. *Ibid.*

19. Haynes and Boone, *Oil Patch Bankruptcy Monitor*, 6 April 2020, archived at https://web.archive.org/web/20200506101011/https://www.haynesboone.com/-/media/files/energy_bankruptcy_reports/oil_patch_bankruptcy_monitor.ashx?la=en&hash=D2114D98614039A2D2D5A43A61146B13387AA3AE.

20. Tom Sanzillo, Director of Finance, Institute for Energy Economics and Financial Analysis, *Comments Submitted to the Railroad Commission of Texas on the Matter of the Pioneer Natural Resources U.S.A Inc. and Parsley Energy, Inc. request for*

determination of reasonable market demand, 7 April 2020, archived at <https://web.archive.org/web/20200414202052/https://www.rrc.state.tx.us/media/57133/cmts-recvd-apr14-conf-ieefa.pdf>, p. 3.

21. Camila Domonoske, "Free fall: oil prices go negative," *All Things Considered*, 20 April 2020, archived at <https://web.archive.org/web/20200603080125/https://www.npr.org/sections/coronavirus-live-updates/2020/04/20/838521862/free-falling-oil-prices-keep-diving-as-demand-disappears>.

22. Jennifer Hill, "Oil prices needed to profit in U.S. shale," *Reuters Graphics*, 14 April 2020, archived at <https://web.archive.org/web/20200426234607/https://fingfx.thomsonreuters.com/gfx/editorcharts/GLOBAL-OIL-SHALE-COSTS/0H001R8GDCBQ/index.html>.

23. BlackRock: Bill McKibben, "Citing climate change, BlackRock will start moving away from fossil fuels," *The New Yorker*, 16 January 2020, archived at <https://web.archive.org/web/20200522214301/https://www.newyorker.com/news/daily-comment/citing-climate-change-blackrock-will-start-moving-away-from-fossil-fuels>; Goldman Sachs: Rachel Koning Beals, "Goldman Sachs becomes first major U.S. bank to stop funding Arctic drilling, pulls back on coal," *MarketWatch*, 21 December 2019, archived at <https://web.archive.org/web/20200508010808/https://www.marketwatch.com/story/goldman-sachs-becomes-first-major-us-bank-to-stop-funding-arctic-drilling-pulls-back-on-coal-2019-12-16>; European Investment Bank: Nathaniel Gronewold, "European Investment Bank will stop lending to fossil fuel projects," *Scientific American*, 18 November 2019, archived at <https://web.archive.org/web/20200518174905/https://www.scientificamerican.com/article/european-investment-bank-will-stop-lending-to-fossil-fuel-projects/>; Jesse Pound, "Cramer sees oil stocks in the 'death knell phase,' says they are the new tobacco," *CNBC*, 31 January 2020, archived at <https://web.archive.org/web/20200602045445/https://www.cnn.com/2020/01/31/cramer-sees-oil-stocks-in-the-death-knell-phase-says-new-tobacco.html>.

24. Gunnar Myhre et al., "Anthropogenic and Natural Radiative Forcing," *Climate Change 2013: The Physical Science Basis, Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, 2013, available at https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter08_FINAL.pdf, Table 8.7.

25. Olusegun Fawole, X.-M. Cai and A. R. MacKenzie, "Gas flaring and resultant air pollution: A review focusing on black carbon," *Environmental Pollution*, 216:182-197, <https://doi.org/10.1016/j.envpol.2016.05.075>, September 2016.

26. Gunnar Schade, "Commentary: To address flaring, raise fees on industry," *San Antonio Express-News*, 27 February 2020, archived at <https://web.archive.org/web/20200316165649/https://www.expressnews.com/opinion/commentary/article/Commentary-To-address-flaring-raise-fees-on-15086695.php/>.

27. Environmental Protection Agency, *Health Effects of Ozone Pollution*, 30 July 2019, archived at <https://web.archive.org/web/20200528165004/https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution>.

28. Kiah Collier, Jamie Smith Hopkins and Rachel Leven, "As oil and gas exports surge, West Texas becomes the world's 'extraction colony,'" *Center for Public Integrity*, 11 October 2018, archived at <https://web.archive.org/web/20200414154545/https://apps.publicintegrity.org/blowout/>.

29. See note 1.

30. Reuters, *Factbox: Flaring by oil majors in the Permian*, 12 March 2020, archived at <https://web.archive.org/web/20200404022019/https://www.reuters.com/article/us-climate-change-flaring-factbox/factbox-flaring-by-oil-majors-in-the-permian-idUSKBN20Z25Q>.

31. Ibid.

32. See note 2.

33. Ibid.

34. See note 3.

35. Ibid.

36. Sergio Chapa, "Pollution from Permian Basin flaring expected to drop to record lows," *Houston Chronicle*, 5 June 2020, archived at <https://web.archive.org/web/20200606011746/https://www.houstonchronicle.com/business/energy/article/Pollution-from-Permian-Basin-flaring-expected-to-15318452.php>.

37. Rebecca Elliott, "Texas showdown flares up over natural gas waste," *Wall Street Journal*, 17 July 2019, available at <https://www.wsj.com/articles/texas-showdown-flares-up-over-natural-gas-waste-11563361201>; see note 3.

38. See note 28.

39. Colin Leyden, Environmental Defense Fund, "New Permian data show how worst offenders prevent progress on flaring," *Texas Clean Air Matters* (blog), 14 August 2019, archived at <https://web.archive.org/web/20200108185401/http://blogs.edf.org/texascleanairmatters/2019/08/14/new-permian-data-show-how-worst-offenders-prevent-progress-on-flaring/>. See table "Rate of Permian Gas Waste by Top 15 Oil Producers."

40. Mark Egan, "Oil prices turned negative. Hundreds of U.S. oil companies could go bankrupt," *CNN Business*, 20 April 2020, archived at <https://web.archive.org/web/20200528020830/https://www.cnn.com/2020/04/20/business/oil-price-crash-bankruptcy/index.html>.

41. See note 6.

42. See Table 2, mean leakage rate from plugged versus unplugged wells, in U.S. Environmental Protection Agency, *Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990-2016: Abandoned Oil and Gas Wells*, April 2018, archived at https://web.archive.org/web/20200516200400/https://www.epa.gov/sites/production/files/2018-04/documents/ghgemissions_abandoned_wells.pdf.

43. Scott Kell, for the Ground Water Protection Council, *State Oil and Gas Agency Groundwater Investigations and Their Role in Advancing Regulator Reforms*, August 2011, archived at <https://web.archive.org/web/20200517095217/http://www.gwpc.org/sites/default/files/State%20Oil%20%26%20Gas%20Agency%20Groundwater%20Investigations.pdf>, p. 75.

44. Bernd Richter, Alan Dutton and Charles Kreitler, Bureau of Economic Geology, University of Texas at Austin, *Identification of Sources and Mechanisms of Salt-Water Pollution Affecting Ground-Water Quality: A Case Study, West Texas*, 1990, available at https://static.texastribune.org/media/documents/RI0191_1.pdf?_ga=2.122985677.731965741.1590613198-1027132129.1590613198, p. 23.

45. Brandon Mulder, "Old oil wells pose problem for Pecos County," *MRT*, 22 August 2015, archived at <https://web.archive.org/web/20191109033024/https://www.mrt.com/business/energy/article/Old-oil-wells-pose-problem-for-Pecos-County-7413749.php>.

46. 6,000: Railroad Commission of Texas, *2019 Oilfield Cleanup Program Annual Report*, 17 December 2019, archived at <https://web.archive.org/web/20200307160157/https://www.rrc.state.tx.us/media/55505/ofcu-2019.pdf>; 1,700: Rep. Rafael Anchia, *Letter to The Honorable Greg Abbott, Re: Request for Texas to affirmatively mitigate oil patch job loss and protect the environment by authorization of increased plugging of orphaned wells*, 6 May 2020.

47. Railroad Commission of Texas, *2019 Oilfield Cleanup Program Annual Report*, 17 December 2019, archived at <https://web.archive.org/web/20200307160157/https://www.rrc.state.tx.us/media/55505/ofcu-2019.pdf>, p. 4.

48. See note 6.

49. See note 40.

50. The state spent \$34.9 million plugging wells in FY2019 and plugged 1,710 wells. That is equal to \$20,409 per plugged well. Railroad Commission of Texas, *2019 Oilfield Cleanup Program Annual Report*, 17 December 2019, archived at <https://web.archive.org/web/20200307160157/https://www.rrc.state.tx.us/media/55505/ofcu-2019.pdf>.

51. Texas Natural Resources Code § 81.067, available at <https://statutes.capitol.texas.gov/Docs/NR/htm/NR.81.htm#81.067>; Railroad Commission of Texas, *2019 Oilfield Cleanup Program Annual Report*, 17 December 2019, archived at <https://web.archive.org/web/20200307160157/https://www.rrc.state.tx.us/media/55505/ofcu-2019.pdf>, p. 8.

52. See note 7.

53. John McFarland, "RRC Sunset Review part III — bond requirements for well plugging," *Oil and Gas Lawyer Blog*, 23 May 2016, archived at <https://web.archive.org/web/20190821230830/https://www.oilandgaslawyerblog.com/rrc-sunset-review-part-iii-bond-requirements-well-plugging/>.

54. The RRC waived a number of fees under 16 Tex. Admin. Code § 3.78 on 5 May 2020, per Railroad Commission of Texas,

Temporary Exception to Certain Fees & Surcharges Required by Statewide Rule 78, 5 May 2020, available at <https://rrc.texas.gov/media/57583/rule-78-exception-05may2020.pdf>. Fees paid under 16 Tex. Admin. Code § 3.78 are collected in accordance with Texas Natural Resources Code § 81.0521 and are paid into the OGCR, per <https://statutes.capitol.texas.gov/Docs/NR/htm/NR.81.htm#81.0521>.

55. See note 8.

56. *Ibid.*

57. See note 9.

58. Tim George, McGinnis, Lochridge & Kilgore, LLP, *Underground Hydrocarbon Storage in Texas*, 30 March 2007, archived at https://web.archive.org/web/20200529043035/https://mcginnislaw.com/images/uploads/news/07-03-01_George_underground_hydrocarbon_storage.pdf, pp. 45-46.

59. See note 10.

60. *Ibid.*

61. Environment Texas Research & Policy Center submitted an open records request to the RRC for all applications for unconventional storage. The RRC responded on 2 June 2020 that no applications had been received as of June 1. Email from Karen Sanchez, Legal Assistant, Office of General Counsel, RRC, RE: Open Records Request, 2 June 2020.

62. See note 11.

63. Texas Commission on Environmental Quality, *Regulatory History of the Edwards Aquifer*, 20 February 2020, archived at <https://web.archive.org/web/20200306114208/https://www.tceq.texas.gov/permitting/eapp/history.html>.

64. FracTracker, *Texas Drought Conditions*, 8 November 2013, available at <http://maps.fractracker.org/latest/?webmap=42286c4e04f34df691a0d731de8cae98>.

65. eCorp, *eCorps Storage History & Evolution*, accessed 28 May 2020, archived at <https://web.archive.org/web/20191022213746/http://www.ecorpintl.com/midstream/storage/sub-page/>; U.S Geological Survey, *Texas Gulf Coast Groundwater and Land Subsidence*, accessed 28 May 2020, archived at https://web.archive.org/web/20200407025838/https://txpub.usgs.gov/houston_subsidence/home/.

66. API Energy Infrastructure, *Underground Natural Gas Storage*, accessed 28 May 2020, archived at <https://web.archive.org/web/20181022000902/http://www.energyinfrastructure.org/energy-101/natural-gas-storage>.

67. Edwards Aquifer Authority, *About the Edwards Aquifer*, accessed 28 May 2020, archived at <https://web.archive.org/web/20200529044847/https://www.edwardsaquifer.org/science-maps/about-the-edwards-aquifer/>.

68. See note 10.

69. Rachel Adams-Heard, "One pipeline giant is looking to stash the oil glut in its lines," *Bloomberg*, 24 April 2020, archived at <https://web.archive.org/web/20200517114003/https://www.bloomberg.com/news/articles/2020-04-23/energy-transfer-wants-to-free-up-pipeline-space-to-store-crude>.

70. Courtney Bernhardt and Alexandra Shaykevich, Environmental Integrity Project, *Greenhouse Gases from Oil, Gas, and Petrochemical Production*, 8 January 2020, archived at <https://web.archive.org/web/20200412011655/https://environmentalintegrity.org/wp-content/uploads/2020/01/Greenhouse-Gases-from-Oil-Gas-and-Petrochemical-Production.pdf>. See related spreadsheet, available at <https://environmentalintegrity.org/wp-content/uploads/2020/01/Database-of-Greenhouse-Gases-from-Oil-Gas-and-Petrochemical-Production.xlsx>.

71. See note 12, Table 2.

72. *Ibid.*, Table 4.

73. U.S. Environmental Protection Agency, *Greenhouse Gas Equivalencies Calculator*, March 2020, available at <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>.

74. Habitat: see note 14; "fewer than 30,000": U.S. Fish and Wildlife Service, *Balcones Canyonlands: Golden-cheeked Warbler*, 15 February 2019, archived at https://web.archive.org/web/20200428151137/https://www.fws.gov/refuge/Balcones_Canyonlands/GCW.html.

75. Billy Gates, "Texas Railroad Commission investigating Kinder Morgan for 'multiple' erosion complaints," *KXAN*, 27 May 2020, archived at <https://web.archive.org/web/20200529224852/https://www.kxan.com/news/local/texas-railroad-commission-investigating-kinder-morgan-for-multiple-erosion-complaints/>.

76. Tahera Rahman, "Muddy water ends up inside homes, officials believe it's tied to Permian Highway Pipeline construction," *KXAN*, 1 April 2020, archived at <https://web.archive.org/web/20200516184935/https://www.kxan.com/news/see-it-muddy-water-ends-up-inside-homes-officials-believe-its-tied-to-permian-highway-pipeline-construction/>.

77. U.S. Fish and Wildlife Service, *Effects of Oil on Wildlife and Habitat* (factsheet), June 2010, archived at <https://web.archive.org/web/20200525083924/https://www.fws.gov/home/dhoilspill/pdfs/DHJICFWSOillImpactsWildlifeFactSheet.pdf>.

78. *Ibid.*

79. Gideon Weissman and John Rumpler, Frontier Group and Environment America Research and Policy Center, *Accidents Waiting to Happen: Toxic Threats to Our Rivers, Lakes and Streams*, February 2019.

80. U.S. Energy Information Administration, *Petroleum and Liquids Data - Total U.S. Weekly Product Supplied* (dataset), accessed on 28 May 2020 at https://www.eia.gov/dnav/pet/pet_cons_wpsup_k_w.htm.

81. Texas LNG LLC, *Regulatory Updates*, accessed 7 June 2020, archived at <https://web.archive.org/web/20191201093721/http://www.txlng.com/theproject/regulatory-updates.html>; "uncertain recovery": Carolyn Davis, "Shell CEO says COVID-19 may 'capitalize society' to reduce long-term oil, natural gas demand," *NGI's Daily Gas Price Index*, 30 April 2020, archived at <https://web.archive.org/web/20200528005645/https://www.naturalgasintel.com/articles/121841-shell-ceo-says-covid-19-may-capitalize-society-to-reduce-long-term-oil-natural-gas-demand>.

82. 30 Tex. Admin. Code § 116; Texas Railroad Commission, *Certification and Company Licensing*, accessed 7 June 2020, archived at <https://web.archive.org/web/20200305061743/https://www.rrc.state.tx.us/alternative-fuels/safety-licensing-training-and-certification/liquefied-natural-gas/certification-and-company-licensing/>.

83. See note 20, p. 2.

84. See note 20, p. 3.

85. Colin Leyden, Environmental Defense Fund, “New Permian data show how worst offenders prevent progress on flaring,” *Texas Clean Air Matters* (blog), 14 August 2019, archived at <https://web.archive.org/web/20200108185401/http://blogs.edf.org/texascleanairmatters/2019/08/14/new-permian-data-show-how-worst-offenders-prevent-progress-on-flaring/>.

86. Railroad Commission of Texas, *Temporary Exception to Certain Fees & Surcharges Required by Statewide Rule 78*, 5 May 2020, available at <https://rrc.texas.gov/media/57583/rule-78-exception-05may2020.pdf>; Cathy Bussewitz, “Texas eases underground oil storage rules, raising concerns,” *Minneapolis Star Tribune*, 5 May 2020, archived at <https://web.archive.org/web/20200513071208/https://www.startribune.com/texas-eases-underground-oil-storage-rules-raising-concerns/570218272/>.

87. John McFarland, “The problem of abandoned wells,” *Oil and Gas Lawyer Blog*, 19 December 2016, archived at <https://web.archive.org/web/20190524022531/https://www.oilandgaslawyerblog.com/problem-abandoned-wells/>.

88. Government Accountability Office, *Oil and Gas: Bureau of Land Management Should Address Risks from Insufficient Bonds to Reclaim Wells*, September 2019, archived at <https://web.archive.org/web/20200526105717/https://www.gao.gov/assets/710/701450.pdf>.