

State of the Anticline

Background

The Record of Decision (ROD) for the Supplemental Environmental Impact Statement (SEIS) for the Pinedale Anticline Project Area (PAPA) was signed in 2008. This second in-depth NEPA analysis of drilling activity on the Anticline superseded the first document approved in 2000. The SEIS analyzed development of 4,399 wells to be located on no more than 600 well pads with development and drilling anticipated occurring through 2025. It is estimated that wells will have a 40-year production life continuing until about 2065. Since the signing of the ROD in September 2008, 992 wells have been drilled. In 2011, 300 wells have been drilled to date.

The project area encompasses almost 200,000 acres. About 4000 acres have been disturbed as a result of well pad construction for the 2200 wells drilled since exploration began in the area in 1939 although accelerated development did not occur until the 1990's. Disturbed areas not supporting production are mandated in the ROD to be in interim reclamation pending final abandonment of the well.

Year-Round Drilling

One of the key decisions of the ROD is a Relief from Seasonal Restrictions clause (ROD pgs. 4, 7, 23, 24) which grants relief from seasonal wildlife restrictions in specific areas. This allows for year-round development and delineation activity within big game (i.e., pronghorn and mule deer) and Greater Sage-grouse seasonal use areas. The concept of year-round drilling was supported by the operators, the Wyoming Game and Fish Department (WGFD), and local government/businesses.

It was thought that year-round drilling would enhance economic stability by reducing the number of transient workers impacting socio-economic conditions in Pinedale on a seasonal basis by allowing year-round operations in certain areas. A large, seasonal workforce was taxing local community infrastructure. Additionally, the operators were unable to maintain an efficient and qualified workforce when seasonal restrictions were applied. The retention and deployment of higher efficiency, lower emissions drill rigs was hampered by the seasonality of drilling. It was suggested that year-round drilling would create non-seasonal jobs and encourage permanent workers to relocate to the area with their families. Project proponents and local government agencies identified potential revenues from tax dollars, royalties, and jobs associated with year-round drilling as benefits to the state, county, and local communities.

The WGFD and BLM supported year-round drilling as a means of reducing the spatial impact of development on winter habitat. Unanticipated impacts to wildlife were being experienced by the scattered development, by intense seasonal activity during summer months, and by delayed reclamation. Phased and concentrated development has provided some relief for mule deer and pronghorn who use this area for crucial winter range, and on Greater Sage-grouse habitat, compared to disbursed development associated with seasonal restrictions.

Perceived benefits to wildlife as a result of Year-Round Drilling include:

1. Standard seasonal restrictions do not preclude production activity, only development activity. This ROD offered crucial winter range and Greater Sage-grouse habitat in the long-term through reducing disturbance, both to habitat and that caused by human presence, during the production phase. The long-term reduction in year-round human presence is due the construction of liquids gathering systems and computer-assisted operations which reduce vehicular traffic;
2. Relief from seasonal restrictions allows for systematic development resulting in decreased development time and theoretically decreased time for commencement of well pad reclamation;

3. Relief from seasonal restrictions will maximize pad drilling in a geographic area to minimize the disturbance footprint and habitat fragmentation elsewhere.

Year-Round Drilling and Mule Deer Populations

Since the signing of the ROD in 2008, there has also been a drop in mule deer population in the Sublette herd unit area. There has been some criticism from the public that the BLM's Year-Round-Drilling policy has contributed to this population decrease. The cause of this decline has not been determined although possible catalysts could be increased energy development, several harsh winters, and/or encroachment by subdivisions. In comparison to the populations during the reference years of 2005/06, during the winter of 2009/10 populations of mule deer dropped 28% on the Mesa in the northern part of the Anticline, 7% within the Sublette Herd Unit, and 12% statewide. Populations increased by 125% in the Soapholes/Ryegrass area to the west of the Mesa. It is speculated that due to the relatively mild winter of 2009/10, the mule deer did not need to migrate from the Soapholes/Ryegrass to the Mesa which could be reflected in the decrease on the Mesa and the resulting increase in the Soapholes/Ryegrass area on the west side of the Green River.

These impacts were not unanticipated. The SEIS acknowledged that habitat impacts would be substantial due to full field development. For this reason, it is premature to revoke this policy until more monitoring data are gathered and delineation drilling activity, i.e., delineating the boundaries of hydrocarbon reservoirs, is completed.

Monitoring data for the winter of 2010/11 has not been finalized but will be made available during the fall of 2011.

For more information on mule deer go to:

<http://www.wy.blm.gov/jio-papo/papo/wildlife.htm> or

<http://www.wy.blm.gov/jio-papo/whatsgoingon.htm> (see Mule Deer Situational Report).

Geographic Management

The ROD incorporates mitigation strategy to minimize impacts to wildlife which includes limiting the spatial extent of development through Geographic Management (ROD pg. 7), reducing the number of well pads by locating multiple wells on enlarged pads, and reducing human presence and traffic through the construction of liquids gathering systems.

Geographic Management of development is a component of mitigation in minimizing impacts to wildlife. Concentrated Development is an integral part of Geographic Management whereby development of PAPA drilling activities are generally located in discrete geographic blocks leaving large percentages of the PAPA free of intensive development activity at any given time. Essentially, Concentrated Development is simultaneous construction, drilling, completion, and production within an identified zone.

The ROD established 4 areas for management of oil and gas activities: 1) Core Area with 5 Development Areas (ROD pg. 7); 2) Potential Development Area (PDA) (ROD pg. 11); 3) River Corridor (ROD pg. 11); and 4) Flanks (ROD pg. 13). Development and delineation activities are managed differently within these areas.

1. The Core Area encompasses about 23 percent of the PAPA and is generally the 2-3 mile wide and 25-30 mile long crest of the Anticline Formation encompassing about 45,400 acres. Relief from seasonal restrictions for big game and sage-grouse is applied within this area. Drilling activity is restricted to specific Development Areas and proceeds sequentially. Most of the drilling in the PAPA is occurring within the Core Area and proceeding sequentially as laid out in the ROD.
2. The Potential Development Area (PDA) is located adjacent to the Core Area and is available for year-round development on about 12 percent of the PAPA. The PDA is

generally a ½-mile-wide buffer outside the Core Area with specific management and development constraints on about 24,900 acres. Requests for drilling activity within the PDA are reviewed annually. Development can only occur within 1 mile of one of five designated sage-grouse key leks at any time within Development Area 5.

3. The River Corridor, i.e., the area along the New Fork River, is of particular importance due to the concentration of raptors and raptor nests and occupies about 3 percent of the PAPA. Development activities must adhere to seasonal habitat restrictions from November 1 to August 15 within 1 mile on either side of the river. Any drilling exceptions are on a case-by-case basis. Compliance is also required with the Bald and Golden Eagle Protection Act and Migratory Bird Treaty Act. Drilling within the River Corridor has occurred on both private and public lands. The location, timing restrictions, and mitigation measures are determined at the annual wildlife planning meeting.
4. The Flanks occupy about 64 percent of the PAPA and are outside of the Core Area and the PDA and encompasses about 127,700 acres. Approximately 50,000 acres will not have additional activity until 2013 while about 40,800 acres are leased and the leases are not suspended. Any development within the Flanks must adhere to seasonal habitat restrictions.

Mitigation Fund and the Pinedale Anticline Project Office (PAPO)

In addition to the above mitigation measures incorporated in the ROD, other mitigation includes the establishment of a Mitigation and Monitoring Fund (ROD pgs. 17, 31). This Fund is used to enhance or conserve wildlife habitat and the establishment of the PAPO (ROD pgs. 18, 31), which manages the Fund. The Fund is also available to support mitigation of other resources such as air quality. (For more information on the PAPO go to: <http://www.wy.blm.gov/jio-papo/papo/index.htm>.)

The PAPO was established to collect, manage, and distribute monitoring information in support of adaptive management and evaluate mitigation projects to be supported from the Fund in the implementation of the ROD. The ROD estimated the necessity of the PAPO would be about 25 years or until 2033. The PAPO currently has a multi-agency staff of 9 specialists. The PAPO has recently been involved with a third-party review of wildlife monitoring protocols, managing wildlife inventory contracts, collecting and analyzing reclamation data, and inventorying and assessing habitat within the Anticline for potential mitigation treatment.

The PAPO Board of Directors has approved funding for several wildlife mitigation projects. These include: conservation easements, habitat enhancements, research, and wildlife monitoring.

Conservation Easements

Conservation easements, which restrict certain types of development on private land in perpetuity, are one of the mitigation options found in the Mitigation Responses section of the Wildlife Monitoring and Mitigation Matrix (ROD B-5). Easements assure continued habitat function by limiting surface development such as residential subdivisions as well as provide an opportunity to enhance habitat function. Other benefits include maintenance/conservation of migration corridors and bottleneck passages, establishment of forage reserves, and conservation of agricultural lands.

Conservation easements were identified as an appropriate mitigation as a result of the trend for new home construction in Sublette County identified in the Final SEIS. New Single Family housing permits more than doubled between 2004 and 2005 (SEIS Table 3.5-22) and dramatic growth in every sector related to population was being experienced. Continued population growth was predicted, and growth in residential housing in response to shortages in availability of affordable housing was anticipated to continue. The “rural Wyoming character”, it was thought, would lead to some portion of the anticipated growth occurring in outlying areas. The conservation easements are intended to protect the most

sensitive areas from this development. Conservation easement proposals were screened as to the importance of the habitat to be protected to wildlife resources and other values.

The Mitigation Fund has contributed to the:

- Murdock Ranch conservation easement on 870 acres
- Sommers/Grindstone conservation easement on 19,000 acres.

Habitat Enhancement

Habitat enhancement is one of the first options available in reaction to wildlife population decline in the sequence of Mitigation Responses in the ROD (pg. B-5). Improvement of habitat on the Anticline is a reasonable approach to mitigating for impacts to wildlife resulting from development. Projects would be designed to enhance available winter forage by increasing sagebrush and other vegetative production, and potentially increasing palatability and nutrient quality on identified crucial winter range.

As the Final Environmental Impact Statement summarized in Chapter 3, the use of the crucial winter range on the Mesa is dependent on snow conditions, with deer relying heavily on the shrub component during this time. Treatments involving disturbance of the shrub component to improve habitat in the area, would initially reduce forage availability. Fertilization is one method of achieving improved forage without disturbing the shrubs.

The Mitigation Fund has financed 2 sagebrush fertilization projects. In 2010 the PAPO and the WGFD implemented a rangeland fertilization project on 468 acres on the Pinedale Anticline to offset natural gas development impacts to the wintering mule deer and year-round Greater Sage-grouse populations. The goal of the project is to increase sagebrush leaders and herbaceous production. Preliminary results from the 2010 fertilization will be available by October 2011. A similar project was approved for implementation in the fall of 2011 and another in a subsequent year if, after reviewing the results from earlier applications, it is determined to be a viable mitigation option.

These proposals could have short-term benefits to mule deer habitat on the Mesa by increasing sagebrush and other vegetative growth. The proposal is an immediate response for habitat enhancement and may have merit in providing for some added browse production. The project has the potential to benefit mule deer, pronghorn, sage-grouse and other wildlife species that use these habitats.

During 2011, PAPO wildlife biologists in cooperation with BLM and WGFD biologists are conducting a Habitat Assessment inventory to identify those areas that would offer the greatest potential for successful habitat treatment or enhancement. The Soapholes and Ryegrass allotments, which are to the west of the Mesa, are the initial targeted areas for assessment. This report will be ready by early winter 2011 and will be used during the evaluation of project applications for 2012.

Migration Corridor Enhancements

The Mitigation Fund has contributed to a fence modification project called the Wildlife Friendly Fencing Initiative-Phase 2. This project is an effort to link wildlife habitat and migration corridors through agricultural land along 500 miles to retrofit existing fence and make it wildlife friendly within a portion of a big game migration route.

Fences are an impediment to wildlife movement. Fences constructed of woven wire, or with multiple tightly spaced wires can also serve as a barrier to movement. Wildlife crossing fences or moving to locations where they can cross exert energy. Migration periods when wildlife most encounter fences blocking their paths are at critical periods when every ounce of energy is important. The Wildlife Friendly fencing initiative is working to address these barriers by realigning fences to areas where wildlife have easier time crossing, changing fence from woven wire to barbed wire, and reducing the number of strands of barbed wire. These efforts will improve the ease with which wildlife make their annual migration, and reduce the stress and energy used during the critical periods of the year.

The mule deer migration route that was chosen will primarily benefit mule deer that migrate down along the Wind River Front. However, in the northern section of the route, near the Hoback, there is potential for fence modification to benefit mule deer that specifically migrate to and from the PAPA and within the Sublette Mule Deer Herd Unit.

Research

Research is one aspect of the adaptive management strategy by providing new data in which to evaluate current protocols. Currently, two research projects are being supported by the Fund.

The Bald Eagle Habitat research project was approved in 2011 with the goal of identifying key habitats to ensure future mitigation efforts target the most effective areas to protect the species. This project meets the following goal of the PAPO strategic plan, i.e., "Actively pursue projects to benefit wildlife on a landscape scale within the Upper Green River Basin with a focus on those populations impacted by development on the Pinedale Anticline Project Area, and is focused on a wildlife population impacted by development on the PAPA."

During 2011, the University of California-Davis is being funded to determine impact on sage-grouse from noise generated from energy development. It is anticipated that a report with findings and recommendations will be available in February 2012.

Wildlife Monitoring

An aspect of the wildlife mitigation effort and an outcome from the ROD was the development and implementation of a Wildlife Monitoring and Mitigation Plan (2009) to monitor wildlife populations while tracking their response to energy development. The data gathered, which is shared between the BLM and WGFD and interested parties, provides guidance for field development and mitigation projects. The plan can be found at: http://www.blm.gov/wy/st/en/field_offices/Pinedale/anticline/resources/wildlife.html.

This plan, through the application of the Wildlife Monitoring Matrix (ROD Appx B), ensures that appropriate management actions are taken by the BLM should a drop in wildlife populations occur below a specified threshold of 15%, in the case of mule deer and pronghorn, compared to a baseline year. The Matrix defines the parameters and thresholds for which monitoring is conducted on the 5 designated species of concern. This process utilizes performance based measures to respond to emerging undesired changes, specifically declines in populations.

For example, during the winter/spring of 2009-10, monitoring showed mule deer populations in the Anticline declined below the Matrix threshold which triggered Mitigation Responses established in the ROD (pg. B-4). A public meeting was held in Pinedale by the WGFD in August 2010 to explain the results and the Mitigation Response process.

The PAPO Mitigation and Monitoring Fund supports annual wildlife inventories for the 5 species listed in the Wildlife Matrix, (i.e., mule deer, pronghorn, pygmy rabbit, prairie dog, and sage-grouse) plus raptors. The purpose of these inventories is to quantitatively monitor and report wildlife population parameters and habitat use within the Anticline and compare them to reference area populations and habitat use. These monitoring surveys are contracted out at an annual cost of about \$1,100,000.

Specific monitoring goals are:

Mule Deer and Pronghorn

- Monitor during winter and report population changes
- Map collared deer locations and migration routes
- Analyze deer distribution and habitat selection

Sage-grouse

- Conduct lek surveys and report population trends
- Monitor winter use to identify winter concentration

Pygmy Rabbit

- Identify and map suitable habitat
- Conduct monitoring sufficient to identify 3 consecutive years of decline in the presence or absence of populations or decline in numbers of individuals each year over 3 years

White-tailed Prairie Dog

- Map prairie dog town within the PAPA and Reference Areas
- Monitor long-term trend in occupancy rates
- Monitor long-term trend in active burrow density/population numbers

Raptors (Although not a Matrix species of concern, the PAPO has been funding raptor surveys)

- Monitor all nests with the PAPA and a 1-mile buffer to determine productivity
- Monitor the New Fork and Green River Corridors within the PAPA to determine occurrence or potential occurrence of wintering bald eagle roosts.

Air Quality

Air quality, particularly visibility and ozone, continues to be a high priority concern and issue. The Wyoming Department of Environmental Quality/Air Quality Division (WDEQ/AQD) regulates and monitors activities in the Anticline relevant to air quality. Random inspections of the well pads are conducted regularly to ensure compliance with air quality permits, and larger facilities periodically undergo scheduled inspections.

An air quality engineer/inspector, located in the PAPO and supported by the Mitigation Fund, is responsible for inspections in the Anticline to ensure compliance with DEQ regulations. DEQ also hired a data analyst to analyze and report on ambient monitoring data for 2 years. The Cheyenne AQD staff is responsible for providing input to the BLM regarding the Record of Decision. Also responsible for monitoring facilities in the area is the AQD staff based out of Lander.

A rigorous assessment of WDEQ-AQD's ambient air monitoring network for southwest Wyoming was completed in August 2008. The final report can be found online on the WDEQ-AQD, Monitoring Program Information, Wyoming Network Assessments page at:

<http://deq.state.wy.us/aqd/Wyoming%20Network%20Assessments.asp>.

The Monitoring and Mitigation Fund provides a funding contribution to WDEQ-AQD not to exceed \$1,250,000 over a 5-year period to establish and/or operate monitors recommended by the "network assessment" for pollutants of interest from the PAPA.

Air monitoring stations near the Anticline include Pinedale, Boulder, Daniel, Juel Springs, Big Piney, Wyoming Range, and South Pass. These stations measure air pollutants including ozone, NO_x, and Particulate Matter and will, to the extent practicable, be used in performing future air quality monitoring.

Ozone

Elevated levels of ground-based ozone were detected in the Upper Green River Basin in February of 2005 and 2006. Starting in the winter of 2007 and continuing through the winter of 2011, WDEQ-AQD contracted with various consulting companies to perform studies of varying parameters of ozone formation in the basin.

Upper Green Winter Ozone Studies (UGWOS) can be viewed online on the WDEQ-AQD, Sublette County Ozone Information, UGWOS page at: <http://deq.state.wy.us/aqd/Ozone%20Main.asp>.

In conjunction with the winter studies, WDEQ-AQD has requested winter specific emission inventories be submitted by the operators yearly for the past several years and are used to help refine the NO_x and VOC emissions inventories.

The complex nature of ozone development within the Upper Green River Basin has proven difficult to emulate through modeling. The WDEQ-AQD is pursuing a variety of avenues with the goal being the

development of a wintertime ozone model. A Technical Advisory Group (TAG) consisting of AQD personnel, academics, industry representatives, consultants and other interested parties was created by WDEQ-AQD in 2010 to seek technical feedback on ozone modeling issues.

In the absence of a working wintertime ozone model the PAPA ROD requires continued monitoring and mitigation. Examples of mitigation actions the operators could implement include reducing emissions from drill rigs, retrofitting production equipment and redesigning systems to minimize/eliminate emission points, and the installation of a liquids gathering system.

Anticline operators developed contingency plans for short-term reductions in VOCs and NOx to address episodic and elevated levels of ozone in the winter. Starting in 2011 these plans were standardized by WDEQ-AQD. Voluntary participation outside of the PAPA has increased over the past few years and is anticipated to continue to grow.

The Pinedale Anticline Spatial Air Quality Analysis (PASQUA) is a University of Wyoming – Department of Atmospheric Sciences air quality study that has completed its 2nd of 3 years of monitoring. The primary aim of the analysis is to provide a spatial measurement survey of key ozone precursors.

Additional information about the UW air quality assessment work can be found online at the WDEQ-AQD, Sublette County Ozone Information, Ozone Technical Forum page at: <http://deq.state.wy.us/aqd/Ozone%20Technical%20Forum.asp>.

More information on ozone and contingency plans can be found at: <http://deq.state.wy.us/aqd/Ozone%20Main.asp> or

<http://www.papaoperators.com/Meeting-Our-Commitments.php#AIR>

Visibility

As a result of ROD requirements (page 26, Section 4.1.1), Anticline operators annually update a 10-year rolling forecast or development plan for submission to the BLM and WDEQ-AQD to ensure zero days of visibility impairment. The forecast or development plan reports the anticipated activity levels and projected air emissions from all project related sources in the PAPA as identified by WDEQ-AQD.

More information on visibility can be found at: <http://wyvisnet.com/> or <http://deq.state.wy.us/aqd/visibility.asp>.

Air Quality Mitigation Options

The actions listed below, with their implementation status, were offered in the ROD (pgs. 25-26) as means for the operators to mitigate for impacts from visibility and/or ozone.

- Replace diesel-fired drilling rig engines with natural gas-fired drilling rig engines
No action
- Use fuel additives
No action
- Use gas turbines rather than internal combustion engines for compressors
No action
- Reduce the number of drilling rigs
No action
- Require Tier 2 equivalent (or better) emissions on drilling rig engines
SWEPI: all rigs are at least tier 2
Ultra: 5 rigs are tier 2
QEP: all rigs have tier 2 or better
- Install Selective Catalytic Reduction (SCR) on drilling rig engines
SWEPI: all rigs have SCR
Ultra: 5 rigs have SCR
QEP: 1 rig has SCR; all rigs will have SCR by the end of 2011

- Use electric drilling rigs
No action
- Implement electric compression
Discussions with BLM and DEQ are on-going
- Require centralization of production facilities to reduce truck traffic
Ultra, Shell, and QEP have each constructed a Liquids Gathering System to centralize production facilities

WDEQ-AQD has also completed an air toxics health assessment for Sublette County residents. The final report is available online at the WDEQ-AQD, Sublette County Ozone Information, Air Toxics page at: http://deq.state.wy.us/aqd/Ozone%20Air%20Toxics_Sublette%20County.asp.

Groundwater

Protection of groundwater resources was a major issue during preparation of the PAPA SEIS. Due to a lack of information regarding groundwater resources and multiple detections of hydrocarbons within the Anticline field, the ROD prescribed a series of actions that BLM would take in accordance with BLM's Regional Framework for Water Resources Monitoring Related to Energy Exploration and Development. The PAPA SEIS ROD mandated that the BLM complete 3 steps which would culminate in an Interim and Final Groundwater/Aquifer Pollution Prevention, Monitoring and Mitigation Plan. The 3 steps necessary under the Framework are: 1) compile all existing information, 2) characterize the groundwater system, and 3) modify the monitoring plan (Sec. 4.2, p. 29). Step 1 was completed prior to the SEIS under the purview of the Pinedale Anticline Working Group-Water Resources Technical Group (PAWG-WRTG) and was incorporated into the SEIS analysis.

AMEC Geomatrix, Inc. was contracted by the PAPA Operators to assist with developing the Interim Plan in October 2008. The BLM, Wyoming Department of Environmental Quality's Water Quality Division (DEQ/WQD), Region 8 of the U.S. Environmental Protection Agency (EPA), SWEPI, QEP Energy, and Ultra collaborated with AMEC to develop the Interim Groundwater/Aquifer Pollution Prevention, Mitigation and Monitoring Interim Plan (Interim Plan) which was completed in December 2008 as required by the SEIS ROD. The Interim Plan is funded by the operators and is not under the purview of, nor does it receive funding from, the PAPO.

The Interim Plan required a number of Work Tasks to be completed in order to identify necessary mitigation, characterize the groundwater environment, and identify potential changes necessary to the current monitoring program. These plans of study included:

- Data Gaps Plan of Study
- Aquifer Characterization
- Hydrostratigraphic Unit Definition and Communication
- Surface/Groundwater Interaction
- Low Level Hydrocarbon Study
- Source Assessment/Rainbow Matrix
- Biogenic vs. Thermogenic Origin of Headspace Gas
- Standard Operating Procedures Evaluation
- Vulnerability/Risk Assessment
- Mitigation Identification.

In order to characterize the groundwater resources of the Pinedale Anticline, 30 Piezometers, 30 Study Wells (30' to 800') [4 on private land, 10 on native range, and 16 on existing disturbance] were installed across the anticline during 2010/2011; we were unable to secure permission for one site on the Green River.

Although, not specifically required in the ROD, Geomatrix and the Operators recently proposed the development and use of a numerical groundwater flow and transport model which the BLM/DEQ/EPA are

currently evaluating. As proposed, the primary purpose of the model is: 1) provide an interpretive tool that will allow stakeholders to evaluate flow and transport across and throughout the project area rather than at single well locations, 2) help identify locations where changes in groundwater quality due to legacy contamination would most likely develop, and 3) allow a much better understanding of uncertainty and how it should be considered in the decision-making process.

A draft Final GW/Aquifer Pollution Prevention, Monitoring and Mitigation plan is expected to be complete in early December 2011. For more information on Groundwater Monitoring go to:
http://www.blm.gov/wy/st/en/field_offices/Pinedale/pawg/DataResults.html.

Further Reading

Updated information about the Anticline can be found at:

<http://www.wy.blm.gov/jio-papo/papo/index.htm>

http://www.blm.gov/wy/st/en/field_offices/Pinedale.html

<http://www.papaoperators.com/>

http://www.blm.gov/wy/st/en/field_offices/Pinedale/pawg.html

An historical background on energy development in this area can be found at:

<http://www.wyohistory.org/essays/jonah-field-and-pinedale-anticline-natural-gas-success-story>.

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