

STATE OF ALASKA
ALASKA OIL AND GAS CONSERVATION COMMISSION
333 West 7th Avenue, Suite 100
Anchorage Alaska 99501

Re: THE APPLICATION OF Pioneer) Disposal Injection Order No. 31
Natural Resources Alaska, Inc. for)
disposal of Class II oil field wastes by) Oooguruk Unit
underground injection in the Torok) DW-1 and DW-2 Wells
Sand in the Oooguruk Unit DW-1 and)
DW-2 Wells, Section 11, T13N, R7E,)
U.M.)
) June 19, 2007
)

IT APPEARING THAT:

1. By application to the Alaska Oil and Gas Conservation Commission (“Commission” or “AOGCC”) dated March 14, 2007 and received on March 15, 2007, Pioneer Natural Resources Alaska, Inc. (“Pioneer”) requested authorization to allow the underground disposal of oil field waste fluids in a Class II well, as defined in 40 C.F.R. 144.6(b), as revised as of July 1, 1998, in the Torok Sand (“Torok”) within the Oooguruk Unit.
2. Proposed Oooguruk DW-1 well (“DW-1”) and substitute Oooguruk DW-2 well (“DW-2”) would be drilled from the Oooguruk Drillsite (“ODS”) beginning September 2007.
3. Pioneer filed an application for a Class I well permit with the United States Environmental Protection Agency (“EPA”) on March 6, 2007 covering the same wells. Pioneer intends the requested Class II disposal injection order to serve as a back-up in the event the Class I well permit is not issued prior to commencement of drilling operations.
4. The Commission published notice of opportunity for public hearing in the Anchorage Daily News on March 25, 2007 and in the Arctic Sounder on March 29, 2007 in accordance with 20 AAC 25.540.
5. The Commission did not receive any protests to the application, comments, or requests for a public hearing. The hearing tentatively scheduled for May 1, 2007 was vacated.

FINDINGS:

1. Location of Adjacent Wells (20 AAC 25.252(c)(1))

DW-1 is planned as a vertical well located 2,385 feet from the north line and 1172 feet from the east line of Section 11, Township 13N North, Range 7 East, Umiat Meridian. The well will be drilled from the newly constructed ODS located in State of Alaska waters within the Beaufort Sea approximately 5.7 miles northeast of the Colville River Delta. DW-1 will support Oooguruk Unit development as the disposal injection well for Class II drilling and production wastes. No wells are located within a ¼ mile radius of the planned DW-1. A substitute disposal well, DW-2, may be sidetracked from DW-1 or drilled from a separate surface location from ODS with a bottomhole location 2,000 feet from DW-1 in the Torok.

2. Notification of Operators/Surface Owners (20 AAC 25.252(c)(2) and 20 AAC 25.252(c)(3))

Pioneer is the only operator within a ¼ mile radius of the proposed disposal well. The sole surface owner within a ¼ mile radius of DW-1 and substitute DW-2 is the State of Alaska. Pioneer contacted the Department of Natural Resources (“DNR”) on April 30, 2007. A DNR representative (Temple Davidson) verbally confirmed to Pioneer (John Hellen) on April 30, 2007 that DNR did not require notification and refused Pioneer’s offer of the disposal injection order application.

3. Geological Information on Disposal and Confining Zones (20 AAC 25.252(c)(4))

Pioneer proposes to conduct disposal into the Albian-aged Torok, which is composed of sandy, marine, base-of-slope fan sediments to be penetrated by DW-1. The proposed disposal zone correlates to the interval between 4,962 feet true vertical depth sub sea (“TVDSS”) and 5,229 feet TVDSS (4,999 feet measured depth and 5,226 feet measured depth in the nearby Kalubik No. 1 well. In the vicinity of DW-1 and DW-2, the Torok is expected to lie between about 4,950 feet TVDSS and 5,300 TVDSS. Offset well control indicates that the Torok will be approximately 250 feet thick in this area.

Within the project area, the Torok consists of thin beds of siltstone and very fine-grained to fine-grained sandstone that are interlaminated with layers of shale and claystone. Conventional and rotary sidewall core data from offset wells Kalubik No. 1 and Ivik No. 1 indicate that the sandstone beds average 21 percent porosity and about 18 millidarcies permeability. A limited number of samples indicate that the siltstone beds average about 18 percent porosity and 3 millidarcies permeability.

The Torok injection zone lies within the thick and laterally extensive marine sediments of the Hue Shale zone. An 800-foot thick arresting zone of claystone and siltstone that is capped by a 150-foot claystone layer will provide upper confinement. A 400-foot thick arresting zone of shale and claystone, which is underlain by a dense,

100-foot thick HRZ shale layer, will provide lower confinement. The prospective Kuparuk and Nuiqsut hydrocarbon reservoirs within the Oooguruk Unit lie beneath the HRZ shale layer. Well and seismic data show no significant faulting in the area.

There are no commercial hydrocarbon accumulations in the Torok in or near the proposed disposal area. Oil shows accompanied by heavier gases (butane and pentane) are present in the Torok within the Kalubik No. 1 and Ivik No. 1 wells. However, mud-logging geologists rated the quality of the oil shows as poor in Ivik No. 1 and fair to good in Kalubik No. 1, which is located up-dip. A 12.5-hour test of the Torok in Kalubik No. 1 yielded rates of only about 10 barrels of oil per day and 280 barrels of water per day.

4. Evaluation of Confining Zones (20 AAC 25.252(c)(9))

The potential to fracture through the confining lithologies at DW-1 was modeled by a Pioneer consultant. The goal of the evaluation was to predict fracture growth during slurry injection. Thirty-two cases were modeled, including different combinations of slurry densities, injection rates, perforations, and fracture geometry. Extreme operating conditions were included in model runs to generate operating condition sensitivities.

Pioneer's modeling indicates that the arresting zone would not be penetrated as a result of disposal injection in DW-1. Anticipating batch-type injection, Pioneer's model results expect a radial type disposal domain to develop around DW-1 as injection proceeds.

5. Standard Laboratory Water Analysis of the Disposal Zone (20 AAC 25.252(c)(10))

Laboratory analyses of water produced during testing of the Torok in offset well Kalubik No. 1 averaged 24,300 mg/l of total dissolved solids. Pioneer reports that water salinities calculated for the Torok disposal interval using log data from 10 wells within 6 miles of DW-1 range from 17,000 mg/l to 24,000 mg/l. These calculations were confirmed by the Commission for the three offset wells closest to DW-1 using techniques recommended in EPA guidance document "Survey of Methods to Determine Total Dissolved Solids Concentrations" (KEDA Project No. 30-956).

6. Well Logs (20 AAC 25.252(c)(5))

Pioneer plans to drill DW-1 beginning in September 2007. Well logs must be submitted within 30 days of well completion. Log data from offset wells to DW-1 are on file with the Commission. DW-2 will be drilled if mechanical problems are encountered with DW-1.

7. Demonstration of Mechanical Integrity and Disposal Zone Isolation (20 AAC 25.252(c)(6))

DW-1 will be a vertically drilled disposal well consisting of the following: conductor pipe driven to refusal (approximately 100 feet TVDSS), surface casing set at 2,570 feet TVDSS, and production casing installed at 5,300 feet TVDSS. The surface casing will be cemented from shoe depth to the surface. Production casing will be cemented from total depth to 3,540 feet TVDSS, which is approximately 500 feet above the top of the upper confining zone. If required, DW-2 will be drilled as a sidetrack of DW-1 (with the same surface location) with a bottomhole location about 2,000 feet east of DW-1. Pioneer may drill DW-2 from a new surface location if mechanical or other problems prevent the use of DW-1 for a sidetrack.

Pioneer plans to evaluate the surface and production casing annuli with cement bond logs to confirm that there is adequate cement sheath to isolate the injected fluids to the well bore and intended injection zone. DW-1 and substitute DW-2 will be equipped with tubing and packer to isolate pressure to the disposal interval. Casing, tubing and packer integrity will be confirmed with pressure tests before injection commences in the well and annually thereafter. Oxygen activation logs or temperature surveys will be used during subsequent years while the disposal well remains in service to confirm the waste materials injected are confined to the Torok.

8. Disposal Fluid Type, Source, Volume and Compatibility with Disposal Zone (20 AAC 25.252(c)(7))

DW-1 will serve as the primary waste disposal well for non-hazardous ODS oil field wastes. Development drilling is expected to take three years to complete; during that time, Pioneer will inject an estimated 500,000 barrels of drill cuttings, mud and flush water. Injection during producing years will include well workover fluids, produced water, wastes from any additional drilling, and other fluids eligible for injection into a Class II disposal well. The total estimated volume of Class II wastes to be injected for disposal over the life of the project is less than 1,000,000 barrels. Disposal injection is expected to be made in batches of approximately 1,000 barrels and at rates of about 2.5 barrels per minute. Fracture modeling evaluated the effect of injection rates of up to 4 barrels per minute, injected batch volumes of up to 2,500 barrels, and fluid densities of up to 10.1 pounds per gallon.

No formation fluid samples or core analyses from the Torok at the Oooguruk Unit have been or will be analyzed for compatibility with disposal injection fluids. Pioneer states that data and extensive operational experience involving similar waste materials, formations, and depths and much higher volumes and rates on the North Slope provide an adequate analogy for the proposed Oooguruk Unit disposal injection.

9. Estimated Injection Pressure (20 AAC 25.252(c)(8))

Pioneer estimates that the average surface injection pressure will be between 1,800 psig and 2,300 psig. The maximum surface injection pressure is projected to be 3,500 psig.

10. Aquifer Exemption (20 AAC 25.252(c)(11))

Pioneer requested an EPA ruling concerning aquifers beneath the ODS as part of the underground injection control program Class I permit application process. By letter (dated August 18, 2006), EPA concluded that a “No USDW [*i.e.*, underground sources of drinking water]” ruling applies to the area within a ½ mile radius from the center of DW-1 and substitute DW-2.

11. Mechanical Condition of Wells Penetrating the Disposal Zone Within ¼ Mile of DW-1 (20 AAC 25.252(c)(12))

There are no wells penetrating the Torok within a ¼-mile radius of DW-1 and substitute DW-2. A few of the development wells planned to be drilled to produce from the Kuparuk formation within the Oooguruk Unit are expected to penetrate the Torok within a ½-mile radius of DW-1 and substitute DW-2; those wells will be designed to ensure that no communication path is established for the migration of fluids injected into the Torok.

CONCLUSIONS:

1. The application requirements and conditions for approval of an underground disposal application in 20 AAC 25.252 have been met.
2. The Torok disposal zone is about 250 feet thick, and it lies within the thick and laterally extensive marine Hue Shale zone. Upper confinement will be provided by about 950 feet of claystone and siltstone, and lower confinement will be provided by 500 feet of shale and claystone. There are no significant faults in the vicinity of the proposed operations. Disposal operations in DW-1 and substitute DW-2 will not impact production because the Kuparuk and Nuiqsut reservoirs lie beneath the HRZ shale layer.
3. The total dissolved solids content of the water within the Torok exceeds 10,000 mg/l. There are no commercial oil or gas accumulations in the Torok within the project area.
4. For disposal operations, fluid compatibility in the Torok is not an issue. Operating experience and data from disposal injection—involving (i) similar materials and (ii) performance parameters (*i.e.*, pressures, rates, and volumes) exceeding those planned for DW-1 and DW-2—elsewhere on the North Slope provide an analogy for underground disposal within the Oooguruk Unit.
5. The proposed well designs (including casing, cement, tubing and packer) for DW-1 and substitute DW-2 will protect freshwater by isolating injected fluids and pressure to the well bore and intended injection zone. Verification of final well construction

through cement evaluation and mechanical integrity testing will be necessary prior to injection.

6. Based on the modeled injection rates, volumes, fluid densities, and pressures that exceeded the expected operating conditions, reasonable grounds exist to conclude that waste fluids should be contained within the receiving intervals by the confining lithologies within the Torok, cement isolation of the well bore and operating conditions. Batch injection will likely result in the development of a radial-type disposal domain, limiting the lateral and vertical propagation of the fractures that result from the slurry injection. Modeling predicted a zone of influence (waste plume area) for injected materials to occupy a fracture domain extending approximately 900 feet from the well.
7. Disposal injection operations in DW-1 and substitute DW-2 will be conducted at rates and pressures below those estimated to fracture through the confining zones. Therefore, oil field wastes injected into DW-1 and substitute DW-2 will be confined to the isolated Torok.
8. Supplemental mechanical integrity demonstrations and the surveillance of injection operations—including temperature surveys, monitoring of injection performance (*i.e.*, pressures and rates), and analysis of the data for indications of anomalous events—are appropriate to ensure that waste fluids remain within the disposal interval.

NOW, THEREFORE, IT IS ORDERED THAT disposal injection be authorized into the Torok Formation within the Oooguruk Unit subject to each of the following:

RULE 1: Injection Strata for Disposal

The underground disposal of Class II well oil field waste fluids is permitted into the Torok within DW-1 and substitute DW-2 in the interval that correlates with the interval between 4,962 feet TVDSS and 5,229 feet TVDSS in the Kalubik No. 1 well. The Commission may immediately suspend, revoke, or modify this authorization if injected fluids fail to be confined by the upper or lower confining zones: *i.e.*, confined within the injection zone and between the upper and lower arresting zones estimated to be between 4,131 feet TVDSS and 5,762 feet TVDSS in DW-1 and substitute DW-2.

RULE 2: Fluids

This authorization is limited to Class II waste fluids generated during drilling, production and workover operations.

RULE 3: Injection Rate and Pressure

Disposal injection is authorized at (a) rates that do not exceed 4 barrels per minute and (b) surface pressures that do not exceed 3,500 psig.

RULE 4: Demonstration of Mechanical Integrity

The mechanical integrity of DW-1 and substitute DW-2 must be demonstrated before injection begins and before returning the well to service following a workover affecting mechanical integrity. A Commission-witnessed mechanical integrity test must be performed after injection is commenced for the first time in DW-1 and substitute DW-2, to be scheduled when injection conditions (temperature, pressure, rate, etc.) have stabilized. Subsequent mechanical integrity tests must be performed at least once every two years. The Commission must be notified at least 48 hours in advance of each such test to enable a representative to witness the test. Unless an alternate means is approved by the Commission, mechanical integrity must be demonstrated by a tubing/casing annulus pressure test using a surface pressure of 1,500 psi, or 0.25 psi/ft multiplied by the vertical depth of the packer, whichever is greater, that shows stabilizing pressure and does not change more than 10 percent during a 30 minute period. A written record of the results of all mechanical integrity tests must be readily available for Commission inspection.

RULE 5: Well Integrity Failure and Confinement

Whenever any pressure communication, leakage or lack of injection zone isolation is indicated by the injection rate, an operating pressure observation, a test, a survey, a log, or any other evidence, the operator shall notify the Commission by the next business day and submit a plan of corrective action on Form 10-403 for Commission approval. The operator shall immediately shut in the well if continued operation would be unsafe or would threaten contamination of freshwater, or if so directed by the Commission. A monthly report of daily tubing and casing annuli pressures and injection rates must be provided to the Commission for all injection wells indicating well integrity failure or lack of injection zone isolation.

RULE 6: Surveillance

The operator shall run a baseline temperature log and perform a baseline step rate test prior to initial injection. A subsequent temperature log must be run one month after injection begins, to delineate the receiving zone of the injected fluids. Surface pressures and rates must be monitored continuously during injection for any indications of fracture height growth. Results of daily wellhead pressure observations in DW-1 and substitute DW-2 must be documented and available to the Commission upon request. Subsequent temperature surveys or other surveillance logging (*e.g.*, oxygen activation and acoustic) will be based on the results of the initial and follow-up temperature surveys and injection performance monitoring data.

A report evaluating the performance of the disposal operation must be submitted to the Commission by July 1 of each year. The report shall include data sufficient to characterize the disposal operation and include, for example: pressures (daily average, maximum and minimum); fluid volumes injected (disposal and clean fluid sweeps); injection rates; an assessment of fracture geometry; a description of any anomalous injection results; and a calculated zone of influence for the injection fluids.

RULE 7: Notification of Improper Class II Injection

The operator must immediately notify the Commission if it learns of any improper Class II injection. Notification requirements of any other State or Federal agency remain the operator's responsibility.

RULE 8: Administrative Action

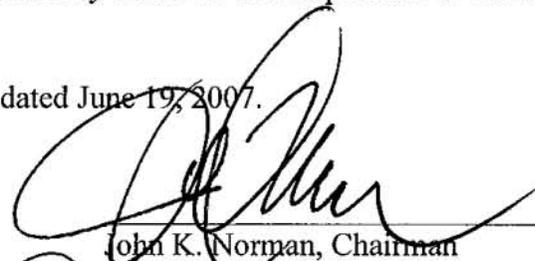
Unless notice and public hearing are otherwise required, the Commission may administratively waive or amend any rule stated above as long as the change does not promote waste or jeopardize correlative rights, is based on sound engineering and geoscience principles, and will not result in fluid movement outside of the authorized injection zone.

RULE 9: Conditions

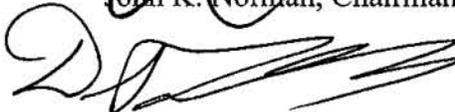
It is a condition of this authorization that operations be conducted in accordance with the rules set out in this order, with AS 31.05, and (unless specifically superseded by Commission order) with 20 AAC 25. Failure to comply with an applicable provision of AS 31.05, 20 AAC 25, or these rules may result in the suspension or revocation of this authorization.

DONE at Anchorage, Alaska, and dated June 19, 2007.

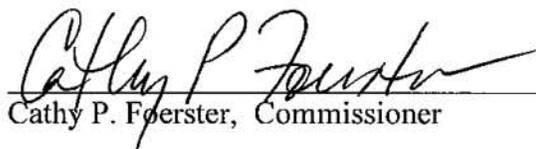




John K. Norman, Chairman



Daniel T. Seamount, Jr., Commissioner



Cathy P. Foerster, Commissioner

AS 31.05.080 provides that within 20 days after receipt of written notice of the entry of an order, a person affected by it may file with the Commission an application for rehearing. A request for rehearing must be received by 4:30 PM on the 23rd day following the date of the order, or next working day if a holiday or weekend, to be timely filed. The Commission shall grant or refuse the application in whole or in part within 10 days. The Commission can refuse an application by not acting on it within the 10-day period. An affected person has 30 days from the date the Commission refuses the application or mails (or otherwise distributes) an order upon rehearing, both being the final order of the Commission, to appeal the decision to Superior Court. Where a request for rehearing is denied by nonaction of the Commission, the 30-day period for appeal to Superior Court runs from the date on which the request is deemed denied (i.e., 10th day after the application for rehearing was filed).