

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

**Re: THE APPLICATION OF ENI US) Area Injection Order No. 36
OPERATING COMPANY INC. for) Docket No. AIO 10-37
an order authorizing underground)
injection of fluids for enhanced oil) Nikaitchuq Field
recovery in the Nikaitchuq Schrader) Nikaitchuq Unit
Bluff Oil Pool, Nikaitchuq Unit,) Nikaitchuq Schrader Bluff Oil Pool
Arctic Slope, Alaska)
) January 19, 2011**

IT APPEARING THAT:

1. By application received on December 2, 2010 , Eni US Operating Company Inc. (Eni US), in its capacity as operator of the Nikaitchuq Unit, requests an order from the Alaska Oil and Gas Conservation Commission (Commission) authorizing the injection of fluids for enhanced oil recovery in the Nikaitchuq Schrader Bluff Oil Pool.
2. A notice of a public hearing scheduled for January 6, 2011 was published on the State of Alaska Online Public Notice web site and on the Commission's web site on December 4, 2010. Publication of the notice in the ANCHORAGE DAILY NEWS was mistakenly delayed by the ANCHORAGE DAILY NEWS until December 9, 2010.
3. The Commission received no comments or requests for a public hearing.
4. Based upon its review of the materials submitted in support of the application, on January 4, 2011, the Commission requested additional information from Eni US. The requested information was submitted by Eni US on January 6, 2011,
5. On January 6, 2011 the public hearing was continued until January 10, 2011 to accommodate the delay caused by the publication mistake by the ANCHORAGE DAILY NEWS.
6. The Commission requested additional information from Eni US at the hearing.
7. On January 11, 2011, Eni US responded to the Commission's request.

FINDINGS:

1. Operator and Owners: Eni US is the operator of the leases in the area proposed for development. Eni Petroleum US LLC is 100% working interest owner and the State of Alaska, Department of Natural Resources (State) is the landowner of the Affected Area, which encompasses the Nikaitchuq Unit.

Correlation	Depth	Resis
GR(DGR)	<TVD	SEDP
0 API 250		0.2 OHMM 2000
SP(N/A)	TVDSS>	SESP
-150 50		0.2 OHMM 2000
	TVD	
	<MD	

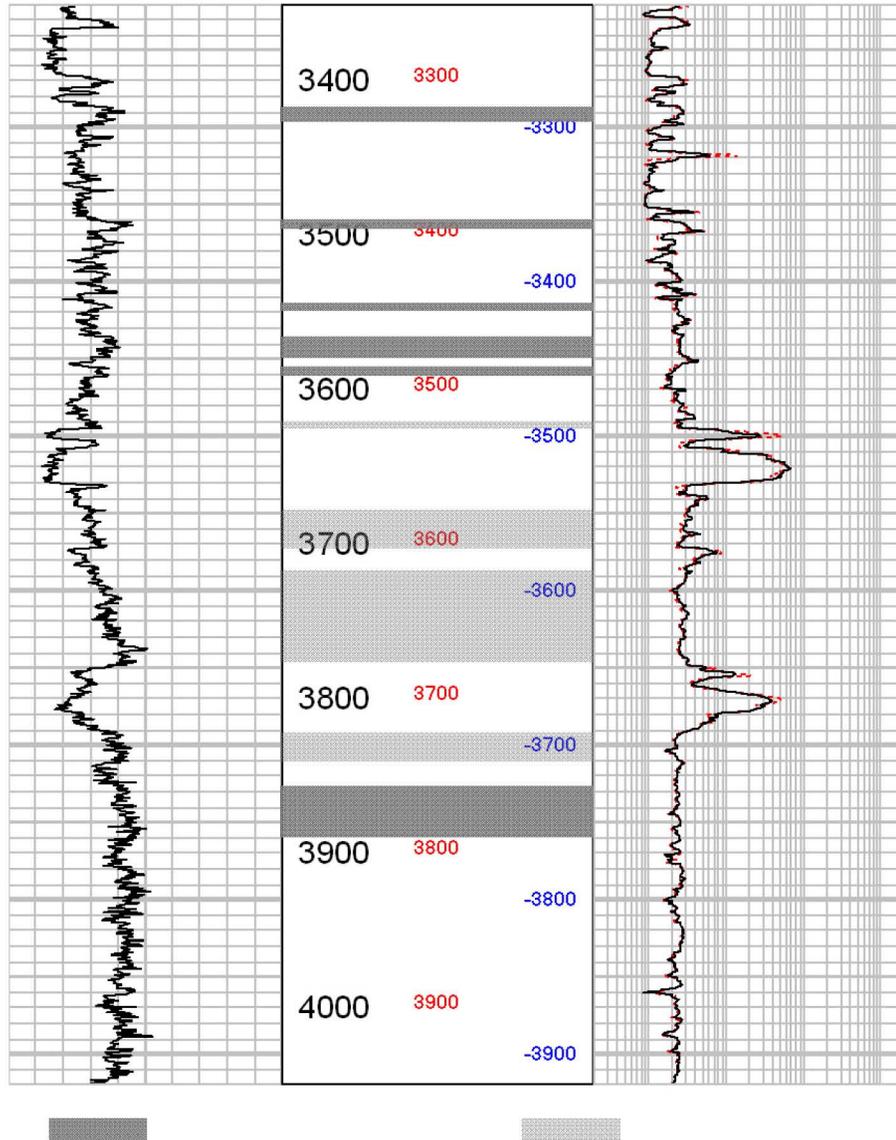
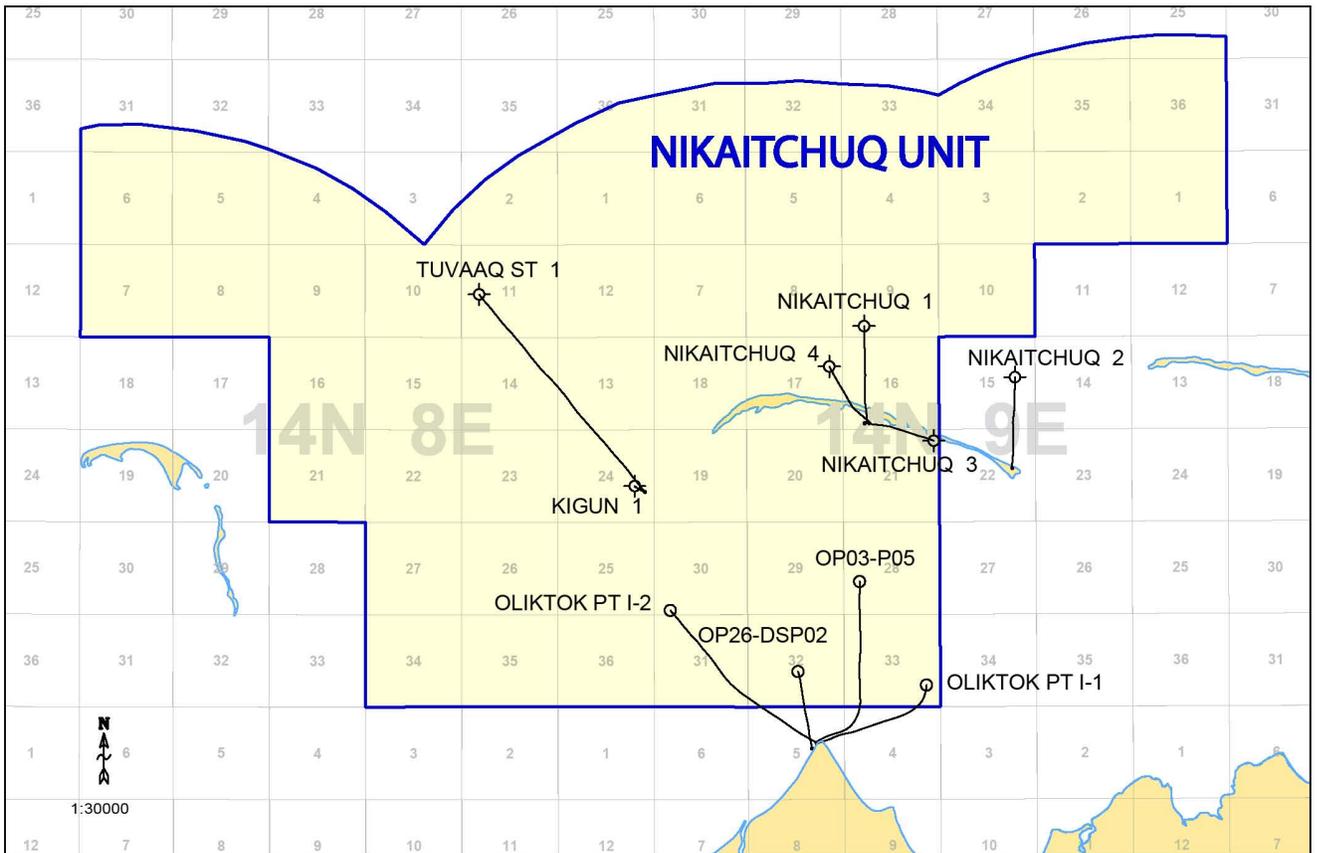


Figure 1. Kigun No. 1 – Type Well Log for Nikaitchuq Schrader Bluff Oil Pool¹

¹ Figure 1 is for illustration purposes only. Refer to the Electromagnetic Wave Resistivity (EWR) well log measurements recorded in well Kigun No. 1 exploratory well for the precise representation of the proposed Nikaitchuq Schrader Bluff Oil Pool.



**Figure 2. Proposed Injection Area for Nikaitchuq Schrader Bluff Oil Pool²
 (highlighted with yellow)**

2. Project Area Pool and Formations Authorized for Enhanced Recovery: Enhanced oil recovery injection is proposed within the Nikaitchuq Schrader Bluff Oil Pool, which is defined in Conservation Order No. 639. The target injection zone is the Nikaitchuq Schrader Bluff Oil Pool, which is correlative to the interval between the measured depths of 3,530 and 3,867 feet³ on the Electromagnetic Wave Resistivity (EWR) well log recorded in exploratory well Kigun No. 1 (see Figure 1, above).
3. Proposed Injection Area: Eni US requests authorization to inject fluids for the purpose of enhanced recovery operations on lands within the Nikaitchuq Unit (see Figure 2, above). The Nikaitchuq Schrader Bluff Oil Pool will be developed initially from the onshore Oliktok

The horizontal grid lines in this figure represent increments of five feet true vertical depth subsea. The acronym TVD refers to true vertical depth, and the acronym TVDSS refers to true vertical depth subsea (true vertical depth below sea level).

² This map is for illustration purposes only. Refer to the legal description for the precise representation of the proposed Affected Area. The Nikaitchuq Unit outline presented on Figure 2 is from the Nikaitchuq Unit Map, published June 15, 2010 by the Alaska Department of Natural Resources, Division of Oil and Gas.

³ Depths presented herein represent measured depths unless otherwise stated.

Point Pad Drillsite (OPP), which is located in Section 5, Township 13N, Range 09E, Umiat Meridian. Eni US' future development plans include construction of an offshore gravel drilling island (termed the Spy Island Drillsite, or "SID") in about six feet of water near Spy Island.

4. Operators/Surface Owners Notification: All lands within the proposed development area are leased and lie within the Nikaitchuq Unit. The only affected surface owner is State of Alaska, Department of Natural Resources. The only affected operator or working interest owner is Eni US, which operates the Nikaitchuq Unit. Eni US provided the application for injection to all operators and surface owners within a one-quarter-mile radius all proposed injection wells.
5. Description of Operations: The Nikaitchuq Schrader Bluff Oil Pool will be developed initially from the OPP using 22 wells: 10 producers, 8 injectors, 3 water source, and 1 disposal. Future development drilling from the SID offshore island will include thirty wells: 16 producers, 13 injectors and 1 disposal. Production and injection horizontal wells will range in length from 4,000 to 10,000 feet within the reservoir, and will be parallel to one another. The wells will trend north or northwest, in general alignment with mapped reservoir faults. Producers and injectors will be arranged end-to-end and alternate to form a line-drive flood pattern. Individual wells will be spaced about 1,200 feet apart. Additional production and injection wells may be added in the future based on net oil pay and reservoir performance. These additional wells will conform to the requirements of Conservation Order No. 639, which governs the Nikaitchuq Schrader Bluff Oil Pool.

Eni US proposes to develop the pool utilizing water injection as the enhanced recovery mechanism. Water injection is scheduled to begin during the first quarter of 2011. Production from the Nikaitchuq Schrader Bluff Oil Pool SID wells will be transported via subsea flow line to the Nikaitchuq field production processing facility located at OPP. Production from the onshore drill site at OPP will be transported by flow line to the Nikaitchuq field production processing facility. Processed Nikaitchuq production will then be transported about 14 miles by above-ground pipeline from the OPP to a tie-in near the Kuparuk River Unit DS-1Y Pad for connection to the Kuparuk Transportation common carrier pipeline.

6. Hydrocarbon Recovery: Estimates of original oil-in-place and recovery (in units of one million stock tank barrels, or MMSTB) within the Nikaitchuq Schrader Bluff Oil Pool development area are:

Hydrocarbon Recovery	(MMSTB)
Original Oil-in-Place (OOIP) – OA Sand	800 - 930
Primary Recovery (4 – 5 % OOIP)	30 - 45
Primary + Water flood (a total of 15% to 22% of OOIP)	120 - 200

First oil from the pool is expected during the first quarter of 2011. The production rate for the Nikaitchuq Schrader Bluff Oil Pool over the project life of 30 years is expected to average about 7,000 barrels of oil per day (BOPD), with a peak production rate of about 28,000 BOPD and 2.2 million cubic feet of gas per day early in the project life.

7. Geology:

- a. Stratigraphy: The Nikaitchuq Schrader Bluff Oil Pool encompasses (in ascending order) the informally named “OA” and “N” sands of the late Cretaceous-aged Schrader Bluff Formation. In exploratory well Kigun No. 1, the OA sand lies between 3,780 and 3,822 feet and the N sand occupies the interval from 3,627 to 3,663 feet. These sediments consist of laminated sands and siltstones deposited as marine shelfal lobes within a foreland basin. They were sourced from the southwest, where the Schrader Bluff Formation interfingers with the marginal marine to non-marine sediments of the Prince Creek Formation. Four distinct lobe deposits are currently interpreted by the operator, and these lobes are separated by layers of siltstone, calcite-cemented siltstone, or mudstone. The OA and N sands appear to persist throughout the Nikaitchuq Unit.

Within the Nikaitchuq Unit, reservoir sands occurring in the proposed Nikaitchuq Schrader Bluff Oil Pool are typically fine- to very fine-grained and lithic-rich. Gross thickness for the OA sand ranges from 30 to 40 true vertical feet. Porosity ranges from 25% to 35%, permeability ranges from 100 to 600 millidarcies, and water saturation ranges from 23% to 45%, with 45% likely representing a transition zone near the oil-water contact (see Reservoir Fluid Contacts, below). Properties of the N sand reservoir are less well understood at present: porosity ranges from 23% to 33%, and water saturation ranges from 13% to 22%.

- b. Structure: Within the proposed development area, the structure of the proposed Nikaitchuq Schrader Bluff Oil Pool forms a monocline that dips gently toward the northeast and is cut by numerous, northwest-trending, normal faults that have vertical displacements ranging up to 80 feet. Within the Nikaitchuq Unit, the top of the pool lies between about -3,300 and -4,100 feet true vertical depth below sea level (true vertical depth subsea, or TVDSS⁴).
- c. Trap Configuration: Well log and seismic information indicate that the Nikaitchuq Schrader Bluff Oil Pool accumulation is trapped by both structural and stratigraphic elements. The Nikaitchuq reservoir sands appear to undergo a facies change toward the southwest, becoming shale. To the north and northeast, structural dip and diminishing sand content in the sediments control oil accumulation extent. To the southeast, the Nikaitchuq structure and the OA and N sands appear to continue beyond the Nikaitchuq Unit boundary toward the Milne Point Unit.

⁴ To avoid confusion, when depths presented in the text represent true vertical depth subsea, the footage will be preceded by a minus sign and followed by the acronym TVDSS (e.g., 3,300 feet below sea level is depicted by the phrase -3,300 feet TVDSS).

- d. Confining and Arresting Intervals: Figure 1, above, displays the arresting and confining intervals that lie above and below the reservoir sands within the Nikaitchuq Schrader Bluff Oil Pool. The OA and N sands are overlain and underlain by laterally extensive, 5 to 60-foot thick mudstone and siltstone intervals that will provide the primary seals to keep injected fluids within the approved intervals and arrest any fractures caused by injection operations. Above and below the arresting intervals are additional 5- to 35-foot thick mudstone and siltstone intervals that will provide additional seals to ensure injected fluids are confined to the approved injection interval.
 - e. Reservoir Compartmentalization: The Nikaitchuq Schrader Bluff Oil Pool reservoir is likely separated into compartments based on the interpreted lobate nature of the reservoir sands, the intervening, laterally extensive siltstone and mudstone layers, and faults having vertical displacements that exceed the thickness of the OA and N reservoir strata.
 - f. Permafrost: Within the proposed current development area, the base of permafrost is interpreted to lie between about -1,800 and -1,900 feet TVDSS.
8. Reservoir Fluid Contacts: In the OA sand, an oil-water contact is estimated to lie at about -4,177 feet TVDSS in the Nikaitchuq No. 2 well. The depth of the oil-water contact in the N sand reservoirs is less certain, lying somewhere between the deepest-known-oil of -3,643 feet TVDSS in well Oliktok Point No. I-1 and the shallowest known water that is interpreted to lie at -3,949 feet TVDSS in well Nikaitchuq No. 4. There is no evidence of different oil-water contacts within separate reservoir compartments.
 9. Reservoir Fluid Properties: Oil samples recovered from the Nikaitchuq No. 4, Kigun No. 1, Oliktok Point No. I-1, and Oliktok Point No. I-2 exploratory wells measure between 16° and 19° API gravity, with viscosity ranging from about 100 to 200 centipoise. The solution gas-oil ratio (GOR) measures from 80 to 140 standard cubic feet per stock tank barrel. The bubble point ranges from about 1,150 psi in the reservoir compartment containing well Oliktok Point No. I-1 to 750 psi in the compartment containing well Oliktok Point No. I-2.
 10. Reservoir Pressure and Temperature: Nikaitchuq reservoir originally measured about 1,700 psi at a depth of -3,760 feet TVDSS in the Kigun No. 1 and Oliktok Point No. I-1 wells. Reservoir temperature is about 80° F.
 11. Well Logs: Logs of injection wells will be filed with the Commission according to the requirements of 20 AAC 25.
 12. Mechanical Integrity and Design of Injection Wells: The casing and cementing programs for all injection wells will comply with 20 AAC 25.030. Cement-bond logs will be run to demonstrate the isolation of injected fluids to the Nikaitchuq reservoir as required by 20 AAC 25.412(d). Mechanical integrity tests will be performed in accordance with 20 AAC 25.412(c). To facilitate wireline access to the deeper portions of highly deviated wellbores, Eni US requests an exception to 20 AAC 25.412(b) to allow packers in injection wells to be located more than 200 feet measured depth above the top of the injection zone; however, packers will not be located above the confining zone.
 13. Type of Fluid / Source: Fluids requested for injection are:
 - a. source water from the Ivishak formation;

- b. produced water from the Schrader Bluff formation;
- c. tracer survey fluid to monitor reservoir performance;
- d. fluids injected for stimulation purposes;
- e. glycol from hydrotests and freeze protection;
- f. diesel used for freeze protection;
- g. methanol used for freeze protection; and
- h. standard oilfield chemicals (corrosion and scale inhibitors, defoamers, emulsion breakers, etc.)

14. Water Compatibility with Formation: Laboratory analytical results for an Ivishak Formation water sample obtained from Nikaitchuq water source well OP23-WW02 and excerpts from a technical study⁵ were submitted as evidence of compatibility of the proposed injected fluids with the formation and native formation fluids. The study excerpt, which is based on analyses of Ivishak and Schrader Bluff formation water samples from the Milne Point, Kuparuk River and Prudhoe Bay fields, predicts mixing native and injected fluids will result in precipitation of insignificant quantities of calcium carbonate, gypsum, barium sulfate and strontium sulfate scale. Computer modeling⁶ also suggests that mixing of these fluids will not result in scale-forming tendencies.

15. Injection Rates, Pressures and Pressure Monitoring: Eni US proposes to develop this oil pool as a water-injection enhanced oil recovery project. Expected maximum and average rates for each injection well are 6,000 and 1,500 barrels of water per day, respectively. Injection rates will be adjusted using surface chokes and downhole injection control devices (ICDs) to manage wellhead pressures, injection rate and reservoir voidage. Once the pool is fully developed, injection operations will maintain a reservoir voidage replacement ratio of about 1 to 1.

Injection pressures are expected to average approximately 750 psi at the wellhead, but may be increased to 1,050 psi with slight modifications. If necessary, Eni US proposes to increase downhole pressure at reservoir level to a maximum of 2,400 psi by adding booster pumps in the future to compensate for friction loss across ICDs and formation plugging. Production and injection voidage will be balanced to maintain reservoir pressure at or near original measured pressure.

Each day at OPP, inner and outer annulus pressure will be monitored for all injection and production wells. At SID, inner annulus, outer annulus, and tubing pressure will be constantly monitored and recorded. Mechanical Integrity Tests (MITs) will be conducted on injection wells as required by the Commission.

16. Fracture Information: The fracture gradient is estimated to range from 0.66 to 0.7 psi per foot. The minimum horizontal stress ranges from 2,800 to 2,900 psi. Maximum planned water injection pressure is 2,400 psi at reservoir level, so injection operations will not initiate or propagate fractures through the arresting or confining intervals.

17. Absence of Underground Sources of Drinking Water: On December 15, 2005, the U.S.

⁵ Stokes, P., and others, 2005, Compatibility and Deliverability Study of Ivishak Source Water for a Schrader Bluff Waterflood, Nikaitchuq Unit, Petrotechnical Resources, Alaska.

⁶ Stokes and others, 2005, cited above.

Environmental Protection Agency (EPA) granted the previous operator of the Nikaitchuq Unit an aquifer exemption for the Ugnu and Sagavanirktok formations, which overlie the Nikaitchuq Schrader Bluff Oil Pool, below a depth of -3,100 feet TVDSS within the Nikaitchuq Development Area (NDA). At that same time, EPA granted a “No Underground Sources of Drinking Water” (No USDW) ruling for the Ivishak Formation below about -9,150 feet TVDSS within the NDA.⁷

On May 19, 2008, the EPA issued a No USDW ruling that extends from the top of the Canning Formation (essentially the base of Schrader Bluff within the NDA) to the base of the Hue Shale (the top of the Highly Radioactive Zone, or HRZ) within a radius of ¼ mile around each Class I disposal well drilled within the NDA.

The Nikaitchuq development will lie entirely offshore beneath State waters of the Beaufort Sea. Freshwater aquifers below permafrost within the NDA are either hydrocarbon-producing or are situated at a depth or location that makes recovery of water for drinking water purposes economically or technologically impractical.

18. Mechanical Condition of Adjacent Wells: There are 15 penetrations of the Nikaitchuq Schrader Bluff reservoir within a ¼-mile radius of the Nikaitchuq Unit exterior boundary. Six of these wells are plugged and abandoned or suspended, with sufficient mechanical isolation to confine fluids and prevent cross-flow. The remaining nine wells are recently-drilled development and service wells with sufficient mechanical isolation to confine injected fluids to the target interval and prevent cross flow into other intervals.

CONCLUSIONS:

1. The requirements of 20 AAC 25.402 have been met.
2. The Commission considered and accepts the cumulative effects of drilling and operating additional injection wells within the NDA. Additional injection wells and injection of water into the Nikaitchuq Schrader Bluff Oil Pool will significantly improve oil recovery.
3. Under 20 AAC 25.440, there are no underground sources of drinking water beneath the proposed Affected Area.
4. Laboratory testing, technical studies and computer modeling indicate that the fluids proposed for injection are compatible with the Nikaitchuq reservoir and native formation fluids.
5. The proposed injection operations will be conducted in permeable strata, which can reasonably be expected to accept injected fluids at pressures less than the fracture pressure of the arresting and confining strata.
6. Injected fluids will be confined within the appropriate receiving intervals by impermeable lithology, cement isolation of the wellbores, and appropriate operating conditions.
7. Daily to continuous well surveillance and reservoir monitoring coupled with regularly

⁷ Letter to R. Britch, Eni US, from M.A. Bussell, Director of the Office of Compliance and Enforcement, US EPA, Region 10, Seattle, Washington, date-stamped 19 May 2008 and included as Exhibit 30 in Eni US' Nikaitchuq Development, Area Injection Order Application dated December 2, 2010.

scheduled MITs will demonstrate appropriate performance of the enhanced oil recovery project and disclose possible abnormalities. An annual report of injection performance is warranted, and it must include an assessment of fracture propagation into adjacent arresting intervals.

8. Setting the packers in the injection wells more than 200 feet MD above the injection interval to facilitate wireline access will not increase the risk of an injection fluid confinement failure, provided that the packer is set at least 300 feet MD below the top of the production casing cement and is not above the confining zone. The location of production casing cement will be established through cement bond logging or alternate methods deemed acceptable by the Commission. Any alternative methods must be approved in advance by the Commission. MITs regularly scheduled by the Commission will ensure integrity of injection wells.
9. Following full-field development, reservoir voidage will be maintained at a replacement ratio of about 1:1.
10. Sufficient information has been provided to authorize injection of water into the Nikaitchuq Schrader Bluff Oil Pool for the purposes of pressure maintenance and enhanced oil recovery, subject to monitoring as described in the rules below.

NOW, THEREFORE, IT IS ORDERED that:

The underground injection of fluids for pressure maintenance and enhanced oil recovery is authorized in the following area, subject to the following rules and, to the extent not superseded by these rules, 20 AAC 25:

Affected Area: Umiat Meridian

<u>Lease Number</u>	<u>Township, Range</u>	<u>Sections</u>
ADL 390433 (Nikaitchuq Unit, Tract 1)	T15N, R09E	Section 31: protracted, all tide and submerged lands shoreward of the line fixed by coordinates found in Exhibit A of the final decree in U.S. vs. Alaska, No. 84 Original, 431.61 acres; Section 32: protracted, all tide and submerged lands shoreward of the line fixed by coordinates found in Exhibit A of the final decree in U.S. vs. Alaska, No. 84 Original, 489.36 acres; Tract 1 contains 920.97 acres, more or less.
ADL 389720 (Nikaitchuq Unit, Tract 2)	T15N, R09E	Section 33: protracted, all tide and submerged lands shoreward of the line fixed by coordinates found in Exhibit A of the final decree in U.S. vs. Alaska, No. 84 Original, 448.39 acres; Section 34: protracted, all tide and submerged lands shoreward of the line fixed by coordinates found in Exhibit A of the final decree in U.S. vs. Alaska, No. 84 Original, 545.63 acres; Tract 2 contains 994.02 acres, more or less.

<u>Lease Number</u>	<u>Township, Range</u>	<u>Sections</u>
ADL 389719 (Nikaitchuq Unit, Tract 3)	T15N, R09E	Section 25: protracted, all tide and submerged lands shoreward of the line fixed by coordinates found in Exhibit A of the final decree in U.S. vs. Alaska, No. 84 Original, 160.10 acres; Section 26: protracted, all tide and submerged lands shoreward of the line fixed by coordinates found in Exhibit A of the final decree in U.S. vs. Alaska, No. 84 Original, 98.90 acres; Section 35: protracted, all, 640.00 acres; Section 36: protracted, all, 640.00 acres; Tract 3 contains 1,539.00 acres, more or less.
ADL 388581 (Nikaitchuq Unit, Tract 4)	T14N, R09E	Section 5: protracted, all tide and submerged lands, 640.00 acres; Section 6: protracted, all tide and submerged lands, 609.00 acres; Section 7: protracted, all tide and submerged lands, 611.00 acres; Section 8: protracted, all tide and submerged lands, 640.00 acres; Tract 4 contains 2,500.00 acres, more or less.
ADL 388580 (Nikaitchuq Unit, Tract 5)	T14N, R09E	Section 3: protracted, all tide and submerged lands, 640.00 acres; Section 4: protracted, all tide and submerged lands, 640.00 acres; Section 9: protracted, all tide and submerged lands, 640.00 acres; Section 10: protracted, all tide and submerged lands, 640.00 acres; Tract 5 contains 2,560.00 acres, more or less.
ADL 388579 (Nikaitchuq Unit, Tract 6)	T14N, R09E	Section 1: protracted, all tide and submerged lands, 640.00 acres; Section 2: protracted, all tide and submerged lands, 640.00 acres; Tract 6 contains 1,280.00 acres, more or less.
ADL 388583 (Nikaitchuq Unit, Tract 7)	T14N, R09E	Section 17: unsurveyed, all tide and submerged lands, 597.76 acres; Section 18: unsurveyed, all tide and submerged lands, 584.52 acres; Section 20: protracted, all tide and submerged lands, 640.00 acres; T. 14 N., R. 09 E., Umiat Meridian, Alaska – Tract A Section 17: unsurveyed, all uplands, 42.24 acres; Section 18: unsurveyed, all uplands, 29.48 acres; Tract 7 contains 1,894.00 acres, more or less.

<u>Lease Number</u>	<u>Township, Range</u>	<u>Sections</u>
ADL 388582 (Nikaitchuq Unit, Tract 8)	T14N, R09E	Section 16: unsurveyed, all tide and submerged lands, 618.37 acres; Section 21: unsurveyed, all tide and submerged lands, 633.08 acres; T. 14 N., R. 09 E., Umiat Meridian, Alaska – Tract A Section 16: unsurveyed, all uplands 21.63 acres; Section 21: unsurveyed, all uplands 6.92 acres; Tract 8 contains 1,280.00 acres, more or less.
ADL 390615 (Nikaitchuq Unit, Tract 9)	T14N, R09E	Section 28: protracted, all, 640.00 acres; Section 33: protracted, all, 640.00 acres; Tract 9 contains 1,280.00 acres, more or less.
ADL 390616 (Nikaitchuq Unit, Tract 10)	T14N, R09E	Section 29: protracted, all, 640.00 acres; Section 32: protracted, all, 640.00 acres; Tract 10 contains 1,280.00 acres, more or less.
ADL 388571 (Nikaitchuq Unit, Tract 11)	T14N, R08E, T15N, R08E	T. 14 N., R. 08 E., Umiat Meridian, Alaska Section 1: protracted, all tide and submerged lands, 640.00 acres; Section 2: protracted, all tide and submerged lands within the computed territorial sea, listed as state acreage on Alaska's seaward boundary diagram approved by the state on April 5, 1996, 539.63 acres; Section 11: protracted, all tide and submerged lands, 640.00 acres; Section 12: protracted, all tide and submerged lands, 640.00 acres; T. 15 N., R. 08 E., Umiat Meridian, Alaska Section 35: protracted, all tide and submerged lands within the computed territorial sea, listed as state acreage on Alaska's seaward boundary diagram approved by the state on April 5, 1996, 24.00 acres; Section 36: protracted, all tide and submerged lands within the computed territorial sea, listed as state acreage on Alaska's seaward boundary diagram approved by the state on April 5, 1996, 282.73 acres; Tract 11 contains 2,766.36 acres.

<u>Lease Number</u>	<u>Township, Range</u>	<u>Sections</u>
ADL 388572 (Nikaitchuq Unit, Tract 12)	T14N, R08E, T15N, R08E	T. 14 N., R. 08 E., Umiat Meridian, Alaska Section 3: protracted, all tide and submerged lands within the computed territorial sea, listed as state acreage on Alaska's seaward boundary diagram approved by the state on April 5, 1996, 170.91 acres; Section 4: protracted, all tide and submerged lands within the computed territorial sea, listed as state acreage on Alaska's seaward boundary diagram approved by the state on April 5, 1996, 516.41 acres; Section 9: protracted, all tide and submerged lands, 640.00 acres; Section 10: protracted, all tide and submerged lands, 640.00 acres T. 15 N., R. 08 E., Umiat Meridian, Alaska Section 33: protracted, all tide and submerged lands within the computed territorial sea, listed as state acreage on Alaska's seaward boundary diagram approved by the state on April 5, 1996, 0.92 acres; Tract 12 contains 1,968.24 acres.
ADL 388573 (Nikaitchuq Unit, Tract 13)	T14N, R08E, T15N, R08E	T. 14 N., R. 08 E., Umiat Meridian, Alaska Section 5: protracted, all tide and submerged lands, 640.00 acres; Section 6: protracted, all tide and submerged lands, 609.00 acres; Section 7: protracted, all tide and submerged lands, 611.00 acres; Section 8: protracted, all tide and submerged lands, 640.00 acres; T. 15 N., R. 08 E., Umiat Meridian, Alaska Section 31: protracted, all tide and submerged lands within the computed territorial sea, listed as state acreage on Alaska's seaward boundary diagram approved by the state on April 15, 1996, 177.20 acres; Section 32: protracted, all tide and submerged lands within the computed territorial sea, listed as state acreage on Alaska's seaward boundary diagram approved by the state on April 15, 1996, 109.39 acres; Tract 13 contains 2,786.59 acres.
ADL 388574 (Nikaitchuq Unit, Tract 14)	T14N, R08E	Section 13: protracted, all tide and submerged lands, 640.00 acres; Section 14: protracted, all tide and submerged lands, 640.00 acres; Section 23: protracted, all tide and submerged lands, 640.00 acres; Tract 14 contains 1,920.00 acres.

<u>Lease Number</u>	<u>Township, Range</u>	<u>Sections</u>
ADL 388575 (Nikaichuq Unit, Tract 15)	T14N, R08E	Section 15: protracted, all tide and submerged lands, 640.00 acres; Section 16: protracted, all tide and submerged lands, 640.00 acres; Section 21: protracted, all tide and submerged lands, 640.00 acres; Section 22: protracted, all tide and submerged lands, 640.00 acres; Tract 15 contains 2,560.00 acres.
ADL 388577 (Nikaichuq Unit, Tract 16)	T14N, R08E	Section 26: protracted, all tide and submerged lands, 640.00 acres; Section 35: protracted, all tide and submerged lands, 640.00 acres; This tract contains 1,280.00 acres, more or less.
ADL 388578 (Nikaichuq Unit, Tract 17)	T14N, R08E	Section 27: protracted, all tide and submerged lands, 640.00 acres; Section 34: protracted, all tide and submerged lands, 640.00 acres; Tract 17 contains 1,280.00 acres.
ADL 391283 (Nikaichuq Unit, Tract 18)	T14N, R08E T14N, R09E	T. 14 N., R. 08 E., Umiat Meridian, Alaska Section 24: Protracted, All, 640.00 acres; Section 25: Protracted, All, 640.00 acres; Section 36: Protracted, All, 640.00 acres; T. 14 N., R. 09 E., Umiat Meridian, Alaska Section 19: Protracted, All, 617.00 acres; Section 30: Protracted, All, 620.00 acres; Section 31: Protracted, All, 623.00 acres; Tract 18 contains 3,780.00 acres, more or less.

Rule 1 Authorized Injection Strata for Enhanced Recovery

Fluids authorized under Rule 3, below, may be injected for purposes of pressure maintenance and enhanced oil recovery within the Affected Area into strata that are common to, and correlate with, the interval between the measured depths of 3,530 and 3,867 feet on the EWR well log recorded in well Kigun No. 1.

Rule 2 Well Construction

Packers in injection wells may be located more than 200 feet measured depth above the top of the Nikaichuq Schrader Bluff Oil Pool; however, packers shall not be located above the confining zone. The production casing cement volume must be sufficient to place cement a minimum of 300 feet measured depth above the planned packer depth. Cement placement must be confirmed by cement bond log or another method approved in advance by the Commission.

Rule 3 Authorized Fluids for Enhanced Recovery

Fluids authorized for injection are:

- a. source water from the Ivishak formation;

- b. produced water from the Schrader Bluff formation;
- c. tracer survey fluid to monitor reservoir performance;
- d. fluids injected for stimulation purposes per 20 AAC 25.280(a)(2);
- e. glycol from hydrotests and freeze protection;
- f. diesel used for freeze protection;
- g. methanol used for freeze protection; and
- h. standard oilfield chemicals (corrosion and scale inhibitors, defoamers, emulsion breakers, etc.)

Any other fluids shall be approved in advance by separate administrative action based upon proof of compatibility with the reservoir and formation fluids.

Rule 4 Authorized Injection Pressure for Enhanced Oil Recovery

Injection pressures must be maintained at or below 2,400 psi at the reservoir sand-face so that injected fluids do not fracture the arresting or confining intervals or migrate out of the approved injection strata.

Rule 5 Monitoring Tubing-Casing Annulus Pressure

Inner and outer annulus pressure shall be monitored each day for all injection and production wells at OPP. Inner annulus, outer annulus, and tubing pressure shall be constantly monitored and recorded for all injection and production wells at SID. The outer annulus pressures of all wells that are not cemented across the Nikaitchuq Schrader Bluff Oil Pool and are located within a ¼-mile radius of a Nikaitchuq injector shall be monitored daily. All monitoring results shall be documented and available for Commission inspection.

Rule 6 Demonstration of Tubing/Casing Annulus Mechanical Integrity

The mechanical integrity of each injection well must be demonstrated before injection begins and before returning a well to service following any workover affecting mechanical integrity. A Commission-witnessed MIT must be performed after injection is commenced for the first time in a well, to be scheduled when injection conditions (temperature, pressure, rate, etc.) have stabilized. Subsequent tests must be performed at least once every four years thereafter (except at least once every two years in the case of a slurry injection well). The Commission must be notified at least 24 hours in advance to enable a representative to witness an MIT.

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 1500 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. Results of MITs must be readily available for Commission inspection.

Rule 7 Well Integrity and Confinement

Whenever any pressure communication, leakage or lack of injection zone isolation is indicated by an injection rate, operating pressure observation, test, survey, log, or any other evidence (including OA pressure monitoring of all wells within a ¼-mile radius of where the Nikaitchuq is not cemented), the Operator shall notify the Commission by the next business day and submit a

plan of corrective action on a 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 8 Annual Performance Reporting

An annual surveillance report will be required by April 1st of each year subsequent to commencement of enhanced oil recovery operations. The report shall include, but is not limited to, the following:

- a. progress of the enhanced recovery project and reservoir management summary including engineering and geological parameters;
- b. reservoir voidage balance by month of produced and injected fluids;
- c. analysis of reservoir pressure surveys within the pool;
- d. results and, where appropriate, analysis of production and injection log surveys, tracer surveys and observation well data or surveys;
- e. assessment of fracture propagation into adjacent arresting intervals;
- f. summary of MIT results;
- g. summary of results of inner and outer annulus monitoring for all production wells, injection wells, and any wells that are not cemented across the Nikaitchuq Schrader Bluff Oil Pool and are located within a ¼-mile radius of a Nikaitchuq injector;
- h. results of any special monitoring;
- i. reservoir surveillance plans for the next year; and
- j. future development plans.

This annual surveillance report may be combined with the report required under Rule 12 of Conservation Order No. 639, which governs the Nikaitchuq Schrader Bluff Oil Pool.

Rule 9 Notification of Improper Class II Injection

Injection of fluids other than those listed in Rule 4 without prior authorization is considered improper Class II injection. Upon discovery of such an event, the operator must immediately notify the Commission, provide details of the operation, and propose actions to prevent recurrence. Additionally, notification requirements of any other State or Federal agency remain the operator's responsibility.

If fluids are found to be fracturing the confining zone or migrating out of the approved injection stratum, the Operator must immediately shut in the injection wells. Injection may not be restarted unless approved by the Commission.

Rule 10 Other Conditions

The Commission may suspend, revoke or modify this authorization if injected fluids fail to be confined within the designated injection strata.

Rule 11 Administrative Action

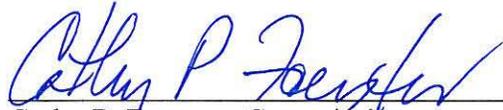
Upon proper application, or its own motion, and unless notice and public hearing are otherwise required, the Commission may administratively waive the requirements of any rule stated herein or administratively amend this order as long as the change does not promote waste or jeopardize correlative rights, is based on sound engineering and geoscience principles, and will not result in an increased risk of fluid movement into freshwater.

DONE at Anchorage, Alaska, and dated January 19, 2011.





John K. Norman, Commissioner
Alaska Oil and Gas Conservation Commission



Cathy P. Foerster, Commissioner
Alaska Oil and Gas Conservation Commission

RECONSIDERATION AND APPEAL NOTICE

As provided in AS 31.05.080(a), within 20 days after written notice of the entry of this order or decision, or such further time as the Commission grants for good cause shown, a person affected by it may file with the Commission an application for reconsideration of the matter determined by it. If the notice was mailed, then the period of time shall be 23 days. An application for reconsideration must set out the respect in which the order or decision is believed to be erroneous.

The Commission shall grant or refuse the application for reconsideration in whole or in part within 10 days after it is filed. Failure to act on it within 10-days is a denial of reconsideration. If the Commission denies reconsideration, upon denial, this order or decision and the denial of reconsideration are FINAL and may be appealed to superior court. The appeal MUST be filed within 33 days after the date on which the Commission mails, OR 30 days if the Commission otherwise distributes, the order or decision denying reconsideration, UNLESS the denial is by inaction, in which case the appeal MUST be filed within 40 days after the date on which the application for reconsideration was filed.

If the Commission grants an application for reconsideration, this order or decision does not become final. Rather, the order or decision on reconsideration will be the FINAL order or decision of the Commission, and it may be appealed to superior court. That appeal MUST be filed within 33 days after the date on which the Commission mails, OR 30 days if the Commission otherwise distributes, the order or decision on reconsideration. As provided in AS 31.05.080(b), "[t]he questions reviewed on appeal are limited to the questions presented to the Commission by the application for reconsideration."

In computing a period of time above, the date of the event or default after which the designated period begins to run is not included in the period; the last day of the period is included, unless it falls on a weekend or state holiday, in which event the period runs until 5:00 p.m. on the next day that does not fall on a weekend or state holiday.