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

Re:	THE APPLICATION OF Aurora Gas, LLC for an order authorizing underground natural gas storage in well Nicolai Creek Unit No. 2 of the Nicolai Creek Unit, Kenai Peninsula Borough, in conformance with 20 AAC 25.252 and 20 AAC 25.412.	Docket Number: SIO-10-01 Storage Injection Order No. 8 Nicolai Creek Field Nicolai Creek Unit South Undefined Gas Pool Kenai Peninsula Borough, Alaska April 16, 2010

IT APPEARING THAT:

1. By application dated February 1, 2010 Aurora Gas, LLC (Aurora) requested a storage injection order from the Alaska Oil and Gas Conservation Commission (Commission) authorizing injection for underground storage of natural gas in the South Undefined Gas Pool of the Nicolai Creek Unit.

2. On February 12, 2010 pursuant to 20 AAC 25.540, the Commission published in the Anchorage Daily News notice of opportunity for public hearing on March 17, 2010.

3. On March 12 and 16, 2010 Aurora submitted supplemental information to the Commission.

4. The Commission held a public hearing on March 17, 2010 at 333 West 7th Avenue, Suite 100, Anchorage, Alaska 99501. No testimony other than from Aurora was offered. The Commission received no protest nor written comments in response to the public notice.

FINDINGS:

1. Operator

   Aurora Gas, LLC (Aurora) operates the Nicolai Creek Unit (NCU) and the Nicolai Creek Unit No. 2 well (NCU 2), which are located on the west side of the Cook Inlet, Kenai Peninsula Borough, Alaska.

2. Injection Strata[1]

   The proposed gas storage reservoir is the South Undefined Gas Pool. The South Undefined Gas Pool is comprised of sandstone reservoirs within the upper portion of the Oligocene- to Miocene-aged Tyonek Formation (Tyonek). The Tyonek

[1] All depths presented in this Order are measured depths unless otherwise specified.

reservoirs are overlain by reservoirs assigned to the Miocene-aged Beluga Formation (Beluga). In NCU 2, the Tyonek and Beluga reservoirs are separated by more than 150' of low permeability clay, siltstone, and coal. The proposed injection and storage sands correspond to the depth interval in the NCU 2 well of 2426' to 2916', or 2141' true vertical depth (TVD to 2511' TVD; see Figure 1, below). These Upper Tyonek reservoirs exhibit combination structural and stratigraphic trapping within a closed fold against the dominant east-trending Nicolai Cross Fault and a smaller, north-northeast-trending fault.

3. Proposed Injection Well

The proposed injection and withdrawal well is the NCU 2 that was originally drilled and completed as a gas producer in 1966. The surface location of the well is 1999' from the south section line (FSL), 209' from the west section line (FWL), Sec 29, T11N, R12W, Seward Meridian (SM). The Upper Tyonek is entered at 1154' FSL, 702' FWL, Sec 29, T11N, R12W, SM. Aurora plans to work over NCU 2 in order to prepare the well for gas cycling service.

4. Operators / Surface Owners Notification

Aurora provided an affidavit affirming that all surface owners and operators within one-quarter mile of the storage injection area were notified of Aurora's subject proposal. Notified entities are the Alaska Department of Natural Resources (DNR) and the Alaska Mental Health Trust.

5. Description of Operation

Aurora proposes to inject excess natural gas into the Nicolai Creek South Undefined Gas Pool. Well NCU 2 (alone initially) will alternate between injection and production so that natural gas can be stored during periods of excess supply and be produced to satisfy peak rate requirements during seasonal high demand periods. The maximum injection pressure is estimated to be 1050 psi.

6. Pool Information

Nicolai Creek Unit is unusual in that it consists of two non-adjacent areas, the North Participating Area and the South Participating Area, that are separated by the large, east-trending Nicolai Cross Fault. The South Undefined Gas Pool, well NCU 2 and the proposed storage reservoir strata lie in the South Participating Area. Three uppermost Tyonek strata (in descending order, Carya 2-1.1, 2-1.2, and 2-2.1) are currently being drained by NCU 2, and only these are proposed as storage strata. Gas in these strata is trapped within a small, east-trending fold that is bounded to the west and to the east by small, north-northeast-trending faults.

Structural dip limits the gas accumulation to the south, structural dip and the Nicolai Cross Fault limit the gas accumulation to the north.

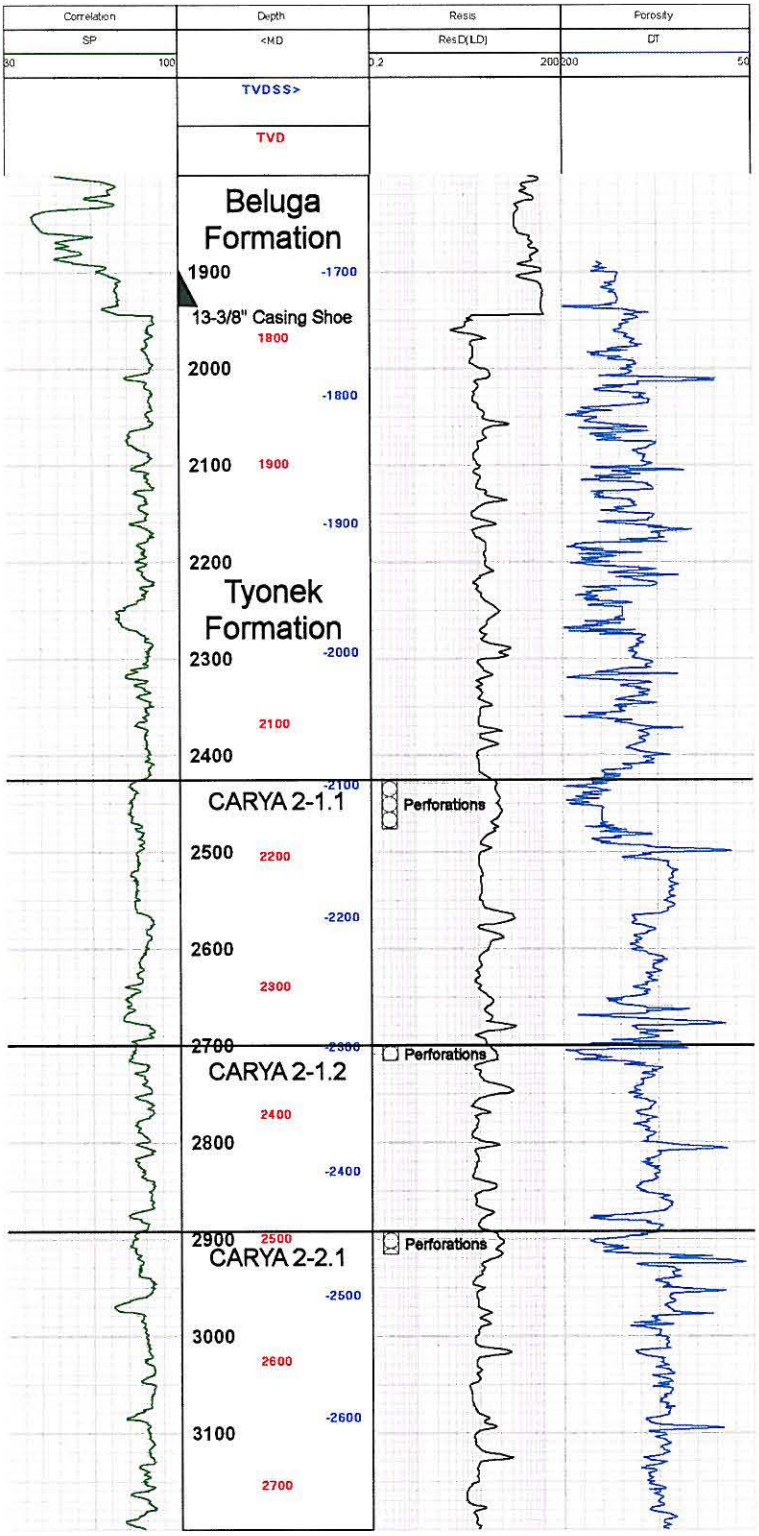

Figure 1. Nicolai Creek Unit No. 2 Well Log

NCU Tyonek sands occur within the Cook Inlet Basin, extending from the Matanuska Valley to the Alaska Peninsula. Hydrocarbon traps in the Cook Inlet Basin are typically tight anticlines and associated structures. Although eight individual sand members exist across the Nicolai Creek Field, South Participating Area reservoir strata are restricted to three Upper Tyonek strata. Porosity in the reservoir strata ranges from 19% to 25% and water saturation varies from 43% to 47%. Permeability is estimated at 120 millidarcies. Beluga sands overlie the Tyonek and are separated by numerous low permeability layers.

NCU 2 was drilled in 1966, completed in a deeper Tyonek sand (3270' to 3315'), and produced about 51 million standard cubic feet (MMSCF) gas from 1968 until 1969, at an average of about 1.0 million standard cubic feet per day (MMSCFD). Next production was from the Carya 2-1.1, 2-1.2, and 2-2.1 sands in 2003, with about 806 MMSCF, or about 85% of estimated ultimate recovery, having been produced by December, 2009. Estimated ultimate recovery from NCU 2 is estimated at 947 MMSCF, with original gas in place estimated at 993 MMSCF. Initial average reservoir pressure in the Tyonek sands was about 1157 psi. Working gas storage volume is estimated to be 600 MMSCF to 700 MMSCF.

7. Well Logs

Logs of NCU 2 are on file with the AOGCC.

8. Mechanical Integrity and Well Design

NCU 2 was constructed in 1966 with 30" casing set at 80', 20" casing at 296', 13-3/8" casing at 1934', and 7" casing at 3585'. All casing strings were cemented to surface. A cement bond log of the 7" casing confirmed cement from 1900' to 3550', with "good bond characteristics" from 2500' to 3550'.

NCU 2 was suspended in 1991 with all perforations squeezed. The 7" casing and 7" x 13-3/8" annulus were plugged with cement. A subsequent well recompletion in 2002 included a 2-7/8" tubing x 7" production casing annulus test to 1000 psi. The plot of NCU 2 P/Z vs. cumulative production can be interpreted as indicating a volumetric reservoir and no fluid migration behind casing.

9. Fluid Type and Source

Excess natural gas, either owned by Aurora or purchased from another producer or utility, will be injected in NCU 2 and stored for later reuse. The precise source of injection gas is not presently known.

10. Fluid Compatibility

Aurora provided gas analysis representative of native gas originating from the Tyonek Formation and will inject only gas that is compatible with Tyonek gas.

11. Injection Rates and Pressures, Fracture Information

NCU 2 gas injection pressure will vary significantly depending upon the reservoir's depletion. Maximum injection pressure will be 1050 psi, maintained so that a pressure gradient of 0.46 psi/ft at mid-depth of the perforated interval is not exceeded. 0.46 psi/ft pressure gradient is equivalent to a gas injection rate of approximately 10 MMSCFD, through 3-1/2" tubing.

The proposed maximum injection pressure in NCU 2 will not exceed a pressure gradient of 0.46 psi/ft, which is equivalent to about 1072 psi at mid-perforation (2309' TVD). The formation fracture gradient is estimated to be 0.9 psi/ft, or approximately 2078 psi at 2309' TVD. The proposed maximum injection pressure thus should not initiate formation fracturing in the proposed storage or confining strata. Original Upper Tyonek reservoir pressure is estimated to be about 1157 psi.

12. Underground Sources of Drinking Water

The nearest drinking water supply well is about 100' deep, and it is located at Shirleyville Camp about 1.6 miles to the east. The nearest registered surface water rights claim is for Markley's Spring, which lies about 2 miles to the east (ref. DNR Case File No. LAS-3400). There are no other surface or subsurface water-rights claims registered with the Alaska Department of Natural Resources within 14 miles of the proposed storage operation.

Aurora presented evidence suggesting that the total dissolved solids concentrations within the affected aquifers is less than 10,000 parts per million. Exemption of these aquifers is addressed in a separate order (see Aquifer Exemption Order No. 12).

13. Mechanical Condition of Pool Wells

The proposed NCU gas storage area encompasses ten wells besides NCU 2. Six NCU wells have been plugged and abandoned. All wells are cased and cemented so as to not provide a conduit for injected gas to escape the injection zone. No corrective action is required.

14. Monitoring

NCU 2 will be tested for mechanical integrity using the standard 30 minute annulus test per 20 AAC 25.412(c). To confirm continued mechanical integrity, Aurora plans to monitor daily injection rates and pressure and notify the AOGCC the next working day if the rates and pressure indicate pressure communication or leakage in any casing, tubing or packer. The rate and pressure data will also be reported to the Commission on a monthly basis.

Mechanical integrity will also be monitored by observing the material balance plot (P/Z vs. cumulative gas produced or injected) during gas storage operations. Gas storage reservoir pressure and volume monitoring is a secondary check upon mechanical integrity. Data from the original depletion can be compared with

subsequent injection and production cycles. Although some hysteresis may occur even in volumetric reservoirs, any problems that result in a loss of mechanical integrity will likely be evident from this data.

15. Public Comment

The Commission received no protest nor written comments in response to the public notice.

CONCLUSIONS:

1. The Nicolai Creek Unit, South Undefined Gas Pool gas storage project meets the requirements of 20 AAC 25.252.
2. There are no compatibility concerns between injected gas and native gas in the NCU South Undefined Gas Pool.
3. Construction records, casing and cementing records, a cement bond log and a witnessed mechanical integrity test demonstrate the mechanical integrity of NCU 2 and demonstrate that fluids will not move behind casing beyond the gas storage zone.
4. The proposed injection and storage 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 confining strata.
5. The thick interval (more than 150') of overlying, low permeability clay, siltstone, and coal that originally trapped gas in the Upper Tyonek reservoirs will prevent upward migration of stored gas.
6. The proposed injection of natural gas into NCU 2 for the purpose of storage will not propagate fractures through the confining zones.
7. Aquifer Exemption Order No. 12 separately addresses exemption of aquifers within the project area.
8. Surveillance of operating parameters for storage and offset wells will provide continued assurance that stored gas remains confined to the NCU South Undefined Gas Pool.
9. Limiting the reservoir pressure to 1050 psi for natural gas storage in the NCU South Undefined Gas Pool eliminates the need for additional pressure monitoring beyond commitments made by Aurora.
10. The proposed injection of natural gas into the NCU South Undefined Gas Pool for the purpose of storage will not cause waste, jeopardize correlative rights, endanger freshwater, or impair ultimate recovery.

NOW THEREFORE IT IS ORDERED that the following rules, in addition to statewide requirements under 20 AAC 25, apply to the underground storage of hydrocarbons by injection operations in the Carya 2-1.1, 2-1.2, and 2-2.1 sands of the well NCU 2 in the affected area described below:

Seward Meridian Township 11N, Range 12W

Section 29: SE ¼ SW ¼ NW ¼; SW ¼ SE ¼ NW ¼; SW ¼ NW ¼ SW ¼; E ½ NW ¼ SW ¼; W ½ NE ¼ SW ¼; SW ¼ SW ¼; NW ¼ SE ¼ SW ¼

RULE 1: STORAGE INJECTION

The Commission approves injection for storage of natural gas in well NCU 2 within the South Undefined Gas Pool interval from 2426' to 2916'.

RULE 2: DEMONSTRATION OF MECHANICAL INTEGRITY

The mechanical integrity of well NCU 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 the 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. The Commission shall be notified at least 24 hours in advance of a 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. Stabilizing pressure that does not change more than 10 percent during a 30-minute period is required for a valid test. Results of all mechanical integrity tests must be provided to the Commission.

RULE 3: WELL INTEGRITY FAILURE AND CONFINEMENT

The operator shall maintain a continuous data acquisition system to record flow rates and pressures on all active wells in the field. Field personnel must perform daily visual inspections and maintenance of all active wells and production equipment. Whenever any pressure communication, leakage or lack of injection zone isolation is indicated by injection rates, operating pressure observations, tests, surveys, logs, or other evidence, 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.

RULE 4: MAXIMUM RESERVOIR PRESSURE

The reservoir pressure for this project shall be limited to 1050 psi.

RULE 5: PERFORMANCE REPORTING

The Operator shall report disposition of production and injection as required by 20 AAC 25.228, 20 AAC 25.230, and 20 AAC 25.235.

An annual report evaluating the performance of the storage injection operation must be provided to the Commission no later than March 15. The report shall include material balance calculations of the gas production and injection volumes and a summary of well performance data to provide assurance of continued reservoir confinement of the gas storage volumes. Additional data collection and analysis will be based on a review of the operating performance and could include temperature surveys, pressure surveys, and production logs.

RULE 6: OTHER CONDITIONS

a. It is a condition of this authorization that the operator complies with all applicable Commission regulations.

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

c. As provided in 20 AAC 25.252(j), if storage operations are not begun within 24 months after the date of this Order, the injection approval shall expire unless an application for extension has been approved by the Commission.

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RULE 7: ADMINISTRATIVE ACTIONS

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.

DONE at Anchorage, Alaska and dated April 16, 2010.

Daniel T. Seamount, Jr., Commissioner, Chair
Alaska Oil and Gas Conservation Commission

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."

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	)	Storage Injection Order No. 8
	)	
	)	Nicolai Creek Field
	)	Nicolai Creek Unit
	)	South Undefined Gas Pool
	)	
	)	Kenai Peninsula Borough, Alaska
	)	
	)	April 16, 2010
	)	

NOTICE CLOSING DOCKET

BY THE COMMISSION:

The Commission has the closed the Docket in the above captioned matter.

ENTERED AND EFFECTIVE at Anchorage, Alaska and this 16th day of April, 2010.

BY DIRECTION OF THE COMMISSION

Jody J. Colombie
Special Assistant to the Commission