



THE STATE
of **ALASKA**
GOVERNOR BILL WALKER

Department of Natural Resources

DIVISION OF OIL & GAS

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July 27, 2017

Mr. Erik Keskula
North Slope Development Manager
ConocoPhillips Alaska, Inc.
700 G Street
Anchorage, AK 99501

Subject: Approval of the 2017 Kuparuk River Unit Plans of Development

Dear Mr. Keskula,

The Department of Natural Resources, Division of Oil and Gas (Division) timely received from the unit operator ConocoPhillips Alaska, Inc. (CPAI) on June 22, 2017 its proposed 2017 Kuparuk River Unit Plan of Development (2017 KPU POD). CPAI submitted its proposed plan on its own behalf and on behalf of the other KRU working interest owners BP Exploration (Alaska), Inc., Chevron U.S.A., Inc., and ExxonMobil Alaska Production Inc. The 2017 KRU POD contains updates for the Kuparuk, Meltwater, Tabasco, Tarn, and West Sak Participating Areas (PA). The Division notified CPAI by e-mail on July 5, 2017 that the POD application was deemed complete based on the information provided under 11 AAC 83.343(a). The Division and CPAI met for the annual KRU POD presentation on July 12, 2017. CPAI presented a summary of field development activities conducted under the 2015 KRU POD and plans for proposed field development activities under the 2016 KRU POD.

The KRU was formed effective December 1, 1981, and is located immediately west of the Prudhoe Bay Unit and southwest of the Milne Point Unit. The unit includes five participating areas (PA): Kuparuk (KPA), Meltwater, Tabasco, Tarn, and West Sak. As the field has matured, reservoir management strategies and associated operational activities continue to evolve in addition to locating and drilling additional oil targets, maximizing production from the KRU relies on maintaining and upgrading facilities, increasing well work over to keep existing wells online, employing new technologies, and optimizing current and future Enhanced Oil Recovery (EOR) programs to recover the remaining oil.

2016 Activity

For the period covering the 2016 POD, CPAI planned to drill 21 CTD (Coiled Tubing Drilling) sidetrack and 8 rotary wells in the KPA. CPAI also planned the continued evaluation of wells, along with two workovers to be performed in the West Sak PA during the 2017 period.

Because Prudhoe Bay Unit (PBU) gas contains levels of carbon dioxide contributing to corrosion in KRU wells and facilities, CPAI stopped importing NGLs (natural gas liquid) from the PBU

for use in the KRU in 2014 and began importing only fuel gas from PBU to maximize use of the remaining formation gas. Use of KRU's indigenous NGLs for Miscible Water Alternating Gas (MWAG) in the KPA (Kuparuk Participating Area) and Viscosity Reducing Water Alternating Gas (VRWAG) in the West Sak PA began in January 2015 (and currently remains in effect). CPAI's plan was to use MWAG first at those drill sites with the least mature well patterns while the remaining drill sites would convert to injecting Immiscible Water Alternating Gas (IWAG) as a lean gas chase. The purpose of this lean gas injection is to recover NGLs left behind by the original MWAG process and to provide benefit in lifting the oil to the surface within the wellbore.

Other notable activities that took place at KRU overall between January 1, 2016 and January 1, 2017 are summarized as follows:

- 78.1 MBOPD average gross oil production from KPA, with another 24.9 MBOPD gross from satellite fields for a total of 103 MBOPD average gross production
- Successful implementation of 20-well Coiled Tubing Drilling (CTD) program, with 55 laterals drill and completed in these wells, which generated a peak incremental oil rate of ~ 3.5 MBOPD gross
- Completion of 8 grassroots rotary wells
- Successful execution of a workover program that added ~ 1.6 MBOPD gross oil in 2016
- Successful execution of non-rig well work activity that included slickline, electric line, and service coiled tubing projects that added ~ 10.7 MBOPD gross oil in 2016
- Continuation of miscible injection with GKA indigenous NGL at drill sites 1B, 1C, 1D, and 1E
- Successful completion of (1) regulatory emergency shutdown test, (2) gas train vessel internal inspections and improvements, and (3) repair of produced water header piping, all for purposes of a major Turnaround at CPF1
- Repair of Water Injection common line for drill sites 3A, 3H, 3I and 3M to allow continuous seawater injection
- The GKA (Greater Kuparuk Area) produced an average of 10,030 bopd of indigenous NGLs. When blended with available lean gas, and average of 59 MMSCFD of MI was injected into the Kuparuk Field.
- The total estimated incremental oil + NGL sales for 2016 from the ongoing Kuparuk MWAG project was 14.2 mbopd.

Additionally, the following specific activities took place at the KRU Participating Areas (PAs) during the 2016 time period and are summarized below.

Meltwater

- Two maintenance pigging operations of the DS 2P produced oil line (2PPO) were completed in 2016, and appear to be adequately controlling corrosion rates. Maintenance pigging of this line is scheduled for 6 to 12 month intervals.
- Converted 2 long-term shut-in wells to injector wells
- Changed voidage strategy to enable better management of cumulative I/W (injection-withdrawal ratio and bring it closer to equilibrium

Tabasco

- Produced 523 mbo, 81 mmscf of gas, and 4.1 mmbw during 2016.
- Improved reservoir management and reduced pool average water-oil ratio to 7.7 at the end of 2016 as compared to 8.1 at the end of 2015
- Continuation of 2014 tracer study used to update full field model and drive future EOR (enhanced oil recovery) options

Tarn

- The 2N-333 producer rig workover was executed in July 2016 to replace tubing and isolate the 7" casing leak in order to restore production for 2N-333
- The 2L-330 production well was converted from gas lift to surface powered jet pump.

West Sak & NEWS

- One new MBE (Matrix Bypass Event) occurred in 2016 between injector 1E-105 and producer 1E-126
- Six MBE remediation attempts were completed in 2016 to re-treat preexisting MBEs with failed prior remediation attempts
- VRWAG (viscosity reducing water-alternating gas) operations were restarted in 2016 in 2 injectors (1J-122 and 1J-164)
- Continued monitoring long-term performance for determining facilitation of higher inter-well gradient and reduction of MBE frequency

Collectively, the Kuparuk field and the four satellite fields within the KRU had over 866 active producer and injector wells in 2016. The cumulative volume of oil produced from the KRU as of December 31, 2016 was 2.41 billion barrels compared with 2.63 billion barrels as of May 31, 2015. The average daily oil rate for the unit for the period covering January 1, 2016 through December 31, 2016 was approximately 102,883 bopd, compared with 104,556 bopd in 2015. The average daily gas rate in 2016 was 236 million standard cubic feet per day (MMSCFD), down from 255 MMSCFD in 2015. The average daily water rate was 568,244 bwpd.

Proposed 2017 Activities

During the period of this POD, CPAI's operations will focus on the following:

KPA

For 2017, approximately 16 CTD sidetrack projects and 4 new rotary wells are planned for the KPA.

As stated previously, because of the high CO₂ content of Prudhoe gas and its corrosion-related effects, the KRU ended natural gas liquid (NGL) imports from the PBU in 2014. Instead, excess indigenous Kuparuk NGL has been since that time and will continue to be re-injected as lean gas chase and indigenous MI (miscible injectant) without introducing any Prudhoe gas into the reservoir. This indigenous MI program will continue at drill sites 1B, 1C, 1D, 1E, 2C, and 2Z.

Meltwater

CPAI will utilize continuous lean gas injection to maintain voidage and maximize recovery from the reservoir.

Tabasco

- Conversion of 2T-209 producer to injection to increase support to wells
- Continue analysis of Tracer study results for purpose of improving recovery in PA

Tarn

- Completion of petrophysical model and subsequent simulation model
- Continued monitoring of GOR (gas-oil ratio), which is now returning to normal after 2015 lean gas injection and resident gas in formation was thought to have led to previously high gas production

Torok

CPAI reports that although injection well 3S-613 was drilled in Q2 of 2016 to test the ability to provide injection support to 3S-620, there has been to date no breakthrough and poor injectivity notwithstanding that well 3S-613 was hydraulically fractured. CPAI, however, is producing ~ 500 bopd from the Torok Moraine and the gas-oil-ratio of the producing well 3S-620 is increasing.

West Sak

- Consideration of additional redevelopment wells from DS1D, the value and work scope of which will be developed in 2017

- Conduct and analyze results of 2015-16 DS1C drilling performance in order to make informed decisions on three additional, lower-value DS1C well targets
- Because surface work expansion of the existing DS1H gravel pad and facilities to accommodate 19 new wells was completed in early 2017, drilling activities are scheduled to recommence in the latter half of 2017 (3Q 2017), despite the 1H NEWS drilling program (4 horizontal multi-lateral producers and 15 vertical injectors) planned for execution in 2016 having been deferred due to market conditions
- Continue mitigating external and internal corrosion by field inspection
- 4D processing of the KWS and WK seismic surveys has demonstrated reservoir changes and fault compartmentalization. Technical analysis of the observed 4D effects will continue in 2017.
- Continue monitoring all wells for possible workovers
- Continue focus on expansion of VRWAG (viscosity reducing water-alternating-gas) by adding new wells following the monitoring of the improved injectivity due to seawater at DS1J
- Continue to evaluate design changes for rig-less ESPs (electric submersible pumps) in consideration for use in potential future wells
- Awaiting arrival of ESP for use at 1H-Ugnu-401, which prior to problems with ESP and shut-in of field, was on production through most of 2014 at rates up to 12 bopd.

Finally, although larger infrastructure projects such as the Kuparuk airstrip, portions of the Kuparuk camp and office space have been completed, other facilities and infrastructure such as pipelines, turbines, and process control safety systems will continue to be maintained through either repair, upgrade, or replacement in order to target another 25 years of production from the KPA and KRU satellite fields.

POD Evaluation Criteria

The Division must consider the criteria in 11 AAC 83.303(a) and (b) when evaluating a POD for approval. 11 AAC 83.303(c)(3). The Division will approve a POD upon a finding that it is necessary or advisable to protect the public interest and that it will (1) promote conservation of all natural resources, including all or part of an oil or gas pool, field, or like area; (2) promote the prevention of economic and physical waste; and (3) provide for the protection of all parties of interest including the state. 11 AAC 83.303(a). In evaluating conservation, prevention of waste, and the parties' interest, the Division will consider (1) the environmental costs and benefits of unitized exploration or development; (2) the geological and engineering characteristics of the potential hydrocarbon accumulation or reservoir proposed for unitization; (3) prior exploration activities in the proposed unit area; (4) the applicant's plans for exploration or development of the unit area; (5) the economic costs and benefits to the state; and (6) any other relevant factors,

including measures to mitigate impacts identified above, the commissioner deems necessary or advisable to protect the public interest. 11 AAC 83.303(b).

Findings and Decision

In approving earlier KRU PODs, the Division considered 11 AAC 83.303 and found the KRU PODs promoted conservation of natural resources, promoted prevention of waste, and protected the parties' interests. The Division incorporates those finding by reference.

The 2017 POD will benefit the state through reservoir management and continued oil production from the KRU. Production protects the State's economic interests in developing oil and gas resources. Continuing to develop the resources as a unit further minimizes impact to the environment, conserves resources, and prevents waste. Considering the 11 AAC 83.303(b) factors and subsection (a) criteria and the degree to which the additional development impacts its analysis from previous POD approvals, the Division finds that the 2017 KRU POD protects the public interest, promotes conservation, prevents waste, and protects the parties' interests.

Based on its findings, the Division approves the 2017 KRU POD for the period August 1, 2017 through July 31, 2018. The 2018 POD is due to the Division 90 days before the 2017 POD expires, on or before May 2, 2018, in accordance with 11 AAC 83.343(c).

A person affected by this decision may appeal it, in accordance with 11 AAC 02. Any appeal must be received within 20 calendar days after the date of "issuance" of this decision, as defined in 11 AAC 02.040(c) and (d) and may be mailed or delivered to Andrew T. Mack, Commissioner, Department of Natural Resources, 550 W. 7th Avenue, Suite 1400, Anchorage, Alaska 99501; faxed to 1-907-269-8918, or sent by electronic mail to dnr.appeals@alaska.gov. This decision takes effect immediately. An eligible person must first appeal this decision in accordance with 11 AAC 02 before appealing this decision to Superior Court. A copy of 11 AAC 02 may be obtained from any regional information office of the Department of Natural Resources.

If you have questions regarding this decision, contact Ken Diemer with the Division at 907-269-8784 or via email at Ken.Diemer@Alaska.gov.

Sincerely,



Chantal Walsh
Director