



NWT OFFICE OF THE REGULATOR OF OIL AND GAS OPERATIONS

Office of the Regulator of Oil and Gas Operations

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March 8, 2023

Dear Jonathon Michel:

Decision: Request for Exemption from Cement Evaluation (ACW-2023-AC-G-04-WID1915)

On February 14, 2023, the Office of the Regulator of Oil and Gas Operations (OROGO) received an application from Canadian Petroleum Engineering Inc., consultants to Aurora College, for the abandonment of the Aurora College Training Well G-04 (WID1915) that includes cement evaluation as required by section 6A of the *Well Suspension and Abandonment Guidelines and Interpretation Notes (Guidelines)*.

Also on February 14, 2023, OROGO received a request from Aurora College for an exemption from the requirement to evaluate the cement behind the casing string of the Aurora College Training Well G-04 (WID1915) before it is abandoned.

This decision:

1. Provides context for Aurora College's request.
2. Considers each of Aurora College's arguments in support of its request.
3. Concludes with my decision on the request.

Context

The requirement for cement evaluation before abandonment is found in section 6A of Guidelines and is intended to address section 56 of the *Oil and Gas Drilling and Production Regulations (OGDPR)*, which states:

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- All oil and gas bearing zones and discrete pressure zones must be isolated.
- Potable water zones must be isolated.
- Formation fluid must be prevented from flowing through or escaping from the wellbore.

The Aurora College Training Well G-04 was drilled in summer 2001 as a training well for Aurora College students. It was never perforated. No cement evaluation was conducted during the drilling or suspension of the well. It was suspended in fall 2001.

In its response to Information Request 1.2 for ACW-2023-AC-G-04-WID1915, Aurora College stated that the wellbore was filled with fresh water when it was suspended.

Consideration of Aurora College's arguments

Aurora College provides the following arguments in support of an exemption from the cement evaluation requirements:

1. The well does not intersect any oil and gas bearing zones.
2. There is no contiguous layer or zone of permafrost to support a sizeable accumulation of hydrocarbon or higher than normal water pressure.
3. The well was designed and drilled to protect and isolate any possible potable groundwater zones and potential hydrocarbon bearing zones.
4. The well appears not to contain any gas.
5. Complying with the requirement for cement evaluation will be a significant financial burden for Aurora College.

The staff of the Energy Geosciences unit at the Northwest Territories Geological Survey (NTGS) assisted me in reviewing the geological information provided in support of the first three arguments. This technical support is reflected in the discussion below.

I consider each argument separately as follows.

Intersection of oil and gas bearing zones

Aurora College's request for an exemption asserts that the well was situated to avoid any intersection with hydrocarbon zones.

NTGS's review indicates that hydrocarbon bearing zone(s) may not exist in and around the Aurora College Training Well G-04. NTGS notes that important oil and gas accumulations are separated from the well by the Husky Lakes Fault Zone (HLFZ) and that most of the tested hydrocarbon reservoirs in the area occur in rocks that were not encountered during the drilling of the well, a nearby well (Inuvik D-54), or any wells south of the HLFZ.

NTGS' review also concluded that it is highly unlikely that gas hydrates would be present in the region.

This information, together with the contents of the Final Well Report for the drilling of the well, leads me to conclude that the Aurora College Training Well G-04 did not intersect oil and gas bearing zones when it was drilled.

Permafrost

Aurora College's request for an exemption asserts that any permafrost found around the well would not be sufficient to act as a barrier that could allow an accumulation of hydrocarbons migrating from a deeper depth into the zones encountered while drilling the well. At the same time, the permafrost would not be sufficient to form a higher-than-normal water pressure zone in the shallower sediments surrounding the wellbore.

NTGS's review confirms that permafrost would not trap a sizeable accumulation of hydrocarbon in the region of the Aurora College Training Well G-04 or create a higher-than-normal water pressure zone.

This information leads me to conclude that the Aurora College Training Well G-04 is not surrounded by permafrost that could affect the isolation of hydrocarbon zones or the protection of potable ground water.

Well design and drilling

Aurora College's request for an exemption asserts that the well was designed and drilled to protect and isolate any possible potable groundwater zones and potential hydrocarbon bearing zones. It provides information on the three casings set in the wellbore (conductor casing at 16 mKB, surface casing at 150 mKB, and main casing string at 401 mKB or total depth). It also states that each casing string was cemented back to surface and good cement returns were observed on each cement job.

NTGS's review compared the strata encountered in drilling the Aurora College Training Well G-04 with those encountered during the drilling of the Inuvik D-54 well nearby. It concludes that these strata can support ground water movement. The total depth of the well, 401 mKB, is shallower than the base of groundwater protection established under the Guidelines (600 mKB in the absence of other data). Therefore, all the groundwater intersected by the well is considered potable groundwater.

A cement bond log was not completed when the well was drilled, cased, and cemented. Therefore, although there were cement returns to surface when the casings were set, the quality of the cement at that time is unknown. Since the well has been suspended for more than 20 years, the cement may also have deteriorated over time.

Aurora College has not completed any gas migration testing for the well, which would also provide some information on the integrity of the casing and cement and the potential for hydrocarbons from below the total depth of the well to migrate along the wellbore into other hydrocarbon bearing zones or potable groundwater zones. Section 4A of the Guidelines requires gas migration testing prior to beginning an abandonment program. Aurora College has committed to completing the gas migration testing in the summer of 2023, after the abandonment is complete, with the understanding that if gas migration is present, well repairs will be required.

Finally, Aurora College's response to Information Request 1.2, received on March 6, 2023, states that the wellbore was filled with fresh water when it was suspended in 2001, except for the upper few meters of the wellbore, which were filled with fresh water containing an additive to prevent freezing. Suspended wellbores are normally filled with corrosion-inhibiting fluid to avoid casing deterioration over time. In this case, given that the wellbore was filled with fresh water and has been suspended for more than 20 years, the casing may have failed due to corrosion or other factors. If this is the case, the cement behind the casing at the failure point may also be compromised.

This information leads me to conclude that, although the Aurora College Training Well G-04 may have been designed and drilled to protect and isolate any possible potable groundwater zones and potential hydrocarbon bearing zones, there is potential that the casing or cement is no longer in a suitable state for permanent plugging, cutting and capping of the well. Given that the entire depth of the wellbore is within the groundwater protection zone (from 600 mKB to surface), poor cement could result in lack of isolation and protection of potable groundwater within the intersected 401 meters.

Gas in the well

Aurora College's request for an exemption asserts that the well appears not to contain any gas. It states that no porous zones were encountered while drilling the well, no significant gas shows were encountered while drilling the well, and there is no indication of surface casing vent flow (SCVF) or pressure build up within the casing since the well was suspended.

NTGS's conclusion with respect to the intersection of oil and gas bearing zones (above) supports this assertion, as does the Final Well Report for the drilling of the well.

Aurora College references periodic well inspections conducted since the well was drilled not recording any SCVF or pressure build up within the casing. OROGO's files indicate that:

- Aurora College completed one inspection of the well in 2009. The inspection report does not speak to SCVF. It indicates that there were no casing pressures, but also that one damaged 5000 psi gauge was removed. It is unclear the extent to which the damaged gauge affected the measurement of casing pressures.
- OROGO completed inspections of the well in 2018, 2019, 2020, and 2022. The 2018 and 2019 inspection reports indicate the surface casing vent was open and dead. They do not address casing pressures. The 2020 inspection report indicates that an SCVF test was conducted and there was no evidence of SCVF. It also notes no casing pressures. The 2022 inspection report does not speak to SCVF or casing pressures.

This information leads me to conclude the Aurora College Training Well G-04 likely does not contain any gas.

Financial burden

Aurora College's exemption request asserts that complying with the requirement for cement evaluation will triple the cost of the abandonment. It does not provide any support for this assertion.

Step 5 of the Abandonment Program included in Aurora College's application for ACW-2023-AC-G-04-WID1915 is for cement evaluation using an e-line logging truck. This demonstrates that Aurora College is aware of and made plans to comply with this requirement.

Aurora College is responsible for abandoning the Aurora College Training Well G-04 in accordance with OROGO's requirements and the requirements of the OGDPR by March 31, 2023. It has been aware of this obligation and the requirement to budget for this well abandonment since August 2017. Aurora College's financial limitations are not a reason to exempt it from the regulatory requirements.

Decision

Based on my consideration of Aurora College's arguments, I find that Aurora College has not demonstrated that the cement in the Aurora College Training Well G-04 meets the requirements of section 56 of the *Oil and Gas Drilling and Production Regulations*, in particular the obligation to isolate and protect potable water zones.

Therefore, Aurora College's request for an exemption from the requirement to evaluate the cement behind the casing string of the Aurora College Training Well G-04 before completing the well abandonment is denied.

Sincerely,



Pauline de Jong
Regulator

- c. Lorne Hammer, Canadian Petroleum Engineering Inc.
Ron McCosh, Canadian Petroleum Engineering Inc.