

Aquifer Exemption Evaluation

Regulatory Agency: Colorado Energy and Carbon Management Commission (CECMC)

Date of Aquifer Exemption Request: 09/19/2024

Substantial or Non-Substantial Program Revision: Non-Substantial

Basis for Substantial or Non-Substantial Determination: This AE Request is considered non-substantial, consistent with EPA Guidance 34

Operator: St. Croix Operating, Inc.

Well Class/Type: Class II SWD Well

Well/Project Name: Longknife SWD #3

Well/Project Permit Number: TBD

Well API number: TBD

Field: Wildcat

Tribal Reservation: No

Well/Project Location: Qtr/Qtr: NENW Section: 6 Township: 3 South Range: 50 West

Footage Call: 204 feet from (N)line, 1598 feet from (W) line

State: Colorado **County:** Washington

Latitude: 39.82992 **Longitude:** -103.02343

DESCRIPTION OF PROPOSED AQUIFER EXEMPTION (depths are approximate values at the well bore)

Aquifer to be Exempted: Lyons **Top:** 5180 feet **Bottom:** 5300 feet

Lithology: Sandstone, fine-medium grained, sub angular to sub rounded, clean friable

Water Quality – TDS (mg/L): 4100 mg/L **Source of WQ Data:** Lyons disposal well in 12-3S-50W

Areal Extent and Description of Exempted Aquifer (i.e. radial distance, encompassed TSR)

Total Area of Aquifer to be Exempted: 360 acres

Description: Legal description of area to be exempted: S2SW & SWSE Section 31 Township 2 South Range 50 West; NW/4 & E2NE Section 6; Township 3 South, Range 50 West

Confining Zone(s):

Upper: Carlile Shale	Lithology: marine shale	Top: 3510'	Bottom: 3635'
Upper: Greenhorn Lime	Lithology: marlstone, limestone, shale	Top: 3635'	Bottom: 3685'
Upper: Graneros Shale	Lithology: marine shale	Top: 3685'	Bottom: 3885'
Upper: D Sand	Lithology: fine grained fluvial sand shale sequence	Top: 3885'	Bottom: 3935'
Upper: Huntsman Shale	Lithology: black marine shale	Top: 3935'	Bottom: 3985'
Upper: J Sand	Lithology: fine grained fluvial sand shale sequence	Top: 3985'	Bottom: 4210'
Upper: Skull Creek Shale	Lithology: silty shale	Top: 4210'	Bottom: 4310'
Upper: Lakota Sandstone	Lithology: fine grained fluvial sand	Top: 4310'	Bottom: 4610'
Upper: "O" Sand	Lithology: fine grained fluvial sand	Top: 4610'	Bottom: 4660'
Upper: Morrison Formation	Lithology: fine grained fluvial sand	Top: 4660'	Bottom: 4860'
Upper: Lykins	Lithology: fine grained fluvial sand	Top: 4860'	Bottom: 5180'
Lower: Fountain Formation	Lithology: silty shale	Top: 5300'	Bottom: 5380'

BACKGROUND

USDW(s): Zero water wells within a 1-mile radius. Closest Well is 1.1 mi away and producing from the Ogallala formation, maximum domestic well depth is 98', next closest is 245' deep and 1.6 mi away producing from the same formation.

Injectate Characteristics: Produced water from the proposed Longknife #1 and #2 J Sand formation oil wells, which have yet to be drilled. Analysis of the J-sand produced water is assumed to be similar to Pronghorn #1 Water Sample Attached

BASIS FOR DECISION

Regulatory Criteria under which the exemption is requested

An aquifer or a portion thereof which meets the criteria for an underground source of drinking water may be determined to be an exempted aquifer if it meets the criteria is 146.4(a) AND 146.4(b) or (c). The purpose of the bullets beneath each criterion is to ensure that appropriate and adequate information is collected to facilitate review of AE requests, and documentation of AE decisions. Some information described here may not apply to all AE requests.

146.4 : **X (a)** Not currently used as a drinking water source and:

- How far from the AE boundary to review drinking water wells and how was this determined? **Approximately 1.1 miles to nearest water well from COGCC/DWR records.**
- Identify drinking water wells in area of review, their depths, and provide source of information. **None within AE.**
- Identify any source water assessment and/or protection areas and designated sole source aquifers. **W-Y Designated Groundwater Management Area, Northern High Plains designated basin.**
- Identify nearest public water supply (PWS). **Greater than 5 miles from the AE.**
- What is the distance of the nearest drinking water well utilizing the aquifer proposed for exemption? **No drinking water wells are known to exist in the Lyons formation in Washington County.**
- Is it in close enough proximity to require a capture zone analysis? **N/A**
- Provide map of AE boundary and location of drinking water wells. **See Attached.**

X (b)(1) It is mineral, hydrocarbon, or geothermal energy producing, or can be demonstrated by a permit applicant as part of a permit application for a Class II or Class II operation to contain minerals or hydrocarbons that considering their quantity and location are expected to be commercially producible; or

- Projections on future use of the proposed aquifer. **Lyons formation is oil productive further to the west in the Denver Julesburg basin.**

Hydrocarbon Production Data:

- Demonstrate historical production having occurred in the project area or field. **N/A**
- Demonstrate existence hydrocarbon (logs, core data, etc) and estimation of the quantity of the hydrocarbon potential. **N/A**

Mineral Resources Available:

- A summary of logging which indicates that commercially producible quantities of minerals are present, a description of the mining method to be used, general information on the mineralogy and geochemistry of the mining zone, and a development timetable. **The Longknife SWD #3 well will have electric logs run through the Lyons formation after the well is drilled to evaluate mineral content.**

X(b)(2) It is situated at a depth or location which makes recovery of water for drinking water purposes economically or technologically impractical; or

- Projections on future use of the proposed aquifer. **Not feasible to use the Lyons formation at this depth for a USDW.**
- Current sources of water supply in the area of the proposed exempted aquifer. **See attached list and map of water wells outside proposed AE and 1 mile radius.**
- Availability, quantity and quality of alternative water supply source(s) to meet present and future needs. **The existing water supply wells in the area are more than adequate to meet current and future expected needs.**
- Population trends in the area and analysis of future water supply needs within the general area. **An increase in the**

water demand is not anticipated due to the sparse population, remoteness of the area, and no economic drivers promoting growth in the area.

- Well construction and water transportation and/or treatment costs to develop aquifer proposed for exemption compared to costs to develop alternative resource(s). To drill and complete a water well in the Lyons formation and then treat the water would cost in excess of \$1,000,000. The shallow groundwater wells in the area can be drilled and equipped for less than 5% of that cost.

X(b)(3) It is so contaminated that it would be economically or technologically impractical to render that water fit for human consumption; or

- Projections on future use of the proposed aquifer. No future use of the Lyons as a domestic water source is anticipated.
- Concentrations, types, and source of contaminants in the aquifer. Chlorides, sulfates, BTEX, hydrocarbons.
- If contamination is a result of a release, extent of contaminated area and whether contamination source has been abated. NA
- Ability of treatment to remove contaminants from ground water. Treatment would include centrifuge, reverse osmosis, softening, and filtering.
- Current sources of water supply in the area of the proposed exempted aquifer. Shallow alluvial domestic water supply wells.
- Availability, quantity and quality of alternative water supply source(s) to meet present and future needs. Abundant.
- Population trends in the area and analysis of future water supply needs within the general area. The area is very sparsely populated with no increase in population density anticipated.
- Well construction and water transportation and/or treatment costs to develop aquifer proposed for exemption compared to costs to develop alternative resource(s). To drill and complete a water well in the Lyons formation and then treat the water would cost in excess of \$1,000,000. The shallow groundwater wells in the area can be drilled and equipped for less than 5% of that cost.

X (c) TDS is more than 3,000 and less than 10,000 mg/l and it is not reasonably expected to supply a public water system.

- Projections on future use of the proposed aquifer. No future use of the Lyons as a domestic water source is anticipated.
- Include information about the quality and availability of water from the aquifer proposed for exemption. Chlorides, sulfates, BTEX, hydrocarbons contaminate this reservoir making it unreasonable for drinking water.
- Analysis of the potential for public water supply use of the aquifer. This may include: a description of current sources of public water supply in the area, a discussion of the adequacy of current water supply sources to supply future needs, population projections, economy, future technology, and a discussion of other available water supply sources within the area. To drill and complete a water well in the Lyons formation and then treat the water would cost in excess of \$1,000,000. The shallow groundwater wells in the area can be drilled and equipped for less than 5% of that cost.

Describe what assurance exists to confine fluids within the AE boundary:

- Discuss injection rate or volume limitation: The maximum proposed injection rate is no more than 1000 BWPD. The 360 acre AE contains over 40 million barrels of available pore space for water storage in the Lyons formation. At the maximum proposed injection rate, it would take 110 years for injected water to fill this pore space and reach past the boundary of the AE.
- Discuss existence and quality of confining zone(s). The Lyons is bounded above and below by competent shales as described above, which provide an adequate barrier to upward and downward fluid migration.
- (Is the confining zone continuous, are there known fractures?) The zones are continuous for many miles, with no known fractures.

Public Comment

Public Comment Conducted? ☐ Yes **X** No

Results of Public Comment Process: NA

Questions for Consideration

☐ Are there deeper aquifers with poorer quality water that can be used for injection (disposal

wells)? **No**

- ☐ Proximity to other jurisdictional boundaries? **NA**
- ☐ Is seismicity a concern in the area? **No**
- ☐ Will injection of fluids cause any original formation fluid or injectate to migrate to any known USDW? **No**
- ☐ Are all wells within the AE boundary and AOR properly cemented to prevent preferential flow paths? **Yes**

Provide other considerations to support aquifer exemption approval: