Garrett, Betty

From: VonTill, Bill
Sent: Tuesday, November 09, 2010 11:31 AM
To: Linton, Ron; Hsueh, Kevin
Cc: Cohen, Stephen; Gersey, Linda
Subject: FW: Draft Permit 10-219, Christensen Ranch Disposal Wellfield
Attachments: DraftPermit_UraniumOne_ClassI_10-219_ChristensenRanch_map.pdf

Importance: High

FYI

From: Langstaff, George [mailto:GLangs@wyo.gov]
Sent: Tuesday, November 09, 2010 10:25 AM
To: VonTill, Bill
Cc: Passehl, John
Subject: Draft Permit 10-219, Christensen Ranch Disposal Wellfield

The Department of Environmental Quality (DEQ) intends to issue an underground injection control permit for the proposed facility. The draft permit, public notice, and deadline for comments have been posted at http://deq.state.wy.us/wqd/events/index.asp for you and the public to review. Additional application material provided by the applicant is available on DEQ's GEM website at https://gem.trihydro.com, which requires registration.

George D. Langstaff
UIC Program, Wyoming Department of Environmental Quality
Herschler Building, 4th Floor West
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Received: from HQCLSTR02.nrc.gov ([148.184.44.77]) by OWMS01.nrc.gov
([148.184.100.43]) with mapi; Tue, 9 Nov 2010 11:30:45 -0500
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From: "VonTill, Bill" <Bill.VonTill@nrc.gov>
To: "Linton, Ron" <Ron.Linton@nrc.gov>, "Hsueh, Kevin" <Kevin.Hsueh@nrc.gov>
CC: "Cohen, Stephen" <Stephen.Cohen@nrc.gov>, "Gersey, Linda"
<Linda.Gersey@nrc.gov>
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STATE OF WYOMING
DEPARTMENT OF ENVIRONMENTAL QUALITY
UNDERGROUND INJECTION CONTROL PERMIT ISSUED UNDER
WYOMING WATER QUALITY RULES AND REGULATIONS
CHAPTER 13

CLASS I INJECTION WELL

( ) New
(X) Modified
County: Johnson

Permit Number: **10-219**
Previous: 00-340, 97-407, 95-241, 88-545
UIC Facility Number: WYS-019-011

In compliance with the Wyoming Environmental Quality Act (W.S. 35-11-101 through 1104, specifically 301(a)(i) through 301 (a)(iv), Laws 1973, Ch. 250, Section 1) and Wyoming Water Quality Rules and Regulations (WQRR) Chapter 13 (Ch13).

Applicant:

Uranium One USA, Inc.
907 N. Poplar St., Suite 260
Casper, WY 82601
(307) 234-8235

Uranium One USA, Inc., hereafter referred as the permittee, is authorized to continue to operate Christensen Ranch 18-3 and Christensen Ranch DW No. 1 and to drill, complete, and operate the proposed wells Christensen Ranch DW No. 2 and Christensen Ranch DW No. 3 according to the procedures and conditions of application 10-219 and to the requirements and other conditions of this permit. Issuance of a permit for a proposed well does not obligate the Department of Environmental Quality to approve injection if doing so would endanger human health or the environment or if the well does not comply with all the terms and conditions of this permit (13.8.e).

This permit replaces permit 00-340, which becomes void on the date of issuance of this permit.

The names Christensen Ranch 18-3, Christensen Ranch DW No. 1, Christensen Ranch DW No. 2, and Christensen Ranch DW No. 3 replace the previous names for the same wells: Christensen 18-3, Cogema DW No. 1, Cogema DW No. 2, and Cogema DW No. 3, respectively.

This is an area permit for <u>four</u> wells of the
<u>Christensen Ranch Disposal Wellfield</u> (Facility No. WYS-019-011).
No additional wells may be constructed under this permit without prior permit modification.

This permit shall become effective on the date of issuance and is valid for 10 years thereafter Any proposed well not completed before expiration of this permit will not be included in a renewal or modification of this permit.

John Wagner, Administrator — Date
Water Quality Division
Herschler Building 4-W, 122 West 25th Street
Cheyenne, WY 82002
(307)-777-7781

John V. Corra, Director — Date
Department of Environmental Quality
Herschler Building 4-W, 122 West 25th Street
Cheyenne, WY 82002

Table of Contents

A. Discharge Zones

The disposal wells are authorized to inject into the Tullock Member of the Fort Union Formation and the Lance Formation within the intervals specified in Table 1:

Table 1. Discharge Zone(s)

Well Name	Surface Elevation	Depth to Top of Discharge Zone	Depth to Bottom of Discharge Zone	Gross Discharge Zone Thickness	Well Depth
Christensen Ranch18-3	4,800 ft	3,998 ft	6,484 ft	2,486 ft	6,566 ft
Christensen Ranch DW No. 1	4,674 ft	3,808 ft	6,310 ft	2,502 ft	6,721 ft
Christensen Ranch DW No. 2 (proposed)	4,660 ft	3,800 ft	6,500 ft	2,700 ft	6,500 ft
Christensen Ranch DW No. 3 (proposed)	4,720 ft	3,800 ft	6,500 ft	2,700 ft	6,500 ft

Additional perforations may be installed in the existing wells within the intervals given above. Perforations in the proposed wells shall be restricted to the Tullock Member and Lance Formation within the given intervals. Perforations above or below the intervals in Table 1 require the prior written approval of the Administrator.

The confining zone above the discharge zone is the Lebo Member of the Fort Union Formation, which consists of about 35% fluvial sandstone and 65% floodplain claystone and siltstone and is approximately 1,400 feet thick.

B. Wells and Areas of Review

The wells authorized by this permit are located as shown in Table 2:

Table 2. Well Location(s)

Well Name	Legal Description	Lat./Northing	Long./Easting
Christensen Ranch 18-3	NE1/4NW1/4 Section 18, T44N,R76W	43.79371 4,849,486*	106.04051 416,290*
Christensen Ranch DW No. 1	SE1/4NW1/4 Section 7, T44N, R76W	43.80339 4,850,563*	106.01018 416,329*
Christensen Ranch DW No. 2 (proposed)	SE1/4NE1/4 Section 7, T44N, R76W	43.80397 4,850,618*	106.03239 416,958*
Christensen Ranch DW No. 3 (proposed)	SW1/4SW1/4 Section 5, T44N, R76W	43.81236 4,851,541*	106.02295 417,728*

*UTM Zone 13, NAD83 (meters)

Sixteenth sections included in the Area of Review (Ch13, Sec5(b)(iv)(E)) are listed in Table 3.

Table 3. Legal Description(s) of the Area(s) of Review

Well Name	Quarter-Quarters	Section	Township
Christensen Ranch18-3	SWSW, SESW, SWSE	7	T44N, R76W
	NWNE, SWNE, all NW	18	T44N, R76W
Christensen Ranch DW No. 1	NWNE, SWNE, all NW, NWSW, NESW, NWSE	7	T44N, R76W
Christensen Ranch DW No. 2 (proposed)	NESE, NWSE, all NE	7	T44N, R76W
	SWNW, NWSW	8	T44N, R76W
Christensen Ranch DW No. 3 (proposed)	all SW	5	T44N, R76W
	NENW, NWNW	8	T44N, R76W

Results of the area of review calculations (Ch13, Sec5(b)(iv)) are shown in Table 4. The area of review is based on the larger of: the radius of a pure waste cylinder, the radius of the cone of influence, or the minimum radius (Ch13, Sec5(b)(iv)).

Table 4. Area of Review

	Christensen Ranch18-3	Christensen Ranch DW No. 1	Christensen Ranch DW No. 2 (proposed)	Christensen Ranch DW No. 3 (proposed)
Radius of Pure Waste Cylinder (ft)	690	670	510	510
Radius of Cone of Influence (ft)	2,020	2,920	2,370	2,370
Minimum Radius of Area of Review (ft)	1,320	1,320	1,320	1,320

To account for historical injection in Christensen Ranch 18-3 of approximately 4,200,000 bbl, the effects of pumping at a rate of 2,212 bbl/day from April 2, 2000 to May 30, 2005 were added to those of pumping at a rate of 2,571 bbl/day from October 1, 2010 to October 1, 2030. To account for historical injection in Christensen Ranch DW No. 1 of approximately 4,500,000 bbl, the effects of pumping at a rate of 2,285 bbl/day from April 1, 2000 to August 30, 2005 were added to those of pumping at a rate of 2,571 bbl/day from October 1, 2010 to October 1, 2030. For the proposed wells, an injection rate of 3,429 bbl/day and a project life of 20 years were assumed.

Wells which penetrate the confining zone, are within the radius of influence (Table 4), and do not have a documented cement plug in the borehole and in the borehole - casing annulus (if cased) between the top of the discharge zone and the next overlying aquifer are potentially endangering. They are listed in Table 5.

Table 5. Wells Penetrating the Confining Zone Within the Area of Review of Christensen Ranch DW No. 1

Well Name	API No.	Location	Total Depth	Casing Depth	Status	Distance
TMU H-7-B	19-20422	7, T44N, R76W	9,800	9,782	Producer	1,300 ft

If the radius of influence calculations (Section I) indicate that it would take less than one year of continued injection before the hydraulic head at the top of the discharge zone in any well in Table 5 would equal the density-equivalent hydraulic head of the fluid in the well, the permittee shall cease injection or reduce the maximum injection rate to a rate approved by the Administrator. If the well fluid density is not documented, a mud with a density of 9.0 pound/gallon shall be used for the calculations. Alternatively, the permittee may submit a corrective action plan which, after approval or modification by the Administrator, shall be incorporated as a permit condition (Ch13, Sec5(b)(x)).

C. Groundwater Classification

The groundwaters in the Tullock Member aquifer of the Fort Union Formation and in the Lance Formation aquifer system within the largest radii specified in Table 4 for each disposal well and with upper and lower boundaries defined by the discharge zones in Table 1 are classified as Class VI according to Water Quality Rules and Regulations (WQRR), Chapter 8. This classification was made for the following reason(s):

- The depth and location make use of the water economically and technologically impractical (WDEQ-WQRR Chapter 8. Section 4.d.ix.C).

Groundwaters in all aquifers below the discharge zone are similarly classified as Class VI because the depths and locations also make use of these waters economically and technologically impractical.

D. Authorized Operations

Well Design – Injection shall be conducted through tubing which has been secured by a packer set below the top of the confining zone and within 500 feet of the top of the authorized discharge zone (Table 1) and within a zone of good quality cement bond (Ch13, Sec9(d)(xxv)). The tubing shall be isolated from the long string casing by an annulus filled with corrosion-inhibiting fluid.

Injection Rates - Each well is allowed the maximum instantaneous injection rate shown in Table 7 provided that the surface pressure limitations are not exceeded. The permittee shall set an alarm or kill switch to prevent injection above the permitted rate.

Permitted Wastes - Wastes to be injected are described as follows:

- Liquid waste generated by uranium mining using in-situ leaching at the Christensen Ranch and Irigaray Ranch mine facilities (as defined in the Land Quality Division Permit to Mine No. 478) including operation bleed streams, yellowcake wash water, sand filter and ion exchange wash water, on-site laboratory waste water, reverse osmosis brine,

groundwater restoration and groundwater sweep solutions, plant washdown water, wash waters used in cleaning or servicing the waste disposal system equipment, and storm water at the mine facilities, and

- Fluids produced during the drilling, completion, testing, or stimulation of wells or test holes related to mining operations at the Christensen Ranch and Irigaray Ranch mine facilities; or during the workover or abandonment of any such well; and drilling equipment wash water.

North American Industry Classification System (NAICS) – 212291

The radionuclide-bearing waste produced at this facility by in-situ uranium mining has been defined by the Atomic Energy Act as Section 11e.(2) byproduct material and is regulated by the Nuclear Regulatory Commission (NRC) under Title 10 Code of Federal Regulations Part 40. It is not "solid waste" according to Title 40 Code of Federal Regulations Part 261.4(a)4 and is consequently not hazardous waste. Because Wyoming is a "non-agreement" state, the NRC retains jurisdiction over in-situ mining wastes and the permittee shall not use the injection wells for waste disposal without the proper NRC license.

Waste disposal is prohibited until the requirements for financial assurance (Section P) have been met.

The expected concentrations for selected chemical species in the waste are listed in Table 6.

Table 6. Water Quality of the Discharge

	Units	Maximum	Minimum
Sodium	mg/L	7,500	500
Bicarbonate	mg/L	7,500	1,000
Sulfate	mg/L	12,000	250
Chloride	mg/L	1,200	100
pH	s.u.	9.0	6.0
Total Dissolved Solids (TDS)	mg/L	25,000	4,000
Uranium	mg/L	15	0.2
^{226}Radium	pCi/L	1,700	200

Permission to discharge other non-hazardous waste may be authorized through a minor permit modification (Ch13, Sec8(d)(v)). Additional monitoring may be required for additional waste types.

Permitted Corrosion Inhibitors, Anti-Scalants, and Biocides - Corrosion inhibitors, anti-scalants, and biocides may be added to the waste stream with the prior written approval of the Administrator.

Injection Pressure - The injection pressure in each injection well shall be limited to the fracture pressure of the receiver except as necessary during well stimulation approved by the

Administrator (Ch13, Sec9(d)(ii)). Permit limits for the existing wells and temporary limits for the proposed wells are listed in Table 7. The temporary limit applies until recalculation of the parameters in Table 7 following completion of a step-rate injection test. Exceeding the limiting surface injection pressure (LSIP) in Table 7 or creating or propagating fractures within the receiver or confining zone once waste disposal has commenced are violations of this permit and shall be reported pursuant to Section K of this permit. A kill switch shall be installed on the injection tubing and set to preclude violations of LSIP limits.

For each proposed well, the permittee shall conduct a step-rate injection test within one year of permit issuance to determine the actual fracture pressure of the receiver (Ch13, Sec9(d)(ii)). For wells which have not been constructed within one year of permit issuance, a step-rate injection test shall be required before waste injection is allowed. Such tests shall be conducted using both surface and down hole presssure gauges or transducers. The down hole device shall be placed within one hundred vertical feet of the packer. For a conclusive result, at least three of the injection rate steps below the fracture threshold will be colinear. Upon completion of the test, the permittee shall recalculate the maximum surface injection pressure (MSIP) and LSIP.

If the recalculated LSIP is greater than the temporary LSIP in Table 7, the permittee must obtain the approval of the Administrator before operating the well at a pressure above the temporary LSIP. If the recalculated LSIP is less than the temporary LSIP in Table 7, the permittee must cease injection and not restart discharge until the wellhead pressure can be maintained below the recalculated LSIP. The permittee may conduct additional step-rate injection tests at its discretion to refine estimates of MSIP as injection continues. Step-rate data, analyses, and interpretations shall be submitted to the Administrator within thirty days of completion of the test or with the next quarterly report, whichever is later.

Annulus Pressure – The annulus between the injection tubing and the long string casing shall be filled with a corrosion-inhibiting fluid and be monitored and maintained in a way that allows reliable leak detection. The annulus pressure shall be maintained within the limits set in Table 7. During periods of continuous injection, the annulus pressure should be reasonably constant but large variations in pressure are permissible during startup and shutdown. The permittee shall set alarms or use daily observations to detect increases or decreases in annulus pressure and shall cease injection and shut the well in if a pressure change indicates the possibility of a loss of mechanical integrity. Interpretations of pressure changes shall take into account annulus pressure changes due to variations in temperature of the injected and annulus fluid.

New Well Construction - The permittee shall obtain written acceptance of financial assurance from WDEQ prior to construction of each of the proposed wells.

Any well stimulation activities require prior approval by the Administrator.

The packer at the bottom of the tubing shall be set below the top of the confining zone and within 500 feet of the top of the authorized discharge zone (Table 1) for each well and within a zone of good quality cement bond as shown by a cement bond log (Ch13, Sec9(d)(xxv)).

Table 7. Maximum Injection Rates, Annulus Pressures, and Maximum and Limiting Surface Injection Pressures (MSIP, LSIP)

	Christensen Ranch18-3	Christensen Ranch DW No. 1	Christensen Ranch DW No. 2 (proposed)	Christensen Ranch DW No. 3 (proposed)
Maximum Annulus Pressure (psig)	800	800	800	800
Minimum Annulus Pressure (psig)	200	200	200	200
Injection Rate at Fracture, R_f (bbl/day)	4,133^	4,133	-	-
Maximum Injection Rate (bbl/day) $R_m = 0.9 \cdot R_f$	3,720^	3,720	4,286	4,286
Depth to Gauge or Top of Perforations, D_p (ft)	3,820^	3,820	3,820	3,820
Fracture Pressure, P_f (psig)	2,975^	2,975	2,292*	2,292*
Fracture Gradient, (psi/ft) $F = P_f/D_p$	0.779^	0.779	0.60*	0.60*
Temperature in Tubing (°F)	75	67	70	70
Maximum Total Dissolved Solids of Injectate (mg/L)	20,000	20,000	20,000	20,000
Density of Injectate, ρ_j (g/cm^3)	1.0124	1.0136	1.0131	1.0131
Injectate Fluid Gradient (psi/ft) $grad_j = \rho_j \cdot 12\frac{in}{ft} \cdot 16.387\frac{cm^3}{in^3}/453.592\frac{g}{lb}$	0.4390	0.4394	0.4392	0.4392
$MSIP = P_f - (D_p \cdot grad_j)$ (psig)	1,298	1,296	614	614
$LSIP = 0.9 \cdot MSIP$ (psig)	1,169	1,167	553#	553#

^Formation didn't fracture during test; data for Christensen Ranch DW No. 1 applies.

*Calculated from the assumed fracture gradient.

#Applies for the first year after permit issuance or until a new LSIP has been approved after the step-rate injection test; if the well is not drilled within one year of permit issuance, a step-rate injection test is required before waste injection.

Injection into a well may not begin until:

1. Well construction is complete (Ch13, Sec9(d)(xxix)); and

2. The permittee has submitted a well completion and testing report and the "Notification of Construction Completion of Injection Well" (available on the WQD - UIC Program web site - http://deq.state.wy.us/wqd/groundwater/uicprogram/index.asp) for a newly constructed or modified well; and

3. The permittee has provided the Administrator with sufficient notice to allow for inspection of the well (Ch13, Sec9(d)(xxiv); and

4. Mechanical integrity of the well and cement bonding of the long string casing have been proven or demonstrated to the satisfaction of the Administrator; and

5. The permittee has demonstrated financial assurance (Ch13, Sec17(a)); and

6. The permittee has received written approval from the Administrator to begin injection.

E. Prohibitions

This permit does not allow for the injection of any hazardous waste as defined in 40 CFR 261.3 or in Wyoming Solid Waste Management Rules and Regulations, Chapter 2. Injection of any substance defined as a hazardous waste, whether hazardous by listing or by characteristic is a violation of this permit.

No person shall conduct any authorized injection activity in a manner that results in a violation of any permit condition or representations made in the application (Ch13, Sec18(b)(i)).

No person shall conduct any authorized injection activity in a manner that results in a movement of fluids out of the receiver (Ch13, Sec18(b)(ii)).

No zone or interval other than the discharge zone shall be used as a receiver for the discharge (Ch13, Sec18(b)(ii)(A)).

No uncased hole may be used as a conduit for the discharge, except that portion of a hole within the discharge zone (Ch13, Sec18(b)(ii)(B)).

No annular space between the wall of the hole and the outer casing may be used as a conduit for discharge, except in that portion of the space within the discharge zone (Ch13, Sec18(b)((ii)(C)). The annular space may receive fluids used in cementing casing during the cementing process.

No person shall construct, install, modify, or improve this authorized injection facility except in compliance with this permit (Ch13, Sec18(b)(iii)).

F. Operation and Maintenance

Each injection well shall be constructed, operated, and maintained to prevent movement of fluid from the well into any USDW (Ch13, Sec11(a)).

The permittee shall operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of the permit. Proper operation and maintenance includes mechanical integrity of the well, effective performance, adequate funding, operator staffing and training, and laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this permit (Ch13, Sec9(d)(vi)).

The permittee is required to operate the facility in accordance with statements, representations and procedures presented in the complete permit application and supporting documents as accepted and approved by the Administrator. If such procedures conflict with those in this permit, the conditions in this permit shall take precedence (Ch13, Sec18(b)(i)).

Measuring and recording devices shall be tested and calibrated at a frequency sufficient to ensure accurate and precise measurements. A record of the date of the most recent calibration or maintenance shall be retained at the well site.

G. Entry and Inspection

The permittee shall allow the Administrator, or an authorized representative of the Administrator (upon presentation of credentials and during normal working hours) to enter the premises where a regulated facility is located, or where records are kept under the conditions of this permit; to inspect and photograph the discharge and related facilities and equipment; to review and copy reports and records required by this permit; to collect fluid samples for analysis; to measure and record pressures and water levels; to observe and record data from monitoring equipment; and to perform any other function authorized by law or regulation (Ch13, Sec9(d)(xii)).

Inspectors shall not be required by the permittee to sign any waiver of liability.

H. Environmental Monitoring Program for Groundwaters of the State

The permittee shall furnish the Administrator any information necessary to establish a monitoring program if requested to do so (Ch13, Sec9(d)(xiii)).

No groundwater monitoring program under this permit, other than that described in Section I, is required because of the reduction in risk of pollution due to the depth and confinement of the receiver aquifers (Ch13, Sec13(a)(ii)).

I. Monitoring Requirements

1. The permittee shall retain records of all monitoring information (Ch13, Sec9(d)(xiv)) including all calibration and maintenance records and all original chart recordings for a period of three years after closure of the facility (Ch13, Sec15(g)), at which time the permittee shall notify the Administrator and either deliver the records to WQD or discard them as directed by the Administrator.

2. Records of monitoring information shall include:

   a. The date, exact place, and time of sampling or measurements;

   b. The name(s) of individual(s) who performed the sampling or measurements;

   c. The types of sample containers used, methods of preservation, and holding times;

   d. The date(s) analyses were performed;

   e. The name(s) of individual(s) who performed the analyses;

   f. The analytical techniques or methods used;

   g. The results and precision of such analyses.

3. For any new well or newly perforated zone within an existing well, the permittee shall collect a baseline groundwater quality sample from each aquifer within the new discharge zone (Ch13, Sec13(a)) and submit results for all the analytes and parameters in Table 1, WDEQ-WQRR Chapter 8, and for the entire suite of volatile organic compounds listed for EPA method 624 prior to waste injection. The methods and procedures for sample collection and analysis must be approved by the Water Quality Division prior to sampling.

4. For any new well, the permittee shall collect at least two measurements of hydraulic head (or fluid density and pressure) within sandstones in the lower 500 feet of the Lebo Member of the Fort Union Formation.

5. Operational Monitoring (Ch13, Sec13(b)(ii)):

Injection Pressure - The permittee shall measure the injection pressure continuously and record the readings on a strip chart recorder, a circular chart recorder, or electronically (Ch13, Sec13(i)).

Injection Rate and Volume - The permittee shall measure the injection rate and volume continuously and record both on a strip chart recorder, circular chart recorder, or electronically (Ch13, Sec13(i)).

Annulus Pressure - The permittee shall measure the pressure of the casing - tubing annulus continuously and record the pressures on a strip chart recorder, a circular chart recorder, or electronically (Ch13, Sec13(i)).

Discharge Zone Reservoir Pressure, Reservoir Boundaries or Anomalies, Permeability, and Skin Factor - The permittee shall shut-in at least 50% of the completed wells covered by this permit annually (1 of 2, 2 of 3, or 2 of 4 wells) for a period of time long enough to observe a valid pressure fall-off curve (Ch13, Sec13(e)). For the first test, the minimum duration of injection and fall-off shall be calculated according to the equations on page A-4 of the "UIC Pressure Falloff

Testing Guideline" (USEPA Region 6, August 2002), or the equivalent equations in subsequent editions. Durations for subsequent tests shall be longer than wellbore storage and skin effects and sufficient for persuasive analysis and accurate estimates of transmissivity. Tests shall be analyzed by the permittee using commonly accepted methods to obtain transmissivity, permeability, and skin factor and to identify reservoir boundaries (including flow in fractures) and other anomalies such as partial penetration or layering. The test method chosen should be justified by a review of relevant assumptions and actual well and aquifer conditions. Along with the analysis and interpretation, the permittee shall submit plots of injection rate, pressure, and the pressure derivative versus time on appropriate graphs. If the method used differs from previous methods used for the same well, the analyst should discuss the comparability of the results.

Digital data, results, analyses, and interpretations for the fall-off test shall be submitted to the Administrator at the address in paragraph K.6 within one month or with the next quarterly report after the test is done, whichever is later (Ch13, Sec15(f)). These data shall include pressures starting with the introduction of the pressure-measuring device into the well (or for at least one hour prior to test start for a permanently installed down hole device); and injection rates starting at least twice the fall-off period before the start of the fall-off test.

Radius of Influence - The results of each pressure fall-off test shall be used to update the radius of influence calculation for each discharge zone (Table 1). These annual updates shall account for historical injection and remaining project life. The permittee shall provide a map showing the updated radius of influence and all wells which penetrate the confining zone within the old and new radii of influence.

If the updated radius of influence encompasses wells not previously identified as within the area of review, construction and plugging and abandonment records for those wells shall be submitted to the Administrator.

For each potentially endangering well which lies within the updated radius of influence, the permittee shall calculate the expected hydraulic head increase at the end of the project life (20 years) due to all disposal wells close enough to significantly affect hydraulic head at the well location. For those wells in which $[\rho_m \cdot H_m/\rho_i] \leq H_i$ (where H_m is the hydraulic head in a borehole filled with mud of known density, or with 9.0 pound/gallon mud if mud density is unknown, H_i is the final expected hydraulic head in the injection zone, ρ_m is the density of the mud, and ρ_i is the density of the fluid in the injection zone; i.e., "W/G $\leq$ B", Ch13, Sec5(b)(iv)(A)), the permittee shall also calculate how long injection could continue at the permittee's proposed rate, or at the maximum monthly injection rate during the prior year, before $[\rho_m \cdot H_m/\rho_i] = H_i$ at the well location. If any calculated time is less than one year, the permittee shall cease injection, reduce the injection rate(s) to new limits approved by the Administrator, or submit a corrective action plan to prevent movement of fluid into any USDW through a potentially endangering well. Upon approval by the Administrator, this plan shall be incorporated as a permit condition (Ch13, sec5(b)(x)).

Radius of influence calculations, figures, and interpretations shall be submitted to the Administrator at the address in paragraph K.6 within thirty days of the annual pressure fall-off test or with the next quarterly report after the test is done, whichever is later (Ch13, Sec15(f)).

Physical and Chemical Properties of the Injectate - The permittee shall measure the quality of the injectate quarterly (Ch13, Sec15(c)(v)), and when significant process changes occur, and when operating changes may significantly alter the waste stream (Ch13, Sec13(h)). The samples must be representative of the waste as it enters the disposal well and include any anti-scalants, biocides, or other additives. If any group of wells receives waste from the same pipe exiting the uranium processing plant, a single sample may be collected for that group from that pipe rather than at individual well locations. Table 8 lists the analytes and parameters to be determined quarterly. WQD may approve alternate methods to those listed in Table 8 upon receipt of a written request describing the procedures, precision, and accuracy of the proposed method and a comparison of the proposed method with that in Table 8.

The first three parameters in Table 8 shall be measured at the sample site(s) unless other methods are approved by the Administrator. The other analyses shall be performed by an EPA-certified laboratory.

Table 8. Analyte and Parameter List for Quarterly Analyses of Injectate

EPA Analytical Method	Analyte or Parameter	CAS Number
SM2550 B	Temperature	None
120.1 or SM2510 B	Specific Conductance at 25 C	None
SM4500-H^+ B	pH	None
none listed	Specific Gravity	None
160.1 or SM2540 C	Total Dissolved Solids	None
SM2320 B	Bicarbonate	71-52-3
SM2320 B	Carbonate	3812-32-6
300.0 or 300.1	Chloride, Total	16887-00-6
300.0, 300.1, or 375.2	Sulfate, Total	14808-79-8
SM4500-S2-D, SM4500-S2-G	Hydrogen Sulfide	7783-06-4
206.5, 200.7, or 200.8	Arsenic, Total	7440-38-2
200.7 or 200.8	Selenium, Total	7782-49-2
200.7 or 200.8	Vanadium, Total	7440-62-2
908.1 or 200.8	Uranium, Total	7440-61-1
903.1	^{226}Radium (picoCuries/liter)	7440-14-4

Note: Methods preceded by "SM" are standard methods.

Limiting Concentrations of Injectate - Analyte and parameter limits for this permit are listed in Table 9. pH has both upper and lower control limits and concentrations must remain within the range indicated in Table 9. Exceedances of these values are a violation of this permit and require notification under Section K of this permit.

Table 9. Control Limits for Injected Waste

Analyte or Parameter	Upper Control Limit
pH	2.0 > pH < 11 s.u.

J. Sampling and Test Procedures

The following units are to be used where applicable: pounds (mass) per square inch for pressure with gage or absolute pressure noted (psig or psia); standard oil field barrels (bbl, equivalent to 42 gallons) for fluid volume; standard oil field barrels per day (bbl/day) for fluid flow rates; milligrams per liter (mg/L) for analyte concentrations, except for pH, which is to be reported in standard logarithmic units (s.u.) and except for radium, radioactive strontium isotopes, and gross alpha particle radioactivity, which are to be reported in picoCuries per liter (pCi/L). The permittee may report equivalent quantities in other units in addition to those above.

Procedures and methods for sample collection and analyses shall be implemented by the permittee to ensure that the samples are representative of the groundwater, water, or waste being sampled (Ch13, Sec14(a)).

A trip blank of distilled water shall be collected for each quarterly sampling date and a duplicate sample shall be collected at least once per year. Blank and duplicate results and chain-of-custody forms shall be included in the quarterly reports.

Procedures for mechanical integrity tests are described in Section M.

Procedures for pressure fall-off tests are described under Operational Monitoring in Section I.

Procedures for step-rate injection tests are described under Injection Pressure in Section D.

K. Records and Reports

1. Record Retention - The permittee shall retain copies of all reports required by this permit, and records of all data used to complete the application for this permit until the permit expires. As described in Section I.2, monitoring records shall be retained for three years after well closure (Ch13, Sec15(g)).

2. Electronic Data Deliverable (EDD) Reporting – The permittee shall use EDD reporting if required by the Administrator.

3. Compliance Schedule Reports – If a compliance schedule is required by the Administrator, reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any such schedule shall be submitted no later than thirty days following each schedule date (Ch13, Sec9(d)(xx)).

4. Noncompliance Event Reports – See Section S.

5. Other Noncompliance Reports - The permittee shall report all instances of noncompliance not reported otherwise and submit the information listed for the written report in Section S with the next quarterly report (Ch13, Sec9(d)(xxii)).

6. Quarterly Reports - Quarterly reports shall be submitted to the Administrator no later than 30 days after the end of each calendar quarter (Ch13, Sec15(a) and 15(c)). The mailing address is: UIC Program Supervisor, DEQ – Water Quality Division, Herschler

Building – 4W, 122 W. 25th St., Cheyenne, WY 82002. The quarterly results shall also be submitted online at https://gem.trihydro.com within 45 days of the end of quarter. The written quarterly report for each well shall include the following information:

a. The minimum, volume-weighted average, and maximum instantaneous injection rates for each well for each month of the quarter. The page showing the maximum injection rates shall also show the maximum permitted injection rate for comparison.

b. The minimum, average, and maximum daily injection pressures for each well for each month of the quarter (Ch13, Sec15(c)(i)). The table or graph showing the maximum injection pressures shall also show the maximum permitted injection pressure for comparison and the pressures at which any alarms or kill switches are activated.

c. The total injection volume in barrels for each month of the quarter, the total for the quarter, and the total cumulative volume of waste injected to date (Ch13, Sec15(c)(iv)).

d. The maximum and minimum annulus pressures for each month of the quarter. The table or graph showing the annulus pressures shall also show the pressures at which any alarms or kill switches are activated.

e. Any quarterly analytical results required by Section I of this permit (Ch13, Sec15(c)(v)). Sample collection dates should allow ample time to receive analytical results prior to reporting deadlines.

f. Any permit exceedances within the quarter.

g. Any events that triggered alarms or shutdowns and the responses taken during the quarter shall be fully described (Ch13, Sec15(c)(iii)).

h. Any well tests conducted more than thirty days before the end of the quarter (e.g., mechanical integrity, pressure fall-off, or step-rate injection) (Ch13, Sec15(f)) and reports of well workovers (Ch13, Sec15(c)(vi)). See also paragraph K.8.

7. Annual Reports - Annual reports shall be submitted to the Administrator at the same address as the quarterly reports. They are due no later than thirty days after the end of each calendar year (Ch13, Sec15((c)). The annual report for each well shall include the following information in addition to that required for the quarterly report:

a. A graphical representation of the injection pressures and volumes for the previous five year's operation and a digital file (e.g., .csv, .txt., .xls, .xlsx) containing these data. The graph shall have calendar dates as the abscissa and pressure and volume as the ordinates.

b. Graphical representations of the quality of the injected waste over time and a digital file (e.g., .csv, .txt., .xls, .xlsx) containing these data. The graphs shall show the injectate quality for the previous five year's operation and shall be prepared on scales appropriate to the variation observed.

8. Well Tests – Reports of well tests conducted less than thirty days before the end of a calendar quarter shall be submitted within thirty days of test completion (Ch13, Sec15(f)). Otherwise, they shall be submitted with the next quarterly report (see paragraph K.6.h).

9. Reports for Aborted Operations - A comprehensive report for any aborted or curtailed operation, which results in the complete termination of discharge or associated activity, shall be submitted to the Administrator within thirty (30) days of termination in lieu of an annual report (Ch13, Sec15(d)).

10. Reports of Plugging and Abandonment – A report of plugging and abandonment (Section N) shall be submitted as soon as practicable after a well is plugged (Ch13, Sec9(d)(xxvii)).

11. Well Completion Report – A report of well construction, completion, and testing and "Notification of Construction Completion of Injection Well" shall be submitted prior to injection into a new or modified well (see New Well Construction in Section D).

12. Step-rate Injection Test Report - A step-rate injection test is required within one year of permit issuance (Ch13, Sec9(d)(ii)) or at the time of well completion and prior to commercial injection.

L. Permit Conditions

This permit is issued for a period of ten years (Ch13, Sec9(a)). If the permittee wishes to continue injection after the expiration date of this permit, he should apply to the Administrator at least four months prior to the expiration date of this permit (Ch13, Sec9(d)(iii)).

It shall not be a defense for the permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of the permit (Ch13, Sec9(d)(iv)).

Nothing in this permit shall be construed to preclude the institution of any legal action or relieve the permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation.

The filing of a request by the permittee, or at the instigation of the Administrator, for permit modification, revocation, or termination, or the notification of planned changes or anticipated noncompliance shall not stay any condition of this permit (Ch13, Sec9(d)(ix)).

After notice and opportunity for a hearing, the Administrator may modify or revoke a permit, in whole or in part, during its term for cause. Causes include, but are not limited to, the following:

1. Noncompliance with terms or conditions of this permit (Ch13, Sec8(e)(i));

2. Failure in the application or during the issuance process to disclose fully all relevant facts, or misrepresenting any relevant facts at any time (Ch13, Sec8(e)(ii)); or

3. Failure of the casing, cement, or the confining layer; or

4. A determination that the activity endangers human health or the environment and can only be regulated to acceptable levels by a permit modification or termination (Ch13, Sec8(e)(iii)).

Permits will be automatically terminated after closure and release of financial responsibility by the Administrator (Ch13, Sec8(i)).

This permit will be reviewed by WQD at least once every five (5) years, and may be reviewed more frequently (Ch13, Sec9(b)). Permits that do not satisfy the review criteria are subject to modification, revocation and reissuance, or termination (Ch13, Sec9(c)).

The conditions in this permit supersede any application content (Ch13, Sec18(b)(i)).

M. Mechanical Integrity

Mechanical integrity shall be maintained continuously and tested at intervals of no longer than five years. The test used to determine mechanical integrity shall be a two part test approved by the Administrator (Ch13, Sec9(d)(vii)). The two parts shall be conducted no more than 90 days apart unless prior approval is obtained from the Administrator.

Part I of the mechanical integrity test shall demonstrate the absence of leaks through the packer, tubing, casing, and wellhead (Ch13, Sec9(d)(vii)(A)). Prior to operational injection and at least once every five (5) years the casing-tubing annulus of each well shall be pressure tested to 1.5 times the LSIP (as measured at the surface). A pressure change of less than 10% after thirty (30) minutes shall be considered successful. The minimum passing annulus pressure test is derived from the following formula: LSIP * 1.5 * 0.9.

Part II of the mechanical integrity test shall demonstrate the absence of fluid movement behind the casing (Ch13, Sec9(d)(vii)(B)) above the topmost perforation. Prior to the commencement of waste injection and at intervals of no longer than five years thereafter, and more frequently if required by the Administrator, each well shall be logged using a radioactive tracer survey and a temperature survey. The static temperature log shall start more than two hours, and preferably more than 24 hours for an active well, after injection has ceased.

Other types of logs may be substituted for Part II of the mechanical integrity test if they satisfy Chapter 13. Section 9. (d) (vii) and are approved by the Administrator.

WQD shall be notified a minimum of 30 days prior to a mechanical integrity test.

Data, results, analyses, and interpretations for the tests shall be submitted to the Administrator at the address in paragraph K.6 within thirty days or with the next quarterly report after the test is done, whichever is later (Ch13, Sec15(f)).

In the case of a failed mechanical integrity test in a well that has begun waste disposal, the well shall be immediately shut-in (Ch13, Sec9(d)(viii)). The Administrator shall be notified by telephone at (307) 777-7781 within twenty-four hours of the test and a written report shall be submitted within seven days. Injection shall not resume until the well has been repaired, a complete mechanical integrity test has been passed, and written permission to resume operation has been obtained from the Administrator.

If at any time injection occurs in any zone not within the discharge zone, a permit violation has occurred. The operator shall prepare an estimate of the volume and quality of all wastewaters which were injected outside of the discharge zone. In the case where any aquifer meeting the standards for Class I through IV(A) under Wyoming Water Quality Rules and Regulations, Chapter 8, has been contaminated due to out of zone injection, the operator shall prepare and implement a plan to recover these solutions. Injection shall not resume until the well has been repaired, a complete mechanical integrity test has been passed, and written permission to resume operation has been obtained from the Administrator.

N. Plugging and Abandonment

Any well under this permit shall be plugged and abandoned within six months after:

- Permit expiration (unless application for a new permit has been made and has not been denied by the Administrator);
- Final cessation of injection activities; or
- The permittee has removed equipment required for the proper operation and monitoring of the well (except for temporary removal during well maintenance).

The permittee shall notify the Administrator of plans to convert or abandon a well at least 90 days prior to the start of any conversion or abandonment activity (Ch13, Sec9(d)(xxvi)). The permittee shall follow the plugging and abandonment procedure described in the application or subsequently prescribed by the Administrator. Well plugging shall meet the requirements of Chapter 11, Section 65 for sealing the well annulus and of Chapter 11, Section 70(c) for sealing within casing. In no case shall the procedure be less stringent than that required by USEPA for Class I non-hazardous waste disposal wells at the time of abandonment (e.g., Title 40 Code of Federal Regulations Part 146.10)

As soon as practicable after plugging and abandonment of any well covered by this permit, the permittee shall submit a plugging and abandonment report describing all activities and detailing any deviations from the original plan (Ch13, Sec9(d)(xxvii)).

O. Duties of the Permittee

Duty to Comply - The permittee shall comply with all conditions of this permit (Ch13, Sec9(d)(i)), all rules and regulations of the Department of Environmental Quality, and all

applicable state and federal laws. Nothing in this permit relieves the permittee of any duties under applicable regulations.

Duty to Mitigate - The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit (Ch13, Sec9(d)(v)).

Duty to Give Notice of Changes - The permittee shall give advance notice to the Administrator as soon as possible of any planned physical alteration or additions, other than authorized operation and maintenance, to the permitted facility and receive authorization prior to implementing the proposed alteration or addition (Ch13, Sec9(d)(xvi)).

Duty to Warn of Noncompliance - The permittee shall give advance notice to the Administrator of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements (Ch13, Sec9(d)(xvii)).

Duty to Provide Information for Permit Modification - The permittee shall furnish the Administrator within a reasonable time, any information which the Administrator may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit(Ch13, Sec9(d)(xi)).

Duty to Provide Records – The permittee shall furnish the Administrator, upon request, copies of records required to be kept by this permit (Ch13, Sec9(d)(xi)).

Duty to Amend Permit - Any modification that will result in a violation of any permit condition shall be reported to the Administrator through the submission of a new or amended permit application and shall not be implemented until a new or modified permit has been issued (Ch13, Sec9(d)(xvii)).

Duty to Correct - The permittee shall report all instances where it becomes aware that it failed to submit any relevant facts in the permit application, or where it submitted incorrect information in a permit application or in any report to the Administrator, and shall promptly submit such facts or information (Ch13, Sec9(d)(xxiii)).

Duty to Monitor - Monitoring results shall be obtained and reported at the intervals specified elsewhere in this permit (Ch13, Sec9(d)(xix)).

Duty to Test - Test results shall be obtained and reported at the intervals specified elsewhere in this permit.

Duty to Provide Current Contact Information – The permittee shall report any changes to physical or mailing address, phone, or email, and any changes of the personnel responsible for complying with this permit to WQD within 30 days of the change.

P. Financial Responsibility

The permittee is required to maintain financial assurance, in a form approved by the Administrator, to close, plug, and abandon the injection well operation and to reclaim the surface facilities in a manner approved by the Administrator (Ch13, Sec17(a)).

The obligation to maintain financial responsibility survives the termination of the permit or the cessation of injection (Ch13, Sec17(c)).

If the institution issuing the financial instrument files for bankruptcy or loses its authority to issue financial instruments, the permittee shall notify the Administrator within 14 days and obtain other financial assurance within 60 days. If the permittee is named as debtor in any voluntary or involuntary bankruptcy proceeding, it must notify the Administrator within 14 days.

The bond for reclamation and restoration of the Christensen Ranch and Irigaray Ranch mine facilities under the Land Quality Division Permit to Mine No. 478A shall be increased from the amount in the August 2009-August 2010 annual report to a minimum of $99,190 for plugging and abandonment of each existing well prior to the use of any well for waste disposal. This bond or replacement financial instrument shall be maintained as long as any of the wells are covered under this permit.

The financial assurance will be re-evaluated during the five-year review, or more frequently if required by the Administrator, and the permittee may be required to increase the amount in order to account for inflation (Ch13, Sec9(b)).

Construction of Christensen Ranch DW No. 2 or Christensen Ranch DW No. 3 may not begin until the mine reclamation and restoration bond has been increased to cover plugging and abandonment costs for the new well(s) or a separate financial instrument has been obtained by the permittee and accepted by the Administrator.

Q. Special Permit Conditions

In addition to the conditions required of all permits, the Administrator may establish specific conditions so as to prevent the migration of fluids into USDWs (Ch13, Sec9(e)). The following special conditions are established for this permit:

- none

R. Signatories Requirement

All reports filed in conjunction with this permit shall contain the following certification (Ch13, Sec9(d)(xv)):

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations." (Ch13, Sec5(c)(xv))

All reports required by this permit and other requested information shall be signed by a responsible officer as described in WQRR Chapter 13, Section 5(b)(xiv));

or

By a duly authorized representative. A person is a duly authorized representative only if:

a. The authorization is made in writing by one of the prescribed principals;
b. The authorization specifies either an individual or position having responsibility for the overall operation of the regulated facility or activity; and
c. The written authorization is submitted to the Administrator.

If an authorization is no longer accurate because a different individual or position has responsibility for the overall operation of the facility, a new authorization must be submitted to the Administrator prior to, or together with, any reports or information to be signed by the new authorized representative.

S. Noncompliance

Any permit noncompliance constitutes a violation of WQRR Chapter 13 and is grounds for enforcement action, permit termination, revocation, or modification. Confirmed noncompliance resulting in a migration of injected fluid outside the discharge zone shall be reported to the Administrator at (307) 777-7781 within twenty-four (24) hours from the time the permittee becomes aware of the circumstances and a written report shall be provided within five days (Ch13, Sec9(d)(xxi)).

The oral report should include:

a. Any monitoring or other information which indicates that any contaminant may cause an endangerment to a useable groundwater of the state.
b. Any noncompliance with a permit condition or malfunction of the discharge (injection) system which may cause fluid migration into or between useable groundwaters of the state.

The written report should include:

a. A description of the noncompliance and its cause;
b. The period of noncompliance, including exact dates and times;
c. If the noncompliance has not been corrected, the anticipated time it is expected to continue; and
d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance (Ch13, Sec9(d)(xxi)).

T. Permit Transfer

Any transfer of this permit shall be accomplished by the submission of the proper forms for permit transfer to the Administrator. Transfer of this permit must be approved by the Director and the Administrator and no transfer shall be approved unless the proposed permittee agrees to correct any and all noncompliance issues (Ch13, Sec9(d)(xviii) and Ch13, Sec8(k)).

The permittee is alone responsible for the operation of the facility covered by this permit. Operation of this facility by another entity is a violation of this permit unless a transfer of this permit has first been accomplished.

U. Property Rights

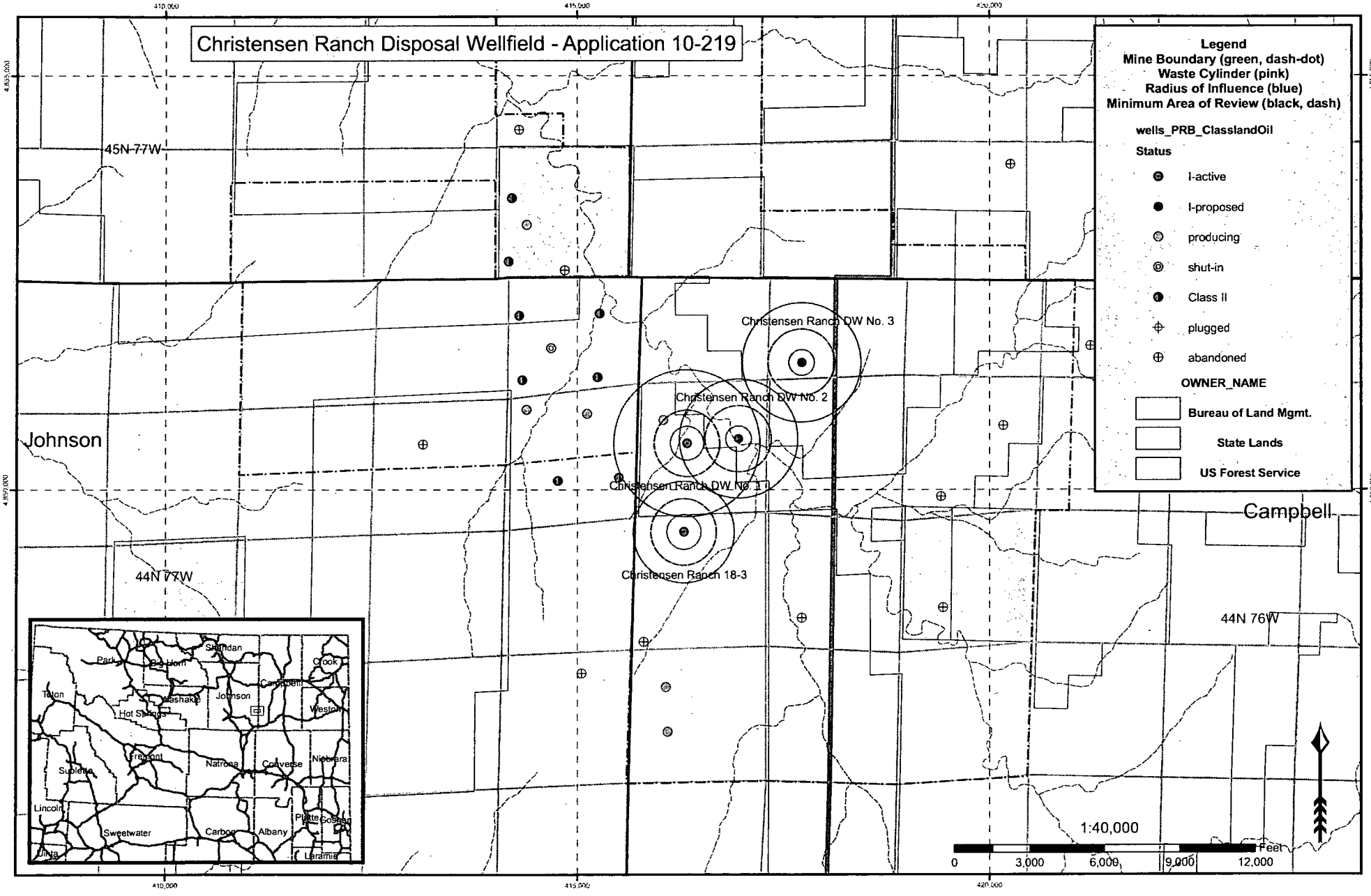
This permit does not convey any property rights or any exclusive privileges. This permit does not authorize any injury to private property or any invasion of personal rights, nor any infringement of federal, state, or local laws or regulations (Ch13, Sec9(d)(x)).

The state of Wyoming recently passed Wyoming statute §34-1-152 and amended Wyoming statute §34-1-202 regarding the ownership of pore space within the subsurface. WDEQ recommends that permittees consider how these laws may apply to their injection of material into the subsurface.

V. Severability

The provisions of this permit are severable, and if any provision of the permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

Abbreviations:
USDW – underground source of drinking water (Classes I, II, III, IV(a), Special(A))
USEPA – United States Environmental Protection Agency
WDEQ – Wyoming Department of Environmental Quality
WQD – Water Quality Division of WDEQ
WQRR – WDEQ Water Quality Rules and Regulations


Christensen Ranch Disposal Wellfield - Application 10-219
45N 77W
44N 77W
44N 76W
Johnson
Campbell
Christensen Ranch DW No. 3
Christensen Ranch DW No. 2
Christensen Ranch DW No. 1
Christensen Ranch 18-3
Legend
Mine Boundary (green, dash-dot)
Waste Cylinder (pink)
Radius of Influence (blue)
Minimum Area of Review (black, dash)
wells_PRB_ClasslandOil
Status
I-active
I-proposed
producing
shut-in
Class II
plugged
abandoned
OWNER_NAME
Bureau of Land Mgmt.
State Lands
US Forest Service
1:40,000
Feet
0
3,000
6,000
9,000
12,000
Sheridan
Crook
Weston
Natrona
Converse
Niobrara
Fremont
Sublette
Lincoln
Sweetwater
Carbon
Albany
Laramie
Platte
Goshen
Uinta