

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
(X) Renewal

Permit Number: **09-621**
Previous Permit: 98-092
Facility Number WYS-005-013

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.

Applicant: AUC LLC
1536 Cole Boulevard, Suite 230
Lakewood, CO 80401

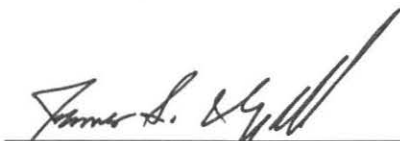
AUC, LLC, hereafter referred to as the permittee, is authorized to drill, complete, and operate proposed wells **IW-1, IW-2, IW-3, and IW-4** according to the statements, representations, procedures, terms and conditions of application 09-621 and requirements and other conditions of this permit. Issuance of this permit 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(s) do not comply with all the terms and conditions of this permit (Chapter 13, Section 8(e)).

This is an area permit for up to four (4) wells of the Reno Creek ISR Project. No additional wells may be constructed under this permit without prior permit modification. This permit shall become effective on date of issuance and is until June 12, 2025.



Kevin Frederick, Administrator
Water Quality Division
Herschler Building 4-W, 122 West 25th Street
Cheyenne, WY 82002

June 26, 2015
Date



Todd T. Parfitt, Director
Department of Environmental Quality
Herschler Building 4-W, 122 West 25th Street
Cheyenne, WY 82002

June 30, 2015
Date

ACRONYMNS

AOR	Area of review
APFT	Annual pressure fall-off test
bbl/day	Barrels per day (standard barrels equal to 42 gallons)
bgs	Below ground surface
C	Celsius
CBL	Cement bond log
CFR	Code of federal regulations
ft	Feet
gpm	Gallons per minute
LSIP	Limiting surface injection pressure (maximum injection pressure which cannot be exceeded at any time other than well stimulation)
MCL	Maximum contaminant level
MCLG	Maximum contaminant level goal
MIT	Mechanical integrity test
mg/L	Milligrams per liter
NAICS	North American industry classification system
NRC	Nuclear Regulatory Commission
PLSS	Public lands survey system
psig	Pounds per square inch, gage
SIP	Surface Injection Pressure
s.u.	Standard units
TCLP	Toxicity characteristic leaching procedure
TDS	Total dissolved solids
UIC	Underground injection control
USEPA	United States Environmental Protection Agency [MT1](EPA)
USDW	Underground source of drinking water (Classes I, II, III, IV(A), Special(A))
WDEQ	Wyoming Department of Environmental Quality[MT2]
WQD	Water Quality Division [MT3]of WDEQ
WQRR	Water quality rules and regulations[MT4]

Table of Contents

1.	WELL LOCATIONS AND AREA OF REVIEW	4
2.	DISCHARGE ZONES.....	5
3.	GROUNDWATER CLASSIFICATION	7
4.	PRE-INJECTION REQUIREMENTS	8
5.	AUTHORIZED OPERATIONS.....	9
6.	PERMITTED WASTES.....	12
7.	PROHIBITIONS.....	13
8.	GENERAL OPERATION AND MAINTENANCE	14
9.	MONITORING AND REPORTING	15
10.	ANNUAL PRESSURE FALL-OFF TEST	18
11.	MECHANICAL INTEGRITY	20
12.	NON-COMPLIANCE REPORTING	21
13.	WHERE TO SUBMIT REPORTS.....	22
14.	PERMIT CONDITIONS.....	22
15.	DUTIES OF THE PERMITEE	23
16.	PLUGGING AND ABANDONMENT	24
17.	FINANCIAL RESPONSIBILITY.....	25
18.	PERMIT TRANSFER.....	26
19.	SIGNATORY REQUIREMENTS	26
20.	ENTRY AND INSPECTION.....	27
21.	PROPERTY RIGHTS.....	27
22.	SEVERABILITY	27

1. **WELL LOCATIONS AND AREA OF REVIEW**

- a. The well(s) authorized by this permit are located as shown on Table 1.

TABLE 1 (Well Location(s))

Well Name	Legal Description	Latitude	Longitude
IW-1	SE¼, NW¼, SW¼ Section 32; T43N; R73W	43.65657	-105.66186
IW-2	SW¼, NW¼, NE¼ Section 33; T43N; R73W	43.65887	-105.63231
IW-3	SW¼, SE¼, NE¼ Section 1; T42N; R74W	43.64199	-105.68935
IW-4	SE¼, NW¼, SE¼ Section 29; T43N; R73W	43.66764	-105.65068

NOTE: latitude and longitude use NAD 83

- b. The AOR for an injection well is the area in which the potential for breaches of the upper and lower confining zones must be evaluated. The AOR is based on the larger of the radius of volume of emplaced waste cylinder, the radius of the cone of influence, or the minimum radius required. The results of the AOR calculations (WQRR Chapter 13, Section 5(b)(iv)) are shown in Table 2. For this facility the AOR is based on the radius of the cone of influence. Calculations for this facility assumed a twenty (20) year life of facility.

TABLE 2 (Area of Review Summary)

Well Name	Radius of Emplaced Waste Cylinder (ft)	Radius of Cone of Influence (ft)	Minimum Radius of Area of Review (ft)
IW-1	843	3,919	1,320
IW-2	843	3,919	1,320
IW-3	843	3,919	1,320
IW-4	843	3,919	1,320

- c. The AOR (Chapter 13, Section 5(b)(iv)(E)) is described using the PLSS to the nearest sixteenth section in Table 3.

TABLE 3 (Legal Description(s) of the Area(s) of Review)

Well Name	Quarter-Quarters	Section	Township Range
IW-1	S ½ of SW ¼	29	T43N; R73W
	SE ¼ of SE ¼	30	
	NE ¼	31	
	SE ¼ of NW ¼		
	E ½ of SW ¼		
	SE ¼	32	
SW ¼			
	SE ¼		

	S ½ of NE ¼ NW ¼ of NE ¼ NW ¼		T42N; R73W
	NW ¼ W ½ of NE ¼ NE ¼ of NE ¼	5	
	NE ¼ NE ¼ of NW ¼	6	
IW-2	W ½ of SW ¼ SE ¼ of SW ¼	27	T43N; R73W
	SE ¼ of NW ¼ SW ¼ SE ¼ S ½ of NE ¼	28	
	SE ¼ of SE ¼	29	
	E ½ of NE ¼ NE ¼ of SE ¼	32	
	All	33	
	W ½ of NW ¼	34	
IW-3	SE ¼ S ½ of SW ¼	36	T43N; R74W
	S ½ of SW ¼	31	T43N; R73W
	All	1	T42N; R74W
	NE ¼ of SW ¼ N ½ of NE ¼	12	T42N; R73W
	NW ¼	6	
	N ½ of NW ¼	7	
IW-4	S ½ of SW ¼ SE ¼	20	T43N; R73W
	W ½	28	
	All	29	
	E ½ of SE ¼	30	
	N ½	32	
	W ½ of NW ¼ NE ¼ of NW ¼	33	

2. DISCHARGE ZONES

- a. The discharge zone is defined as the Lewis (Teckla member) and Mesaverde (Teapot member) formations, located from approximately 7,000 to 7,860 ft-bgs. The injection well(s) are authorized to inject within the estimated interval(s) specified in Table 4 and will be noted on as-built diagrams. The Parkman member of the Mesaverde formation is not included as an authorized injection zone for this permit.

TABLE 4 (Discharge Zone(s))

Well Name	Surface Elevation (ft)	Depth to Top of Discharge Zone (ft)*	Depth to Bottom of Discharge Zone (ft)*	Gross Discharge Zone Thickness (ft)*	Well Depth (ft)*
IW-1	5,110	7,000	7,860	860	8,060
IW-2	5,235	7,000	7,860	860	8,060
IW-3	5,160	7,000	7,860	860	8,060
IW-4	5,215	7,000	7,860	860	8,060

*Estimated depths referenced to ground level (not KB)

Actual depths to be verified by wireline logs.

- b. If the permittee determines that the authorized discharge zones identified in Table 4 are inadequate, and additional discharge zones are necessary, a permit modification will be required. The Permittee must make application for a permit modification and the request shall be supported by data approved by the Administrator.
- c. The upper confining zone consists of approximately 440 feet of Lewis shale.
- d. The lower confining zone consists of approximately 500 feet of Steele shale.
- e. There are nine (9) wells that penetrate one or both of the confining units within the proposed injection well's AORs (cone of influence). Five (5) wells were identified within the AOR of IW-1 and two (2) wells were identified within the AOR's for IW-2 and IW-4 as shown in Table 5. Analysis indicates that no wellbore conditions represent a pathway for injected fluids to impact an underground source of drinking water (USDW). No penetrations were identified for IW-3.

**Table 5 (Wells Penetrating the Confining Zone
Within the AOR of IW-1, IW-2, IW-3, IW-4)**

Wells		Distance from	Well	P&A'd or In Use
API	Name	IW #1 (feet)	Depth	
49-005-24704	Sinadin 1	2,810	9,456	Plugged and Abandoned -1977
49-005-29240	Carlotta 23-31	4,095	13,800	Plugged and Abandoned -1996
49-005-61484	Leavitt Trust 44-31 TH	1,877	10,890	In Use (properly completed)
49-005-61498	Leavitt Trust 11-5 TH	2,183	10,984	In Use (properly completed)
49-005-61759	Leavitt Trust 24-32 TH	1,929	10,834	In Use (properly completed)
Wells		Distance from	Well	P&A'd, In Use, or Not Yet Drilled
API	Name	IW #2 (feet)	Depth	
49-005-61486	Groves Trust 44-28 TH	2,099	10,775	In Use (properly completed)
49-005-62138	Groves Trust 44-28PH	2,125	7,856	In Use (properly completed)
Wells		Distance from	Well	P&A'd, In Use, or Not Yet Drilled
API	Name	IW #4 (feet)	Depth	
49-005-56671	Drake 31-29	3,303	8,076	In Use (properly completed)
49-005-61271	Drake Federal 31-29 HT	3,470	10,804	In Use (properly completed)

3. GROUNDWATER CLASSIFICATION

- a. The groundwater in the Lewis formation (Teckla member) and Mesaverde formation (Teapot and Parkman members) within the AORs is classified as Class VI (unusable/unsuitable) in accordance with WQRR, Chapter 8 as described in 3(b). This classification was made for the following reasons:
 - i. The groundwater in the Lewis and Mesaverde formations contains concentrations of total dissolved solids greater than 3,000 mg/L and cannot reasonably be expected to provide a source of drinking water due to excessive concentrations of total dissolved solids or specific constituents (WQRR Chapter 8, Section 4 (d)(ix)(A)).
 - ii. These formations are located in such a way including depth below the surface so as to make use economically and technologically impractical (WQRR Chapter 8, Section 4(d)(ix)(C)).
- b. The aquifer Class VI designation is limited to the larger of the volume of emplaced waste cylinder radii or the minimum radii for each well shown in Table 2. The Class VI designation extends 1,320 feet in all lateral directions from injection wells identified in Table 2. All waste injected over the twenty (20) year life of this facility is calculated to remain within the minimum radii of 1,320 feet identified in Table 2.

- c. The Teckla and Teapot members of the Lewis and Mesaverde formations have not produced hydrocarbons within the immediate area; however, the Parkman member of the Mesaverde formation has produced hydrocarbons.
- d. The AOR requested for USEPA aquifer exemptions are based on the larger of the volume of emplaced waste cylinder radii or the minimum radii for each well shown in Table 2 (1,320 feet).

4. PRE-INJECTION REQUIREMENTS

Injection into a well may not begin until written authorization to discharge is provided by the Administrator. The authorization to discharge will not be provided until the following are completed to the satisfaction of the Administrator:

- a. Well construction is complete (Chapter 13, Section 9(d)(xxix)).
- b. The permittee has submitted an as-built well completion and testing report and the "Notification of Construction Completion of Injection Well" (available at <http://deq.state.us/wqd/groundwater/uicprogram>). Note that these documents require a Wyoming PE or PG certification.
- c. For each new well, the permittee shall report depth to formations top for each formation from ground surface to the total depth drilled.
- d. For each new well or newly perforated zone within an existing well, the permittee shall collect a baseline groundwater quality sample from each aquifer or formation within the new discharge zones (Chapter 13, Section 13(a)) and submit results for all the analytes and parameters in WQRR Chapter 8, Table I. The methods and procedures for sample collection and analysis must be approved by the Water Quality Division prior to sampling.
- e. The permittee has demonstrated cement bond integrity by submitting cement bond logs (CBL) that are sensitive enough to identify channels in the cement annulus (cement to long string casing and cement to formation) that could result in a poor hydraulic seal. CBL output tracks shall include: gamma, amplitude, CBL waveform, and cement image. CBL shall be conducted no sooner than 72 hours from the last cement job to ensure adequate cement curing. A cement design shall also be included on a well schematic showing depth of fill for lead and tail cement (with compressive strength curves) for all stages.
- f. Mechanical integrity of the well has been demonstrated (see Section 11 of this permit).

- g. The permittee has demonstrated financial assurance (Chapter 13, Section 17 (a)).
- h. Aquifer exemptions for each Underground Source of Drinking Water (USDW) to be injected into has been obtained from the US Environmental Protection Agency (EPA).

5. AUTHORIZED OPERATIONS

- a. The maximum instantaneous injection rate for each well shown in Table 6 is allowed provided that the LSIP is not exceeded.
- b. The injection pressure in each injection well shall be limited to the LSIP shown in Table 6 except as necessary during well stimulation approved by the Administrator (Chapter 13, Section 9 (d)(ii)).
 - i. Exceeding the LSIP in Table 6 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 12 of this permit.
 - ii. The LSIPs in Table 6 for each well are temporary. The temporary limits apply until a step-rate injection test has been conducted and the recalculated LSIP has been approved by the Administrator.
 - iii. The permittee shall conduct a step-rate injection test within one year of permit issuance or well construction or modification, whichever comes later, to determine the actual fracture pressure of the receiver (Ch13, Sec9(d)(ii)).
 - iv. The permittee may conduct additional step-rate injection tests at their discretion to refine estimates of the SIP as injection continues. The SIP will be used to recalculate the LSIP.
 - 1. Step-rate injection tests shall be conducted using both surface and down hole pressure gauges or transducers. The down hole device shall be placed within 100 vertical feet of the packer, if possible. For a conclusive result, at least three of the injection rate steps below fracture threshold will be collinear. Upon completion of the step-rate injection test, the permittee shall recalculate the LSIP.
 - 2. If the recalculated LSIP is greater than the permitted LSIP in Table 6, the permittee must obtain the approval of the Administrator before operating the well at a pressure above the permitted LSIP.
 - 3. If the recalculated LSIP is less than the permitted LSIP in Table 6, the permittee must cease injection and not restart discharge until the wellhead pressure can be maintained below the recalculated LSIP.

- v. Digital data, analyses, and interpretations for the step-rate tests shall be submitted to the Administrator within thirty (30) days or with the next quarterly report after the test is done, whichever is later.

**TABLE 6 (Maximum Injection Rates, Annulus Pressures,
and Surface and Limiting Surface Injection Pressures (SIP, LSIP))**

Parameter	IW-1	IW-2	IW-3	IW-4
Maximum Injection Rate (bbl/day)	2,057	2,057	2,057	2,057
Maximum Injection Rate (gpm)	60	60	60	60
Maximum Annulus Pressure (psig)	800	800	800	800
Minimum Annulus Pressure (psig)	200	200	200	200
Estimated Fracture Gradient, F (psi/ft)	0.61	0.61	0.61	0.61
Fracture Pressure, $P_f = F \cdot D_p$	4,270	4,270	4,270	4,270
Depth to Top of Formation, D_p (ft) (bgs)	7,000	7,000	7,000	7,000
Temperature at Mid-Point of Perforations ($^{\circ}$ F)	155	155	155	155
Total Dissolved Solids of Injectate (mg/L)	12,000	12,000	12,000	12,000
Density of Injectate, ρ_i (g/cm ³)	1.005	1.005	1.005	1.005
Injectate Fluid Gradient (psi/ft) $grad_j = \rho_j \cdot 12 \frac{in}{ft} \cdot 16.387 \frac{cm^3}{in^3} / 453.592 \frac{g}{lb}$	0.4370	0.4370	0.4370	0.4370
Hydrostatic Pressure (psi) $P_h = D_p \cdot grad_j$	3,059	3,059	3,059	3,059
Tubing Length, T_L (feet)	7,100	7,100	7,100	7,100
Tubing Inside Diameter, d (inches)	2.441	2.441	2.441	2.441
Tubing Friction Loss Factor, T (psi/1000 ft)	7	7	7	7
Average Injection rate, q (gpm)	40	40	40	40
Pressure Loss due to Tubing Friction (psi/ft) $P_d = (4.52q^{1.85}) / (c^{1.85} d^{4.8655})$	0.00664	0.00664	0.00664	0.00664
Total Pressure Loss from Tubing Friction (psi) $P_L = P_d \cdot T_L$	47	47	47	47
$SIP = P_f - P_h + P_L$ (psig)	1,258	1,258	1,258	1,258
$LSIP = 0.9 \cdot SIP$ (psig)*	1,132*	1,132*	1,132*	1,132*

c = Hazen-Williams design coefficient for steel piping, normally (130)

*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 (1) year of permit issuance, a step-rate injection test is required prior to waste injection.

6. PERMITTED WASTES

a. General Information:

- i. All wastes accepted under any authorization contained in this permit shall be neutralized to a pH of greater than 2.0 and less than 12.5.
- ii. General categories of wastes that may be injected are described in detail below.
- iii. For each waste accepted under any of the categorical authorizations contained in this permit, the permittee shall require that the company generating these wastes provide a full written description of the wastes to support the fact that the wastes are similar to the wastes described in the authorization.
- iv. Sampling and other requirements that must be fulfilled prior to injecting waste are detailed by category, below.
- v. Permittee shall keep records on site concerning the source of all such wastes.
- vi. Permission to discharge non-hazardous waste other than from within those categories authorized under this permit may be authorized only upon written approval of the Administrator. Additional monitoring may be required for additional waste types.
- vii. For further information on definitions of various waste sources and analysis of samples for hazardous waste toxicity characteristics please refer to "Underground Injection Control Program, Water Quality Division, Wyoming Department of Environmental Quality's Guidance Document #2, Approval/or New Waste Streams For Disposal in Class I Wells" (May 6, 2003) available on the WDEQ UIC website.

b. Radionuclide Bearing Waste:

Wastes to be injected include liquid waste generated by uranium mining using in-situ leaching (as defined in the Land Quality Division Permit to Mine not yet issued) 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 wash down water, wash waters used in cleaning or servicing the waste disposal system equipment, and storm water at the mine facilities. Permitted wastes also include fluids produced during the drilling, completion, testing, or stimulation of wells or test holes related to mining operations or during the work over or abandonment of any such well; and drilling equipment wash water.

The radionuclide-bearing waste produced at this facility by in-situ uranium mining has been defined by the Atomic Energy Act as Section 11(e)(2) byproduct material and is regulated by the 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.

c. Corrosion Inhibitors and Other Additives:

The composite injection stream may also contain a small amount of the following categories of additives, which have been shown to not meet the definition of Hazardous waste under RCRA. A copy of the SDS must be submitted to the UIC program prior to use.

- i. Biocides
- ii. Scale/gypsum, inhibitors
- iii. Emulsifying/demulsifying agents
- iv. Corrosion inhibitors
- v. Acidizing agents

7. **PROHIBITIONS**

- a. **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 and requires notification under Section 12 of this permit.
- b. 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 (Chapter 13, Section 18(b)(i)).
- c. No person shall conduct any authorized injection activity in a manner that results in a movement of fluids out of the receiver (Chapter 13, Section 18(b)(ii)).
- d. No zone or interval other than the discharge zone shall be used as a receiver for the discharge (Chapter 13, Section 18(b)(ii)(A)).
- e. No uncased hole may be used as a conduit for the discharge, excepting that portion of a hole within the discharge zone (Chapter 13, Section 18(b)(ii)(B)).
- f. No annular space between the wall of the hole and the outer casing may be used as a conduit for discharge, excepting in that portion of the space within the discharge zone (Chapter 13, Section 18(b)(ii)(C)). The annular space may receive fluids used in cementing casing during the cementing process.
- g. No person shall construct, install, modify, or improve this authorized injection facility except in compliance with this permit (Chapter 13, Section 18(b)(iii)).

8. GENERAL OPERATION AND MAINTENANCE

- a. North American Industry Classification System (NAICS) – 212291 - uranium mining.
- b. Each injection well shall be constructed, operated, and maintained to prevent movement of fluid from the well into any USDW (Chapter 13, Section 11(a)).
- c. Injection shall be conducted through tubing which has been secured by a packer set below the top of the confining zone and within one-hundred (100) feet of the top of the authorized discharge zone (Table 1) and within a zone of good quality cement bond (Chapter 13, Section 9(d)(xxv)).
- d. An automatic kill switch shall be installed on the injection tubing and set to preclude violations of LSIP limits found in Table 6.
- e. 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.
 - i. The annulus pressure shall be maintained within the limits set in Table 6. During periods of continuous injection, the annulus pressure should be reasonably constant but large variations in pressure are allowed during startup and shutdown.
 - ii. The permittee shall set alarms or use daily observations to detect increases or decreases in annulus pressure and shall immediately cease injection and shut the well in when an alarm is triggered; or the permittee shall install a kill switch to stop injection if casing, tubing, packer, or well head leak.
 - iii. Settings for low- and high-pressure alarms shall take into account annulus pressure changes due to variations in temperature of the injected and annulus fluid.
- f. The operator shall 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 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 (Chapter 13, Section 18(b)(i)).
- g. The permittee is required to operate 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 (Chapter 13, Section 18(b)(i)).

- h. 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.
- i. Well stimulation requires prior approval of the Administrator (Chapter 13, Section 9 (d)(ii)).
- j. Each time a well is re-entered, a well work over report and Part I MIT shall be submitted to the Administrator within thirty (30) days or with the next quarterly report after the test is done, whichever is later.
- k. 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 (Chapter 13, Section 15 (d))

9. MONITORING AND REPORTING

a. Operational Monitoring

- i. The permittee shall monitor the injection pressure, both in the annulus and in the tubing, continuously and record the readings on a strip chart recorder, a circular chart recorder, or electronically (Chapter 13, Section 13(i)).
- ii. The permittee shall monitor the injection rate continuously and record the rates and volumes on a strip chart recorder, circular chart recorder, or electronically (Chapter 13, Section 13(i)).

b. Environmental Monitoring

- i. The permittee shall furnish the Administrator any information necessary to establish a monitoring program if requested to do so (Chapter 13, Section 9(d)(xiii)).
- ii. 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 aquifer (Chapter 13, Section 13(a)(ii)).
- iii. 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 wastes being sampled (Chapter 13, Section 14(a)). Samples of waste must be representative of the waste as it enters the well. A single injectate sample may be obtained from a pipe that services all associated wells provided there are no additional waste streams between the sample point and the wells. The procedures and methods must be included in an approved written waste analysis plan (Chapter 13, Section 13(g)).

- iv. Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.
- v. The permittee shall monitor the quality of the injectate quarterly (Chapter 13, Section 15 (c)(v)), and when significant process changes occur, and when operating changes may significantly alter the waste stream (Chapter 13, Section 13(h).
- vi. Table 7 lists the parameters and methods to be analyzed quarterly and the associated permitted limits. WQD may approve alternate methods to those in Table 7 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 7.
- vii. The first three (3) parameters in Table 7 shall be measured at the sample site unless other methods are approved by the Administrator. Specific conductance shall be reported for the equivalent value at a temperature of 25° C. The other analyses shall be performed by an EPA-certified laboratory. Metals shall be reported as total values, not dissolved.
- viii. Exceedances of the values in Table 7 are a violation of this permit and require notification under Section 12 of this permit.

TABLE 7 (Parameters, Methods and Limits for Quarterly Analyses of Injectate)

Analyte or Parameter	EPA Analytical Method	CAS Number	Permit Limit (mg/L)
Temperature	SM2550 B	None	n/a
Specific Conductance at 25 C	120.1 or SM2510 B	None	n/a
pH	SM4500-H ⁺ B	None	2.0≤pH≤12.5 s.u
Specific Gravity	none listed	None	n/a
Total Dissolved Solids	160.1 or SM2540 C	None	n/a
Bicarbonate	SM2320 B	71-52-3	n/a
Carbonate	SM2320 B	3812-32-6	n/a
Chloride, Total	300.0 or 300.1	16887-00-6	n/a
Sulfate, Total	300.0, 300.1, or 375.2	14808-79-8	n/a
Hydrogen Sulfide	SM4500-S2-D, SM4500-S2-G	7783-06-4	n/a
Arsenic, Total	206.5, 200.7, or 200.8	7440-38-2	n/a
Selenium, Total	200.7 or 200.8	7782-49-2	n/a
Vanadium, Total	200.7 or 200.8	7440-62-2	n/a
Uranium, Total	908.1 or 200.8	7440-61-1	n/a
²²⁶ Radium (picocuries/liter)	903.1	7440-14-4	n/a

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

- ix. The following units are to be used where applicable:

1. Pressure - pounds (mass) per square inch for pressure with gauge or absolute pressure noted (psig or psia)
 2. Volume - standard oil field barrels (bbl, equivalent to 42 gallons) for fluid volume
 3. Fluid Flow Rate - standard oil field barrels per day (bbl/day) for fluid flow rates
 4. Concentration - milligrams per liter (mg/L) for analyte concentrations other than pH in standard units (s.u.) or radium, radioactive strontium isotopes, and gross alpha particle radioactivity in picocuries per liter (pCi/L).
- x. Quality Assurance - A trip blank of distilled water shall be collected for each quarterly sampling date when VOCs are collected, 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.
- c. Environmental Reporting Requirements
- i. Quarterly Reports shall be submitted to the Administrator no later than thirty (30) days after the end of each calendar quarter ((Chapter 13, Section 15 (a) and 15(c)). The quarterly results shall also be submitted online at <https://gem.wqd.apps.deq.wyoming.gov>, within forty-five (45) days of the end of quarter. The written quarterly report for each well shall include the following information:
 1. Injection rates for each month of the quarter, including:
 - i. Minimum instantaneous
 - ii. Volume-weighted average
 - iii. Maximum instantaneous
 - iv. Maximum permitted injection rate
 2. Injection pressures for each month of the quarter, including:
 - i. Minimum daily
 - ii. Average daily
 - iii. Maximum daily
 - iv. Maximum permitted injection pressure
 - v. Pressures at which alarms or kill switches are activated
 3. Injection volume per well, including:
 - i. Total volume for each month
 - ii. Total volume for the quarter
 - iii. Total volume to date
 4. Annulus pressures, including:
 - i. Maximum for each month
 - ii. Minimum for each month
 - iii. Pressures at which alarms or kill switches are activated
 5. Analytical results required by Table 7 of this permit.
 6. Any permit exceedances within the quarter.
 7. Description of all events that triggered alarms or shutdowns and the responses taken during the quarter.

8. Reports for any well tests or well work overs conducted more than thirty (30) days before the end of the quarter.
- ii. Annual Reports shall be submitted to the Administrator no later than thirty (30) days after the end of each calendar year (Chapter 13, Section 15 (c)). The annual report for each well shall include the following information in addition to that required for the quarterly report:
 1. A graphical representation of the injection pressures and volumes for the previous five (5) years 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.
 2. 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 (5) years operation and shall be prepared on scales appropriate to the variation observed.
- iii. Records of Monitoring Information shall include:
 1. The date, exact place, and time of sampling or measurements.
 2. The name(s) of individual(s) who performed the sampling or measurements.
 3. The types of sample containers used, methods of preservation, and holding times.
 4. The date(s) analyses were performed.
 5. The name(s) of individual(s) who performed the analyses.
 6. The analytical techniques or methods used.
 7. The results and precision of such analyses.
 8. Chain of Custody forms.
- iv. Record Retention
 1. The permittee shall retain records of all monitoring information (Chapter 13, Section 9 (d)(xiv)), including all calibration and maintenance records and all original chart recordings for a period of three (3) years after closure of the facility (Chapter 13, Section 15 (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. The Permittee shall retain all records concerning the nature and composition of injected fluids until five (5) years after completion of any specified plugging and abandonment procedures. The Administrator may require the owner/permittee to deliver the records to the Administrator at the conclusion of the retention period.

10. ANNUAL PRESSURE FALL-OFF TEST

- a. The permittee shall shut-in each well covered by this permit annually for a period of time long enough to observe a valid pressure fall-off curve (Chapter 13, Section 13(e)).

- b. The minimum duration of injection and fall-off shall be longer than wellbore storage and skin effects and sufficient for persuasive analysis and accurate estimates of permeability.
- c. Tests shall be analyzed by the permittee using commonly accepted methods to obtain hydraulic conductivity or permeability, transmissivity, 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.
- d. 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.
- e. Data required shall include monitoring of pressures for at least one (1) hour prior to test start; and injection rates equal in time to the length of at least one fall-off period prior to the start of the fall off test. A downhole device shall be used to measure pressures for the APFT.
- f. Digital data, results, analyses, and interpretations for the fall-off test shall be submitted to the Administrator at the address in Section 13 within one (1) month or with the next quarterly report after the test is done, whichever is later (Chapter 13, Section 15 (f)).
- g. The results of each pressure fall-off test shall be used to update the cone of influence calculation for each discharge zone (Table 2). These annual updates shall account for historical injection and remaining project life. The permittee shall provide a map showing the updated Cone of influence and all wells which penetrate the confining zone within the old and new radii of influence.
- h. If the updated cone of influence encompasses wells not previously identified as within the area of review:
 - i. The permittee shall demonstrate that the new wells do not represent potential pathways from the receiver to the lowermost non-exempted USDW above the injection zone.
 - ii. If this cannot be demonstrated, a corrective action plan to prevent movement of fluid into any USDW shall be submitted to and approved by the Administrator and shall be incorporated as a permit condition (Chapter 13, Section 5(b)(x)).
 - iii. Cone of influence calculations and figures shall be submitted to the Administrator within thirty (30) days of the annual pressure fall-off test or with the next quarterly report after the test is done, whichever is later (Chapter 13, Section 15(f)).

11. MECHANICAL INTEGRITY

- a. Mechanical integrity shall be maintained continuously and tested prior to injection and at intervals of no longer than five (5) years.
- b. The test used to determine mechanical integrity shall be a two (2) part test approved by the Administrator (Chapter 13, Section 9(d)(vii)). The two (2) parts shall be conducted no more than ninety (90) days apart unless prior approval is obtained from the Administrator
- c. WQD shall be notified a minimum of **thirty (30) days prior** to a mechanical integrity test.
- d. Part I of the MIT shall demonstrate the absence of leaks through the packer, tubing, and casing (Chapter 13, Section 9 (d)(vii)(A)).
 - i. The casing-tubing annulus of each well shall be tested at a pressure equal to the LSIP (of each well) or 1,000 psig, whichever is greater.
 - ii. A pressure change of less than 10% over a thirty (30) minute test period shall be considered successful.
 - iii. **A Part I MIT must be conducted and passed every time a well is re-entered per Section 8(j) of this permit.**
- e. Part II of the mechanical integrity test shall demonstrate the absence of fluid movement behind the long-string casing (Chapter 13, Section 9 (d)(vii)(B)) above the top perforation.
 - i. Each well shall be logged using a radioactive tracer survey (or oxygen activation log) and a temperature survey from the base of the conductor casing to the total depth of the well.
 - ii. The baseline temperature survey shall be logged prior to any injection or other tests.
 - iii. For an active injection well, the temperature survey shall start more than two (2) hours, preferably more than twenty-four (24) hours, after injection has ceased.
 - iv. **A Part I MIT must be conducted and passed after completing the Part II MIT.**
- f. Other types of pressure tests or logs may be substituted for those described above (Section 7, c and d of this permit) if they demonstrate mechanical integrity and are first approved by the Administrator (Chapter 13, Section 9(d)(vii)(C)).

- g. Data, results, analyses, and interpretations for the tests shall be submitted to the Administrator at the address in Section 13 within thirty (30) days or with the next quarterly report after the test is done, whichever is later (Chapter 13, Section 15(f)).
- h. **In the case of a failed mechanical integrity test in a well that has begun waste disposal:**
 - i. The well shall be immediately shut-in (Chapter 13, Section 9 (d) (viii)).
 - ii. The Administrator shall be notified both orally and in writing according to the procedures in Section 11 of this permit (Chapter 13, Section 9(d)(xxi)).
 - iii. Injection into any zone not within the discharge zone is a violation of this permit. 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(B) under Wyoming Water Quality Rules and Regulations, Chapter 8, has been contaminated due to out of zone injection, the operator shall prepare a plan to recover these solutions to the extent practicable. The estimate of volume and quality of wastewater, and the plan to recover the solutions, if necessary, shall be provided to the Administrator within ninety (90) days of the notification date. The plan shall be immediately implemented upon WDEQ approval.
 - iv. 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.

12. NON-COMPLIANCE REPORTING

- a. Any permit noncompliance constitutes a violation of WQRR Chapter 13 and is grounds for enforcement action, permit termination, revocation, or modification.
- b. 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 (5) days** (Chapter 13, Section 9(d)(xxi)).
 - i. The oral report should include:
 - 1. Any monitoring or other information which indicates that any contaminant may cause an endangerment to a useable groundwater of the state.
 - 2. Any noncompliance with a permit condition or malfunction of the discharge (injection) system which may cause fluid migration into or between useable ground waters of the state.
 - ii. The written report should include:
 - 1. A description of the noncompliance and its cause;
 - 2. The period of noncompliance, including exact dates and times;
 - 3. 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(B) under Wyoming Water Quality Rules and Regulations, Chapter 8, has been contaminated due to out of zone injection, the operator shall prepare a plan to recover these solutions to the extent practicable. The estimate of volume and quality of wastewater, and the plan to recover the solutions, if necessary, shall be provided to the Administrator within 90 days of the notification date. The plan shall be immediately implemented upon WDEQ approval. Injection shall not resume until the well has been repaired, a complete (Part I and II) MIT has been passed, and written permission to resume operation has been obtained from the Administrator

4. If the noncompliance has not been corrected, the anticipated time it is expected to continue; and
5. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance (Chapter 13, Section 9(d)(xxi)).

13. WHERE TO SUBMIT REPORTS

All reports submitted in conjunction with this permit including but not limited to permit transfers, monitoring reports, and well test reports shall be addressed to: UIC Program Supervisor, DEQ – Water Quality Division, Herschler Building – 4W, 122 W. 25th St., Cheyenne, WY, 82002. This includes any information the operator is required to submit to the Administrator.

14. PERMIT CONDITIONS

- a. This permit is valid until the date specified on Page 1 of this permit. If the permittee wishes to continue injection after the expiration date of this permit, he should apply to the Administrator at least four (4) months prior to the expiration date of this permit (Chapter 13, Section 9 (d)(iii)).
- b. 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 (Chapter 13, Section 9 (d)(iv)).
- c. 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.
- d. 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 (Chapter 13, Section 9(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:
 - i. Noncompliance with terms or conditions of this permit (Chapter 13, Section 8(e)(i)).

- ii. Failure in the application or during the issuance process to disclose fully all relevant facts, or misrepresenting any relevant facts at any time (Chapter 13, Section 8(e)(ii)).
- iii. Failure of the casing, cement, or the confining layer.
- iv. 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 (Chapter 13, Section 8(e)(iii)).
- e. Permits will be automatically terminated after closure and release of financial responsibility by the Administrator (Chapter 13, Section 8(i)).
- f. This permit will be reviewed by WQD at least once every five (5) years, and may be reviewed more frequently (Chapter 13, Section 9(b)). Permits that do not satisfy the review criteria are subject to modification, revocation and reissuance, or termination (Chapter 13, Section 9(c)).
- g. The conditions in this permit supersede any application content (Chapter 13, Section 18(b)(i)).
- h. To comply with the Governor's Executive Order 2011-5 on Greater Sage-Grouse Core Area Protection, the Permittee shall ensure that all activities and habitat disturbances related to injection well(s) authorized by this permit are covered by the relevant Wyoming Game and Fish Department stipulations to protect sage grouse habitat.

15. DUTIES OF THE PERMITEE

- a. The permittee shall comply with all conditions of this permit (Chapter 13, Section 9(d)(i)), all rules and regulations of the WDEQ, and all applicable state and federal laws. Nothing in this permit relieves the permittee of any duties under applicable regulations.
- b. The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit (Chapter 13, Section 9(d)(v)).
- c. 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 (Chapter 13, Section 9(d)(xvi)).

- d. 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 (Chapter 13, Section 9(d)(xvii)).
- e. 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. (Chapter 13, Section 9(d)(xi)).
- f. The permittee shall furnish the Administrator, upon request, copies of records required to be kept by this permit (Chapter 13, Section 9(d)(xi)).
- g. 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 (Chapter 13, Section 9 (d)(xvii)).
- h. 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 (Chapter 13, Section 9(d)(xxiii)).
- i. Monitoring results shall be obtained and reported at the intervals specified elsewhere in this permit (Chapter 13, Section 9(d)(xix)).
- j. Test results shall be obtained and reported at the intervals specified elsewhere in this permit.
- k. 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 one (1) month of the change.

16. PLUGGING AND ABANDONMENT

- a. Any well under this permit shall be plugged and abandoned within six (6) months after:
 - i. Permit expiration (unless application for a new permit has been made and has not been denied by the Administrator) or termination; or
 - ii. Final cessation of injection activities; or
 - iii. The permittee has removed equipment required for the proper operation and monitoring of the well (except for temporary removal during well maintenance).
- b. The permittee shall notify the Administrator of plans to convert or abandon a well at least **ninety (90) days prior** to the start of any conversion or abandonment activity

(Chapter 13, Section 9(d)(xxvi)). The permittee shall follow the plugging and abandonment procedure described in the application or subsequently prescribed by the Administrator. The procedure shall include well plugging, abandonment, surface reclamation and seeding of the well site, closure of related surge ponds, and removal or purging and plugging of any underground piping. Well plugging shall meet the requirements of Chapter 26, Section 6 for sealing the well annulus and of Chapter 26, Section 9 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)

- c. The permittee shall submit a plugging and abandonment report **within thirty (30) days** after plugging and abandonment of any wells covered by this permit, detailing the compliance with the plugging and abandonment procedures outlined in the original permit application, and describing any deviation from the original plan (Chapter 13, Section 9 (d)(xxvii)).

17. FINANCIAL RESPONSIBILITY

- a. 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 (Chapter 13, Section 17(a)).
- b. The obligation to maintain financial responsibility survives the termination of the permit or the cessation of injection (Chapter 13, Section 17(c)).
- 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 two (2) weeks and obtain other financial assurance within two (2) months. If the permittee is named as debtor in any voluntary or involuntary bankruptcy proceeding, it must notify the Administrator within two (2) weeks.
- d. The financial assurance instrument for reclamation and restoration of this mine facility shall include plugging and abandonment costs (upon completion of each well but prior to the start of injection) for a minimum of \$111,570 for each well. The financial assurance for these injection wells shall be covered in the Land Quality Division (Permit to Mine) financial assurance document and attachments. The permittee shall submit a copy of the financial assurance document and a copy of the spreadsheet or other document that identifies all existing Class I wells that require plugging and abandonment to the Administrator for approval.
- e. Injection shall not proceed prior to written acceptance by the Administrator. This financial instrument shall be maintained as long as any of the wells are covered under this permit.
- f. The financial assurance amount shall be updated each calendar year on the

anniversary date of the annual report that is submitted in accordance with Land Quality Division rules and regulations. The permittee shall submit a copy of the Land Quality Division financial assurance document and a copy of the spreadsheet or other document that identifies all existing Class I wells that require plugging and abandonment to the Water Quality Administrator no later than **February 14th** of each year.

18. PERMIT TRANSFER

- a. 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 (Chapter 13, Section 9(d)(xviii) and Chapter 13, Section 8(k)).
- b. 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.

19. SIGNATORY REQUIREMENTS

- a. All reports filed in conjunction with this permit shall contain the following certification (Chapter 13, Section 9(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." (Chapter 13, Section 5(c)(xv))

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

20. ENTRY AND INSPECTION

- a. The permittee shall allow the Administrator, or an authorized representative for 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 and inspect and photograph the discharge and related facilities, review and copy reports and records required by this permit, collect fluid samples for analysis, measure and record water levels, and perform any other function authorized by law or regulation.
- b. Inspectors shall not be required by the permittee to sign any waiver of liability.

21. PROPERTY RIGHTS

- a. 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 (Chapter 13, Section 9(d)(x)).
- b. 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. The Permittee shall consider how these laws may apply to their injection of material into the subsurface.

22. 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.

END OF PERMIT