ADDENDUM 4-A

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING REPORT

Subsurface Exploration and Geotechnical Engineering Report

Prepared for:

AUC LLC
1536 Cole Boulevard, suite 330
Lakewood, CO 80401

Reno Creek Project
Campbell County, Wyoming

July 9, 2012

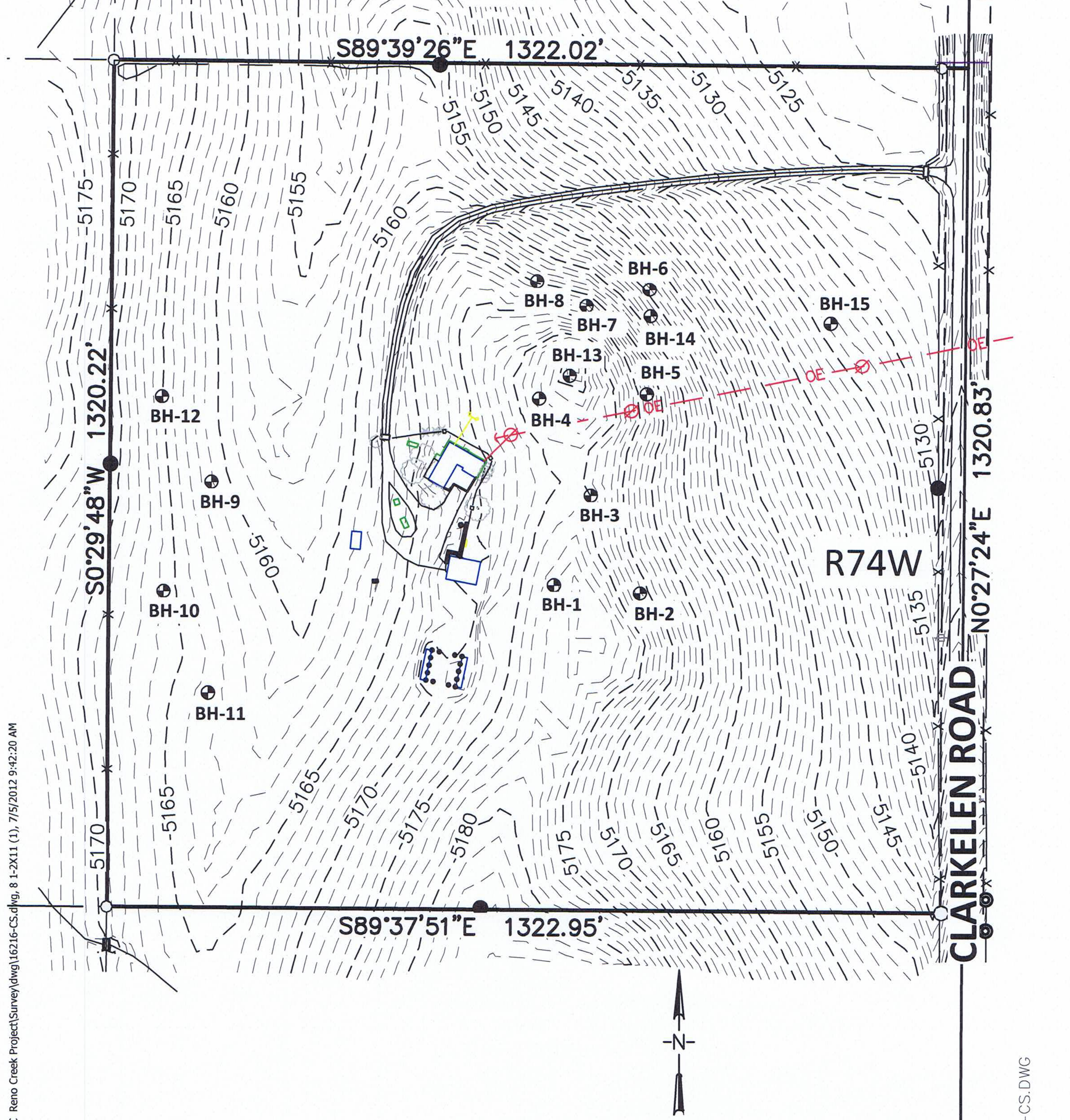
16216-CX

Prepared by:

INBERG-MILLER ENGINEERS
1120 East "C" Street
Casper, WY 82601

BORING LOCATION MAP

T42N



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124 East Main Street	1120 East C Street	350 Parsley Boulevard	428 Alan Road	193 West Flaming Gorge Way
Riverton, WY 82501	Casper, WY 82601	Cheyenne, WY 82007	Powell, WY 82435	Green River, WY 82935
307-856-8136	307-577-0806	307-635-6827	307-754-7170	307-875-4394

SCALE	HORZ 1"=200'	VERT
DRN. MDH	BK: 1135	JOB NO. 16216-CS
CHK. BH	PAGE: 11+	DATE: 7/5/12

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IME
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TEST BORING B9

Project: Reno Creek
Location: WY State Plane 1145815, 517746
Job No.: 16216-CX
Client: AUC LLC

Surface Elevation (Ft): 5161.1

ELEVATION	DEPTH (ft)	SOIL DESCRIPTION	SAMPLE TYPE	N BLOWS PER Ft	Qp (TSF)	% GRAVEL	% SAND	% -200	WATER CONTENT	OTHER TESTS AND NOTES
5161.1	0	Stiff, dry, brown, sandy CLAY								
			X	17					6	
			X	11					7	
5155	5		X	18		0	22	78	5	CL LL= 39 PL= 21 PI= 18
	7.5	7.5' Grades very fine clayey SAND	X	27					9	
5150	10	10' Grades gray	X	34					10	
	14	Very stiff, moist, dark-brown, CLAY with lignite								
5145	15		X	28					12	
5140	20		X	28					37	
	21.5									

Remarks:

Date Begun:	6/13/12
Date Completed:	6/13/12
Termination Depth (ft):	21.5
Crew:	BH,BWH,JLH
Rig:	CME-85
Method:	Solid-Stem Auger
Benchmark/Datum (Ft):	

SAMPLE TYPES

X Standard Penetration Test

WATER LEVEL OBSERVATIONS

While Drilling (ft)	None
End of Drilling(ft)	None

Depth to Cave In (Ft): 21.3

NEW BORING LOG 16216-CX AUC RENO CREEK.GPJ INB_MLLR 6-23-10.GDT 7/9/12

TEST BORING B10

INBERG-MILLER ENGINEERS — QUALITY SOLUTIONS THROUGH TEAMWORK

Project: Reno Creek
Location: WY State Plane 1145643, 517672
Job No.: 16216-CX
Client: AUC LLC

Surface Elevation (Ft): 5165.7

ELEVATION	DEPTH (ft)	SOIL DESCRIPTION	GRAPHIC	SAMPLE TYPE RECOVERY	N BLOWS PER Ft	Qp (TSF)	% GRAVEL	% SAND	% -200	WATER CONTENT	OTHER TESTS AND NOTES
5165	0	Stiff, moist, dark-brown, sandy CLAY		Standard Penetration Test	16					6	
				Standard Penetration Test	12					5	
5160	5			Standard Penetration Test	40					4	
	7	Hard, moist, gray CLAY (iron oxide staining)		Standard Penetration Test	35		0	10	90	13	CH LL= 68 PL= 25 PI= 44
5155	10	10' Grades to include lignite		Drive Sampler	20					42	
5150	15	15' Grades to (severely weathered CLAYSTONE)		Standard Penetration Test	50/5					19	
5145	20			Standard Penetration Test	51					17	
	21.5										

Remarks:

Date Begun:	6/14/12
Date Completed:	6/14/12
Termination Depth (ft):	21.5
Crew:	BH,BWH,JLH
Rig:	CME-85
Method:	Solid-Stem Auger
Benchmark/Datum (Ft):	

SAMPLE TYPES

- Standard Penetration Test
- Drive Sampler, 2.41-I.D.

WATER LEVEL OBSERVATIONS

While Drilling (ft)	None
End of Drilling(ft)	None

Depth to Cave In (Ft): 21.0

NEW BORING LOG 16216-CX AUC RENO CREEK.GPJ INB_MLLR 6-23-10.GDT 7/9/12

INBERG-MILLER ENGINEERS
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QUALITY SOLUTIONS THROUGH TEAMWORK

TEST BORING B11

Project: Reno Creek
Location: WY State Plane 1145485, 517741
Job No.: 16216-CX
Client: AUC LLC

Surface Elevation (Ft): 5163.5

Depth (ft)	Soil Description
0 – 4.5	Stiff, dry, brown, sandy CLAY
4.5 – 21.5	Very stiff to hard, moist, gray CLAY
21.5	21.5' Grades to lignite

Sample Type	N Blows per Ft	Qp (TSF)	% Gravel	% Sand	% -200	Water Content	Other Tests and Notes
Standard Penetration Test	11					6	
Standard Penetration Test	17		0	24	76	5	CL LL= 49 PL= 18 PI= 30
Standard Penetration Test	21					12	
Standard Penetration Test	28					13	
Standard Penetration Test	58					8	
Standard Penetration Test	42					6	
Standard Penetration Test	14					18	

Remarks:

Date Begun:	6/14/12
Date Completed:	6/14/12
Termination Depth (ft):	21.5
Crew:	BH,BWH,JLH
Rig:	CME-85
Method:	Solid-Stem Auger
Benchmark/Datum (Ft):	

SAMPLE TYPES

Standard Penetration Test

WATER LEVEL OBSERVATIONS

While Drilling (ft)	None
End of Drilling(ft)	None
Depth to Cave In (Ft):	21

NEW BORING LOG 16216-CX AUC RENO CREEK.GPJ INB_MLLR 6-23-10.GDT 7/9/12

INBERG-MILLER ENGINEERS
QUALITY SOLUTIONS THROUGH TEAMWORK

TEST BORING B12

Project: Reno Creek
Location: WY State Plane 1145948, 517669
Job No.: 16216-CX
Client: AUC LLC

Surface Elevation (Ft): 5165.0

ELEVATION	DEPTH (ft)	SOIL DESCRIPTION	SAMPLE TYPE	N BLOWS PER Ft	Qp (TSF)	% GRAVEL	% SAND	% -200	WATER CONTENT	OTHER TESTS AND NOTES
5165	0	Stiff, dark-brown, sandy CLAY								
			SPT	12					7	
			SPT	11					6	
5160	5									
			SPT	20		0	42	58	6	CL LL= 36 PL= 10 PI= 26
		Grades more clay and less sand								
			SPT	14					12	
5155	10	Grades more sand and less clay								
			SPT	25		0	46	54	7	CL LL= 31 PL= 18 PI= 14
5150	15									
			SPT	46					11	
	18	Hard, moist, dark-brown, CLAY with lignite								
5145	20									
			SPT	29					18	
	21.5									
5140										

Remarks:

Date Begun:	6/14/12
Date Completed:	6/14/12
Termination Depth (ft):	21.5
Crew:	BH,BWH,JLH
Rig:	CME-85
Method:	Solid-Stem Auger
Benchmark/Datum (Ft):	

SAMPLE TYPES

⊠ Standard Penetration Test

WATER LEVEL OBSERVATIONS

While Drilling (ft)	None
End of Drilling(ft)	None
Depth to Cave In (Ft):	21.5

NEW BORING LOG 16216-CX AUC RENO CREEK.GPJ INB_MLLR 6-23-10.GDT 7/9/12

ADDENDUM 4-B
UIC CLASS I DEEP DISPOSAL WELL PERMIT APPLICATION

Reno Creek ISR Project

Application For
Wyoming Underground Injection Control Permit
For Class I Non-Hazardous Injection Wells

AUC, LLC

Geologist and Engineer Signatures

I, John DeJoia, hereby certify that I am a Professional Geologist licensed as required by the provisions of W.S. 33-41-101 through W.S. 33-41-121 and that all geological work performed in relation to this technical document was performed by me or under my direct supervision.

IN WITNESS WHEREOF, I have here under set my hand and affixed my seal.

John DeJoia, P.G.
Geologist

I, Thomas G. Michel, hereby certify that I am a Professional Engineer licensed as required by the provisions of W.S. 33-29-105 through W.S. 33-29-113 and that this technical document was prepared by me or under my direct supervision.

IN WITNESS WHEREOF, I have here under set my hand and affixed my seal.

Thomas G. Michel, P.E.
Hydrologist

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Acronyms and Abbreviations

μmhos	micromhos or microsiemens
AOR	Area Of Review
°C	degrees Celsius
BGS	below ground surface
BHC	borehole compensated
BHP	bottom hole pressure
BKB	below kelly bushing
BPM	barrels per minute
CBL	cement bond log
CBM	coal bed methane
cc	cubic centimeter
cfs	cubic feet per second
cm	centimeter
cu. ft.	cubic feet
DIL	dual induction log
DST	drill stem test
EPA	Environmental Protection Agency
°F	degrees Fahrenheit
FC	float collar
FDC	formation density/caliper
ft	foot (feet)
gm	gram
gpm	gallons per minute
HH	hydrostatic head
IES	induction-electrical survey
ISR	in-situ recovery
l	liter
lb	pound
mg	milligrams
MIT	mechanical integrity test
MSL	mean sea level
O.D.	outside diameter
pCi	picocuries
PRB	Powder River Basin
psi	pounds per square inch
psig	pounds per square inch guage
RCRA	Resource Conservation and Recovery Act
RO	reverse osmosis
ROW	right-of-way
QA/QC	quality assurance/quality control
sec	seconds
sx	sacks
T.D.	total depth
TDS	total dissolved solids

Acronyms and Abbreviations (continued)

UIC	Underground Injection Control
USDW	Underground Source of Drinking Water
USGS	United States Geological Survey
WDEQ	Wyoming Department of Environmental Quality
WOGCC	Wyoming Oil and Gas Conservation Commission
WQD	Water Quality Division
WY	Wyoming

1. INTRODUCTION AND PERMIT APPLICATION

1.1 Introduction

This document is an application for four Class I Injection Wells at AUC, LLC (AUC's) Reno Creek in-situ recovery (ISR) uranium processing location. Two of the wells in this application were permitted by Power Resources, Inc. under UIC 98-092 in June of 1998.

AUC is a limited liability company organized in the state of Delaware with two members: American Uranium Corporation (American) and Strathmore Resources (US) LLC (Strathmore). Strathmore currently owns 100% of AUC and is the operator for AUC. Jim Crouch, Strathmore's Vice President of Wyoming Operations serves as AUC's general manager. American has an option to acquire up to a 60% interest in AUC. As part of the initial contributions, Strathmore has agreed to transfer certain of its uranium mining claims, state leases, and private leases to AUC. Strathmore is currently in the process of making those transfers. References to property ownership in this application may designate AUC or Strathmore as the legal owner, depending on what stage the transfer is at. American's initial contribution to AUC consists of a thirty three million dollar ($33,000,000.00) investment, which must be paid by January 3, 2014 and entitles it the 60% interest in AUC.

The original permit application was purchased by American on April 15, 2008 on behalf of AUC. Strathmore signed the financial responsibility requirements for the transfer of a Class I Well later that month. The transfer form was approved by the Wyoming Department of Environmental Quality (WDEQ) and Water Quality Division (WQD) Administrator the following month, in May, 2008. The original permit application for UIC 98-092 is included as Attachment I and the subsequent transfer documents and financial form are included as Attachment II of this submittal.

Of the four wells included in this application, two wells were permitted under UIC 98-092. Two additional wells are included in this permit as a mechanism for insuring adequate injectivity and to allow siting of individual wells adjacent to additional processing facilities. This application for a Class I Injection Well permit is based on the existing UIC 98-092 permit and utilizes supporting information presented therein. As stated previously, the permit application for UIC 98-092 is included as Attachment I of this submittal and will hereafter be referenced as UIC 98-092. Figure 1 presents a general location map for the project area.

The proposed disposal of uranium ISR mining-related fluids remains fundamentally unchanged from the previous submittal. One or more of the planned injection wells will be used for disposal of fluids generated by the solution mining operation. These fluids fall under the Bevill Exclusion to the Resource Conservation and Recovery Act of 1976 (RCRA) as described in 40 CFR 261.4(b)(7). The Reno Creek project area has been explored and partially developed since the 1970's. There was a pilot research and development (R&D) ISR test operation conducted in the late 1970's and early 1980's, but the site development has not progressed beyond the evaluation and testing phase. AUC has acquired mineral rights for identified uranium ore bodies in the area and is in the process of obtaining ISR mining permits for the project. The planned operation includes construction and operation of an ISR solution processing plant. The processing plant will receive solution from one or more operating well fields within the project area at a rate of up to 4000 gallons per minute (gpm).

The Class I well(s) will serve as the primary disposal for the well field bleed stream and other process fluids generated during mining and restoration phases.

Because the Reno Creek ISR project has not yet been developed to the point of constructing a permanent processing plant, the status of the two wells permitted under UIC 98-092 has not changed since the permit was issued in 1998. The first well is designated as well IW-1 and is located in the SW ¼ of the SE ¼ of Section 31, T43N, R73W at a latitude of 43° 39' 2" and a longitude of 105° 40' 17". This well will be installed as an injection well conversion of an existing plugged and abandoned oil well designated as Sinadin #1. Well IW-1 has remained undisturbed in a plugged and abandoned condition since 1977. Construction/conversion of the well will occur prior to usage for fluid disposal. The second well is designated as well IW-2 and will be drilled in the NE ¼ of Section 33, T43N, R73W. In the UIC 98-092 permit, the proposed location of well IW-2 was in the NE ¼ of Section 29, T43N, R73W coincident with the planned location of the satellite ISR processing plant proposed by the property holders in 1998. However, the proposed location of the AUC ISR plant facilities is in Section 33, T43N, R73W, and the proposed location of well IW-2 has been adjusted accordingly. The impact on the planned installation and completion of well IW-2 is nominal. The distance between wells IW-1 and IW-2 is basically unchanged at approximately two (2) miles. The differential in land surface elevation between the previous and current proposed locations for well IW-2 is less than 25 feet, and the expected stratigraphy is essentially unchanged from the UIC 98-092 application submittal.

The two additional proposed wells are designated as IW-3 and IW-4. These wells will be installed if required to provide necessary injection capacity. Well IW-3 is located in the NE ¼ of Section 34, T43N, R73W. Well IW-4 is located in the NW ¼ of Section 27, T43N, R73W. Both wells are sited proximate to identified ore bodies and potential satellite plant locations, and are expected to have the same stratigraphy and well completions as wells IW-1 and IW-2. Figure 2 presents the proposed location of wells IW-1 through IW-4. The anticipated construction sequence for the wells is:

1) Well IW-2 constructed adjacent to the preferred plant location and the first proposed well field.
2) Well IW-3 constructed in Section 34 unless geophysical logging of well IW-2 indicates that the receiver hydraulic properties are less promising than those at the existing well proposed for conversion to Well IW-1. If this is the case, Well IW-1 will be converted prior to drilling of Well IW-3.
3) Well IW-1 converted/constructed using the plugged and abandoned Sinadin #1 well.
4) Well IW-4 constructed adjacent to a major well field in Section 27.

The sequence of well construction may be altered to accommodate changes in plant, facilities or mining unit development. At least one well will be constructed, but subsequent well construction will be dependent on the performance of the previously installed wells and the required injection rate.

The fluid disposed in the well will include waste and process waters from the uranium ISR process plant and will originally be produced from Wasatch and/or Ft. Union Formations. The fluid will be disposed in the Cretaceous Teapot and Parkman sandstones at depths of approximately 7,450 to 8,390 feet Below Ground Surface (BGS).

The operator of the Reno Creek ISR uranium mining project will be AUC, LLC. The mailing address of the operator is:

AUC, LLC
2420 Watt Court
Riverton, WY 82501

Riverton Phone: 307-856-8080

The preliminary disposal wellhead pressure is limited to a maximum of 1087 pounds per square inch (psi) with a cumulative daily injection volume not to exceed that equivalent to a continuous rate of 115 gpm for each well. Details of the well construction such as perforated intervals are preliminary estimates and are subject to adjustment during well installation. Likewise, the maximum wellhead pressure will be recalculated following testing of the well.

1.2 UIC-1-I Form

(A paper copy of the UIC-1-I permit application form is enclosed in the attached map holder at the end of this section.)

1.3 Class I Well Justification

Sections 2 and 4 of this document describe geologic and hydrologic conditions that support this application for Class I injection well permits. A Class I well is one in which the receiver zone is located below the lowest viable Underground Source of Drinking Water (USDW). Moreover, the receiver zone must be hydrologically isolated from overlying USDWs. Multiple criteria are used to evaluate the suitability of the proposed receiver zone for the Class I well. These factors include: water quality within the receiver interval, presence of hydrocarbons within the receiver interval, hydraulic properties of the receiver interval, presence of USDWs above the receiver interval, nature and thickness of materials separating the receiver interval from identified USDWs above the receiver, and nature of strata or aquifers below the receiver interval. Sections 1.3.1 through 1.3.5 present summary analyses of these criteria.

1.3.1 Nature of Receiver Interval

The receiver interval consists of the Cretaceous Teapot and Parkman sandstones at depths of approximately 7,450 to 8,390 feet BGS. The more permeable sandstones occur within thick intervals of shale, and the Teapot sandstone is overlain by the Lewis shale. Water samples from nearby producing oil wells completed within the Parkman have a total dissolved solids (TDS) concentration of greater than 10,000 mg/l. The producing oil wells are within two (2) miles of the central mining area and well IW-1 will be a conversion of an existing oil and gas exploration hole. Hence, the available information indicates that water within the receiver interval will: have a TDS concentration in excess of 10,000 mg/l, have constituent (e.g. chloride and barium) concentrations that render it generally unusable, and have significant hydrocarbon concentrations that also make the water unusable. As indicated in UIC 98-092, this leads to the characterization of the water in the receiver zone as a Class VI ground water according to criteria and standards presented in Chapter 8 of the WDEQ-WQD rules and regulations.

1.3.2 Receiver Isolation From Overlying Aquifers

The receiver interval is overlain by the Lewis Shale (see Sections 2 and 4 of this application). The Lewis shale is low-permeability marine shale with a thickness of approximately 850 feet (including the Teckla sandstone) at the site. As indicated in Section 2, roughly one-half of the Lewis Shale is true shale, and this should provide isolation of the receiver zone from overlying aquifers. The Fox Hills sandstone and Lance Formation overlie the Lewis Shale. The Fort Union and Wasatch Formations overlie the Lance Formation. The strata from the Fox Hills sandstone through the Wasatch Formation have the potential to be a USDW.

1.3.3 USDWs Above Receiver

The Wasatch, Fort Union, and Lance Formations and the Fox Hills sandstone have the potential to be characterized as USDWs in the vicinity of the mine. There is large degree of heterogeneity in the nature of the strata, and there are coal intervals within the Wasatch and Fort Union Formations, so there is likely considerable variability in the water quality. Water quality samples from sands and sandstones in the Wasatch indicate generally good water quality (see UIC 98-092), although there are elevated concentrations of radionuclides in mineralized intervals within the project area. For the purposes of this application, all strata above the Lewis Shale are considered to be potential USDWs.

1.3.4 Receiver Isolation From Underlying Strata

The receiver interval is underlain by the Steele Shale (see Sections 2 and 4 of this application). The Steele shale is low-permeability marine shale member within the massive Cody Shale. There are also sandstone members (e.g Sussex and Shannon) within the Steele/Cody Shale. The thickness and limited permeability of the Steele Shale provides virtually complete isolation of the receiver interval from underlying strata. The remaining stratigraphic sequence below the Parkman is shown in Figures 2-2 and 2-3 of UIC 98-092. The majority of the material between the receiver interval and the Madison Limestone is indicated to be shale in Figure 2-3 of UIC 98-092.

1.3.5 Hydrogeology of Strata Below the Receiver

The Madison Limestone, which is below the Parkman receiver interval at large depth, is considered an interval of interest at the project site. The Madison Limestone exists over the Powder River Basin and the structure generally conforms to that of the basin. The basin configuration results in a large depth to the limestone in the central area of the basin with a tapering of the depth to the limestone on the periphery of the basin. The reduced depth to the limestone and the proximity to recharge areas results in the Madison Limestone potentially serving as a USDW on the periphery of the Powder River Basin as well as other areas in the state. However, the great depth to the Madison Limestone near the project site and the large distance from recharge areas makes it very unlikely that the Madison Limestone can be characterized as a viable USDW in the central part of the Powder River Basin.

Section 4.2 and associated subsections include information and discussion of the hydrogeology of strata between the Parkman receiver interval and the Madison Limestone. Because the Madison Limestone is at great depth (estimated at 15,000 feet or more BGS) at the project site, there are no wells or borings that penetrate to the limestone. Many available drilling records typically extend only to the target oil and gas production intervals in the area that include the Parkman, Sussex, Shannon and Turner intervals at depths of less than 11,000 feet BGS in the project vicinity.

Although there is limited drilling data for the deeper strata below the Shannon sandstone extending to and including the Madison Limestone, there are several characteristics and properties in the deeper strata that make it very unlikely that these strata contain a viable USDW. Further discussion of these characteristics and properties is included in Section 4.2 and is summarized herein. The large depth to these strata dramatically increases the drilling cost and difficulty which raises economic considerations for installation and operation of a drinking water supply from these deep strata. The cost of installation of well in the Madison Limestone is likely two to three times greater than the cost of installation of a similar Parkman well. Also, the large overburden load with increasing depth tends to reduce permeability and the increased pressures and temperatures will likely result in very poor formation water quality.

Available water quality data for the deep strata are presented in Section 4.2.2. The indicated water quality as measured by TDS concentration is poor for the stratigraphic sequence between the receiver interval and the Madison Limestone. TDS concentrations ranging up to approximately 33,000 mg/l may be present in ground water in theses deep strata. There is no representative water quality data for the Madison Limestone at the site and the only estimates of TDS concentration are projections from samples taken at great distance from the site. As cited in Section 4.2.2, the projected TDS concentration of water from the Madison Limestone at the site is 2,500 mg/l. Actual TDS is likely much larger, but even water with a TDS concentration of 2,500 mg/l would require treatment (likely reverse osmosis) prior to utilization as drinking water. A reverse osmosis system produces a brine stream at a rate of approximately 25% of the well production rate, and this brine stream would then require disposal. In short, a water supply well completed to the Madison Limestone at the project site would be expensive and would penetrate several thousand feet of deep strata wherein the typical water would likely be Class VI ground water according to WDEQ-WQD criteria. Even with a very optimistic expectation of the water quality in the Madison Limestone, the water would still require treatment and this would likely produce an additional brine stream requiring disposal.

With increasing depth below the receiver interval, the ground water temperature also increases. References cited in Section 4.2.3 indicate that water temperature in the Madison Limestone is expected to be 100 to 130ºC (212 to 266ºF). This makes the water potentially suitable for geothermal use which is a possible aquifer exemption criterion. These temperatures and the resulting impacts on water quality are also generally incompatible with characterization of the aquifer as a USDW because the high temperature and pressure conditions are expected to result in dramatically increased mineral solubilization.

Although the Madison Limestone is correctly designated as a USDW in other areas, this designation is not appropriate for the project area because of factors that are related to the large depth to the limestone. The large depth is an obvious economic consideration for the installation and operation of a water supply well, but the depth also contributes to high temperatures and deteriorating water quality that make it extremely unlikely that water produced from the limestone in the project area could plausibly be used for drinking water. The limited potential well yield is also expected to preclude utilization of the Madison Limestone as a USDW. As described in Section 4.3, an application for injection wells in a similar setting by Power Resources Inc. contains a thorough discussion of likely Madison well yields for the area that indicates potential yields are far too small to justify any consideration of production of potable water.

2. RECEIVING ZONES AND CONFINING LAYERS

Reno Creek injection wells IW-1, IW-2, IW-3 and IW-4 will be completed in two deep horizons. The target injection zones are the Teapot and Parkman sandstones. The Teckla sandstone is located above the Teapot sandstone and is separated from the Teapot by a large thickness of the Lewis shale. The Teckla sandstone will not be used as a target injection zone. The two target injection members and the overlying Teckla are sandstone intervals within Cretaceous marine sediments of the Lewis and Mesaverde Formations. UIC 98-092 contains a thorough description of the geology of the target injection zones and confining layers in Sections 2.3 through 2.5 of Attachment I as well Figures 2-2 through 2-6 of Attachment I. Structure contour maps for the Teapot and Parkman formations are included in Plates 2-1 and 2-2 of UIC 98-092 (see Attachment I). The geology presented in UIC 98-092 is summarized in the following discussion.

The estimated thickness of the Teckla member at the well locations is 216 feet with the anticipated top of the member at the IW-1 site at 7164 feet BKB. The member is characterized by marine fine-grained sandstone, siltstone, and shale. Geophysical logs indicate the likely presence of a more permeable interval of the sandstone from 7265 feet to 7375 feet BGS. Although this interval may have sufficient injectivity to justify inclusion as an injection zone, it is not included as a target injection zone in order to provide more vertical separation between injection intervals and overlying aquifers. A cross section location map and two cross sections are presented in Figures 2-4 through 2-6 of UIC 98-092. The available density porosity log for well IW-1 indicates typical density porosity values of 8% to 10% in the Teckla sandstone interval. The stratigraphy and depths to formation tops for well IW-2, IW-3 and IW-4 are expected to be similar to those of the IW-1 site. Figure 4 presents an additional cross section C-C’ and cross section location map. Based on cross sections A-A’ and B-B’ in Figures 2-5 and 2-6 of UIC 98-092, and cross section C-C’ in Figure 4, the structural top of the Teckla member is very similar to that of the Teapot and is located 400 to 500 feet above the top of the Teapot member.

The estimated thickness of the Teapot member at the well locations is 173 feet with the anticipated top of the member at the IW-1 site at 7582 feet Below Kelly Bushing (BKB). The member is characterized by marine, coarsening-upward sandstone. The more permeable interval of the sandstone is anticipated to be 7582 feet to 7720 feet BGS. The available density porosity log for well IW-1 indicates typical density porosity values of 6% to 18% in the potential Teapot injection zone.

The estimated thickness of the Parkman member at the well locations is 520 feet with the anticipated top of the member at the IW-1 site at 7870 feet BKB. The member is characterized by marine, coarsening-upward sandstone and siltstone similar to the Teapot member. The more permeable interval of the Parkman sandstone is anticipated to be 7870 feet to 8040 feet BKB. The available density porosity log for well IW-1 indicates typical density porosity values of 6% to 18% in the potential Parkman injection zone.

The upper confining layer is the Lewis Shale. The estimated thickness of the Lewis Shale above the Teckla sandstone at the proposed IW-1 well location is 520 feet and it separates the Teckla from the Fox Hills sandstone. Below the Teckla sandstone, the Lewis Shale separates the Teapot sandstone from the Teckla sandstone. The Lewis Shale is described as a marine fine-grained sandstone, siltstone, and shale, and the total thickness of the Lewis Shale including the Teckla is approximately 850 feet at the IW-1 location. Roughly one-half of the Lewis is a true shale. Although there are no available measurements of permeability in the Lewis Shale, a very low vertical permeability is expected for shale. The available density porosity log for Sinadin #1 indicates typical porosities of 4% to approximately 6% in the Lewis Shale for a thickness of at least 300 feet above the Teckla sandstone. The remaining interval of Lewis Shale above the Teckla was not included in the available geophysical log. There is also a 100 foot thick interval of shale between the Teckla and Teapot sandstones with similarly small indicated porosity.

The lower confining layer consists of the Cody (Steele) Shale (approximately 525 feet thick at Sinadin #1) Marine shales have very low permeabilities, making them good seal facies. The available density porosity log for Sinadin #1 indicates typical porosities of 4% to approximately 6% in the majority of the lower interval of what was classified as the Parkman Sandstone in UIC 98-092. There is an interval of approximately 20 feet near the base of identified Parkman with slightly greater indicated porosity, and this interval will also be included as an injection zone to increase injection exposure through the Parkman.

2.1 Receiving Zone Properties

The physical and hydraulic properties of the Teapot and Parkman receiving zones are presented in Table 2-1 of UIC 98-092. These properties were used in determining the area of review (AOR) in UIC 98-092 and were evaluated for calculation of the updated AOR in Section 5.

The properties of the Teapot receiving zone (see Table 2-1 of UIC 98-092) include a gross thickness of 173 feet, an average porosity of 15% for porosity greater than 8%, and an average permeability of 4.7 millidarcy as calculated using Timur's (1968) equation using an irreducible water saturation of 66%. Based on the density-porosity log for Sinadin #1 (IW-1), the more permeable interval is from 7580 to 7720 feet BKB. There is a 40 foot thick higher porosity interval immediately above the specified top of the Teapot that will also be included in the Teapot perforation interval. The estimated initial reservoir pressure from offset Drill Stem Test (DST) data is 2825 psi at the midpoint of the perforations (7636 feet BKB in Table 2-1 of UIC 98-092).

The properties of the Parkman receiving zone (see Table 2-1 of UIC 98-092) include a gross thickness of 520 feet, an average porosity of 17% for porosity greater than 8%, and an average permeability of 8.1 millidarcy as calculated using Timur's (1968) equation using an irreducible water saturation of 66%. Based on the density-porosity log for Sinadin #1 (IW-1), the more permeable interval is from 7870 to 8040 feet BKB. The estimated initial reservoir pressure from offset DST data is 2940 psi at the midpoint of the perforations (7947 feet BKB in Table 2-1 of UIC 98-092).

2.2 Proposed Well Completion Zone Conditions

The proposed well(s) will be completed in sandstone intervals in the Mesaverde Formation. Three perforated intervals totaling 470 to 510 feet are anticipated for the proposed wells. At well IW-1, the perforated interval is approximately 58% of the 855 feet interval between the top of the planned upper perforated zone and the base of the lower perforated zone. Of the proposed 500 foot perforated interval at well IW-1, approximately 310 feet are considered the effective injection zone based on indications of sandstone (in the API gamma, SP, and/or Resistivity logs) with a density porosity of

8% or greater in the available geophysical logs. This indicates that a significant portion of the receiver zone is comprised of shale, siltstone, and low-porosity sandstone.

2.2.1 Updates of Receiver Properties for AOR Calculation

Physical and hydraulic properties of the receiving zone are utilized in the calculation of the AOR (see Section 4.0 of UIC 98-092). Critical properties include effective thickness, permeability, and porosity. The gross thickness of the receiving intervals in the Teapot and Parkman were used in calculation AOR in UIC 98-092. A review of the density-porosity log for Sinadin #1 (well IW-1) indicates that only a portion of the gross interval thickness has sufficient porosity (and by implication, permeability) to function as an effective receiver zone. For the purposes of defining an "effective" receiver thickness, the two receiver intervals were reduced to zones where the typical indicated porosity is greater than 6%. For the Teapot, this zone is from 7580 to 7720 feet BKB (140 feet thickness). For the Parkman, this zone is from 7870 to 8040 feet BKB (170 feet thickness). Total receiver thickness included in the AOR calculation is thus 310 feet. Anticipated perforated zone thickness will be 470 to 510 feet in three or more intervals. The perforated zone will be expanded beyond the higher porosity intervals as indicated in geophysical logs to ensure contact with most porous intervals and to add contact through the remainder of the Parkman.

The average permeability for the Parkman and Teapot receiver intervals was estimated as 6.7 millidarcy (md) using Timur's (1968) method (Section 2-4 and Table 2-1 of UIC 98-092). This value was a composite from estimates of 8.1 md and 4.7 md permeability for the Parkman and Teapot, respectively. Available records from the Wyoming Oil and Gas Commission (WOGC) were reviewed for permeability data. There is core permeability (horizontal) data available for a significant interval in the Parkman sandstone in a handful of wells in the area. The Larson 31-32 well is located in section 32 of T45N, R74W and had an average permeability of 6.87 md and an average porosity of 15.7% for 120 feet of core. The average permeability for the most permeable 100 foot interval of core was 8.23 md with a corresponding porosity of 16.8%. The Marquiss 32-31 well is located in Section 31 of T44N, R73W and had an average permeability of 3.85 md and an average porosity of 14.8% for 102 feet of core. When the data was restricted to the most permeable 80 foot interval, the permeability increased to 4.89 md and the porosity increased to 16.4%. The Gilbertz #1 well is located in Section 30 of T45N, R74W and had an average permeability of 20.56 md and an average porosity of 14.9% for 135.5 feet of core. Within this cored interval, there was a 56.5 foot thick interval with an average permeability of 42.31 md. The Ickes #1 well is located in Section 31 of T43N, R73W and had an average permeability of 9.37 md and an average porosity of 12.9% for 36 feet of core. When the data was restricted to the most permeable 29 foot interval, the permeability increased to 11.6 md and the porosity increased to 14.4%. No core permeability records were found in nearby wells for the Teapot or Teckla sandstone intervals.

The preceding core permeability data summary indicates that the estimate of 6.7 md for the composite Teapot and Parkman is reasonable. The range of measured permeabilities for the Parkman encompasses the estimate used in the AOR calculation, and since the Parkman represents the largest thickness in the receiver zone, its hydraulic properties are considered the most critical. Likewise, the measured porosities from the core samples are reasonably consistent with the values presented in Table 2-1 of UIC 98-092 (17% and 15% for the Parkman and Teapot, respectively). However, a conservatively small porosity of 11% was selected from density porosity logs of Sinadin #1 for use in the AOR calculation.

3. WELLS PENETRATING RECEIVER

There are no wells that penetrate the proposed receivers within the area of review for the four UIC wells. Figure 3 presents the existing wells within the project and surrounding area. Additional information including the plugging and abandonment is included in Appendix A.

4. GEOLOGIC CONDITIONS

The regional and local geology is discussed in detail in UIC 98-092. This discussion is referenced, summarized and presented in part in Section 4.1. Section 4.2 presents additional information on the geologic and hydrologic conditions for formations below the target injection zone in the Upper Cretaceous strata.

4.1 Regional Hydrogeologic Setting

The Reno Creek ISR project area is located in the central Powder River Basin (PRB) with a sedimentary strata thickness of approximately 16,000 feet in the project area (cited from Feathers et al, 1981 in UIC 98-092). Figures 2-1, 2-2 and 2-3 of UIC 98-092 present a geologic map, generalized stratigraphy, and a generalized cross section for the Powder River Basin, respectively. Section 2.1 of UIC 98-092 presents a detailed discussion of the hydrogeologic setting for the region.

The Quarternary deposits consist of alluvium, terrace deposits and eolian sands. The thickness of Quarternary deposits vary with surface topography and may be absent or indistinguishable from the underlying Tertiary strata. Tertiary strata in the project area consist primarily of the Wasatch Formation (Eocene) and Ft. Union Formation (Paleocene). The uranium ore bearing sandstones are within the Wasatch Formation. The Wasatch and Ft. Union Formation strata consist of an interbedded sequence of fluvial-continental sandstones, siltstones, claystones, and coals.

The target injection interval is within the Upper Cretaceous strata and specifically within sandstone members of the Mesaverde Formation with potential limited extension into the lower Lewis Formation at the top of the Teapot sandstone. Upper Cretaceous strata consist primarily of shales and sandstones extending from the uppermost Lance Formation to the Frontier Formation. The Mesaverde Formation includes the Teapot and Parkman sandstone members, but is primarily marine shale. The Lewis Shale is directly above the Mesaverde Formation, and includes the Teckla sandstone. The Cody Shale underlying the Mesaverde Formation is a thick marine shale with two identified sandstone members (Sussex and Shannon) in the project area. In addition to changes in the geology across the PRB, there are also some changes in naming convention for formations and strata in an east-west direction across the PRB (see Figures 2-2 and 2-3 of UIC 98-092), and these naming differences first occur in the Upper Cretaceous layers. As an example, the Steele Shale member of the Cody Shale on the western side of the PRB is designated as the Pierre Shale on the eastern side of the PRB.

The Lower Cretaceous strata are primarily shale with sandstone members or intervals. The presence of numerous sandstone and shale sequences with the Upper and Lower Cretaceous strata has resulted in sealing of petroleum in several reservoirs within the PRB (UIC 98-092). These same shale and sandstone sequences also provide hydraulic isolation of the target sandstone receiver intervals.

The entire receiver zone is marine with a consistent correlation of strata over the area of review. Cross sections are presented in Figures 2-5 and 2-6 of UIC 98-092 and an additional cross section is presented in Figure 4.

4.2 Hydrogeologic Setting Beneath the Parkman Sandstone

As cited in the previous section, the estimated thickness of sedimentary strata at the Reno Creek site is approximately 16,000 feet. An evaluation of the strata underlying the target injection zone was undertaken to confirm that there was no potential for injection well impacts on viable USDW's. In order to evaluate hydrogeologic conditions beneath the Parkman Sandstone, information was compiled from a variety of sources including: United States Geological Survey (USGS) Professional Paper 1402-A "The Regional Aquifer System Underlying the Northern Great Plains in Parts of Montana, North Dakota, South Dakota, and Wyoming –Summary" by J.S Downey and G.A. Dinwiddie (1988); USGS Professional Paper 1402-E "Geohydrology of Bedrock Aquifers in the Northern Great Plains of Montana, North Dakota, South Dakota , and Wyoming" by J.S Downey (1986); USGS Professional Paper 1402-F "Geochemistry of Water in Aquifers and Confining Units of the Northern great Plains in Parts of Montana, North Dakota, South Dakota, and Wyoming" by J.F Busby, B.A. Kimball,J.S Downey and K.D. Peter (1995); USGS Professional Paper 1273-G "Geohydrology of the Madison and Associated Aquifers in Parts of Montana, North Dakota, South Dakota, and Wyoming" by J.S Downey (1984); and records from the Wyoming Oil and Gas Conservation Commission (WOGCC). Selected excerpts from these records and reports are included in Appendix H.

4.2.1 Deep Geologic Setting

The target injection zone includes the Teapot and Parkman sandstones within the Upper Cretaceous Measaverde Formation (see Plate 2 of USGS Professional Paper 1402-A in Appendix H). The following discussion of Cretaceous through Mississippian lithologic sequence is based primarily on Plates 1 and 2 of USGS Professional Paper 1402-A which are included as Figures H-1 and H-2 of Appendix H. Underlying the Parkman is the Cody Shale (alternately designated as the Steele Shale) which has the Sussex, Shannon, and Fishtooth sandstone members. Figure 4 presents a geologic cross section indicating that the interval of Steele Shale between the Parkman and Sussex sandstones is approximately 600 feet thick in the Reno Creek area. The Parkman, Sussex, and Shannon sandstones are oil and gas producing intervals in the area according to WOGCC records. The remaining strata within the Upper Cretaceous include the Niobrara Member of the Cody Shale and the Frontier Formation. The Lower Cretaceous consists of the Mowry Shale, Muddy Sandstone, Skull Creek or Thermopolis Shale, Fall River Sandstone equivalent, Fuson Formation equivalent, and Lakota Formation.

The Jurassic geologic sequence consists of the Morrison Formation, upper and lower parts of the Sundance Formation, and Gypsum Spring Formation. There is a minor discrepancy between Plates 1 and 2 of USGS Professional Paper 1402-A in that Plate 1 indicates the Piper Formation is present in the Middle Jurassic series, while Plate 2 indicates the Gypsum Spring Formation is present at the base of the Middle Jurassic sequence. The geologic sequence presented in Plate 2 is listed as being located in the western Powder River Basin, while Plate 1 indicates the sequence is for the more general Powder River Basin, so there may be a change in naming convention with the minor difference in stratigraphic column location.

The Permian age strata consist of the Goose Egg Formation with no remaining Triassic age material between the Jurassic and Permian age materials. The Pennsylvanian age material includes Tensleep Sandstone and Amsden Formation, or alternately, the Minnelusa Formation. The Mississippian age material includes the Madison Limestone.

4.2.2 Expected Deep Formation Water Quality

USGS reports and WOGCC records were reviewed to evaluate water quality in the target receiver zone and underlying strata. Water quality within the receiver intervals was evaluated in UIC 98-092 and is also described in Section 7.1 and presented in Appendix D. Water quality was measured in samples taken from oil wells that are producing from the Parkman Sandstone just north of the planned injection well sites. The TDS concentration of these samples ranged from 12,130 to 13,840 mg/l.

Water quality data in strata beneath the oil production zones (e.g. Parkman, Sussex, Shannon sandstones) is relatively scarce because there is little incentive to drill beyond target oil and gas production intervals. Wyoming Oil and Gas Conservation Commission (WOGCC) records did provide a water quality sample for the 29-1 Cosner Fee well which is located in Section 29 of T43N, R72W, or approximately five miles east of the central ISR project site. The sample was listed as taken from the Frontier Formation in 1995, and had a TDS concentration of 33,918 mg/l. The Frontier Formation is at the base of the Upper Cretaceous interval, and is separated from the Parkman Sandstone by a significant interval of Cody/Steele Shale. Based on WOGCC records, the sample was likely taken from an interval at a depth of slightly over 10,000 feet BGS, and this is separated from the base of the Parkman by an interval of over 2,300 feet.

USGS reports were also reviewed for relevant water quality information. These reports included USGS Professional Papers 1402-F, 1273-G, 1402-E, and 1402-A as authored by Busby, J.F. et al (1995), Downey J.S., (1984), Downey, J.S, (1986) and Downey, J.S., and G.A. Dinwiddie (1988), respectively. Selected figures from these reports are included as Figures H-1 through H-14 of Appendix H. Further references to this information in this report will be according to the Appendix H Figure designation for simplicity. In the maps included as Figures H-3 through H-12 of Appendix H, the labeled town of Midwest in central Wyoming represents the most convenient reference point for locating the project site. The Reno Creek project site is approximately 23 miles east and 11 miles north of the town of Midwest.

Figure H-8 presents estimates of TDS in what is described as the Lower Cretaceous aquifer for the northern Great Plains area. The Lower Cretaceous aquifer includes the Muddy Sandstone through the Lakota Formation according to Figure H-2. These formations are expected to be 3,380 feet or more below the Parkman Sandstone based on lithology at the 29-1 Cosner Fee well. The USGS estimates the TDS concentration as being greater than 10,000 mg/l and approaching 20,000 mg/l. in these strata. This is supported by Figure H-14 which presented TDS iso-concentration contours for the same strata designated as the Inyan Kara aquifer.

Figure H-7 presents estimates of TDS in the Jurassic or Triassic age formations for the northern Great Plains area. The Jurassic age strata at the project site are expected to include the Morrison, Sundance, and Gypsum Springs or Piper Formations. These formations are expected to be 3,700 feet or more below the Parkman Sandstone based on lithology at the 29-1 Cosner Fee well. The USGS estimates the TDS concentration as being greater than 10,000 mg/l and approaching 20,000 mg/l in these strata.

Figure H-6 presents estimates of TDS in what is described as the Pennsylvanian aquifer for the northern Great Plains area. The Pennsylvanian aquifer includes the Tensleep Sandstone and Amsden Formation or Minnelusa Formation according to Figure H-1. There are no known deep penetrations that reach the Pennsylvanian aquifer in the project area, so the interval between the Parkman Sandstone and the Tensleep Sandstone/Minnelusa Formation is not known. The USGS estimates the TDS concentration as being greater than 5,000 and likely approaching 20,000 mg/l in these strata.

Figure H-5 presents estimates of TDS in what is described as the Madison aquifer for the northern Great Plains area. The Madison aquifer includes the Madison Limestone according to Figure H-1. There are no known deep penetrations that reach the Madison Limestone in the project area, so the interval between the Parkman Sandstone and the Madison Limestone is not known. The USGS estimates the TDS concentration at 2,500 mg/l. in the Madison Limestone. However, the TDS contours in northeastern Wyoming as shown in Figure H-5 (Figure 36 of USGS Professional Paper 1402-E) are based upon known recharge areas and available samples on the perimeter of the Powder River Basin where the depth to the Madison Limestone is much smaller than it is at the project site. Hence, the estimated TDS concentration at the project site is an extrapolation of data from wells much closer to the known aquifer recharge areas. The actual Madison Limestone water quality at the project site is not known, but there is a strong likelihood that water quality will deteriorate with increasing distance from the recharge areas.

4.2.3 Expected Deep Formation Water Temperature

USGS reports include water temperature data and estimates for aquifers from the Createaceous to Mississippian strata. Relevant figures from these USGS reports have been included in Appendix H and, as in the preceding section, will be referenced by Appendix H figure designation for simplicity.

Figure H-12 presents estimates of water temperature in the Upper Cretaceous aquifer which, according to Figure H-2, includes the Lance Formation and Fox Hills Sandstone and extends through the Teapot and Parkman sandstones and down to the Frontier Formation. Both the Lance Formation and Fox Hills Sandstone are above the receiver zones and are separated from the Teapot Sandstone by a significant thickness (750 feet or more) of Lewis Shale. The USGS estimates the water temperature at approximately 20 to 30ºC (68 to 86ºF) in the Upper Cretaceous aquifer at the project site.

Figure H-11 presents estimates of water temperature in the Lower Cretaceous aquifer which includes the Muddy Sandstone through the Lakota Formation according to Figure H-2. These formations are expected to be 3,380 feet or more below the Parkman Sandstone based on lithology at the 29-1 Cosner Fee well. The USGS estimates the water temperature at approximately 60 to 100ºC (140 to 212ºF) in the Lower Cretaceous aquifer at the project site.

Figure H-10 presents estimates of water temperature in the Madison aquifer which includes the Madison Limestone. The USGS estimates the water temperature at approximately 100 to 130ºC (212 to 266ºF) in the Madison aquifer at the project site. Figure H-13 presents a similar estimate of Madison Limestone water temperature. With increasing solubility at elevated temperature, the dissolved mineral concentration in water at this temperature is likely to be significantly larger than in cooler and shallower areas of the Madison aquifer.

4.2.4 Expected Deep Formation Vertical Head Gradients

USGS reports include estimated potentiometric surfaces for deep aquifer systems. These potentiometric surfaces were used to evaluate vertical gradients between the receiver zone and underlying formations. Figure H-3 indicates that the water level altitude (or water level elevation) in the Madison aquifer is approximately 3,900 feet above mean sea level (MSL) at the project site. Figure H-4 indicates that the water level altitude in the Pennsylvanian aquifer is approximately 5,000 feet above MSL at the project site. However, there is a relatively steep gradient in this area shown on Figure H-4, so the actual water level altitude in the Pennsylvanian aquifer at the cite may differ slightly from this estimate. The cited USGS reports do not include a potentiometric surface for the Lower Cretaceous aquifer, but do present a simulated surface (USGS Professional Paper 1402-E, Figure 45) that indicates an approximate water level altitude of 4,600 feet above MSL at the project site. For informational purposes, the expected water level altitude in the Upper Cretaceous aquifer as shown in Figure H-9 is approximately 4,800 feet above MSL.

For the three pertinent aquifer systems (Lower Cretaceous, Pennsylvanian, and Madison), the USGS reports indicate that the highest water level altitude occurs in the Pennsylvanian aquifer which is in the middle of the sequence, The estimated water level altitude in both the overlying Lower Cretaceous and underlying Madison aquifers is lower than it is in the Pennsylvanian aquifer. The combination of water level altitude estimates for the sequence of aquifers indicates that there likely is a significant upward gradient from the Pennsylvanian aquifer to the receiver zone which is between the designated Upper and Lower Cretaceous aquifers. Below the Pennsylvanian aquifer, there is a significant downward gradient to the Madison aquifer. Hence, vertical flow will be from the Pennsylvanian aquifer up to the Upper and Lower Cretaceous aquifers, and down to the Madison aquifer.

4.3 Deep Formation Hydrology

The combination of water quality, water temperature, and potentiometric surface data leads to the conclusion that strata beneath the receiver interval do not include a viable USDW. Although the Madison Limestone is a USDW at other sites where it is at a much smaller depth and is much closer to recharge areas, the water quality in the Madison Limestone would be expected to deteriorate dramatically with increasing travel distance from recharge areas and with increasing ground water temperature. The depth to the Madison aquifer at the project site is not known, but based upon lithology from the perimeter of the Powder River Basin, the depth is expected to be 15,000 feet or more BGS.

With the increasing overburden load at these depths, the expected aquifer transmissivity, potential well yields, and corresponding ground water movement rates would likely be very small. Power Resources Inc. (PRI) submitted a detailed discussion of anticipated porosity, permeability and well yield for the Madison Limestone in their application for injection wells designated as UIC 09-054.

This discussion was included as Appendix L in the 09-054 Smith Ranch Highland Uranium Project Injection Well Application. The discussion focused on the very small indicated Madison porosity in a geophysical log from the No. 1 Hornbeck well located in Section 16 of T36N, R74W or approximately 33 miles south of the Reno Creek site. The geologic setting for this well is generally similar to that at the Reno Creek site and the location within the central area of the Powder River Basin makes the PRI analysis relevant to the Reno Creek site. As with the Reno Creek site, the depth to the Madison Limestone at the No. 1 Hornbeck site is very large (slightly over 16,500 feet BGS).

The PRI analysis presented documentation that the average porosity of the Madison Limestone at the No. 1 Hornbeck site was approximately 1.5 percent. Using a record of production data and an analysis of production interval porosity and permeability from the Elk Basin Field in the Big Horn Basin, PRI also estimated a permeability of 0.0005 millidarcy for the Madison at the No. 1 Hornbeck site. They then estimated the potential yield for the Madison aquifer at the No. 1 Hornbeck site at 0.055 gpm, which is dramatically smaller than a suitable yield for a USDW.

The very small anticipated permeability and potential well yield also translates to very small ground water movement rates. With slower ground water movement rates, the residence time of the ground water increases and the TDS concentration typically increases. The combination of increasing distance from recharge zones, slower ground water movement rates, and high ground water temperatures typically results in poor water quality.

The water quality and water temperature for strata between the receiver interval and the Madison Limestone precludes the use of these aquifers as USDWs. There is relatively poor water quality (TDS concentration of 10,000 mg/l or more) for virtually all of the aquifers below the Parkman Sandstone receiver, and there is also significant oil production from intervals in and below the Parkman Sandstone. Since there is documented poor water quality for aquifers between the receiver zones and the Madison Limestone, and no available water quality data for the Madison Limestone, the presence of better water quality in the Madison would also indicate that there is no significant vertically downward migration of poor quality water from overlying zones to the Madison.

5. AREA OF REVIEW

The radius of the Area of Review (AOR) for the Reno Creek Disposal Well(s) was determined to be 1699 feet according to the radius of the cone of influence calculation. The location of plant facilities, pipeline routing, power supply lines, etc. is subject to some minor adjustment to accommodate surface topography, existing roads, rights-of-way (ROW), coal bed methane (CBM) infrastructure, etc., and to satisfy landowner concerns. Therefore, the planned location is presented as the center of a circle within which the well location may be adjusted to address previously cited concerns. An expanded AOR is evaluated by adding the calculated radius of the cone of influence to the radius of the circle enclosing potential well locations. The radius of the resulting expanded AOR is 2000 feet which is the sum of a calculated radius of the cone of influence of 1699 feet and the well location adjustment circle radius of 301 feet. This allows minor adjustment of the well location while still providing notification of affected parties within the affected AOR. The calculated radius of the cone of influence was larger than the calculated volumetric fillup radius and the default minimum radius of 1320 feet and thus was the controlling radius for the AOR. The one exception to the expanded AOR is well IW-1 where the location is fixed and the calculated AOR of 1699 feet applies. Figure 5 shows the circular area and the effective AOR bounded by a line to the quarter of the quarter section for each proposed injection well location.

5.1 Radius of the Cone of Influence

The calculation of the radius of the cone of influence for each injection well is based on the hydraulic conditions and properties of the receiver zones, hydraulic conditions in the nearest underground source of drinking water (USDW), injection rate and duration of injection. The method of calculation is presented in Guidance Document Number 1, Permitting of Class I Injection Wells provided by the Underground Injection Control (UIC) Program, Wyoming Department of Environmental Quality – Water Quality Division (WDEQ-WQD). The calculation presented in UIC 98-092 was used as the basis for determining the radius of the cone of influence with updates to the calculation inputs as described in the following discussion. The radius of the cone of influence for twenty years of water disposal injection into the Teapot and Parkman, members in the Reno Creek Disposal Well(s) is shown by the following calculations:

$$r = \sqrt{\frac{(2.25)(KHt)}{S(10)^x}}$$

$$x = \left[\frac{W}{G} - B\right]\left[\frac{4\pi KH}{2.3Q}\right]$$

$$K = Ki \times \left({}^{\rho g}\!\big/_{\mu} \right) \times 2835 \frac{ft/day}{cm/\sec}$$

Where:
- r = Radius of the cone of influence of an injection well (ft)
- K = Hydraulic conductivity of the injection zone (ft/day)
- Ki = Injection zone permeability (cm^2)
- ρ = Density of injected water (gm/cc)

g	=	Acceleration of gravity (cm/sec^2)
μ	=	Viscosity of water (gm/cm·sec or poise)
H	=	Thickness of injection zone (ft)
t	=	Time of injection (days)
S	=	Storage coefficient (dimensionless) = H x 10^{-6}
W	=	Hydrostatic head of the Underground Source of Drinking Water (USDW) Referenced to the base of the receiver (ft)
G	=	Specific gravity of water in the injection zone (dimensionless)
B	=	Original hydrostatic head of the receiver (ft)
Q	=	Injection rate (ft^3/day)

Data:

Ki	=	0.0067 darcy, from UIC 98-092 as calculated by Timur's (1968) method
ρ	=	0.999099 gm/cc
g	=	980 cm/sec^2
μ	=	0.011404 gm/cm·sec or poise
H	=	310 ft
t	=	20 years or 7300 days
S	=	4.20 x 10^{-4}
W	=	8390 ft.
G	=	1.00464
B	=	2940 psi ÷(1.00464 x 0.433 psi/ft) = 6758 ft.
Q	=	115 gpm or 22,139 ft^3/day

Calculations:

Ki	=	0.0067 darcy x 9.87 x 10^{-9} cm^2/darcy
	=	6.61 x 10^{-11} cm^2
K	=	{Ki x 1.0 x 980 cm/sec^2 ÷ 0.011404 gm/cm·sec} x 2835 $\frac{ft/day}{cm/\sec}$
	=	0.0161 ft/day
W/G	=	(8390 ft./1.00464) = 8351 ft.
B	=	6758 ft. (cited as resulting from offset DST data in UIC 98-092)

The current hydrostatic head (HH) of the USDW, W, is greater than the HH of the receiver, B. The group W/G – B = 1593 feet and the x exponent in the radius of influence is greater than zero. The following calculations illustrate the determination of the radius of influence:

$$x = (1593)\frac{(4\pi)(0.0161)(310)}{(2.3)(22139)}$$

$$x = 1.962$$

$$r = \sqrt{\frac{2.25 \times 0.0161\, x 310 \times 7300}{310 \times 10^{-6} \times \left(10^{\ 1.962}\right)}}$$

$r =$ 1699 feet (0.32 miles)

The input parameters for this calculation were updated or derived from UIC 98-092 in the following manner:

Ki - Cited value from UIC 98-092 is 0.0067 darcies as calculated by Timur's (1968) equation. This value was used for the AOR calculation.

H - Adjusted from 693 feet in UIC 98-092 to 310 feet in the preceding calculation to reflect a more conservative estimate of the effective injection zone.

K - Calculated from permeability and fluid properties for injectate. Value of 0.0161 ft/day is unchanged from UIC 98-092.

ρ - The density of the injected water (0.999099 gm/cc) was unchanged from the UIC 98-092. The density of water changes slightly with temperature and TDS concentration, but is relatively constant within the expected ranges for the injectate.

g - Acceleration of gravity (980 cm/sec^2) is unchanged.

Q - Projected injection rate is 115 gpm/well. This is increased from 57 gpm/well in UIC 98-092.

S - Storage coefficient is calculated as H x 1E-06 or 3.1 E-04.

t - Time of injection is unchanged from 20 years or 7300 days.

W - Estimated hydrostatic head of lowermost drinking water source measured from the base of the injection zone is unchanged from the UIC 98-092 estimate of 8390 feet.

B - Original hydrostatic head of injection zone measured from the base of the injection zone is changed slightly from the UIC 98-092 value of 6790 feet to 6758 feet. The change is a result of a small fluid specific gravity adjustment for the well fluid in offset DST data from the Sinadin #1 well.

G - Specific gravity of the fluid in the injection zone is unchanged from the UIC 98-092 value of 1.00464 which was estimated for water with a TDS of 13,000 mg/l.

The radius of the Area of Review is a function of the injection rate because the HH of the USDW is greater than the HH in the receiver.

5.2 Volumetric Fillup Calculation

The calculation of the radius of volumetric fillup for twenty years of water disposal injection at 115 gpm into the proposed Reno Creek disposal well(s) is presented as:

$$R = \sqrt{\frac{Qt}{\pi H \phi}}$$

Where:	R	=	Radius of volumetric fillup (ft)
	Q	=	Average injection rate (ft^3/day)
	t	=	Time of Injection (days)
	H	=	Thickness of injection zone (ft)
	φ	=	Porosity expressed as a pure decimal

Data:	Q	=	115 gpm or 22,139 ft^3/day
	t	=	20 years or 7300 days
	H	=	310 feet
	φ	=	0.11

Calculations:

$$R = \sqrt{\frac{22{,}139 \times 7300}{\pi \times 310 \times 0.11}}$$

$$R = 1228 \ \mathit{feet}$$

The radius of volumetric fillup after 20 years of future injection into the planned Reno Creek disposal wells is 1228 feet.

5.3 Fixed Area of Review

The calculated area of review exceeds the minimum fixed AOR of ¼ mile. The calculated AOR based on the cone of influence calculation (1699 feet radius) is the controlling area for the purposes of this calculation.

6. SURFACE AND MINERAL OWNERSHIP AND WATER RIGHTS

6.1 Surface Ownership

The surface ownership of land within the well AORs is presented in Figure 6. Appendix B provides a description of the surface ownership within each AOR by ¼ ¼ of each section. The AOR circles do not overlap, but some ¼ ¼ sections are common to two AORs. The IW-1, IW-2 and IW-3 well locations are on property owned and administered by the Leavitt family, with whom AUC currently has a relationship that allows access upon request. The proposed ISR plant location is also adjacent to well IW-2 on the Leavitt property, so the installation of well IW-2 will be preceded by substantial facilities construction in the immediate vicinity. Because other ISR mine facilities on the Leavitt property will necessarily be authorized and/or installed prior to installation of the injection wells, landowner agreements for installation of wells IW-1, IW-2, and IW-3 will be incorporated into a broader agreement that authorizes construction of the ISR plant and installation of other ISR mine facilities that surround or are adjacent to the proposed injection well locations.

Injection well IW-4 is located on property owned and administered by the Groves family, and is adjacent to an identified uranium ore body planned for future ISR mining by AUC. AUC does not presently have an access agreement for the property. Well IW-4 is incorporated as a contingency well location and will only be installed if there is development of the adjacent ISR mining unit that is also located on the Groves property. As with the other injection wells, the landowner agreement for installation of well IW-4 will be incorporated in a broader agreement that includes authorization for ISR mining in the area.

6.2 Mineral Ownership

The mineral ownership of land within the AORs is presented in Figure 7. Strathmore has ownership of the uranium resource within the permit boundary. Appendix B presents the mineral ownership within the AOR by ¼ ¼ of each section.

6.3 Oil and Gas Leaseholder

The oil and gas ownership is presented in Figure 8. The oil and gas leases within the AOR are presented in Figure 9. Appendix B presents the oil and gas ownership and leases within the AOR by ¼ ¼ of each section.

6.4 Water Rights

The permitted ground and surface water rights within the well AORs are presented in Figure 10. Wells with a use of monitoring are not included, but wells or surface water rights within a ¼ ¼ of a section that is all or partly within an injection well AOR are presented . The permit number is posted within the designated ¼ ¼ of each section. Appendix C presents a tabulation of permitted ground and surface water rights within the AORs by ¼ ¼ or lot number for each section. There are two surface water permits (P16331S and P16030S) in the tabulation in Appendix C that are located according to lot number. Additionally, surface water permit P17057S (SE NW of Sec 6, T42N, R73W) is located outside of the AOR of Well IW-1, but is on a drainage that flows through the AOR.

7. WATER QUALITY INFORMATION

7.1 Analysis of Water Within the Receiver

The anticipated water quality in the receiver is presented in Section 5.1.a and Tables 5-1 through 5-5 of UIC 98-092. Water quality samples were taken from three producing oil wells in the vicinity that are completed in the Parkman. The TDS concentration of these samples ranged from 12,130 to 13,840 mg/l. Additionally, available water quality data within a ten mile radius from Section 32 of T43N, R73W, was tabulated for the Teapot and Parkman sandstones in Tables 5-4 and 5-5 of UIC 98-092. These tables are reproduced in Appendix D.

7.2 Analysis of Water from any Usable Aquifer

Numerous samples of water have been taken from strata above the base of the Fox Hills sandstone and representative results are included in Appendix D and in UIC 98-092. The base of the Fox Hills sandstone is considered the base of the usable aquifer zone. Water quality within the Wasatch and Ft. Union formations is generally good with TDS concentration significantly less than 10,000 mg/l. However, naturally high activities (>15 pCi/l) of radionuclides such as Radium-226 and Thorium-230 are common in uranium mineralization zones of the Wasatch and Ft. Union Formations.

8. DESCRIPTION OF DISCHARGE

The fluid to be injected in the Reno Creek Water Disposal Well(s) is a blended stream resulting from several wastewater sources from the well field, ground water restoration and the brine concentrate discharge from the reverse osmosis (RO) units. The fluid is exempt from RCRA regulation under the Bevill Amendment listed in 40 CFR 261.4(b)(7). The proportion of these water sources in the injectate stream will change over the life of the project as individual well fields are developed, operated, and transitioned to restoration.

The potential or anticipated sources of disposal fluids include:

- wash down waters from the Reno Creek Plant
- ion exchange screening wash waters
- yellowcake wash waters
- ion exchange circuit/well field bleed waters
- brine discharge from the reverse osmosis units during ground water restoration
- Elution fluid from Reno Creek Central Plant (emergency situations only)

The ion exchange circuit/well field bleed water is the uranium leaching fluid which consists of ground water fortified with dissolved oxygen, carbon dioxide, sodium bicarbonate and/or other lixiviant enhancements. Reverse osmosis units may be used to reduce volume of bleed water injectate.

A tabulation of injection fluid properties for several uranium ISR projects and the proposed injection fluids is included in Table 1. This table is replicated from Table 6-1 of UIC 98-092 and includes a wide range of anticipated injectate water composition for the Reno Creek ISR project. The properties of the injectate are likely to vary over the course of the project. Initially, the injectate will likely include various plant wash waters and the well field bleed waters. The well field bleed waters will constitute the majority of the injectate while the quantities of wash water will typically be incidental to the injectate stream. If it is necessary to reduce the volume of injectate, the well field bleed waters may be processed through a RO unit. The brine from the RO will then be included in the injectate while the high quality RO product water will be utilized for other purposes. In contrast to the direct well field bleed stream, constituent concentrations (particularly major ions) in the RO brine will be very large and may approach the projected concentrations for the Reno Creek Project Eluant as presented in Table 1.

As the project matures, the composition of the injectate will change. When well field restoration begins, the injectate will likely include waters produced during ground water sweep operations. Initially, these waters will be similar in quality to the well field bleed. Because there are multiple well fields planned for the project area, there will likely be simultaneous ISR mining operations and well field restoration operations during the project life. During this period, the injectate may include the plant operations wash water, well field bleed water, ground water restoration water, and RO brine water. It is anticipated that the eluant or the RO brine will contain the largest concentrations of major constituents for the injectate. The design fluid composition for the Reno Creek Project in Table 1 incorporates a range that will include the eluant or RO brine fluids.

Table 1. UIC 98-092 Class I Injection Well Waste Water Composition

	Irigarary Project			Highland Project		URI Rosita Project			Reno Creek Project		
Constituent	Bleed	Eluant	RO Brine	Projected	Design	Bleed	Eluant	Composite	Bleed	Eluant	Design
Calcium	82		95-115	50	50	600		1210	330		50-1000
Magnesium	46		40-55	25	25	123		224	50		50-100
Sodium	750		870-1500	8000	31700	687	30000	4650	350	30000	30000
Potassium	11		0	50	50	34		96	0		50
Bicarbonate	689		650-800		0	558	8000	1125	340	8000	1000-8000
Sulfate	684	6889		4000	5797	1150	20000	2820	1130	20000	7000-20000
Chloride	578	19553	1200-2000	35000	53440	1174	25000	7460	240	25000	20000-35000
Nitrate	5.1	0.22				0.11		0.26			
TDS	2426	40381		50000	93300	3840	50000	17500		50000	50000
Conductivity (μmhos/cm)	4515	55796	5350-8440			5750		24000			
pH (Standard Units)	7.83	7.78	7.8-7.9	6	6	7.51	8.7	7.7		8.7	6.0-9.0
Aluminum	<0.1										
Arsenic	<0.001					0.014		0.039			0.01
Barium	<0.1				<0.01				0.1		0.01
Cadmium	<0.1				<0.0001	0.0001		0.0007	<0.01		0.0001
Chromium	<0.05								<0.1		0.1
Copper	<0.01				0.12						
Fluoride	<0.05				0	0.7		2.2			0
Iron					0.57	0.04		0.05			0.1
Mercury	<0.001					0.0001		0.0001	<0.001		0.0001
Manganese	<0.01					0.37		0.82			0.01
Molybdenum	<0.1				<0.1	0.43		2.9			0.01
Lead	<0.05				<0.001	0.001		0.001	<0.1		0.001
Nickel	<0.05				<0.01				<0.05		0.05
Selenium	0.314					0.006		0.022	1		1
Vanadium	<0.1										
Zinc	<0.01	0.08			0.02						0.01
Uranium	0.74	91	10-43	5	5.51	1.53		10.3	2		5-10
Radium (pCi/l)	0.4	52		100	314			574	5		300-500

All units in mg/l, except as noted

Following the beginning of operation of the disposal well, routine sampling of the composite disposal fluid will be performed and the samples will be analyzed to provide a periodic detailed description of the fluid.

9. DESCRIPTION OF THE WELLS

The planned sequence of well construction is described in Section 1.1. It is anticipated that well IW-2 will be constructed first with the remaining installation sequence and scheduling subject to adjustment based on the performance of well IW-2. The planned drilling and construction of wells IW-2, IW-3 and IW-4 will be very similar and many of the installation procedures are common as described in the following sections. Well IW-1 will be installed as a conversion of the existing plugged and abandoned Sinadin #1 well and the completion and installation approach will necessarily differ from that of the other three wells.

9.1 Description and Schematic of Well IW-1

Well IW-1 will be completed in the Teapot and Parkman members of the Mesaverde Formation.

Tasks and procedures associated with drilling and completing the well will be similar to those presented in Appendix E. A schematic of the completed well is provided in Figure 11.

The perforation intervals shown in Figure 11 reflect the target zones selected from existing logs of Sinadin #1 well. Minor adjustments in perforation intervals may be made after completion of additional logging. The proposed well is designed to cement the long string from total depth of approximately 8,400 feet to the surface.

9.2 Records of Well IW-1

Existing geophysical logs will be supplemented by additional geophysical logging during construction of the Reno Creek Disposal Well IW-1. Perforation intervals and daily drilling records will also be provided when available. Results of well testing including mechanical integrity testing, pressure testing, and step injection testing will be provided as soon as possible after completion of the testing.

9.3 Description and Schematic of Wells IW-2, IW-3, and IW-4

The Reno Creek Disposal Well(s) will be completed in the Teapot and Parkman members of the Mesaverde Formation. The following plans and specifications related to the drilling and completion of this well are preliminary. They represent AUC's current preferred approach to the task. They are, however, subject to final revision and refinement when the actual work is authorized.

Tasks and procedures associated with drilling and completing the well will be similar to those presented in Appendix E. Prognoses for the drilling of the Reno Creek Disposal Wells are also provided in Appendix E. Schematic for the completed wells IW-2, IW-3, and IW-4 are provided in Figure 12, Figure 13 and Figure 14, respectively. The perforation intervals shown in Figures 12, 13 and 14 are only illustrative. Actual targets will be selected at the time of perforating based on geophysical logs obtained from the well. The proposed well is designed to cement the long string from total depths ranging from 8,200 feet to 8,350 feet to the surface.

9.4 Records of Well IW-2, IW-3 and IW-4

Numerous geophysical logs will be provided when available for the Reno Creek Disposal Well(s). Perforation intervals and daily drilling records will also be provided when available. Results of well testing including mechanical integrity testing, pressure testing, and step injection testing will be provided as soon as possible after completion of the testing.

10. OPERATING CONDITIONS

10.1 Operating Data

The average daily injection rate will not exceed 115 gpm for each of the Reno Creek Disposal Wells. The Reno Creek ISR project is currently in the permitting stage, and no firm schedule has been established for constructing or operating the injection well(s).

The fracture pressure of the receiver was based on calculations provided in Section 8 of UIC 98-092 and is calculated as follows:

$$P = F \times D$$

where: P = Fracture pressure of the receiver, in psig
F = Fracture gradient, in psi/ft
D = Depth to the bottom of the receiver, in ft

In UIC 98-092, the calculation was made to the base of the Teapot sandstone at a depth of 7,755 feet to the base of the receiver. The indicated fracture gradient of the Teapot in UIC 98-092 was 0.7 psi/foot. A minor change in the base of the receiver formation was made to reflect the bottom of the anticipated perforated zone in the Teapot at 7,735 feet with a resulting fracture pressure of:

$$P = F \times D = 0.7 \times 7735 = 5415 \text{ psig}$$

This fracture pressure differs only slightly from the value of 5,429 psi as calculated in UIC 98-092. In order to extend the fracture pressure estimate to encompass a wider range of potential fracture pressures for the three planned perforated zones, a calculation was also made for the base of the receiver in the lower perforated zone in the Parkman at a depth of 8,390 feet. Cited fracture gradients for other Class I injection wells in the general area range from 0.55 to 0.63. Using a fracture gradient of 0.55 for the Parkman, the resulting fracture pressure is:

$$P = F \times D = 0.55 \times 8390 = 4615 \text{ psig}$$

Based on the preceding calculations, the more conservative estimate of fracture pressure is 4615 psig.

The hydrostatic head at the base of the Parkman perforated zone with fluid at the land surface is calculated as follows:

$$H = G \times D \times .433 = 1.03 \times 8390 \times .433 = 3742 \text{ psig}$$

where: H = Hydrostatic head at the bottom of the receiver, in psig
G = Specific gravity of the injection fluid
D = Depth to the bottom of the receiver, in ft

The specific gravity of the injection fluid was conservatively estimated for a high TDS fluid.

The friction loss in the tubing was calculated as follows:

T = 4.5 psi/100 ft x 74.5 = 335 psig (Halliburton friction pressure Charts, 2.441" diameter, 2.74 BPM, packer @ 7450').

Perforation pressure loss (L) was assumed to be negligible.

The surface injection pressure was calculated as follows:

S = (P – H + T + L) x (0.90) psig = (4615 – 3742 + 335 + 0) x (0.90) = 1087 psig

After completion of the well, a step injection pressure test will be conducted. The test results, the calculated fracture pressure, and the recalculated maximum surface injection pressure will be provided.

10.2 Proposed Stimulation Program

The proposed stimulation program includes the following items for initial and periodic stimulation:

1. A packer and bridge plug will be used to isolate each receiver formation and each receiver formation will be acidized with hydrochloric acid. Hydraulically fracture using proppant with the amount of frac fluid and proppant designed for a propped fracture half-length of approximately 200 feet. Temperature logs and/or gamma ray logs run in conjunction with radioactive frac sand will be used to determine fracture height.

2. For periodic stimulation, pump approximately 15,000 gallons of 15% HCL into the perforation zone. A pump truck with be used to remove any acid soluble materials in the perforation tunnels or in the near-wellbore formation.

10.3 Schematic of Water Disposal Surface Equipment

A schematic drawing of surface equipment is shown in Figure 15. This schematic shows the proposed tanks, filters and pumps used to deliver the disposal water to the well.

10.4 Injection Procedures

Operation of the injection system may be conducted on either a semi-continuous or a batch basis. Once sufficient waste water is accumulated in the storage tank (Figure 15), the water is pumped through filter housing, polishing filter housing, and through buried high density polyethylene piping which terminates at the suction manifolds of the disposal well pump. Well IW-2 will be located in close proximity to the plant and it is possible that the transfer pipeline will be enclosed above ground. The pump boosts the fluid pressure to that required for injection into the receiver intervals. The injection pressure, as measured at the wellhead, is limited to 200 psig less than the formation's estimated fracture pressure. Prior to reaching the disposal well pumps, a properly selected corrosion or scale inhibitor may be added to the wastewater to minimize the potential for downhole corrosion or scaling.

10.5 Description of Recording Devices

AUC will monitor and continuously record the injection rate. Pressure monitors will be installed on the injection tubing and on the well annulus. Continuous recording of these pressures will be provided. Complete specifications of the recording devices will be provided upon request when the devices are purchased. With this design, leakage in either the casing or the tubing will be detected and the injection well will be shut down automatically. Useable water quality in the area will be monitored by the required well field monitor wells associated with the ISR uranium operations.

10.6 Methods and Procedures Used for Inspection and Failure Detection

The injection pressure will be measured and recorded at all times. Should the pressure reach 90% of the maximum allowable injection pressure, a relief valve will automatically open and the disposal well pump will be shut down. If there are repeated occurrences of relief valve opening, the threshold relief pressure may be adjusted, but will not exceed 99% of the maximum allowable injection pressure. The annulus pressure will also be continuously measured and recorded.

The flow rate from the polishing filter (Figure 15) is measured, recorded and compared against the flow rate measured at the wellhead during injection. A deviation of greater than 3% between the two measurements will be investigated to determine if there is leakage from the buried or enclosed pipeline to the injection well.

10.7 Information About Staffing

The Reno Creek ISR project is currently in the permitting phase and there are no on-site facilities. Prior to construction of the injection well(s), AUC will provide documentation of on-site facilities, staffing, organization, and assigned responsibilities. Operation and maintenance of the injection disposal well will be under the direction of the Reno Creek Plant Supervisor. On-site personnel will include a Radiation Safety Officer. Personnel responsible for operating and monitoring the disposal well will be trained in all tasks necessary to safely and correctly operate the disposal well pumps, valves, recording devices, and scale/corrosion inhibitor systems.

11. MONITORING PLAN

11.1 Plan of Analysis of Injected Water

Following the approval to inject, a composite sample will be collected of the waste stream and analyzed for the parameters noted below, on a quarterly basis or when process changes occur that will significantly alter the characteristics of the waste stream.

Radium-226 (pCi/l)	pH (standard units)
Uranium, natural (mg/l)	Sulfate (mg/l)
Chloride (mg/l)	Bicarbonate (mg/l)
Carbonate (mg/l)	Conductivity (µ/cm)
Total Dissolved Solids (mg/l)	Ammonia, NH_3 as N (mg/l)

The records of monitoring will be reported quarterly and will include:

a. The date, exact place, and time of sampling;
b. The name(s) of individuals performing the sampling;
c. The date(s) of analysis;
d. Name(s) of individuals performing analysis;
e. Analytical procedures or methods used;
f. The results of the analysis.

The samples will be collected before the high pressure injection pump and will be representative of the waste being injected. The results of the analyses will be furnished to the Division within 30 days following the end of each calendar quarter.

The constituents will be analyzed using approved methods as described and in accordance with Wyoming Water Quality Rules and Regulations Chapter VIII, Section 7.

Other items which will be monitored include the continuous measurement and recording of injection and annulus pressures. Additionally, the injection zone pressure will be determined and a pressure falloff curve will be developed on an annual basis.

11.2 Monitor Wells

Useable water quality in the area will be monitored by the required well field monitor wells associated with the ISR uranium operations.

11.3 Monitoring Plan

All information and records of the monitoring plan will be reported as outlined in Section 16 of this application. All records will be retained for a minimum of three (3) years following well closure and with the records delivered to the Division, upon Administrator request, at the conclusion of the retention period.

11.4 Quality Assurance Plan

The Quality Assurance Program will incorporate and utilize the appropriate techniques outlined in the Environmental Protection Agency's (EPA's) manual "RCRA Groundwater Monitoring Technical Enforcement Guidance Document" including using guidelines for sampling and preservation established in 40 CFR §136. The program will incorporate the appropriate field and laboratory quality assurance and control procedures including splitting of samples between laboratories, submittal of blanks, maintenance and calibration of equipment, use of standards, and chain of custody records. Analysis of all samples will be performed in accordance with Chapter VIII, Water Quality Rules and Regulations, Section 7 and 8.

12. WELL ABANDONMENT

At the present time, minimum Plugging & Abandonment (P & A) requirements are to squeeze cement through the existing perforations using a cement retainer, place approximately 50 feet of cement on top of the retainer, set a 250 foot stabilizer plug mid-way in the casing, cut off the casing near the surface and place a dry hole marker in a 10 sack cement plug at the surface. A more detailed abandonment procedure is described in Section 10 of UIC 98-092. The procedure in Section 10.1.a of UIC 98-092 was used as a guideline, and well abandonment volumes and costs were estimated based on the well IW-1completion with the assumption of perforations extending to include the Teckla sandstone. This expands the cemented interval and adds a measure of conservatism to the abandonment cost estimates. Appendix F includes a prepared bid with costing for cementing abandonment of well IW-1. At the time of abandonment, there will be minor changes reflecting actual perforation intervals and installed casing depth.

When wastewater disposal operations cease and the well is no longer necessary, the well(s) will be plugged and abandoned according to the previous description and the rules of the Wyoming Oil and Gas Conservation Commission in effect at the time of abandonment.

Additional costs for decommissioning and abandonment of the Class I injection wells are included in Appendix G. These costs include removal and disposal of surface equipment and structures, removal of pipelines, and surface reclamation of the site and pipeline corridors.

13. FINANCIAL SURETY

The current decommissioning and abandonment cost estimate for a single injection well is $126,300. At the time of well construction, a specific abandonment cost estimate will be developed for each well that is installed. Because the Class I injection well(s) will not be installed until after a significant portion of the ISR operations facilities have been constructed or installed, the financial surety for the injection well abandonment and closure will be included as an increase in the surety instrument for the ISR mining operations. AUC will provide a Financial Surety Bond to the WDEQ using an approved surety arrangement prior to the commencement of well construction activities.

14. MECHANICAL INTEGRITY

Mechanical integrity will be demonstrated before subsurface injection commences, and at least once every five (5) years thereafter during the life of the well. The well will be deemed to have mechanical integrity if there is no measurable leak in the casing, tubing, or packer; and there is no indication of movement of injected fluid into an underground source of usable water through vertical channels adjacent to the well bore. The absence of leaks will be determined by an acceptable pressure test. The absence of vertical fluid movement will be determined by the results and interpretation of appropriate geophysical logs(s), such as a cement bond, temperature, noise or other log, or combination of logs; or another technique acceptable to the Administrator. The results of the

replaced 3/26/10

initial mechanical integrity testing will be submitted and approved before subsurface injection will commence.

15. SIGNATURE REQUIREMENTS

Pursuant to the provision of Chapter XIII, Section 5(b) (xiv), the permit application has been signed by Jim Crouch, Manager, AUC, LLC.

16. REPORTING REQUIREMENTS

16.1 Quarterly Reporting

AUC will submit quarterly reports within 30 days after the end of each calendar quarter signed by a duly authorized representative.

The quarterly report will contain:

1) The maximum and minimum daily injection pressure (not an average pressure) as well as maximum and minimum daily injection volume for each month within the quarter, and the dates that these maximums and minimums were reached. The accumulated total volume of waste injected for each month and the accumulated total volume injected to date.
2) The maximum and minimum daily annulus pressures, date(s) of occurrence of minimum and maximum, and a well operating log for that day.
3) Chemical analyses of waste fluid as listed in Section 11.
4) Total water disposal volumes and a list of facilities that produced the water.
5) A discussion of any non-compliance, mechanical integrity test (MIT), or significant event during the quarter.
6) The average maximum injection pressure and annulus pressure for each month calculated by averaging the maximum pressures for each day.
7) The average injection rate calculated by dividing the total waste injected by the total hours of operation.

16.2 Annual Report

The Annual Report shall consist of the 4th Quarter Report along with a summary of the year's operation. This summary shall include the maximum injected volume for the year and the date on which it was reached as well as the total volume of waste fluid injected. The Annual Report shall include significant events for the year such as Mechanical Integrity Tests, and any noncompliance with permit conditions.

17. REFERENCES

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Downey, J.S, 1984, Geohydrology of the Madison and Associated Aquifers in Parts of Montana, North Dakota, South Dakota, and Wyoming, U.S. Geological Survey Professional Paper 1273-G

Downey, J.S, 1986, Geohydrology of Bedrock Aquifers in the Northern Great Plains of Montana, North Dakota, South Dakota , and Wyoming, U.S. Geological Survey Professional Paper 1402-E

Downey, J.S., and G.A. Dinwiddie , 1988, The Regional Aquifer System Underlying the Northern Great Plains in Parts of Montana, North Dakota, South Dakota, and Wyoming –Summary, U.S. Geological Survey Professional Paper 1402-A

Timur; A., 1968, "An Investigation of Permeability, Porosity and Residual Water Saturation Relationships for Sandstone Reservoirs", Transaction SPWLA, June 1968.

Figure 1. Location Map for Project Area

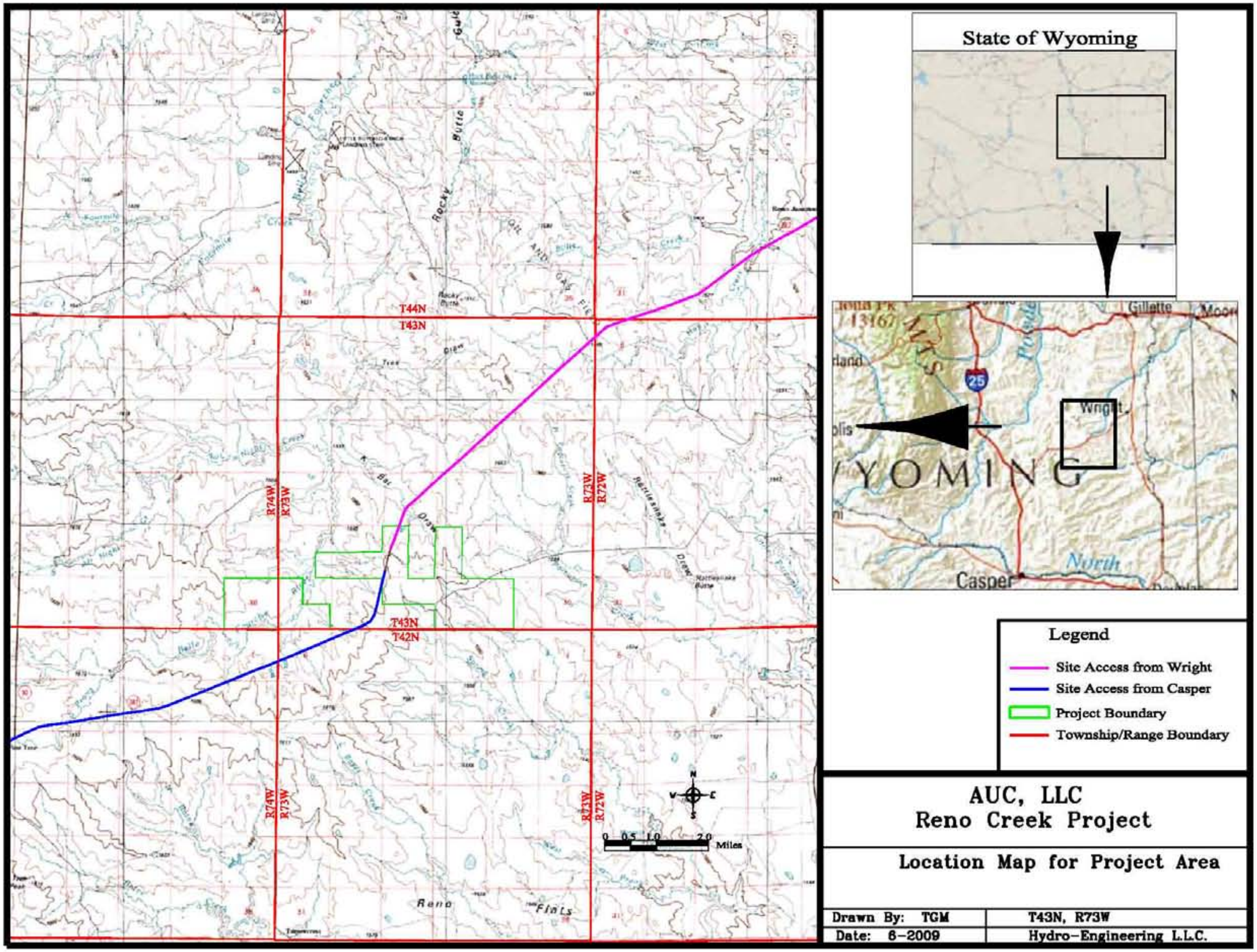


Figure 2. Location of Proposed Class I Injection Wells

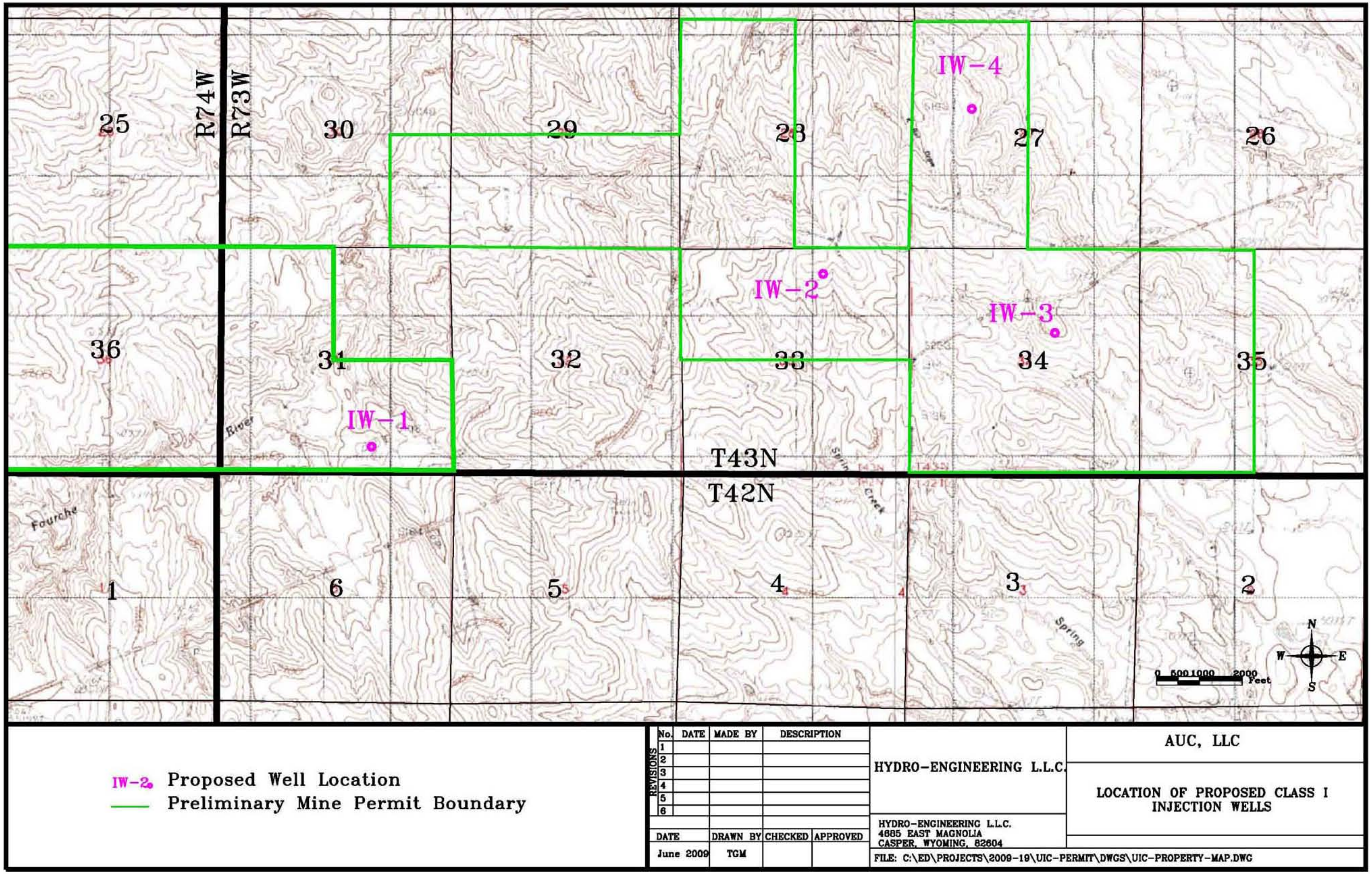


Figure 3. Existing Wells Within the Project Area

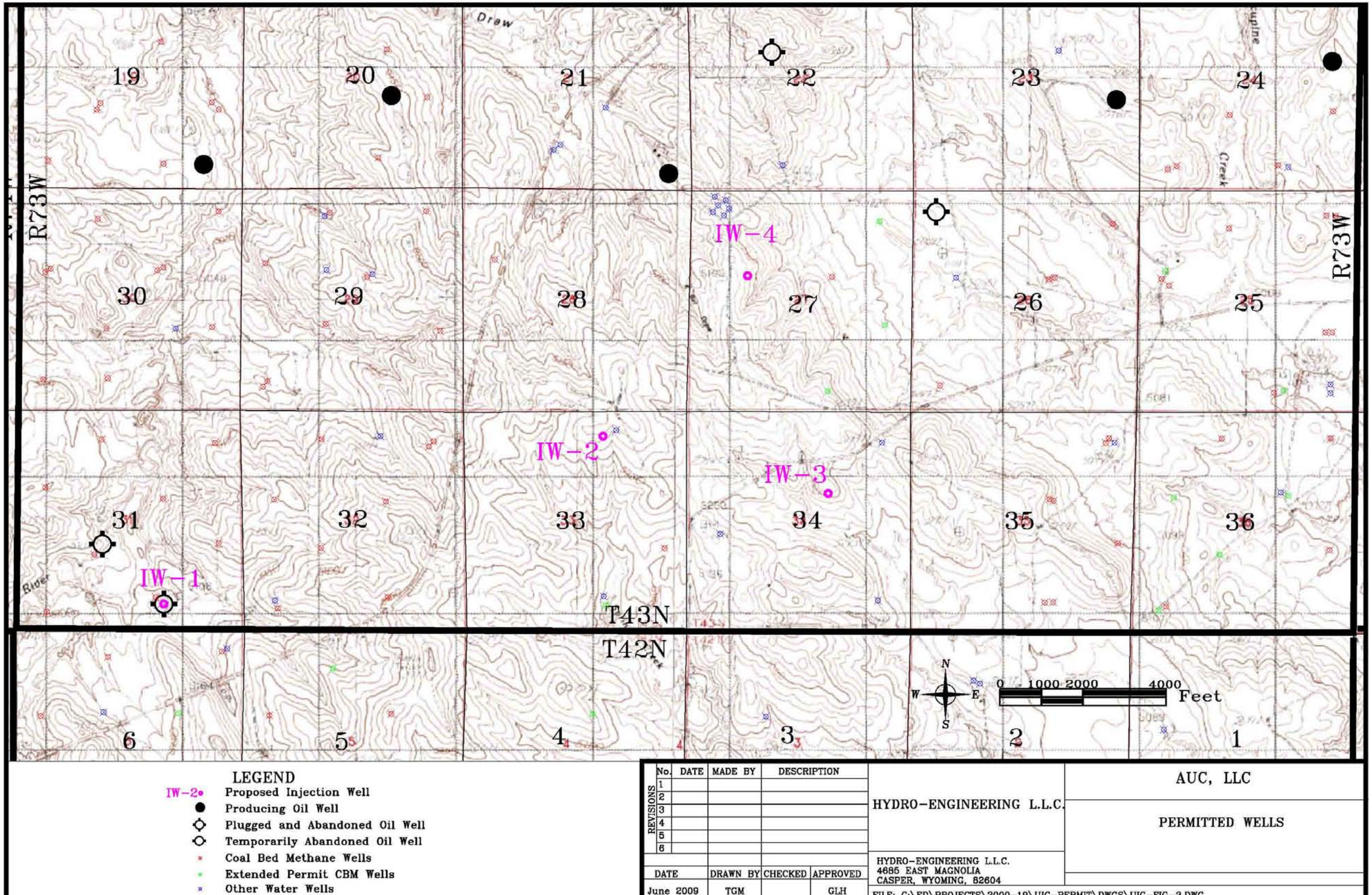


Figure 4. Geologic Cross Section Through Project Area

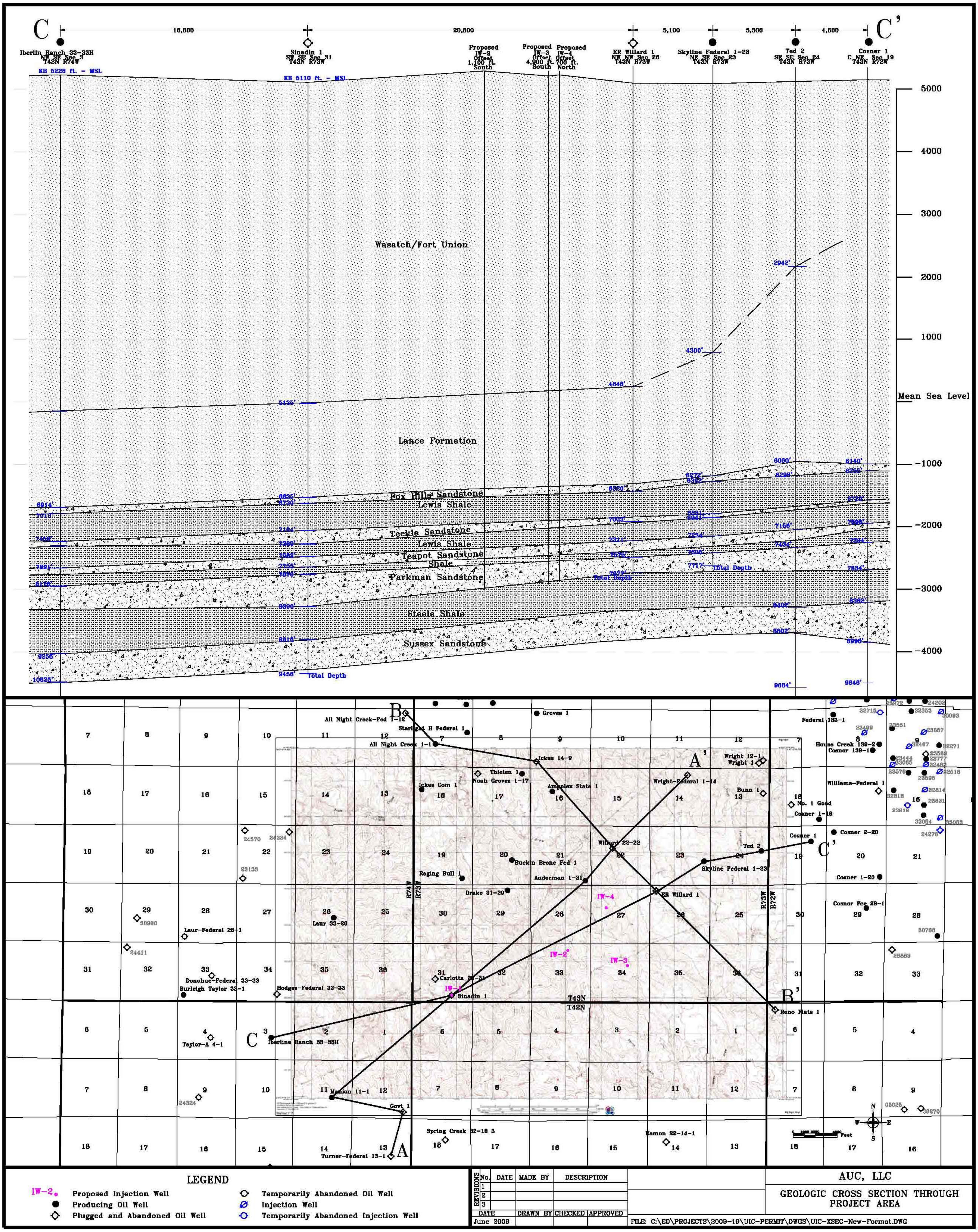


Figure 5. Injection Well Areas of Review

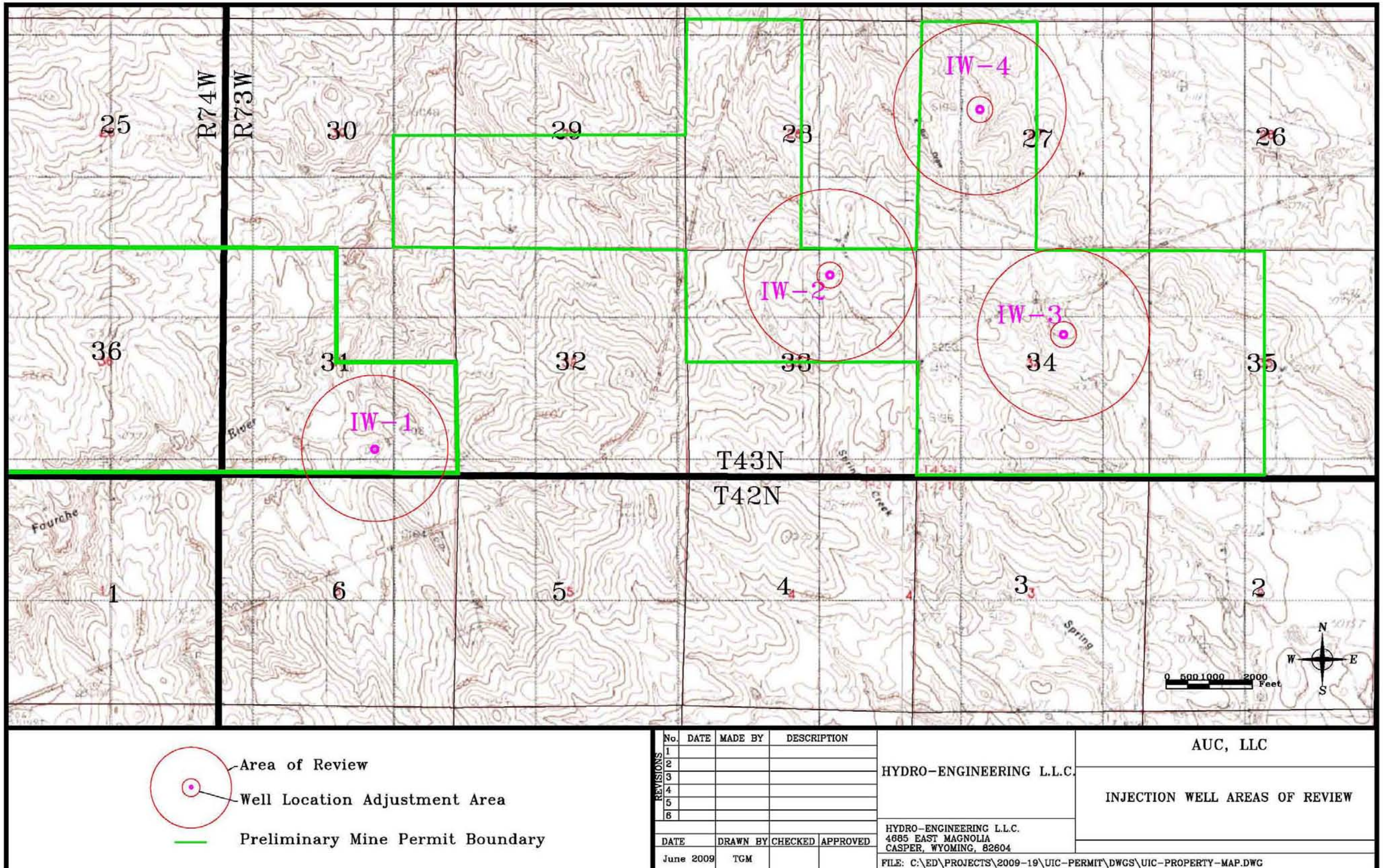


Figure 6. Surface Land Ownership

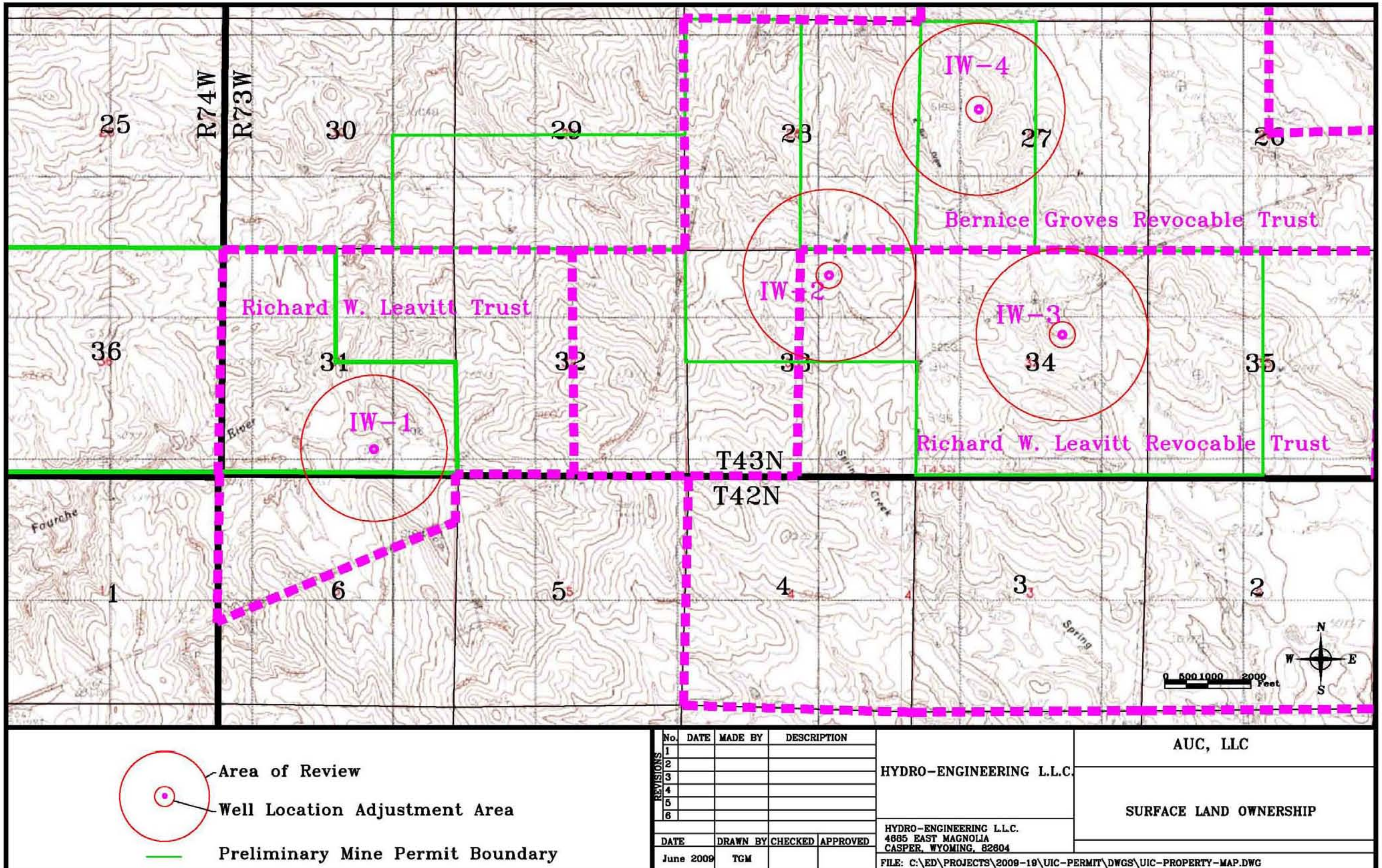


Figure 7. Mineral Ownership

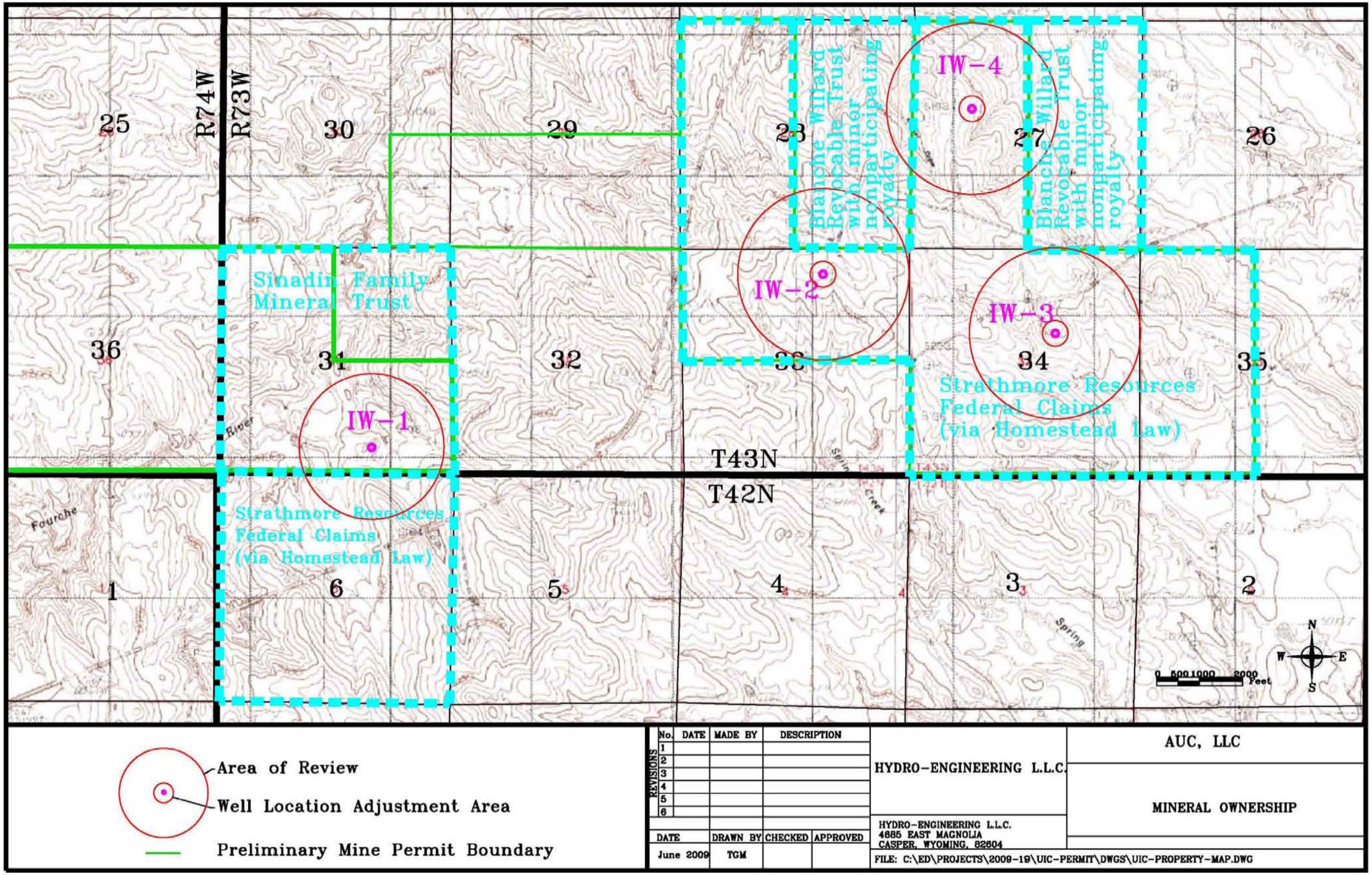
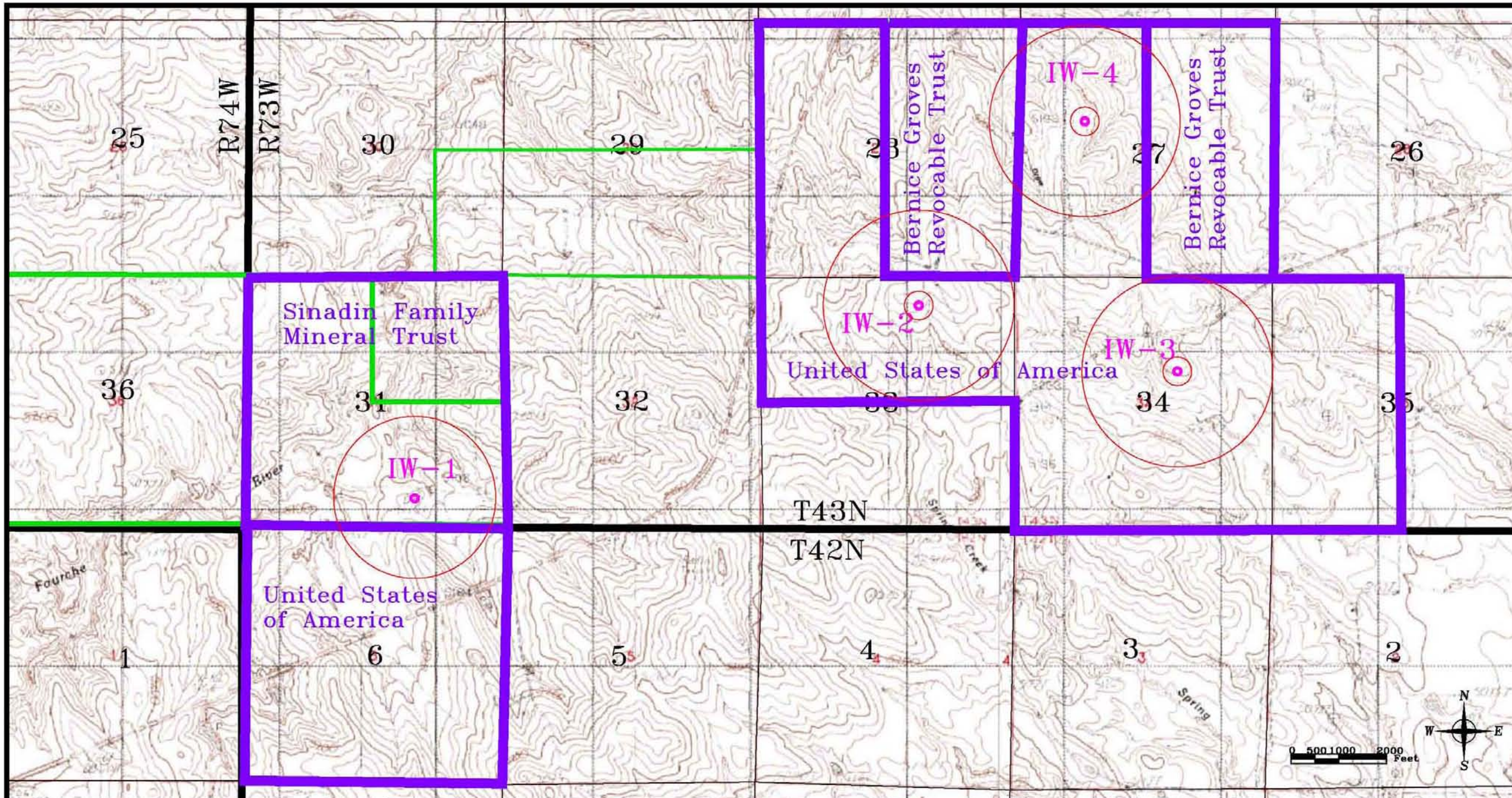


Figure 8. Oil and Gas Ownership



REVISIONS No.	DATE	MADE BY	DESCRIPTION
1			
2			
3			
4			
5			
6			

DATE	DRAWN BY	CHECKED	APPROVED
June 2009	TGM		

HYDRO-ENGINEERING L.L.C.

HYDRO-ENGINEERING L.L.C.
4685 EAST MAGNOLIA
CASPER, WYOMING, 82604

STRATHMORE RESOURCES U.S. Ltd

OIL AND GAS OWNERSHIP

FILE: C:\ED\PROJECTS\2009-19\UIC-PERMIT\DWGS\UIC-PROPERTY-MAP.DWG

Figure 9. Oil and Gas Leaseholder

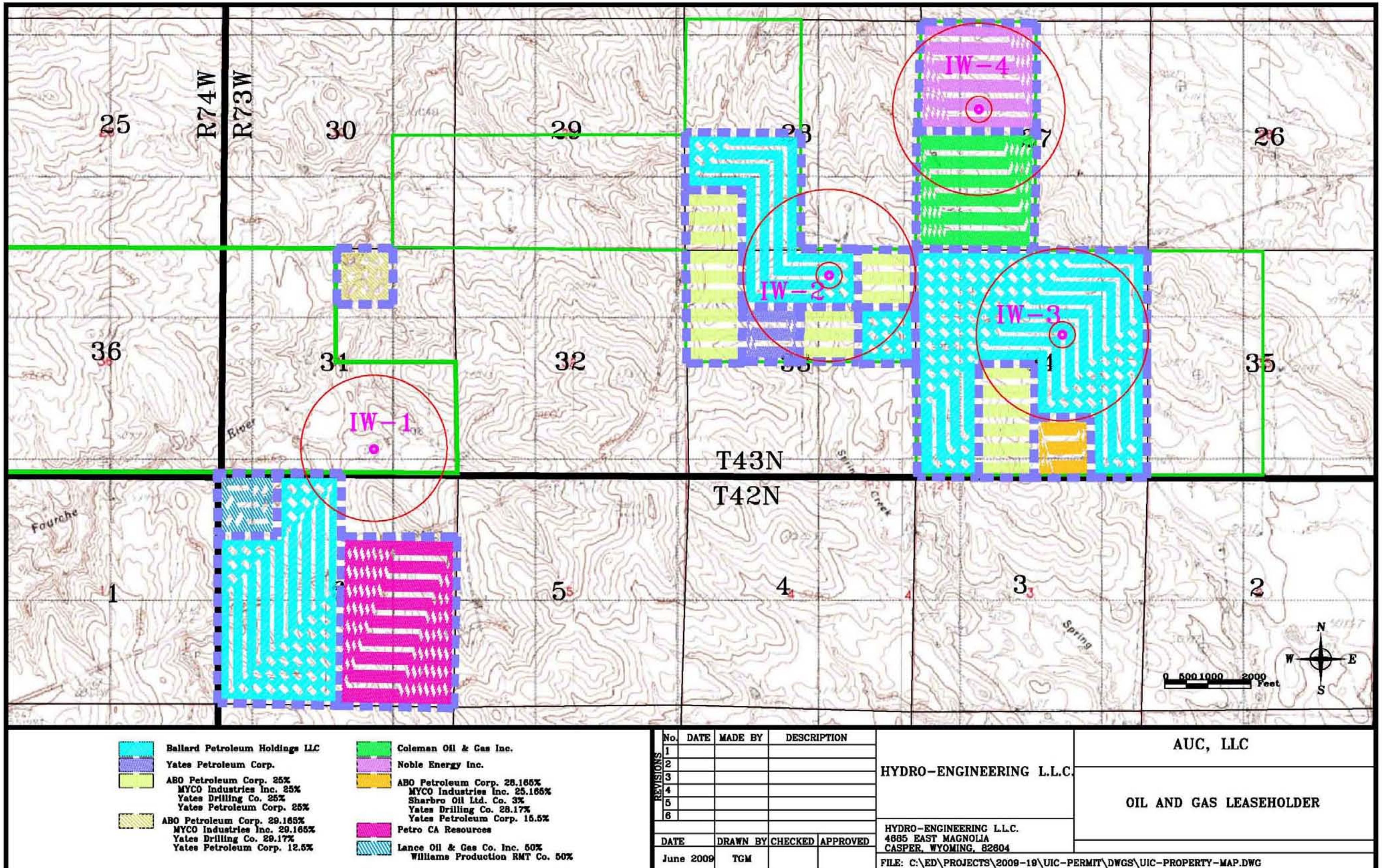
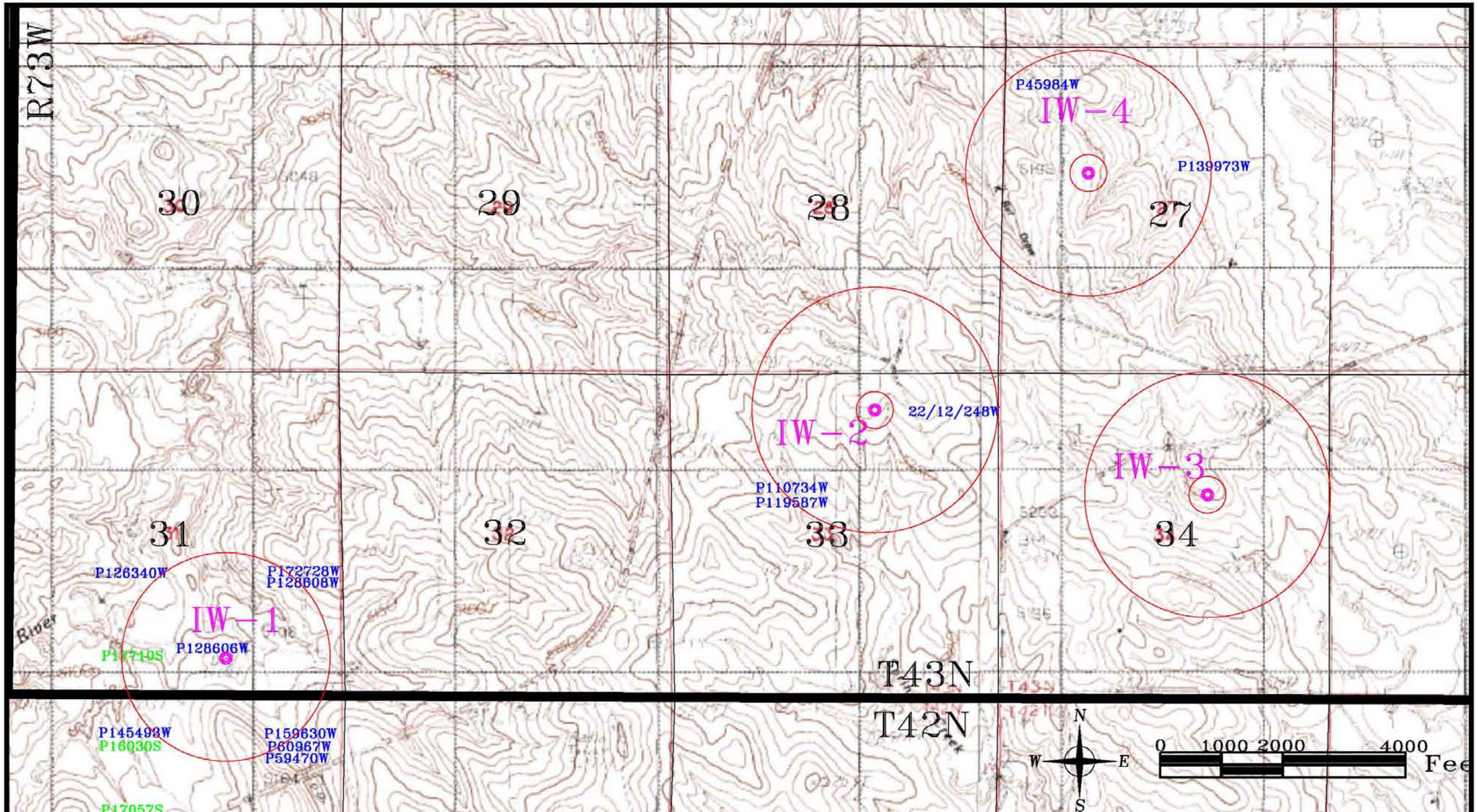


Figure 10. Permitted Ground and Surface Water Rights



No.	DATE	MADE BY	DESCRIPTION
1			
2			
3			
4			
5			
6			

REVISIONS

DATE	DRAWN BY	CHECKED	APPROVED
June 2009	TGM		GLH

HYDRO-ENGINEERING L.L.C.

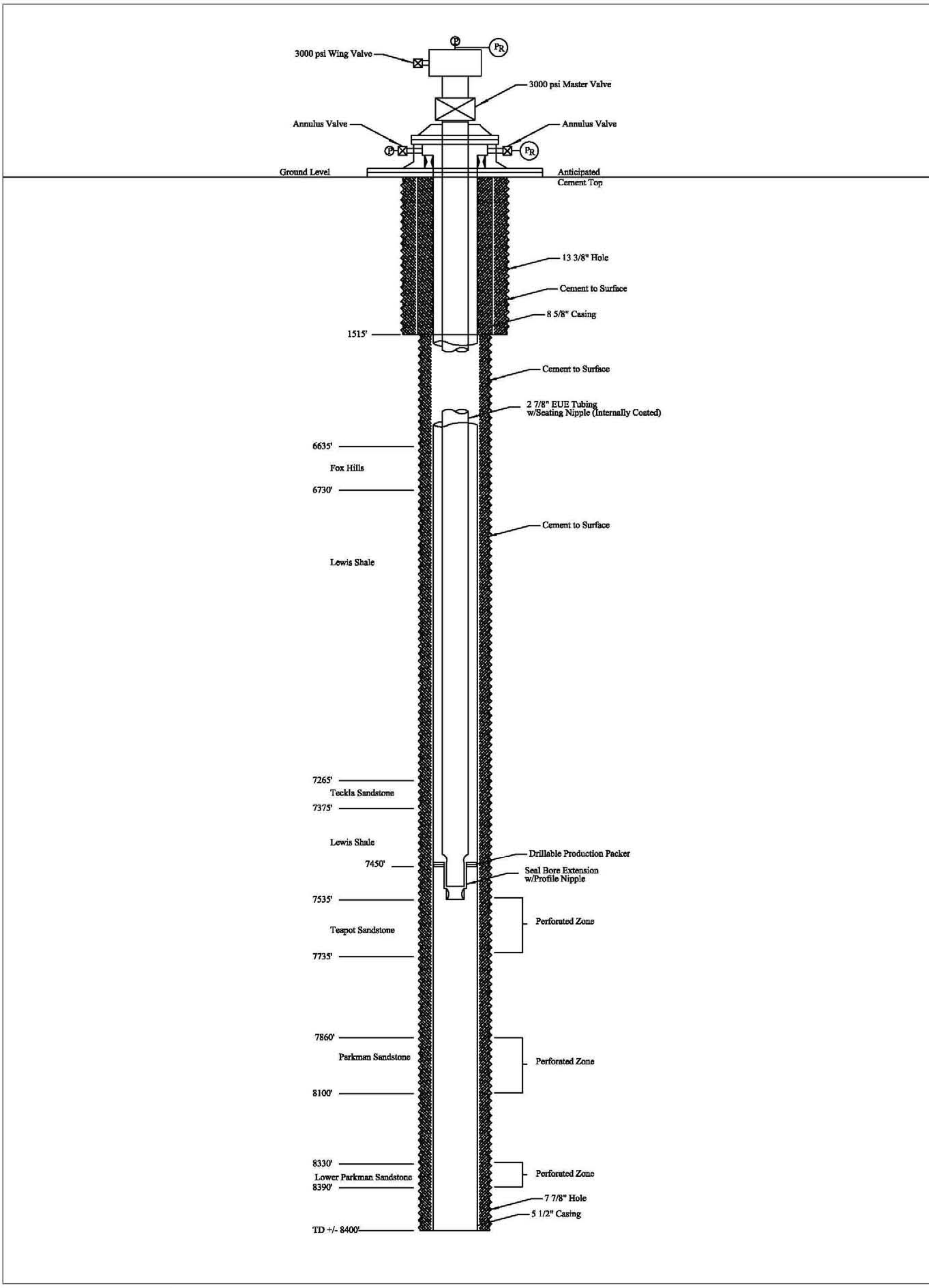
AUC, LLC

PERMITTED
GROUND AND SURFACE WATER RIGHTS

HYDRO-ENGINEERING L.L.C.
4685 EAST MAGNOLIA
CASPER, WYOMING, 82604

FILE: C:\ED\PROJECTS\2009-19\UIC-PERMIT\DWGS\UIC-Water-Rights.DWG

Figure 11. IW-1 Class I Injection Well Completion



Legend
P = Pressure Gage
P_R = Pressure Recorder

REVISIONS No.	DATE	MADE BY	DESCRIPTION
1			
2			
3			
4			
5			
6			

DATE	DRAWN BY	CHECKED	APPROVED
June 2009	TGM		

HYDRO–ENGINEERING L.L.C.

HYDRO–ENGINEERING L.L.C.
4685 EAST MAGNOLIA
CASPER, WYOMING, 82604

AUC, LLC

Figure 11

IW–1 Class I Injection Well Completion

FILE: C:\ED\PROJECTS\2009-19\UIC-PERMIT\DWGS\Figure-11.dwg

Figure 12. Proposed IW-2 Class I Injection Well Completion

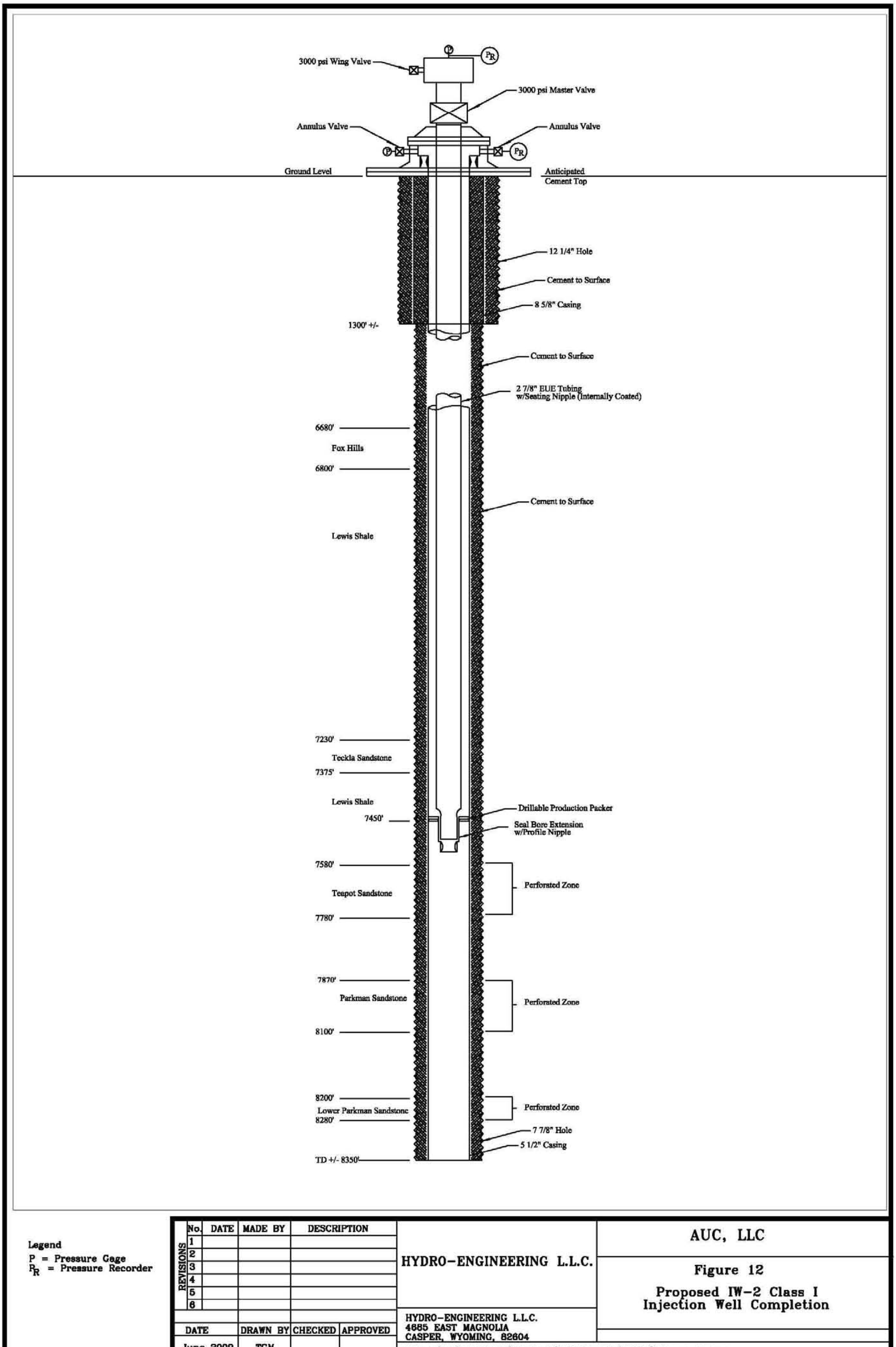
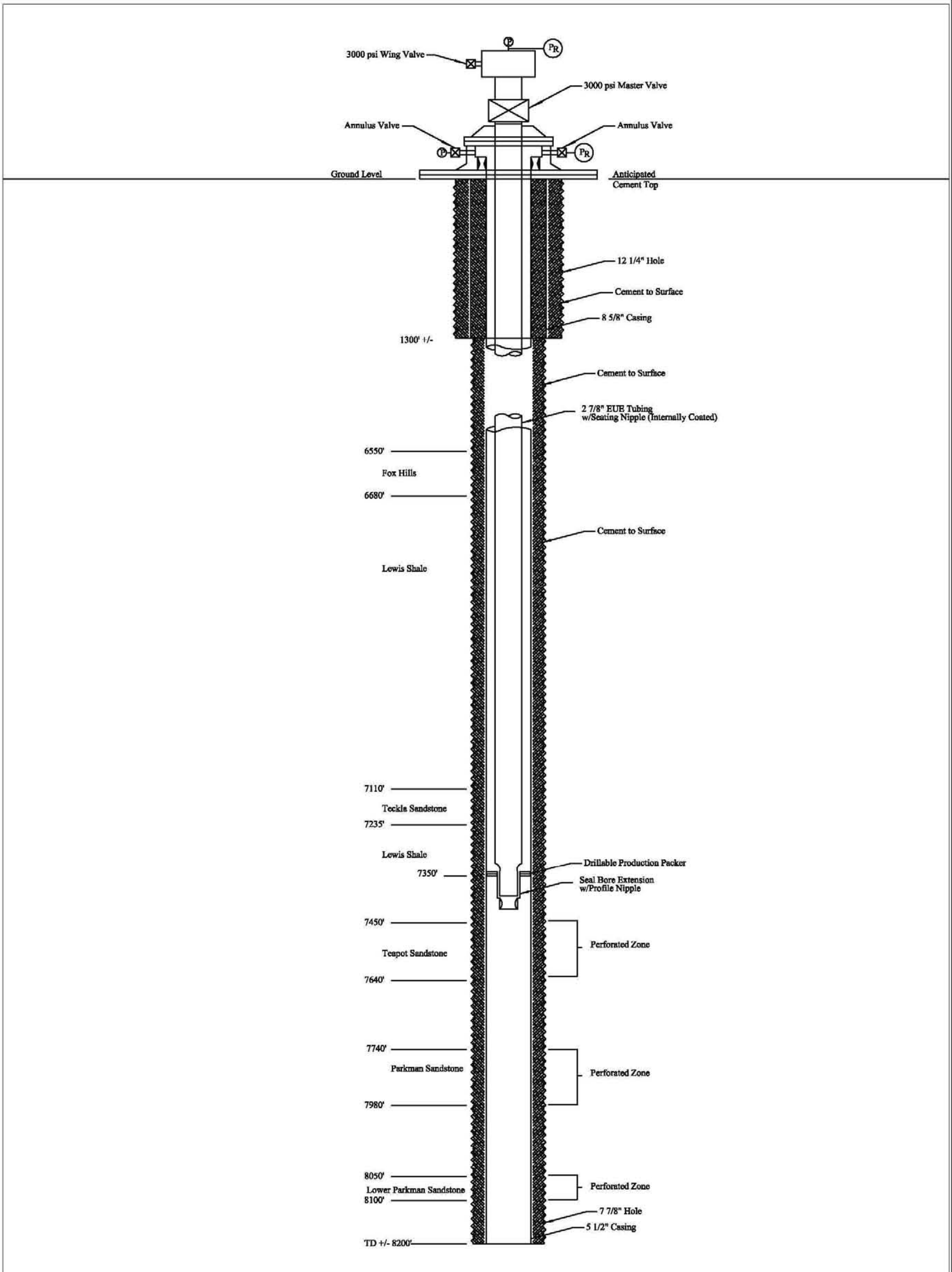


Figure 13. Proposed IW-3 Class I Injection Well Completion



REVISIONS No.	DATE	MADE BY	DESCRIPTION
1			
2			
3			
4			
5			
6			

DATE	DRAWN BY	CHECKED	APPROVED
June 2009	TGM		

HYDRO–ENGINEERING L.L.C.

HYDRO–ENGINEERING L.L.C.
4685 EAST MAGNOLIA
CASPER, WYOMING, 82604

AUC, LLC

Figure 13

Proposed IW–3 Class I Injection Well Completion

FILE: C:\ED\PROJECTS\2009–19\UIC–PERMIT\DWGS\Figure–11.dwg

Figure 14. Proposed IW-4 Class I Injection Well Completion

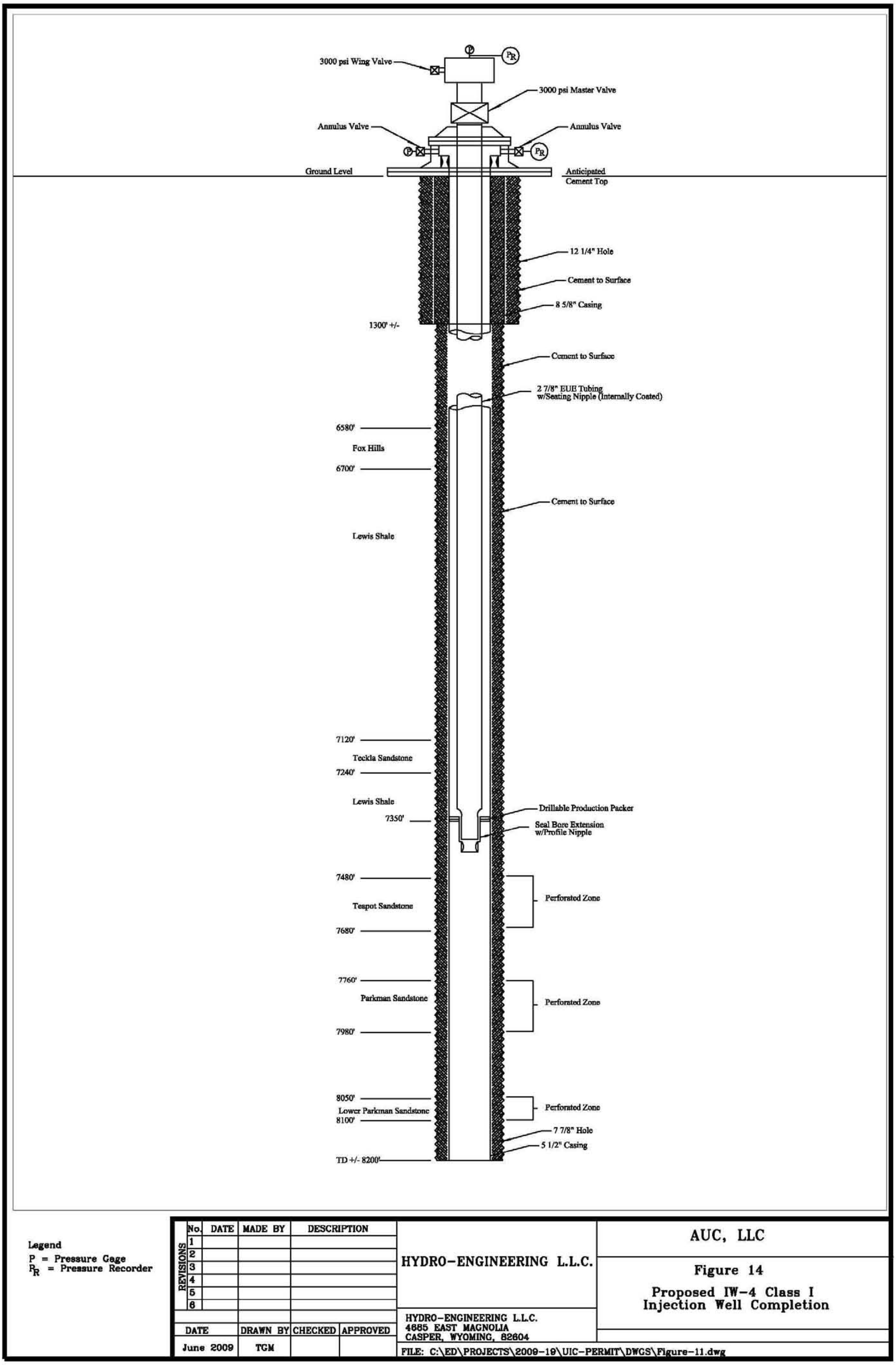
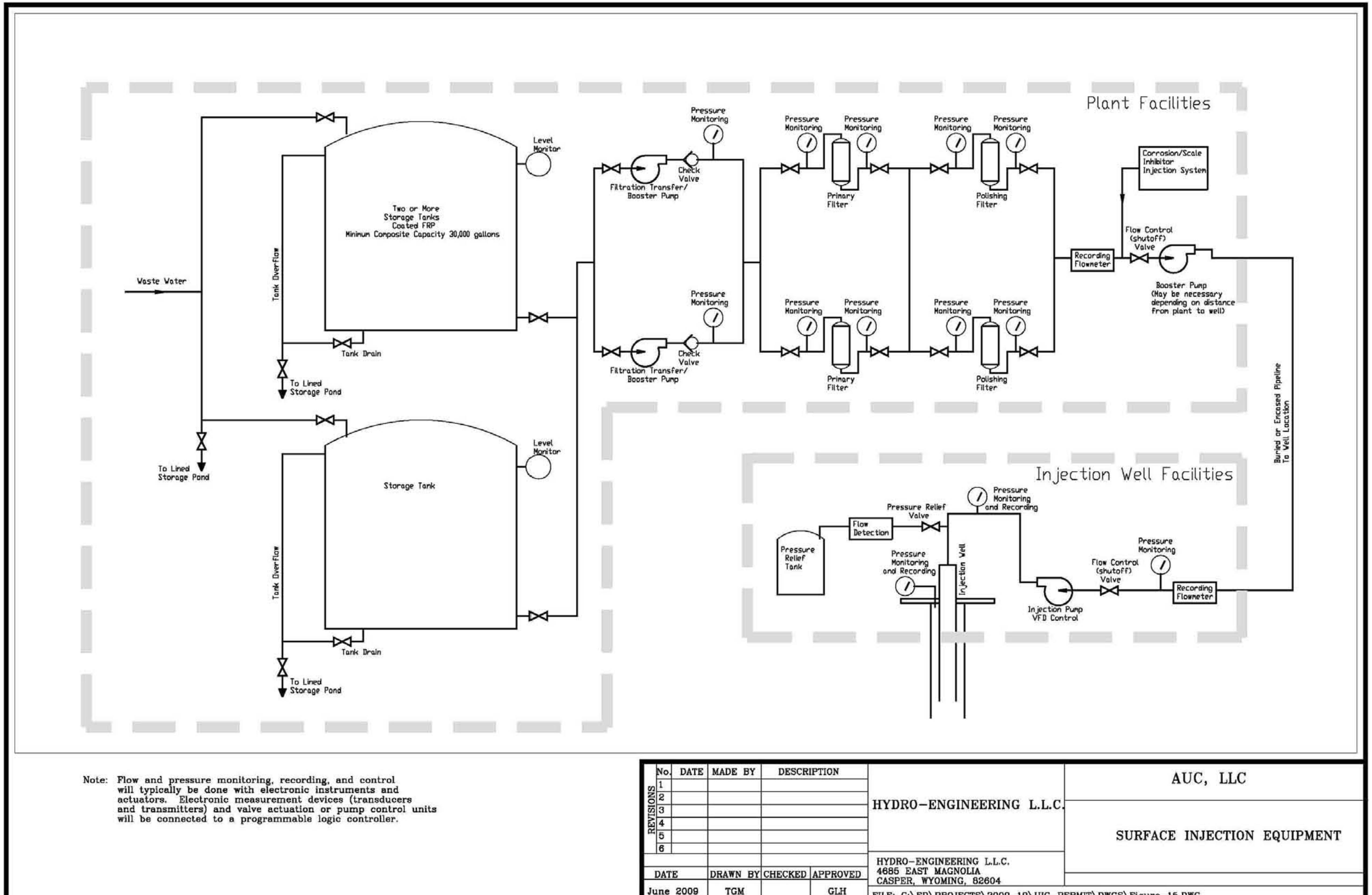


Figure 15. Surface Injection Equipment



Appendix A. Wells Penetrating Receiver

There are no wells penetrating the receiver within the AOR of the four wells. There are both producing oil wells and plugged and abandoned wells within a mile of planned well locations. The following listing includes Wyoming Oil and Gas Conservation Commission records for wells within Sections 20 thru 23 and Sections 26 thru 35 of T43N, R73W. The Wyoming Oil and Gas Conservation Commission records do not indicate the presence of wells within Sections 1 thru 6 of T42N, R73W, Section 1 of T42N, R74W, or Section 36 of T43N, R74W.

List of Appendix A Figures

Figure A-1. WOGCC Completion Report For E R Willard 1

01/23/2009

STATE OF WYOMING
OIL AND GAS CONSERVATION COMMISSION
Office of State Oil and Gas
Supervisor

Lease No.:
Unit No.:
Lease Name: E R WILLARD
Api No.: 49-005-05026
County: CAMPBELL
Well Name: E R WILLARD 1
Field: WC

Operator: ARROWHEAD EXPLORATION CO

Surface Location	Qtr-Qtr	Section	Township	Range	Latitude	Longitude
660 FNL & 660 FWL	NW NW	26	43 NORTH	73 WEST	43.67609	105.60095

Bottom Hole:

Well Class	Minerals	Elevation	Elevation KB
O	FEDERAL	0	5093 KB

First Prod	Well Status	Form 2 Status
	PA 08/29/1958	

Total Depth	Plug Back Depth	Bottom Formation	Permitted Formation	Apd Received	Apd Approved
7887	0	PARKMAN			08/10/1958

Spud Date	TD Reached	Completed
08/10/1958		08/29/1958

Hole Size	Csg Size	Csg Depth
	8 5/8	300
		0

Verbal To Plug and Abandon:
Notice of Intent To Abandon:
Subsequent Report Of Abandonment:
Plug and Abandonment Date:
Ip Oil Bbls:
Ip Gas Mcf:
Ip Water Bbls:
Cumulative Production:
Oil Bbls:
Gas Mcf:
Water Bbls:
Logs Ran:
Form 2 Filed:

Geolgical Formation	Depth
LEWIS,SH	6520
TEAPOT,MBR (PARKMAN SS)	7311
PARKMAN,SS	7575

http://wogcc.state.wy.us/QuickLook.cfm?nAPI=505026 1/23/2009

Figure A-2. WOGCC Completion Report For Anderman 1-21

01/23/2009

STATE OF WYOMING

OIL AND GAS CONSERVATION COMMISSION

Office of State Oil and Gas Supervisor

Lease No.	Unit No.	Lease Name	Api No.	County	Well Name	Field
PATENTED		ANDERMAN	49-005-24167	CAMPBELL	ANDERMAN 1-21	K-BAR

Operator: **EXCO RESOURCES INC**

Surface Location	Qtr-Qtr	Section	Township	Range	Latitude	Longitude	Well Class	Minerals	Elevation	Elevation KB
570 FSL & 705 FEL	SE SE	21	43 NORTH	73 WEST	43.67978	105.62658	O	FEE	0	5202

Bottom Hole	First Prod	Well Status	Form 2 Status
	04/23/1976	PO 04/23/1976	PR 11/2008

Total Depth	Plug Back Depth	Bottom Formation	Permitted Formation	Apd Received	Apd Approved	Spud Date	TD Reached	Completed
8868	0	SUSSEX	PARKMAN		02/11/1976	02/11/1976		05/20/1976

Verbal To Plug and Abandon	Notice of Intent To Abandon	Hole Size	Csg Size	Csg Depth
			5 1/2	7997

Subsequent Report Of Abandonment	Plug and Abandonment Date	Hole Size	Csg Size	Csg Depth
			8 5/8	512

Ip Oil Bbls	Ip Gas Mcf	Ip Water Bbls
90		102

Cumulative Production	Oil Bbls	Gas Mcf	Water Bbls
Jan 1978 To Nov 2008	90,945	0	59,708

Logs Ran	Form 2 Filed
	PARKMAN

Top Perfs	Bottom Perfs	Holes/Ft	Size	Purpose	Type	Prod Interval Top	Prod Interval Bot	Formation
7771	7814							

Form Date	Submission	Action
1994/11/14	FORM 4A	SEVERANCE TAX REDUCTION

Geological Formation	Depth	
TECKLA,SAND MBR (LEWIS SH)	7168	
TEAPOT,MBR (PARKMAN SS)	7493	
PARKMAN,SS	7733	
SUSSEX,SS	8723	

Figure A-3. WOGCC Completion Report For Skyline Federal 1-23

01/23/2009

STATE OF WYOMING

OIL AND GAS CONSERVATION COMMISSION

Office of State Oil and Gas Supervisor

Lease No.	WYW5331
Unit No.	
Lease Name	SKYLINE FEDERAL
Api No.	49-005-24260
County	CAMPBELL
Well Name	SKYLINE FEDERAL 1-23
Operator	MARLIN OIL COMPANY LLC
Field	K-BAR

Surface Location	Qtr-Qtr	Section	Township	Range	Latitude	Longitude
1980 FSL & 660 FEL	NE SE	23	43 NORTH	73 WEST	43.68327	105.58565

Bottom Hole

Well Class	Minerals	Elevation	Elevation KB
O	FEDERAL	5080	5090

First Prod	Well Status	Form 2 Status
08/14/1976	PO 12/31/1986	PR 09/2008

Total Depth	Plug Back Depth	Bottom Formation	Permitted Formation	Apd Received	Apd Approved
7717	0	PARKMAN	PARKMAN		06/13/1976

Spud Date	TD Reached	Completed
06/13/1976		08/15/1976

Verbal To Plug and Abandon	Notice of Intent To Abandon
Subsequent Report Of Abandonment	Plug and Abandonment Date

Hole Size	Csg Size	Csg Depth
	5 1/2	7717
	8 5/8	1460

Ip Oil Bbls	Ip Gas Mcf	Ip Water Bbls
43	40	160

Cumulative Production	Oil Bbls	Gas Mcf	Water Bbls
Jan 1978 To Sep 2008	54,376	45,369	111,704

Logs Ran

Form 2 Filed
PARKMAN

Top Perfs	Bottom Perfs	Holes/Ft	Size	Purpose	Type	Prod Interval Top	Prod Interval Bot	Formation
7506	7576							

Geolgical Formation	Depth
WASATCH,FM	0
FORT UNION,FM	1060
LANCE,FM	4300
FOX HILLS,FM	6272
LEWIS,SH	6362
TEAPOT,MBR (PARKMAN SS)	7234
PARKMAN,SS	7505
PARKMAN,SS	7505

http://wogcc.state.wy.us/QuickLook.cfm?nAPI=524260 1/23/2009

Figure A-4. WOGCC Completion Report For Sinadin 1

01/23/2009

STATE OF WYOMING
OIL AND GAS CONSERVATION COMMISSION
Office of State Oil and Gas Supervisor

Lease No.	FEE
Unit No.	
Lease Name	SINADIN
Api No.	49-005-24704
County	CAMPBELL
Well Name	SINADIN 1
Operator	BP AMERICA PRODUCTION COMPANY
Field	WC
Surface Location	660 FSL & 1982 FEL
Qtr-Qtr	SW SE
Section	31
Township	43 NORTH
Range	73 WEST
Latitude	43.65058
Longitude	105.67147
Well Class	O
Minerals	FEE
Elevation	0
Elevation KB	5110
Bottom Hole	
First Prod	
Well Status	PA 07/27/1977
Form 2 Status	
Total Depth	9456
Plug Back Depth	0
Bottom Formation	SHANNON
Permitted Formation	
Apd Received	
Apd Approved	06/26/1977
Spud Date	06/26/1977
TD Reached	
Completed	07/27/1977
Verbal To Plug and Abandon	
Notice of Intent To Abandon	
Hole Size	
Csg Size	18
Csg Depth	30
Subsequent Report Of Abandonment	
Plug and Abandonment Date	
Hole Size	
Csg Size	8 5/8
Csg Depth	1515
Ip Oil Bbls	
Ip Gas Mcf	
Ip Water Bbls	
Cumulative Production	
Oil Bbls	
Gas Mcf	
Water Bbls	
Logs Ran	
Form 2 Filed	

Geolgical Formation	Depth
TECKLA,SAND MBR (LEWIS SH)	7164
TEAPOT,MBR (PARKMAN SS)	7582
PARKMAN,SS	7886
SUSSEX,SS	8915
SHANNON,SS MBR (CODY SH)	9365

Figure A-5. WOGCC Completion Report For Willard 22-22

01/23/2009

STATE OF WYOMING
OIL AND GAS CONSERVATION COMMISSION
Office of State Oil and Gas Supervisor

Lease No.	
Unit No.	
Lease Name	WILLARD
Api No.	49-005-29105
County	CAMPBELL
Well Name	WILLARD 22-22
Operator	TRUE OIL LLC
Field	K-BAR

Surface Location	Qtr-Qtr	Section	Township	Range	Latitude	Longitude
1935 FNL & 1825 FL	SE NW	22	43 NORTH	73 WEST	43.68731	105.61056

Bottom Hole	Well Class	Minerals	Elevation	Elevation KB
	O	FEE	5254GR	5268 KB

First Prod	Well Status	Form 2 Status
	PA 06/11/1996	

Total Depth	Plug Back Depth	Bottom Formation	Permited Formation	Apd Received	Apd Approved	Spud Date	TD Reached	Completed
12090	0	MORRISON	DAKOTA	06/16/1987	06/18/1987	08/08/1987		09/07/1987

Verbal To Plug and Abandon: 09/05/1987	Notice of Intent To Abandon: 09/22/1987	Hole Size:	Csg Size: 9 5/8	Csg Depth: 1598
Subsequent Report Of Abandonment: 06/11/1995	PA Date: 09/05/1987	Hole Size:	Csg Size:	Csg Depth: 0
Ip Oil Bbls:	Ip Gas Mcf:	Ip Water Bbls:		
Cumulative Production:	Oil Bbls: / Gas Mcf:	Water Bbls:		
Logs Ran:		Form 2 Filed:		

Form Date	Submission	Action
1987/09/22	SUBSEQUENT REPORT	PLUG AND ABANDON
1987/09/05	NOTICE OF INTENT	VERBAL PLUG AND ABANDON

Geolgical Formation	Depth	
FOX HILLS,FM	6530	
LEWIS,SH	6605	
TECKLA,SAND MBR (LEWIS SH)	7112	
TEAPOT,MBR (PARKMAN SS)	7518	
PARKMAN,SS	7784	
STEELE	8244	
SUSSEX,SS	8754	
SHANNON,SS MBR (CODY SH)	9405	
NIOBRARA,FM	10078	
CARLILE	10495	
TURNER,SANDY MBR (CARLILE SH)	10667	
FRONTIER,FM	11168	
MOWRY,MBR (SH)	11500	
MUDDY,FM	11673	
SKULL CREEK,SH	11736	
DAKOTA,FM	11878	
FUSON	11918	
LAKOTA,FM (INYAN KARA GP)	11952	
MORRISON,FM	12024	

Figure A-6. WOGCC Completion Report For Carlotta 23-31

01/23/2009

STATE OF WYOMING

OIL AND GAS CONSERVATION COMMISSION

Office of State Oil and Gas

Supervisor

Lease No.	FEE
Unit No.	
Lease Name	CARLOTTA
Api No.	49-005-29240
County	CAMPBELL
Well Name	CARLOTTA 23-31
Operator	ENCANA OIL AND GAS USA INC
Field	WC

Surface Location	Qtr-Qtr	Section	Township	Range	Latitude	Longitude	Well Class	Minerals	Elevation	Elevation KB
2105 FSL & 1955 FWL	NE SW	31	43 NORTH	73 WEST	43.65451	105.67728	O	FEE	5087	5103

Bottom Hole	First Prod	Well Status	Form 2 Status
		PA 04/24/1996	

Total Depth	Plug Back Depth	Bottom Formation	Permited Formation	Apd Received	Apd Approved	Spud Date	TD Reached	Completed
13800	0	MINNELUSA		10/26/1987	10/27/1987	11/14/1987		12/13/1987

Verbal To Plug and Abandon: 09/02/1990	Notice of Intent To Abandon: 04/24/1996	Hole Size:	Csg Size: 9 5/8	Csg Depth: 2014
Subsequent Report Of Abandonment: 04/24/1996	PA Date: 09/02/1990	Hole Size:	Csg Size: 7	Csg Depth: 10782
Ip Oil Bbls:	Ip Gas Mcf:	Ip Water Bbls:		
Cumulative Production	Oil Bbls:	Gas Mcf:	Water Bbls:	
Logs Ran: DST #1 (On File), DST #2-MIS (On File)		Form 2 Filed:		

Form Date	Submission	Action
2000/05/17	FINAL ABANDONMENT NOTICE	PLUG AND ABANDON
1996/04/24	NOTICE OF INTENT	PLUG AND ABANDON
1996/04/24	SUBSEQUENT REPORT	PLUG AND ABANDON
1996/04/10	SUBSEQUENT REPORT	WROTE NIA & SRA-RE-ENRTY
1990/09/02	NOTICE OF INTENT	VERBAL PLUG AND ABANDON
1990/09/02	SUBSEQUENT REPORT	VERBAL FOR RE-ENTRY

Geolgical Formation	Depth	
FOX HILLS,FM	6606	
LEWIS,SH	6710	
TECKLA,SAND MBR (LEWIS SH)	7146	
TEAPOT,MBR (PARKMAN SS)	7566	
PARKMAN,SS	7842	
STEELE,SH	8363	
ARDMORE,BENTONITE BEDS(CODY SH	8870	
SUSSEX,SS	8890	
SHANNON,SS MBR (CODY SH)	9290	
NIOBRARA,FM	10230	
CARLILE,MBR (CODY SH)	10644	
FRONTIER,FM	10832	
MOWRY,MBR (SH)	11670	
MUDDY,FM	11850	
SKULL CREEK,SH	11888	
DAKOTA,FM	11998	
FUSON,FM (INYAN KARA GP)	12098	
LAKOTA,FM (INYAN KARA GP)	12130	

Figure A-7. WOGCC Completion Report For Buckin Bronc Fed 1

STATE OF WYOMING
OIL AND GAS CONSERVATION COMMISSION
Office of State Oil and Gas Supervisor

01/23/2009

Lease No.	WYW138127
Unit No.	
Lease Name	BUCKIN BRONC FED
Api No.	49-005-37518
County	CAMPBELL
Well Name	BUCKIN BRONC FED 1
Field	WC
Operator	YATES PETROLEUM CORPORATION

Surface Location	Qtr-Qtr	Section	Township	Range	Latitude	Longitude
2385 FSL & 2196 FEL	NW SE	20	43 NORTH	73 WEST	43.68517	105.65214

Bottom Hole

Well Class	Minerals	Elevation	Elevation KB
O	FEDERAL	5158	0

First Prod	Well Status	Form 2 Status
03/19/2000	PO 06/02/2005	PR 11/2008

Total Depth	Plug Back Depth	Bottom Formation	Permitted Formation	Apd Received	Apd Approved
12114	11210	LAKOTA		11/01/1999	11/16/1999

Spud Date	TD Reached	Completed
11/15/1999	12/20/1999	12/07/2000

Verbal To Plug and Abandon	Notice of Intent To Abandon
Subsequent Report Of Abandonment	**Plug and Abandonment Date**

Hole Size	Csg Size	Csg Depth
12 1/4	9 5/8	1525
8 3/4	7	11407

Ip Oil Bbls	Ip Gas Mcf	Ip Water Bbls
106		18

Cumulative Production	Oil Bbls	Gas Mcf	Water Bbls
Mar 2000 To Nov 2008	81,850	34,600	86,956

Logs Ran
DRILL STEM (On File), DIGITAL ACOUSTILOG GAMMA RAY C (On File), HIGH DEFINITION INDUCTION GAMM (On File), DENSILOG-C-NEUTRON GAMMA RAY (On File), CORE ANALYSIS (On File), GAS-MUD (On File), CEMENT BOND GAMMA RAY (On File), CORE ANALYSIS (On File), GEOLOGICAL REPORT (On File), HIGH DEFINITION INDUCTION GAMM (On File), DENSILOG-C-NEUTRON GAMMA RAY (On File), DIGITAL ACOUSTILOG GAMMA RAY C (On File)

Form 2 Filed
PARKMAN-TURNER, PARKMAN

Top Perfs	Bottom Perfs	Holes/Ft	Size	Purpose	Type	Prod Interval Top	Prod Interval Bot	Formation
7768	7777		.32			7768	7777	PARKMAN
10711	10718		.42			10711	10718	TURNER

Form Date	Submission	Action
2005/06/08	SUBSEQUENT REPORT-SIGNED	RELEASE RBP & COMMINGLE
2004/11/11	SUBSEQUENT REPORT-SIGNED	PRODUCTION (START/RESUME)
2001/03/29	SUBSEQUENT REPORT	PERFORATE AND FRAC-1-11-00
2001/03/01	SUBSEQUENT REPORT	PRODUCTION (START/RESUME)
2001/03/01	SUBSEQUENT REPORT	PUT PRKM/TURNER BACK TOGETHER
2001/03/01	SUBSEQUENT REPORT	TEST PARKMAN PERFS-10/4/00
2001/03/01	SUBSEQUENT REPORT	SPUD AND CASING
2001/03/01	SUBSEQUENT REPORT	TD & PLUG BACK-11-15-99
2001/03/01	SUBSEQUENT REPORT	TD & PLUGBACK-12-20-00
2000/05/16	APPLICATION	COMINGLE
2000/03/03	APPLICATION	EXCEPTION LOCATION
2000/02/21	SUBSEQUENT REPORT	CHANGE WELL NAME & OPERATOR
2000/02/15	SUBSEQUENT REPORT	COMPLETION & NI-CHNG OF OP
1999/11/16	SUBSEQUENT REPORT	SPUD WELL
1999/11/15	NOTICE OF INTENT	SPUD WELL

http://wogcc.state.wy.us/QuickLook.cfm?nAPI=537518 1/23/2009

Figure A-8. WOGCC Completion Report For Ted 2

01/23/2009

STATE OF WYOMING

OIL AND GAS CONSERVATION COMMISSION

Office of State Oil and Gas Supervisor

Lease No.							
Unit No.							
Lease Name: TED							
Api No.: 49-005-39686							
County: CAMPBELL							
Well Name: TED 2							
Operator: YATES PETROLEUM CORPORATION						Field: K-BAR	
Surface Location: 2160 FNL & 840 FEL	Qtr-Qtr: SE NE	Section: 24	Township: 43 NORTH	Range: 73 WEST	Latitude: 43.6869	Longitude: 105.5661	Well Class: O / Minerals: FEE / Elevation: 5099 / Elevation KB: 0
Bottom Hole							First Prod: 05/12/2000 / Well Status: PG 04/17/2001 / Form 2 Status: PR 11/2008
Total Depth: 10450	Plug Back Depth: 10406	Bottom Formation: TURNER	Permitted Formation: TURNER	Apd Received: 02/08/2000	Apd Approved: 02/25/2000		Spud Date: 03/09/2000 / TD Reached: 03/24/2000 / Completed: 05/10/2000
Verbal To Plug and Abandon			Notice of Intent To Abandon				Hole Size: 24 / Csg Size: 16 / Csg Depth: 69
Subsequent Report Of Abandonment			Plug and Abandonment Date				Hole Size: 12 1/4 / Csg Size: 8 5/8 / Csg Depth: 1575
Ip Oil Bbls: 50		Ip Gas Mcf		Ip Water Bbls: 28			Hole Size: 7 7/8 / Csg Size: 5 1/2 / Csg Depth: 10450
Cumulative Production: May 2000 To Nov 2008			Oil Bbls: 23,581	Gas Mcf: 20,400			Water Bbls: 22,645
Logs Ran: DUAL INDUCTION FOCUSED 2-ARM C (On File), DENSILOG-C-NEUTRON 2ARM CALIPE (On File)							Form 2 Filed: PARKMAN-TURNER

Top Perfs	Bottom Perfs	Holes/Ft	Size	Purpose	Type	Prod Interval Top	Prod Interval Bot	Formation
7458	7468	4		120 DEG PHSG		7458	7468	PARKMAN
10237	10243	6		60 DEG PHSG		10237	10243	TURNER

Top Treated Interval	Bottom Treated Interval	Date	Treatment
7458	7468	//	FRAC W/26,124 GALS VISTAR 20 IT AND 81,200# 20/40 OTTAWA SAND
10237	10243	//	FRAC W/59,800 GALS VIKING ID-30 BORATE GEL AND 165,000# 16/30 PR-6000 RESIN COATED SAND

Form Date	Submission	Action
2001/04/06	SUBSEQUENT REPORT	PRODUCTION CASING
2001/04/06	SUBSEQUENT REPORT	PERFFORATE AND FRAC
2001/04/04	SUBSEQUENT REPORT	PRODUCTION (START/RESUME)
2000/05/16	APPLICATION	COMINGLE
2000/03/20	SUBSEQUENT REPORT	SPUD WELL
2000/03/17	NOTICE OF INTENT	BOP TEST
2000/03/17	SUBSEQUENT REPORT	BOP TEST & DRILL STEM TEST
2000/03/14	NOTICE OF INTENT	SPUD WELL

Figure A-9. WOGCC Completion Report For Raging Bull 1

01/23/2009

STATE OF WYOMING
OIL AND GAS CONSERVATION COMMISSION
Office of State Oil and Gas Supervisor

Lease No.	
Unit No.	
Lease Name	RAGING BULL
Api No.	49-005-45589
County	CAMPBELL
Well Name	RAGING BULL 1
Operator	YATES PETROLEUM CORPORATION
Field	WC

Surface Location	Qtr-Qtr	Section	Township	Range	Latitude	Longitude
660 FSL & 860 FEL	SE SE	19	43 NORTH	73 WEST	43.67997	105.66802
Bottom Hole: 660 FNL & 1980 FEL	NW NE	19	43 NORTH	73 WEST	43.69112	-105.6722

Well Class	Minerals	Elevation	Elevation KB
O	FEE	5074.5	5093

First Prod	Well Status	Form 2 Status
11/13/2003	PO 11/24/2003	FL 11/2008

Total Depth	Plug Back Depth	Bottom Formation	Permitted Formation	Apd Received	Apd Approved
10690	10204	TURNER	TURNER	08/13/2002	08/14/2002

Spud Date	TD Reached	Completed
08/11/2003		11/23/2003

Verbal To Plug and Abandon	Notice of Intent To Abandon
Subsequent Report Of Abandonment	Plug and Abandonment Date

Hole Size	Csg Size	Csg Depth
12 1/4	9 5/8	1540
8 3/4	7	10972

Ip Oil Bbls	Ip Gas Mcf	Ip Water Bbls
27		202

Cumulative Production	Oil Bbls	Gas Mcf	Water Bbls
Sep 2003 To ?	40,411	15,845	35,564

Logs Ran	Form 2 Filed
HIGH DEFINITION INDUCTION GAMM (On File), DENSILOG-C-NEUTRON GAMMA RAY (On File)	TURNER, PARKMAN

Top Perfs	Bottom Perfs	Holes/Ft	Size	Purpose	Type	Prod Interval Top	Prod Interval Bot	Formation
7738	7741	18		PRODUCTION		7738	7741	PARKMAN

Top Treated Interval	Bottom Treated Interval	Date	Treatment
7700	7702	11/23/2003	
7738	7741	11/23/2003	FRAC W/14,740G VIKING D30 X-LINKED BORATE GEL AND 33,400# 20/40 OTTAWA SAND
7800	7802	11/23/2003	PERF SQUEEZE HOLES W/100SX

Form Date	Submission	Action
2009/01/09	SUBSEQUENT REPORT	BILL CORRECTION
2003/11/24	NOTICE OF INTENT	WELL NAME CHANGE - SIGNED
2003/10/14	SUBSEQUENT REPORT	FRACTURE TREAT-SIGNED
2003/09/15	SUBSEQUENT REPORT	RECOMPLETE-SIGNED
2003/07/23	NOTICE OF INTENT	RECOMPLETE -SIGNED
2003/06/03	NOTICE OF INTENT	RECOMPLETE-SIGNED
2003/02/26	SUBSEQUENT REPORT	DIRECTIONAL DRILLING-SIGNED
2002/11/19	SUBSEQUENT REPORT	SET PRODUCTION CASING
2002/10/14	SUBSEQUENT REPORT	SET SURFACE CASING
2002/10/04	SUBSEQUENT REPORT	CORRECTED LOCATION
2002/09/26	SUBSEQUENT REPORT	SEE SUNDRY
2002/07/31	APPLICATION	CHAPTER 3, SECTION 25
2001/04/27	APPLICATION	CHAPTER 3, SEC 2 & 25

Figure A-10. WOGCC Completion Report For E R Willard

01/23/2009

STATE OF WYOMING
OIL AND GAS CONSERVATION COMMISSION
Office of State Oil and Gas Supervisor

Lease No.	
Unit No.	
Lease Name	DRAKE
Api No.	49-005-56671
County	CAMPBELL
Well Name	DRAKE 31-29
Operator	BALLARD PETROLEUM HOLDINGS LLC
Field	K-BAR

Surface Location	Qtr-Qtr	Section	Township	Range	Latitude	Longitude
575 FNL & 2096 FEL	NW NE	29	43 NORTH	73 WEST	43.67658	105.65272

Bottom Hole

Well Class	Minerals	Elevation	Elevation KB
O	FEE	5157	0

First Prod	Well Status	Form 2 Status
12/16/2006	PO 03/25/2008	PR 11/2008

Total Depth	Plug Back Depth	Bottom Formation	Permitted Formation	Apd Received	Apd Approved
8076	8030	STEEL	PARKMAN	10/31/2005	11/23/2005

Spud Date	TD Reached	Completed
08/14/2006	08/25/2006	11/14/2006

Verbal To Plug and Abandon	Notice of Intent To Abandon

Subsequent Report Of Abandonment	Plug and Abandonment Date

Hole Size	Csg Size	Csg Depth
7 7/8	5 1/2	8075
12 1/4	8 5/8	1328
7 7/8		

Ip Oil Bbls	Ip Gas Mcf	Ip Water Bbls
50		90

Cumulative Production	Oil Bbls	Gas Mcf	Water Bbls
Dec 2006 To Nov 2008	4,849	0	18,455

Logs Ran

Form 2 Filed: PARKMAN

Top Perfs	Bottom Perfs	Holes/Ft	Size	Purpose	Type	Prod Interval Top	Prod Interval Bot	Formation
7860	62	4	.46	PRODUCTION		7860	7862	PARKMAN STONE
7865	80	4	.46	PRODUCTION		7862	7880	PARKMAN STONE

Top Treated Interval	Bottom Treated Interval	Date	Treatment
		//	BORE-GEL 6 FLUID. ISIP=1536#, 5MIN= 164#, 10 MIN= 56# 15MIN=VAC.
7860	7880	//	34500# OF 20/40 SAND FRAC JOB, PUMPED AT 11.5 BPM AVG, 2505 PSI AVG, IN 391 BBLS OF

Form Date	Submission	Action
2008/03/25	SUBSEQUENT REPORT	PRODUCTION (START/RESUME)
2008/02/06	NOTICE OF INTENT	START/RESUME PRODUCTION
2007/09/14	SUBSEQUENT REPORT	FRACTURE TREAT
2007/09/14	SUBSEQUENT REPORT	SHUT IN
2007/02/15	NOTICE OF INTENT	FRACTURE TREAT
2006/12/20	SUBSEQUENT REPORT	PRODUCTION (START/RESUME)
2006/09/08	SUBSEQUENT REPORT	REPORT CORRECT ELEV

Geolgical Formation	Depth
TECKLA	71
FOX HILLS	6580
LEWIS	6702
TEAPOT	7506
PARKMAN	7820
STEEL	7890

Appendix B. Surface and Mineral Ownership, Leaseholders and Right-of-Way Owner

OWNERS OF OIL AND GAS LEASES WITHIN THE AREA OF REVIEW:

IW-1:	T43N, R73W, Section 31: SE ¼, E ½ SW ¼	Costilla Energy Inc./Ballard Petroleum LLC
	T42N, R73W, NE ¼ NW ¼	Costilla Energy Inc./Ballard Petroleum LLC
	T42N, R73W, Section 6: N ½ NE ¼	M.J. Harvey, Jr.
IW-2:	T43N, R73W, Section 29: NE ¼, E ½ NW ¼	Costilla Energy Inc./Ballard Petroleum LLC
	T43N, R73W, Section 20: S ½ SE ¼	Costilla Energy Inc./Ballard Petroleum LLC

OWNERS OF SURFACE RIGHTS WITHIN THE AREA OF REVIEW:

IW-1

Section 31, T43N, R73W, 6th PM, Section 6 PT, T42N, R73W, 6th PM

Richard W. Leavitt Trust
%Wells Fargo Real Estate
1740 Broadway Street C7300-07E
Denver, CO 80274

IW-2

Section 33: NW/4, Sec 28 S/2, T43N, R73W, 6th PM

Bernice Groves Revocable Trust
PO Box 408
Wright, WY 82732-0408

Section 33: NE/4, T43N, R73W, 6th PM

Richard W. Leavitt Revocable Trust
%Wells Fargo Real Estate
1740 Broadway Street C7300-07E
Denver, CO 80274

IW-3

Section 34: All, T43N, R73W, 6th PM

Richard W. Leavitt Revocable Trust
%Wells Fargo Real Estate
1740 Broadway Street C7300-07E
Denver, CO 80274

IW-4

Section 27: All, Sec 28: E/2

Bernice Groves Revocable Trust
PO Box 408
Wright, WY 82732-0408

OWNER OF RECORD FOR ANY OTHER PROPERTY RIGHT WITHIN THE AREA OF REVIEW:

Mineral Ownership:

IW-1

Section 31, T43N, R73W, 6th PM

Sinadin Family Mineral Trust* 100% (except coal)
% Dorothy Reichmuth, Trustee
1531 S. 77th Street
Lincoln, NE 68506

* Subject to the following obligation to share equally all income therefrom with the following life estates:

Milton Austin
1115 S. Elm
Denver, CO 80222

Nila Fern Sherard Harnden

PO Box 521
Manteca, CA 95336-0521

Everett Sherard
1553 North 1st Avenue
Upland, CA 91786

Coal Ownership:
United States of America 100%
Bureau of Land Management
Wyoming State Office
PO Box 1828
2515 Warren Avenue
Cheyenne, WY 82003

Section 6 – PT (area of review), T42N, R73W, 6th PM
Unpatented Mining Claims No. BFR-5, BFR-7, BFR-9, BFR-11, BFR-13, BFR-15, BFR-17

IW-2

Section 33: N/2, Sec 28 W/2, T43N, R73W, 6th PM
Federal Claims (via Homestead Law) held by:
Strathmore Resources
2420 Watt Court
Riverton, WY 82501

Sec 28: E/2, T43N, R73W, 6th PM
Blanche Willard Revocable Trust (Bernice and Edra) 100% . Subject to:
3.125% Nonparticipating Royalty – Drake Family LLC
3.125% Nonparticipating Royalty – Bernice Groves Revocable Trust
PO Box 408
Wright, WY 82732-0408
Sec 28: W/2, T43N, R73W, 6th PM
Federal Claims (via Homestead Law) held by:
Strathmore Resources
2420 Watt Court
Riverton, WY 82501

IW-3

Section 34: All, T43N, R73W, 6th PM
Federal Claims (via Homestead Law) held by:
Strathmore Resources
2420 Watt Court
Riverton, WY 82501

IW-4

Sec 27: W/2, T43N, R73W, 6th PM
Federal Claims (via Homestead Law) held by:
Strathmore Resources
2420 Watt Court
Riverton, WY 82501

Sec 27: E/2 and Sec 28: E/2, T43N, R73W, 6th PM

Blanche Willard Revocable Trust (Bernice and Edra) 100% . Subject to:

3.125% Nonparticipating Royalty – Drake Family LLC

3.125% Nonparticipating Royalty – Bernice Groves Revocable Trust

PO Box 408
Wright, WY 82732-0408

NMC Lease

United States of America 100%
Bureau of Land Management
Wyoming State Office
PO Box 1828
2515 Warren Avenue
Cheyenne, WY 82003

*****

Coal Ownership:

United States of America
Bureau of Land Management 100%
Wyoming State Office
PO Box 1828
2515 Warren Avenue
Cheyenne, WY 82003

Mineral leases:

Sinadin Family Mineral Trust – Energy Fuels, Ltd.
Sec 31: Lots 1, 2, 3, 4, E1/2NE1/4, SW1/4NE1/4, E1/2W1/2, SE1/4

Appendix C. Permitted Water Rights Inventory

Appropriation	Township	Range	Section	Quarter	Qtrqtr	Lots	HeadGate-Outlet-Well	Status	Supply type	Adj Uses	SW Permit Uses	SW Permit Facility name	SW Permit Applicant	SW Permit Priority	SW Permit Amount	SW Permit Unit	SW Permit Source	Gw Permit Uses	GW Permit Facility Name	GW Permit Applicant
P45984W	43N	73W	27	6	NWNW		X	PUW	ORI									MIS	RENO RANCH ISL P 1	ROCKY MOUNTAIN ENERGY COMPANY
P139973W	43N	73W	27	3	SWNE		X	GSE	ORI									STO,CBM	PICKETT CS FEE #2	YATES PETROLEUM CORP.
P128606W	43N	73W	31	15	SWSE		X	GST	ORI									CBM	LEAVITT TRUST 34-31-4373	WILLIAMS PRODUCTION RMT, COMPANY
P172728W	43N	73W	31	13	NESE		X	GSI	ORI									CBM,MIS	COSNER #43-24 C	BIG BASIN PETROLEUM, LLC
P16331S	43N	73W	31	0		L18	X	UNA	STR		STO	Leavitt 24-31-4373 Stock Reservoir	Richard Leavitt Trust-Wells Fargo** Williams Production RMT Co.	6/15/2004	5.08	ACFT	Sawbuck Draw			
P126340W	43N	73W	31	9	NESW		X	GST	ORI									CBM	ANCU LEAVITT TRUST 23-31-4373	WILLIAMS PRODUCTION RMT, COMPANY
P128608W	43N	73W	31	13	NESE			GST	ORI									CBM	LEAVITT TRUST 43-31-4373	WILLIAMS PRODUCTION RMT, COMPANY
P17710S	43N	73W	31	16	SESE		X	UNA	STR	STO	STO	Leavitt 44-31-4373 Stock Reservoir	Richard Leavitt Trust	1/30/2006	0.6	ACFT	Radio Draw			
22/12/248W	43N	73W	33	1	NENE		X	UNA	ORI											
P110734W	43N	73W	33	8	SENW				ORI									IND,MIS	House Creek 79-2	DEVON ENERGY PRODUCTION COMPANY L.P.
P119587W	43N	73W	33	8	SENW			UNA	ORI									IND	HCSU MIDDLE PLANT	DEVON ENERGY CORP. (NEVADA)
P17057S	43N	73W	33	8	SENW		X	UNA	STR		STO	Groves 22-33-4373	Bernice Groves	7/22/2005	0.22	ACFT	Spring Creek			
P145493W	42N	73W	6	5	NENW	L10	X	GST	ORI									CBM	ANCU 21-6-4273	WILLIAMS PRODUCTION RMT COMPANY
P16030S	42N	73W	6	0		L10	X	UNA	STR		STO	Leavitt 21-6-4273 Stock Reservoir	Richard Leavitt Trust** Williams Production RMT Co.	6/15/2004	1.5	ACFT	Lettuce Draw			
P59470W	42N	73W	6	1	NENE		X	PUW	ORI									MIS	FORGEY #1	INC. RUSSELL FORGEY CONSTRUCTION COMPANY
P60967W	42N	73W	6	1	NENE		X	PUW	ORI									MIS	FORGEY - #1	INC. RUSSELL FORGEY CONSTRUCTION COMPANY
P159630W	42N	73W	6	1	NENE		X	GSI	ORI									STO,CBM	LEAVITT TRUST FEDERAL 41-6-4273	WILLIAMS PRODUCTION RMT COMPANY

Appendix D. Water Quality Data

Figure D-1. UIC 98-092 Water Quality Table 5-1

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.

1105 WEST FIRST STREET • GILLETTE, WY 82716 • PHONE (307) 686-7175
FAX (307) 682-4625

TABLE 5-1

LABORATORY REPORT

TO: Energy Fuels Nuclear
ADDRESS: 6765 S. Highway 59
Gillette, WY 82718

LAB NO.: G94-7240
DATE: 4-15-94

WATER ANALYSIS

Manx Oil
Skyline 1-23
Tank Bottom at Load Line
Sampled 3-25-94
Submitted 3-25-94

CONSTITUENT	mg/l
Calcium	32
Magnesium	9
Sodium	5,560
Potassium	18
Carbonate	0
Bicarbonate	2,460
Sulfate	15
Chloride	6,910
Ammonia	1.23
Fluoride	4.80
Barium	9.70
Iron	6.78
Manganese	0.09
Strontium	8.52
Phosphate	1.5
Total Dissolved Solids @ 180°C	13,786
Total Suspended Solids @ 105°C	46
Specific Conductance @ 25°C	21,950 μmhos/cm
pH	7.80 S.U.

Figure D-2. UIC 98-092 Water Quality Table 5-2

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
1105 WEST FIRST STREET • GILLETTE, WY 82716 • PHONE (307) 686-7175
FAX (307) 682-4625

TABLE 5-2

LABORATORY REPORT

TO:	Energy Fuels Nuclear	**LAB NO.:**	G94-7241
ADDRESS:	6765 S. Highway 59 Gillette, WY 82718	**DATE:**	4-15-94

WATER ANALYSIS

DNR Oil & Gas
All Night Creek Fed 1-7
Treater Site Glass
Sampled 3-25-94
Submitted 3-25-94

CONSTITUENT	mg/l
Calcium	29
Magnesium	6
Sodium	4,548
Potassium	23
Carbonate	0
Bicarbonate	2,110
Sulfate	5
Chloride	6,248
Ammonia	3.56
Fluoride	3.50
Barium	7.19
Iron	1.09
Manganese	0.06
Strontium	7.33
Phosphate	<0.5
Total Dissolved Solids @ 180°C	12,130
Total Suspended Solids @ 105°C	34
Specific Conductance @ 25°C	18,960 μmhos/cm
pH	8.11 S.U.

Figure D-3. UIC 98-092 Water Quality Table 5-3

ENERGY LABORATORIES

ENERGY LABORATORIES, INC.
1105 WEST FIRST STREET • GILLETTE, WY 82716 • PHONE (307) 686-7175
FAX (307) 682-4625

TABLE 5-3
LABORATORY REPORT

TO: Energy Fuels Nuclear
ADDRESS: 6765 S. Highway 59
Gillette, WY 82718

LAB NO.: G94-7242
DATE: 4-15-94

WATER ANALYSIS

Central Resources
Anderman 1-21
Flow Line @ Treater
Sampled 3-25-94
Submitted 3-25-94

CONSTITUENT	mg/l
Calcium	15
Magnesium	5
Sodium	5,490
Potassium	29
Carbonate	0
Bicarbonate	2,300
Sulfate	24
Chloride	7,300
Ammonia	4.52
Fluoride	3.10
Barium	8.72
Iron	11.6
Manganese	0.63
Strontium	7.64
Phosphate	<0.5
Total Dissolved Solids @ 180°C	13,840
Total Suspended Solids @ 105°C	144
Specific Conductance @ 25°C	22,060 µmhos/cm
pH	8.32 S.U.

Figure D-4. UIC 98-092 Water Quality Table 5-4

TABLE 5-4

WATER QUALITY DATA FOR THE TEAPOT SANDSTONE

Location					Depth (feet)	Equivalent NaCl (ppm)	Data Source
T (N)	R (W)	Sec.	¼	¼			
39	72	4	NE	NE	7,380-7,406	5,023	PI
35	70	2				19,133	Hall
34	70	24				20,207	Hall

Data Source: Hall Halliburton (Kundert,1994).

PI Petroleum Information, 1985. Rocky Mountain Formation Water Resistivities Catalog.

Figure D-5. UIC 98-092 Water Quality Table 5-5

TABLE 5-5
WATER QUALITY DATA FOR THE PARKMAN SANDSTONE

Location					Depth (feet)	Equivalent NaCl (ppm)	TDS (mg/l)	Data Source
T (N)	R (W)	Sec.	¼	¼				
44	73	5			7,144-7,304	7,586	7,745*	PI
43	73	7	NE	SW	7,653-7,690	--	12,130	EFNI**
43	73	9	SW	SW	7,666-7,740	13,366	13,647*	PI
43	73	21	SE	SE	7,771-7,814	--	13,840	EFNI**
43	73	23	NE	SE	7,506-7,576	--	13,786	EFNI**
42	74	24	SW	NW	8,130-8,155	9,616	9,818*	PI
42	73	11	SW	SE	8,038-8,070	5,821	5,943*	PI
42	74	24	SW	NW	8,130-8,155	9,616	9,818*	PI
41	73	17					12,292	Hall

Data Source: Hall Halliburton (Kundert-1994).

PI Petroleum Information, 1985. Rocky Mountain Formation Water Resistivities Catalog.

* Estimated by Hydro-Search, Inc. from equivalent NaCl/TDS ratios for Parkman SS based on chemical analysis data in Powder River Basin.

** Chemical Analysis Data, Samples taken @ surface by Energy Fuels Nuclear Inc. (EFNI) from currently active Parkman oil producers.

Figure D-6. UIC 98-092 Water Quality Table 5-6

TABLE 5-6
WATER QUALITY DATA FROM THE SOLUTION MINING PRODUCTION, INJECTION AND MONITOR WELLS (WASATCH FORMATION)

Well	Location*	Sample Date	Depth Drilled (feet)	TDS (mg/l)
Project Wells				
RI1	1090916 366496	930624	380	705
RI2	1093887 368844	930624	438	1340
RI3	1096336 373133	930622	400	1180
RI4	1097986 376492	930622	405	931
RI5	1095673 379417	930629	460	1339
RI6	1092287 378192	930629	490	1385
RI7	1088861 378118	930630	330	569
RI15U	1091190 377780	930819	245	381
RI24U	1098019 376479	930819	146	568
RI25U	1090965 366494	930819	116	1685
RI30U	1094256 370479	930819	160	1579
RI42C	1091360 378900	931007	400	1339
MP-08	1094105 373754	931007	460	589

Figure D-7. UIC 98-092 Water Quality Table 5-6a

TABLE 5-6a WATER QUALITY DATA FROM REGIONAL WELLS (WASATCH FORMATION)				
Well	**Location***	**Sample Date**	**Depth Drilled (feet)**	**TDS (mg/l)**
Regional Wells				
	41721 dd	761130		2900
	41734 aa	761130		1640
	427220 cd	761130		2720
	427220 cd2	761130		5180
McClure Well	42732 ba2	761130	200	1510
Hi-Way Well	42735 ba	820727	350	775
Deep Well #2a	42738 ca	761130	450	1680
RI - 9	427310 cb	930630	360	2354
	427320 ac	761130		1220
RI - 10	427323 bc	820718	270	1350
	427327 ac	790725		785
RI - 11	427327 ad	820719	185	975
	427331 dc	761130		412
	427336 bb	761130		575

Figure D-8. UIC 98-092 Water Quality Table 5-6a (continued)

TABLE 5-6a (Continued)
WATER QUALITY DATA FROM REGIONAL WELLS
(WASATCH FORMATION)

Well	Location*	Sample Date	Depth Drilled (feet)	TDS (mg/l)
Regional Wells				
Red Well	427412 db	761130	234	2210
Cosner #10	437230 dc	761130	55	797
	437236 ac	761130		3330
	43731 db	820727		825
Willard #6	437310 dc	761130	105	688
Underwood #8	437325 bc	761130	350	276
	437326 bb	761130		2220
Willard #5	437328 ab	761130	80	1100
Willard #3	437332 ab	761130		1960
	437425 da	761130		404

*Location — Project Wells: State Plane Coordinates - Northing Easting
Regional Wells: TN, RW, Section, Descending Quarter Sections
ac = NE 160 acres
SW 40 acres

Figure D-9. UIC 98-092 Water Quality Table 5-7

TABLE 5-7

WATER QUALITY DATA - ORE SAND AND UPPER AQUIFER WELLS

Ore Sand Wells: ***RI-1, 2, 3, 4, 5, 6, 7, 9, 42***
Upper Aquifer Wells: ***RI-24U, RI-25U, RI-30U***

Constituent*	ORE SAND		UPPER AQUIFER	
	Mean	Two Std Dev I	Mean	Two Std Dev I
Ca	134	214	173	262
Mg	32.7	62.4	44.2	78.4
Na	186	140	106	96
K	8.16	5.94	5.20	5.16
Cl	14.0	16.4	12.1	19
SULFATE	666	794	564	846
BICARBONAT	201	304	276	200
CARBONATE	4.75	19.35	2.31	13.08
pH (std units)	8.09	2.06	7.79	1.5
pHf (std units)	7.29	1.04	6.95	1.08
COND(umhos)	1539	1038	1434	1458
CONDf(unhos)	1228	942	1080	1180
TDS	1217	1162	1101	1232
HARD	507	874	--	--
NO_2	.037	.092	.070	.102
ALK	175	242	241	150
Al	.139	.406	ND	ND
As	.005	.014	.001	.002
Ba	.044	.094	ND	ND
B	.148	.590	ND	ND
Cd	.002	.004	ND	ND
Cr	ND	ND	ND	ND
Cu	ND	ND	ND	ND
F	0.192	.438	.449	.930
Fe	.558	1.854	.498	1.462
Pb	ND	ND	ND	ND
Mn	.115	.240	.217	.400
Hg	ND	ND	ND	ND
Mo	ND	ND	ND	ND
Ni	ND	ND	ND	ND
NH_3	.111	.266	.270	.256
NO_3	.301	1.852	.086	.206

Figure D-10. UIC 98-092 Water Quality Table 5-7 (continued)

TABLE 5-7

WATER QUALITY DATA - ORE SAND AND UPPER AQUIFER WELLS

Ore Sand Wells: *RI-1, 2, 3, 4, 5, 6, 7, 9, 42*

Upper Aquifer Wells: *RI-24U, RI-25U, RI-30U*

Constituent*	ORE SAND		UPPER AQUIFER	
	Mean	Two Std Dev I	Mean	Two Std Dev I
Se	.004	.01	.001	.002
Ag	ND	ND	ND	ND
V	ND	ND	ND	ND
Zn	.048	.16	.029	.046
U	.031	.112	.022	.064
Ra226 (pCi/l)	51.9	158	1.46	1.52
Th230 (pCi/l)	1.41	2.66	--	--
SiO_2	4.21	11.14	15.0	5.8
Eh (mv)	180	142	--	--

*All units are mg/l except as noted.

Figure D-11. UIC 98-092 Water Quality Tables 5-8 and 5-9

TABLE 5-8

WATER QUALITY DATA FOR THE WASATCH FORMATION

Location			Depth (feet)	TDS (mg/l)
T (N)	R (W)	Sec.		
44	73	35	205	1,070
44	72	15	145	2,660
43	72	11	160	2,700
43	72	11	240	1,780
43	72	16	345	1,790
43	72	18	261	1,030
43	72	21	550	367
42	74	6	225	941

Data Source: USGS United States Geological Survey, Chemical Analysis Data (Hodson, et.al. - 1971).

TABLE 5-9

WATER QUALITY DATA FOR THE FORT UNION FORMATION

Location			Depth (feet)	TDS (mg/l)
T (N)	R (W)	Sec.		
43	72	11	485	314

Data Source: USGS United States Geological Survey, Chemical Analysis Data (Hodson, et.al. - 1971).

Appendix E. Drilling Prognoses for Disposal Wells

The well history and drilling prognoses in this section were derived primarily from the UIC 98-092 permit application. Much of the information presented is duplicated from Section 7 of UIC 98-092. More recent drilling prognoses from other well installations in the area were also reviewed for changes in installation requirements.

Well History for IW-1

Well History of Sinadin #1, Existing Well to be converted to Class 1 Non-Hazardous Injection Well. The primary objective of this well was the Shannon Sandstone. No coring and/or Dill Stem Testing (DST) were done. The well was plugged with 8 open hole cement plugs and also plugged at the surface on 7/29/77. There is a minor conflict in the records for surface elevation at the well site with a recorded surface elevation ranging from 5110 feet above MSL to 5118 feet above MSL. This minor discrepancy does not appreciably affect the anticipated completion.

Operator: Amoco Production
Well: Sinadin #1
Location: SW ¼, SE ¼, Section 31, T43N R73W, 660' FSL, 1982'FEL
County: Campbell Co., WY
Spud Date: June 26, 1977
Completion Date: July 27, 1977
Type of Completion: Cased hole/perforated
Elevation: 5118' GL (Est.)
Total Depth: 9,456'
Electric Logs: Induction-Laterolog 1,504'-9,450' 7/27/77
Borehole Compensated 1,504'-9,445' 7/27/77
Sonic Log
Compensated Formation 6,800'-9,455' 7/27/77
Density Log (Logged by Schlumberger)
Bottom Formation: Steele Shale
Well Status: Dry and abandoned (D&A)

Dry/P&A (7/29/77):
Plug #1 35 Sx Class "G" @ 9,415'
Plug #2 35 Sx Class "G" @ 8,965'
Plug #3 35 Sx Class "G" @ 7,918'
Plug #4 35 Sx Class "G" @ 7,632'
Plug #5 35 Sx Class "G" @ 7,214'
Plug #6 50 Sx Class "G" @ 6,750'
Plug #7 35 Sx Class "G" @ 4,100'
Plug #8 60 Sx Class "G" @ 1,600'
Plug #9 10 Sx Class "G" @ Surface
Note: Plugs #1 and #2 will be left in place during recompletion as an injection well.

Drilling Prognosis for IW-1

Operator: AUC, LLC
Well: IW-1
Location: SW ¼, SE ¼, Section 31, T43N R73W, 660' FSL, 1982'FEL
County: Campbell Co., WY
Elevation: 5118' GL (Est.)

Estimated Formation Tops (depth in feet from ground surface):

Tertiary	Surface
Fox Hills	6635'
Lewis	6730'
Teckla ss	7255'
Teapot ss	7535'
Parkman ss	7860'
Lower Parkman ss	8330'
T.D.	9456'

Hole Size:
13 3/8" to 1,515'
7 7/8" 1,515' to T.D.

Casing/Tubing Program:

Conductor: 0' - 30', 18" casing - Existing

Surface Casing:
0 - 1,515'-8 5/8", 24#/ft. in a 13 3/8" Hole – Existing casing cemented to surface

Production Casing:

Interval	Net '	Specifications
0' – 6,000'	6,000'	5 1/2", 17#/ft., K-55
6,000' – 8,400'	2,400'	5 1/2", 17#/ft., N-80
Totals	8,400'	

Injection Tubing:
2 7/8" 6.5# J-55 at ± 7,450'

Injection Packer:
5 ½" x 2 7/8" carbon steel packer with 20 feet of tailpipe @ ± 7,450'

Annular Fluid:
Inhibited brine/fresh water.

Cementing Program:

Conductor: 2 cubic yard of cement - existing

Surface Casing: Cemented to surface with 1120 sx Class G cement - existing

Production Casing:

1st Stage Cement:

245 sx Premium
Yield: 1.20 cu.ft/sx
Density: 15.60 lb/gal
Water Ratio: 5.27 gal/sx

2nd Stage Cement

Lead:
555 sx Light Cement
Yield: 2.26 cu.ft/sx
Density: 11.80 lb/gal
Water Ratio: 13.00 gal/sx

Tail:
180 sx Light Cement
Yield: 1.20 cu.ft/sx
Density: 15.60 lb/gal
Water Ratio: 5.28 gal/sx

Cement Stage Collar: ± 7,000 feet

Open Hole Logging Program:

Utilize logs obtained during drilling of Sinadin #1 on 7/27/77

Induction-Latero log 1,504'-9,450' Schlumberger
BHC Sonic Log 1,504'-9,445' Schlumberger
FDC Log 6,800'-9,445' Schlumberger

Cased Hole Logs:

Production Casing:

Cement Bond Log (CBL) 0'-8,400'
Baseline Temperature Survey 0'-8,400'
Electromagnetic Casing Inspection Log 0'-8,400'
Radioactive Tracer Survey 0'-8,400'

Formation Evaluation:

Quartz Crystal BHP 0'-8,400'
Static Survey and Pressure Fall off

Core: None

DST's: Proposed – DST's for Teapot and Parkman injection zones.

Mud Logging Unit: None

Samples:

Representative formation water samples will be collected (if possible) during DST's for the Teapot and Parkman Sandstones. After recovery, samples will be sent to a qualified laboratory for analysis. All sampling procedures will follow WDEQ guidelines for sampling methods/protocols, QA/QC, chain of custody, etc.

Proposed Completion Procedure:

The following is a step-by-step description of what will be required, at minimum, to convert the existing dry and abandoned well (Sinadin #1) into a disposal well (IW-1):

1. Notify the Wyoming Department of Environmental Quality (WDEQ) of workover start-up schedule.
2. Move in and rig-up workover rig and peripheral equipment.
3. Install blowout prevention and equipment that conforms with Section 23 of Chapter 3 of the Wyoming Oil and Gas Conservation Commission Rules. Proposed equipment is as follows:
    - Rotating Head
    - Annular Preventer
    - Blind Rams (4.5")
    - Pipe Rams
    - Drilling Spool with 2-3" outlets
    - Casing Head
    - Kill line equipped with 2-2" x 5,000 psi valves and 1-2" x 5,000 psi check valve minimum
    - Choke line equipped with 2-3" 5,000 psi valves
    - Choke manifold equipped with 2-3" 5,000 psi valves, 4-3" 5,000 psi wing outlet valves, a remote operated choke, a manual choke, 2-3" x 5,000 psi valves downstream of the remote chokes, 2-3" x 5,000 psi valves downstream of the manual choke and pressure gauge. Bypass line from flare line to mud gas separator line.
    - Upper Kelly cock with handle available on floor
    - Full opening internal blowout preventer or drill pipe safety valve to fit all connections
    - Minimum 5,000 psi working pressure rating for equipment

The well has an existing 8 5/8" 24# surface casing at 1515 feet in 13 3/8" hole and is cemented to the surface.

4. Pick up 7 7/8" bit and go in hole with same. Drill out the cement plugs at surface, 1600 feet, 4100 feet, 6750 feet, 7214 feet, 7632 feet, and 7918 feet. Leave the existing bottom two cement plugs at 8965 feet and 9415 feet in place.
5. Cleanout drilling mud and debris in hole to below the Parkman Sandstone at approximately 8400 feet.
6. Evaluate existing open hole logs.

7. Run Drill Stem Tests (DSTs) for the Teapot and Parkman injection zones and collect fluid samples from each of the zones. Evaluate DST data.
8. Circulate and condition mud prior to running the 5 ½” protection casing.
9. Notify WDEQ of 5 ½” long string casing cementing and cased hole logging schedules.
10. Run 5 ½” production casing as per described casing program.
11. Cement production casing as per described cementing program.
12. Go in hole with 4 ¾” bit and clean out to the top of the 5 ½” float collar (FC). Pressure test the 5 ½” casing per WDEQ-WQD requirements.
13. Circulate mud out of the hole with clean brine.
14. Run cement bond and electromagnetic casing inspection/electronic caliper logs over the length of the 5 ½” casing extending from the FC back to the surface.
15. Perforate the Teapot and Parkman formation selectively.
16. Perform step-rate injection test/falloff to evaluate potential performance. Include spinner survey and quartz crystal bottom-hole pressure gauge to determine flow distribution and performance.
17. Notify WDEQ of radioactive tracer logging schedule.
18. Run radioactive tracer survey to demonstrate mechanical integrity.
19. Stimulate if required.
20. Run packer with 20 feet of 2 7/8” tailpipe on work string and set packer at approximately 7450 feet.
21. Go in hole with 2 7/8” O.D. 6.5 #J-55 injection string and seal assembly.
22. Space out 2 7/8” injection tubing.
23. Circulate corrosion inhibiter fluid down annulus side.
24. Latch injection string into packer and install wellhead.
25. Notify WDEQ of annulus pressure test.
26. Pressure test annulus as per WDEQ to demonstrate mechanical integrity.
27. Rig down and move out.
28. Prepare final report.

Drilling Prognoses for IW-2, IW-3 and IW-4

The drilling prognoses for proposed injection wells IW-2, IW-3 and IW-4 are very similar and are included within this section. The prognoses were developed from that of well IW-1 as included in UIC 98-092 with some modification to accommodate site specific conditions. The location of each of these three proposed well can be changed to within a 301 foot radius of the proposed location as described in Section 5. This results in a range of potential surface elevations of up to 55 feet and the corresponding potential changes in depth to formation tops. Hence, the cited depths are subject to changes of several tens of feet due to variable surface elevation in addition to the potential depth changes resulting from the differential between projected and actual geologic structure. Where possible, the well construction procedures, depths and completion techniques are presented in a common format within these prognoses.

<u>Well IW-2 Location and Structure Information</u>

Operator:	AUC, LLC
Well:	IW-2
Location:	NW ¼ , NE ¼, Section 33, T43N R73W
County:	Campbell Co., WY
Elevation:	5275' GL (Est.)

Estimated Formation Tops (depth in feet from ground surface):

Tertiary	Surface
Fox Hills	6680'
Lewis	6800'
Teckla ss	7220'
Teapot ss	7600'
Parkman ss	7880'
Lower Parkman ss	8200'
T.D.	± 8,350'

<u>Well IW-3 Location and Structure Information</u>

Operator:	AUC, LLC
Well:	IW-3
Location:	SW ¼ , NE ¼, Section 34, T43N R73W
County:	Campbell Co., WY
Elevation:	5200' GL (Est.)

Estimated Formation Tops (depth in feet from ground surface):

Tertiary	Surface
Fox Hills	6550'
Lewis	6680'
Teckla ss	7100'
Teapot ss	7480'
Parkman ss	7750'
Lower Parkman ss	8050'
T.D.	± 8,200'

Well IW-4 Location and Structure Information

Operator:	AUC, LLC
Well:	IW-4
Location:	NW ¼, Section 27, T43N R73W
County:	Campbell Co., WY
Elevation:	5220' GL (Est.)

Estimated Formation Tops (depth in feet from ground surface):

Tertiary	Surface
Fox Hills	6580'
Lewis	6700'
Teckla ss	7120'
Teapot ss	7500'
Parkman ss	7770'
Lower Parkman ss	8050'
T.D.	± 8,200'

Wells IW-2, IW-3, and IW-4 Installation

The following installation and completion information generally applies for wells IW-2, IW-3 and IW-4. Volume calculations (e.g. cementing program) are based upon the projected completion of well IW-2, and will differ slightly for wells IW-3 and IW-4. The proposed cementing program from UIC 98-092 was used as the basis for cementing program included below, with some modification for differing hole sizes and depths.

Hole Size:

12 ¼ " to 1300'
7 7/8" 1300' to T.D.

Casing/Tubing Program:

Conductor:

0' - 50'-16" O.D., 65 lb/ft, H-40 or equivalent in 20" hole.

Surface Casing:

0 - 1300'-8 5/8" O.D., 24 lb/ft, K-55 or equivalent in 12 ¼ " hole.

Production Casing:

Interval	Net '	Specifications
0' – 6,000'	6,000'	5 ½ ", 17 lb/ft., J/K-55
6,000' – T.D.	2,200' to 2,350'	5 ½ ", 17 lb/ft., N-80
Totals	8,200' to 8,350'	

Injection String:

2 7/8" 6.5# J-55 at ± 7,450'

Injection Packer:

5 ½" x 2 7/8" carbon steel packer with 20 feet of tailpipe @ ± 7,450'

Annular Fluid:

Inhibited brine/fresh water.

Cementing Program:

Check water quality and compatibility for all cement slurries.

Conductor:

± 50 feet to surface cemented with ± 2 cubic yards

Surface Casing:

± 1300 feet to surface cemented
(310 sx. light premium – lead and 310 sx. premium – tail, approx. 100% excess)

Production Casing:

1st Stage Cement: (T.D. to 7000' plus 20%)

235 sx Premium

Yield:	1.20 cu.ft/sx
Density:	15.60 lb/gal
Water Ratio:	5.27 gal/sx

2nd Stage Cement: (7000' to surface plus 20%)

Lead:

560 sx Light Cement

Yield:	2.26 cu.ft/sx
Density:	11.80 lb/gal
Water Ratio:	13.00 gal/sx

Tail:

185 sx Light Cement

Yield:	1.20 cu.ft/sx
Density:	15.60 lb/gal
Water Ratio:	5.28 gal/sx

Cement Stage Collar: ± 7,000 feet

Cement volumes will be recalculated after caliper logging.

Open Hole Logging Program:

Surface Interval:

12 ¼ " hole, 0'-1300'

Induction Electric (IES) Caliper

Production/Injection Interval:
7 7/8" hole 1300'- TD
Dual Induction (DIL)
Gamma Ray/Neutron Caliper
Formation Density Compensated
Other logs (e.g. CNL, SFL) at the discretion of operator

Cased Hole Logs:

Surface Casing:
Temperature Log 0'-1300'

Production Casing:
Cement Bond Log (CBL) 0'- T.D.
Baseline Temperature Survey 0'- T.D.
Electromagnetic Casing Inspection Log 0'- T.D.
Radioactive Tracer Survey 0'- T.D.

Formation Evaluation:
Quartz Crystal BHP 0'- T.D. minus 100'
Static Survey and Pressure Fall off
Spinner Survey 0'- T.D.

Core:

Two – 30'x3" full hole cores may be collected in well IW-2; one each from within the following formations.

Formation	IW-2 Top/Bottom
Teapot Formation	± 7,600 – 7,770
Parkman Formation	± 7,880 – 8,280

After recovery, the cores are to be sent to a qualified laboratory for a minimum analysis of:

1. Permeability – vertical and horizontal
2. Porosity – total
3. Saturation – water, gas and oil
4. Lithologic description

Coring in wells IW-3 and IW-4 will be at the discretion of the operator.

DST's: Proposed DST's in Teapot and Parkman sandstone receiver zones.

Mud Logging Unit: None

Samples:

Representative formation water samples will be collected during DST's for the Teapot and Parkman Sandstones. After recovery, samples will be sent to a qualified laboratory for analysis. All sampling procedures will follow WDEQ guidelines for sampling methods/protocols, QA/QC, chain of custody, etc.

Proposed Completion Procedure:

The following is a step-by-step description required, at minimum, to drill and install wells IW-2, IW-3 and IW-4:

1. Notify the Wyoming Department of Environmental Quality (WDEQ) of start-up schedule.
2. Move in and rig up drilling rig and peripheral equipment.
3. Install 16" O.D., 65lb/ft., H-40, or equivalent, conductor casing into bedrock @ ±50 feet.
4. Drill 12 ¼ " surface hole to a depth of ± 1300".
5. Upon reaching surface casing depth of 1300' ±, condition mud and run open hole logs as per logging program.
6. Circulate and condition mud/open hole prior to running surface casing.
7. Notify WDEQ of surface casing cement and temperature logging schedule.
8. Run ± 1300' of 8 5/8", 24 lb/ft, K-55 surface casing.
9. Cement surface casing back to surface as per the attached cement program.
10. Wait on cement as per cement company recommendation prior to running temperature log
11. Cut off 16" and 8 5/8" at ground level and install blowout prevention and equipment that conforms with Section 23 of Chapter 3 of the Wyoming Oil and Gas Conservation Commission Rules. Proposed equipment is as follows:
    - Rotating Head
    - Annular Preventer
    - Blind Rams (4.5")
    - Pipe Rams
    - Drilling Spool with 2-3" outlets
    - Casing Head
    - Kill line equipped with 2-2" x 5,000 psi valves and 1-2" x 5,000 psi check valve minimum
    - Choke line equipped with 2-3" 5,000 psi valves
    - Choke manifold equipped with 2-3" 5,000 psi valves, 4-3" 5,000 psi wing outlet valves, a remote operated choke, a manual choke, 2-3" x 5,000 psi valves downstream of the remote chokes, 2-3" x 5,000 psi valves downstream of the manual choke and pressure gauge. Bypass line from flare line to mud gas separator line.
    - Upper Kelly cock with handle available on floor
    - Full opening internal blowout preventer or drill pipe safety valve to fit all connections
    - Minimum 5,000 psi working pressure rating for equipment
12. Pressure test the 8 5/8" casing as required by the WDEQ.
13. Pick up 7 7/8" bit and go in hole with same. Drill out float equipment.
14. Condition mud prior to drilling new formation.

15. Drill 7 7/8" hole to the top of the Teapot Sandstone (top estimated at 7,580'). Exact depth to be selected by geologist.
16. Attempt a 30' full-hole core of the Teapot Sandstone.
17. Ream cored interval and continue drilling 7 7/8" hole to the top of the Parkman Sandstone (top estimated at 7,870'). Exact depth to be selected by geologist.
18. Attempt a 30' full-hole core of the Parkman Sandstone. Evaluate core data.
19. Ream cored interval and continue drilling 7 7/8" hole to approximately 100' below the base of Parkman Sandstone (estimated at 8,350').
20. Run open hole logs as per attached logging program. Evaluate logs. Set a DST tool in the Parkman Sandstone. Perform a DST and collect a fluid sample of the Parkman. Evaluate DST data. DST test for Teapot may be conducted if electric logs show potentially favorable injection zones.
21. Circulate and condition mud prior to running production casing.
22. Notify WDEQ of surface casing cement and cased hole logging schedule.
23. Run 5 ½ " production casing as per descried casing program.
24. Cement production casing as per described cementing program.
25. Go in hole with 4 ¼" bit and clean out the top of the 5 ½ " float collar. Pressure test the 5 ½" production casing as per the WDEQ.
26. Circulate mud out of the hole with brine.
27. Run cement bond and electromagnetic casing inspection/electronic caliper logs over the length of the 5 ½" production casing extending from the float collar back to the surface.
28. Perforate the Teapot and Parkman formation selectively.
29. Perform step-rate injection test/falloff to evaluate potential well performance. Include spinner survey and quartz crystal bottom-hole pressure gauge to determine flow distribution and performance.
30. Notify WDEQ of radioactive tracer logging schedule.
31. Run radioactive tracer survey to demonstrate mechanical integrity.
32. Stimulate if required.
33. Run packer with 20 feet of 2 7/8" tailpipe on work string and set packer at approximately 7450 feet.
34. Go in hole with 2 7/8" O.D. 11.60 lb/ft K-55 carbon steel injection string and seal assembly.
35. Space out 2 7/8" injection tubing.
36. Circulate corrosion inhibiter fluid down annulus side.
37. Latch injection string into packer and install wellhead.
38. Notify WDEQ of annulus pressure test.
39. Pressure test annulus as per WDEQ to demonstrate mechanical integrity.
40. Rig down and move out.
41. Prepare final report.

Appendix F. Abandonment Cementing Estimate

The included document presents a proposed cementing procedure and cost estimate for well IW-1. At the time the cost estimate was prepared, the anticipated completion interval included perforations in the Teckla sandstone. The proposed completion intervals for wells IW-1, IW-2, IW-3, and IW-4 do not include the Teckla sandstone, so there is a conservatively large cemented interval included in the cost estimate.

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S M Stoller Corporation
105 Technology Dr Ste 190
Broomfield, Colorado 80021

Reno Creek IW-1

Campbell County, Wyoming
United States of America

PTA Cement Treatment

Prepared for: Mr. Geoff Asmus

January 21, 2009
Version: 1_187515

Submitted by:
Larry Staten
Halliburton
6900 Nugget Rd
Evansville, Wyoming 82636
307-473-8275

HALLIBURTON

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Halliburton appreciates the opportunity to present this proposal and looks forward to being of service to you.

Foreword

Enclosed is our recommended procedure for plugging to abandon the referenced well. The information in this proposal includes well data, calculations, materials requirements, and cost estimates. This proposal is based on information from our field personnel and previous cementing services in the area.

Halliburton Energy Services recognizes the importance of meeting society's needs for health, safety, and protection of the environment. It is our intention to proactively work with employees, customers, the public, governments, and others to use natural resources in an environmentally sound manner while protecting the health, safety, and environmental processes while supplying high quality products and services to our customers.

We appreciate the opportunity to present this proposal for your consideration and we look forward to being of service to you. Our Services for your well will be coordinated through the Service Center listed below. If you require any additional information or additional designs, please feel free to contact me or one of our representatives listed below.

Prepared by: ____________________
Amber Barbarick
Senior Proposal Specialist

Submitted by: ____________________
Larry Staten
District Sales Manager

Service Location:	Gillette, WY	(307) 685-5160
Service Coordinator:	Robert Birkle	(307) 685-5160
District Operations Manager-Cement:	Calvin Alverado	(307) 473-8200
District Technical Manager:	Paul Rauzi	(307) 232-2007

Cementing Best Practices

1. Cement quality and weight: You must choose a cement slurry that is designed to solve the problems specific to each casing string.

2. Waiting time: You must hold the cement slurry in place and under pressure until it reaches its' initial set without disturbing it. A cement slurry is a time-dependent liquid and must be allowed to undergo a hydration reaction to produce a competent cement sheath. A fresh cement slurry can be worked (thickening or pump time) as long as it is in a plastic state and before going through its' transition phase. If the cement slurry is not allowed to transition without being disturbed, it may be subjected to changes in density, dilution, settling, water separation, and gas cutting that may lead to a lack of zonal isolation and possible bridging in the annulus.

3. Pipe movement: Pipe movement may be one of the single most influential factors in mud removal. Reciprocation and/or rotation mechanically breaks up gelled mud and changes the flow patterns in the annulus to improve displacement efficiency.

4. Mud properties (for cementing):

Rheology:

Plastic Viscosity (PV) < 15 centipoise (cp)
Yield Point (YP) < 10 lb/100 ft2
These properties should be reviewed with the Mud Engineer, Drilling Engineer, and Company Representative(s) to ensure no hole problems are created.

Gel Strength:

The 10-second/10-minute gel strength values should be such that the 10-second and 10-minute readings are close together or flat (i.e., 5/6). The 30-minute reading should be less than 20 lb/100 ft^2. Sufficient shear stress may not be achieved on a primary cement job to remove mud left in the hole if the mud were to develop more than 25 lb/100 ft^2 of gel strength.

Fluid Loss:

Decreasing the filtrate loss into a permeable zone enhances the creation of a thin, competent filter cake. A thin, competent filter cake created by a low fluid loss mud system is desirable over a thick, partially gelled filter cake. A mud system created with a low fluid loss will be more easily displaced. The fluid loss value should be < 15 cc's (ideal would be 5 cc's).

5. Circulation: Prior to cementing circulate full hole volume twice, or until well conditioned mud is being returned to the surface. There should be no cutting in the mud returns. An annular velocity of 260 feet per minute is optimum (SPE/IADC 18617), if possible.

6. Flow rate: Turbulent flow is the most desirable flow regime for mud removal. If turbulence cannot be achieved pump at as high a flow rate that can practically and safely be used to create the maximum flow energy. The highest mud removal is achieved when the maximum flow energy is obtained.

7. Pipe Centralization: Cement will take the path of least resistance; therefore, proper centralization is important to help prevent the casing from contacting the borehole wall. A minimum standoff of 70% should be targeted for optimum displacement efficiency.

8. Rat hole: A weighted viscous pill placed in the rat hole prior to cementing will minimize the risk of higher density cement mixing with lower density mud when the well is static.

9. Top and Bottom plugs: A top and bottom plug are recommended to be run on all primary casing jobs. The bottom plug should be run after the spacer and ahead of the first cement slurry.

10. Spacers and flushes: Spacers and/or flushes should be used to prevent contamination between the cement slurry and the drilling fluid. They are also used to clean the wellbore and aid with bonding. To determine the volume, either a minimum of 10 minutes contact time or 1000 ft. of annular fill, whichever is greater, is recommended.

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Job Information *PTA*

Well Name: Reno Creek	Well #: IW-1
5 1/2" Production Casing	0 - 8400 ft (MD) 0 - 8400 ft (TVD)
Outer Diameter	5.500 in
Inner Diameter	4.892 in
Linear Weight	17 lbm/ft
Cement Plug	1615 ft (MD)
Cement Plug	50 ft (MD)
Cement Plug	7550 ft (MD)

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Job Recommendation *PTA*

Fluid Instructions

Fluid 1: Plug Cement			
Premium Cement		Fluid Weight	15.800 lbm/gal
94 lbm/sk	Premium Cement (Cement)	Slurry Yield:	1.150 ft^3/sk
0.2 %	HR-5 (Retarder)	Total Mixing Fluid:	5 Gal/sk
		Proposed Sacks:	385 sks
Fluid 2: Plug Cement			
Premium Cement		Fluid Weight	15.800 lbm/gal
94 lbm/sk	Premium Cement (Cement)	Slurry Yield:	1.150 ft^3/sk
2 %	Calcium Chloride (Additive Material)	Total Mixing Fluid:	5 Gal/sk
		Proposed Sacks:	25 sks
Fluid 3: Plug Cement			
Premium Cement		Fluid Weight	15.800 lbm/gal
94 lbm/sk	Premium Cement (Cement)	Slurry Yield:	1.150 ft^3/sk
2 %	Calcium Chloride (Additive Material)	Total Mixing Fluid:	5 Gal/sk
		Proposed Sacks:	25 sks

Detailed Pumping Schedule

Fluid #	Fluid Type	Fluid Name	Surface Density lbm/gal	Estimated Avg Rate bbl/min	Downhole Volume
1	Cement	Plug 1	15.8	3.0	385 sks
2	Cement	Plug 2	15.8	3.0	25 sks
3	Cement	Plug 3	15.8	3.0	25 sks

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Cost Estimate PTA

SAP Quote # 0

Mtrl Nbr	Description	Qty	U/M	Base Amt	Unit Price	Net Amt
7528	CMT PLUG TO ABANDON BOM	1	JOB			0.00
	Cementing Services and Equipment					
2	MILEAGE FOR CEMENTING CREW,ZI Number of Units	120 1	MI		5.76	331.78
1	ZI-MILEAGE FROM NEAREST HES BASE,/UNIT Number of Units	120 1	MI		9.79	563.90
16094	PLUG BACK/SPOT CEMENT OR MUD,ZI DEPTH FEET/METERS (FT/M)	1 8400 FT	EA		12,584.00	6,040.32
16092	ADDITIONAL HOURS (PUMPING EQUIPMENT), ZI HOURS	0 0	EA		1,071.00	0.00
141	RCM II W/ADC,/JOB,ZI NUMBER OF UNITS	1 1	JOB		1,990.00	955.20
132	PORT. DAS W/CEMWIN;ACQUIRE W/HES, ZI NUMBER OF DAYS	1 1	JOB		1,649.00	791.52
3	ZI-DERRICK CHARGE	0	EA		987.00	0.00
	SubTotal		**USD**			**8,682.72**
	Cementing Materials					
100003685	CLASS G / PREMIUM	385	SK		40.54	7,491.79
100005050	HR-5	73	LB		11.07	387.89
100003685	CLASS G / PREMIUM	25	SK		40.54	486.48
100005053	CALCIUM CHLORIDE HI TEST PLT	1	SK		251.00	120.48
100003685	CLASS G / PREMIUM	25	SK		40.54	486.48
100005053	CALCIUM CHLORIDE HI TEST PLT	1	SK		251.00	120.48
76400	ZI MILEAGE,CMT MTLS DEL/RET MIN NUMBER OF TONS	60 20.53	MI		3.35	1,980.73
3965	HANDLE&DUMP SVC CHRG, CMT&ADDITIVES,ZI NUMBER OF EACH	438 1	CF		5.49	1,154.22
	SubTotal		**USD**			**12,228.55**
	Cementing Surcharges					
7	ENVIRONMENTAL SURCHARGE,/JOB,ZI	1	LE		134.00	134.00
8	IRON SAFETY INSPECTION SURCHARGE /JOB ZI	1	LE		83.00	83.00
372867	Cmt PSL - DOT Vehicle Charge, CMT	3	EA		241.00	723.00
	SubTotal		**USD**			**940.00**
	Total	**USD**				**44,505.16**
	Discount	**USD**				**22,653.89**
	Discounted Total	**USD**				**21,851.27**

Primary Plant: Casper, WY, USA
Secondary Plant: Casper, WY, USA

Price Book Ref: 01 Western US
Price Date: 1/21/2009

7 / 8 Proposal SM Stoller Corp_Reno Crekk IW-1_PTA_8400_1-21-09 v.1_187515

Conditions

NOTE

The cost in this analysis is good for the materials and/or services outlined within and shall be valid for 30 days from the date of this proposal. In order to meet your needs under this proposal with a high quality of service and responsive timing, Halliburton will be allocating limited resources and committing valuable equipment and materials to your area of operations. Accordingly, the discounts reflected in this proposal are available only for materials and services awarded on a first-call basis. Alternate pricing may apply in the event that Halliburton is awarded work on any basis other than as a first-call provider.

The unit prices stated in the proposal are based on our current published prices. The projected equipment, personnel, and material needs are only estimates based on information about the work presently available to us. At the time the work is actually performed, conditions then existing may require an increase or decrease in the equipment, personnel, and/or material needs. Charges will be based upon unit prices in effect at the time the work is performed and the amount of equipment, personnel, and/or material actually utilized in the work. Taxes, if any, are not included. Applicable taxes, if any, will be added to the actual invoice.

It is understood and agreed between the parties that with the exception of the subject discounts, all services performed and equipment and materials sold are provided subject to Halliburton's General Terms and Conditions contained in our current price list, (which include LIMITATION OF LIABILITY and WARRANTY provisions), and pursuant to the applicable Halliburton Work Order Contract (whether or not executed by you), unless a Master Service and/or Sales Contract applicable to the services, equipment, or materials supplied exists between your company and Halliburton, in which case the negotiated Master Contract shall govern the relationship between the parties. A copy of the latest version of our General Terms and Conditions is available from your Halliburton representative or at: http://www.halliburton.com/hes/general_terms_conditions.pdf for your convenient review, and we would appreciate receiving any questions you may have about them. Should your company be interested in negotiating a Master Contract with Halliburton, our Law Department would be pleased to work with you to finalize a mutually agreeable contract. In this connection, it is also understood and agreed that Customer will continue to execute Halliburton usual field work orders and/or tickets customarily required by Halliburton in connection with the furnishing of said services, equipment, and materials.
Any terms and conditions contained in purchase orders or other documents issued by the customer shall be of no effect except to confirm the type and quantity of services, equipment, and materials to be supplied to the customer.
If customer does not have an approved open account with Halliburton or a mutually executed written contract with Halliburton, which dictates payment terms different than those set forth in this clause, all sums due are payable in cash at the time of performance of services or delivery of equipment, products, or materials. If customer has an approved open account, invoices are payable on the twentieth day after date of invoice.

Customer agrees to pay interest on any unpaid balance from the date payable until paid at the highest lawful contract rate applicable, but never to exceed 18% per annum. In the event Halliburton employs an attorney for collection of any account, customer agrees to pay attorney fees of 20% of the unpaid account, plus all collection and court costs.

Appendix G. Injection Well Abandonment Cost Estimate

The attached costing sheet presents a total well and ancillary structures abandonment cost estimate for a single injection well. The costing includes well abandonment based on well IW-1 and assumed a conservatively large perforation interval. The costing also includes reclamation of the well site and pipeline corridors and disposal of wastes generated during abandonment. The total estimated cost is $126,300.

replaced 3/26/10 [initials]

Figure G-1. Injection Well Abandonment Cost Estimate

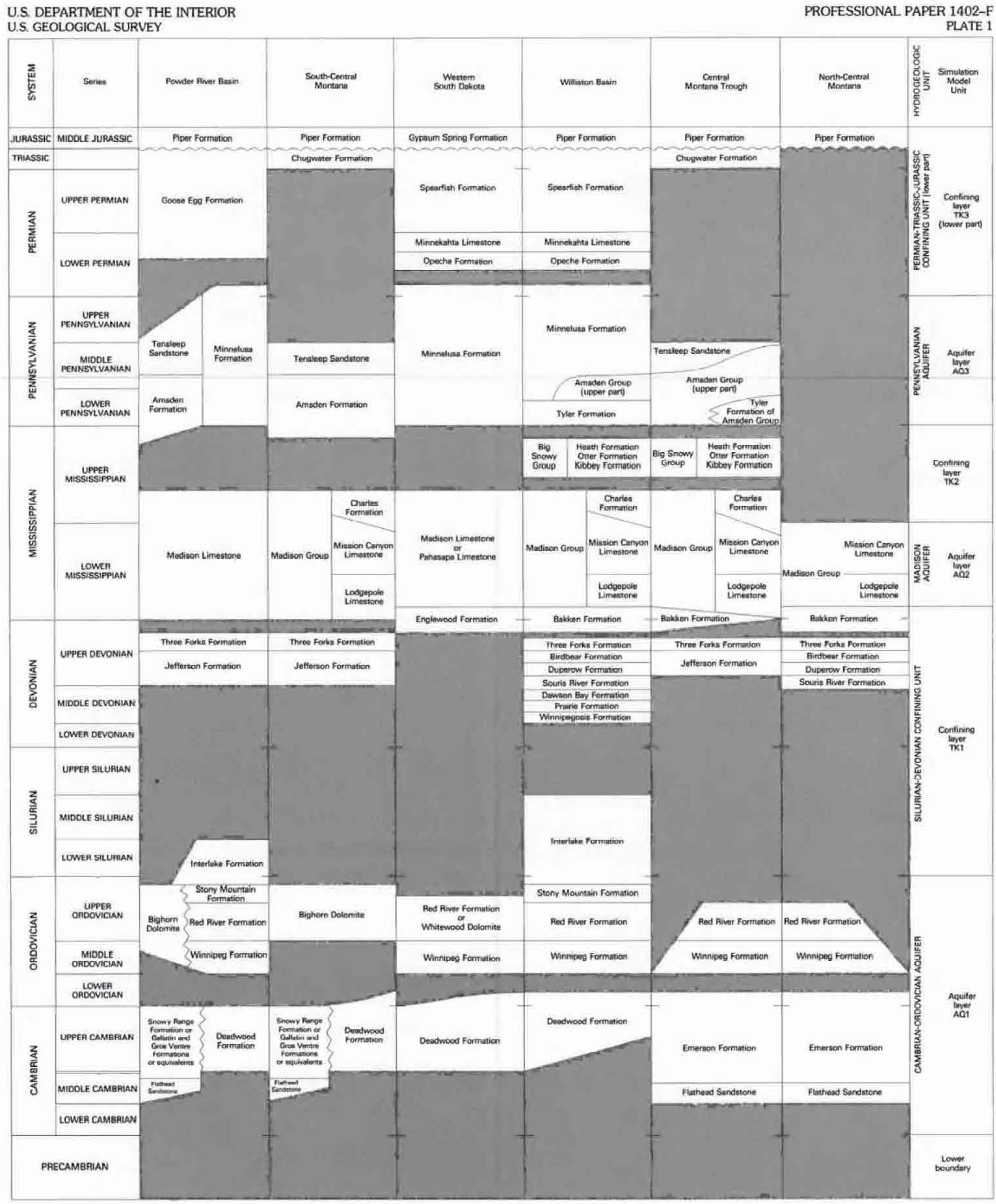
Item		Unit cost			Units	Total Cost	References
Well Plugging and Abandonment							
Cementing Services and Equipment							
Mileage for cementing crew						$ 332	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Mileage from nearest base						$ 564	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Plug back/spot cement or mud						$ 6,040	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
RCM II w/ADC						$ 955	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Port DAS W/CEMWIN; acquire w/HES						$ 792	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Cementing Materials							
Class G/Premium						$ 7,492	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
HR-5						$ 388	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Class G/Premium						$ 486	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Calcium Chloride H1 Test Pit						$ 120	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Class G/Premium						$ 486	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Calcium Chloride H1 Test Pit						$ 120	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Mileage, cement materials, return						$ 1,981	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Handling & dump service charge, cmt/addivs						$ 1,154	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Cementing surcharges							
Environmental surcharge						$ 134	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Iron safety inspection surcharge						$ 83	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
CMT PSL DOT Vehicle charge						$ 723	Abandonment cost estimate received from Halliburton, Evansville, WY, January 21, 2009
Rig and Associated Equipment							
Mob/Demob and Completion Rig Time						$ 28,000	Estimated from reviews of similar recent Class I well permit applications
Rental Tools and Equipment						$ 5,000	Estimated from reviews of similar recent Class I well permit applications
Wireline Work						$ 3,000	Estimated from reviews of similar recent Class I well permit applications
Fluids, Mud Additives, Water and Supplies						$ 10,000	Estimated from reviews of similar recent Class I well permit applications
Contract Services (welding, roustabout, etc.)						$ 3,000	Estimated from reviews of similar recent Class I well permit applications
Abandoment and Decommissioning Supervision and Support (Geologic and Engineering)						$ 4,000	Estimated from reviews of similar recent Class I well permit applications
Miscellaneous and Contingency						$ 8,000	Estimated from reviews of similar recent Class I well permit applications
						$ 80,851	
Surface Plant Removal							
Equipment Removal							
labor	$	23.85	per hour	foreman	24	$ 572	2008 Wyoming Heavy and Highway Prevailing Wages, laborer plus $5 per hour
	$	17.85	per hour	laborer	48	$ 857	2008 Wyoming Heavy and Highway Prevailing Wages
equipment rent	$	26.41	per hour	pickup	48	$ 1,268	WYDEQ Guideline 12 - Standardized Reclamation Performance Bond Format and Cost Calculation Methods
	$	17.29	per hour	boom truck	6	$ 104	Means 2009
Building Demolition							
decontamination							
labor	$	23.85	per hour	foreman	6	$ 143	2008 Wyoming Heavy and Highway Prevailing Wages, laborer plus $5 per hour
	$	17.85	per hour	laborer	6	$ 107	2008 Wyoming Heavy and Highway Prevailing Wages
equipment rent	$	26.41	per hour	pickup	6	$ 158	WYDEQ Guideline 12 - Standardized Reclamation Performance Bond Format and Cost Calculation Methods
	$	4.20	per hour	steam cleaner	6	$ 25	Means 2009
demolition	$	1.83	per ft^2	4 in walls	250	$ 458	Means 2009
	$	4.61	per ft^2	6 in slab	250	$ 1,153	WYDEQ Guideline 12 - Standardized Reclamation Performance Bond Format and Cost Calculation Methods
						$ 4,844	
Pipeline Removal (12,000 feet of 6 inch line)							
Excavation							
equipment	$	32.39	per hour	backhoe	178	$ 5,765	Means, 2009 for backhoe rate. Pipeline 5 feet deep, trench is 2 feet wide, 12,000 feet long - 4,444 yd3, excavation rate is 200 yards per day for 1/2 yd. backhoe, 22 days required or 178 hours
labor	$	22.09	per hour	operator	178	$ 3,932	2008 Wyoming Heavy and Highway Prevailing Wages
	$	17.85	per hour	laborer	178	$ 3,177	2008 Wyoming Heavy and Highway Prevailing Wages
Pipe Removal							
labor	$	23.85	per hour	foreman	24	$ 572	2008 Wyoming Heavy and Highway Prevailing Wages, laborer plus $5 per hour
	$	17.85	per hour	laborer	48	$ 857	2008 Wyoming Heavy and Highway Prevailing Wages
equipment rent	$	26.41	per hour	pickup	24	$ 634	WYDEQ Guideline 12 - Standardized Reclamation Performance Bond Format and Cost Calculation Methods
	$	17.29	per hour	boom truck	6	$ 104	Means 2009
Backfill Trench							
equipment rent	$	32.39	per hour	backhoe	89	$ 2,883	WYDEQ Guideline 12 - Standardized Reclamation Performance Bond Format and Cost Calculation Methods
labor	$	22.09	per hour	operator	89	$ 1,966	2008 Wyoming Heavy and Highway Prevailing Wages
	$	17.85	per hour	laborer	89	$ 1,589	2008 Wyoming Heavy and Highway Prevailing Wages
						$ 21,479	
Disposal of Waste							
Haulage for disposal							
uncontaminated	$	0.19	per ton-mile	building	12.3	$ 140	60 miles to Campbell County Landfill, Means 2009 has $3.39/mile for 18 ton load, or $0.19 per ton mile
	$	0.19	per ton-mile	concrete	8.3	$ 95	60 miles to Campbell County Landfill, Means 2009 has $3.39/mile for 18 ton load, or $0.19 per ton mile
contaminated	$	0.33	per ton-mile	pumps, etc.	2	$ 233	353 miles to Clean Harbors Deer Trail facility, Means 2009 has $5.95/mile for 18 ton load, or $0.331 per ton mile
	$	0.33	per ton-mile	pipes	43.6	$ 5,079	353 miles to Clean Harbors Deer Trail facility, Means 2009 has $5.95/mile for 18 ton load, or $0.331 per ton mile, volume of pipe = 12,000 x (0.25 feet)^2
	$	0.33	per ton-mile	concrete	0.9	$ 105	353 miles to Clean Harbors Deer Trail facility, Means 2009 has $5.95/mile for 18 ton load, or $0.331 per ton mile
Disposal							
uncontaminated	$	95.00	per ton	building	12.3	$ 1,169	WYDEQ Guideline 12 - Standardized Reclamation Performance Bond Format and Cost Calculation Methods
	$	95.00	per ton	concrete	8.3	$ 789	WYDEQ Guideline 12 - Standardized Reclamation Performance Bond Format and Cost Calculation Methods
contaminated	$	150.00	per ton	total from above	46.5	$ 6,975	Deer Trail disposal cost is $150/ton per Jack Kehoe, plant manager, verbal estimate, January 27, 2009 - assume 1 ton = 1 yd3
						$ 14,584	
Powerline Removal (no cost per Guideline 12)							WYDEQ Guideline 12 - Standardized Reclamation Performance Bond Format and Cost Calculation Methods
Fence Removal	$	0.50	per foot	fence	1200	$ 600	WYDEQ Guideline 12 - Standardized Reclamation Performance Bond Format and Cost Calculation Methods
						$ 600	
Reclamation and Revegetation							
	$	1.00	per yd^3	gravel removal	2167	$ 2,167	gravel volume = (12,000 ft x 12 ft x 0.25 ft / 27) + (300 ft x 300 ft x 0.25 ft / 27) = 1,333.3 + 833.3 = 2,167 yd^3, unit cost based on commercial rates for pick-up and haul
	$	59.41	per acre	scarifying	7.58	$ 450	scarifying area = (1,000 ft x 24 ft) + (300 ft x 300 ft) = 240,000 + 90,000 = 330,000 ft 2 = 7.58 acres, unit cost from WDEQ Guideline 12
	$	79.16	per acre	grading	7.58	$ 600	grinding and ripping area = (1,000 feet x 24 feet) + (300 feet x 300 feet) = 240,000 + 90,000 = 330,000 ft^2 = 7.58 acres, unit cost from WDEQ Guideline 12
	$	80.94	per acre	seed	7.58	$ 614	Unit costs from "Regional Cost Estimates for Reclamation practices on Arid and Semi-Arid Lands", DOE NNSA, 2002
	$	12.95	per acre	drill seeding labor/equipment	7.58	$ 98	Unit costs from "Regional Cost Estimates for Reclamation practices on Arid and Semi-Arid Lands", DOE NNSA, 2002
						$ 3,929	
					Total	**$ 126,287**	

replaced 3/26/10

Appendix H. Deep Formation Hydrogeology

List of Appendix H Figures

Figure H-1. Plate 1 of USGS Professional Paper 1402-A

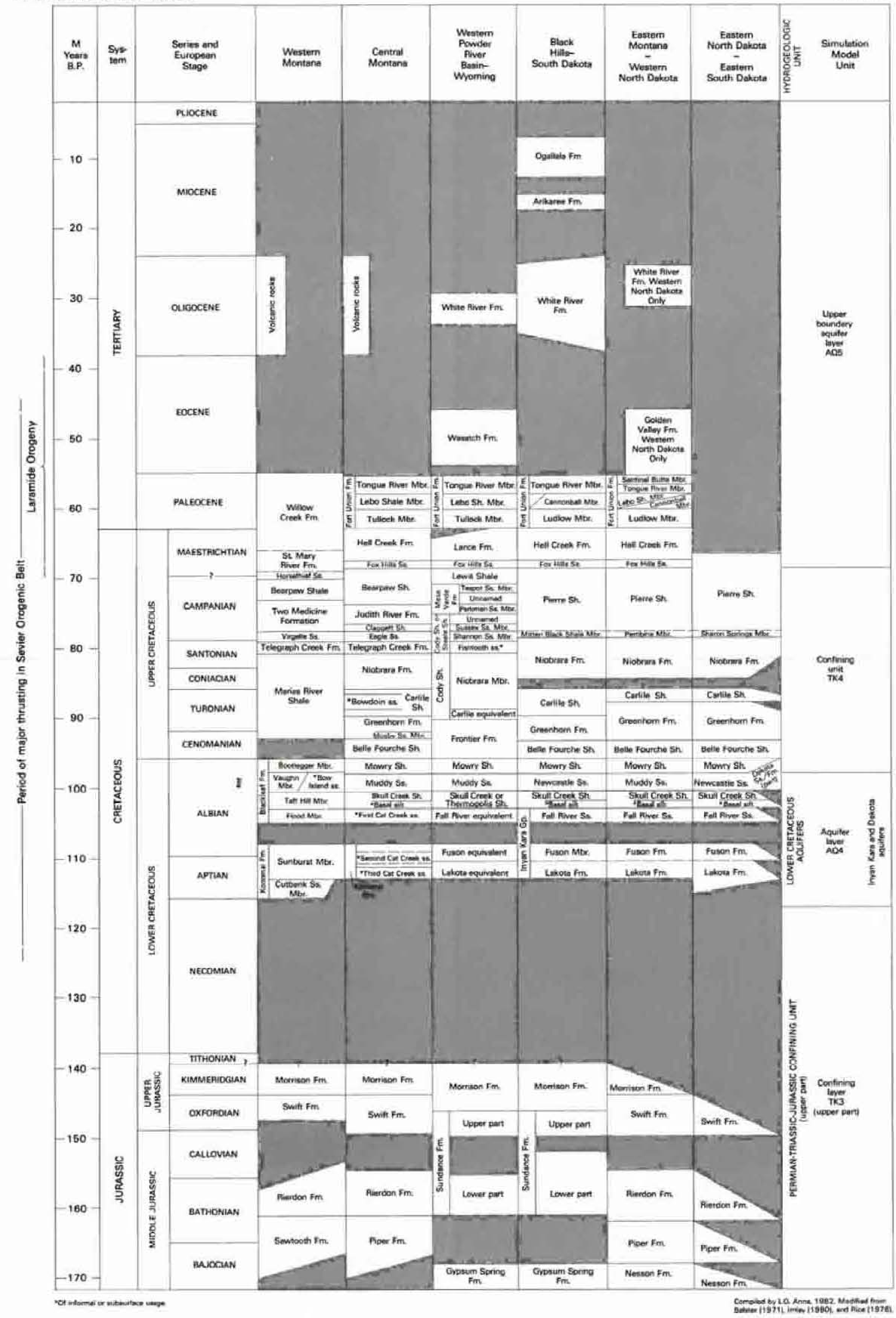


GENERALIZED GEOLOGIC CORRELATION CHART OF MESOZOIC AND PALEOZOIC ROCKS IN THE NORTHERN GREAT PLAINS

Figure H-2. Plate 2 of USGS Professional Paper 1402-A

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PROFESSIONAL PAPER 1402–F
PLATE 2



GENERALIZED GEOLOGIC CORRELATION CHART OF JURASSIC, CRETACEOUS (MESOZOIC), AND TERTIARY ROCKS IN THE NORTHERN GREAT PLAINS

Figure H-3. Figure 32 of USGS Professional Paper 1402-E

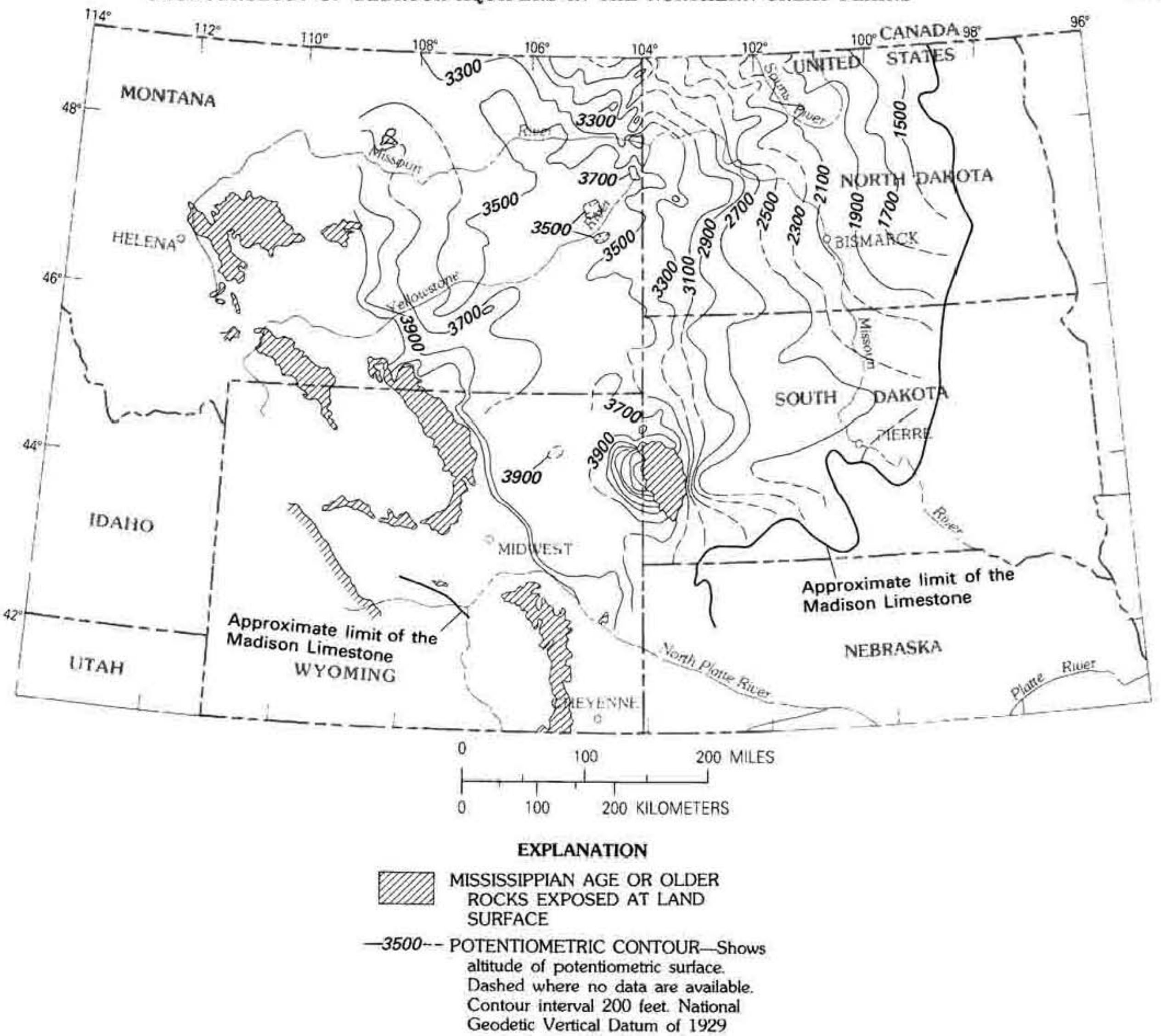


FIGURE 32.—Potentiometric surface of the Madison aquifer. Modified from Miller and Strausz (1980b).

the cone of depression. In addition, Busby, Lee, and Hanshaw (1983), in their analysis of geochemical data from the Midwest area, indicated that some leakage occurred from the overlying Pennsylvanian and Permian formations that was not considered by Konikow in his calculations, and so transmissivity of the Madison aquifer in the Midwest, Wyo., area may be less than 0.013 ft^2/s.

W. R. Miller (1976) states that data from DST's in Montana indicate that transmissivity of the Madison aquifer ranges from about $5x10^{-7}$ to $6x10^{-2}$ ft^2/s. However, Miller did not consider water viscosity changes with temperature in his calculations. The reliability of transmissivity values derived from DST's also is questionable because of inherent errors in the recording devices and the short shut-in times of most DST's.

On the basis of an analysis of data from step-drawdown tests performed at selected intervals in the Madison Limestone at Madison test well 3 (fig. 1), Blankennagel, Howells, and Miller (1981) reported a transmissivity range of from 0.037 to 0.052 ft^2/s, with an assumed storage coefficient of $2x10^{-6}$. The lower value of transmissivity appears to be associated with the upper part of the Madison aquifer at this location. The range in reported transmissivity values may be related to the significant variability of secondary porosity

Figure H-4. Figure 33 of USGS Professional Paper 1402-E

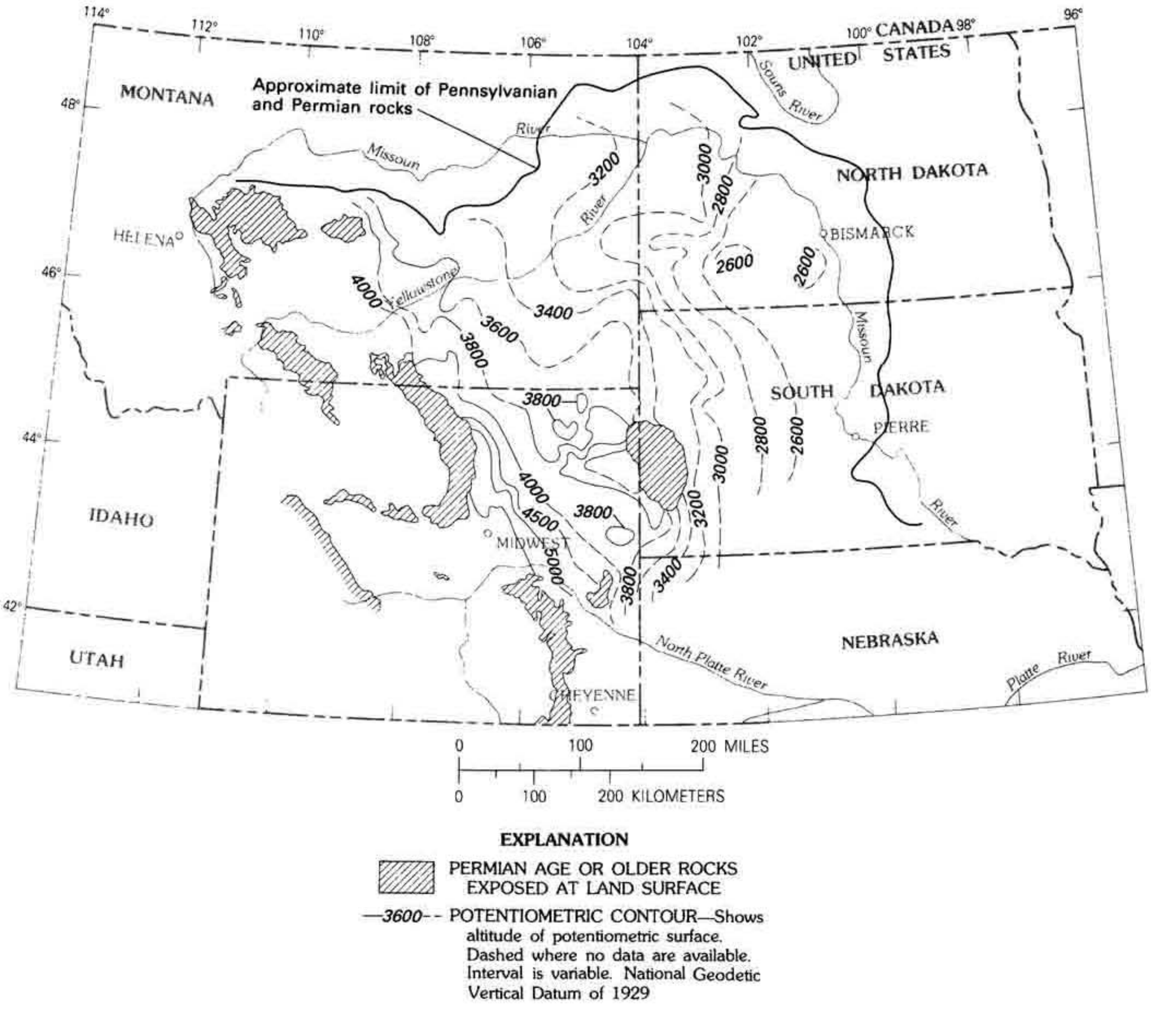


FIGURE 33.—Potentiometric surface of the Pennsylvanian aquifer. From W. R. Miller (written commun., 1980).

Figure H-5. Figure 36 of USGS Professional Paper 1402-E

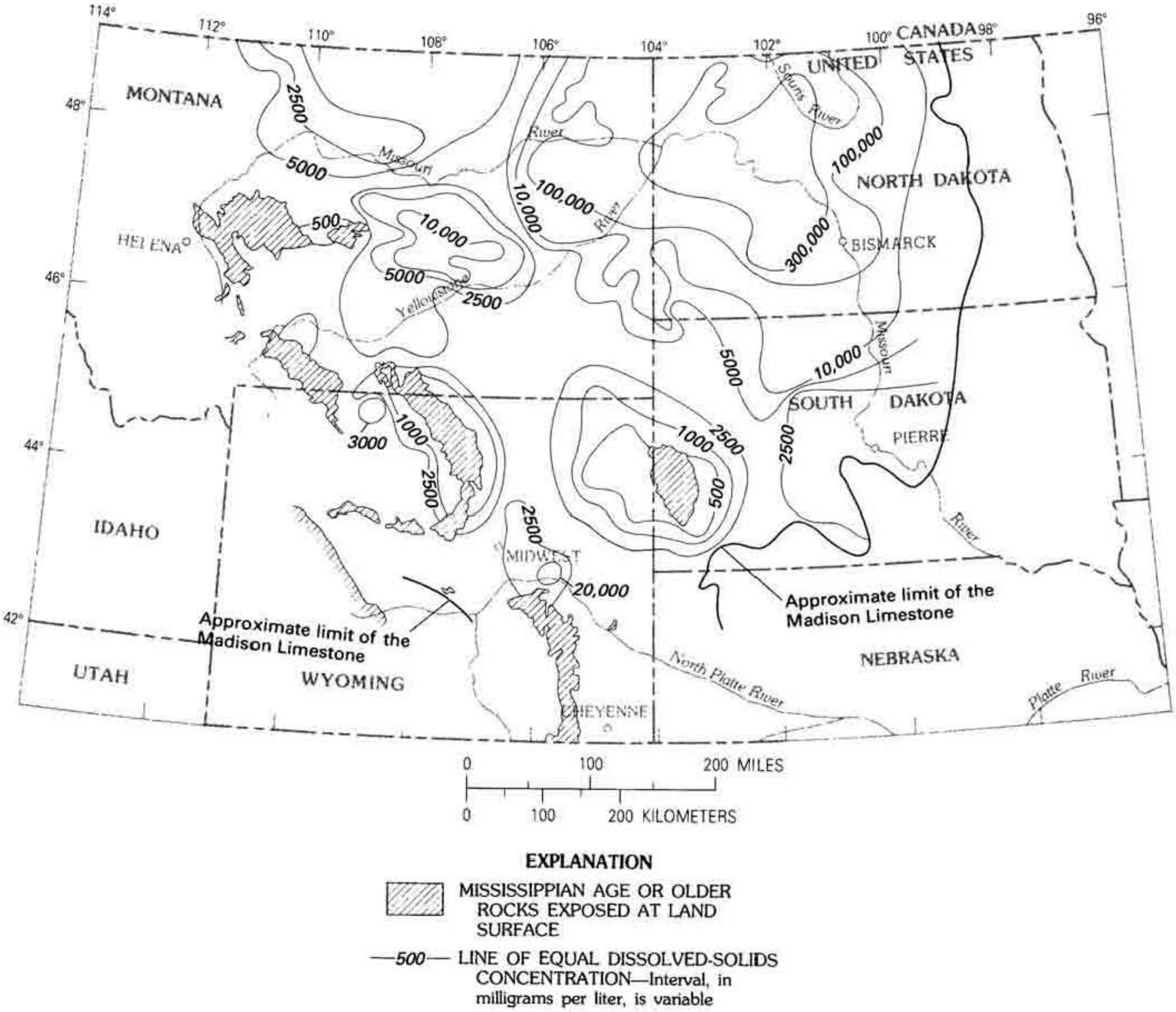


FIGURE 36.—Concentration of dissolved solids in water from the Madison aquifer. From J. F. Busby (written commun., 1981).

Figure H-6. Figure 37 of USGS Professional Paper 1402-E

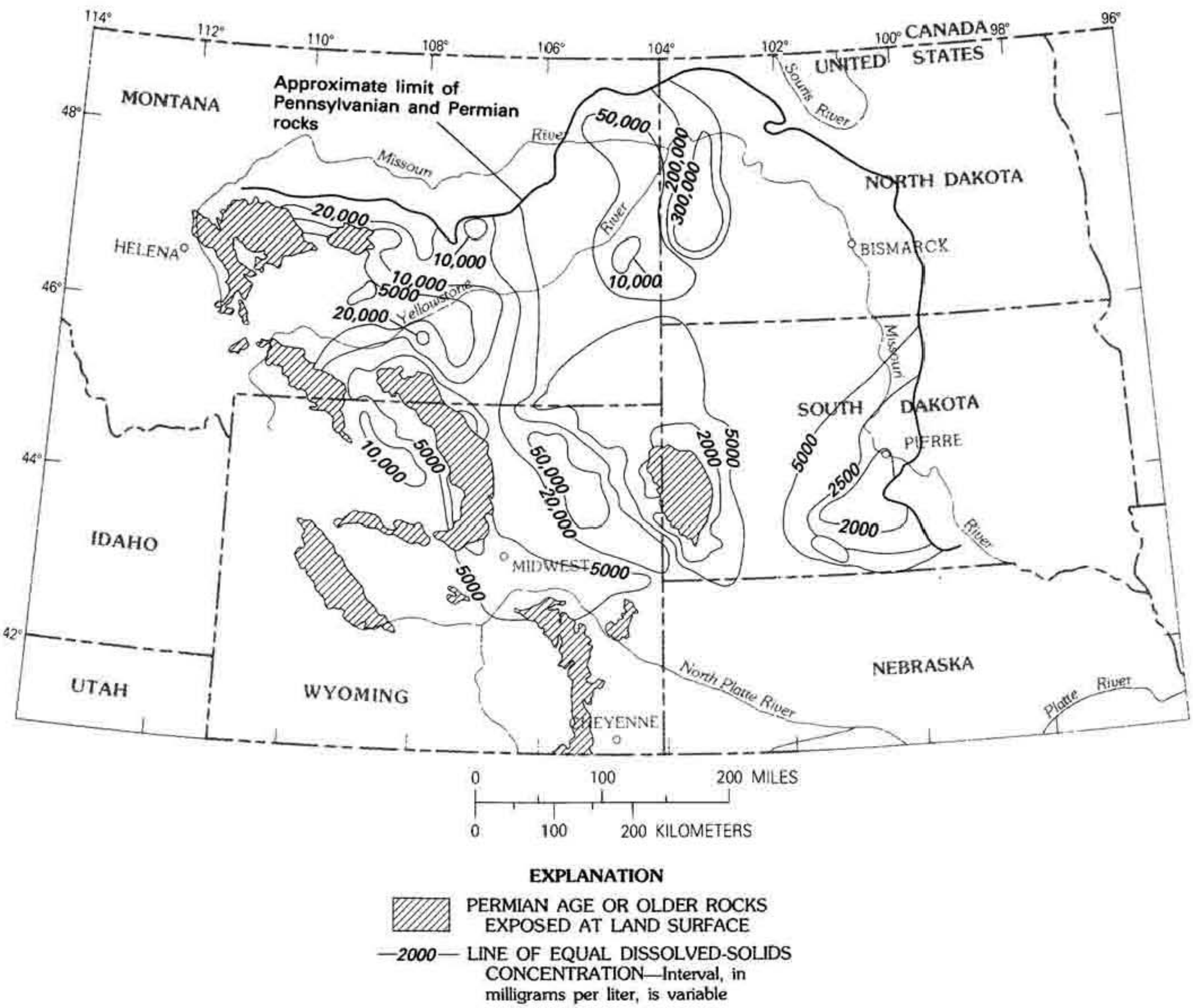


FIGURE 37.—Concentration of dissolved solids in water from the Pennsylvanian aquifer. From J. F. Busby (written commun., 1982).

Figure H-7. Figure 38 of USGS Professional Paper 1402-E

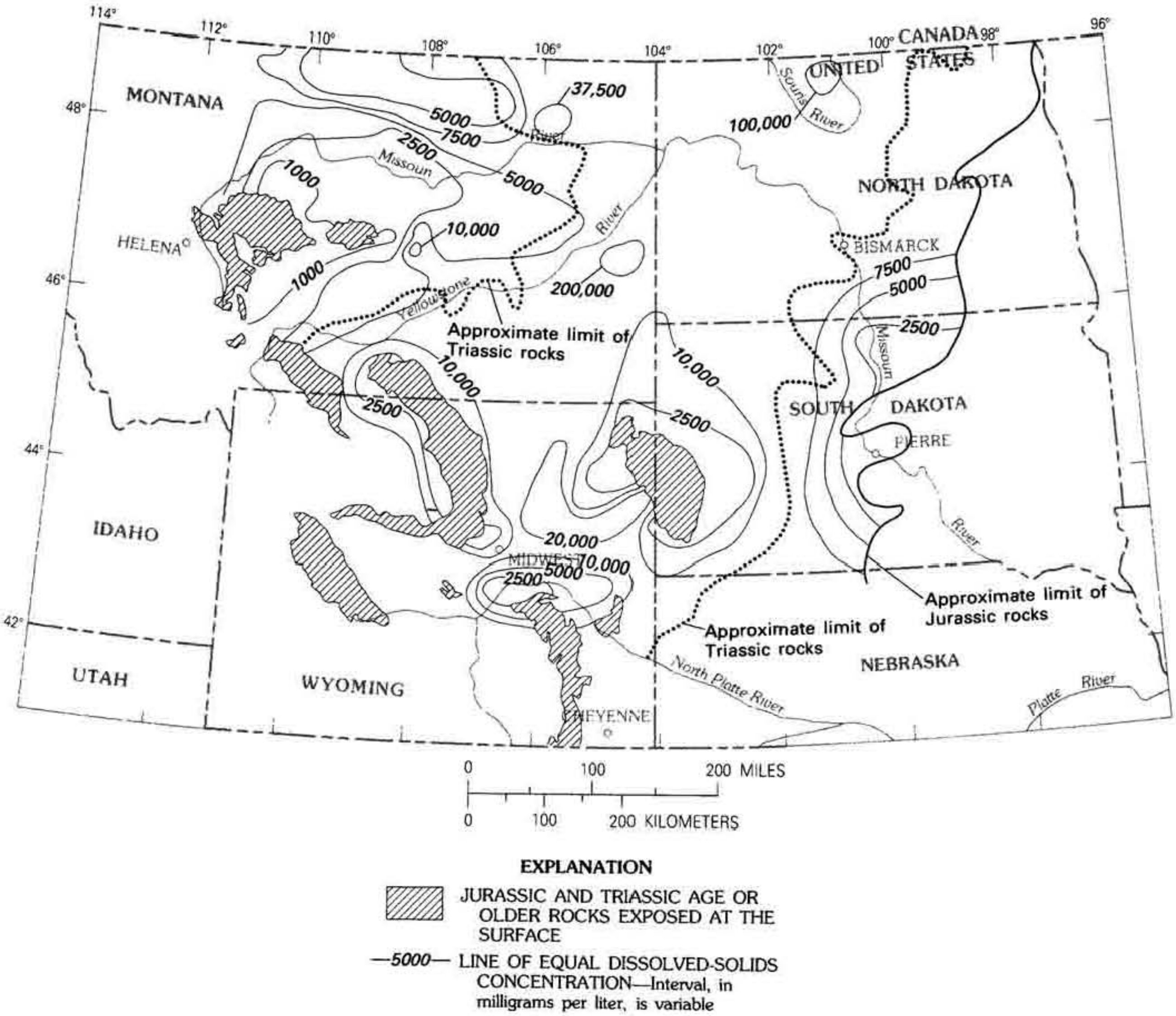


FIGURE 38.—Concentration of dissolved solids in water from the Triassic and Jurassic formations. From J. F. Busby (written commun., 1981).

Figure H-8. Figure 39 of USGS Professional Paper 1402-E

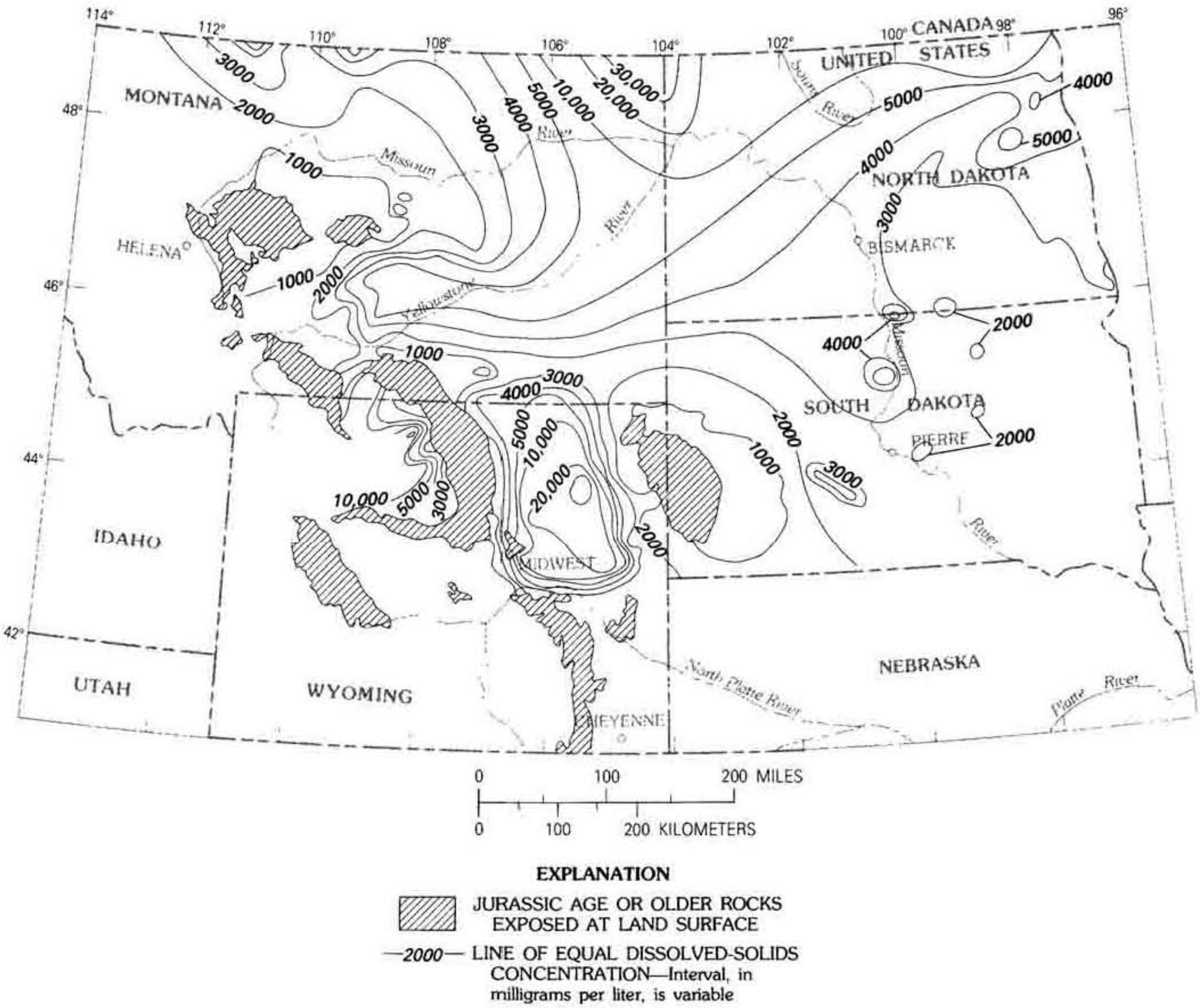
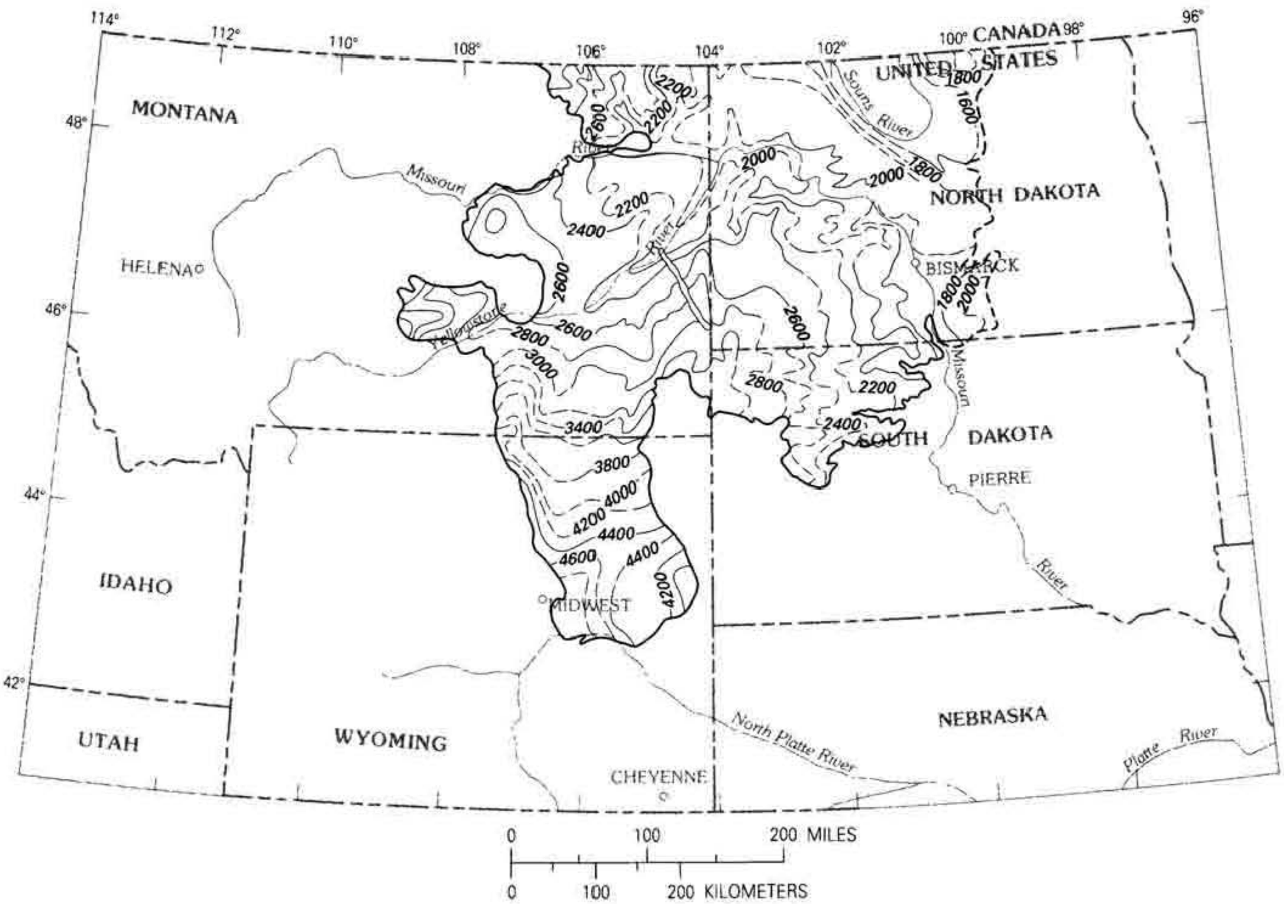


FIGURE 39.—Concentration of dissolved solids in water from the Lower Cretaceous aquifer. Modified from K. D. Peter (written commun., 1982).

Figure H-9. Figure 41 of USGS Professional Paper 1402-E



EXPLANATION

—1600— — POTENTIOMETRIC CONTOUR—Shows altitude of potentiometric surface. Dashed where no data are available. Interval 200 feet. National Geodetic Vertical Datum of 1929

——— — — LIMIT OF FOX HILLS SANDSTONE (LATE CRETACEOUS AGE)—Dashed where inferred

FIGURE 41.—Potentiometric surface of the Upper Cretaceous aquifer. From D. H. Lobmeyer (written commun., 1982).

Figure H-10. Figure 51 of USGS Professional Paper 1402-E

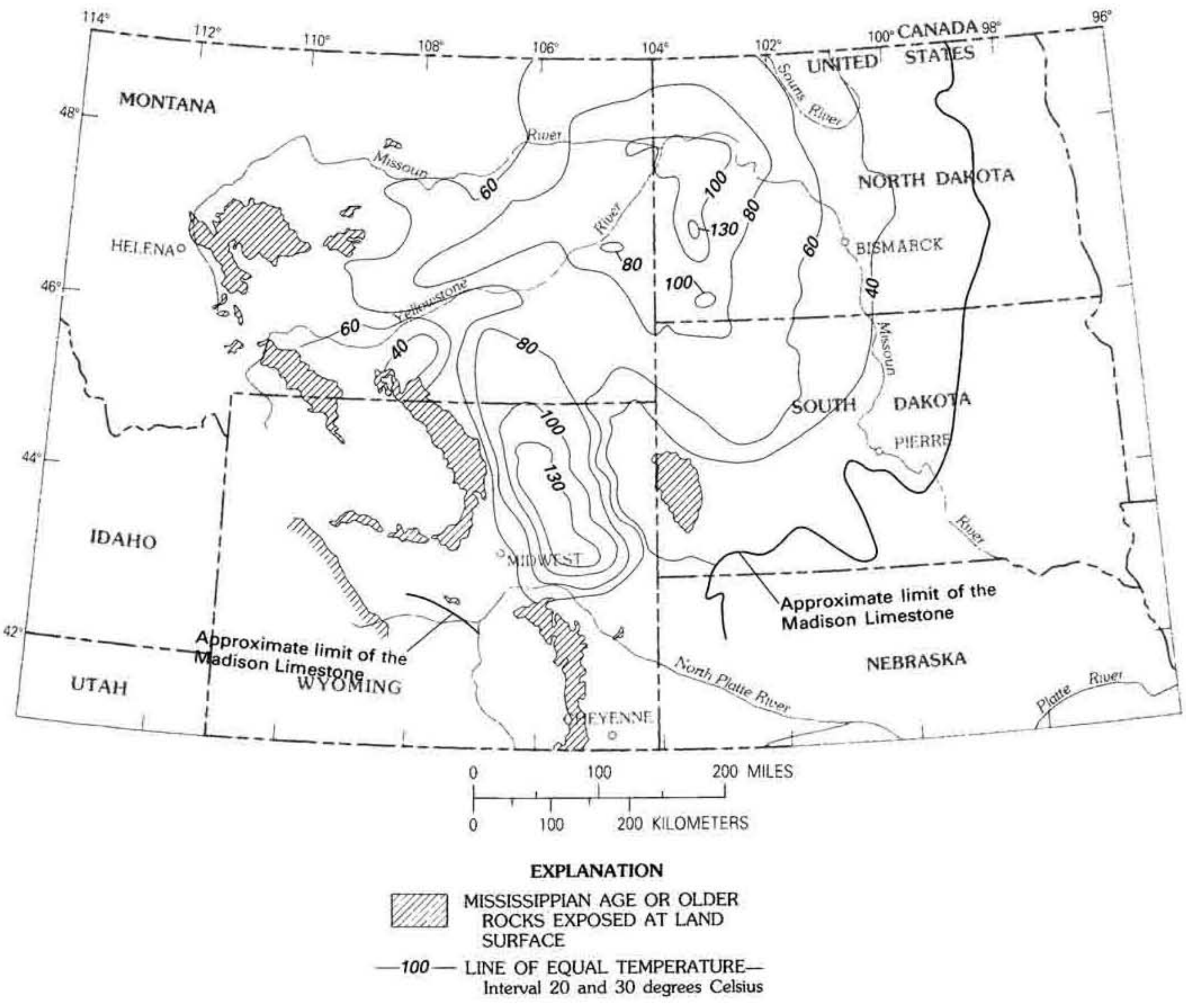


FIGURE 51.—Water temperatures in the Madison aquifer. Modified from MacCary (1981) and Head, Kilty, and Knottek (1979).

Figure H-11. Figure 52 of USGS Professional Paper 1402-E

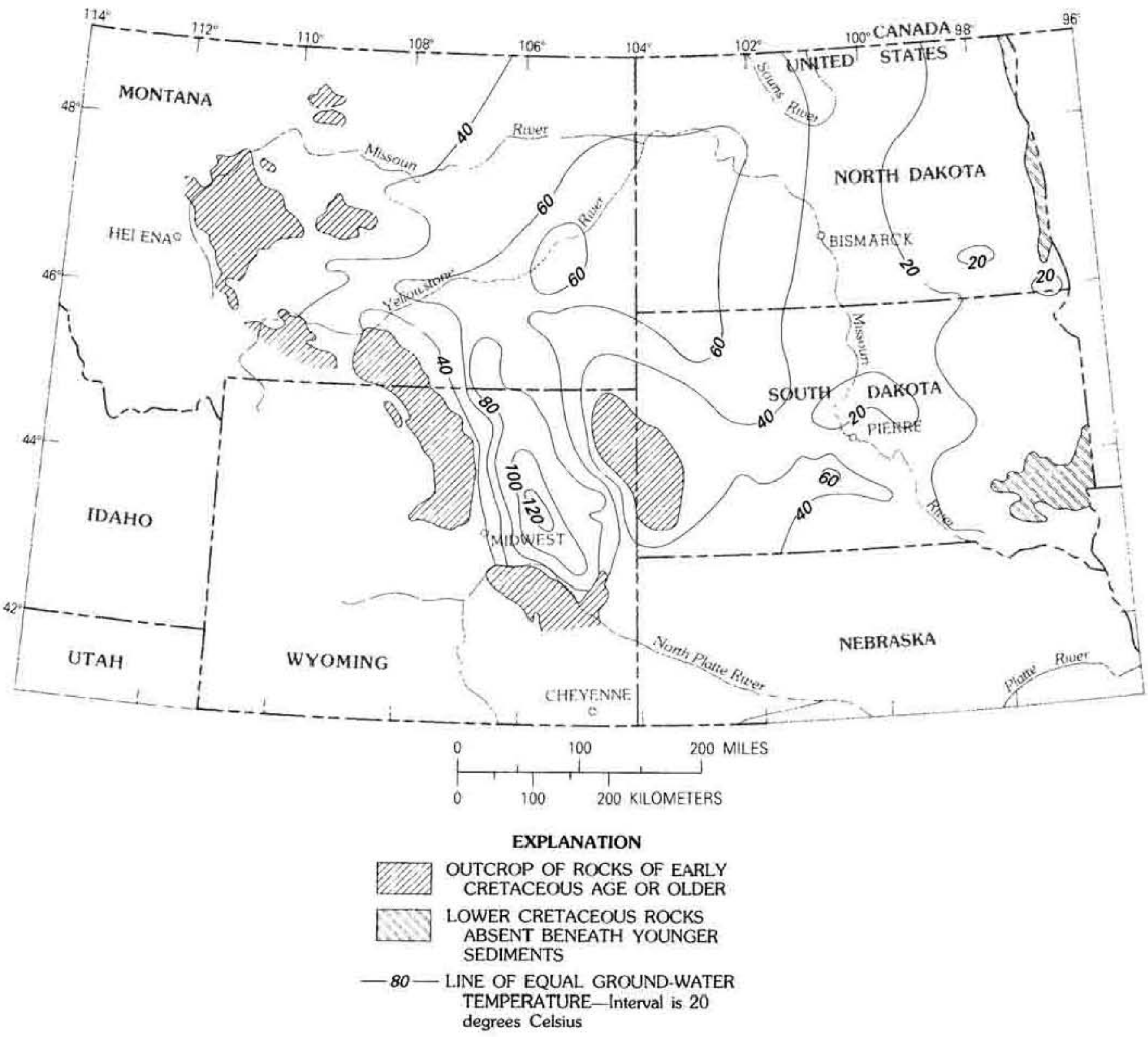


FIGURE 52.—Water temperatures in the Lower Cretaceous aquifer. Modified from D. H. Lobmeyer (written commun., 1982).

Figure H-12. Figure 53 of USGS Professional Paper 1402-E

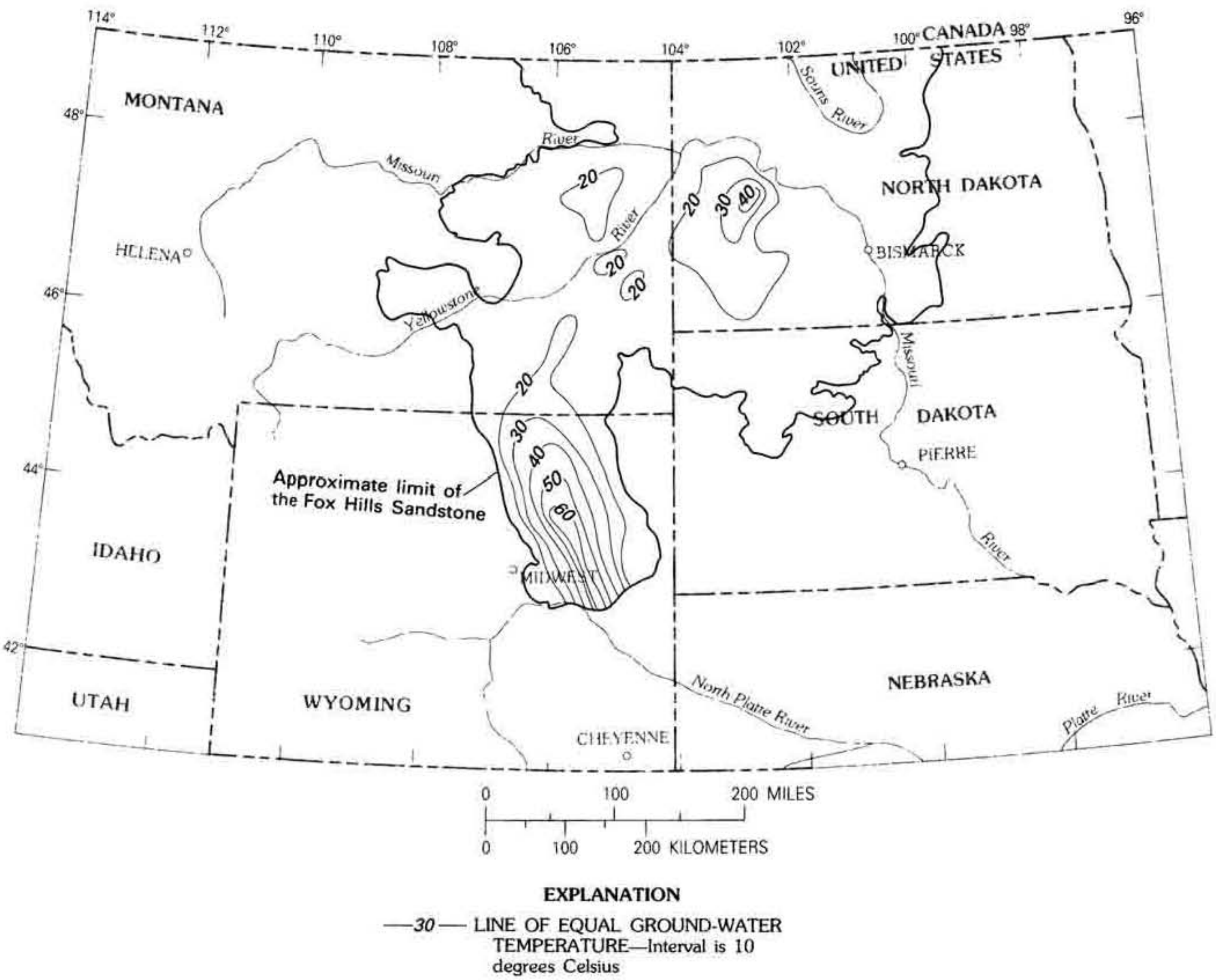


FIGURE 53.—Water temperatures in the Upper Cretaceous aquifer. Modified from D. H. Lobmeyer (written commun., 1982).

GEOHYDROLOGY OF THE MADISON AND ASSOCIATED AQUIFERS G33

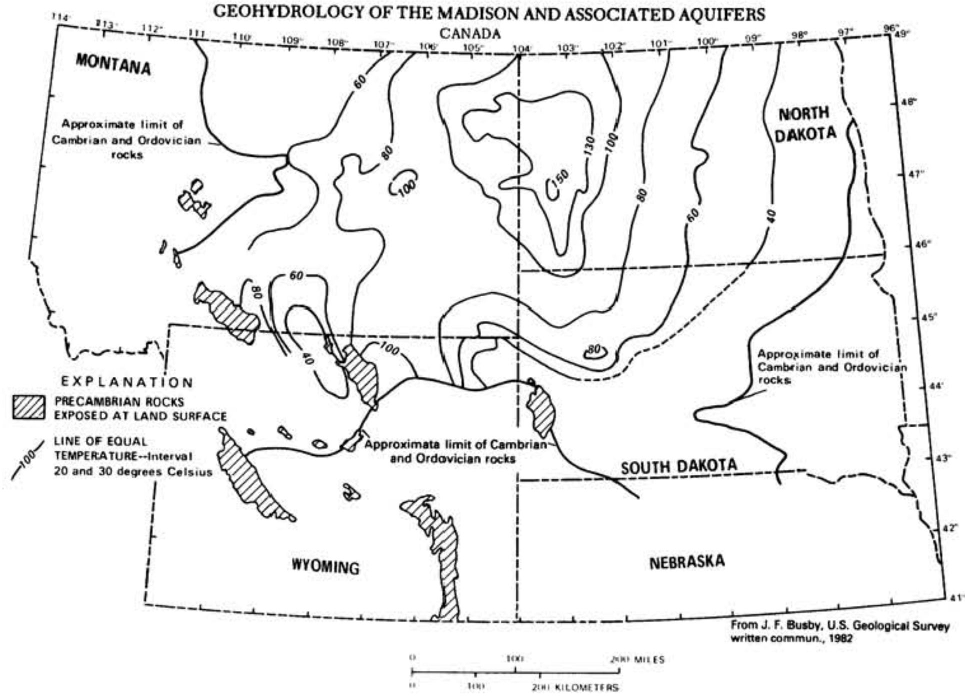


FIGURE 32. – Water temperture in the Cambrian-Ordovician aquifer.

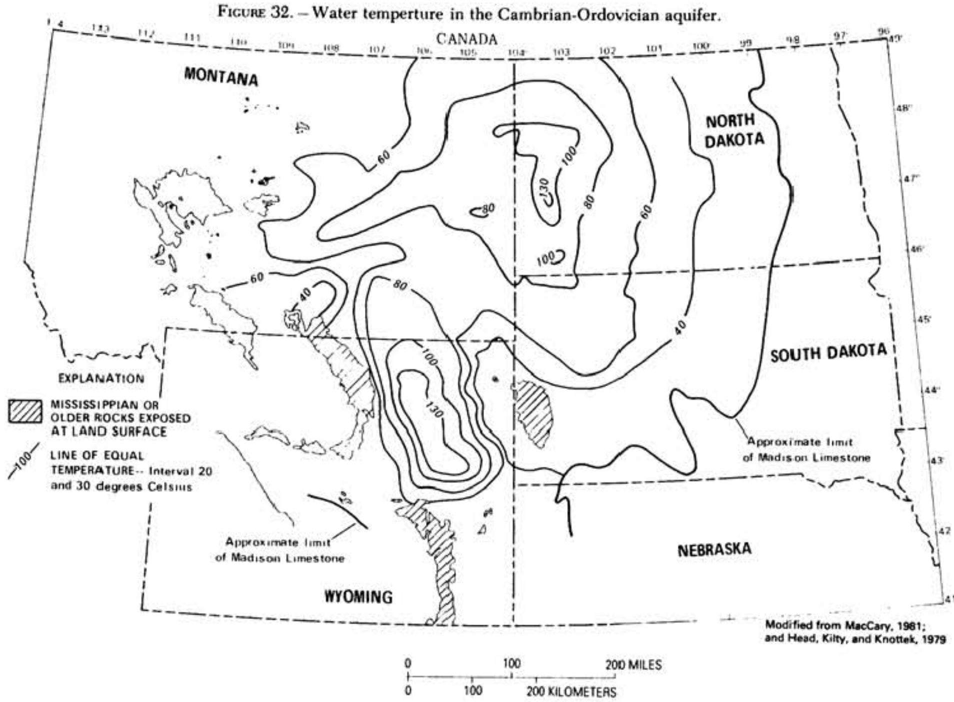


FIGURE 33. – Water temperature in the Madison aquifer.

Figure H-14. Figure 63 of USGS Professional Paper 1402-F

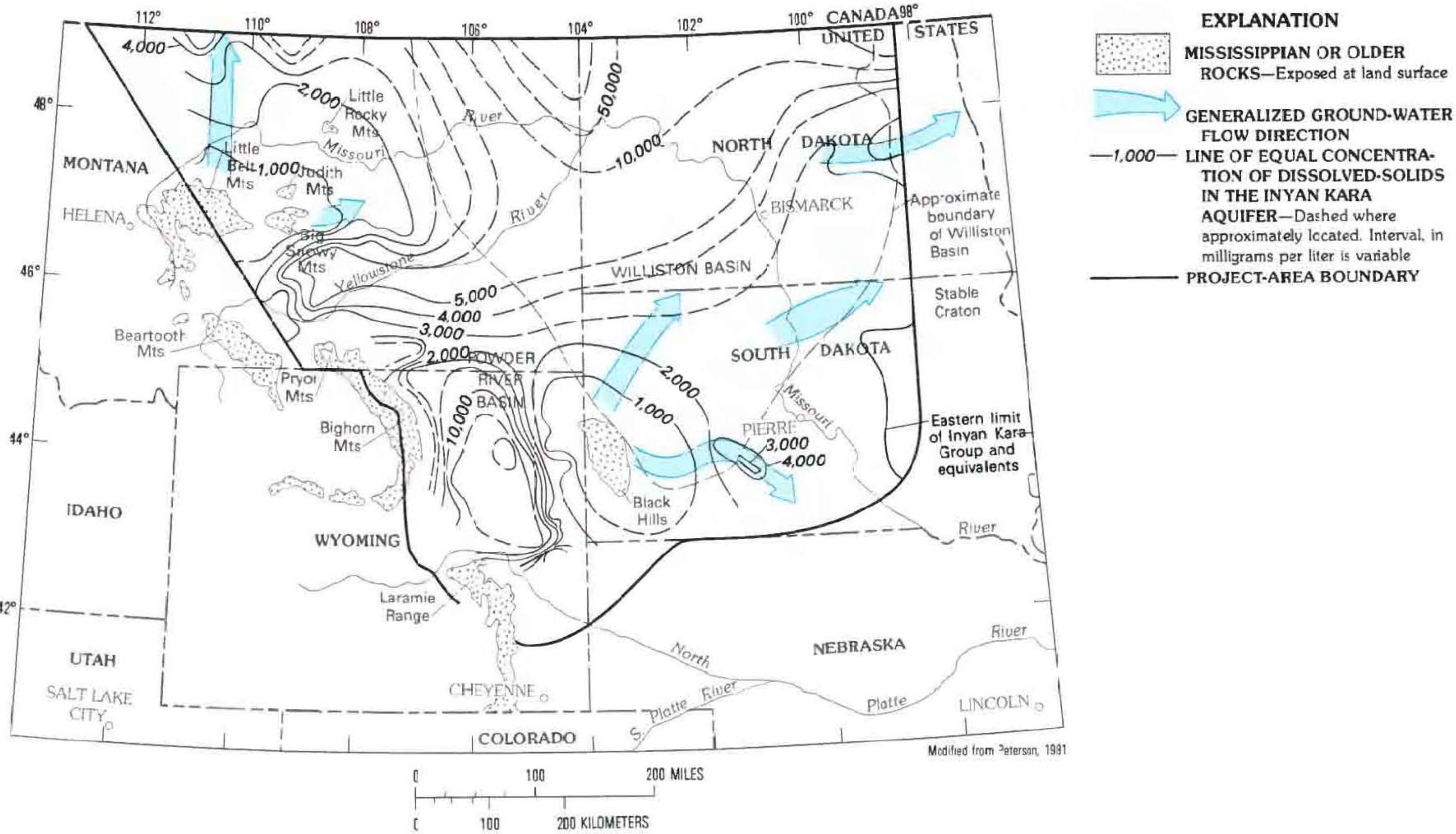


FIGURE 63.—Concentration of dissolved solids in water from the Inyan Kara aquifer in the northern Great Plains.

Attachment I. UIC 98-092 Permit

The enclosed CD includes an electronic copy of the UIC 98-092 permit in PDF format. Separate files are provided for each section and attachment of the UIC 98-092 permit and these are listed under generally self-explanatory files names. The following files are included on the CD:

Application-Maps.pdf	Includes the permit application form and associated maps.
Table-of-Contents.pdf	Includes the table of contents for the permit document.
Sec-1.pdf	Includes Section 1 of the permit document.
Sec-2.pdf	Includes Section 2 of the permit document.
Sec-3.pdf	Includes Section 3 of the permit document.
Sec-4.pdf	Includes Section 4 of the permit document.
Sec-5.pdf	Includes Section 5 of the permit document.
Sec-6.pdf	Includes Section 6 of the permit document.
Sec-7.pdf	Includes Section 7 of the permit document.
Sec-8.pdf	Includes Section 8 of the permit document.
Sec-9.pdf	Includes Section 9 of the permit document.
Sec-10.pdf	Includes Section 10 of the permit document.
Sec-11.pdf	Includes Section 11 of the permit document.
Sec-12.pdf	Includes Section 12 of the permit document.
Sec-13.pdf	Includes Section 13 of the permit document.
Attach-A.pdf	Includes Attachment A of the permit document.
Attach-B.pdf	Includes Attachment B of the permit document.
Attach-C.pdf	Includes Attachment C of the permit document.
Attach-D.pdf	Includes Attachment D of the permit document.
Attach-E.pdf	Includes Attachment E of the permit document.

Attachment II. Permit Transfer Documents and Financial Form

List of Attachment II Documents

Document II-1. Permit Transfer Application

UNDERGROUND INJECTION CONTROL PERMIT TRANSFER APPLICATION
WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY
WATER QUALITY DIVISION

PART I (To be completed by current operator)

As present operator, Power Resources, Inc. (name) hereby applies to the Administrator to transfer operation of the facility or facilities authorized under UIC Permit # UIC 98-092

Stephen P. Collings — Printed name of person signing

Stephen P. Collings — Signature

President — Title

3-26-2008 — Date

PART II (To be completed by proposed operator)

As proposed transferee, Strathmore Resources US Ltd, A Nevada Corporation 2420 Watt Ct, Riverton, WY 82501 (name and address) agrees to be bound by all of the terms and conditions of the permit described above. (In addition, for Class I facilities the potential transferee must complete the second page of this form to show financial responsibility). If this permit is presently out of compliance, the proposed transferee agrees to bring the operation into compliance according to the (schedule, agreement, letter, notice) attached and dated__/__/__

David Miller — Printed name of person signing

[signature] — Signed

CEO — Title

4/21/08 — Date

APPROVAL FOR TRANSFER OF PERMIT

This transfer is approved effective on the later of the two dates below:

[signature] — Administrator/Water Quality Division

5/1/08 — Date

[signature] — Director/Department of Environmental Quality

5/2/08 — Date

Page 1

REV 13JAN2006 FORM UIC-4

Document II-2. Permit Transfer Application (continued)

FINANCIAL RESPONSIBILITY REQUIREMENTS FOR TRANSFER OF CLASS I WELLS

PART III (To be completed by the company assuming responsibility)

NAME OF FACILITY Reno Creek Uranium Project

LOCATION (T, R, ¼ ¼ SEC, COUNTY) NW/4NE/4 Sec. 29-T43N, R73W SW/4SE/4 Sec. 31-T43N, R73W

PERMIT NUMBER UIC 98-092

OPERATOR'S NAME AND ADDRESS STRATHMORE RESOURCES (US) LTD.

2420 WATT CT, RIVERTON, WY 82501

CERTIFICATION OF FINANCIAL RESPONSIBILITY

The above named operator(s) has adequate financial resources for dealing with the above identified UIC discharge (injection) well(s) and system(s) which either may be improperly abandoned or may otherwise cause pollution and contamination of groundwater sources, and with incomplete or inadequate groundwater pollution reduction or elimination.

Submitted with this document, as proof of adequate financial resources is (check and submit one of the following):

(✓) A copy of the latest annual corporation report to the Wyoming Secretary of State which shows nature and value of assets and copies or relevant instruments or statements which show liabilities, and accounts and goods as collateral; or

(✓) Balance sheet showing assets and liabilities, operator's equity and statements of operations for the most recent three years; or

( ) A surety bond or similar financial instrument in the amount determined by the Administrator.

SIGNATORIES REQUIREMENT FOR CERTIFICATION OF FINANCIAL RESPONSIBILITY

The certification shall be signed as follows:

For a corporation - by a principal executive officer of at least the level of vice-president.

For a partnership or sole proprietorship - by a general partner or the proprietor, respectively.

For a municipality, State, Federal, or other public agency - by either a principal executive officer or ranking elected official.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment.

David Miller — Printed name of person signing

CEO — Title

[signature] — Signature

4/21/08 — Date

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REV 13JAN2006 FORM UIC-4

Document II-3. Permit Bill of Sale

BILL OF SALE

Power Resources, Inc., a Wyoming Corporation, who's address is 141 Union Boulevard, Suite 330, Lakewood, Colorado 80228 ("Seller"), in consideration of $25,000.00 paid on behalf of AUC LLC* by ***American Uranium Corporation***, a Nevada Corporation, whose address is 600 17th Street, Suite 2800 South, Denver, Colorado 80202 ("Purchaser"), does hereby assign its Wyoming Department of Environmental Quality (WDEQ) Underground Injection Control Permit Number UIC 98-092 for Class I Injection Wells, dated June 4, 1998 (Attachment A).

The assignment of the Permit is made "as is" and done in accordance with the procedure required by WDEQ using the WDEQ "Underground Injection Control Permit Transfer Application" (Attachment B).

It is the sole responsibility of AUC LLC to timely file the renewal application and obtain the Permit extension. If for any reason AUC LLC's renewal of the Permit is not successful, it is agreed that the $25,000.00 is not refundable.

Please acknowledge that you are in agreement with these terms by counter-signing this Bill of Sale.

IN WITNESS WHEREOF, Seller and Purchaser have executed this Bill of Sale the ____ of April, 2008.

Power Resources, Inc.	American Uranium Corporation
By: William C Salisbury	By: Robert A Rich
Name: William C. Salisbury	Name: ROBERT A. RICH
Title: Director, Land & Evaluation	Title: PRESIDENT

**Note: AUC LLC is a Delaware Corporation with the following address: 2420 Watt Court, Riverton, WY 82501*