

Application for UIC Class II-D Well Permit Renewal

EXCO Resources LLC

Irvin A-19 Well

Bell Township, Clearfield County, Pennsylvania

July 2025

Prepared for:

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TETRA TECH

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ACRONYMS AND ABBREVIATIONS

AOR	Area Of Review
API	American Petroleum Institute
BCF	Billion Cubic Feet
BHA	Bottom Hole Assembly
CBM	Coal Bed Methane
CO ₂	Carbon Dioxide
EDWIN	Exploration And Development Well Informaiton Network
EXCO	EXCO Resources LLC
GPM	Gallons Per Minute
MAIP	Maximum Allowabel Injection Pressure
MCF	Million Cubic Feet
MCFD	Million Cubic Feet per Day
MD	Measured Depth
mD	Milli-Darcy
PAGWIS	Pennsylvania Groundwater Information System
PSI	Pound Per Square Inch
TARGET	Target Drilling, Inc.
TETRA TECH	Tetra Tech Inc.
UIC	Underground Injection Control
VD	Vertical Depth

1.0 INTRODUCTION

The permit application entitled “EPA Underground Injection Control Well Application, Saltwater Disposal Well, Irvin A19 Well, Bell Township, Clearfield County, Pennsylvania” was prepared for EOG Resources, Inc. by Mactech Mineral Management, Inc., in January 2005. The subject UIC Class II-D Well permit was issued to EOG Resources on May 20, 2005. Conditions of the permit included a monthly volume limit of 21,000 bbls/month and Maximum Injection Pressure (MIP) (Surface) of 3240 psi. The Area of Review (AOR) for the permit application was a ¼ mile radius around the Irvin A-19 well. In a letter dated February 12, 2009, USEPA increased the monthly volume limit to 27,000 bbls/month. The Irvin A-19 well was transferred from EOG to EXCO via an asset purchase agreement effective November 1, 2007.

Injection occurs into the Lower Devonian Oriskany Group (Ridgeley Sandstone and Shriver Chert), with injection occurring via tubing and packer with the top of the injection interval at 7293 feet. This renewal application has been developed to meet all pertinent requirements of EPA Form 7520-6 and 40 CFR Sections 144 and 146A. A copy of the completed EPA Form 7520-6 is presented in Appendix A.

2.0 ATTACHMENT A – MAPS AND AREA OF REVIEW

2.1 PART I – WELL LOCATION

The surface location of the Irvin A-19 injection well is adequately described by the latitude and longitude coordinates on EPA Form 7520-6 (Appendix A). The well is located approximately 2.2 miles northwest of the town of Rock Springs, Clearfield County, Pennsylvania.

2.2 PART II – AREA OF REVIEW SIZE DETERMINATION (40 CFR § 144.6)

The Area of Review (AOR) utilized in this application is a 0.25-mile fixed radius from the proposed injection well per 40 CFR § 144.6(b).

2.3 PART III – MAPS (40 CFR § 144.31 AND 146.24)

- The mapping presented in this section is developed to address requirements of 40 C.F.R. §§ 144.31(e)(7) & 146.24(2). Oil and gas well locations and other well information referenced in this section were obtained from the Pennsylvania Geologic Survey Exploration and Development Well Information Network (EDWIN). Water well information was obtained from the Pennsylvania Ground Water Information System (PAGWIS) database.

Figure 2-1 is a topographic map showing the AOR and the following items within the AOR:

- **Producing oil or gas wells** – As indicated on Table 2-1 and summarized on Table 2-1, there are four wells identified in the EDWIN database as producing oil or gas wells in the AOR. All of the subject wells were present at the time of the initial application. The total depth of these wells range from 3294 to 4758 ft, with the deepest well approximately 2,500 ft above the injection interval.
- **Abandoned oil or gas wells** – There are no abandoned wells based on EXCO's knowledge and review of publicly available information.
- **Wells Within Proposed Injection Interval** - There are no wells within the injection interval of the Irvin A-19 well.
- **Shallow oil and gas wells** – No other shallow oil and gas wells are within the AOR
- **Dry holes** – There are no dry holes based on EXCO's knowledge and review of publicly available information.
- **Injection wells** – Other than the permitted Irvin A-19 well, no other UIC Class IID injection wells were identified in the AOR.
- **Drinking water wells** – Review of the PAGWIS indicated that there are no wells within the AOR.
- **Springs and surface water bodies** – An unnamed tributary to Laurel Run cuts across, from east to west) the central portion of the AOR and is located approximately 180 feet north of the Irvin

A-19 well. No other surface bodies are within the AOR. No known springs are located within the AOR, specifically springs used as a potable water source.

- **Mines (surface and subsurface), quarries** – Former surface mines were located within the southern portion of the AOR. These mines have been reclaimed and are no longer active. The Irvin A-19 well is located outside of the former mined area. No quarries were identified within the AOR.
- **Residences** – The surface owners of properties within 1/4 mile of the injection well are shown on Figure 2-3. Table 2-3 lists the owners and addresses for the subject parcels.
- **Schools** – No schools were identified in the AOR.
- **Hospitals** – No hospitals were identified in the AOR.
- **Roads** – There are no named roads within the AOR. McGees-Mills Road is the nearest named road and is approximately one-mile to the east.
- **Faults** – There were no faults identified in the AOR based on information available to Tetra Tech including the surface geologic map (included in Section 2.0).

Figure 2-2 - Topographic map that extends 1/4-mile beyond the AOR boundary (a radius of 1/2 mile from the proposed injection well)

- **Producing oil or gas wells** – <<Need to be updated based on database information>>
- **Abandoned oil or gas wells** – <<I think there may be a couple plugged wells>>
- **Dry holes** – There were no dry holes in the reviewed area.
- **Injection wells** – No UIC Class II injection wells were identified in the reviewed area.
- **Drinking water wells** – One well (484306) was identified within one-mile of the Irvin A-19 well and is approximately 1/2-mile west of the Irvin A-19 well. This well is listed as 380-feet in depth.
- **Springs and surface water bodies** – An unnamed tributary to Laurel Run cuts across, from east to west) the central portion of the AOR and is located approximately 180 feet north of the Irvin A-19 well. No other surface bodies or springs are located within half a mile.
- **Mines (surface and subsurface), quarries** – No active mines or quarries were identified in the 0.5-mile reviewed area, other than what was detailed in the previous section.
- **Schools** – No schools were identified in the reviewed area.
- **Hospitals** – No hospitals were identified in the reviewed area.
- **Roads** – There are no named roads within a half mile of the Irvin A-19 well. McGees-Mills Road is the nearest named road and is approximately one-mile to the east.
- **Faults** – There were no faults identified in the reviewed area based on information reviewed by Tetra Tech including the surface geologic map (included in Section 2.0).
-

Figure 2-3 - Topographic map extending one mile beyond the facility property boundary (a radius of 1.25 miles from the proposed injection well)

- **Project injection well(s), well pad(s) and/or project area** – The proposed injection well, Irvin A-19, is shown on the map.
- **Applicable AOR** – the 1/4 mile AOR is shown.

- **All outcrops of injection and confining formations** – Based on the surface geologic map for the reviewed area, there were no outcrops of the injection or confining formations.
- **All surface water intake and discharge structures** – No surface water intake or discharge structures were identified in the reviewed area.
- **All hazardous waste treatment, storage, or disposal facilities** – No such facilities were identified in the reviewed area.

2.4 PART IV – AREA OF REVIEW WELLS AND CORRECTIVE ACTION PLANS (40 CFR § 144.31 AND 146.24)

Table 2-1 provides available information on producing wells in the referenced mapped areas. These wells were identified and presented in the original application package and have not changed in the last 20 years.

The Pennsylvania Geologic Survey “Ground Water Inventory System” (PAGWIS) database was accessed to determine sources of groundwater in the site area. It is noted that the well reporting requirement, which was established in 1968, is not considered to be a complete record of water wells and other wells which may be present. (Pennsylvania Topographic and Geologic Survey, February 7, 2019). No wells were identified within the AOR

2.5 PART V – LANDOWNERS INFORMATION (40 CFR § 144.31 AND 147)

Tetra Tech reviewed the property owner information provided by the Greene County GIS web site (<https://gis.vgsi.com/GreeneCountyPAMap/>) for property owner information. Figure 2-4 presents a view of the property boundaries and owners with respect to the injection well. The following landowners are within a ¼-mile of the facility property boundary:

- Yoder, Dustin L & Karen S, 2420 Byrd Lane, Alexandria, Virginia, 22303 (PN 1020B0800000004)
- Commonwealth of Pennsylvania, PA Game Commission, 2001 Elmerton Ave, Harrisburg, Pennsylvania 17110. (PN 1020B0800000009)
- Commonwealth of Pennsylvania, PA Game Commission, 2001 Elmerton Ave, Harrisburg, Pennsylvania 17110. (PN 1020B0800000012)
- EXCO Resources PA LLC, 12377 Merit Drive, Suite 1700, Dallas, Texas, 75251 (PN 1020B08000000040)

3.0 ATTACHMENT B - GEOLOGICAL DATA ON INJECTION AND CONFINING ZONES

3.1 PART I – GEOLOGICAL DATA (40 CFR § 146.24)

3.1.1 Regional Physiography

From a regional perspective, the Irvin A-19 well is located on the eastern edge of the Appalachian Plateau Geologic Province. As indicated on Figure 3-1, the well is situated along the northwest flank of the Chestnut Ridge Anticline. As such, the regional dip in the vicinity of the well would be anticipated to be to the northwest. There are no faults indicated on the geologic map suggesting that there are no significant faults extending to the surface.

3.1.2 Drinking Water Aquifers

Based on drilling records of shallow gas wells in the area, the base of the lowest most underground sources of drinking water (USDW) was indicated in the original application to be approximately 540 ft. A review of the PA Groundwater Information System (PAGWIS) in July 2025 indicated that there were no drinking water wells in the ½- mile AOR. There was three drinking water well in the database within one mile of the Irvin A-19 well. A well and is located approximately ½ mile northeast of the Irvin A-19 well and is reported to have a depth of 380 ft. Two additional wells are located between ¾ to 1 mile to the north and are have reported depths of 200 feet and 163 feet. The location of the wells are shown on Figure 3-2.

3.1.3 Geologic Setting

Figure 3-1 is a geologic map of the McGees Mills quadrangle. From a regional perspective, the Irvin A-19 well is located on the eastern edge of the Appalachian Plateau Geologic Province. As indicated on Figure 3-1, the well is situated along the northwest flank of the Chestnut Ridge Anticline. As such, the regional dip in the vicinity of the well would be anticipated to be to the northwest. There are no faults indicated on the geologic map suggesting that there are no significant faults extending to the surface.

Figure 3-2 presents a generalized geologic section of the region from the original Mactech application in 2005.

Injection Zone

The Irvin A-19 well injects into the Lower Devonian Oriskany Group (Ridgeley Sandstone and Shriver Chert). This zone is described in the original permit application as:

- Ridgeley Sandstone: The Ridgeley sandstone thickness is approximately 6 feet in thickness and is described as a 2 foot section of sandstone from 7,295-7,297 feet in depth, fine to medium grained, light gray to gray, quartzitic, quartz grains mostly sub angular, a few rounded and 4 feet of limestone from 7,297 -7,301 feet in depth.
- Shriver Chert: The Shriver Chert is approximately 43 feet in thickness and is described as consisting of limestone, fine, clastic, brownish to dark brownish gray, containing fragments of shells, and a great deal of quartz silt and sand in the upper 26 feet. The lower 17 feet of the Shriver Chert is described as limestone, very fine to fine, clastic brownish to dark brownish, containing a great deal of light gray silty tripolitic chert and light brownish to brownish-gray sub chalcedonic chert.

Confining Zones

Upper Confining Zones: Devonian age Onondaga Formation and Hamilton Group-Gross Thickness 589 feet. Onondaga formation is described as being 74 feet in thickness generally consisting of limestone, shale and chert. Immediately lying above the Onondaga is a 1-foot section the Tioga bentonite, lying above the Tioga bentonite is the Hamilton group is 515 feet in thickness predominately consisting of grayish-black shale.

Lower Confining Zone: Silurian age Helderberg and Keyser formations-The Helderberg is generally described as consisting of limestone and shale is 166 feet in thickness and the Keyser is described as consisting of limestone and dolomite and is 70 feet in thickness.

3.1.4 Faulting and Seismic Activity

Faulting is known to occur in the Appalachian Plateau region, particularly associated with anticlinal structures. Many researchers consider the potential for induced seismicity related to injection wells to be greater when injected fluids and pressures interact with faults which extend to Precambrian basement rocks. As discussed in the “Geology of Pennsylvania” (Pennsylvania Geological Survey and Pittsburgh Geological Survey, 1999) in describing the typical faults occurring in the Appalachian Plateau structures, “These faults die out in the overlying Devonian Shales. Beneath the Onondaga-Ridgeley units, the fault planes flatten and pass into a decollement surface in the Salina Group.” In other words, the typical faults associated with the Appalachian Plateau structures “ramp up” out of the Salina Salt Formation and extend upward until dying out at, or slightly above, the Tully Limestone. According to the PA DCNR “Precambrian Basement Map of the Appalachian Basin and Piedmont Province in Pennsylvania”

http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_016250.pdf) the depth to Precambrian basement in the site vicinity is estimated at approximately 5000 meters (or approximately 16,400 feet) below sea level. The base of the Oriskany Sandstone at the Irvin A-19 well is approximately 5,600 ft. below sea level, or roughly 2 miles above the estimated top of Precambrian basement. The

base of the Salina Salt Formation (the interval acting as the fault decollement) is estimated to occur at a depth of approximately 1500 ft below the Oriskany Sandstone or roughly 1.5 miles above Precambrian basement rocks. The Tully, which in general is the upper limit of the faulting extent for faults impacting the Oriskany, is approximately 6,000 feet below the anticipated lowest most USDW.

3.1.5 Geologic Risk Summary

The Irvin A-19 well has been permitted and injecting brine since 2005. The permit was previously renewed in 2015. In summary, should faults be present in the Irvin A-19 area that intersect the injection intervals (i.e., Ridgeley Sandstone or Shriver Chert) the faults would not likely extend to the USDW or to Precambrian basement (which is believed to be a condition resulting in greater risk for induced seismicity). The USGS Seismic Hazards Map for Pennsylvania (Figure 3-3) indicates that the Irvin A-19 well is situated in the lowest seismic risk area. It is also noted that there have been no reports of seismicity associated with the Irvin A-19 well, which has been operating for approximately 20 years.

3.2 PART II – PROPOSED FORMATION TESTING PROGRAM (40 CFR § 146.22)

The Irvin A-19 well has been permitted and injecting brine since 2005. The permit was previously renewed in 2015. No additional testing has been conducted and no additional testing is planned.

4.0 ATTACHMENT C – WELL CONSTRUCTION INFORMATION

4.1 PART I – WELL SCHEMATIC DIAGRAM (40 CFR § 146.24)

Figure 4-1 illustrates the well construction diagram for the existing Irvin A-19 well which was submitted with the initial permit application prepared by Mactech. The completion rework report for the well is included in Appendix A. The following features are shown on the EOG diagram in Figure 4-1:

- Underground Source of Drinking Water (USDW): As discussed in Section 2.0 Attachment B – Geological and Geophysical Information, the base of the USDW is estimated at 380 ft based on the depth of drinking water wells in the area and regional hydrogeologic conditions.
- Confining and Injection Zones: The injection interval is overlain by over 100 ft of confining interval including the Hamilton Group Shale and Onondaga Chert and Shale. The confining zone consists of over 500 feet of shale. The injection zone extends from a depth of 7,293' to 7,335' and consists of the Oriskany Group, Ridgley Sandstone and Shriver Chert.
- Casing and Cementing Details: The 7-inch OD casing is set to a depth of 7,232 feet and is cemented in place up to a depth of 5,434 feet. The surface casing (10.75-inch OD) is set to a depth of 1,013 feet and cemented to the surface. This surface casing below the estimated base of the USDW at 380 feet and is over 600 feet below the USDW which meets the minimum of 50 ft is required by EPA.
- Tubing and Packer: The tubing will be 2 7/8 inch diameter, and the packer was set at approximately 7,009 feet in depth, which is approximately 20 ft above the injection interval.
- Pressure Gauges: Wellhead pressure gauges are used to monitor the 7-inch well casing annular space and the 10.75-inch conductor casing annular space. In addition, the 2 7/8-inch injection tubing pressure is monitored continually.

4.2 PART II – WELL CONSTRUCTION OR CONVERSION PROCEDURES (40 CFR §§ 144.52, 146.22, AND 146.24)

The Irvin A-19 well is an existing well that was permitted in 2005 as a Class IID UIC well. The permit for the well was renewed in 2015. This application is to extend the existing permit for the operation of the facility under the approved operation levels and no changes or conversions are planned.

5.0 ATTACHMENT D – INJECTION OPERATION AND MONITORING PROGRAM (40 CFR §§ 146.23 AND 146.24)

5.1 FACILITY LAYOUT

The existing facility is located approximately 1,100-feet south-southwest of the Irvin A-19 well. Appendix C presents the a layout map of the injection facility, and the location of the injection facility with respect to the injection Irvine A-19 well.

In general, the inject system/facility includes the following items:

- Wellhead at Irvin A-19 (approximately 1,100-feet north-northeast of the processing facility)
- Offload valve to manifold to fill tanks.
- Three 300- barrel tanks within secondary containment.
- Filer pump
- Disposal pump
- Generator
- Buried piping from processing facility to the Irvin A-19 well

5.2 PREPARATION AND OPERATION

The facility is currently in operation and has been since 2005. The permitted Maximum Injection Pressure (MIP) (surface) is 3,240 psi and the maximum monthly volume limit is 36,000 bbls. EXCO generally operates the facility from Monday through Friday, but occasionally operates the facility on a seven day a week basis to facilitate injecting the additional volume of brine.

EXCO routinely submits Specific Gravity data with its annual report for the Irvin A-19 well. Appendix D includes Specific Gravity data from a sample collected by EXCO in December 2024 on sources of brine disposed at the Irvin A-19 well. The average Specific Gravity of these sources is 1.136.

5.3 MONITORING PROGRAM

Injection pressures at the wellhead as well as the annular pressures of the casing and surface casing is monitored to verify the integrity of the wells and cement seals. The well is operated within permitted operating conditions which includes a MIP of 3,240 psi and a monthly volume limit of 36,000 bbls. Required reports are submitted in accordance with the permit conditions.

5.4 PLAN FOR WELL FAILURE

In the event of unexpected pressure changes in any of the monitored locations, the system will be shut down and the cause of the pressure change will be investigated. Once a cause is determined, remedial actions will be implanted to rectify the issue prior to restarting the injection operations. The EPA will be notified within 24-hours and a written notification will be provided within 7 days. Appropriate

remedial actions will be implemented immediately, and an analysis of the failure will be conducted. Remedial actions, proposed repairs, and corrective actions will be evaluated with the EPA prior to any further injection attempts.

6.0 ATTACHMENT E – PLUGGING AND ABANDONMENT PLAN (40 CFR §§ 146.23 AND 146.24)

There is no plan for plugging or abandonment and EXCO plans to continue operation of the injection well. In order to meet the requirements of the application, EXCO has completed a Well Rework Record, Plugging and Abandonment Plan calculations. A copy of the plugging plan and estimate costs are presented in Appendix E.

7.0 ATTACHMENT F – FINANCIAL ASSURANCE (40 CFR § 144.52)

EXCO will provide a Letter of Credit to meet the financial assurance requirements for properly plugging and abandoning the well per the cost estimate provided in Section 6, Attachment E – Plugging and Abandonment Plan. This document will be provided under a separate cover at a later date.

8.0 ATTACHMENT G – SITE SECURITY AND MANIFEST REQUIREMENTS

This facility is currently in operation and has been in operation since 2005. The facility is has a limited access road that is gated and the brine processing facility is surrounded by a chain link fence. During operation, the facility is manned and secured during non-operation times. The Irvin A-19 well is located in a remote area that is not accessible to the public.

9.0 ATTACHMENT H – AQUIFER EXEMPTIONS (40 CFR §§ 144.7 AND 146.4)

The Irvin A-19 well is 7,840 feet in depth with an injection zone ranging from 7,293 to 7,335 below the ground surface. The deepest water well within one-mile of the injection point is 380-feet, which is more than 6,800 feet above the injection zone. An aquifer exemption is not applicable to this renewal permit.

10.0 ATTACHMENT I – EXISTING EPA PERMITS (40 CFR § 144.52)

The facility is currently permitted as a Class II D injection well; UIC permit PAS2D205BCLE. There are no other EPA permits currently associated with this project.

11.0 ATTACHMENT J – DESCRIPTION OF BUSINESS (40 CFR § 144.31)

The Irvin A-19 well is currently operating as a Class II D injection well and has operated since 2005. EXCO plans to continue operating the injection well in accordance with the permit conditions.

12.0 ATTACHMENT K – OPTIONAL ADDITIONAL PROJECT INFORMATION (40 CFR § 144.4)

12.1 THE WILD AND SCENIC RIVER ACT, 16 U.S.C 1273 ET SEQ

This is not applicable to this application; the facility exists and is in operation. This is for a permit renewal.

12.2 THE NATIONAL HISTORIC PRESERVATION ACT OF 1966, 16 U.S.C 470 ET SEQ

This is not applicable to this application; the facility exists and is in operation. This is for a permit renewal and no expansion is planned at this point.

12.3 THE ENDANGERED SPECIES ACT, 16 U.S.C 1531 ET SEQ

This is not applicable to this application; the facility exists and is in operation. This is for a permit renewal and no expansion is planned at this point.

12.4 THE COASTAL ZONE MANAGEMENT ACT, 16 U.S.C 1451 ET SEQ

This is not applicable to this application; the facility exists and is in operation. This is for a permit renewal.

13.0 REFERENCES

- EPA Underground Injection Control Application, Saltwater Disposal Well, Irvin A19 Well, 2005, Mactech Mineral Management
- PAGWIN, 2025: Pennsylvania Groundwater Information System

TABLES

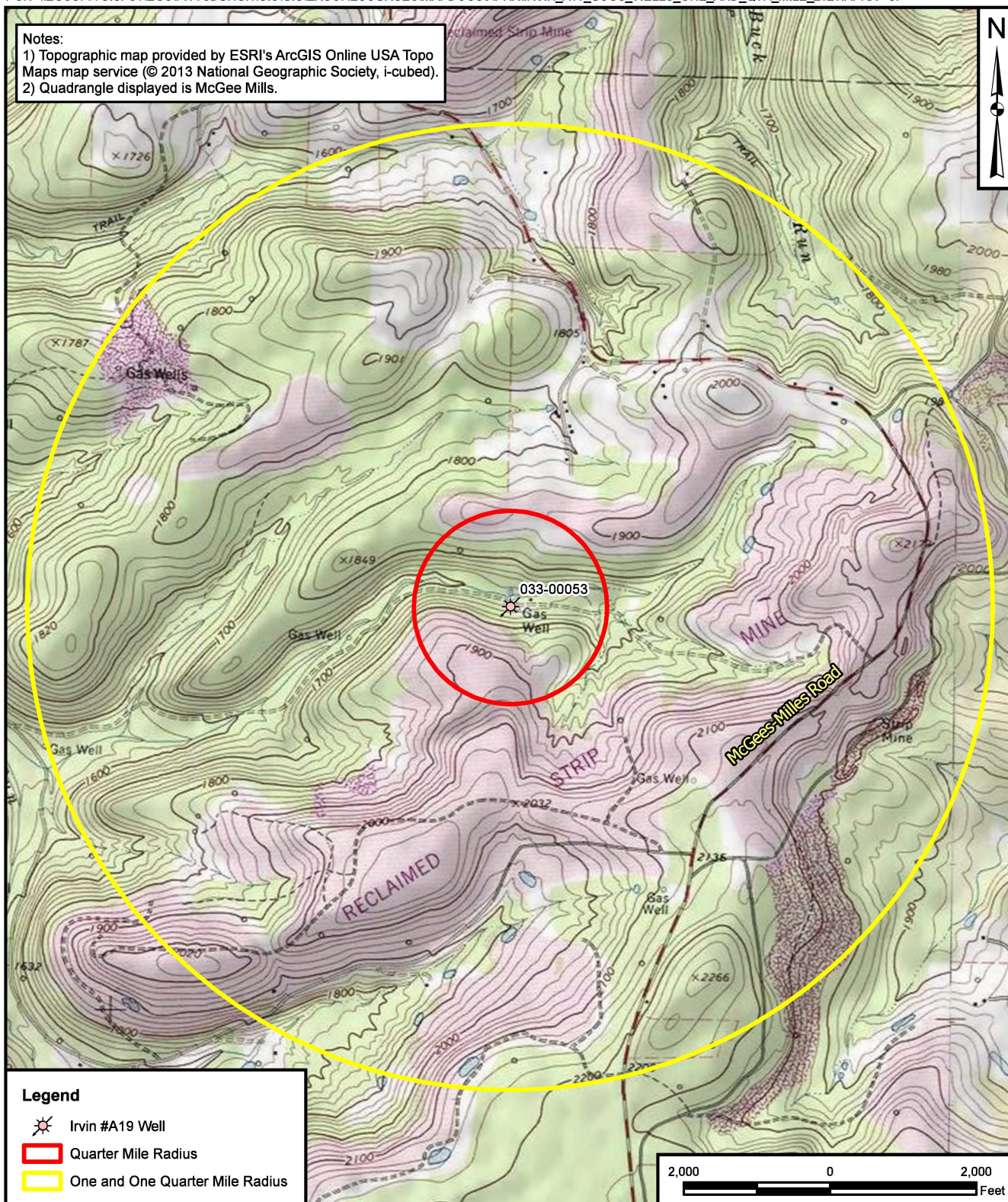
Table 2-1
Oil and Gas Wells Located Within the 1/4 Mile AOR
Irvin A-19 Well
Clearfield County, Pennsylvania

Permit No.	Well Name	Operator	Type	Spud Date	County	Latitude	Longitude	Total Depth (Ft.)
033-24072	FEE A M597 HOPKINS 330 WELL	EXCO RESOURCES PA LLC	GAS	7/23/1998	Clearfield	40.971192	-78.775075	4758
033-24173	FEE A M-591 A IRVIN 427	EXCO RESOURCES PA LLC	GAS	12/9/1998	Clearfield	40.971769	-78.771327	3374
033-24210	FEE A M-597 HOPKINS 424	EXCO RESOURCES PA LLC	GAS	1/29/1999	Clearfield	40.975954	-78.77524	3294
033-24552	IRVIN (M-591) #657	EXCO RESOURCES PA LLC	GAS	2/1/2001	Clearfield	40.974956	-78.768195	3350

FIGURES

Notes:

- 1) Topographic map provided by ESRI's ArcGIS Online USA Topo Maps map service (© 2013 National Geographic Society, i-cubed).
- 2) Quadrangle displayed is McGee Mills.



Legend

- Irvin #A19 Well
- Quarter Mile Radius
- One and One Quarter Mile Radius



**OIL AND GAS WELL LOCATIONS WITHIN 1-1/4 MILE
IRVIN #A-19**

EXCO RESOURCES INC.
CLEARFIELD COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 06/23/25
CHECKED BY: L. DRANE 07/07/25
APPROVED BY:

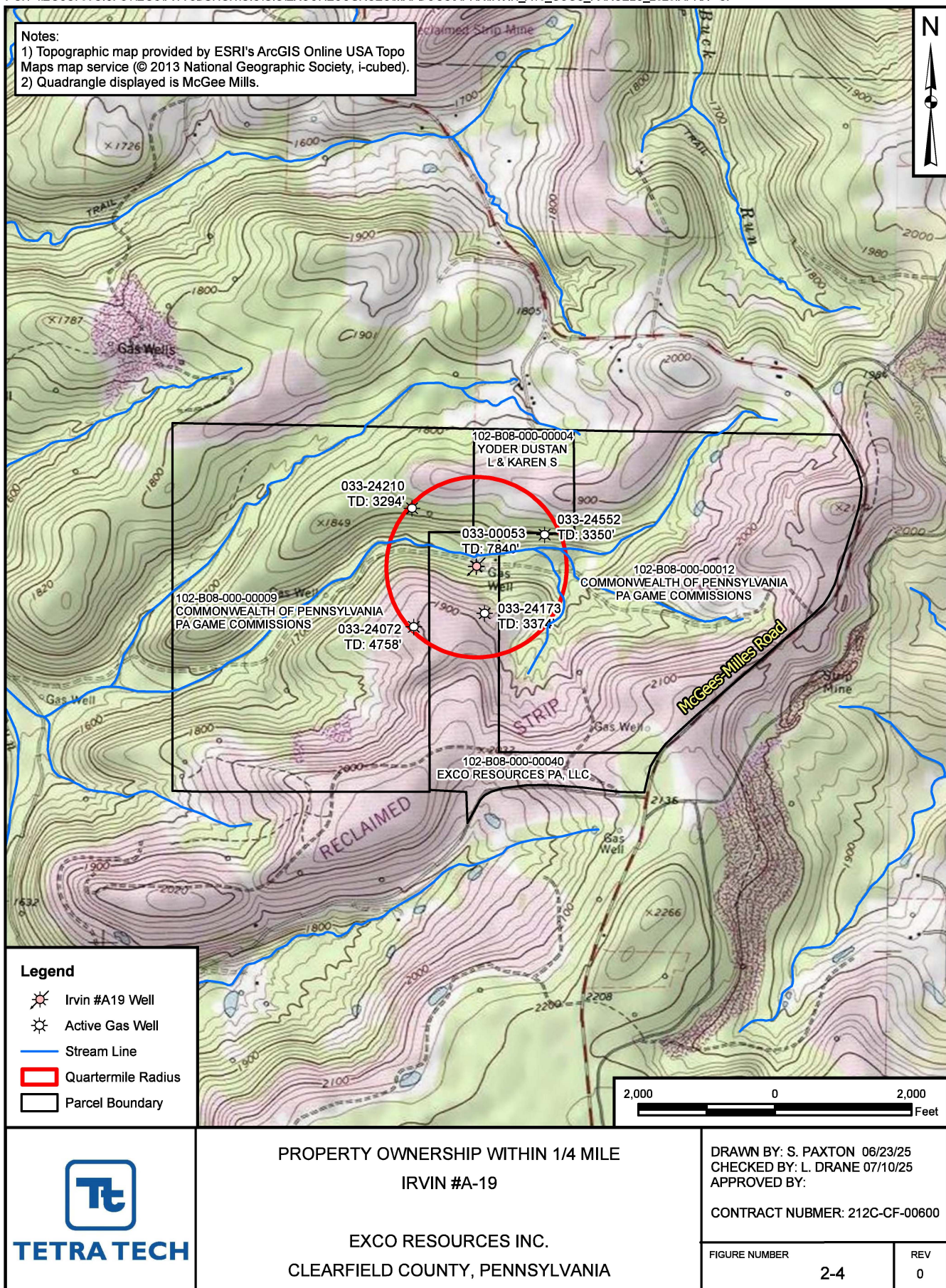
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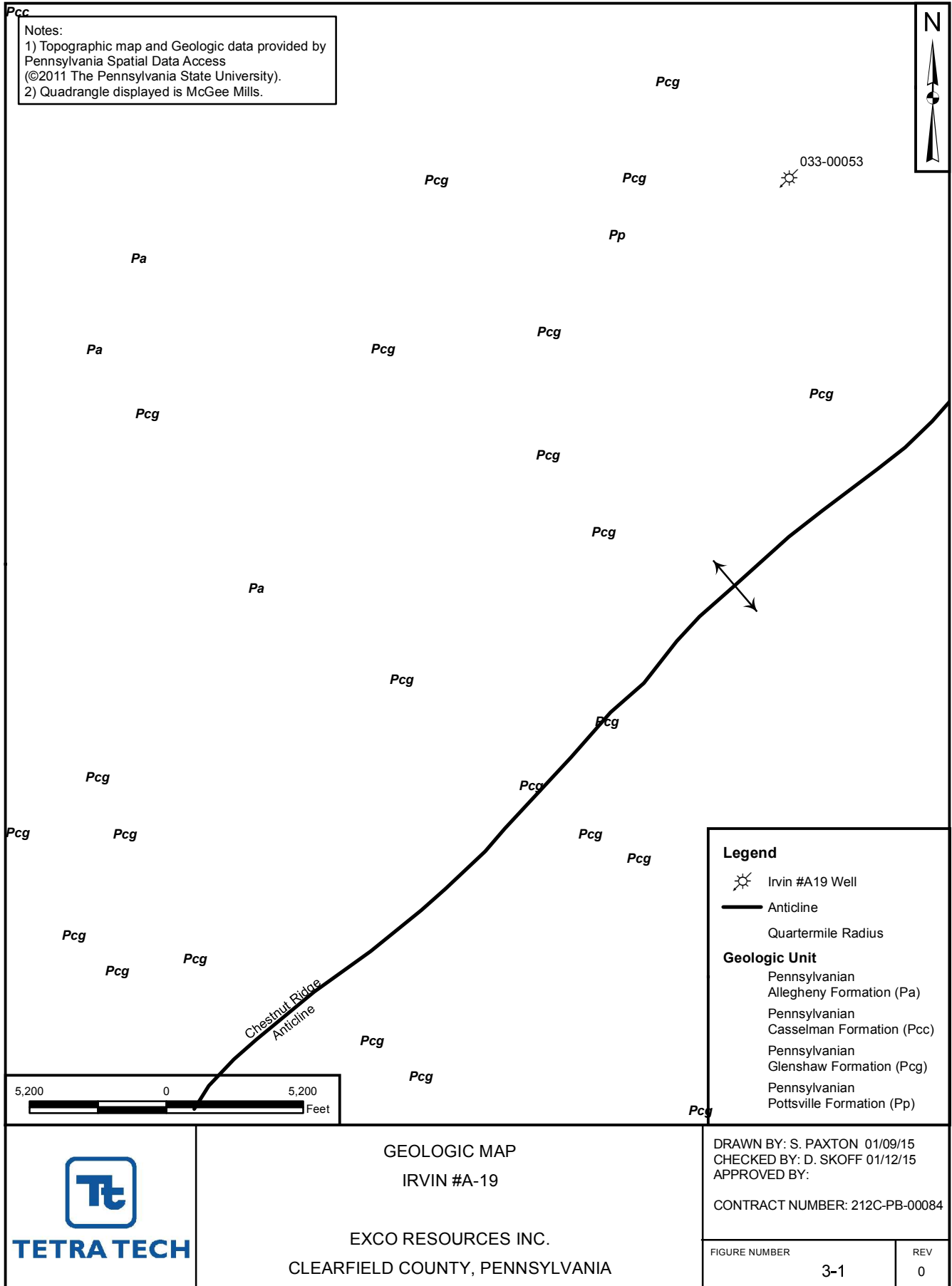
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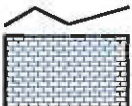
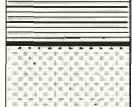
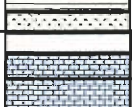
REV

0





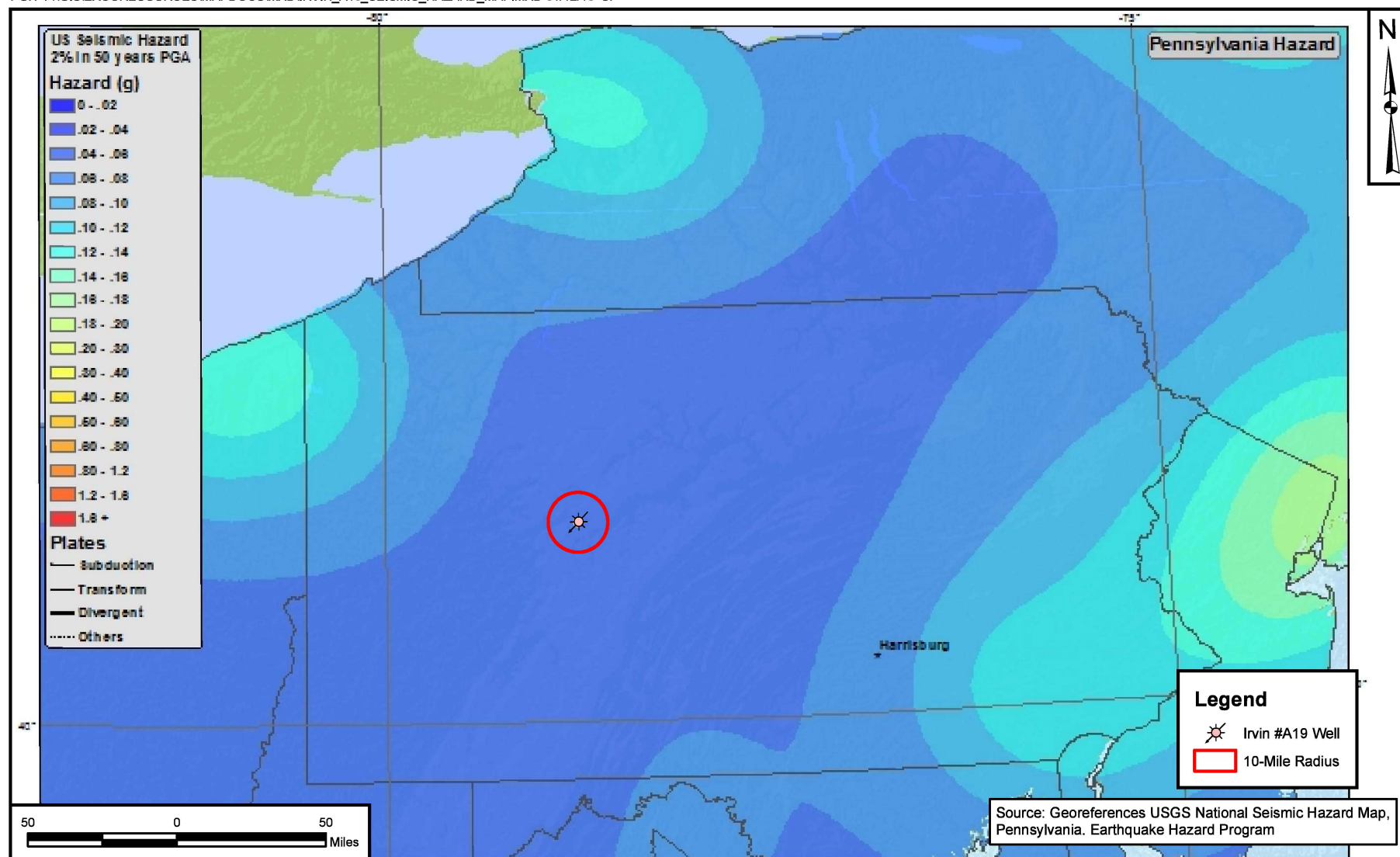
System**Description of Strata****Formation Name**

DEVONIAN	Upper Confining Zones (Minimum 590' in thickness)		180' of Limestone	Tully 6525'-6705' (180')
			515' of Shale	Hamilton 6705'-7220' (515')
			11' of Shale	Tioga 7220'-7221' (1')
			36' of Chert	Onondaga 7221'-7295' (74')
			22' of Shale	
			3' of Chert	
Injection Zone (49' in thickness)			2' of Sandstone	Ridgeley Sandstone 7295'-7301' (6')
			4' of Limestone	
			43' of Limestone	Shriver Chert 7301'-7344' (43')
SILURIAN	Lower Confining Zones		166' of Limestone & Shale	Helderberg 7344-7510 (166')
				
			70' of Limestone & Dolomite	Keyser 7510'-7580' (70')
				
			T.D. 7840' Well reached Salt	
		 Geological Column &		



**Geological Column &
Lithological Description
Irvin #A-19- API ID 37-003-0053
EPA UIC Project**

**Figure 3-2 - Generalized
Stratigraphic Column**



USGS SEISMIC HAZARDS MAP FOR PENNSYLVANIA

EXCO RESOURCES INC
CLEARFIELD COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/05/15
CHECKED BY: D. SKOFF 01/12/15
APPROVED BY:

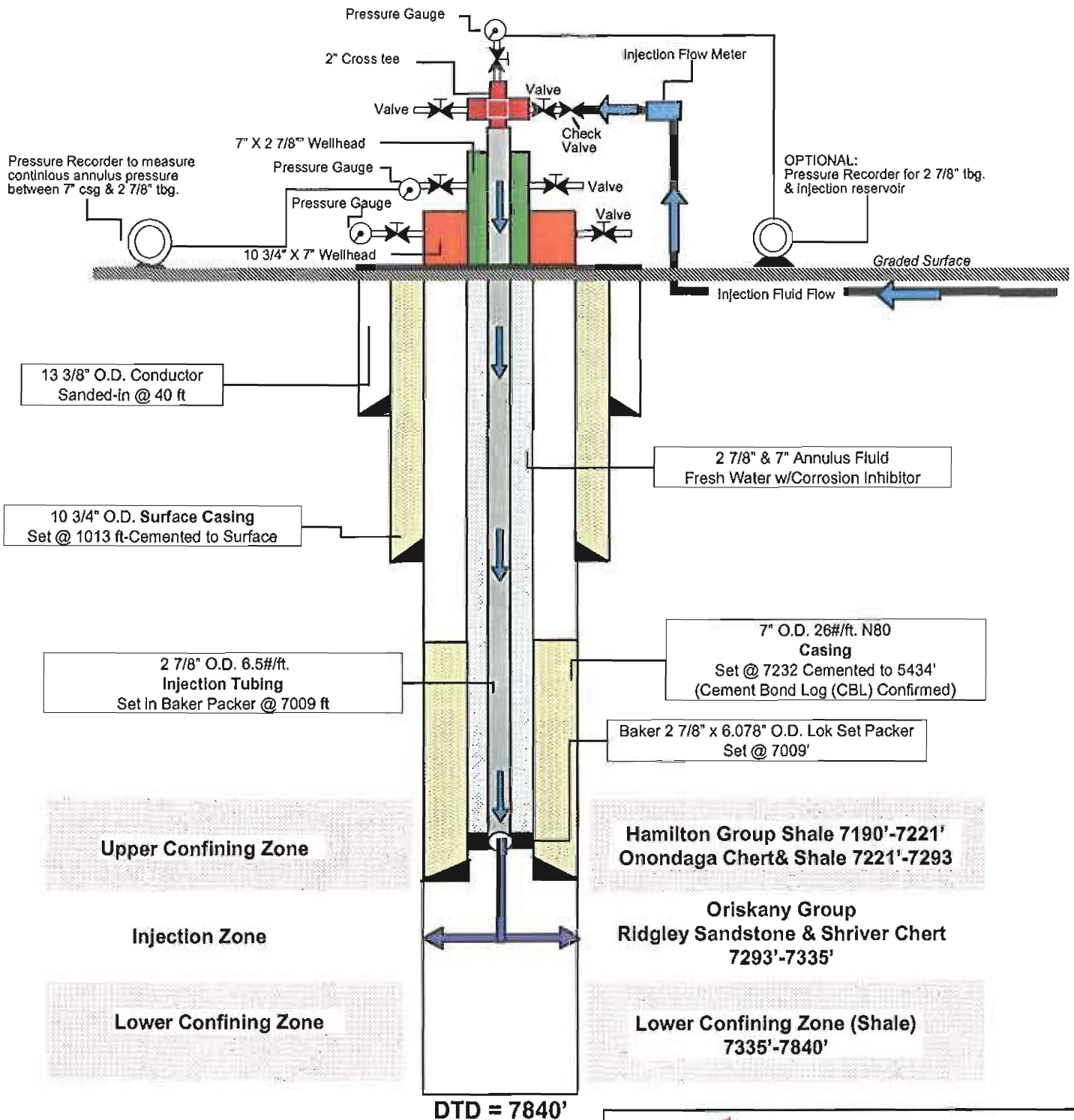
CONTRACT NUMBER: 212C-PB-00084

FIGURE NUMBER

3-3

REV
0

PROPOSED WELL CONSTRUCTION



Injection Well Schematic
Irvin #A-19

API ID 37-003-0053

EPA UIC Project

Prepared By:



Mactech Mineral Management, Inc.
Energy and Environmental Consultants
Bradford, PA.

Figure 4-1

January 2005

APPENDICES

 United States Environmental Protection Agency Underground Injection Control Permit Application for a Class II Well <i>(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, and 40 CFR Part 144)</i>		For Official Use Only Date Received Permit Number	
Read Attached Instructions Before Starting			
I. Owner Name, Address, Phone Number and/or Email		II. Operator Name, Address, Phone Number and/or Email	
EXCO Resources, Inc 12377 Merit Drive, Suite 1700 Dallas, TX 75251 (214) 368-2084		EXCO Resources (PA), LLC 325 Airport Road Montoursville, PA 17754 (214) 368-2084	
III. Commercial Facility	IV. Ownership	V. Permit Action Requested	VI. SIC Code(s)
☐ Yes ☒ No	☒ Private ☐ Federal ☐ State/Tribal/Municipal	☐ New Permit ☒ Permit Renewal ☐ Modification ☐ Add Well to Area Permit ☐ Other	1311
VII. Indian Country			
☐ Yes ☒ No			
VIII. Type of Permit (For multiple wells, use additional page(s) to provide the information requested for each additional well)			
☒ A. Individual ☐ B. Area	Number of Wells 1	Well Field and/or Project Names 	
IX. Class and Type of Well (see reverse)			
A. Class	B. Type (enter code(s))	C. If type code is "X," explain.	
II	D		
X. Well Status		XI. Well Information	
☒ A. Operating Date Injection Started 06/20/2005		☐ B. Conversion Date Well Constructed	
☐ C. Proposed		API Number 37-033-00053 Permit (or EPA ID) Number PAS2D205BCLE Full Well Name IRVIN A-19	
XII. Location of Well or, for Multiple Wells, Approximate Center of Field or Project			
Locate well in two directions from nearest lines of quarter section and drilling unit Surface Location 1/4 of 1/4 of Section Township Range ft. from (N/S) Line of quarter section ft. from (E/W) Line of quarter section.		Latitude 40.970541 Longitude -78.773395	
XIII. Attachments			
<i>In addition to this form, complete Attachments A-U (as appropriate for the specific well class) on separate sheets. Submit complete information, as required in the instructions and list all attachments, maps or other figures, by the applicable letter.</i>			
XIV. Certification			
I certify under the 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. (Ref. 40 CFR § 144.32)			
Authorized Signatory and Official Title (Please Type or Print)		Signature	Date Signed
Philip Points - EHS & Regulatory Director 			07/10/2025



EXCO Resources (PA), LLC

12377 Merit Drive • Suite 1700 • Dallas, Texas 75251

Phone (214)368-2084 • Fax (214)368-8754

July 7, 2025

Kevin Rowsey
UIC Program Lead, Water Division
United States Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, PA 19103-2029

RE: Notice of Signature Authority pursuant to UIC Permit Renewal
UIC No. PAS2D205BCLE
Irvin A-19 well, Clearfield County, PA.

Mr. Rowsey,
Please accept this letter as notice that I fully authorize and delegate the following individual to have signature authority regarding US EPA UIC Permit applications submitted on behalf of EXCO Resources (PA), LLC.

Philip Points - EHS & Regulatory Director

This individual is under my general supervision and maintains direct knowledge and control of facility compliance for which a UIC permit is required. As such, they are hereby authorized to have complete signature authority in all matters of compliance related to EXCO's assets within the State of Pennsylvania.

Thank you,

A handwritten signature in blue ink, appearing to read "H. Jameson". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Harold Jameson
Vice President & Chief Operating Officer

APPENDIX A – EPA FORM 7520-6


 United States Environmental Protection Agency
 Washington, DC 20460

WELL REWORK RECORD

Name and Address of Permittee Exco Resources (PA), LLC 3000 Ericsson Drive, Suite 200 Warrendale PA, 15086		Name and Address of Contractor 	
Locate Well and Outline Unit on Section Plat - 640 Acres N E W S	State Pennsylvania	County Clearfield	Permit Number
	Surface Location Description 1/4 of 1/4 of 1/4 of 1/4 of Section Township Range		
	Locate well in two directions from nearest lines of quarter section and drilling unit Surface Location ft. from (N/S) Line of quarter section and ft. from (E/W) Line of quarter section.		
	WELL ACTIVITY ☒ Brine Disposal ☐ Enhanced Recovery ☐ Hydrocarbon Storage Lease Name A. Irvin	Total Depth Before Rework 7820 Total Depth After Rework 7820 Date Rework Commenced 06/01/2010 Date Rework Completed 06/22/2010	TYPE OF PERMIT ☒ Individual ☐ Area Number of Wells Well Number A-19 3703300053

WELL CASING RECORD -- BEFORE REWORK						
Casing		Cement		Perforations		Acid or Fracture Treatment Record
Size	Depth	Sacks	Type	From	To	
13 3/8	140					sanded in
10 3/4	1013					cemented to surface
7	7232					cement top at 6434' per historic records

WELL CASING RECORD -- AFTER REWORK (Indicate Additions and Changes Only)						
Casing		Cement		Perforations		Acid or Fracture Treatment Record
Size	Depth	Sacks	Type	From	To	
13 3/8	40					
10 3/4	1013					
7	7232	423	Class A - 1	3700	3701	

DESCRIBE REWORK OPERATIONS IN DETAIL USE ADDITIONAL SHEETS IF NECESSARY	WIRE LINE LOGS, LIST EACH TYPE	
	Log Types	Logged Intervals
Released packer, perforated casing from 3700 - 3701, squeezed 423 sx	Cement Bond Log	37010 - 4200
Class A Type I cement, ran bond log, log indicated good cement and a		
new cement top of 4594, reran packer and tubing, returned to injection		
Dave Rectenwald witnessed MIT test and has a copy of bond log		

Certification

I certify under the 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. (Ref. 40 CFR 144.32)

Name and Official Title (Please type or print) William E. Veigel, Production Engineer	Signature 	Date Signed 07/20/2010
--	---------------	---------------------------

APPENDIX B – AVAILABLE COMPLETION LOGS

APPENDIX C – GENERALIZED FACILITY LAYOUT



Pace Altoona
2019 Ninth Avenue
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(814) 946-4306

EPA Lab ID: PA01737

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WV DW 9963 CM

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PA DEP Chapter 252
PA 33-00258

Pace Erie
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Erie, PA 16510
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EPA Lab ID: PA01736

NELAP
PA 25-05907
NY 12175

Pace Wysox
1851 Golden Mile Road
Wysox, PA 18854
(570) 265-5040

EPA Lab ID: PA01733

NELAP
PA 08-05622
NY 12127



EXCO Resources

260 Executive Drive

Cranberry Twp, PA 16066

Project Manager: Vince Armstrong

Project: Irvin

Project Number: [none]

Reported:

12/10/24 15:09

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Sample Type	Date Sampled	Date Received
Irvin	AYK4168-01	Water	Grab	11/22/24 08:50	11/22/24 09:18

Pace Analytical Services, LLC

Reviewed and Submitted by:

Walter Burham

Project Manager

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EXCO Resources
260 Executive Drive
Cranberry Twp, PA 16066

Project Manager: Vince Armstrong

Project: Irvin

Project Number: [none]

Reported:

12/10/24 15:09

Client Sample ID: Irvin

Date/Time Sampled: 11/22/24 08:50

Laboratory Sample ID: AYK4168-01 (Water/Grab)

Analyte	Result	MDL	RL	Units	Date / Time Analyzed	Analytical Method	* Analyst	Note
---------	--------	-----	----	-------	----------------------	-------------------	-----------	------

Analyses to be performed immediately upon sampling. See Definition indicated by: #

# Dissolved Oxygen	5.88		0.100	mg/l	12/10/24 11:40	SM 4500-O-H-16	rmg	
--------------------	------	--	-------	------	----------------	-------------------	-----	--

Calculated Analytes

Hardness	48800		207	mg equiv. CaCO3/L	12/05/24 01:54	CALC-	seg	
----------	-------	--	-----	----------------------	----------------	-------	-----	--

General Chemistry Analysis Performed in DuBois

Specific Conductance @ 25°C	178000		1.00	µmhos/cm	11/22/24 14:15	SM(22) 2510 B-2011	amb-D	
pH @ 20.8°C	5.6			pH Units	11/22/24 14:25	SM(22) 4500-H+ B-2011	amb-D	B3
Total Dissolved Solids (Residue, Filterable)	194000		10.0	mg/l	11/26/24 15:00	SM(23) 2540 C-2015	kjm-D	

Conventional Chemistry Parameters by SM/EPA Methods

Total Alkalinity to pH 4.5	<20.0		20.0	mg CaCO3/L	11/26/24 20:30	SM 2320B-11	zbt	
Chloride	100000		20000	mg/l	11/25/24 12:41	EPA 300.0/2.1	bdw	
Specific Gravity	1.136		0.300	-	11/26/24 15:55	SM 2710F	ers	
Sulfide	<5.00		5.00	mg/l	11/25/24 14:40	SM 4500 S2 F-11	hdm	
Total Organic Carbon	<5.00		5.00	mg/l	12/03/24 17:10	SM 5310 C-14	jei	

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PA 08-05622
NY 12127



EXCO Resources

260 Executive Drive

Cranberry Twp, PA 16066

Project Manager: Vince Armstrong

Project: Irvin

Project Number: [none]

Reported:

12/10/24 15:09

Client Sample ID: Irvin

Date/Time Sampled: 11/22/24 08:50

Laboratory Sample ID: AYK4168-01 (Water/Grab)

Analyte	Result	MDL	RL	Units	Date / Time Analyzed	Analytical Method	* Analyst	Note
---------	--------	-----	----	-------	----------------------	-------------------	-----------	------

Metals by Prep Method EPA 200.2

Barium	4120		2.00	mg/l	12/05/24 01:54	EPA 200.7/4.4	seg	T
Calcium	17600		50.0	mg/l	12/05/24 01:54	EPA 200.7/4.4	seg	T
Iron	82.0		20.0	mg/l	12/05/24 01:55	EPA 200.7/4.4	seg	
Magnesium	1160		20.0	mg/l	12/05/24 01:54	EPA 200.7/4.4	seg	
Manganese	9.09		2.00	mg/l	12/05/24 01:56	EPA 200.7/4.4	seg	
Sodium	36100		100	mg/l	12/05/24 01:54	EPA 200.7/4.4	seg	T



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Project Manager: Vince Armstrong

Project: Irvin

Project Number: [none]

Reported:

12/10/24 15:09

Notes

- B3 This sample was analyzed outside the EPA holding time.
- T Result was over the calibration range, but within the linear dynamic range of the instrument for the noted analyte.



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Project: Irvin

Project Number: [none]

Reported:

12/10/24 15:09

Definitions:

If surrogate values are not within the indicated range, then the results are considered to be estimated.

Reporting limits are adjusted accordingly when samples are analyzed at a dilution due to the matrix.

+ MBAS, calculated as LAS, mol wt 348

If the solid sample weight for VOC analysis does not fall within the 3.5-6.5 gram range, the results are considered estimated values.

Unless otherwise noted, all results for solids are reported on a dry weight basis.

Samples collected by Pace Labs' personnel are done so in accordance with Standard Operating Procedures established by Pace Labs.

The following analyses are to be performed immediately upon sampling: pH, sulfite, chlorine residual, dissolved oxygen, filtration for ortho phosphorus, and ferrous iron. The date and time reported reflect the time the samples were analyzed at the laboratory; and should be considered as analyzed outside the EPA holding time.

^ The following analytes are to be filtered immediately upon sampling: Hexavalent Chromium. Filtration through a 0.45 micron filter within 15 minutes of sampling is required for compliance with the Clean Water Act (CWA) for reporting of hexavalent chromium to prevent interconversion of chromium species.

* Analysis location indicator:

D: Indicates analysis performed by Pace Analytical Laboratories, LLC, 40 Hoover Ave., DuBois, PA 15801. PA DEP Chapter 252 certification: PA 33-00258.

E: Indicates analysis performed by Pace Analytical Laboratories, LLC, 1920 East 38th Street, Erie, PA 16510. NELAP certification: PA 25-05907.

W: Indicates analysis performed by Pace Analytical Laboratories, LLC, 1851 Golden Mile Rd., Wysox, PA 18854. NELAP certification: PA 08-05622 and NY 12127.

< Represents "less than" - indicates that the result was less than the RL, or the MDL if indicated for the parameter.

MDL Method Detection Limit - is the lowest or minimum level that provides 99% confidence level that the analyte is detected. Any reported result values that are less than the RL are considered estimated values. If Radiological results are reported, the MDC - Minimum Detectable Concentration is shown in the MDL column.

Definitions Continued:

Pace Analytical Services, LLC

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Project: Irvin

Project Number: [none]

Reported:

12/10/24 15:09

RL	Reporting Limit - is the lowest or minimum level at which the analyte can be quantified.
[CALC]	Indicates a calculated result. Calculations use results from other analyses performed under accredited methods.
ND	Non Detect. The noted analyte was not detected in the sample.

(-) Method Revision Indicator - West Virginia Samples

CALC- : Indicates analysis by SM2340 B-2011. This method appears on the WV DEP List of Certified Parameters but the PA DEP does not offer accreditation for this method.

EPA 8270D - : Indicates that samples collected in West Virginia are analyzed by Method SW 8270E.

EPA 8260B - : Indicates that samples collected in West Virginia are analyzed by Method SW 8260D.

EPA 8015D - : Indicates that samples collected in West Virginia are analyzed by Method SW 8015C.

EPA 1010 - : Indicates that samples collected in West Virginia are analyzed by Method SW 1010B.

EPA 6010B - : Indicates that samples collected in West Virginia are analyzed by Method SW 6010D.



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260 Executive Drive

Cranberry Twp, PA 16066

Project Manager: Vince Armstrong

Project: Irvin

Project Number: [none]

Reported:

12/10/24 15:09

Terms & Conditions

Services provided by Pace Analytical Services, LLC are limited to the terms and conditions stated herein, unless otherwise agreed to in a formal contract.

CHAIN OF CUSTODY Pace Analytical Services, LLC ("Pace", "us", or "we") will provide, upon client request, chain of custody forms for use.

CONFIDENTIALITY Pace maintains confidentiality in all of our client interactions. The client's consent will be required before releasing information about the services provided.

CONTRACTS All contracts are subject to review and approval by Pace's legal council. Each contract must be signed by a corporate officer.

PAYMENT/BILLING Unless otherwise set forth in a signed contract or purchase order, terms of payment are "NET 30 Days." The time allowed for payment shall begin based on the invoice date. A 1.5% per month service charge may be added to all unpaid balances beyond the initial 30 days. In its sole discretion, Pace reserves the right to request payment before services and hold sample results for payment of due balances. We will not bill a third party without prior agreement among all parties acknowledging and accepting responsibility for payment.

SAMPLE COLLECTION AND SUBMISSION Clients not requesting collection services from Pace are responsible for proper collection, preservation, packaging, and delivery of samples to the laboratory in accordance with current law and commercial practice. Pace shall have no responsibility for sample integrity prior to the receipt of the sample(s) and/or for any inaccuracy in test or analyses results as a result of the failure of the client or any third party to maintain the integrity of samples prior to delivery to Pace. All samples submitted must be accompanied by a completed chain of custody or similar document clearly noting the requested analyses, dates/time sampled, client contact information, and trail of custody. Samples received at the laboratory after business hours are verified on the next business day. Discrepancies are documented on the Receiving Document.

SUBCONTRACTING Some analyses may require subcontracting to another laboratory. Unless the client indicates otherwise, this decision will be made by Pace. Subcontracted work will be identified on the final report in accordance with NELAC requirements.

RETURN OF RESULTS Pace routinely provides verbal or email results within 10 working days of receipt of sample(s). If requested, a hard copy of the data results are routinely sent via US Postal Service within 10 working days. At the request of the client, Pace may offer expedited return of sample results. Surcharges may apply to rush requests. All rush requests must be pre-approved by Pace. Pace reserves the right to charge an archive retrieval fee for results older than one (1) year from the date of the request. All records will be maintained by Pace in accordance with their retention policy.

SAMPLE DISPOSAL Pace will maintain samples for four (4) weeks after the sample receipt date. Pace will dispose of samples which are not and/or do not contain hazardous wastes (as such term is defined by applicable federal or state law), unless prior arrangements have been made for long-term storage. Pace reserves the right to charge a disposal fee for the proper disposal of samples found or suspected to contain hazardous waste. A return shipping charge will be invoiced for samples returned to the client at their request.

HAZARD COMMUNICATION The client has the responsibility to inform the laboratory of any hazardous characteristics known or suspected about the sample, and to provide information on hazard prevention and personal protection as necessary or otherwise required by applicable law.

WARRANTY AND LIMITATION OF LIABILITY For services rendered, Pace warrants that it will apply its best scientific knowledge and judgment and to employ its best level of effort consistent with professional standards within the environmental testing industry in performing the analytical services requested by its clients. We disclaim any other warranties, expressed or implied by law. Pace does not accept any legal responsibility for the purposes for which client uses the test results.

LITIGATION All costs associated with compliance to any subpoena for documents, for testimony in a court of law, or for any other purpose relating to work performed by Pace Analytical Services, LLC shall be invoiced by Pace and paid by client. These costs shall include, but are not limited to, hourly charges for the persons involved, travel, mileage, and accommodations and for any and all other expenses associated with said litigation.

Pace Analytical Services, LLC

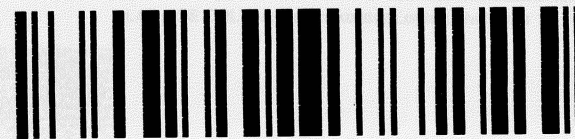
Pace Labs in Altoona, PA is a NELAP (National Environmental Laboratory Accreditation Program) accredited lab, and as such, certifies that all applicable test results meet the requirements of NELAP, unless otherwise stated on the analytical report.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Pace® Location Requested (City/State):
40 Hoover Ave. DuBois PA 15801
Phone: (814) 375-0823

CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevant fields



AYK4168

Company Name:	EXCO Resources	Contact/Report To:	Vince Armstrong
Street Address:	12377 Marrit Dr. Suite 1700 Dallas, TX 75251	Phone #:	
		E-Mail:	varmstrong@excoresources.com
		Cc E-Mail:	
Customer Project #:			
Project Name:	Irvin	Invoice To:	
		Invoice E-Mail:	
Site Collection Info/Facility ID (as applicable):		Purchase Order # (if applicable):	
		Quote #:	
Time Zone Collected: [] AK [] PT [] MT [] CT [] ET		County / State origin of sample(s):	

Specify Container Size **								**Container Size: (1) 1L, (2) 500mL, (3) 250mL, (4) 125mL, (5) 100mL, (6) 40mL vial, (7) EnCore, (8) TerraCore, (9) 90mL, (10) Other							
3	1	10	3	3	4										
Identify Container Preservative Type***								*** Preservative Types: (1) None, (2) HNO3, (3) H2SO4, (4) HCl, (5) NaOH, (6) Zn Acetate, (7) NaHSO4, (8) Sod. Thiosulfate, (9) Ascorbic Acid, (10) MeOH, (11) Other							
1	1	1	2	6+5	3										
Analysis Requested															

Data Deliverables: ☐ Level II ☐ Level III ☐ Level IV ☐ EQUIS ☐ Other	Regulatory Program (DW, RCRA, etc.) as applicable: Reportable ☐ Yes ☐ No	
	Rush (Pre-approval required): ☐ Same Day ☐ 1 Day ☐ 2 Day ☐ 3 Day ☐ Other _____	DW PWSID # or WW Permit # as applicable:
	Date Results Requested:	Field Filtered (if applicable): ☐ Yes ☐ No Analysis:

[illegible]

* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Waste Water (WW), Product (P), Soil/Solid (SS), Oil (OL), Wipe (WP), Tissue (TS), Bioassay (B), Vapor (V), Surface Water (SW), Sediment (SED), Sludge (SL), Caulk (CK), Leachate (LL), Biosolid (BS), Other (OT)

[illegible]

Additional Instructions from Pace®:	Collected By: (Printed Name) Vince Acosta Signature: 
-------------------------------------	---

Customer Remarks / Special Conditions / Possible Hazards:						
# Coolers:	Thermometer ID:	Correction Factor (°C):	Obs. Temp. (°C)	Corrected Temp. (°C)	On Ice:	
	#2	+0.2	9.4	9.6	✓	

Page 8	Relinquished By/Company: (Signature)	Date/Time: 1/27/04 9:18A	Received by/Company: (Signature) Sheri Hammond
	Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)
	Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)
	Relinquished by/Company: (Signature)	Date/Time:	Received by/Company: (Signature)

318	Date/Time: 11-22-24 0918	Tracking Number:
	Date/Time:	Delivered by: ☐ In-Person ☐ Courier
	Date/Time:	☐ FedEx ☐ UPS ☐ Other
	Date/Time:	Page: of



DC#_Title: ENV-FRM-DUBO-0026 v01_Sample Receipt Form

Effective Date: 12/06/2023

WORK ORDER ID: AK91108

CLIENT: Exco Resources

1. CHECK ALL THAT APPLY: PA ☒ WV ☐ MD ☐ PWS ☐ NPDES/COMPLIANCE ☒ DAIRY ☐ RUSH ☐

2. WERE ANY OF THE SAMPLE CONTAINERS DAMAGED/LEAKING? (ARE CUSTODY SEALS BROKEN?) YES ☐ NO ☒

IF YES, EXPLAIN: _____

3. NUMBER OF CONTAINERS RECEIVED: 9

4. WERE THE SAMPLES RECEIVED ON ICE/OTHER ACCEPTABLE REFRIGERANT? YES ☒ NO ☐

IF NO, EXPLAIN: _____

5. RECEIVING TEMP: 9.6°C TEMP CONTROL(S) PRESENT YES ☐ NO ☐ BOTTLE(S) TEMPED: 9

6. WERE THE SAMPLES PROPERLY PRESERVED? YES ☒ NO ☐ IF NO, EXPLAIN: _____

7. WERE THE SAMPLES COLLECTED IN THE CORRECT CONTAINERS? YES ☒ NO ☐

IF NO, EXPLAIN: _____

8. IS THERE HEADSPACE PRESENT FOR VOLATILES/ODOR SAMPLES? YES ☐ NO ☐ N/A ☒

9. WAS COC COMPLETED PROPERLY? YES ☒ NO ☐

IF NO, EXPLAIN: _____

10. DID SAMPLE LABEL CONTAIN CLIENT/DATE/TIME PRESERVE YES ☒ NO ☐

IF NO, EXPLAIN: _____

11. WERE ANY OF THE SAMPLES RECEIVED OUTSIDE OF HOLDING TIME? YES ☒ NO ☐

IF YES, EXPLAIN: pH

12. DO THE SAMPLES REQUIRE ANALYSES THAT HAVE A SHORT HOLDING TIME? YES ☒ NO ☐

IF YES, WHAT ANALYSES? pH, Dis. Oxygen PLEASE NOTIFY LABORATORY ANALYSTS!

13. IS SUBCONTRACTING REQUIRED? YES ☐ NO ☒ IF YES, WHAT ANALYSES? _____

14. WAS THE CLIENT CONTACTED? IF YES, FILL OUT THE FOLLOWING:

EMPLOYEE INITIALS: _____ CLIENT SPOKEN TO: _____ DATE/TIME: _____

OUTCOME: _____

SIGNATURE: Sheri Hannold



Date of Issue: 12/12/2024 04:03:38

DEP Bureau of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg, PA 17105-1467

Contact Phone Number: (717) 346-7200

NELAP - accredited by

NJ DEP - Laboratory Number: PA059
PA DEP LAP - DEP Lab ID: 22-00223

Analytical Report For
Oil And Gas Mgmt

Sample ID: 3442 783

Date Collected: 11/20/2024 12:10:00 PM

Lab Sample ID: I2024018742

Status: Completed

Name of Sample Collector: Melissa S Herzing

Date Received: 11/21/2024

County: Clearfield

State:

Municipality: Bell Twp

Sample Medium: Water

Sample Medium Type: Water

Location: UNT Laurel Rn Downstream

Reason: Routine Sampling

Project: NOT INDICATED

Standard Anlysis: 046

Matrix: Water

Field Tests		
pH	7.56	pH units
Temperature	9.6	C
Specific Conductance	586	umhos/cm

Legal Seal:	I202663	Intact:	Yes
Legal Seal:	I202665	Intact:	Yes
Legal Seal:	I202666	Intact:	Yes
Legal Seal:	I202664	Intact:	Yes

Stream Condition:

**Analytical Report For
Oil And Gas Mgmt**

Sample ID: 3442 783

Date Collected: 11/20/2024 12:10:00 PM

Lab Sample ID: I2024018742

Status: Completed

Appearance: clear

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
00410 ALKALINITY AS CaCO3 @ pH 4.5	96.6 mg/L	11/21/2024 04:54 PM	JAHOGUE	SM 2320B
** Comment ** Sample bottle had headspace present before analysis				
01105A ALUMINUM, TOTAL (WATER & WASTE) BY ICP	<300. ug/L (U)	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
00610A AMMONIA TOTAL AS NITROGEN	<.02 mg/L (U)	11/26/2024 03:38 AM	MAMCNULTY	EPA 350.1
01002H ARSENIC, TOTAL (WATER & WASTE) BY ICPMS	<3.00 ug/L (U)	12/03/2024 09:23 AM	ELEEDY	EPA 200.8
01007A BARIUM, TOTAL (WATER & WASTE) BY ICP	44.00 ug/L	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
01022K BORON, TOTAL (WATER & WASTE) BY ICP	<200. ug/L (U)	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
71870 BROMIDE BY ION CHROMATOGRAPHY	<0.2 mg/L (U)	11/21/2024 12:14 PM	FVODOPIVEC	EPA 300.0
00916A CALCIUM, TOTAL (WATER & WASTE) BY ICP	77.400 mg/L	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
00316 Carbonaceous Biochemical Oxygen Demand 5 Day	8.46 mg/L	11/26/2024 08:56 AM	KAYLEONARD	SM 5210B-16
Duplicate values are not within acceptable range				
00900 HARDNESS, TOTAL (CALCULATED)	260 mg/L	12/02/2024 10:31 AM	CREITMEYER	SM 2340 B
** Comment ** Accredited by NJ only - accreditation not available from PA				
01045A IRON, TOTAL (WATER & WASTE) BY ICP	<100.0 ug/L (U)	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
01132A LITHIUM, TOTAL (WATER & WASTE) BY ICP	<25.0 ug/L (U)	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
00927A MAGNESIUM, TOTAL (WATER & WASTE) BY ICP	16.10 mg/L	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
01055A MANGANESE, TOTAL (WATER & WASTE) BY ICP	<10.0 ug/L (U)	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
01062A MOLYBDENUM, TOTAL (WATER & WASTE) BY ICP	<70.0 ug/L (U)	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
82550 OSMOTIC PRESSURE, MOSM/KG	5 mosm/kg	11/21/2024 12:11 PM	CLONTZ	PADEP 391-2000-008
00403 pH, Lab (Electrometric)	7.7 pH units	11/21/2024 04:54 PM	JAHOGUE	SM 4500-H+ B
** Comment ** Holding time exceeded				
01147H SELENIUM, TOTAL (WATER & WASTE) BY ICPMS	<4.00 ug/L (U)	12/03/2024 09:23 AM	ELEEDY	EPA 200.8
00929A SODIUM, TOTAL (WATER & WASTE) BY ICP	3.24 mg/L	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
00095 SPECIFIC CONDUCTIVITY @ 25.0 C	516.00 umhos/cm	11/21/2024 08:44 PM	MTUZINSKI	SM 2510B
01082A STRONTIUM, TOTAL (WATER & WASTE) BY ICP	176.00 ug/L	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7
00403T Temperature at which pH is measured	21.81 C	11/21/2024 04:54 PM	JAHOGUE	SM 4500-H+ B
00940 Total Chloride-Ion Chromatograph	8.00 mg/L	11/21/2024 12:14 PM	FVODOPIVEC	EPA 300.0
70300U TOTAL DISSOLVED SOLIDS @ 180C BY USGS-I-1750	376 mg/L	11/22/2024 03:03 PM	CLONTZ	USGS I-1750-85
00630A Total Nitrate & Nitrite Nitrogen	0.06 mg/L	11/21/2024 01:25 PM	TBEAR	EPA 353.2
00665A Total Phosphorus as P	<.01 mg/L (U)	12/10/2024 02:09 PM	LBENT	EPA 365.1
** Comment ** Result Is Approximate				

Analytical Report For
Oil And Gas Mgmt

Sample ID: 3442 783

Date Collected: 11/20/2024 12:10:00 PM

Lab Sample ID: I2024018742

Status: Completed

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
00945 Total Sulfate-Ion Chromatograph	164.37 mg/L	11/21/2024 07:50 PM	FVODOPIVEC	EPA 300.0
00530 TOTAL SUSPENDED SOLIDS	<20 mg/L (U)	11/24/2024 02:16 PM	JULLEHMAN	USGS I-3765-85
01092A ZINC, TOTAL (WATER & WASTE) BY ICP	<30.0 ug/L (U)	12/02/2024 10:31 AM	CREITMEYER	EPA 200.7

The results of the analyses provided in this laboratory report relate only to the sample(s) identified therein. Unless otherwise noted, the results presented on this laboratory report meet all requirements of the 2016 TNI standard. Sample was in acceptable condition when received by the Laboratory. Any exceptions are noted in the report.

* denotes tests that the laboratory is not accredited for

U - Indicates analysis was performed for the test but it was not detected. The sample quantitation limit is reported.

J - Indicates an estimated value, reported between Reporting Limit (RL) and Minimum Detection Limit (MDL).

Jennifer Fesler, Technical Director, Bureau of Laboratories



Date of Issue: 12/18/2024 04:14:31

DEP Bureau of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg, PA 17105-1467

Contact Phone Number: (717) 346-7200

NELAP - accredited by

NJ DEP - Laboratory Number: PA059
PA DEP LAP - DEP Lab ID: 22-00223

Analytical Report For
Oil And Gas Mgmt

Sample ID: 3442 784

Date Collected: 11/20/2024 12:25:00 PM

Lab Sample ID: I2024018743

Status: Completed

Name of Sample Collector: Melissa S Herzing

Date Received: 11/21/2024

County: Clearfield

State:

Municipality: Bell Twp

Sample Medium: Water

Sample Medium Type: Water

Location: UNT Laurel Rn Upstream

Reason: Routine Sampling

Project: NOT INDICATED

Standard Anlysis: 046

Matrix: Water

Field Tests		
pH	7.12	pH units
Temperature	9.7	C
Specific Conductance	714	umhos/cm

Legal Seal:	I202667	Intact:	Yes
Legal Seal:	I202669	Intact:	Yes
Legal Seal:	I202670	Intact:	Yes
Legal Seal:	I202668	Intact:	Yes

Stream Condition:

**Analytical Report For
Oil And Gas Mgmt**

Sample ID: 3442 784

Date Collected: 11/20/2024 12:25:00 PM

Lab Sample ID: I2024018743

Status: Completed

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
00410 ALKALINITY AS CaCO3 @ pH 4.5 ** Comment ** Sample bottle had headspace present before analysis	83.2 mg/L	11/21/2024 05:02 PM	JAHOUE	SM 2320B
01105A ALUMINUM, TOTAL (WATER & WASTE) BY ICP	<300. ug/L (U)	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
00610A AMMONIA TOTAL AS NITROGEN ** Comment ** Possible Matrix Interference	<.02 mg/L (U)	12/09/2024 03:05 PM	MAMCNULTY	EPA 350.1
01002H ARSENIC, TOTAL (WATER & WASTE) BY ICPMS	<3.00 ug/L (U)	12/03/2024 09:25 AM	ELEEDY	EPA 200.8
01007A BARIUM, TOTAL (WATER & WASTE) BY ICP	49.00 ug/L	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
01022K BORON, TOTAL (WATER & WASTE) BY ICP	<200. ug/L (U)	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
71870 BROMIDE BY ION CHROMATOGRAPHY	<0.2 mg/L (U)	11/21/2024 12:32 PM	FVODOPIVEC	EPA 300.0
00916A CALCIUM, TOTAL (WATER & WASTE) BY ICP	73.600 mg/L	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
00316 Carbonaceous Biochemical Oxygen Demand 5 Day	1.68 mg/L	11/26/2024 09:00 AM	KAYLEONARD	SM 5210B-16
00900 HARDNESS, TOTAL (CALCULATED) ** Comment ** Accredited by NJ only - accreditation not available from PA	252 mg/L	12/02/2024 10:37 AM	CREITMEYER	SM 2340 B
01045A IRON, TOTAL (WATER & WASTE) BY ICP	<100.0 ug/L (U)	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
01132A LITHIUM, TOTAL (WATER & WASTE) BY ICP	<25.0 ug/L (U)	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
00927A MAGNESIUM, TOTAL (WATER & WASTE) BY ICP	16.50 mg/L	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
01055A MANGANESE, TOTAL (WATER & WASTE) BY ICP	<10.0 ug/L (U)	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
01062A MOLYBDENUM, TOTAL (WATER & WASTE) BY ICP	<70.0 ug/L (U)	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
82550 OSMOTIC PRESSURE, MOSM/KG	5 mosm/kg	11/21/2024 03:15 PM	CLONTZ	PADEP 391-2000-008
00403 pH, Lab (Electrometric) ** Comment ** Holding time exceeded	7.5 pH units	11/21/2024 05:02 PM	JAHOUE	SM 4500-H+ B
01147H SELENIUM, TOTAL (WATER & WASTE) BY ICPMS	<4.00 ug/L (U)	12/03/2024 09:25 AM	ELEEDY	EPA 200.8
00929A SODIUM, TOTAL (WATER & WASTE) BY ICP	3.01 mg/L	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
00095 SPECIFIC CONDUCTIVITY @ 25.0 C	498.00 umhos/cm	11/21/2024 08:47 PM	MTUZINSKI	SM 2510B
01082A STRONTIUM, TOTAL (WATER & WASTE) BY ICP	208.00 ug/L	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7
00403T Temperature at which pH is measured	21.78 C	11/21/2024 05:02 PM	JAHOUE	SM 4500-H+ B
00940 Total Chloride-Ion Chromatograph	8.21 mg/L	12/04/2024 02:05 PM	FVODOPIVEC	EPA 300.0
70300U TOTAL DISSOLVED SOLIDS @ 180C BY USGS-I-1750	368 mg/L	11/22/2024 03:03 PM	CLONTZ	USGS I-1750-85
00630A Total Nitrate & Nitrite Nitrogen	0.06 mg/L	11/21/2024 01:26 PM	TBEAR	EPA 353.2
00665A Total Phosphorus as P ** Comment ** Result Is Approximate	<.01 mg/L (U)	12/10/2024 02:11 PM	LBENT	EPA 365.1

Analytical Report For
Oil And Gas Mgmt

Sample ID: 3442 784

Date Collected: 11/20/2024 12:25:00 PM

Lab Sample ID: I2024018743

Status: Completed

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
00945 Total Sulfate-Ion Chromatograph	162.27 mg/L	11/21/2024 05:59 PM	FVODOPIVEC	EPA 300.0
00530 TOTAL SUSPENDED SOLIDS	<20 mg/L (U)	11/24/2024 02:16 PM	JULLEHMAN	USGS I-3765-85
01092A ZINC, TOTAL (WATER & WASTE) BY ICP	<30.0 ug/L (U)	12/02/2024 10:37 AM	CREITMEYER	EPA 200.7

The results of the analyses provided in this laboratory report relate only to the sample(s) identified therein. Unless otherwise noted, the results presented on this laboratory report meet all requirements of the 2016 TNI standard. Sample was in acceptable condition when received by the Laboratory. Any exceptions are noted in the report.

* denotes tests that the laboratory is not accredited for

U - Indicates analysis was performed for the test but it was not detected. The sample quantitation limit is reported.

J - Indicates an estimated value, reported between Reporting Limit (RL) and Minimum Detection Limit (MDL).

Jennifer Fesler, Technical Director, Bureau of Laboratories



Date of Issue: 12/14/2024 04:03:52

DEP Bureau of Laboratories - Harrisburg
P.O. Box 1467
2575 Interstate Drive
Harrisburg, PA 17105-1467

Contact Phone Number: (717) 346-7200

NELAP - accredited by

NJ DEP - Laboratory Number: PA059
PA DEP LAP - DEP Lab ID: 22-00223

Analytical Report For
Oil And Gas Mgmt

Sample ID: 3442 785

Date Collected: 11/20/2024 12:45:00 PM

Lab Sample ID: I2024018744

Status: Completed

Name of Sample Collector: Melissa S Herzing

Date Received: 11/21/2024

County: Clearfield

State:

Municipality: Bell Twp

Sample Medium: Water

Sample Medium Type: Water

Location: Irvin A-19 Well

Reason: Routine Sampling

Project: NOT INDICATED

Standard Anlysis: 046

Matrix: Water

Legal Seal:	I202674	Intact:	Yes
Legal Seal:	I202673	Intact:	Yes
Legal Seal:	I202672	Intact:	Yes
Legal Seal:	I202671	Intact:	Yes

Stream Condition:

Sample Comment: filtered brine fluids

Appearance: light orange in color

**Analytical Report For
Oil And Gas Mgmt**

Sample ID: 3442 785

Date Collected: 11/20/2024 12:45:00 PM

Lab Sample ID: I2024018744

Status: Completed

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
00410 ALKALINITY AS CaCO3 @ pH 4.5 ** Comment ** Sample bottle had headspace present before analysis	10.6 mg/L	11/21/2024 02:33 PM	JAHOUE	SM 2320B
MR01105 Aluminum ICP Manual Entry ** Comment ** Detection Limit Not Met - Interference	<15000.000 ug/L	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7
01105A ALUMINUM, TOTAL (WATER & WASTE) BY ICP Result entered manually.	Cancelled	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7
00610A AMMONIA TOTAL AS NITROGEN	229.05 mg/L	12/02/2024 07:06 PM	MAMCNULTY	EPA 350.1
01002H ARSENIC, TOTAL (WATER & WASTE) BY ICPMS ** Comment ** Diluted Before Analysis	<3000.000 ug/L	12/12/2024 01:01 PM	ELEEDY	EPA 200.8
DETECTION LIMIT NOT MET - INTERFERENCE				
01007A BARIUM, TOTAL (WATER & WASTE) BY ICP	8396000.00 ug/L	12/05/2024 10:47 AM	CREITMEYER	EPA 200.7
MR01022 Boron ICP Manual Report ** Comment ** Detection Limit Not Met - Interference	<10000.000 ug/L	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7
01022K BORON, TOTAL (WATER & WASTE) BY ICP Result entered manually.	Cancelled	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7
71870 BROMIDE BY ION CHROMATOGRAPHY	1103.700 mg/L	11/21/2024 01:24 PM	FVODOPIVEC	EPA 300.0
00916A CALCIUM, TOTAL (WATER & WASTE) BY ICP	29250.000 mg/L	12/05/2024 10:47 AM	CREITMEYER	EPA 200.7
00316 Carbonaceous Biochemical Oxygen Demand 5 Day Initial DO oversaturated- result may be biased high	4.56 mg/L	11/26/2024 09:01 AM	KAYLEONARD	SM 5210B-16
00900 HARDNESS, TOTAL (CALCULATED) ** Comment ** Accredited by NJ only - accreditation not available from PA	79536 mg/L	12/05/2024 10:47 AM	CREITMEYER	SM 2340 B
01045A IRON, TOTAL (WATER & WASTE) BY ICP	96100.00 ug/L	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7
01132A LITHIUM, TOTAL (WATER & WASTE) BY ICP	174000.00 ug/L	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7
00927A MAGNESIUM, TOTAL (WATER & WASTE) BY ICP	1556.00 mg/L	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7
01055A MANGANESE, TOTAL (WATER & WASTE) BY ICP	14700.00 ug/L	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7
MR01062 Molybdenum Manual Entry ** Comment ** Detection Limit Not Met - Interference	<7000.000 ug/L	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7
01062A MOLYBDENUM, TOTAL (WATER & WASTE) BY ICP Result entered manually.	Cancelled	12/05/2024 10:47 AM	CREITMEYER	EPA 200.7
82550 OSMOTIC PRESSURE, MOSM/KG	Cancelled	11/22/2024 08:30 AM	CLONTZ	PADEP 391-2000-008
00403 pH, Lab (Electrometric) ** Comment ** Holding time exceeded	4.9 pH units	11/21/2024 02:33 PM	JAHOUE	SM 4500-H+ B

**Analytical Report For
Oil And Gas Mgmt**

Sample ID: 3442 785

Date Collected: 11/20/2024 12:45:00 PM

Lab Sample ID: I2024018744

Status: Completed

Test Codes / CAS # - Description	Reported Results	Date And Time Analyzed	Approved by	Test Method
01147H SELENIUM, TOTAL (WATER & WASTE) BY ICPMS ** Comment ** Diluted Before Analysis	<4000.000 ug/L	12/12/2024 01:01 PM	ELEEDY	EPA 200.8
DETECTION LIMIT NOT MET - INTERFERENCE				
00929A SODIUM, TOTAL (WATER & WASTE) BY ICP	60800.00 mg/L	12/05/2024 10:47 AM	CREITMEYER	EPA 200.7
00095 SPECIFIC CONDUCTIVITY @ 25.0 C	>12890 umhos/cm	11/21/2024 08:50 PM	MTUZINSKI	SM 2510B
01082A STRONTIUM, TOTAL (WATER & WASTE) BY ICP	1.08E+07 ug/L	12/05/2024 10:47 AM	CREITMEYER	EPA 200.7
00403T Temperature at which pH is measured	26.28 C	11/21/2024 02:33 PM	JAHOUE	SM 4500-H+ B
00940 Total Chloride-Ion Chromatograph	170735.00 mg/L	11/21/2024 07:34 PM	FVODOPIVEC	EPA 300.0
70300U TOTAL DISSOLVED SOLIDS @ 180C BY USGS-I-1750	270000 mg/L	11/26/2024 03:16 PM	CLONTZ	USGS I-1750-85
This is only an approximation. Sample had to be run at a 1:100 dilution so as to not exceed the method's residue limit of 200 mg. 1:100 dilute solution prepared with 1 mL of sample diluted to 100 mL in a 100mL volumetric flask with DI water. 50 mL of this dilute solution was analyzed, so sample aliquot was approximately 0.5 mL.				
00630A Total Nitrate & Nitrite Nitrogen ** Comment ** Possible Matrix Interference	<0.05 mg/L (U)	11/21/2024 01:28 PM	TBEAR	EPA 353.2
00665A Total Phosphorus as P RESULT IS APPROXIMATEDILUTED BEFORE ANALYSIS	45.989 mg/L	12/10/2024 11:09 PM	LBENT	EPA 365.1
00945 Total Sulfate-Ion Chromatograph	<11.00 mg/L	12/04/2024 03:29 PM	FVODOPIVEC	EPA 300.0
00530 TOTAL SUSPENDED SOLIDS	679 mg/L	11/24/2024 02:16 PM	JULLEHMAN	USGS I-3765-85
MR01092 Zinc Manual Entry ** Comment ** Detection Limit Not Met - Interference	<1500.000 ug/L	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7
01092A ZINC, TOTAL (WATER & WASTE) BY ICP Result entered manually.	Cancelled	12/02/2024 10:47 AM	CREITMEYER	EPA 200.7

The results of the analyses provided in this laboratory report relate only to the sample(s) identified therein. Unless otherwise noted, the results presented on this laboratory report meet all requirements of the 2016 TNI standard. Sample was in acceptable condition when received by the Laboratory. Any exceptions are noted in the report.

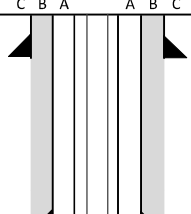
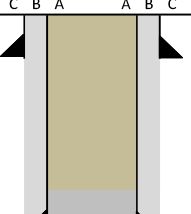
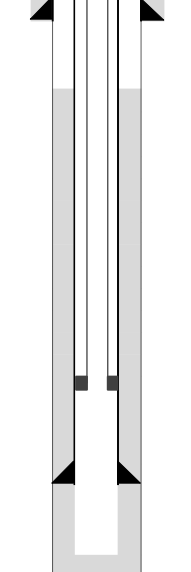
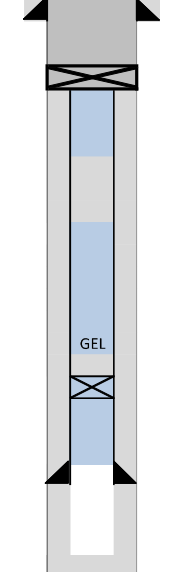
* denotes tests that the laboratory is not accredited for

U - Indicates analysis was performed for the test but it was not detected. The sample quantitation limit is reported.

J - Indicates an estimated value, reported between Reporting Limit (RL) and Minimum Detection Limit (MDL).

Jennifer Fesler, Technical Director, Bureau of Laboratories

APPENDIX D – WATER ANALYTICAL REPORT

Formation	MD	Current Well Status	Sections/Comments	Plugged	Procedure
		C B A A B C		C B A A B C	
	51		<u>Conductor Csg</u> Hole Size 16" Csg, in 13-3/8" Depth 40'		Fill hole above top plug with either gel or gravel.
	926		<u>Surface Csg</u> Hole Size 12-1/4" Csg, in 10-3/4" Depth 1013' TOC, ft 6434' Production Tbg 2-3/8", 4,6 #, J-55 6974' Production Packer 6945' <u>Production Csg</u> Hole Size 8-3/4" Csg, in 7" Depth 7232' <u>Open Hole</u> Hole Size 8-3/4" Depth 7840'		Cement F/1150 ',T/900' Set CIBP @ 1150' Cut & pull casing at 1150' Spot cement plug from 3100' to 2200' Spot 100' of cement at 6945' Leave Packer in the hole Spot 100' of cement across production casing shoe
PBTD TD	3374 3439				

Plug and Abandonment Cost Estimate

Description	Category	Cost	Comments
1 Containment	Location	\$ 3,000	
2 Dozer and back hoe	Location	\$ 2,000	
3 Service rig + assoc. equip.	Rig (5 days)	\$ 45,000	Workover rig
4 Casing cutting/handling	Service	\$ 16,000	Pulling 7" casing
5 Trucking	Transportation	\$ 8,000	
6 Tubing Rental	Rental	\$ -	
7 Water trucking and disposal	Water	\$ 10,000	
8 Cement cost	Material & Service	\$ 25,000	900' cement plug in 7" casing
9 Wireline services	Service	\$ 20,000	Setting CIBP and Cutting casing
10 Misc Rentals	Service	\$ 6,000	
Subtotal		\$ 135,000	
Pad Reclamation		\$ -	
Total		\$ 135,000	

Plugging Procedure

- 1 MIRU WOR, dig pit & set liner
- 2 Unlatch from packer and pull tubing
- 3 PU tubing and TIH to spot 100' cement plug on top of packer
- 4 Spot cement plug from 3100' to 2200'
- 5 Pull up tubing, WOC, tag and top off if needed. TOOH
- 6 PU and spot second plug from 1750' to 1650'.
- 7 RU wireline w/ casing cutter and RIH to cut casing at +/-1150'. POOH.
- 8 RU 7" tools and pull 7" casing, LD.
- 9 RIH and set CIBP at 1150'
- 10 RU cementers and TIH w/ tubing to spot Cement F/1150 ',T/900'
- 11 Pull up tubing, WOC, tag and top off if needed. TOOH w/ tubing.
RD, install marker and reclaim location.



TETRA TECH

January 22, 2015

S. Stephen Platt
U.S. EPA Region III
Ground Water & Enforcement Branch (3WP22)
1650 Arch Street
Philadelphia, PA 19103

**Subject: Application for UIC Class II-D Well Permit Renewal
EXCO Resources, LLC Irvin A-19 Well
Bell Township, Clearfield County, Pennsylvania
UIC Well Permit: PAS2D205BCLE**

Dear Mr. Platt:

This letter prepared by Tetra Tech, Inc. (Tetra Tech) on behalf of EXCO Resources, LLC (EXCO) is the application for renewal of the UIC Class II-D Well permit for the EXCO Irvin A-19 well located in Clearfield County, PA. The information provided is based on the application requirements discussed during our telephone conversation on December 9, 2014. As agreed, this renewal application consists of updates to key sections of the original permit application, which are referenced below.

Background: The permit application entitled "EPA Underground Injection Control Well Application, Saltwater Disposal Well, Irvin A19 Well, Bell Township, Clearfield County, Pennsylvania" was prepared for EOG Resources, Inc. by Mactech Mineral Management, Inc., in January 2005. The subject UIC Class II-D Well permit was issued to EOG Resources on May 20, 2005. Conditions of the permit included a monthly volume limit of 21,000 bbls/month and Maximum Injection Pressure (MIP) (Surface) of 3240 psi. The Area of Review (AOR) for the permit application was a ¼ mile radius around the Irvin A-19 well. In a letter dated February 12, 2009, USEPA increased the monthly volume limit to 27,000 bbls/month. The Irvin A-19 well was transferred from EOG to EXCO via an asset purchase agreement effective November 1, 2007.

Injection occurs into the Lower Devonian Oriskany Group (Ridgeley Sandstone and Shriver Chert), with injection occurring via tubing and packer with the top of the injection interval at 7293 feet. These units and confining intervals are depicted on "Figure G-1, Geologic Column and Lithologic Description" which was included in the original 2005 permit application. Figure G-1 is included for reference as Attachment A.

Section B - Maps of Well Area and Area of Review (AOR)

Figure 1 is a topographic map, extending greater than one mile beyond the Irvin A-19 well, showing the injection well and indicating the ¼ mile AOR radius around the injection well. There are no intake or discharge structures or hazardous waste treatment, storage or disposal

Tetra Tech NUS

661 Andersen Drive, Pittsburgh, PA 15220
Tel 412.921.7090 Fax 412.921.4040 www.tetrattech.com



facilities located within a one-mile radius of the injection well. The following summarizes results of the updated review of the AOR for the indicated features based on review of publicly available sources and information otherwise known to EXCO:

- Producing oil or gas wells – There are 4 producing oil or gas wells in the AOR with key information on these wells summarized on Table 1. All of the subject wells were present at the time of the initial application. The total depth of these wells range from 3294 to 4758 ft, with the deepest well approximately 2,500 ft above the injection interval.
- Injection wells – there are no other injection wells located in the AOR
- Abandoned wells – There are no abandoned wells based on EXCO's knowledge and review of publically available information.
- Dryholes – There are no dryholes based on EXCO's knowledge and review of publically available information.
- Surface water bodies, springs – There are no surface water features in the AOR except for a minor drainage area to the north which only intermittently contains water.
- Mines (surface and subsurface), quarries – As indicated on Figure 1, the USGS Topographic Map, there is a reclaimed strip mine located immediately to the south of the Irvin A-19 well.
- Residences – The surface owners shown on Map B-1 of the original application have not changed.
- Roads – McGees-Mills Road is located approximately one mile to the east of the Irvin A-19 well.
- Faults – As discussed in greater detail below, there are no known or suspected faults present in the AOR.
- Drinking water wells– There are no drinking water wells or springs located within the AOR.

Section E - Name and Depth of USDWs

The original permit application indicated that there were no drinking water wells within the AOR, or within a broader one mile radius. Based on drilling records of shallow gas wells in the area, the base of the lowestmost underground sources of drinking water (USDW) was indicated in the original application to be approximately 540 ft. A review of the PA Groundwater Information System (PAGWIS) in January 2015 indicated that there were no drinking water wells in the ¼ mile AOR. There was one new drinking water well in the database within one



mile of the Irvin A-19 well. Information on this well, which has a reported depth of 380 ft and is located approximately ½ mile northeast of the Irvin A-19 well, is summarized on Table 2. The location of the well is shown on Figure 2. In summary, no new information has become available which would change the previous determination of the base of the lowestmost USDW in the AOR.

Section G - Geological Data on Injection and Confining Zones

As discussed above, injection at the Irvin A-19 well occurs into the Lower Devonian Oriskany Group (Ridgeley Sandstone and Shriver Chert). The lithology of the injection interval and confining intervals are described in detail in the original 2005 permit application. Figure 3 is a geologic map of the McGees Mills quadrangle. From a regional perspective, the Irvin A-19 well is located on the eastern edge of the Appalachian Plateau Geologic Province. As indicated on Figure 3, the well is situated along the northwest flank of the Chestnut Ridge Anticline. As such, the regional dip in the vicinity of the well would be anticipated to be to the northwest. There are no faults indicated on the geologic map suggesting that there are no significant faults extending to the surface.

Faulting is known to occur in the Appalachian Plateau region, particularly associated with anticlinal structures. Many researchers consider the potential for induced seismicity related to injection wells to be greater when injected fluids and pressures interact with faults which extend to Precambrian basement rocks. As discussed in the “Geology of Pennsylvania” (Pennsylvania Geological Survey and Pittsburgh Geological Survey, 1999) in describing the typical faults occurring in the Appalachian Plateau structures, “These faults die out in the overlying Devonian Shales. Beneath the Onondaga-Ridgeley units, the fault planes flatten and pass into a decollement surface in the Salina Group.” In other words, the typical faults associated with the Appalachian Plateau structures “ramp up” out of the Salina Salt Formation and extend upward until dying out at, or slightly above, the Tully Limestone. According to the PA DCNR “Precambrian Basement Map of the Appalachian Basin and Piedmont Province in Pennsylvania” (http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_016250.pdf) the depth to Precambrian basement in the site vicinity is estimated at approximately 5000 meters (or approximately 16,400 feet) below sea level. The base of the Oriskany Sandstone at the Irvin A-19 well is approximately 5,600 ft. below sea level, or roughly 2 miles above the estimated top of Precambrian basement. The base of the Salina Salt Formation (the interval acting as the fault decollement) is estimated to occur at a depth of approximately 1500 ft below the Oriskany Sandstone or roughly 1.5 miles above Precambrian basement rocks. The Tully, which in general is the upper limit of the faulting extent for faults impacting the Oriskany, is approximately 6,000 feet below the anticipated lowestmost USDW.

In summary, should faults be present in the Irvin A-19 area that intersect the injection intervals (i.e., Ridgeley Sandstone or Shriver Chert) the faults would not likely extend to the USDW or to Precambrian basement (which is believed to be a condition resulting in greater risk for induced seismicity). The USGS Seismic Hazards Map for Pennsylvania (Figure 4) indicates that the Irvin A-19 well is situated in the lowest seismic risk area. It is also noted that there have been no



reports of seismicity associated with the Irvin A-19 well, which has been operating for approximately 10 years.

Section H - Operating Data

As indicated above, the permitted Maximum Injection Pressure (MIP) (surface) is 3,240 psi and the maximum monthly volume limit is 27,000 bbls. To accommodate potential future needs for brine disposal, EXCO requests an increase in the monthly volume to 36,000 bbls, realizing that achieving this volume would be predicated on not exceeding the permitted MIP. It is noted that currently EXCO operates the facility from Monday through Friday, but in the future may wish to operate the facility on a seven day a week basis to facilitate injecting the additional volume of brine.

EXCO routinely submits Specific Gravity data with its annual report for the Irvin A-19 well. Attachment B includes Specific Gravity data from a study performed by EXCO in March 2014 on sources of brine disposed at the Irvin A-19 well. The average Specific Gravity of these sources is 1.0987.

Section Q - Plugging and Abandonment (P&A) Plan and Section R- Necessary Resources

The estimate to plug and abandon the Irvin A-19 well provided in the original permit application was \$48,611. EXCO had previously filed financial assurance in the amount of \$50,000 as required by the existing permit. EXCO engineering staff has determined that the estimated cost to properly plug and abandon the well has not changed significantly from the original estimate. As such there is no need to change the existing financial assurance since it remains adequate to cover implementing the P&A plan.

Your prompt processing of this request for permit renewal would be greatly appreciated. Please feel free to contact me at (412) 921-4006 or Shawn Meenihan of EXCO Resources at 724-720-2550, if you have questions or comments.

Sincerely,
Tetra Tech, Inc.

Dale E. Skoff, P.G.
Account Manager

cc: Dave Rectenwald – EPA
Shawn Meenihan - EXCO

TABLES

Table 1**Oil and Gas Wells Located Within the 1/4 Mile Area of Review (AOR)****Irvin A-19 Well****Clearfield County, PA**

Permit No.	Well Name	Operator	Type	Spud Date	County	Latitude	Longitude	Total Depth (Ft.)
033-24072	FEE A M597 HOPKINS 330 WELL	EXCO RESOURCES PA LLC	GAS	7/23/1998	Clearfield	40.97119200000	-78.77507500000	4758
033-24173	FEE A M-591 A IRVIN 427	EXCO RESOURCES PA LLC	GAS	12/9/1998	Clearfield	40.97176900000	-78.77132700000	3374
033-24210	FEE A M-597 HOPKINS 424	EXCO RESOURCES PA LLC	GAS	1/29/1999	Clearfield	40.97595400000	-78.77524000000	3294
033-24552	IRVIN (M-591) #657	EXCO RESOURCES PA LLC	GAS	2/1/2001	Clearfield	40.97495600000	-78.76819500000	3350

Table 2

Drinking Water Wells Within One Mile of the Irvin A-19 Well

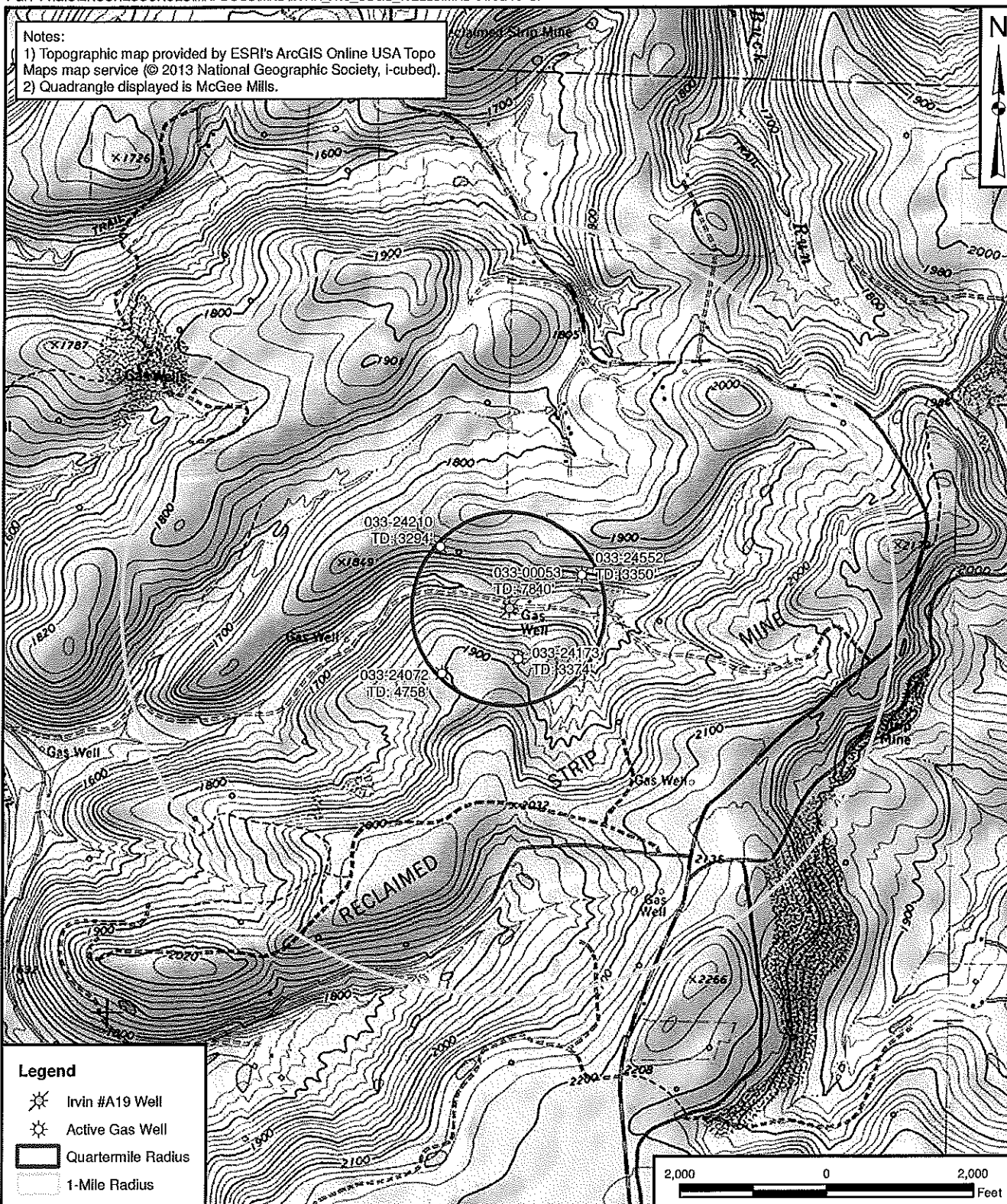
Clearfield County, PA

Well ID No.	Well Owner	Date Drilled	County	Latitude	Longitude	Well Depth (ft)	Well Yield (GPM)	Water Use
484306	SEKULA	3/10/2009	CLEARFIELD	40.97722	-78.78056	380	1	DOMESTIC

FIGURES

Notes:

- 1) Topographic map provided by ESRI's ArcGIS Online USA Topo Maps map service (© 2013 National Geographic Society, i-cubed).
- 2) Quadrangle displayed is McGee Mills.



Legend

- Irvin #A19 Well
- Active Gas Well
- Quartermile Radius
- 1-Mile Radius



TETRA TECH

OIL AND GAS WELL LOCATIONS IN AOR
IRVIN #A-19

EXCO RESOURCES INC.
CLEARFIELD COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/05/15
CHECKED BY: D. SKOFF 01/08/15
APPROVED BY:

CONTRACT NUMBER: 212C-PB-00084

FIGURE NUMBER

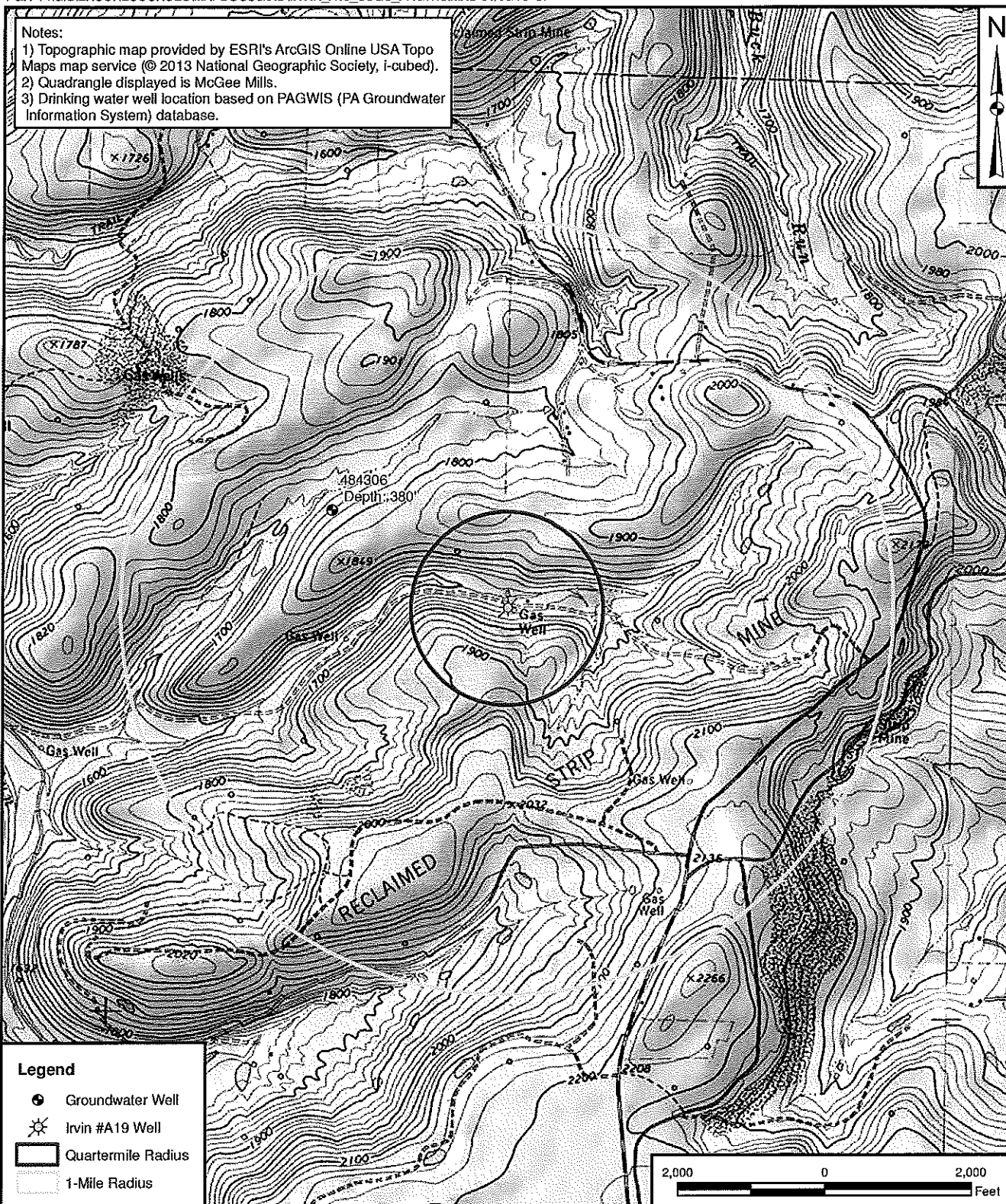
1

REV

0

Notes:

- 1) Topographic map provided by ESRI's ArcGIS Online USA Topo Maps map service (© 2013 National Geographic Society, i-cubed).
- 2) Quadrangle displayed is McGee Mills.
- 3) Drinking water well location based on PAGWIS (PA Groundwater Information System) database.



Legend

- Groundwater Well
- Irvin #A19 Well
- Quartermile Radius
- 1-Mile Radius



TETRA TECH

DRINKING WATER WELL MAP

IRVIN #A-19

EXCO RESOURCES INC.
CLEARFIELD COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/05/15
CHECKED BY: D. SKOFF 01/08/15
APPROVED BY:

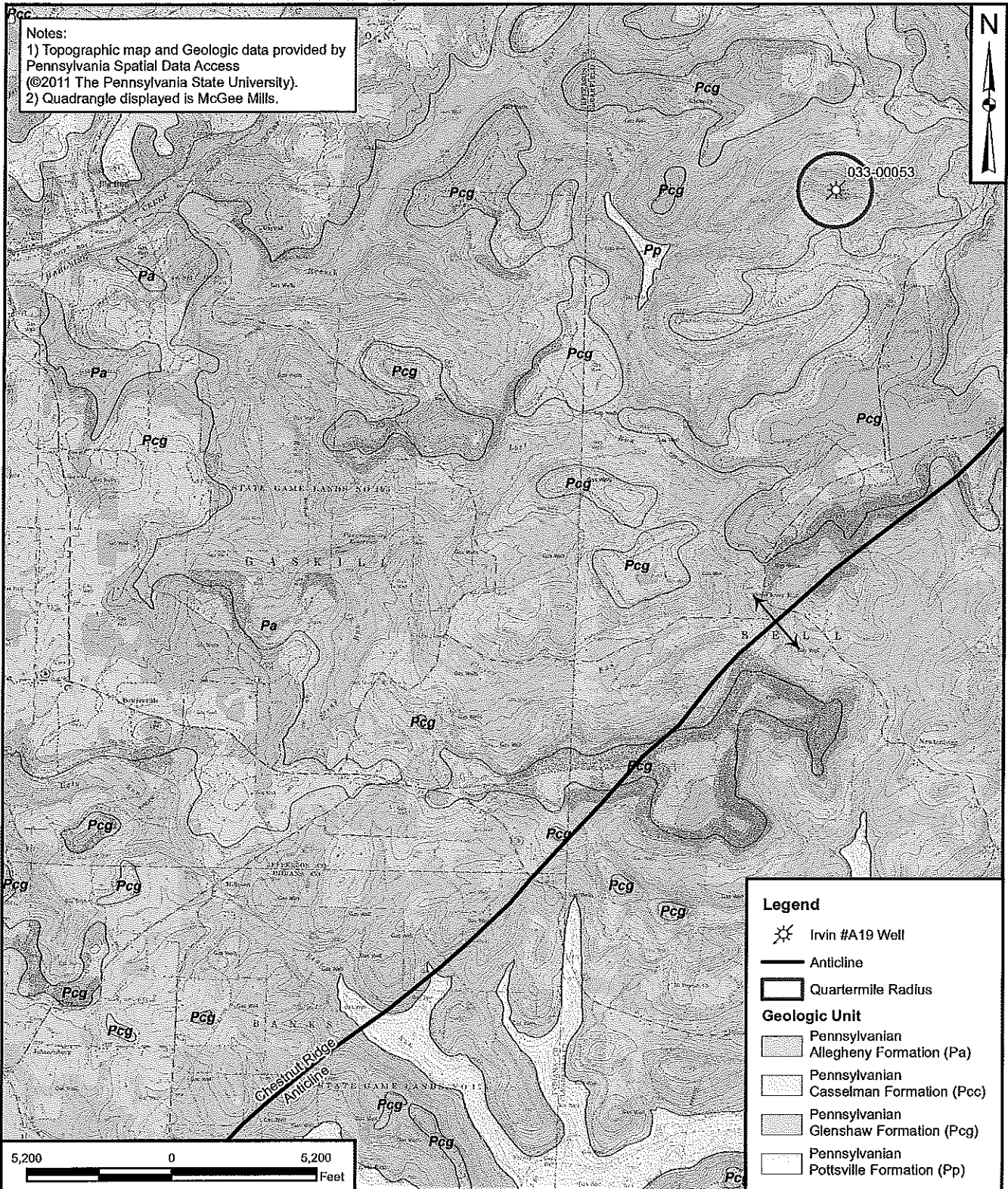
CONTRACT NUMBER: 212C-PB-00084

FIGURE NUMBER

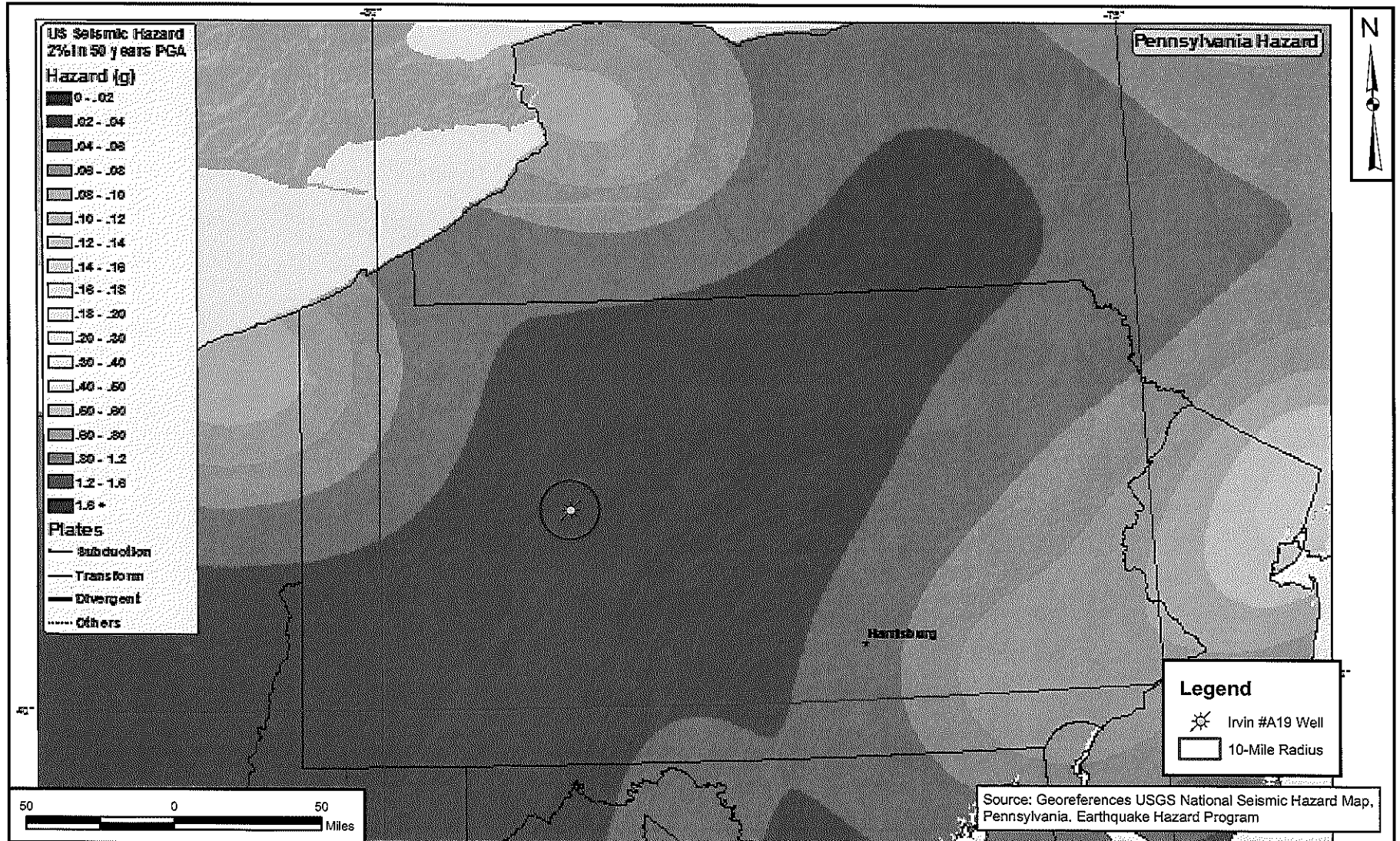
2

REV

0



 TETRA TECH	GEOLOGIC MAP IRVIN #A-19 EXCO RESOURCES INC. CLEARFIELD COUNTY, PENNSYLVANIA	DRAWN BY: S. PAXTON 01/09/15 CHECKED BY: D. SKOFF 01/12/15 APPROVED BY: CONTRACT NUMBER: 212C-PB-00084	
		FIGURE NUMBER 3	REV 0



USGS SEISMIC HAZARDS MAP FOR PENNSYLVANIA

EXCO RESOURCES INC
CLEARFIELD COUNTY, PENNSYLVANIA

DRAWN BY: S. PAXTON 01/05/15
CHECKED BY: D. SKOFF 01/12/15
APPROVED BY:

CONTRACT NUMBER: 212C-PB-00084

FIGURE NUMBER

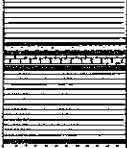
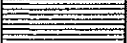
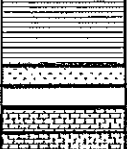
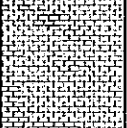
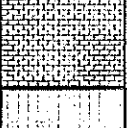
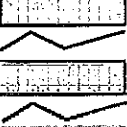
4

REV

0

ATTACHMENT A
FIGURES G-1 FROM ORIGINAL UIC CLASS IID WELL
PERMIT APPLICATION

(“EPA Underground Injection Control Well Application, Saltwater Disposal Well, Irvin A19 Well, Bell Township, Clearfield County, Pennsylvania” Prepared for EOG Resources, Inc. by Mactech Mineral Management, Inc., January 2005)

System	Description of Strata	Formation Name
DEVONIAN	 180' of Limestone	Tully 6525'-6705' (180')
	 515' of Shale	Hamilton 6705'-7220' (515')
	 11' of Shale	Tioga 7220'-7221' (1')
	 36' of Chert	Onondaga 7221'-7295' (74')
	 22' of Shale	
	 3' of Chert	
	 2' of Sandstone  4' of Limestone	Ridgeley Sandstone 7295'-7301' (6')
	 43' of Limestone	Shriver Chert 7301'-7344' (43')
	 166' of Limestone & Shale	Helderberg 7344-7510 (166')
SILURIAN	 70' of Limestone & Dolomite	Keyser 7510'-7580' (70')
	 T.D. 7840' Well reached Salt	



Pennsylvania Department of Environmental Protection

Geological Column &
Lithological Description
Irvin #A-19- API ID 37-003-0053
EPA UIC Project
FIGURE G-1

January 2005

ATTACHMENT B
INJECTED FLUID SPECIFIC GRAVITY DATA

Summary of Brine Source Sampling Study
EXCO Irvin A-19 Well
Cleatfield County, PA

Well:	Sample Date:	Specific Gravity:
Claypoole (Marcellus)	3/15/2014	1.1096
Schrecengost (Marcellus)	3/25/2014	1.0953
Stonis (Marcellus)	3/25/2014	1.0918
Tickle (Marcellus)	3/25/2014	1.0983
Hartzfeld 613 (Devonian)	3/31/2014	1.1030
Hopkins 775 (Devonian)	3/31/2014	1.0986
Weber 1031 (Devonian)	3/31/2014	1.0941
Average		1.0987

NALCO Champion Water Analysis Report

An Ecolab Company

Attention: Thomas.Patterson@CHAMP-TECH.com

Customer: Exco (1506461)

Location Code: 133826

Region: Not Available

Sample ID: AB62694

Location: Southwest PA

Login Batch: 04-01-2014-HUG-SW-EWA

System: Production System

Collection Date: 03/15/2014

Equipment: Claypoole 1H

Receive Date: 04/01/2014

Lab ID: ABU-0004

Report Date: 12/30/1899

Sample Point: Sampling Valve

Analyses	Result	Unit
Dissolved CO2	616	mg/L
Dissolved H2S	0	mg/L
pH	6.38	
Pressure	1100	psi
Temperature	68.3	° F

Analyses	Result	Unit
Bicarbonate	24	mg/L
Carbonate	Not Detected	mg/L
Conductivity	277097	µS - cm3
Ionic Strength	3.82	
Resistivity	0.036	ohms - m
Specific Gravity	1.1096	
Total Dissolved Solids	178402.1	mg/L

Cations	Result	Unit
Iron	1015	mg/L
Manganese	45.2	mg/L
Barium	1734	mg/L
Strontium	5349	mg/L
Calcium	24490	mg/L
Magnesium	2004	mg/L
Sodium	34129.89	mg/L
Potassium	1172	mg/L
Boron	18.12	mg/L
Lithium	149.6	mg/L
Copper	7.564	mg/L
Nickle	2.166	mg/L
Zinc	1.016	mg/L
Lead	<	mg/L
Cobalt	0.738	mg/L
Chromium	1.051	mg/L
Silicon	21.02	mg/L
Aluminum	3.696	mg/L

Anions	Result	Unit
Chloride	109611	mg/L
Sulfate	<.25	mg/L

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Attention: **Thomas.Patterson@CHAMP-TECH.com**Customer: **Exco (1506461)**Location Code: **133826**Region: **Not Available**Sample ID: **AB62694**Location: **Southwest PA**Login Batch: **04-01-2014-HUG-SW-EWA**System: **Production System**Collection Date: **03/15/2014**Equipment: **Claypoole 1H**Receive Date: **04/01/2014**Lab ID: **ABU-0004**Report Date: **12/30/1899**Sample Point: **Sampling Valve**

Scale Type	Result
Anhydrite CaSO4 SI	-6.82
Barite BaSO4 SI	-3.29
Calcite CaCO3 SI	-1.00
Celestite SrSO4 SI	-5.49
Gypsum CaSO4 SI	-6.85
Hemihydrate CaSO4 SI	-6.90
Saturation Index Calculation (Tomson-Oddo Model)	

Comments:

NALCO Champion Water Analysis Report

An Ecolab Company

Attention: Thomas.Patterson@CHAMP-TECH.com

Customer: Exco (1506461)

Location Code: 133827

Region: Not Available

Sample ID: AB62695

Location: Southwest PA

Login Batch: 04-01-2014-HUG-SW-EWA

System: Production System

Collection Date: 03/25/2014

Equipment: Schrec

Receive Date: 04/01/2014

Lab ID: ABU-0004

Report Date: 12/30/1899

Sample Point: Production Tank

Analyses	Result	Unit
Dissolved CO2	418	mg/L
Dissolved H2S	0	mg/L
pH	6.39	
Pressure	1100	psi
Temperature	67.2	° F

Analyses	Result	Unit
Bicarbonate	122	mg/L
Carbonate	Not Detected	mg/L
Conductivity	244589	µS - cm3
Ionic Strength	3.27	
Resistivity	0.041	ohms - m
Specific Gravity	1.0953	
Total Dissolved Solids	156841.8	mg/L

Cations	Result	Unit
Iron	293.9	mg/L
Manganese	10.93	mg/L
Barium	2339	mg/L
Strontium	5723	mg/L
Calcium	18010	mg/L
Magnesium	1588	mg/L
Sodium	33441.98	mg/L
Potassium	1039	mg/L
Boron	22.08	mg/L
Lithium	209.2	mg/L
Copper	<	mg/L
Nickle	<	mg/L
Zinc	<	mg/L
Lead	<	mg/L
Cobalt	<	mg/L
Chromium	<	mg/L
Silicon	8.155	mg/L
Aluminum	1.162	mg/L

Anions	Result	Unit
Chloride	95313	mg/L
Sulfate	<.25	mg/L

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Attention: **Thomas.Patterson@CHAMP-TECH.com**Customer: **Exco (1506461)**Location Code: **133827**Region: **Not Available**Sample ID: **AB62695**Location: **Southwest PA**Login Batch: **04-01-2014-HUG-SW-EWA**System: **Production System**Collection Date: **03/25/2014**Equipment: **Schrec**Receive Date: **04/01/2014**Lab ID: **ABU-0004**Report Date: **12/30/1899**Sample Point: **Production Tank**

Scale Type	Result
Anhydrite CaSO4 SI	-7.03
Barite BaSO4 SI	-3.23
Calcite CaCO3 SI	-0.51
Celestite SrSO4 SI	-5.52
Gypsum CaSO4 SI	-6.98
Hemihydrate CaSO4 SI	-7.03
Saturation Index Calculation (Tomson-Oddo Model)	

Comments:

NALCO Champion Water Analysis Report

An Ecolab Company

Attention: Thomas.Patterson@CHAMP-TECH.com

Customer: Exco (1506461)

Location Code: 133828

Region: Not Available

Sample ID: AB62696

Location: Southwest PA

Login Batch: 04-01-2014-HUG-SW-EWA

System: Production System

Collection Date: 03/25/2014

Equipment: Stonis

Receive Date: 04/01/2014

Lab ID: ABU-0004

Report Date: 12/30/1899

Sample Point: Production Tank

Analyses	Result	Unit
Dissolved CO2	418	mg/L
Dissolved H2S	0	mg/L
pH	6.61	
Pressure	1100	psi
Temperature	66.5	° F

Analyses	Result	Unit
Bicarbonate	24	mg/L
Carbonate	Not Detected	mg/L
Conductivity	235656	µS - cm3
Ionic Strength	3.20	
Resistivity	0.042	ohms - m
Specific Gravity	1.0918	
Total Dissolved Solids	150973.2	mg/L

Cations	Result	Unit
Iron	147.7	mg/L
Manganese	5.813	mg/L
Barium	2635	mg/L
Strontium	5561	mg/L
Calcium	18850	mg/L
Magnesium	1649	mg/L
Sodium	30275.66	mg/L
Potassium	867.7	mg/L
Boron	20.77	mg/L
Lithium	149.6	mg/L
Copper	<	mg/L
Nickle	<	mg/L
Zinc	<	mg/L
Lead	<	mg/L
Cobalt	0.978	mg/L
Chromium	<	mg/L
Silicon	13.6	mg/L
Aluminum	0.192	mg/L

Anions	Result	Unit
Chloride	91825	mg/L
Sulfate	<.25	mg/L

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Attention: **Thomas.Patterson@CHAMP-TECH.com**Customer: **Exco (1506461)**Location Code: **133828**Region: **Not Available**Sample ID: **AB62696**Location: **Southwest PA**Login Batch: **04-01-2014-HUG-SW-EWA**System: **Production System**Collection Date: **03/25/2014**Equipment: **Stonis**Receive Date: **04/01/2014**Lab ID: **ABU-0004**Report Date: **12/30/1899**Sample Point: **Production Tank**

Scale Type	Result
Anhydrite CaSO4 SI	-7.03
Barite BaSO4 SI	-3.19
Calcite CaCO3 SI	-0.99
Celestite SrSO4 SI	-5.54
Gypsum CaSO4 SI	-6.97
Hemihydrate CaSO4 SI	-7.02
Saturation Index Calculation (Tomson-Oddo Model)	

Comments:

NALCO Champion Water Analysis Report

An Ecolab Company

Attention: Thomas.Patterson@CHAMP-TECH.com

Customer: Exco (1506461)

Location Code: 133829

Region: Not Available

Sample ID: AB62697

Location: Southwest PA

Login Batch: 04-01-2014-HUG-SW-EWA

System: Production System

Collection Date: 03/25/2014

Equipment: Tickle

Receive Date: 04/01/2014

Lab ID: ABU-0004

Report Date: 12/30/1899

Sample Point: Production Tank

Analyses	Result	Unit
Dissolved CO2	418	mg/L
Dissolved H2S	0	mg/L
pH	6.42	
Pressure	1100	psi
Temperature	66.4	° F

Analyses	Result	Unit
Bicarbonate	24	mg/L
Carbonate	Not Detected	mg/L
Conductivity	252229	µS - cm3
Ionic Strength	3.35	
Resistivity	0.040	ohms - m
Specific Gravity	1.0983	
Total Dissolved Solids	161606.7	mg/L

Cations	Result	Unit
Iron	173.4	mg/L
Manganese	6.862	mg/L
Barium	2726	mg/L
Strontium	4780	mg/L
Calcium	18190	mg/L
Magnesium	1591	mg/L
Sodium	35826.48	mg/L
Potassium	634.7	mg/L
Boron	17.26	mg/L
Lithium	242.6	mg/L
Copper	0.082	mg/L
Nickle	0.096	mg/L
Zinc	<	mg/L
Lead	<	mg/L
Cobalt	0.987	mg/L
Chromium	<	mg/L
Silicon	11.58	mg/L
Aluminum	0.877	mg/L

Anions	Result	Unit
Chloride	98289	mg/L
Sulfate	<.25	mg/L

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Attention: **Thomas.Patterson@CHAMP-TECH.com**Customer: **Exco (1506461)**Location Code: **133829**Region: **Not Available**Sample ID: **AB62697**Location: **Southwest PA**Login Batch: **04-01-2014-HUG-SW-EWA**System: **Production System**Collection Date: **03/25/2014**Equipment: **Tickle**Receive Date: **04/01/2014**Lab ID: **ABU-0004**Report Date: **12/30/1899**Sample Point: **Production Tank**

Scale Type	Result
Anhydrite CaSO ₄ SI	-7.01
Barite BaSO ₄ SI	-3.14
Calcite CaCO ₃ SI	-1.18
Celestite SrSO ₄ SI	-5.58
Gypsum CaSO ₄ SI	-6.97
Hemihydrate CaSO ₄ SI	-7.02
Saturation Index Calculation (Tomson-Oddo Model)	

Comments:

NALCO Champion

Water Analysis Report

An Ecolab Company

Attention: Thomas.Patterson@CHAMP-TECH.com

Customer: Exco (1506461)

Location Code: 133830

Region: Not Available

Sample ID: AB62698

Location: Southwest PA

Login Batch: 04-01-2014-HUG-SW-EWA

System: Production System

Collection Date: 03/31/2014

Equipment: Hartzfeld Well 613

Receive Date: 04/01/2014

Lab ID: ABU-0004

Report Date: 12/30/1899

Sample Point: Sampling Valve

Analyses	Result	Unit
Dissolved CO2	198	mg/L
Dissolved H2S	0	mg/L
pH	5.97	
Pressure	1100	psi
Temperature	68.8	° F

Analyses	Result	Unit
Bicarbonate	0	mg/L
Carbonate	Not Detected	mg/L
Conductivity	260151	µS - cm3
Ionic Strength	3.36	
Resistivity	0.038	ohms - m
Specific Gravity	1.1030	
Total Dissolved Solids	166575.6	mg/L

Cations	Result	Unit
Iron	67.79	mg/L
Manganese	10.87	mg/L
Barium	774	mg/L
Strontium	853	mg/L
Calcium	14920	mg/L
Magnesium	1896	mg/L
Sodium	45062.94	mg/L
Potassium	270.4	mg/L
Boron	0.49	mg/L
Lithium	30.42	mg/L
Copper	<	mg/L
Nickle	<	mg/L
Zinc	0.033	mg/L
Lead	<	mg/L
Cobalt	<	mg/L
Chromium	<	mg/L
Silicon	3.468	mg/L
Aluminum	0.88	mg/L

Anions	Result	Unit
Chloride	102991	mg/L
Sulfate	<.25	mg/L

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04/08/2014

Page 1 of 2

Attention: **Thomas.Patterson@CHAMP-TECH.com**Customer: **Exco (1506461)**Location Code: **133830**Region: **Not Available**Sample ID: **AB62698**Location: **Southwest PA**Login Batch: **04-01-2014-HUG-SW-EWA**System: **Production System**Collection Date: **03/31/2014**Equipment: **Hartzfeld Well 613**Receive Date: **04/01/2014**Lab ID: **ABU-0004**Report Date: **12/30/1899**Sample Point: **Sampling Valve**

Scale Type	Result
Anhydrite CaSO ₄ SI	-7.07
Barite BaSO ₄ SI	-3.69
Celestite SrSO ₄ SI	-6.31
Gypsum CaSO ₄ SI	-7.04
Hemihydrate CaSO ₄ SI	-7.09
Saturation Index Calculation (Tomson-Oddo Model)	

Comments:

NALCO Champion Water Analysis Report

An Ecolab Company

Attention: **Thomas.Patterson@CHAMP-TECH.com**

Customer: **Exco (1506461)**

Location Code: **133831**

Region: **Not Available**

Sample ID: **AB62699**

Location: **Southwest PA**

Login Batch: **04-01-2014-HUG-SW-EWA**

System: **Production System**

Collection Date: **03/31/2014**

Equipment: **Hopkins Well 775**

Receive Date: **04/01/2014**

Lab ID: **ABU-0004**

Report Date: **12/30/1899**

Sample Point: **Sampling Valve**

Analyses	Result	Unit
Dissolved CO2	242	mg/L
Dissolved H2S	0	mg/L
pH	5.74	
Pressure	1100	psi
Temperature	68.8	° F

Analyses	Result	Unit
Bicarbonate	0	mg/L
Carbonate	Not Detected	mg/L
Conductivity	249438	µS - cm3
Ionic Strength	3.21	
Resistivity	0.040	ohms - m
Specific Gravity	1.0986	
Total Dissolved Solids	159730.4	mg/L

Cations	Result	Unit
Iron	71.49	mg/L
Manganese	18.77	mg/L
Barium	1028	mg/L
Strontium	867.6	mg/L
Calcium	14070	mg/L
Magnesium	1756	mg/L
Sodium	43341.52	mg/L
Potassium	271.5	mg/L
Boron	0.504	mg/L
Lithium	71.42	mg/L
Copper	<	mg/L
Nickle	<	mg/L
Zinc	0.037	mg/L
Lead	<	mg/L
Cobalt	0.325	mg/L
Chromium	<	mg/L
Silicon	3.041	mg/L
Aluminum	0.839	mg/L

Anions	Result	Unit
Chloride	98577	mg/L
Sulfate	<.25	mg/L

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Attention: **Thomas.Patterson@CHAMP-TECH.com**Customer: **Exco (1506461)**Location Code: **133831**Region: **Not Available**Sample ID: **AB62699**Location: **Southwest PA**Login Batch: **04-01-2014-HUG-SW-EWA**System: **Production System**Collection Date: **03/31/2014**Equipment: **Hopkins Well 775**Receive Date: **04/01/2014**Lab ID: **ABU-0004**Report Date: **12/30/1899**Sample Point: **Sampling Valve**

Scale Type	Result
Anhydrite CaSO ₄ SI	-7.11
Barite BaSO ₄ SI	-3.58
Celestite SrSO ₄ SI	-6.32
Gypsum CaSO ₄ SI	-7.07
Hemihydrate CaSO ₄ SI	-7.12
Saturation Index Calculation (Tomson-Oddo Model)	

Comments:

NALCO Champion Water Analysis Report

An Ecolab Company

Attention: Thomas.Patterson@CHAMP-TECH.com

Customer: Exco (1506461)

Location Code: 133832

Region: Not Available

Sample ID: AB62700

Location: Southwest PA

Login Batch: 04-01-2014-HUG-SW-EWA

System: Production System

Collection Date: 03/31/2014

Equipment: Weber Well 1031

Receive Date: 04/01/2014

Lab ID: ABU-0004

Report Date: 12/30/1899

Sample Point: Sampling Valve

Analyses	Result	Unit
Dissolved CO2	154	mg/L
Dissolved H2S	0	mg/L
pH	5.86	
Pressure	1100	psi
Temperature	68.8	° F

Analyses	Result	Unit
Bicarbonate	0	mg/L
Carbonate	Not Detected	mg/L
Conductivity	237157	µS - cm3
Ionic Strength	3.13	
Resistivity	0.042	ohms - m
Specific Gravity	1.0941	
Total Dissolved Solids	151850.3	mg/L

Cations	Result	Unit
Iron	59.74	mg/L
Manganese	10.07	mg/L
Barium	805	mg/L
Strontium	887.1	mg/L
Calcium	15030	mg/L
Magnesium	2084	mg/L
Sodium	38843.40	mg/L
Potassium	231.9	mg/L
Boron	0.397	mg/L
Lithium	22.91	mg/L
Copper	<	mg/L
Nickle	<	mg/L
Zinc	<	mg/L
Lead	<	mg/L
Cobalt	0.126	mg/L
Chromium	.08	mg/L
Silicon	3.715	mg/L
Aluminum	0.913	mg/L

Anions	Result	Unit
Chloride	94131	mg/L
Sulfate	<.25	mg/L

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NALCO Champion

An Ecolab Company

Water Analysis Report

NALCO Champion

An Ecolab Company

Attention: **Thomas.Patterson@CHAMP-TECH.com**

Customer: **Exco (1506461)**

Location Code: **133832**

Region: **Not Available**

Sample ID: **AB62700**

Location: **Southwest PA**

Login Batch: **04-01-2014-HUG-SW-EWA**

System: **Production System**

Collection Date: **03/31/2014**

Equipment: **Weber Well 1031**

Receive Date: **04/01/2014**

Lab ID: **ABU-0004**

Report Date: **12/30/1899**

Sample Point: **Sampling Valve**

Scale Type	Result
Anhydrite CaSO ₄ SI	-7.10
Barite BaSO ₄ SI	-3.71
Celestite SrSO ₄ SI	-6.33
Gypsum CaSO ₄ SI	-7.05
Hemihydrate CaSO ₄ SI	-7.10
Saturation Index Calculation (Tomson-Oddo Model)	

Comments:



**EPA Underground Injection Control Application
Saltwater Disposal Well
Irvin A19 Well
Bell Township, Clearfield County
Pennsylvania**

Prepared for:

**EOG Resources, Inc.
Pittsburgh Division
400 Southpointe Blvd.
Southpointe Plaza 1, Suite 300
Canonsburg, Pennsylvania 15317**

Prepared by:

**Mactech Mineral Management, Inc.
1185 East Main St.
Bradford, Pennsylvania 16701**

January 2005

**EPA UIC Permit Application-Class II
Saltwater Disposal Well-Irvin A19 SWD
Bell Township, Clearfield County, PA**

Prepared for: EOG Resources, Inc.
Pittsburgh Division
400 Southpointe Blvd.
Southpointe Plaza 1, Suite 300
Canonsburg, PA 15317
Michael McCown, P.E.-Operations Manager
(724) 743-2662-Direct Phone
(724) 743-2663-Direct Fax
(724) 745-1102-Main Phone

Prepared by: Mactech Mineral Management, Inc
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(814) 362-4263 (Phone)
(814) 362-3249 (Fax)

Submitted to: U.S. Environmental Protection Agency-Region III
SDWA Branch (3WP32)
Office of Compliance and Enforcement
1650 Arch Street
Philadelphia, PA 19103-2029
S. Stephen Platt

Submitted: January 2005

**EOG Resources, Inc.
EPA UIC Permit Application-Class II
Saltwater Disposal Well - Irvin A19 SWD**

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A. Area of Review

EOG Resources, Inc. is proposing to convert an existing Lower Devonian Oriskany gas well designated as the Irvin A19 into a Saltwater Disposal well and is applying for a EPA Class II injection well permit. The specified fixed radius of ¼ mile is used to determine the Area of Review (AOR) for this application.

The injection project being proposed by EOG Resources, Inc. is located in the Bell Township, Clearfield County, Pennsylvania and lies within EOG's Brady Field. The surface owners are listed and shown within the AOR.

The existing Irvin A-19 well to converted to a saltwater disposal well was originally drilled during 1953 to a depth of 7,840'. The well produced natural gas from the Oriskany formation from a depth of 7,295' to 7,344'. During 2004, EOG applied for a 30-day injection test and was granted permission on June 23, 2004 by the EPA to commence testing. Through various well workovers and subsequent injection testing completed on January 4, 2005, EOG is submitting application for the Class II injection permit.

EOG will commence the project upon approval of both Federal and State agencies.

B. Maps

- **Map B-1**

This map is a portion of USGS 7 ½' topographic map of the McGees Mills, PA. Quadrangle. This map shows both a radius of 1-mile and the ¼ mile AOR beyond the proposed saltwater disposal well.

Included within both the 1-mile and ¼ mile radius's are all gas wells both shallow (Upper Devonian Bradford & Elk Group reservoirs ranging from a depth of 1,750'-3,400') and deep (Lower Devonian Oriskany Group reservoir which is the injection zone), also lease boundaries, surface bodies of water, springs, mines (surface or subsurface), quarries and other pertinent surface features, including residences and roads are indicated on this map.

There are neither hazardous waste treatment nor storage, discharge or disposal facilities in this area.

The surface owners within a ¼ mile radius of the proposed saltwater disposal well are shown on this map.

The scale of Map B-1 is one inch equals 2,000 feet.

- **Map B-2**

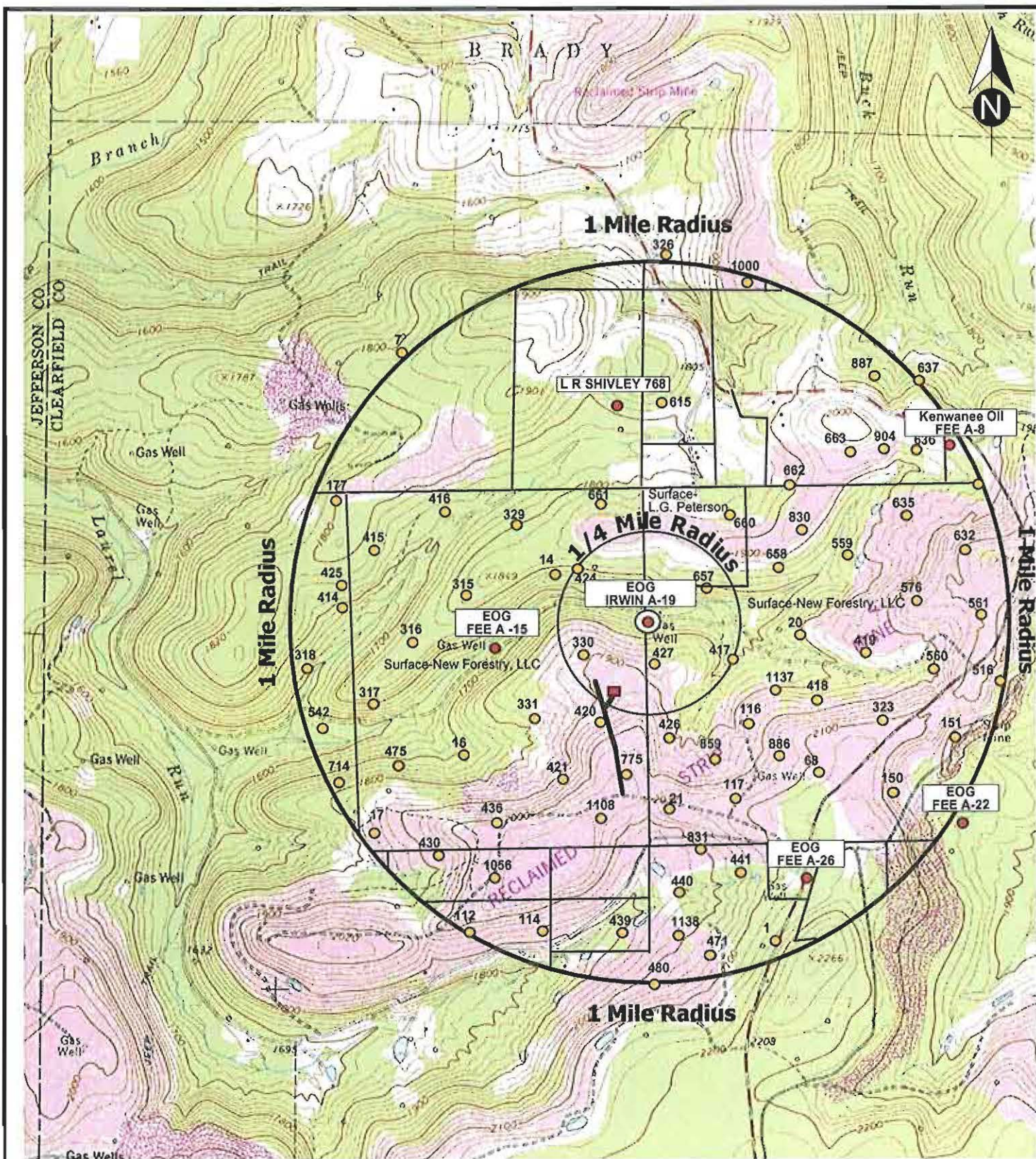
This map is a portion of USGS 7 ½' topographic map of the McGees Mills, PA. Quadrangle.

The name and/or number of all wells only penetrating the Oriskany reservoir within a 1-mile radius are shown on this map.

There are neither hazardous waste treatment nor storage, discharge or disposal facilities in this area.

The surface owners within a ¼ mile radius of the proposed saltwater disposal well are shown on this map.

The scale of Map B-2 is one inch equals 2,000 feet.



SOURCE: MCGEES MILLS, PA 7.5 QUAD USGS TOPO

LEGEND

- Proposed Saltwater Disposal Well Penetrating Oriskany
- Deep Gas Well Penetrating Oriskany
- Shallow Gas Well
- Proposed Brine Storage Facility
- Property Boundary

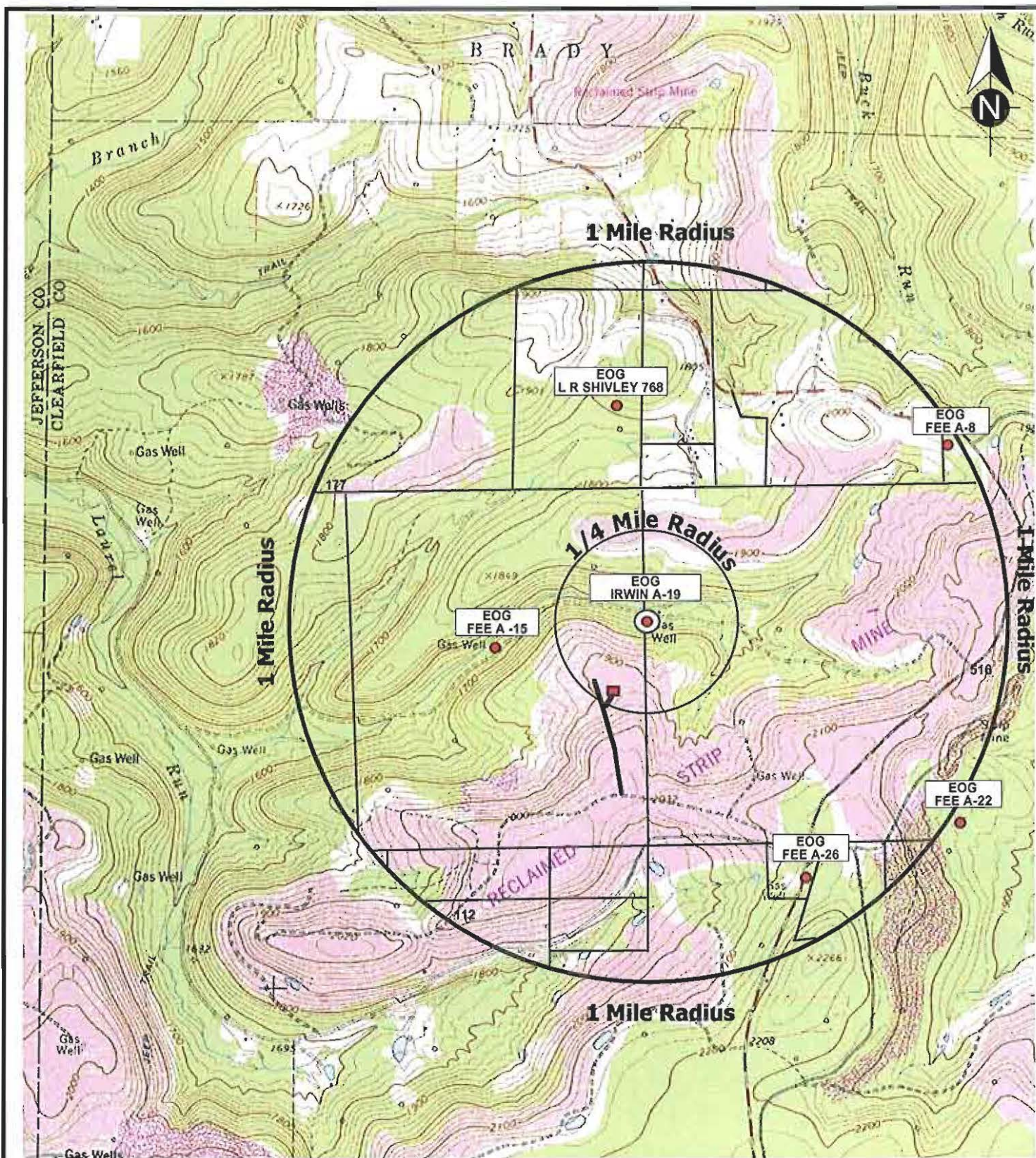
SCALE
(FT.)

0 2000 4000



Area of Review
Irvin #A-19
API ID 37-003-0053
EPA UIC Project
MAP B-1

January 2005



SOURCE: MCGEES MILLS, PA 7.5 QUAD USGS TOPO

LEGEND

- Proposed Brine Disposal Well Penetrating Oriskany
- Deep Gas Well Penetrating Oriskany
- Proposed Brine Storage Facility
- Property Boundary

SCALE
(FT.)

0 2000 4000



Area of Review- Oriskany Only Wells

Irvin #A-19

API ID 37-003-0053

EPA UIC Project

MAP B-2

January 2005

C. Corrective Action Plan

Abandoned Wells and Active Wells:

Table C-1 compiles known data on the wells penetrating the Oriskany reservoir within the 1-mile and ¼ mile Area of Review.

Map C-1 accompanies Table C-1 and shows the wells penetrating the Oriskany only within the 1- mile and ¼ mile Area of Review. The scale of this map is one inch equals 2,000 ft.

It is the intent EOG Resources to convert the existing Irvin A19 well into a saltwater disposal well per EPA specifications.

Corrective Action Plan

Within a ¼ mile radius of the proposed injection well Irvin A-19, there are no other wells that penetrate the Oriskany reservoir.

Within a 1-mile radius there are an additional (5) wells that have penetrated the Oriskany reservoir. Of these (5) wells, (2) have been plugged and abandoned, (2) have been plugged back and produce from the shallow Upper Devonian reservoirs and are currently operated by EOG Resources and the remaining (1) well (A-15) is to be plugged and abandoned by EOG prior to the injection operation of Irvin A-19.

Data of these aforementioned wells are shown in **Table C-1**.

Brine Disposal Well:

EOG has converted the existing Irwin A-19 well into a saltwater disposal well during 2004 under the approval of the EPA to perform a 30-day injection test. The injection well has been completed to approved EPA specifications.

Producing Wells:

There are no wells that are currently producing from the Oriskany formation within a 1-mile radius.

In-Active Well to be Plugged and Abandoned:

One (1) existing well Fee A-15 which is approximately 2,200 feet southwest of the proposed injection well, will be plugged and abandoned prior to commencement of brine disposal operations. This well will be plugged by EOG according to PADEP specifications.

Monitoring Wells:

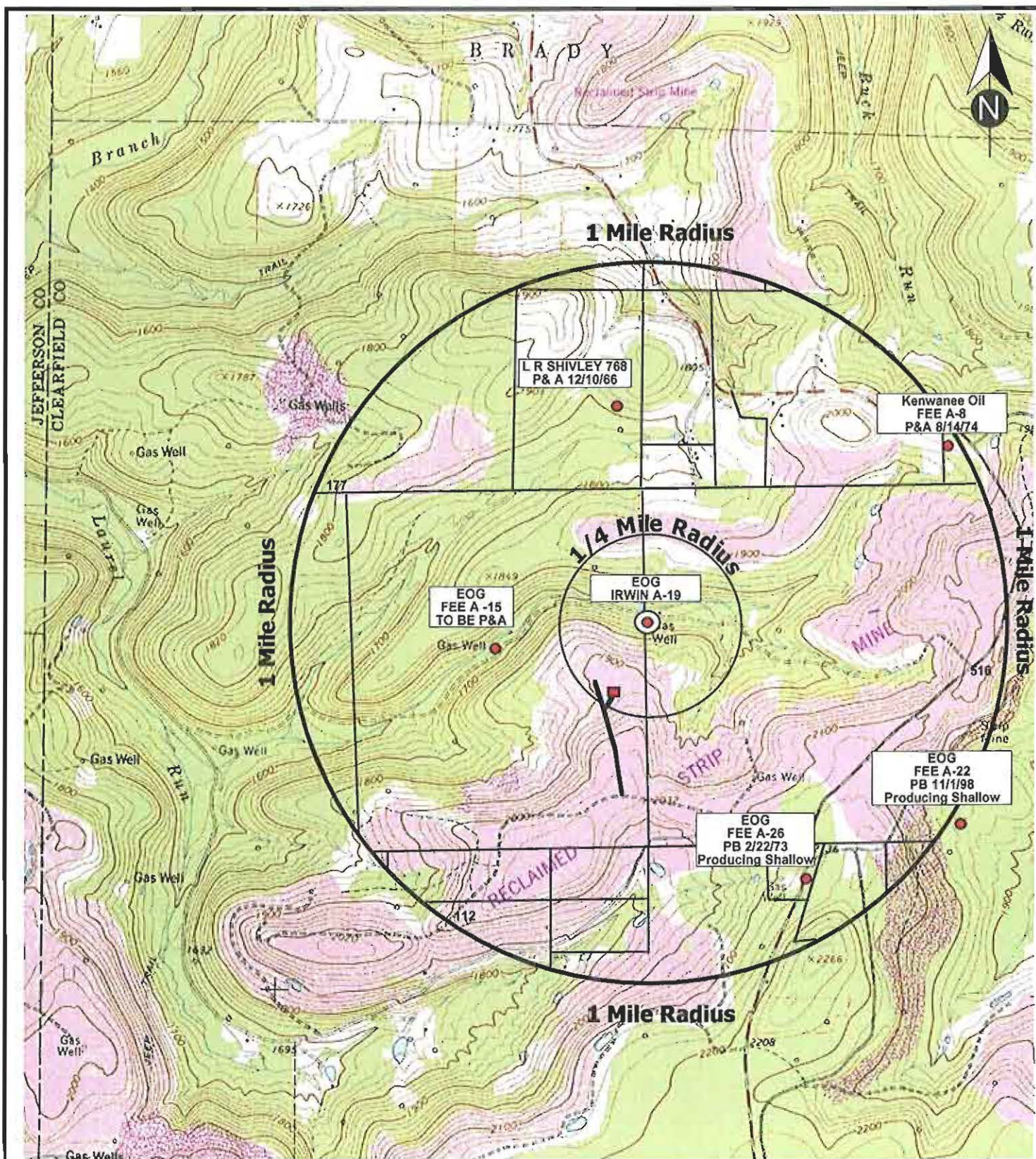
There will be no wells within a 1-mile radius currently producing or in active from the Oriskany reservoir.

EOG RESOURCES, INC.
BELL TOWNSHIP, CLEARFIELD CO., PA
ORISKANY WELL STATUS AOR 1-MILE RADIUS

TABLE C-1



API ID	Well Name	Well No.	Operator	Date Drilled	Total Depth (ft)	Top of Oriskany Depth (ft)	Oriskany Thickness Ridgeley-Shriver (ft)	Current Status
3700300050	Fee A	15	EOG	6/8/1954	7360	7214	65	To be P&A by EOG
3700300053	Fee A	19	EOG	12/1/1953	7840	7295	43	To be Converted to Saltwater Disposal Well
3700300056	Fee A	22 (M-591)	EOG	5/2/1954	8049	n/a	n/a	Plug Back 11/1/98 Completed in Upper Devonian 2185'-3141'
3700320007	L.R. Shivley	768	F.C. Deemer	11/30/1959	n/a	n/a	n/a	PADEP Records P&A 12/10/1966
3700320548	Fee A	8	Kewanee Oil	9/9/1955	7700	7482	n/a	PADEP Records P&A 8/14/74 Plug Back 2/22/73
3703320507	Fee A	26 (M-626)	EOG	10/21/1955	7810	n/a	n/a	Completed in Upper Devonian 2558'-3142'



SOURCE: MCGEES MILLS, PA 7.5 QUAD USGS TOPO

LEGEND

- Proposed Brine Disposal Well Penetrating Oriskany
- Deep Gas Well Penetrating Oriskany
- Proposed Brine Storage Facility
- Property Boundary

SCALE
(FT.)

0 2000 4000



Area of Review -Corrective Action Plan
Irvin #A-19
API ID 37-003-0053
EPA UIC Project
MAP C-1

January 2005

E. Name and Depth of USDWs (Underground Sources Drinking Water)

The USDW's in the AOR are typically within the **Mississippian Pocono Formation** consisting mostly of sandstone with interbedded shale and siltstone.

Based upon certain driller records of existing shallow upper Devonian gas wells drilled to an average depth of 3,400' depth, 8 5/8" surface casing (fresh water string) is typically set at a depth of 1000'. Records indicate fresh water zones are encountered from a depth of 45 – 540' in the AOR.

There are no existing drinking water supply wells (private or public) within in the 1-mile and ¼ mile AOR.

G. Geologic Data

The Lower Devonian Oriskany group (Ridgeley sandstone and Shriver chert) is the proposed injection zone for this application.

Figure G-1 represents a geological column from the Tully Limestone to the Silurian salt

Based upon the drillers record and sample log for the Irvin A-19 well the geologic data can be summarized as follows:

Injection Zone

Devonian age Ridgeley "Oriskany" Sandstone & Shriver Chert - Gross thickness 49 feet

The Ridgeley sandstone thickness is approximately 6 feet in thickness and is described as a 2 foot section of sandstone from 7,295-7,297 feet in depth, fine to medium grained, light gray to gray, quartzitic, quartz grains mostly sub angular, a few rounded and 4 feet of limestone from 7,297 -7,301 feet in depth

The Shriver Chert is approximately 43 feet in thickness and is described as consisting of limestone, fine, clastic, brownish to dark brownish gray, containing fragments of shells, and a great deal of quartz silt and sand in the upper 26 feet. The lower 17 feet of the Shriver Chert is described as limestone, very fine to fine, clastic brownish to dark brownish, containing a great deal of light gray silty tripolitic chert and light brownish to brownish-gray sub chalcedonic chert.

Confining Zones

Upper Confining Zones

Devonian age Onondaga Formation and Hamilton Group-Gross Thickness 589 feet

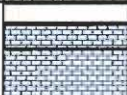
Onondaga formation is described as being 74 feet in thickness generally consisting of limestone, shale and chert. Immediately lying above the Onondaga is a 1-foot section the Tioga bentonite, lying above the Tioga bentonite is the Hamilton group is 515 feet in thickness predominately consisting of grayish-black shale.

Lower Confining Zones

Silurian age Helderberg and Keyser formations-

The Helderberg is generally described as consisting of limestone and shale is 166 feet in thickness and the Keyser is described as consisting of limestone and dolomite and is 70 feet in thickness.

System**Description of Strata****Formation Name**

D E V O N I A N	Upper Confining Zones (Minimum 590' in thickness)	 180' of Limestone	Tully 6525'-6705' (180')
		 515' of Shale	Hamilton 6705'-7220' (515')
		 11' of Shale	Tioga 7220'-7221' (1')
		 36' of Chert	Onondaga 7221'-7295' (74')
	Injection Zone (49' in thickness) 	 22' of Shale	
		 3' of Chert  2' of Sandstone  4' of Limestone	Ridgeley Sandstone 7295'-7301' (6')
S I L U R I A N	Lower Confining Zones	 43' of Limestone	Shriver Chert 7301'-7344' (43')
		 166' of Limestone & Shale	Helderberg 7344-7510 (166')
		 70' of Limestone & Dolomite	Keyser 7510'-7580' (70')
		 T.D. 7840' Well reached Salt	



**Geological Column &
Lithological Description
Irvin #A-19- API ID 37-003-0053
EPA UIC Project
FIGURE G-1**

January 2005

H. Operating Data

1. Average and Maximum Injection Rates

On June 23, 2004, EOG Resources obtained an EPA Region III Underground Injection Control temporary injection test permit for the injection of produced fluid into the Oriskany formation. Subsequently, Irvin A19 well was temporarily converted to an injection well. After various well workover's a 24-day test was successfully performed from December 10, 2004 through January 4, 2005. Results of this test are shown in **Figure H-1**

As indicated by Figure H-1, injection rates into the Oriskany formation had a daily peak of 142 barrels and the average daily injection rate was 97 barrels per day over the 24-day test period.

2. Average and Maximum Injection Pressures

During the 24-day test period of Irvin A-19, maximum tubing/surface pressure was recorded to be 1635 psig, with the 24-day average pressure of 1236 psig as indicated in Figure H-1.

The temporary injection test permit allowed for the maximum injection pressure not to exceed 2,400 psig, measured as surface pressure. This maximum allowable pressure, determined by EPA from EOG's initial request on May 17, 2004 was based upon using saltwater produced from the Oriskany formation with a specific gravity of 1.225.

It is the intent of EOG Resources to inject shallow Upper Devonian saltwater with a specific gravity of 1.0976, thus by using the specific gravity of 1.0976 in the formula for determining maximum allowable pressure, subsequently increases the allowable maximum surface pressure from 2,400 psig to 3,200 psig. Therefore, EOG is requesting a maximum allowable operating pressure to be 3,200 psig for this Class II application.

Calculation of Maximum Injection Pressure

Fracture Gradient (FG)

$$FG = (ISIP + (.433 \times SG \times D)) / D$$

$$ISIP^* = 3520$$

$$SG = 1.00$$

$$D = 7232$$

$$FG = (3520 + (.433 \times 1 \times 7232)) / 7232$$

$$FG = 0.92$$

Maximum Injection Pressure (Pmax)

$$P_{max} = (FG - (.433 \times SG)) \times D$$

$$FG = 0.92$$

$$SG = 1.0976$$

$$D = 7232$$

$$P_{max} = (0.92 - (.433 \times 1.0976)) \times 7232$$

$$P_{max} = 3200 \text{ psig}$$

**ISIP (obtained from minifrac 5/16/03, see Section I - Formation Testing for details)*

3. Nature of Annulus Fluid

The fluid between the annular space of the 7" long string and the 2 7/8" injection tubing will consist of freshwater with corrosion inhibitor.

4. Physical and Chemical Properties of Injection Fluid

Produced saltwater from EOG's Brady Field operations produced from the Upper Devonian Bradford Group reservoirs will be used as the injection fluid. An analysis of the produced brine is shown in **Figure H-2**. This Upper Devonian saltwater was also used during the 30-day injection test.

EOG RESOURCES, INC.

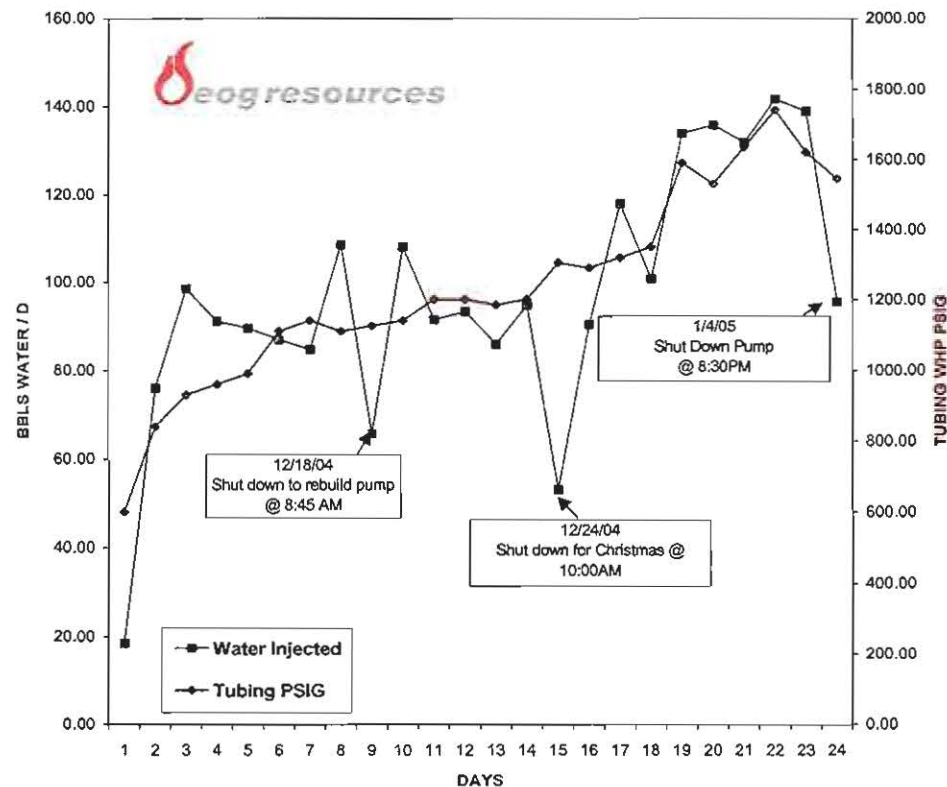
EPA UIC-INJECTIVITY TEST

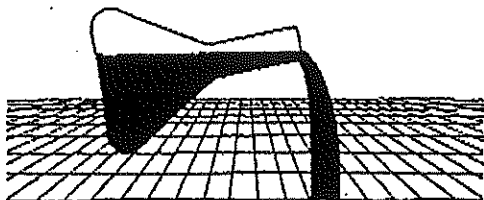
WELL IRVIN A-19

BELL TOWNSHIP, CLEARFIELD CO., PA

FIGURE H-1

Date	Days	Daily Bbls Water	Cumulative Bbls Water	Tbg. WHP psig	Csg. WHP psig
12/10/04	1	18.40	18.40	600.00	30.00
12/11/04	2	75.90	94.30	840.00	0.00
12/12/04	3	98.40	192.70	930.00	0.00
12/13/04	4	91.00	283.70	960.00	0.00
12/14/04	5	89.45	373.15	990.00	0.00
12/15/04	6	86.90	460.05	1110.00	0.00
12/16/04	7	84.65	544.70	1140.00	0.00
12/17/04	8	108.50	653.20	1110.00	0.00
12/18/04	9	65.55	718.75	1125.00	0.00
12/19/04	10	108.05	826.80	1140.00	0.00
12/20/04	11	91.38	918.18	1200.00	0.00
12/21/04	12	93.23	1011.41	1200.00	0.00
12/22/04	13	85.81	1097.22	1185.00	0.00
12/23/04	14	94.64	1191.86	1200.00	0.00
12/24/04	15	52.90	1244.76	1305.00	0.00
12/27/04	16	90.30	1335.06	1290.00	0.00
12/28/04	17	117.90	1452.96	1320.00	0.00
12/29/04	18	100.70	1553.66	1350.00	0.00
12/30/04	19	133.90	1687.56	1590.00	0.00
12/31/04	20	135.80	1823.36	1530.00	0.00
1/1/05	21	131.80	1955.16	1635.00	0.00
1/2/05	22	141.60	2096.76	1740.00	0.00
1/3/05	23	138.85	2235.61	1620.00	0.00
1/4/05	24	95.45	2331.06	1545.00	0.00
AVERAGE		97.13		1235.63	





ENVIRONMENTAL

SERVICE LABORATORIES, INC.

2794 West Pike Rd., Indiana, PA 15701

(724) 463-TEST FAX (724) 465-4209

Figure H-2

Report of Analysis

Name: EOG
2039 South 6th St.
Indiana, PA 15701
Receipt Date: 5/12/04 1:57 PM
Report Date: 5/25/04

Sample ID#: 04 38948
Sample Type: Water
Sampler: TP (Client)
Client Sample ID: Injection Fluid

Analyte	Analyst	Date Analyzed	Sample Result	Units	Method	MDL
Barium	GD	5/20/04	482.27	mg/L	SM3111D	0.20
Calcium, Flame	GD	5/19/04	62143.00	mg/L	SM3111B	0.05
Hardness	SK	5/24/04	141276	mg/L	SM2340B	5
Iron	GD	5/19/04	3.43	mg/L	SM3111B	0.05
Magnesium	GD	5/20/04	5479.00	mg/L	SM3111B	0.02
Manganese	GD	5/19/04	10.75	mg/L	SM3111B	0.02
Sodium	GD	5/20/04	158162.00	mg/L	SM3111B	0.10
Specific Gravity	TP	5/13/04	1.0976	none	SM2710F	0.000
pH	TP	5/18/04	5.16	SI	150.1	0.00
Specific Conductance	GD	5/13/04	171817	uS/cm	120.1	1

ND = Not Detected

Note: DEP Certification # 32-382

Approved By:

Susan Kon
Susan Kon, Laboratory Director

I. Formation Testing Program

EOG Resources performed a formation test on June 16-17, 2003. A minifrac using HCL and water were pumped into the Oriskany formation at various rates starting from 1BPM to 10 BPM at one minute pumping times. Then 5,000 gallons of 15% HCL w/additives was pumped into the Oriskany formation @ 10 BPM. Treating pressure was 4,675 PSI and the ISIP was recorded to be 3,520 PSI.

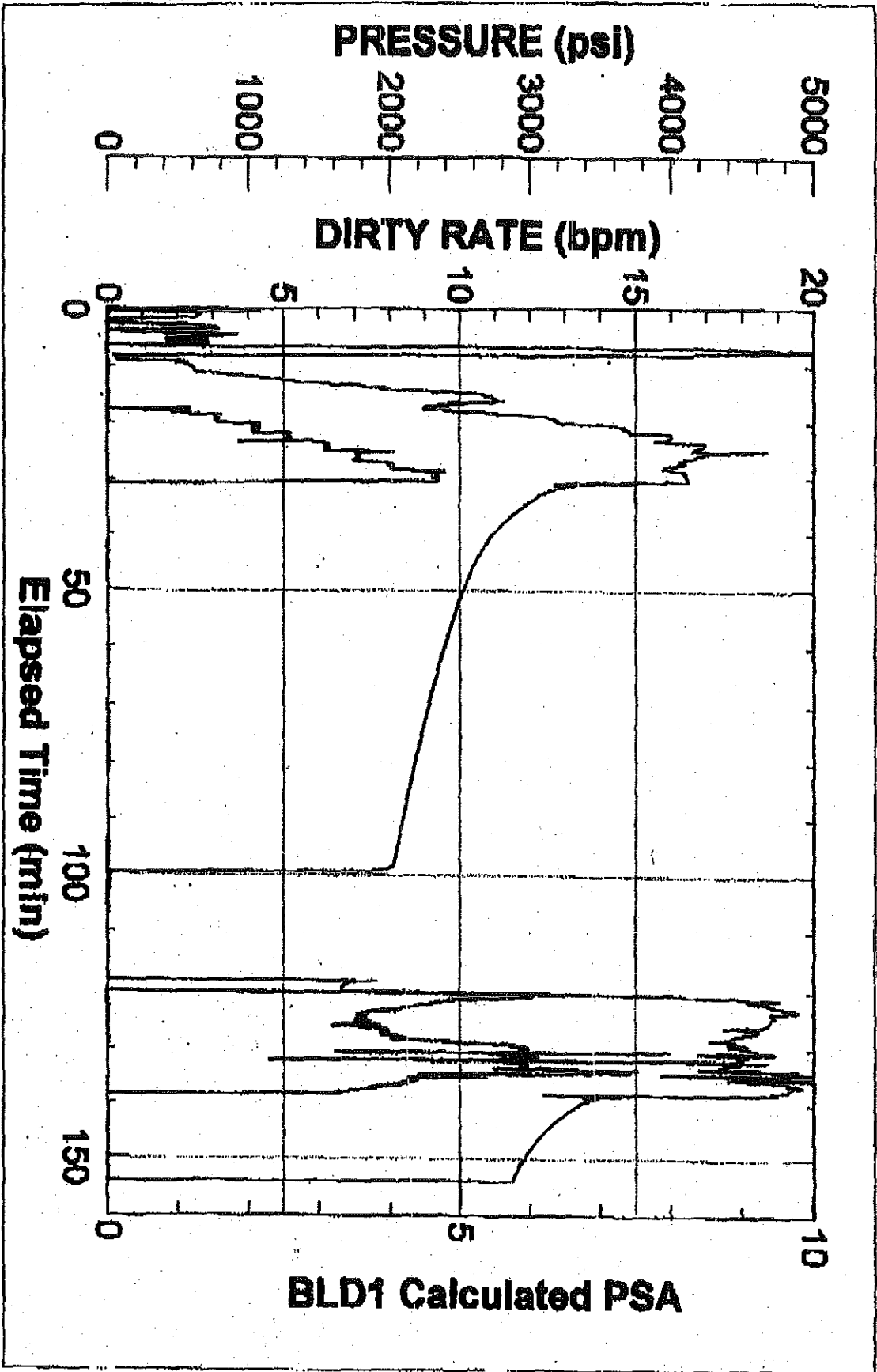
EOG's daily Completion and Workover Report and BJ Hughes test data for this minifrac are shown in **Figure I-1**.

See following documentation for BJ Hughes Minifrac data

1208 (2/99)

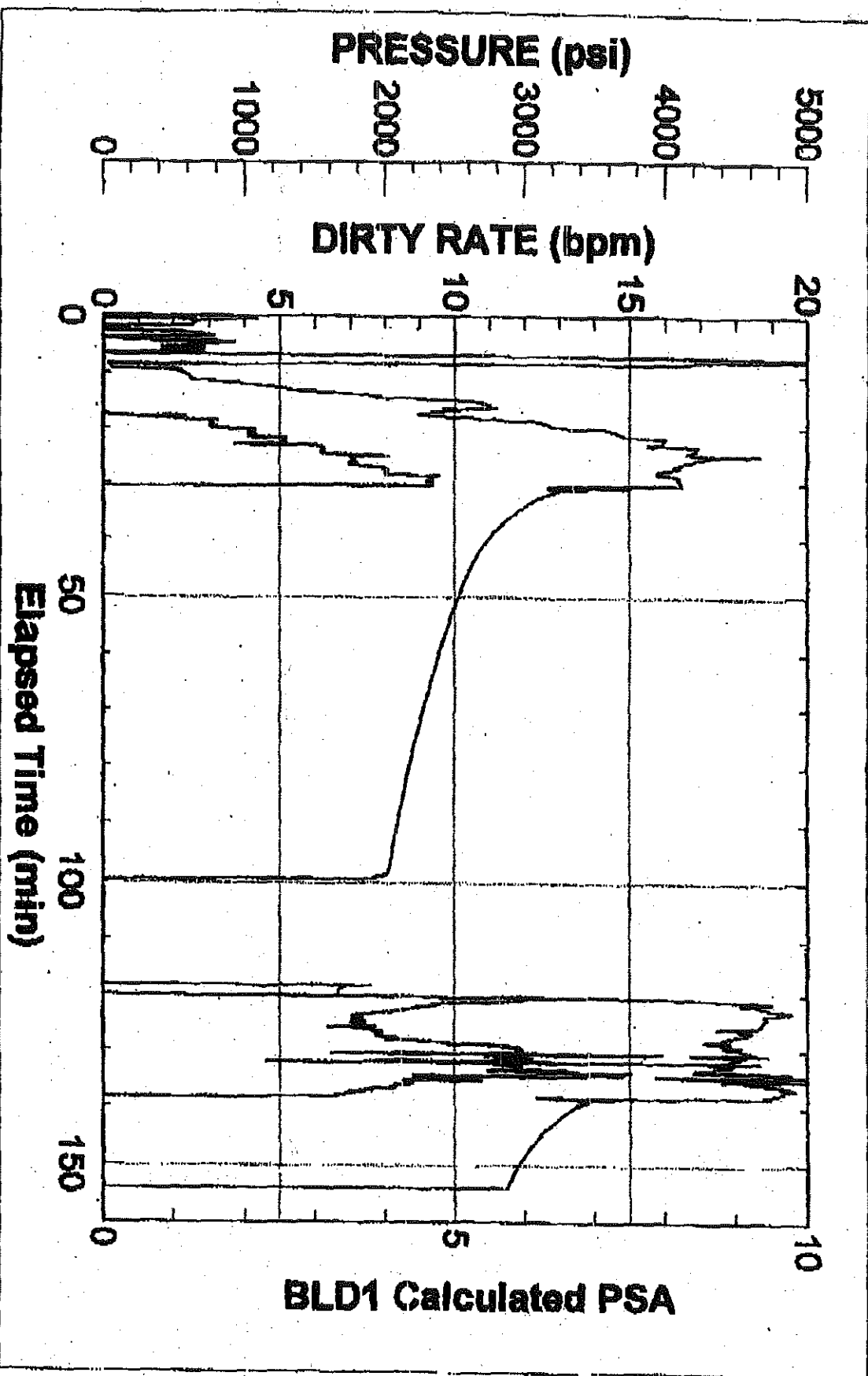


BJ Services JobMaster Program Version 2.61
Job Number: 32810000
Customer: EDG RESOURCES
Well Name: DUNE A-79





BJ Services JobMaster Program Version 2.61
Job Number: 126710539
Customer: EOG RESOURCES
Well Name: IRVIN A-10



**BJ Services JobMaster Program Version 2.01**

Job Number: 325110559

Customer: EOG RESOURCES

Well Name: IRVIN A-19

Time of Day	Stage Number	PRESSURE (psi)	DIRTY RATE (bpm)	DENSITY (ppg)	DIRTY STAGE (bbl)	DIRTY TOTAL (bbl)	SAND TOTAL (lbm)	AVG RATE (bpm)	AVG PRE (psi)
Monday, June 16, 2003									
13:05:31	1	0	0.0	0.5	0	0	0	0.0	0
13:06:01	1	1012	0.0	0.0	0	0	0	0.0	363
13:06:31	1	633	0.0	0.0	0	0	0	0.0	533
13:07:01	1	555	0.0	0.0	0	0	0	0.0	559
13:07:31	1	28	0.0	0.0	0	0	0	0.0	440
13:08:01	1	169	0.0	0.0	0	0	0	0.0	381
13:08:31	1	712	0.0	0.0	0	0	0	0.0	403
13:09:01	1	630	0.0	0.0	0	0	0	0.0	451
13:09:31	1	9	0.0	0.0	0	0	0	0.0	403
13:10:01	1	786	0.0	0.0	0	0	0	0.0	424
13:10:31	1	708	0.0	0.0	0	0	0	0.0	452
13:11:01	1	712	0.0	0.0	0	0	0	0.0	466
13:11:31	1	697	0.0	0.0	0	0	0	0.0	474
13:12:01	1	198	0.0	0.0	0	0	0	0.0	468
13:12:31	1	4703	0.0	0.0	0	0	0	0.0	670
13:13:02	1	5032	0.0	0.0	0	0	0	0.0	961
13:13:32	1	4160	0.0	0.0	0	0	0	0.0	1187
13:14:02	1	57	0.0	0.0	0	0	0	0.0	1169
13:14:32	1	83	0.0	0.0	0	0	0	0.0	1107
13:15:02	1	540	0.0	0.0	0	0	0	0.0	1075
13:15:32	1	589	0.0	0.0	0	0	0	0.0	1049
13:16:02	1	607	0.0	0.0	0	0	0	0.0	1028
13:16:32	1	621	0.0	0.0	0	0	0	0.0	1009
13:17:02	1	661	0.0	0.0	0	0	0	0.0	998
13:17:32	1	1085	0.0	0.0	0	0	0	0.0	997
13:18:02	1	1249	0.0	0.0	0	0	0	0.0	1004
13:18:32	1	1422	0.0	0.0	0	0	0	0.0	1017
13:19:02	1	1768	0.0	0.0	0	0	0	0.0	1038
13:19:32	1	1909	0.0	0.0	0	0	0	0.0	1069
13:20:02	1	2328	0.0	0.0	0	0	0	0.0	1103
13:20:32	1	2661	0.0	0.0	0	0	0	0.0	1150
13:21:02	1	2734	0.0	0.0	0	0	0	0.0	1201
13:21:32	1	2748	0.0	0.0	0	0	0	0.0	1249
13:22:02	1	2525	0.0	0.0	0	0	0	0.0	1292
13:22:32	1	2939	0.0	0.0	0	0	0	0.0	1324
13:23:02	1	2241	0.0	0.0	0	0	0	0.0	1351
13:23:32	1	2885	1.9	0.0	1	1	0	0.0	1360
13:24:02	1	2828	3.0	0.0	2	2	0	0.1	1417
13:24:32	1	3136	3.1	0.0	3	3	0	0.2	1461
13:25:02	1	3185	3.1	0.0	5	5	0	0.2	1504
13:25:32	1	3341	3.6	0.0	6	6	0	0.3	1548
13:26:02	1	3636	4.2	0.0	9	9	1	0.4	1597
13:26:32	1	3585	4.2	0.0	11	11	1	0.5	1646
13:27:02	1	3716	4.3	0.0	13	13	1	0.6	1694
13:27:32	1	4000	5.1	0.0	15	15	1	0.7	1744
13:28:02	1	3966	5.2	0.0	16	16	1	0.8	1794
13:28:32	1	3725	5.3	0.0	20	20	2	1.0	1841
13:29:02	1	4239	6.2	0.0	23	23	2	1.1	1889
13:29:32	1	4214	6.2	0.0	26	26	2	1.2	1938
13:30:02	1	4171	6.2	0.0	29	29	2	1.3	1984
13:30:32	1	4625	7.8	0.0	33	33	2	1.3	2030
13:31:02	1	4251	7.1	0.0	37	37	3	1.4	2076
13:31:32	1	4182	7.1	0.0	40	40	3	1.5	2117

**BJ Services JobMaster Program Version 2.61**

Job Number: 325110569

Customer: EOG RESOURCES

Well Name: IRVIN A-19

Time of Day	Stage Number	PRESSURE (psf)	DIRTY RATE (bpm)	DENSITY (psa)	DIRTY STAGE (bbl)	DIRTY TOTAL (bbl)	SAND TOTAL (lbm)	AVG RATE (bpm)	AVG PRE (psf)
Monday, June 16, 2003									
13:32:02	1	4066	7.0	0.0	44	44	3	1.6	2185
13:32:32	1	4067	7.8	0.0	47	47	4	1.7	2190
13:33:02	1	4038	8.0	0.0	51	51	6	1.8	2225
13:33:32	1	3948	8.0	0.0	55	55	7	2.0	2258
13:34:02	1	4009	8.9	0.0	59	59	7	2.1	2288
13:34:32	1	4103	9.3	0.0	64	64	8	2.2	2317
13:35:02	1	4103	9.4	0.0	69	69	8	2.3	2347
13:35:32	1	4116	9.6	0.0	73	73	8	2.4	2377
13:36:02	1	4084	3.0	0.0	78	78	9	2.6	2405
13:36:32	1	3164	0.0	0.0	78	78	9	2.5	2420
13:37:02	1	3217	0.0	0.0	78	78	9	2.5	2433
13:37:32	1	3157	0.0	0.0	78	78	9	2.4	2445
13:38:02	1	3111	0.0	0.0	78	78	9	2.4	2458
13:38:32	1	3099	0.0	0.0	78	78	9	2.4	2466
13:39:02	1	3041	0.0	0.0	78	78	9	2.3	2474
13:39:32	1	3007	0.0	0.0	78	78	8	2.3	2482
13:40:02	1	2978	0.0	0.0	78	78	9	2.3	2490
13:40:32	1	2981	0.0	0.0	78	78	9	2.2	2496
13:41:02	1	2925	0.0	0.0	78	78	9	2.2	2503
13:41:32	1	2900	0.0	0.0	78	78	9	2.2	2508
13:42:02	1	2876	0.0	0.0	78	78	9	2.1	2513
13:42:32	1	2852	0.0	0.0	78	78	9	2.1	2518
13:43:02	1	2830	0.0	0.0	78	78	9	2.1	2522
13:43:32	1	2808	0.0	0.0	78	78	9	2.1	2526
13:44:02	1	2789	0.0	0.0	78	78	9	2.0	2530
13:44:32	1	2770	0.0	0.0	78	78	9	2.0	2533
13:45:02	1	2754	0.0	0.0	78	78	9	2.0	2536
13:45:32	1	2737	0.0	0.0	78	78	9	2.0	2539
13:46:02	1	2722	0.0	0.0	78	78	9	1.9	2541
13:46:32	1	2708	0.0	0.0	78	78	9	1.9	2543
13:47:02	1	2693	0.0	0.0	78	78	9	1.9	2545
13:47:32	1	2679	0.0	0.0	78	78	9	1.9	2547
13:48:02	1	2666	0.0	0.0	78	78	9	1.8	2548
13:48:32	1	2654	0.0	0.0	78	78	9	1.8	2549
13:49:02	1	2642	0.0	0.0	78	78	9	1.8	2551
13:49:32	1	2631	0.0	0.0	78	78	9	1.8	2552
13:50:02	1	2621	0.0	0.0	78	78	9	1.8	2552
13:50:32	1	2610	0.0	0.0	78	78	9	1.7	2553
13:51:02	1	2600	0.0	0.0	78	78	9	1.7	2554
13:51:32	1	2591	0.0	0.0	78	78	9	1.7	2554
13:52:02	1	2582	0.0	0.0	78	78	9	1.7	2554
13:52:32	1	2572	0.0	0.0	78	78	9	1.7	2555
13:53:02	1	2564	0.0	0.0	78	78	9	1.6	2555
13:53:32	1	2555	0.0	0.0	78	78	9	1.6	2555
13:54:02	1	2547	0.0	0.0	78	78	9	1.6	2555
13:54:32	1	2539	0.0	0.0	78	78	9	1.6	2555
13:55:02	1	2530	0.0	0.0	78	78	9	1.6	2555
13:55:32	1	2523	0.0	0.0	78	78	9	1.6	2554
13:56:02	1	2515	0.0	0.0	78	78	9	1.5	2554
13:56:32	1	2507	0.0	0.0	78	78	9	1.5	2553
13:57:02	1	2500	0.0	0.0	78	78	9	1.5	2553
13:57:32	1	2493	0.0	0.0	78	78	9	1.5	2552
13:58:02	1	2486	0.0	0.0	78	78	9	1.5	2552

**BJ Services JobMaster Program Version 2.61**

Job Number: 325110559

Customer: EOG RESOURCES

Well Name: IRVIN A-19

Time of Day	Stage Number	PRESSURE (psf)	DIRTY RATE (bpm)	DENSITY (psa)	DIRTY STAGE (bbl)	DIRTY TOTAL (bbl)	SAND TOTAL (lbm)	AVG RATE (bpm)	AVG PRE (psf)
Monday, June 16, 2003									
13:58:32	1	2478	0.0	0.0	78	78	9	1.5	2551
13:59:02	1	2471	0.0	0.0	78	78	9	1.6	2550
13:59:32	1	2484	0.0	0.0	78	78	9	1.4	2550
14:00:02	1	2457	0.0	0.0	78	78	9	1.4	2549
14:00:32	1	2460	0.0	0.0	78	78	9	1.4	2548
14:01:02	1	2443	0.0	0.0	78	78	9	1.4	2547
14:01:32	1	2437	0.0	0.0	78	78	9	1.4	2546
14:02:02	1	2430	0.0	0.0	78	78	9	1.4	2546
14:02:32	1	2423	0.0	0.0	78	78	9	1.4	2544
14:03:02	1	2417	0.0	0.0	78	78	9	1.4	2543
14:03:32	1	2410	0.0	0.0	78	78	9	1.3	2542
14:04:02	1	2404	0.0	0.0	78	78	9	1.3	2541
14:04:32	1	2398	0.0	0.0	78	78	9	1.3	2540
14:05:02	1	2392	0.0	0.0	78	78	9	1.3	2539
14:05:32	1	2386	0.0	0.0	78	78	9	1.3	2537
14:06:02	1	2379	0.0	0.0	78	78	9	1.3	2536
14:06:32	1	2373	0.0	0.0	78	78	9	1.3	2535
14:07:02	1	2367	0.0	0.0	78	78	9	1.3	2533
14:07:32	1	2361	0.0	0.0	78	78	9	1.3	2532
14:08:02	1	2355	0.0	0.0	78	78	9	1.3	2530
14:08:32	1	2350	0.0	0.0	78	78	9	1.2	2529
14:09:02	1	2344	0.0	0.0	78	78	9	1.2	2528
14:09:32	1	2338	0.0	0.0	78	78	9	1.2	2526
14:10:02	1	2332	0.0	0.0	78	78	9	1.2	2525
14:10:32	1	2326	0.0	0.0	78	78	9	1.2	2523
14:11:02	1	2320	0.0	0.0	78	78	9	1.2	2522
14:11:32	1	2314	0.0	0.0	78	78	9	1.2	2520
14:12:02	1	2309	0.0	0.0	78	78	9	1.2	2519
14:12:32	1	2303	0.0	0.0	78	78	9	1.2	2517
14:13:02	1	2297	0.0	0.0	78	78	9	1.2	2515
14:13:32	1	2292	0.0	0.0	78	78	9	1.1	2514
14:14:02	1	2287	0.0	0.0	78	78	9	1.1	2512
14:14:32	1	2282	0.0	0.0	78	78	9	1.1	2510
14:15:02	1	2276	0.0	0.0	78	78	9	1.1	2509
14:15:32	1	2271	0.0	0.0	78	78	9	1.1	2507
14:16:02	1	2266	0.0	0.0	78	78	9	1.1	2506
14:16:32	1	2261	0.0	0.0	78	78	9	1.1	2504
14:17:02	1	2256	0.0	0.0	78	78	9	1.1	2502
14:17:32	1	2251	0.0	0.0	78	78	9	1.1	2500
14:18:02	1	2246	0.0	0.0	78	78	9	1.1	2499
14:18:32	1	2241	0.0	0.0	78	78	9	1.1	2497
14:19:02	1	2236	0.0	0.0	78	78	9	1.1	2495
14:19:32	1	2231	0.0	0.0	78	78	9	1.1	2493
14:20:02	1	2226	0.0	0.0	78	78	9	1.0	2491
14:20:32	1	2221	0.0	0.0	78	78	9	1.0	2490
14:21:02	1	2216	0.0	0.0	78	78	9	1.0	2488
14:21:32	1	2212	0.0	0.0	78	78	9	1.0	2486
14:22:02	1	2207	0.0	0.0	78	78	9	1.0	2484
14:22:32	1	2203	0.0	0.0	78	78	9	1.0	2482
14:23:02	1	2198	0.0	0.0	78	78	9	1.0	2481
14:23:32	1	2193	0.0	0.0	78	78	9	1.0	2479
14:24:02	1	2189	0.0	0.0	78	78	9	1.0	2477
14:24:32	1	2184	0.0	0.0	78	78	9	1.0	2475

**BJ Services JobMaster Program Version 2.61**

Job Number: 325110559

Customer: EOG RESOURCES

Well Name: IRVIN A-10

Time of Day	Stage Number	PRESSURE (psf)	DIRTY RATE (bpm)	DENSITY (psg)	DIRTY STAGE (bbl)	DIRTY TOTAL (bbl)	SAND TOTAL (lbm)	AVG RATE (bpm)	AVG PRE (psf)
Monday, June 16, 2003									
14:25:02	1	2180	0.0	0.0	78	78	9	1.0	2473
14:25:32	1	2175	0.0	0.0	78	78	9	1.0	2471
14:26:02	1	2171	0.0	0.0	78	78	9	1.0	2470
14:26:32	1	2166	0.0	0.0	78	78	9	1.0	2468
14:27:02	1	2162	0.0	0.0	78	78	9	1.0	2466
14:27:32	1	2158	0.0	0.0	78	78	9	1.0	2464
14:28:02	1	2153	0.0	0.0	78	78	9	0.9	2462
14:28:32	1	2149	0.0	0.0	78	78	9	0.9	2460
14:29:02	1	2145	0.0	0.0	78	78	9	0.9	2458
14:29:32	1	2140	0.0	0.0	78	78	9	0.9	2457
14:30:02	1	2136	0.0	0.0	78	78	9	0.9	2455
14:30:32	1	2132	0.0	0.0	78	78	9	0.9	2453
14:31:02	1	2128	0.0	0.0	78	78	9	0.9	2451
14:31:32	1	2124	0.0	0.0	78	78	9	0.9	2449
14:32:02	1	2120	0.0	0.0	78	78	9	0.9	2447
14:32:32	1	2115	0.0	0.0	78	78	9	0.9	2445
14:33:02	1	2111	0.0	0.0	78	78	9	0.9	2443
14:33:32	1	2107	0.0	0.0	78	78	9	0.9	2441
14:34:02	1	2103	0.0	0.0	78	78	9	0.9	2439
14:34:32	1	2099	0.0	0.0	78	78	9	0.9	2438
14:35:02	1	2095	0.0	0.0	78	78	9	0.9	2436
14:35:32	1	2091	0.0	0.0	78	78	9	0.9	2434
14:36:02	1	2087	0.0	0.0	78	78	9	0.9	2432
14:36:32	1	2083	0.0	0.0	78	78	9	0.9	2430
14:37:02	1	2079	0.0	0.0	78	78	9	0.9	2428
14:37:32	1	2075	0.0	0.0	78	78	9	0.8	2426
14:38:02	1	2071	0.0	0.0	78	78	9	0.8	2424
14:38:32	1	2067	0.0	0.0	78	78	9	0.8	2422
14:39:02	1	2063	0.0	0.0	78	78	9	0.8	2420
14:39:32	1	2059	0.0	0.0	78	78	9	0.8	2419
14:40:02	1	2055	0.0	0.0	78	78	9	0.8	2417
14:40:32	1	2051	0.0	0.0	78	78	9	0.8	2415
14:41:02	1	2047	0.0	0.0	78	78	9	0.8	2413
14:41:32	1	2043	0.0	0.0	78	78	9	0.8	2411
14:42:02	1	2039	0.0	0.0	78	78	9	0.8	2409
14:42:32	1	2036	0.0	0.0	78	78	9	0.8	2407
14:43:02	1	2032	0.0	0.0	78	78	9	0.8	2405
14:43:32	1	2028	0.0	0.0	78	78	9	0.8	2403
14:44:02	1	2024	0.0	0.0	78	78	9	0.8	2401
14:44:32	1	1941	0.0	0.0	78	78	9	0.8	2399
14:45:02	1	29	0.0	0.0	78	78	9	0.8	2395
14:45:32	1	8	0.0	0.0	78	78	9	0.8	2393
14:46:02	1	0	0.0	0.0	78	78	9	0.8	2371
14:46:32	1	0	0.0	0.0	78	78	9	0.8	2369
14:47:02	1	6	0.0	0.0	78	78	9	0.8	2348
14:47:32	1	8	0.0	0.0	78	78	9	0.8	2338
14:48:02	1	4	0.0	0.0	78	78	9	0.8	2325
14:48:32	1	0	0.0	0.0	78	78	9	0.8	2314
14:49:02	1	0	0.0	0.0	78	78	9	0.8	2303
14:49:32	1	0	0.0	0.0	78	78	9	0.8	2282
14:50:02	1	0	0.0	0.0	78	78	9	0.7	2281
14:50:32	1	0	0.0	0.0	78	78	9	0.7	2270
14:51:02	1	0	0.0	0.0	78	78	9	0.7	2269



BJ Services JobMaster Program Version 2.61

Job Number: 325110559

Customer: EOG RESOURCES

Well Name: IRVIN A-19

Time of Day	Stage Number	PRESSURE (psf)	DIRTY RATE (bpm)	DENSITY (pcf)	DIRTY STAGE (bbl)	DIRTY TOTAL (bbl)	SAND TOTAL (lbm)	AVG RATE (bpm)	AVG PRE (psf)
Monday, June 16, 2003									
14:51:32	1	0	0.0	0.0	78	78	9	0.7	2248
14:52:02	1	0	0.0	0.0	78	78	9	0.7	2238
14:52:32	1	0	0.0	0.0	78	78	9	0.7	2227
14:53:02	1	0	0.0	0.0	78	78	9	0.7	2217
14:53:32	1	0	0.0	0.0	78	78	9	0.7	2207
14:54:02	1	0	0.0	0.0	78	78	9	0.7	2197
14:54:32	1	0	0.0	0.0	78	78	9	0.7	2188
14:55:02	1	0	0.0	0.0	78	78	9	0.7	2178
14:55:32	1	0	0.0	0.0	78	78	9	0.7	2167
14:56:02	1	0	0.0	0.0	78	78	9	0.7	2157
14:56:32	1	0	0.0	0.0	78	78	9	0.7	2147
14:57:02	1	0	0.0	0.0	78	78	9	0.7	2137
14:57:32	1	0	0.0	0.0	78	78	9	0.7	2128
14:58:02	1	0	0.0	0.0	78	78	9	0.7	2118
14:58:32	1	0	0.0	0.0	78	78	9	0.7	2109
14:58:47	1	0	0.0	0.0	78	78	9	0.7	2104
End stg 1									
14:58:48	2	0	0.0	0.0	0	78	9	0.0	0
End stg 2									
14:59:18	3	0	0.0	0.0	0	78	9	0.0	0
14:59:48	3	0	0.0	0.0	0	78	9	0.0	0
15:00:18	3	0	0.0	0.0	0	78	9	0.0	0
15:00:48	3	0	0.0	0.0	0	78	9	0.0	0
15:01:18	3	0	0.0	0.0	0	78	9	0.0	0
15:01:48	3	0	0.0	0.0	0	78	9	0.0	0
15:02:18	3	0	0.0	0.0	0	78	9	0.0	0
15:02:48	3	0	0.0	0.0	0	78	9	0.0	0
15:03:18	3	0	0.0	0.0	0	78	9	0.0	0
15:03:48	3	1868	0.0	0.0	0	78	9	0.0	0
15:04:18	3	1890	0.0	0.0	0	78	9	0.0	22
15:04:48	3	1867	0.0	0.0	0	78	9	0.0	179
15:05:18	3	1862	0.0	0.0	0	78	9	0.0	303
15:05:48	3	2239	5.8	0.0	0	78	9	0.0	408
15:06:18	3	4267	12.0	1.0	6	84	100	0.0	501
15:06:48	3	4755	10.8	1.1	12	90	345	0.0	710
15:07:18	3	4638	8.6	0.0	17	95	363	1.5	843
15:07:48	3	4721	8.8	0.0	21	99	363	1.0	1160
15:08:18	3	4830	8.4	0.0	25	104	363	2.3	1358
15:08:48	3	4783	7.7	0.0	30	109	363	2.7	1536
15:09:18	3	4715	7.2	0.0	33	112	363	3.0	1705
15:09:48	3	4718	7.1	0.0	37	116	363	3.2	1848
15:10:18	3	4692	7.2	0.0	41	119	363	3.4	1978
15:10:48	3	4679	7.2	0.0	44	122	363	3.6	2098
15:11:18	3	4823	6.8	0.0	48	126	363	3.7	2204
15:11:48	3	4549	7.8	0.0	51	130	363	3.8	2302
15:12:18	3	4584	7.8	0.0	55	133	363	4.0	2387
15:12:48	3	4486	7.9	0.0	59	137	363	4.1	2489
15:13:18	3	4410	8.2	0.0	63	141	363	4.2	2543
15:13:48	3	4288	8.9	0.0	67	145	363	4.4	2608
15:14:18	3	4435	10.1	0.0	72	150	363	4.6	2686
15:14:48	3	4418	11.4	0.0	77	156	363	4.6	2722
									2776

**BJ Services JobMaster Program Version 2.61**

Job Number: 325110559

Customer: EOG RESOURCES

Well Name: IRVIN A-10

Time of Day	Stage Number	PRESSURE (psf)	DIRTY RATE (bpm)	DENSITY (psa)	DIRTY STAGE (bbl)	DIRTY TOTAL (bbl)	SAND TOTAL (lbm)	AVG RATE (bpm)	AVG PRE (psf)
Monday, June 16, 2003									
15:15:19	3	4548	11.7	0.0	83	162	363	5.1	2828
15:16:49	3	4603	12.0	0.0	89	168	363	5.3	2881
15:18:19	3	4419	11.2	0.0	95	173	363	5.4	2928
15:18:50	3	4521	12.2	0.0	101	179	363	5.6	2972
15:17:20	3	4483	11.7	0.0	107	185	363	5.8	3013
15:17:41	3	4486	11.4	0.0	110	189	363	5.9	3036
End stg 3									
15:18:11	4	4444	11.7	0.0	6	195	363	11.6	4445
15:18:41	4	4344	11.8	0.0	12	200	363	11.7	4412
15:19:11	4	4456	12.5	0.0	18	208	363	11.8	4391
15:19:41	4	4847	14.8	0.0	25	213	363	12.4	4489
15:20:11	4	4320	9.6	0.0	31	220	363	12.6	4527
15:20:41	4	4848	10.7	0.0	38	225	363	12.1	4538
15:21:11	4	4671	8.7	0.0	41	229	363	11.6	4554
15:21:41	4	4524	8.4	0.0	45	234	363	11.3	4581
15:22:11	4	4907	7.8	0.0	49	238	363	10.9	4814
15:22:41	4	4855	7.4	0.0	53	242	363	10.6	4837
15:23:11	4	4784	6.8	0.0	57	245	363	10.3	4652
15:23:41	4	4741	4.8	0.0	60	248	363	10.0	4658
15:24:11	4	3440	0.0	0.0	60	249	363	9.2	4577
15:24:41	4	3429	0.0	0.0	60	249	363	8.5	4494
15:25:11	4	3374	0.0	0.0	60	249	363	8.0	4421
15:25:41	4	3341	0.0	0.0	60	249	363	7.5	4354
15:26:12	4	3313	0.0	0.0	60	249	363	7.0	4293
15:26:42	4	3284	0.0	0.0	60	249	363	6.9	4238
15:27:12	4	3258	0.0	0.0	60	249	363	6.3	4187
15:27:42	4	3232	0.0	0.0	60	249	363	6.0	4139
15:28:12	4	3208	0.0	0.0	60	249	363	5.7	4098
15:28:42	4	3182	0.0	0.0	60	249	363	5.4	4055
15:29:12	4	3155	0.0	0.0	60	249	363	5.2	4016
15:29:42	4	3139	0.0	0.0	60	249	363	5.0	3980
15:30:12	4	3118	0.0	0.0	60	249	363	4.8	3948
15:30:42	4	3099	0.0	0.0	60	249	363	4.6	3914
15:31:12	4	3081	0.0	0.0	60	249	363	4.4	3884
15:31:42	4	3064	0.0	0.0	60	249	363	4.3	3855
15:32:12	4	3048	0.0	0.0	60	249	363	4.1	3828
15:32:42	4	3032	0.0	0.0	60	249	363	4.0	3801
15:33:12	4	3018	0.0	0.0	60	249	363	3.8	3776
15:33:42	4	3005	0.0	0.0	60	249	363	3.7	3752
15:34:12	4	2989	0.0	0.0	60	249	363	3.6	3729
15:34:42	4	2972	0.0	0.0	60	249	363	3.5	3707
15:35:12	4	2960	0.0	0.0	60	249	363	3.4	3686
15:35:43	4	2948	0.0	0.0	60	249	363	3.3	3665
15:36:13	4	2937	0.0	0.0	60	249	363	3.2	3646
15:36:43	4	2925	0.0	0.0	60	249	363	3.1	3627
15:37:13	4	2918	0.0	0.0	60	249	363	3.1	3609
15:37:43	4	2907	0.0	0.0	60	249	363	3.0	3591
15:38:13	4	2897	0.0	0.0	60	249	363	2.9	3575
15:38:43	4	2889	0.0	0.0	60	249	363	2.8	3558
15:39:13	4	2880	0.0	0.0	60	249	363	2.6	3543
15:39:30	4	0	0.0	0.0	60	249	363	2.7	3529

J. Stimulation Procedures

No stimulation is planned for this application.

K. Injection Procedures

The produced brine from EOG Resources Upper Devonian shallow gas production operations will be trucked to a proposed storage facility near the proposed saltwater disposal well (Map B-1). This brine is produced from EOG Resources Brady Field operations and originates from the upper Devonian reservoirs, regionally known as the Bradford and Elk Group reservoirs at depth from 1,700'-3,400'.

Figure K-1 is a schematic showing the proposed injection and production flow procedures. The following procedures are to be implemented for this project:

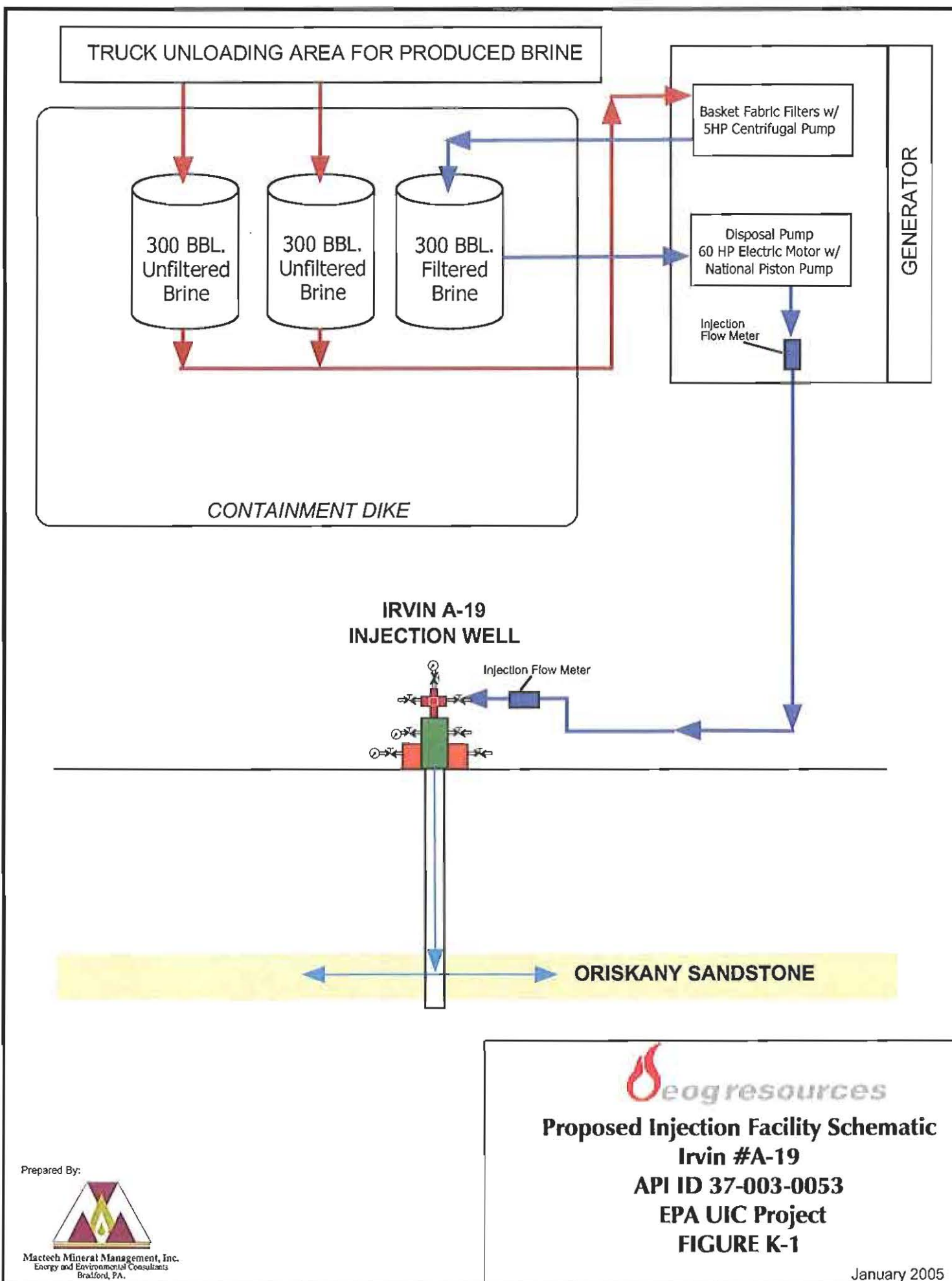
Two (300-barrel) tanks will be set for the unfiltered brine water storage. From these two tanks, a 5-HP centrifugal pump will transfer the unfiltered brine through basket fabric filters to filter the produced saltwater.

The filtered water then will be pumped to one (300-barrel) tank and this tank will be used to store the filtered water prior to injection.

From the 300-barrel filtered water storage tank, filtered water will be pumped by a 60 HP electric motor National piston pump via buried pipeline to the disposal/injection well.

All of these tanks will be properly constructed and diked to ensure that any water that may spill is contained.

The amount of water injected will be metered prior to entering the pipeline and at the injection wellhead.



L. Construction Procedures

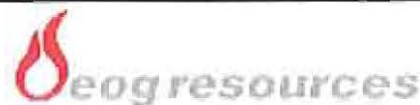
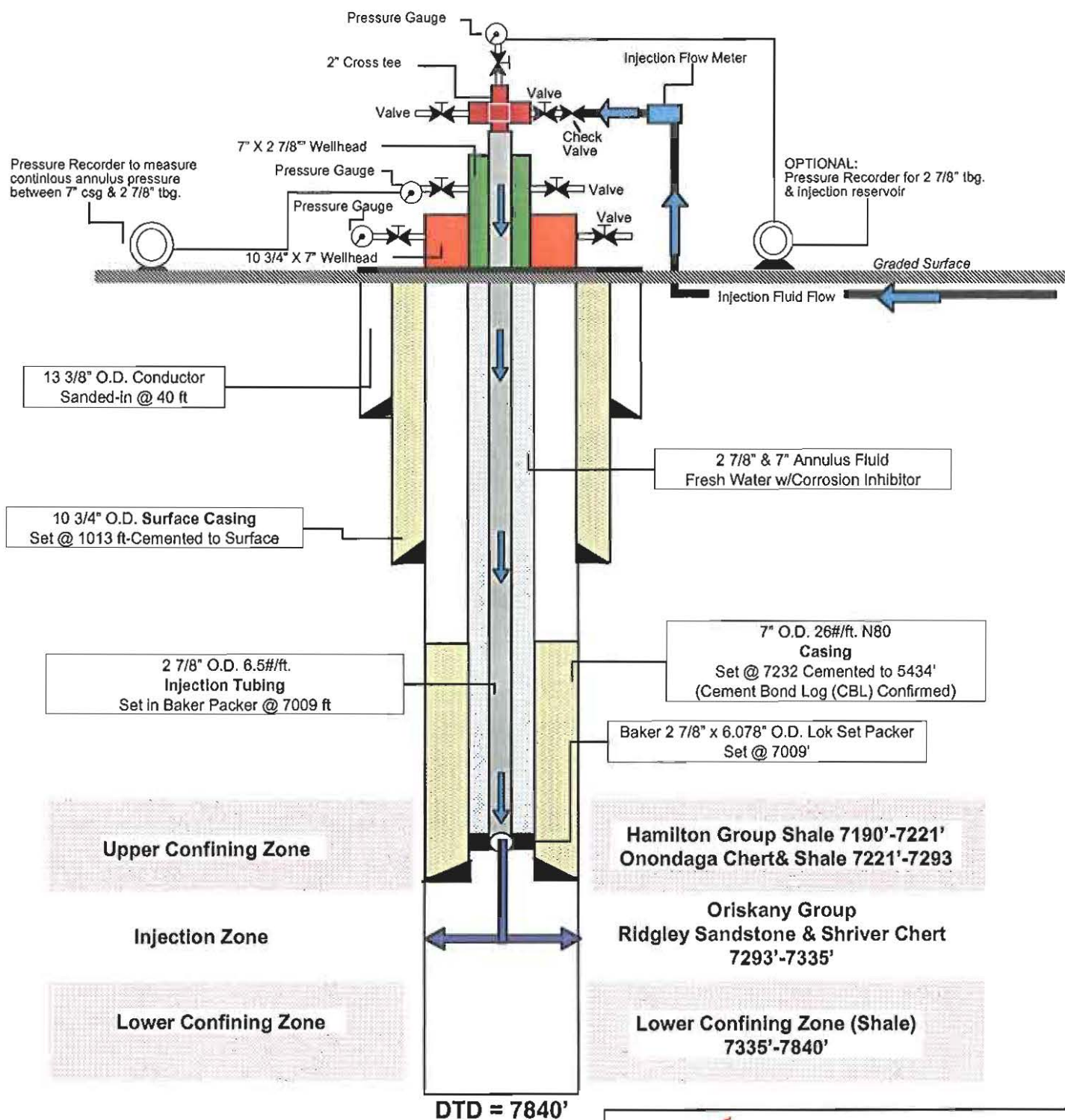
The proposed disposal/injection well (Irvin A-19) has been constructed with the following procedures and materials to provide sufficient casing and cement to prevent contamination of the UJSDW's:

1. **Original Conductor Casing:** 13 3/8" O.D. Sanded-in @ 40'.
2. **Original Surface Casing:** 10 3/4" O.D. Set @ 1013' cemented to surface.
3. **Original Long String Casing:** 7" O.D. 26#/ft. N80 Set @ 7232 cemented back to a depth of 5434'. Cement top confirmed by EOG Resources by Cement Bond Log (CBL) run during 2004.
4. **New Injection Tubing & Packer:** EOG Resources installed @ 7009' of 2 7/8" - 6.50 lb./ft. tubing set-in a Baker 2 7/8" x 6.078" O.D. Lok Set Packer. Prior to injection, EOG will fill annular space between 7" casing and 2-7/8" tubing with a mixture of fresh water and corrosion inhibitor.

M. Construction Details

Figure M-1 illustrates the downhole and surface wellhead construction of the injection well.

PROPOSED WELL CONSTRUCTION



Proposed Injection Well Schematic
Irvin #A-19
API ID 37-003-0053
EPA UIC Project
FIGURE M-1

January 2005

Prepared By:



Mactech Mineral Management, Inc.
 Energy and Environmental Consultants
 Bradford, PA.

O. Plans for Well/ Equipment Failures

Considering that various problems may to occur, EOG will institute certain preventive measures to minimize the occurrence and severity of these situations. However, when unforeseen difficulties do arise, predetermined contingency procedures will be implemented.

The following **Table O-1** outlines potential problems, how they will be detected, the preventive measure or corrective procedure:

Table O-1

<u>Situation</u>	<u>Detection</u>	<u>Response</u>
1) Plugging off of water injection pipeline or injection tubing in well.	Injection pressure recorder at pump will sense pressure rise.	*Automatic shut-down by mercoird switch.
2) Rupture of water injection pipeline.	Injection pressure recorder at pump will sense pressure drop.	*Automatic shut-down by mercoird switch.
3) Rupture of injection tubing into annular space.	Pressure recorder should sense this situation; however individual pressure gauges at injection wells will be monitored daily.	*Manually shut off injection to problem well.
4) Electricity failure.	Observation by operator.	No effect on injection unless prolonged power outage.
5) Injection/Circulating pump breakdown.	Observation by operator.	Check valves in manifold line will prevent back-flow.
6) Injection/Circulating pump over-speed.	Injection pressure recorder will sense pressure rise.	*Automatic shut-down by mercoird switch.

*Indicates automatic telephone message to EOG's Indiana, PA Division office on 24-hour line (724) 465 3314.

It is relevant to note that operation of the Brine Storage and Injection facility and normal maintenance procedures will necessitate an employee to be on-site for at least 2-3 hours each day seven (7) days per week. This individual will be in a position to observe any malfunction of the system and will be trained to respond appropriately.

The operator will have communications capability by telephone and/or pagers to EOG's Brady Division office in Mahaffey, PA and Indiana, PA office and/or the immediate supervisor.

If a situation develops which could endanger health or the environment, one or all of the below listed agencies will be contacted as deemed appropriate:

Agencies	Phone Number
Mahaffey Fire Department	814-277-6639
Pennsylvania State Police	814-938-0510
PA Dept. of Environmental Protection-Inspector	814-472-1714 Office/ 412-417-7951 Cell
Environmental Protection Agency-Region III	215-814-5464
Environmental Protection Agency-Inspector	814-827-1952 Office/814-449-9577 Cell
PA. Fish Commission-Northcentral Dist.	814-359-5250

Conditions, which would prompt contacting EPA UIC Region III, shall include:

- 1) Indications that a contaminant may endanger a U.S.D.W. or
- 2) Noncompliance or malfunction of the injection system which may cause fluid migration into or between USDWS

An emergency report will be communicated orally within 24 hours, with a written report submitted within 5 days.

P. Monitoring Program

Based upon the Section C- Corrective Action, (2) of the (5) wells that have penetrated the Oriskany formation have been plugged and abandoned, (2) wells have been plugged backed and completed and currently are producing from the shallow Upper Devonian formations and the remaining (1) well will be plugged and abandoned prior to the proposed injection procedures, thus all wells within a 1-mile radius that have penetrated the Oriskany formation are properly accounted for.

On a daily basis the injection well will have the wellhead pressure recorded to monitor vertical migration of the injected fluid. A pressure recorder will be installed to measure the continuous annulus pressure between the 7" casing and the 2 7/8" injection tubing with a positive pressure of 100 psig maintained in the annulus.

Q. Plugging and Abandonment Plan

The plugging and abandonment procedure that EOG Resources will implement is in compliance with both the PADEP and EPA specifications. This procedure will prevent contamination of all USDW's.

The plugging procedure model will consist of the following:

1. Run blind plug down 2 7/8" tubing and set in profile nipple in packer.
2. Release 2 7/8" tubing from packer.
3. Pump 100 ft. Type 1 cement plug on top of packer.
4. Pull 100' of 2 7/8" tubing. Pump 1325' of 6% gel spacer.
5. Pull 2 7/8" tubing.
6. Cut 7" casing 5484' (50' above TOC). Pull 7" casing.
7. Run 2 7/8" tubing to a depth of 5584'
8. Pump 200' Type 1 cement plug (plugs 3 & 4, 100' in casing stub & 100' above casing stub).
9. Pull 200' of 2 7/8" tubing. Pump 2284' 6% gel spacer.
10. Pull 2284' of 2 7/8" tubing. Pump 900' of 50/50 Poz cement plug.
11. Pull 900' of 2 7/8" tubing. Pump 1137' of 6% gel spacer.
12. Pull 1137' 2 7/8" tubing. Pump 100' 50/50 Poz Cement plug (50' below 10 3/4" casing and 50' in bottom of 10 3/4" casing).
13. Pull 2 7/8" tubing.
14. Bail fluid out of 10 3/4" to TOC.
15. Fill 10 3/4" casing with #2B Gravel to surface.
16. Install 2" vent pipe with permanent marker indicating API-ID of subject well.

Figure Q-1 is the EPA UIC Plugging and Abandonment form completed for the subject injection well as described above.

Various independent third-party contractors as shown in **Figure Q-2**, have verified the aforementioned plugging and abandonment plan cost. The cost to plug and abandon the subject injection well is estimated to be **\$48,611**


 United States Environmental Protection Agency
 Washington, DC 20460

Figure Q-1

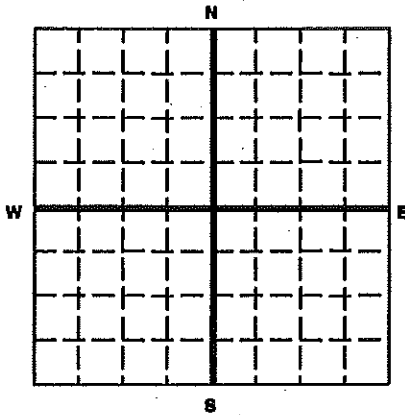
PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility

Irvin Fee 'A'-19

Name and Address of Owner/Operator

 EOG Resources, Inc.
 400 Southpointe Blvd-Southpointe Plaza 1, Suite 300
 Canonsburg, PA. 15317

 Locate Well and Outline Unit on
 Section Plat - 640 Acres
State
PACounty
ClearfieldPermit Number
37-003-00053

Surface Location Description N 40 58' 24.6" W 78 48' 18.3"

1/4 of 1/4 of 1/4 of 1/4 of Section Township Range

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface

Location ft. from (N/S) Line of quarter section

and ft. from (E/W) Line of quarter section.

TYPE OF AUTHORIZATION

- ☒ Individual Permit
☐ Area Permit
☐ Rule

Number of Wells 1

WELL ACTIVITY

- ☐ CLASS I
☒ CLASS II
☒ Brine Disposal
☐ Enhanced Recovery
☐ Hydrocarbon Storage
☐ CLASS III

Lease Name Irvin Fee

Well Number 'A'-19

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
13 3/8	48.00	40	40	17 1/4
10 3/4	40.50	1013	1013	12 3/4
7	26.00	7232	@ 1850	9 7/8
2 7/8	6.50	7099	0	

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☒ The Balance Method
☐ The Dump Bailer Method
☐ The Two-Plug Method
☐ Other

CEMENTING TO PLUG AND ABANDON DATA:

	PLUG #1	PLUG #2	PLUG #3	PLUG #4	PLUG #5	PLUG #6	PLUG #7	PLUG #8
Size of Hole or Pipe in which Plug Will Be Placed (Inches)	7"	7"	7"	9 7/8"	9 7/8"	9 7/8"	9 7/8"	9 7/8"
Depth to Bottom of Tubing or Drill Pipe (ft)	7099	6909	5584	5484	5384	3100	2200	1063
Sacks of Cement To Be Used (each plug)	18.20	----	18.20	45.08	----	371.09	----	41.23
Slurry Volume To Be Pumped (cu. ft.)	21.48	284.61	21.48	53.19	1214.86	478.71	604.77	53.19
Calculated Top of Plug (ft.)	6909	5584	5484	5384	3100	2200	1063	963
Measured Top of Plug (if tagged ft.)	6909	----	5484	5384	----	2200	----	963
Slurry Wt. (Lb./Gal.)	15.6	8.34	15.6	15.6	8.34	14.15	8.34	14.15
Type Cement or Other Material (Class III)	Type 1	6% Gel	Type 1	Type 1	6% Gel	50/50poz	6% Gel	50/50Poz

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)

From	To	From	To

Estimated Cost to Plug Wells

\$48,611.00

Certification

I certify under the 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. (Ref. 40 CFR 144.32)

Name and Official Title (Please type or print)

Michael McCown, P.E. Operations Manager

Signature

Date Signed

1-31-05

EOG Resources, Inc. Estimated Costs to Plug and Abandonment Summary

See attached documentation for Third Party verification of the above costs.



Key Energy Services, Inc.
Appalachian Basin
2021 South 6th Street
Indiana, PA 15701
Telephone: 724-349-7930
Fax: 724-465-6410

January 21, 2005

EOG RESOURCES, INC
ATTN: DAVE SWEELY
SOUTH 6TH STREET
INDIANA, PA 15701

Dear Dave,

Per our telephone conversation, Key Energy Services, Inc. would like to submit this estimate to plug and abandon the Irvin FEE #19 well in Brady. This estimate is made at current rates that could change. This also excludes any tubing or pipe rental, disposal costs, wire line, and any pump company costs.

Estimate to plug and abandon is \$31,439.00

Equipment needed is as follows:

Double Derrick Service Rig
Crew travel to & from location
Dozer
Truck & Trailer
Excavator
Water Trucks
Power Tongs
Stripper Head
Trash pump & Hoses
Open Top Tank
300bbl Tank
Steel Cellar
Rig Base Beam
Extra Labor
Pit Liner to line Cellar

Sincerely,

A handwritten signature in dark ink, appearing to read "Charles Ashbaugh", is written over a light-colored background.

Charles Ashbaugh
Rig Supervisor

APPALACHIAN WELL SERVICES PRICE ESTIMATE

19-Jan-05

Customer/Operator: E.O.G.

Well/Lease: Irvin FEE(A) #19 P&A

Preparer: Dave Miller

Day 1

: Job Type

CEMENTING EQUIPMENT & SERVICES		Unit Price	Units	Extended Price
MILEAGE				
Cement Pump, Auxiliary Equipment, and all other Service Units		4.60	20.00	92.00
Small Vehicles, Supervisory Vehicles, etc.		3.00	20.00	60.00
CEMENT EQUIPMENT				
Plug To Abandon, per pump, 5,000' - 10,000', per 8 hours		3,000.00	1.00	3,000.00
Minimum slurry blending charge (100 cu. ft. minimum), per job		200.00	1.00	200.00
Minimum delivery charge, per job		325.00	1.00	325.00
Bentonite Gel, per cwt		30.40	11.00	334.40
TOTAL PRICE				4,011.40
DISCOUNT		30%		1,203.42
FUEL SURCHARGE				100.00
NET PRICE				2,907.28

The above Prices and Discounts are an estimate only and subject to the Terms and Conditions as set forth in the current Price Book as published and available by Appalachian Well Services, Inc. These Terms and Conditions are printed on all Field Receipts and Invoices.

APPALACHIAN WELL SERVICES PRICE ESTIMATE

19-Jan-06

Customer/Operator: E.O.G.

Well/Lease: Irvin FEE(A) #19 P&A

Preparer: Dave Miller

: Job Type

Day 2

CEMENTING EQUIPMENT & SERVICES		Unit Price	Units	Extended Price
MILEAGE				
Cement Pump, Auxiliary Equipment, and all other Service Units		4.00	20.00	80.00
Small Vehicles, Supervisory Vehicles, etc.		3.00	20.00	60.00
CEMENT EQUIPMENT				
Plug To Abandon, per pump, 0' - 5,000', per 8 hours		2,160.00	1.00	2,160.00
Minimum slurry blending charge (100 cu. ft. minimum), per job		200.00	1.00	200.00
Minimum delivery charge, per job		325.00	1.00	325.00
CEMENTING PRODUCTS				
Standard Cement (Type 1), per sack (cu. ft.) (94 lbs)		11.75	85.00	998.75
Bentonite Gel, per cwt.		30.40	18.00	547.20
TOTAL PRICE				4,372.95
DISCOUNT		30%		1,311.89
FUEL SURCHARGE				100.00
NET PRICE				3,161.07

The above Prices and Discounts are an estimate only and subject to the Terms and Conditions as set forth in the current Price Book as published and available by Appalachian Well Services, Inc. These Terms and Conditions are printed on all Field Receipts and Invoices.

APPALACHIAN WELL SERVICES PRICE ESTIMATE

18-Jan-05

Customer/Operator: E.O.G.
Well/Lease: Irvin FEE(A) #19 P&A
Preparer: Dave Miller

: Job Type

Day 3

CEMENTING EQUIPMENT & SERVICES		Unit Price	Units	Extended Price
MILEAGE				
Cement Pump, Auxiliary Equipment, and all other Service Units		4.60	20.00	92.00
Small Vehicles, Supervisory Vehicles, etc.		3.00	20.00	60.00
CEMENT EQUIPMENT				
Plug To Abandon, per pump, 0' - 5,000', per 8 hours		2,150.00	1.00	2,150.00
Minimum slurry blending charge (100 cu. ft. minimum), per job		200.00	1.00	200.00
Minimum delivery charge, per job		325.00	1.00	325.00
CEMENTING PRODUCTS				
60/50 Poz (includes 2% Gel), per sack (cu. ft.) (84 lbs)		8.75	415.00	3,631.25
Bentonite Gel, per cwt		30.40	17.00	516.80
Salt, per pound		0.28	2,075.00	601.75
TOTAL PRICE				7,576.80
DISCOUNT		30%		2,273.04
FUEL SURCHARGE				100.00
NET PRICE				5,403.76

The above Prices and Discounts are an estimate only and subject to the Terms and Conditions as set forth in the current Price Book as published and available by Appalachian Well Services, Inc. These Terms and Conditions are printed on all Field Receipts and Invoices.



Dave Sweeley
EOG Resources
2039 South 6th Street
Indiana, Pa 15701

December 15, 2004

RE: Cased hole

Dear Dave:

Allegheny Wireline Services, Inc. would like to extend the following Cased Hole price for you. Well depth approx. 4800 ft. (Brady Field)

1st trip to cut 7in. csg.

Price;	Service Charge	\$1,400.00
	Cement Bond Log	\$1,450.00
	7 in. CSG. Cutter	\$1,350.00
	Total	<u>\$4,200.00</u>

Less 35% Discount \$2,730.00

Look forward to providing you with the same excellent service quality you have grown to expect from Allegheny Wireline Services, Inc. We offer you state of the art equipment with well trained, experienced personal. In addition, the areas best Temperature, Ultra-sonic Gas Detector and time saving full stack capabilities. Combine all this together with safety-first policy equals a winning combination for your company.

If you have any questions or concerns about the terms of this price proposal, please contact me at (724) 354-3090 or (724) 388-4819

Sincerely,

Mike Daquilante
Sales Engineer

Eastern Reservoir Services

16450 Route 8
Union City, PA 16438

Phone: 814-438-2006
Fax: 814-438-2293

Proposal

To: Dave Sweely / EOG

From: Tom Miller / ERS

CC: N/A

Date: January, 24, 2005

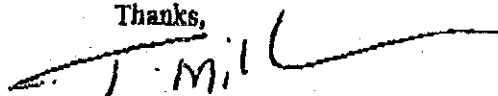
Reference: Price proposal for setting Baker 1.81" FWG plug, into existing profile nipple for well plugging purposes.

Dave,

Based on what we spoke about this morning here are representative prices for the work you would like Eastern Reservoir Services to perform for you.

• ERS Wireline Crew	\$700 / per day
• ERS Wireline Service (slickline truck and all equipment needed)	\$950 / per well
• Mobilization (round trip to job)	\$140 / Total
• Baker FWG 1.81 Plug	\$1270.00
Total Cost:	Total \$3060.00

Thanks,



Tom Miller
ERS

Job Number: Quote
 LO Number: -
 Delivery Date: 7/24/2025

Rental Quote



Service Location: Workover Solutions Inc.
 Imperial District- 156 S.
 Campus Dr. Imperial, PA
 15126

Customer Rep: Phill Durrell
 Rep Contact:
 WOS Rep: Jenn Strobel
 Sales Rep: Drew Daley
 Payment Terms: Net 30

Job Type: P&A Spear Rental
 Pad: **Spencer Pad SWD**
 Well:
 SP or CTU: Stickpipe
 County: Clarion
 State: PA

Customer Info: Exco

THE ESTIMATED CHARGES AND ITEMS BELOW ARE SUBJECT TO CORRECTION BY WOS

Item	Item Code	Description	QTY	UDM	Usage Days	Minimum Charge	Discount	Line Total
1		Fishing / Completions specialist per 12 hour shift	1	EA	1	\$4,000.00	50.00%	\$ 2,000.00
2		Pickup mileage for tool specialists	1	MI	1	\$5.00	50.00%	\$ 2.50
3		Subsistence for tool specialists	1	EA	1	\$350.00	50.00%	\$ 175.00
4		Rental of 4.5" Ito Casing Spear Grapple - per run	1	RUN	1	\$950.00	10.00%	\$ 855.00
		- 94#6 spear and grapple 3.973" - 4.090" [Nom: 4.010"]						\$ -
5		Rental of 4.5" Casing Spear - first 5 days	1	EA	1	\$775.00	10.00%	\$ 697.50
6		Rental of 4.5" Ito Casing Spear - add day	1	DAY	1	\$250.00	10.00%	\$ 225.00
7		Subsistence for tool specialists	1	EA	1	\$350.00	50.00%	\$ 175.00
8		Crossover Rental < 3.50" OD - (5 Day Minimum) 2-7/8" PH8 BOX x 2-3/8" REG PIN	0	EA	1	\$350.00	50.00%	\$ -
9		Crossover Rental < 3.50" OD - (add day) 2-7/8" PH8 BOX x 2-3/8" REG PIN	0	DAY	1	\$55.00	50.00%	\$ -
10		Elevators - Bottleneck, 3-1/2" (5 day Minimum)	0	EA	1	\$550.00	10.00%	\$ -
11		Elevators - Bottleneck, 3-1/2" (Ea. Add Day)	0	DAY	1	\$55.00	10.00%	\$ -
12		Elevators, Center Door, 4-1/2" (5 Day Minimum)	1	EA	5	\$148.50	10.00%	\$ 668.25
13		Elevators, Center Door, 4-1/2" (Ea. Add. Day)	1	EA	1	\$87.00	10.00%	\$ 78.30
14		Bowl, Sips, 4-1/2" (5 Day Minimum)	1	EA	5	\$389.00	10.00%	\$ 1,750.50
15		Bowl, Sips, 4-1/2" (Ea. Add. Day)	1	EA	1	\$173.00	10.00%	\$ 155.70
16		Clamp, Safety, Type C, 4-1/2" (5 Day Minimum)	1	EA	5	\$235.00	10.00%	\$ 1,057.50
17		Clamp, Safety, Type C, 4-1/2" (Ea. Add. Day)	1	EA	1	\$114.00	10.00%	\$ 102.60
18		Post Job inspection per connection	4	EA	1	\$32.50	10.00%	\$ 117.00
19		2-7/8" PH6 Pup Joint Rental - 1st 5 days	0	EA	1	\$850.00	10.00%	\$ -
20		2-7/8" PH6 Pup Joint Rental - Add days	0	DAY	1	\$85.00	10.00%	\$ -
21		Environment charge	1	EA	1	\$250.00	0.00%	\$ 250.00

Page Total: \$ 11,296.50

Discount: \$ 2,986.65

Page Sub Total (USD): \$ 8,309.85

Page 1 Estimated Job Total (USD): \$ 8,309.85

THE SERVICES, MATERIALS AND EQUIPMENT PROVIDED BY THIS SERVICE TICKET HAVE BEEN EXECUTED OR RECEIVED AS INDICATED ABOVE. THE ESTIMATED CHARGES AND ITEMS BELOW ARE SUBJECT TO CORRECTION BY WOS. ESTIMATED CHARGES DO NOT INCLUDE TAXES OR TOOL DAMAGES.

DREW DALEY



Proposal

Workover Solutions, Inc.

156 S Campus Drive
Imperial, PA 15126

Customer:	Exco
Customer billing address:	
Well:	Spencer
County:	0
State:	PA
AFE # or PO #:	0
WOS service location:	0

Ticket #: NEWL-Quote

Job type:	4.5" Casing - CIBP, Jet Cut
Rig or CTU:	WL CONVEYED
Customer representative:	0
WOS representative:	0
Valid for:	30 days

THE ESTIMATED CHARGES AND ITEMS BELOW ARE SUBJECT TO CORRECTION BY WOS

Item	Description	QTY	UOM	Price	Discount	Total
1	Service Charge, CH per Well	1	EA	\$3,250.00	70.00%	\$975.00
2	Environmental Charge	1	EA	\$500.00	55.00%	\$225.00
3	Crew Subsistence, per man, per day	2	EA	\$300.00	50.00%	\$300.00
4	Mileage Charge Miles, RT, per mile, from Imperial shop	100	MI	\$5.00	15.00%	\$425.00
5	Diesel Fuel Surcharge (\$4.00 to \$5.00 per gal)	100	MI	\$1.00	0.00%	\$100.00
6	Junk Basket / Gauge Ring, per descent	1	EA	\$2,500.00	80.00%	\$500.00
7	Baker 10 Setting tool					
	- Slow Burn	1	EA	\$1,200.00	70.00%	\$360.00
	- Ignitor	1	EA	\$175.00	55.00%	\$78.75
	- Baker 10 Setting Tool, Includes Redress & Inspection	1	EA	\$2,350.00	55.00%	\$1,057.50
	- Wireline Adapter Kit, for Cast Iron Bridge Plug	1	EA	\$840.00	82.00%	\$151.20
8	CIBP, 3.593" 10K psi for 4.5", 9.5-16.6H casing	1	EA	\$3,150.00	70.00%	\$945.00
9	3.50" Jet Cutter for 4.5" casing					
	- Depth Charge, 5000' minimum	5000	FT	\$0.60	50.00%	\$1,500.00
	- Operation Charge, Includes detonator & shock sub	1	EA	\$4,750.00	50.00%	\$2,375.00
Optional:						
10	5" 5K psi Pressure Control Equipment, per day	1	DAY	\$4,000.00	62.00%	\$1,520.00
11	1-9/16" Free Point Tool per descent					
	- Depth Charge, 5000' minimum	5000	FT	\$0.60	40.00%	\$1,800.00
	- Operation Charge	1	RUN	\$3,955.00	40.00%	\$2,373.00

Total: \$8,811.00

THE ESTIMATED CHARGES AND ITEMS BELOW ARE SUBJECT TO CORRECTION BY WOS. ESTIMATED CHARGES DO NOT INCLUDE TAXES OR CREW AND EQUIPMENT STAND BY CHARGE

Note:

WOS Contact:

John Forstner
Wireline Operations Manager
Mobile: 412-510-6022
jforstner@workoversolutions.com

Timothy Zotara
Wireline District Manager
Mobile: 716-901-4244
tzotara@workoversolutions.com

DREW DALEY
[Signature]

IRVIN SWD COST ESTIMATE EXCO Resources, Inc. Viking Well Service, Inc. 23 Jul 2025		
--	--	---

No.	ITEM	PRICE	UOM	QTY	TOTAL
1	Rig 252 250K lb. NOV 500 Series 108' Derrick: \$475 - 108' Derrick, Double Drum and Wanch, Tongs, and Weight Indicator - 40 R Base Beam - Crew Dog House - Rig Operator, Derrick Hand, 2 Floor Hands - Pipe Racks	\$475.00	HRS	10	\$4,750.00
	AUXILIARY EQUIPMENT	PRICE	UOM	QTY	TOTAL
2	Hydraulic Catwalk - Hawker Pipe Handler	\$1,500.00	DAY	1	\$1,500.00
3	2.5 Power Swivel - <i>Per Day Used</i>	\$1,200.00	DAY	1	\$1,200.00
4	Mud Pump 5K/10K	\$1,200.00	DAY	1	\$1,200.00
5	Per Diem	\$250.00	MAN	4	\$1,000.00
6	Casing Tongs - <i>Per Day Used</i>	\$500.00	DAY	1	\$500.00
7	Daily Vehicle Charge	\$200.00	DAY	2	\$400.00
8	Travel Time	\$85.00	HRS	4	\$340.00
9	Fuel	\$4.00	GAL	50	\$200.00
10	Tank Flowback - 1000BBL	\$100.00	DAY	1	\$100.00
11	Supplies/Consumables - Depts, Gloves, Oil, Dies, Etc.	\$55.00	DAY	1	\$55.00
12				MIN	MAX
				SUBTOTAL	\$9,545.00 \$11,245.00
13				MULTI WELL DISCOUNT	15%
14				DAILY TOTAL	\$8,113.25 \$9,558.25 x 5 days

	ADDITIONAL SERVICE RATES	PRICE	UOM	QTY	TOTAL
15	B&B - BOP, Accumulator, Consumables (Add Days = \$686-\$5/Day)	\$6,183.55	5-DAY-MIN	1	\$6,183.55
16	Cement Gel - 3 Plugs/300 Sacks, 271 BBLs Gel	\$26,047.50	WELL	1	\$26,047.50

	MOBILIZATION RATES	PRICE	UOM	QTY	TOTAL
17	Derrick Rig Mob/DeMOB	\$237.50	HRS	1	\$237.50
18	Winch Tractor with Tire Roller Trailer	\$165.00	HRS	1	\$165.00
19	Helshol	\$110.00	HRS	1	\$110.00
20	Permits	Cost + 15%	EACH	1	Cost + 15%

Terms & Conditions: as with all proposals, this is an estimate and actual charges will be billed based upon negotiated rates.
 Pricing is valid for 30 days. All third party charges (fueling, rentals, services, etc.) will be passed through at 15%.
 There is a fuel surcharge when actual cost exceeds \$4.00/gal. An additional when rig is working onsite, this is not a standby cost.

VWS Representative: *Vittorio Orsini* (Vittorio Orsini)

Job Number: Quote
LO Number: -
Delivery Date: 7/24/2025

Service Quote Page 1



Service Location: Workover Solutions Inc.
Imperial District- 156 S.
Campus Dr. Imperial, PA
15126

Customer Rep: Phill Durrell
Rep Contact:
WOS Rep: Jenn Strobel
Sales Rep: Drew Daley
Payment Terms: Net 30

Job Type: P&A Spear Rental
Pad: Irwin Pad SWD
Well:
SP or CTU: Stickpipe
County: Clarion
State: PA

Customer Info: Exco

THE ESTIMATED CHARGES AND ITEMS BELOW ARE SUBJECT TO CORRECTION BY WOS

Item / Item Code	Description	QTY	UOM	Usage Days	Minimum Charge	Discount	Line Total
1	Fishing / Completions specialist per 12 hour shift	1	EA	1	\$4,000.00	50.00%	\$ 2,000.00
2	Pickup mileage for tool specialists	1	MI	1	\$5.00	50.00%	\$ 2.50
3	Subsistence for tool specialists	1	EA	1	\$350.00	50.00%	\$ 175.00
4	Casing Jack Unit - 282 ton - complete with power unit,	0	EA	1	\$7,500.00	50.00%	\$ -
	Per 12 Hour Run day						\$ -
5	Standby for casing jacks - Per day on site not used	0	DAY	1	\$2,000.00	26.00%	\$ -
6	Casing Jack Slips - Rotary.	0	DAY	1	\$130.00	10.00%	\$ -
7	Subsistence for tool specialists	1	EA	1	\$350.00	50.00%	\$ 175.00
8	Crossover Rental > 3.50" OD - (5 Day Minimum)	1	EA	1	\$550.00	50.00%	\$ 275.00
9	Crossover Rental > 3.50" OD - (add day)	0	DAY	1	\$110.00	50.00%	\$ -
10	Elevators - Bottleneck, 3-1/2" (5 day Minimum)	1	EA	1	\$550.00	10.00%	\$ 495.00
11	Elevators - Bottleneck, 3-1/2" (Ea. Add Day)	0	DAY	1	\$55.00	10.00%	\$ -
12	Elevators, Center Door, 7" (5 Day Minimum)	1	EA	5	\$450.00	10.00%	\$ 2,025.00
13	Elevators, Center Door, 7" (Ea. Add. Day)	0	EA	1	\$175.00	10.00%	\$ -
14	Bowl, Slips, 7" (5 Day Minimum)	1	EA	5	\$850.00	10.00%	\$ 3,825.00
15	Bowl, Slips, 7" (Ea. Add. Day)	0	EA	1	\$350.00	10.00%	\$ -
16	Clamp, Safety, Type C, 7" (5 Day Minimum)	1	EA	5	\$350.00	10.00%	\$ 1,575.00
17	Clamp, Safety, Type C, 7" (Ea. Add. Day)	0	EA	1	\$175.00	10.00%	\$ -
18	Post job inspection per connection (7" casing or larger)	6	EA	1	\$38.50	10.00%	\$ 207.90
19	Casing Handling Tool Post Job Inspection and Redress \$195 Per Tool.	3	EA	1	\$975.00	10.00%	\$ 2,632.50
20	Casing Jack Delivery mileage to location (Cost Plus 15%)	0	EA	1	\$950.00	0.00%	\$ -
21	Environment charge	1	EA	1	\$250.00	0.00%	\$ 250.00

Page Total: \$ 17,461.00

Discount: \$ 3,823.10

Page Sub Total (USD): \$ 13,637.90

Page 1 & 2 Estimated Job Total (USD): \$ 17,427.35

THE SERVICES, MATERIALS AND EQUIPMENT PROVIDED BY THIS SERVICE TICKET HAVE BEEN EXECUTED OR RECEIVED AS INDICATED ABOVE. THE ESTIMATED CHARGES AND ITEMS BELOW ARE SUBJECT TO CORRECTION BY WOS. ESTIMATED CHARGES DO NOT INCLUDE TAXES OR TOOL DAMAGES.

DREW DALEY
Drew Daley



Job Type:	Stickpipe Cut / Pull
Well:	Irwin Pad SWD
AFE / PO #	0
SP or CTU:	Stickpipe
County:	Clarion
State:	PA

Customer Info: Exco

THE ESTIMATED CHARGES AND ITEMS BELOW ARE SUBJECT TO CORRECTION BY WOS

[illegible]

Page Total: \$ 4,210.50

Discount: \$ 421.05

Page Sub Total (USD): \$ 3,789.45

Page 1 & 2 Estimated Job Total (USD): \$ 17,427.35

THE SERVICES, MATERIALS AND EQUIPMENT PROVIDED BY THIS SERVICE TICKET HAVE BEEN EXECUTED OR RECEIVED AS INDICATED ABOVE. THE ESTIMATED CHARGES AND ITEMS BELOW ARE SUBJECT TO CORRECTION BY WOS. ESTIMATED CHARGES DO NOT INCLUDE TAXES OR TOOL DAMAGES.

Date:

Customer Stamp Area

7/24/2025

Phil Durrett

Date:

7/24/2025

Jenn Strobel

Page 1 of 2

THIS DOCUMENT IS CONFIDENTIAL

July 24, 2025



Proposal

Workover Solutions, Inc.

156 S Campus Drive
Imperial, PA 15126

Customer:	Exco
Customer billing address:	
Well:	Irvin
County:	0
State:	PA
AFE # or PO #:	0
WOS service location:	0

Ticket #: NEWL-Quote

Job type:	7" Casing - CIBP, Jet Cut
Rig or CTU:	WL CONVEYED
Customer representative:	0
WOS representative:	0
Valid for:	30 days

THE ESTIMATED CHARGES AND ITEMS BELOW ARE SUBJECT TO CORRECTION BY WOS

Item	Description	Qty	UOM	Price	Discount	Total
1	Service Charge, CH per Well	1	EA	\$3,250.00	70.00%	\$975.00
2	Environmental Charge	1	EA	\$500.00	55.00%	\$225.00
3	Crew Subsistence, per man, per day	2	EA	\$300.00	50.00%	\$300.00
4	Mileage Charge Miles, RT, per mile, from Imperial shop	100	MI	\$5.00	15.00%	\$425.00
5	Diesel Fuel Surcharge (\$4.00 to \$5.00 per gal)	100	MI	\$1.00	0.00%	\$100.00
6	Junk Basket / Gauge Ring, per descent	1	EA	\$2,500.00	80.00%	\$500.00
7	Baker 20 Setting tool					
	- Slow Burn	1	EA	\$1,200.00	70.00%	\$360.00
	- Ignitor	1	EA	\$175.00	55.00%	\$78.75
	- Baker 20 Setting Tool, Includes Redress & Inspection	1	EA	\$2,250.00	55.00%	\$1,012.50
	- Wireline Adapter Kit, for Cast Iron Bridge Plug	1	EA	\$840.00	82.00%	\$151.20
8	Cast Iron Bridge Plug, 8.125" OD, Setting Range = 8.435" - 9.063"	1	EA	\$7,450.00	50.00%	\$3,725.00
9	5.750" Jet Cutter for 7" Casing					
	- Depth Charge, 5000' minimum	5000	FT	\$0.60	50.00%	\$1,500.00
	- Operation Charge, includes detonator & shock sub	1	EA	\$5,100.00	50.00%	\$2,550.00
	Optional:					
10	7" 5K psi Pressure Control Equipment, per day	1	DAY	\$5,000.00	62.00%	\$1,900.00
11	1-9/16" Free Point Tool, per descent					
	- Depth Charge, 5000' minimum	5000	FT	\$0.60	40.00%	\$1,800.00
	- Operation Charge	1	RUN	\$3,955.00	40.00%	\$2,373.00

total: \$11,872.00

THE ESTIMATED CHARGES AND ITEMS BELOW ARE SUBJECT TO CORRECTION BY WOS. ESTIMATED CHARGES DO NOT INCLUDE TAXES OR CREW AND EQUIPMENT STAND BY CHARGE

Note:

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Plug and Abandon Cost Estimates

Irvin A-19 SWD & Spencer Land 2 SWD

IRVIN A-19 SWD - Plug and Abandonment Cost Estimate					
	Description	Category	Vendor	Cost	Comments
1	Containment	Location	TBD	\$ 3,000	
2	Dozer and back hoe	Location	TBD	\$ 2,000	
3	Service rig + assoc. equip.	Rig (5 days)	Viking Well Service	\$ 47,791	\$9,558.25/day for 5 days
4	Cement cost	Material & Service	Viking Well Service	\$ 26,048	
5	Casing cutting/handling	Service	Workover Solutions	\$ 17,427	
6	Wireline services	Service	Workover Solutions	\$ 11,872	
7	Trucking	Transportation	TBD	\$ 8,000	
8	Water trucking and disposal	Water	TBD	\$ 8,000	
9	Misc. Rentals	Service	TBD	\$ 6,000	
Total				\$ 130,139	

SPENCER LAND 2 SWD - Plug and Abandonment Cost Estimate					
	Description	Category	Vendor	Cost	Comments
1	Containment	Location	TBD	\$ 3,000	
2	Dozer and back hoe	Location	TBD	\$ 2,000	
3	Service rig + assoc. equip.	Rig (3 days)	Viking Well Service	\$ 19,457	\$6,485.50/day for 3 days
4	Cement cost	Material & Service	Viking Well Service	\$ 15,353	
5	Casing cutting/handling	Service	Workover Solutions	\$ 8,310	
6	Wireline services	Service	Workover Solutions	\$ 8,811	
7	Trucking	Transportation	TBD	\$ 8,000	
8	Water trucking and disposal	Water	TBD	\$ 10,000	
9	Misc. Rentals	Service	TBD	\$ 5,000	
Total				\$ 79,930	