EXHIBIT 2

Tt TETRA TECH

21335 Signal Hill Plaza, Suite 100, Sterling, VA 20164   703-444-7000 703-444-1685 (FAX)

TECHNICAL MEMORANDUM

TO: Dale Skoff, Tetra Tech NUS

FROM: Jeffrey Benegar

DATE: October 4, 2010

RE: Area of Review/Zone of Endangerment Analysis for Bittinger #1 and #4 Well – Bear Lake Properties

---

EXECUTIVE SUMMARY

This technical memorandum (TM) summarizes the analytical modeling we have performed for the area of review/zone of endangerment analysis for the potential brine disposal injection wells, Bittinger #1 and #4, located in Columbus Township, Warren County, Pennsylvania. The relevant parameters for our analysis were obtained from Bear Lake Properties, LLC or estimated in the absence of any information. Our analysis is described in more detail below.

OVERVIEW AND METHODOLOGY

There are several methods proposed for calculating the zone of endangerment of an injection well. The most simplistic method is the use of a fixed radius, based on the type of injection well being permitted. Other methods involve calculation of the radius based on well and formation properties. Most regulatory agencies require the use of calculations to determine the zone of endangerment. The method used here is the graphical method first used by US EPA Region 6. It involves the calculation of the increase of pressure in the formation due to injection, then converting that pressure into equivalent feet of head. The increase in head in the formation due to injection is then compared to the equivalent head of the lowest most underground source of drinking water (USDW). When plotted graphically, the intersection of those two curves at some distance, r, determines the radius of the zone of endangerment.

The increase in pressure in the formation due to injection depends on the properties of the injection fluid and the formation, the rate of fluid injection, and the length of time of injection. The most common mathematical expression to describe this increase in pressure was developed by Matthews and Russell (1967). Matthews and Russell assume that, for a single well injecting

into an infinite, homogeneous and isotropic, non-leaking formation, the increase in pressure (delta p) can be described as:

delta p = 162.6 Qμ / kh * [(log(kt / $\Phi\mu$Cr^2) – 3.23] where:
delta p = pressure change (psi) at radius, r and time, t
Q = injection rate (barrels/day)
μ = injectate viscosity (centipoise)
k = formation permeability (millidarcies)
h = formation thickness (feet)
t = time since injection began (hours)
C = compressibility (total, sum of water and rock compressibility) (psi^{-1})
r = radial distance from wellbore to point of investigation (feet)
Φ = average formation porosity (decimal)

PARAMETERS USED IN THE ANALYSIS

The following parameters were used in the zone of endangerment analysis. There are several parameters that are unknown, including injection rate and formation permeability. For injection rate, we used the average and maximum rates expected. For permeability, we estimated a value considered representative of the average of the upper and lower range of values for this parameter.

Bittinger #1 Medina Group Well
Q = 1000 (average rate) or 2000 (maximum rate) barrels/day
t = 10 years = 87,600 hours
μ = 1 centipoise
k = 100 md
h = 30 feet
C = 3.0e-06 psi^{-1}
Φ = 0.08
Specific gravity of injectate = 1.218
Surface elevation = 1518 feet
Depth to injection formation = 4210 feet
Base of lowest most USDW = 1218 feet in elevation (depth of 300 feet below surface)
Initial pressure at top of injection formation = 128 psi

Bittinger #4 Medina Group Well
Q = 1000 (average rate) or 2000 (maximum rate) barrels/day
t = 10 years = 87,600 hours
μ = 1 centipoise
k = 100 md
h = 30 feet
C = 3.0e-06 psi^{-1}
Φ = 0.08
Specific gravity of injectate = 1.218
Surface elevation = 1561 feet
Depth to injection formation = 4285 feet

Base of lowest most USDW = 1261 feet in elevation (depth of 300 feet below surface)
Initial pressure at top of injection formation = 128 psi

RESULTS

The Matthews and Russell equation was solved for various distances from the wellbore based on the parameters listed above. The distance between the Bittinger #1 and #4 wells is approximately ¼ mile. The Matthews and Russell equation was used to calculate the increase in pressure in the formation with only one of these wells injecting. The results are shown in Table 1 for the two scenarios simulated. This increase in pressure was added to the values of delta p and the existing pressure in the injection formation to obtain the total pressure in the formation when both wells are injecting.

Table 1. Increase in pressure in formation due to both Bittinger wells injecting.

Scenario	Increase in pressure (psi)
Q = 1000 bpd, k = 100 md	222
Q = 2000 bpd, k = 100 md	443

These values were then converted to feet of head of formation brine. The values are plotted against distance from the wellbore and are shown in Figure 1 for the Bittinger wells for the two scenarios simulated (e.g., 2 unknowns: 2 injection rates and 1 permeability value). The plot shows the calculated pressure surface within the injection formation, measured as feet of head of formation brine above the top of the injection formation. Also shown is the head of the lowest most USDW. Where the two lines intersect, the radius of the zone of endangerment can be estimated. The increase in head in the formation due to injection will remain below the elevation of the lowest most USDW assuming even worst-case conditions (maximum injection rate of 2000 bpd).

As indicated above, certain input parameters (e.g., permeability) were approximated due to lack of site-specific data. In order to validate the findings of the analysis presented above, Bear Lake Properties plans to monitor fluid levels in the monitoring wells designated below on a semiannual basis. The proposed monitoring wells were all completed in the Medina Group rocks, as were the two proposed injection wells.

Injection Well	Monitoring Well	Approximate Distance and Direction From Injection Well
Bittinger #1	Bittinger #4 (unless injection also being performed in Bittinger #4)	0.25 mi to the south
	R. Trisket 2	0.34 mi to the west
	Smith/Ras Unit 1	0.29 mi to the east
Bittinger #4	Bittinger #1 (unless injection also being performed in Bittinger #1)	0.25 mi to the north
	R. Trisket 1	0.33 mi to the west
	Joseph Bittinger 2	0.37 mi to the southeast

Should fluid levels in any of the monitoring wells rise to within 100 ft of the lowest most USDW (indicated above), then injection would cease, EPA notified and steps taken to adjust the injection rate to prevent fluid levels from rising to within 100 ft of the lowest most USDW in any of the monitoring wells.

CONCLUSIONS

Our analysis of the area of review/zone of endangerment for the Bittinger #1 and #4 wells injecting together is based on a methodology typically used by US EPA. Based on the results, we believe the wells are excellent candidates for use as brine disposal wells. The analysis indicates that the increase in head in the formation due to injection will remain below the elevation of the lowest most USDW. The standard fixed radius of ¼ mile can be used for the area of review/zone of endangerment for the Bittinger #1 and #4 wells. As indicated above, Bear Lake Properties plans to perform monitoring of nearby wells to validate the results of this analysis.

REFERENCES

Matthews, C.S., Russell, D.G., (1967) Pressure Buildup and Flow Tests in Wells, SPE Monograph Series, Volume 1, New York.

FIGURES

Figure 1. Feet of head of injection formation and USDW vs. distance from the well for Bittinger #1 and #4 well when both wells are injecting.

AREA OF REVIEW

WELLS WITHIN 0.25 MILES

Bittinger Area; Columbus Twp; Warren County, PA
Wells w/in 0.25 mile radius of Bittinger #4

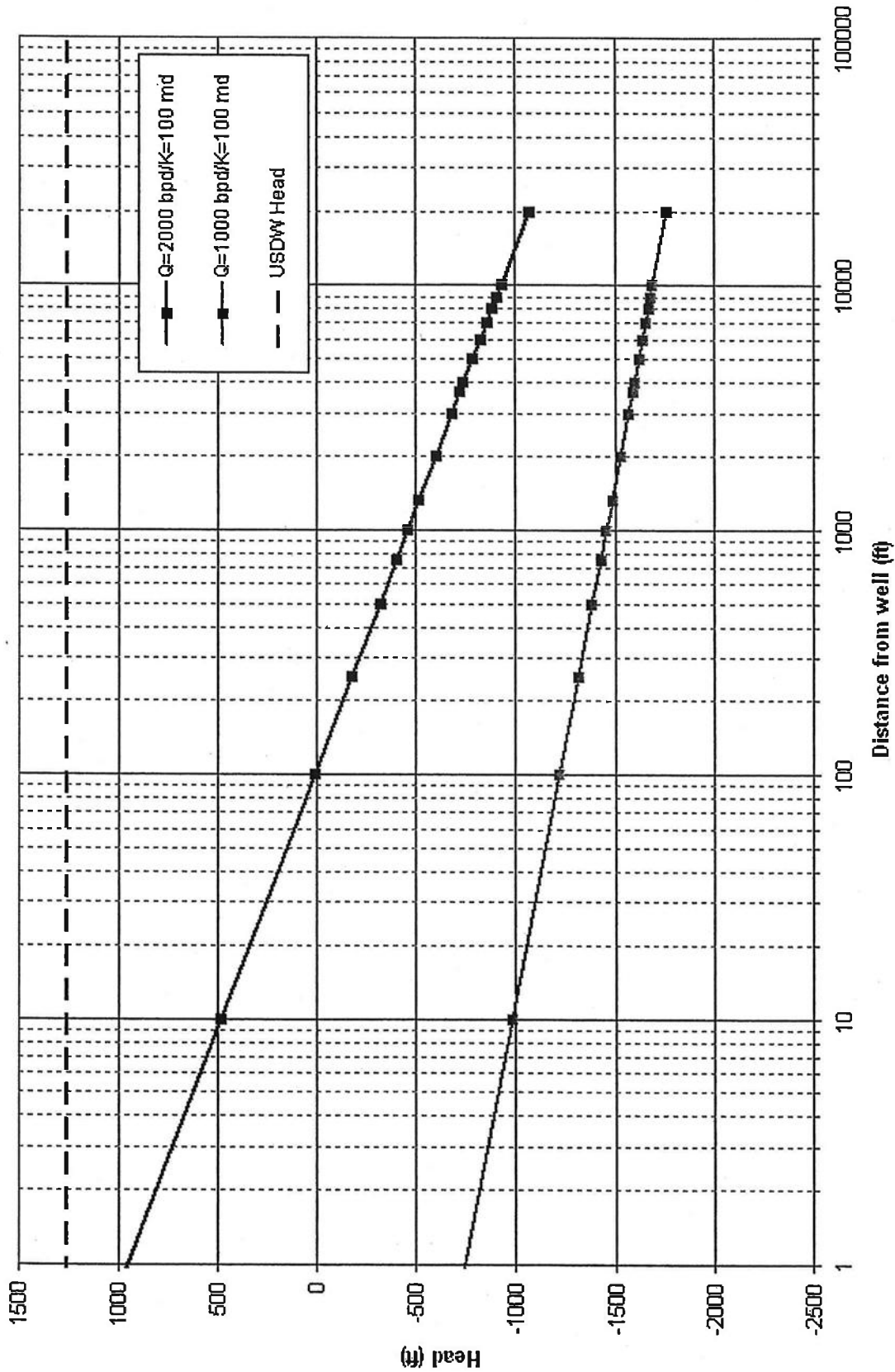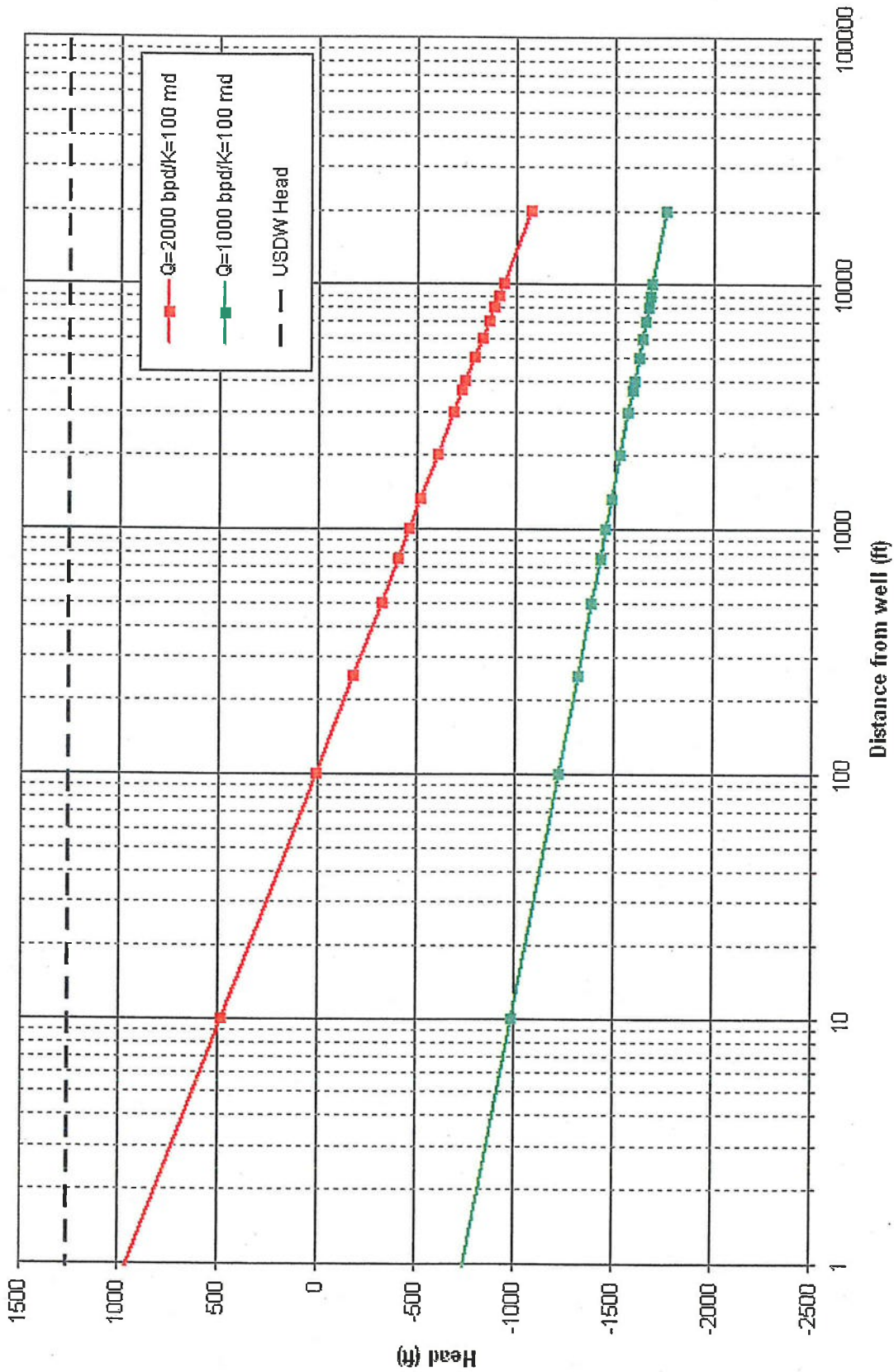|	API #	TD	Drilling Completed	Last Csg	Csg depth	Completion	Comments
Proposed Injection and Monitoring Wells							
Bittinger #1	123-33914	4467	12/29/1983	4.5	4416	Perf'd & Frac'd: 4210-4327'	Subject of separate UIC Class II permit application
Bittinger #4	123-39874	4496	8/15/1987	4.5	4455	Perf'd & Frac'd: 4285-4302'; & 4352-4365'	
Water Wells							

FIGURES

Figure 1. Feet of head of injection formation and USDW vs. distance from the well for Bittinger #1 and #4 well when both wells are injecting.

AREA OF REVIEW

WELLS WITHIN 0.25 MILES

Bittinger Area; Columbus Twp; Warren County, PA
Wells w/in 0.25 mile radius of Bittinger #1

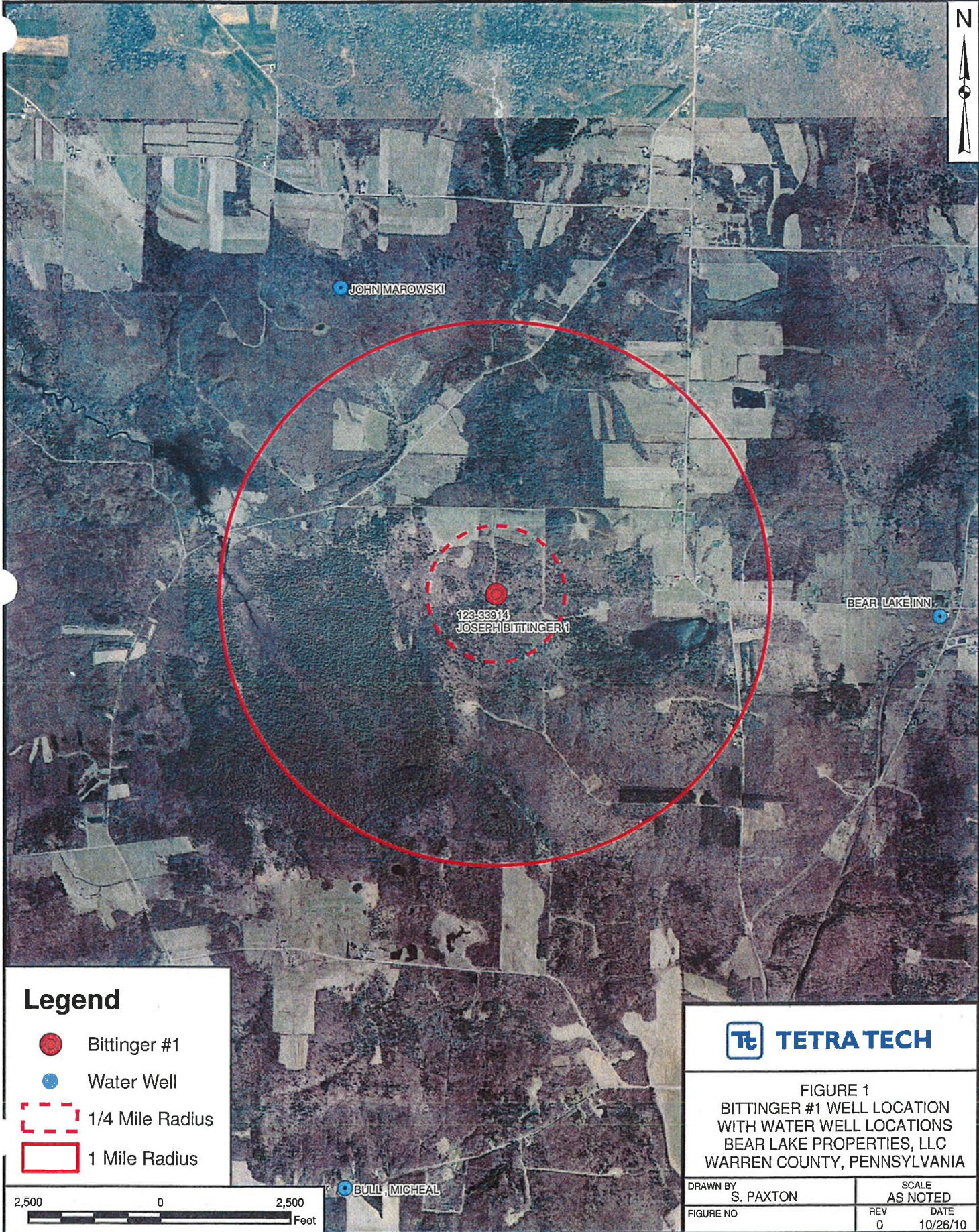|	API #	TD	Drilling Completed	Last Csg	Csg depth	Completion	Comments
Proposed Injection and Monitoring Wells							
Bittinger #1	123-33914	4467	12/29/1983	4.5	4416	Perf'd & Frac'd: 4210-4327'	
Bittinger #4	123-39874	4496	8/15/1987	4.5	4455	Perf'd & Frac'd: 4285-4302'; & 4352-4365'	Subject of separate UIC Class II permit application
Existing / Former Oil and Gas Wells							
Bittinger #4	123-39874	4496	8/15/1987	4.5	4455	Perf'd & Frac'd: 4285-4302'; & 4352-4365'	Subject of separate UIC Class II permit application
Water Wells							
None							

Area of Review

According to available records in the area, there are no intake or discharge structures, hazardous waste treatment, storage, or disposal facilities, mines, or quarries within one mile of the Bittinger #1 well. An intermittent unnamed tributary (UNT) to Tamarack Swamp is located just south of the Bittinger #1 well. Tamarack Swamp is located approximately 0.75 to 1 mile west-southwest, Brokenstraw Creek is located approximately 0.75 miles northwest, and an UNT to Pine Valley Creek is located approximately 0.75 miles southeast of Bittinger #1.

According to publicly available records, there are no groundwater wells within ¼ mile of the Bittinger #1 well. The nearest groundwater well is located approximately 1 ¼ mile to the northwest. The only oil and gas well located within ¼ mile of the Bittinger #1 is the Bittinger #4 located approximately ¼ mile to the north, which is also a proposed injection well and the subject of a UIC Class II Well permit application.

The names and addresses of residents located within ¼ mile of the proposed injection well are provided in Appendix B.

AREA OF REVIEW MAPS

GROUNDWATER WELLS

FIGURE 1
BITTINGER #1 WELL LOCATION
WITH WATER WELL LOCATIONS
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

AREA OF REVIEW MAPS

OIL AND GAS WELLS

Legend

- Bittinger #1
- Water Well
- 1/4 Mile Radius
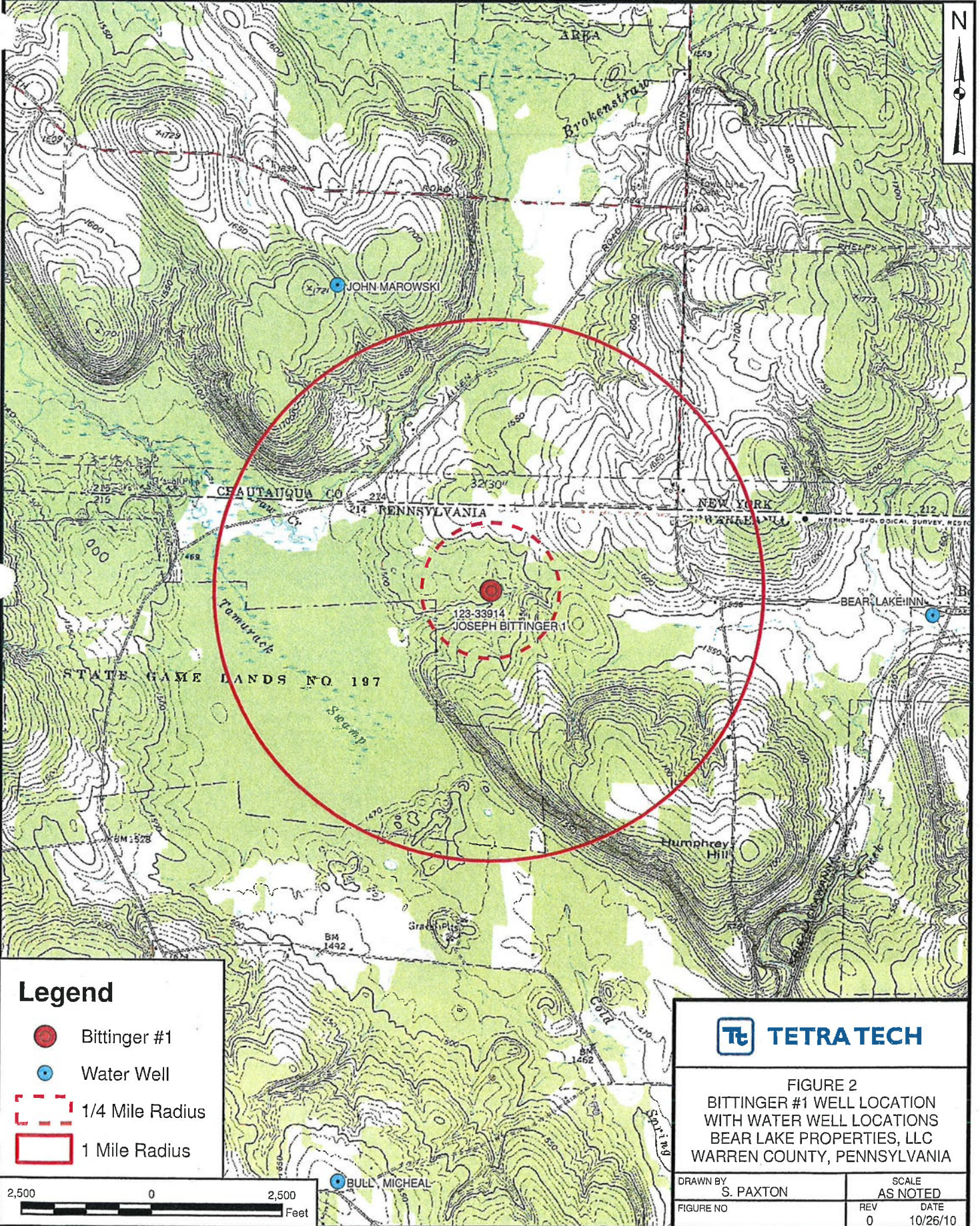- 1 Mile Radius

TETRA TECH

FIGURE 2
BITTINGER #1 WELL LOCATION
WITH WATER WELL LOCATIONS
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

DRAWN BY S. PAXTON	SCALE AS NOTED
FIGURE NO	REV 0	DATE 10/26/10

2,500   0   2,500
Feet

FIGURE 3
BITTINGER #1 WELL LOCATION
WITH OIL AND GAS WELL LOCATIONS
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

FIGURE 4
BITTINGER #1 WELL LOCATION
WITH OIL AND GAS WELL LOCATIONS
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA
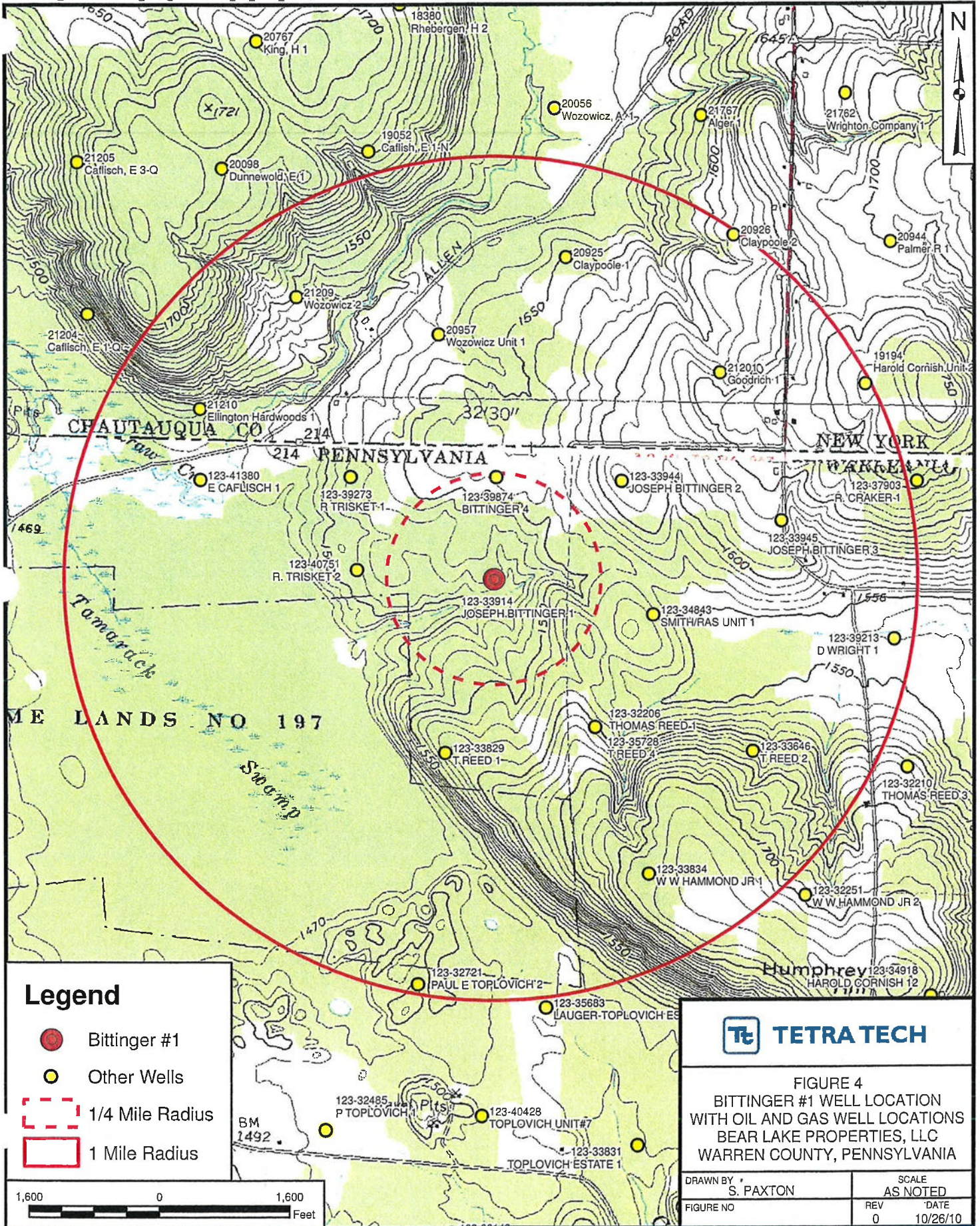
<u>Underground Sources of Drinking Water – Bittinger No. 1/Columbus Township,</u>
<u>Warren County, PA</u>

The site lies within the Glaciated Plateau section of the Appalachian Plateaus Physiographic province. Both unconsolidated glacial units and bedrock are used for potable water. The uppermost unit at the site is mapped as Wisconsin age glacial kame deposits. Kame deposits consist primarily of sand and gravel interbedded with minor amounts of silt and clay. The well log for Bittinger No. 1 indicates that unconsolidated gravel is present from the surface to a depth of 36 feet below ground surface. (Pennsylvania Topographic and Geologic Survey, 1959)

The uppermost bedrock beneath the site is mapped as the Devonian age Venango formation. The Venango formation consists of interbedded pebble conglomerate, crossbedded sandstone, siltstone, and shale. This unit is up to 330 feet thick in Venango County; however, only a portion of the unit is present in the site area. This unit is used as an aquifer throughout Warren County. The well log for Bittinger No. 1 indicates that Devonian age shale is present from 37 ft to a depth of 2,679 ft below ground surface. This is believed to include the Venango Formation, the Chadokoin formation, and the underlying Bradford Group. The Bittinger No. 1 well log indicated that salt water was encountered at a depth of 3,935 feet below ground surface. Wells deeper than 100 feet deep usually encounter salt water, which is supported by the generally shallow well depths in Columbus Township. (PADER, 1982, US Geologic Survey, 2007)

The Devonian age Chadakoin formation underlies Venango formation and consists of fine-grained marine clastics (siltstone and shale) and includes a purplish pink sequence which is often used as a marker unit. This unit is up to 450 thick in Warren County.

The Pennsylvania Geologic Survey "Ground Water Inventory System" (GWIS) database was accessed to determine the sources of groundwater sources in the site area. This data base did not contain any groundwater wells within a one-mile radius of Bittinger #1 well. Although there are no wells listed, the well reporting requirement was established in 1968 is not considered to be a complete record of water wells and other wells may be present. (Pennsylvania Topographic and Geologic Survey, September 15, 2010)

To better understand the underground sources of drinking water, the GWIS was searched for all wells within Columbus Township. Available well records for wells in Columbus Township are provided in Appendix A. The GWIS indicated that there are 35 recorded water wells in Columbus Township. The deepest well is listed as 130 feet deep, with reported well depths ranging from 42 to 130 feet deep. (Pennsylvania Topographic and Geologic Survey, September 20, 2009)

Based on the available information, the glacial units and the top 100 feet of bedrock is considered as the underground sources of drinking water in the site area. The well logs indicate that the glacial material is approximately 37 feet thick beneath the site. Freshwater is expected

to be encountered to a depth of approximately 150 feet with increasing salinity beyond a depth of 150 feet. Bittinger No. 1 has surface casing to a depth of 401 feet below ground surface, providing a buffer of approximately 250 beyond the base of the underground sources of drinking water based on the well data in Columbus Township (maximum well depth of 130 feet) and the references indicating brine being encountered at depths over 100 feet within the bedrock units. Production casing extends several thousands of feet below the drinking water sources and the injection interval is at a depth from 4150 to 4330 feet below the ground surface.

For the purpose of this application, the depth of the deepest well in the area 130 feet (it is believed that the generally shallow well depth in the area was related to water quality issues based on the available literature) was doubled and rounded upward to the nearest 100 feet, providing a conservative maximum depth estimate of the underground source of drinking water of 300 feet.

References:

Pennsylvania Topographic and Geologic Survey, 1959. " Glacial Geology of Northwestern, PA." Bulletin G 32.

Pennsylvania Topographic and Geologic Survey, 1981. " Atlas of Preliminary Quadrangle Maps of Pennsylvania, PA." Map 61.

PADER, 1982. "Engineering Characteristics of the Rocks of Pennsylvania". Environmental Geology Report 1.

Pennsylvania Topographic and Geologic Survey, September 15/20, 2010. "Ground Water Inventory System". www.dcnr.state.pa.us/topogeo/groundwater/PAGWIS

US Geologic Survey, 2007. "Ground-Water Resources and the Hydrologic Effects of Petroleum Occurrence and Development, Warren County, Northwestern Pennsylvania." Scientific Investigations Report 2006-5263.

UNDERGROUND SOURCES OF DRINKING WATER

GROUNDWATER WELLS WITHIN 1 MILE

Bittinger Area; Columbus Twp; Warren County, PA
Wells w/in 1 mile radius of Bittinger #1

Proposed Injection and Monitoring Wells

	API #	TD	Drilling Completed	Last Csg	Csg depth	Completion	Comments
Bittinger #1	123-33914	4467	12/29/1983	4.5	4416	Perf'd & Frac'd: 4210-4327'	
Bittinger #4	123-39874	4496	8/15/1987	4.5	4455	Perf'd & Frac'd: 4285-4302'; & 4352-4365'	Subject of separate UIC Class II permit application

Water Wells

None							

Injection and Confining Zones

The well is designed to inject into the Grimsby and Whirlpool sandstone units of the Medina formation, with injection zone perforations at a depth of 4,210 to 4,327 feet below ground surface. The Medina is a depleted reservoir in this area.

As seen on the generalized stratigraphic column (attached), most of the geologic "groups" and "formations" overlying the Medina can be considered confining units totaling approximately 1,800 feet . Although many of these units are predominantly shale, they also contain reservoir rock and are shown with shading in confining unit column. Therefore, the Lockport and the Salina are seen as the most significant confining units and are a combined 520 feet thick in the site area. But as indicated these units provide only a portion of the confining capacity and there are numerous other units that provide further protection.
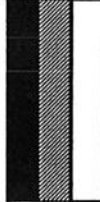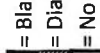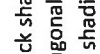
Also attached are the following:

- Bittinger #1 completion record and geophysical log,
- Maximum Injection Pressure (MIP) calculations based on Instantaneous Shut-In Pressure (ISIP) data for two nearby wells (R. Trisket #1 and #2),
- Bittinger #4 completion record,
- R. Trisket #1 and #2 treatment reports.

GEOLOGIC DATA

GENERALIZED STRATIGRAPHIC COLUMN

Generalized Stratigraphic Column
Bittinger No 1 and Bittinger No. 4 Area
Warren County, PA

Age	Group	Formation	Predominant Rock Type	Total Depth to Base(Feet)	Thickness Feet	Confining Zone
Glacial Units						
Upper Devonian	Venango		Shale/sandstone	18	18	
Upper Devonian		Chadakoin	Shale			
Upper Devonian	Bradford		Shale			
Upper Devonian	Elk		Shale	2741	2723	
Upper Devonian		Java	Shale			
Upper Devonian		West Falls	Shale			
Upper Devonian		Sonyea	Shale			
Upper Devonian		Genesee	Shale			
Upper Devonian		Tully Limestone	Limestone	2848	107	
Upper Devonian	Hamilton	Mahantango	Shale, some sandstone	3018	170	
Upper Devonian	Hamilton	Marcellus Shale	Shale			
Middle Devonian		Onondaga	Limestone	3182	164	
Lower Devonian		Bois Blanc/Oriskany Sandstone	Sandstone	3211	29	
Upper Silurian		Bass Islands	Dolomite	3547	336	
Upper Silurian		Salina	Evaporites/Dolomite	3896	349	
Upper Silurian		Lockport Dolomite	Dolomite	4067	171	
Lower Silurian	Clinton		Sandstone	4189	122	
Lower Silurian		Medina, inlcuding the Grimsby and Whirlpool Sandstones	Sandstone/Shale	4367	178	

Notes

= Black shading indicates that this unit is considered to be a confining zone

= Diagonal shading indicates that this unit is a confining unit that also contains producing zones within it

= No shading indicates that this unit is a producing zone and is not considered to be a confining unit

GEOLOGIC DATA

MAXIMUM INJECTION PRESSURE CALCULATIONS

Maximum Injection Pressure (MIP) Calculations for Bear Lake Properties Wells
(Bittinger #1 and Bittinger #4)

1) Frac Gradient Based on Trisket #1 and Trisket #2 Wells

R. Trisket #1
FG = [ISIP + (.433 X SG X D)] /D
Where:
ISIP = 2150 psi
SG = 1.218
D = 4253

R. Trisket #2
FG = [ISIP + (.433 X SG X D)] /D
Where:
ISIP = 2100 psi
SG = 1.218
D = 4254 ft

Well	ISIP (psi)*	Hydrostatic Factor (psi/ft)	SG	D (ft)	Fracture Gradient (psi/ft)
R. Trisket #1	2150	0.433	1.218	4253	1.033
R. Trisket #2	2100	0.433	1.218	4254	1.021
				Average Frac Gradient	1.027

2) Maximum Injection Pressure (MIP) Using Average Frac Gradient From Trisket Wells

MIP = [FG - (.433XSG)] X D

Depth:	Bittinger #1	Bittinger #4
Top Perf	4210	4285
Bottom Perf	4327	4365
Difference	117	80
Mid-Point	4269	4325

		Hydrostatic Factor (psi/ft)	SG	D (ft)	Fracture Gradient (psi/ft)	MIP (Surface)
Bittinger #1	-	0.433	1.218	4210	1.027	2103
Bittinger #4	-	0.433	1.218	4285	1.027	2141

GEOLOGIC DATA

R. TRISKET #2 WELL DATA

HALLIBURTON SERVICES

HALLIBURTON DIVISION Pittsburgh, Pa **HALLIBURTON LOCATION** Bradford, Pa

CTURING SERVICE TREATING REPORT

M. F 2012 R-3

R. TRISKETT #2 **BILLED ON TICKET NO.** 896925-7

WELL DATA

d Columbus Sec. _____ Twp. _____ Rng. _____ County Warren State Pa

mation Name _____ Type _____
mation Thickness _____ From _____ To _____
ial Prod: Oil _____ Bpd. Water _____ Bpd. Gas _____ Mcfd.
ent Prod: Oil _____ Bpd. Water _____ Bpd. Gas _____ Mcfd.
ation Tool # _____ Mandrel Size _____ Extensions _____ In.
ker Type _____ Set At _____
tom Hole Temp. _____ RBP@ _____
d Or Flange _____ Pbtd _____

	NEW USED	WEIGHT	SIZE	FROM	TO	MAXIMUM PSI ALLOWABLE
CASING	N	10.5	4½	0	4389	
LINER						
TUBING						
OPEN HOLE						SHOTS/FT.
PERFORATIONS		.39	4201	4307		8
PERFORATIONS						
PERFORATIONS						

MATERIALS

at. Fluid H2O Density 8.33 Lb./Gal.°API
pl. Fluid H2O Density 8.3 Lb./Gal.°API
p. Type Sand Size 80/100 Lb. 67,000
p. Type Sand Size 20/40 Lb. 10,000
ioactive Tracer _____ Carrier _____ Units-MCI _____
factant Type _____ Gal. _____ @ _____ /1000 Gal.
factant Type _____ Gal. _____ @ _____ /1000 Gal.
id Loss Type _____ Gal.-Lb. _____ @ _____ /1000 Gal.
ling Agent _____ Gal.-Lb. _____ @ _____ /1000 Gal.
ling Agent LGC-IV Gal.-Lb. 780 @ _____ /1000 Gal.
aker Type GBW-30 Gal.-Lb. 4 @ _____ /1000 Gal.
aker Type _____ Gal.-Lb. _____ @ _____ /1000 Gal.
ker _____ Gal.-Lb. _____ @ _____ /1000 Gal.
r _____ Gal.-Lb. _____ @ _____ /1000 Gal.
ffer Type _____ Gal.-Lb. _____ @ _____ /1000 Gal.
ffer Type Citric Acid Gal.-Lb. 200 @ _____ /1000 Gal.
teriacide _____ Gal.-Lb. _____ @ _____ /1000 Gal.
n-Foamer AQF-4 Gal.-Lb. 38 @ _____ /1000 Gal.
y Control ClaSta XP Gal.-Lb. 10 @ _____ /1000 Gal.
erter CloFX II Gal.-Lb. 80 @ _____ /1000 Gal.
tion Reducer _____ Gal.-Lb. _____ @ _____ /1000 Gal.
rfpac Balls _____ Qty. _____ Size _____ S.G.
ner _____

ACID DATA

id Type _____ % _____ Gal.-Bbl. _____
id Type _____ % _____ Gal.-Bbl. _____
rfactant Type _____ Gal. _____ @ _____ /1000 Gal.
rfactant Type _____ Gal. _____ @ _____ /1000 Gal.
Agent Type _____ Gal. _____ @ _____ /1000 Gal.
y Control Type _____ Gal.-Lb. _____ @ _____ /1000 Gal.
rrosion Inhibitor _____ Gal.-Lb. _____ @ _____ /1000 Gal.
rrosion Inhibitor _____ Gal.-Lb. _____ @ _____ /1000 Gal.
acking Inhibitor _____ Gal.-Lb. _____ @ _____ /1000 Gal.
n Sequester _____ Gal.-Lb. _____ @ _____ /1000 Gal.
iction Reducer _____ Gal.-Lb. _____ @ _____ /1000 Gal.

JOB DATA

CALLED OUT	ON LOCATION	JOB STARTED	JOB COMPLETED
DATE 01/05/90	DATE 01/05/90	DATE 01/05/90	DATE 01/05/90
TIME 0730	TIME 1200	TIME 1400	TIME 1530

PERSONNEL AND SERVICE UNITS

NAME	UNIT NO. & TYPE	LOCATION
B. Jackson 46175		
C. Thomas 69581	3298 HT400	
R. Wheeler 87697	2683 HT400	
K. Thompson B4639	5997 MSU	
L. Colts C6159	8892 I Bxd	
Caldwell D8034	3305 SBP	
M. English D7811	3302 SBP	
J. Pascarella D7783	99.11 T.O	
J. Gould D7896	3905 LGC	
	JBP Cortland	

DEPARTMENT Stim
DESCRIPTION OF JOB Water Frac

JOB DONE THRU: TUBING ☐ CASING ☒ ANNULUS ☐ TSG./ANN. ☐

PRESSURES IN PSI   SUMMARY   VOLUMES

ng _____ Displacement 3601
in 3367 Maximum 4600
rage 3601 Fracture Gradient _____
2100 5 Min. 2180 10 Min. _____ 15 Min. _____

HYDRAULIC HORSEPOWER
ered 1500 Available 7000 Used 1480

AVERAGE RATE IN BPM
ating 16.7 Displ 16.7 Overall 16.7

Preflush: Bbl.-Gal. _____ Type _____
Load & Bkdn. Bbl.-Gal. 5318 Pad: Scf-Bbl.-Gal. _____
Treatment Bbl.-Gal. 20,480 Displ. Bbl.-Gal. 2860
Gas Assist _____ Tons-Scf _____ @ _____ Scf./Bbl.
Foam Quality _____ % Total Volume Foam _____ Bbl.-Gal.
Total Volume: Bbl.-Gal. 28,604 Fluid-Foam

REMARKS

HALLIBURTON SERVICES
JOB LOG

FORM 2013 R-2
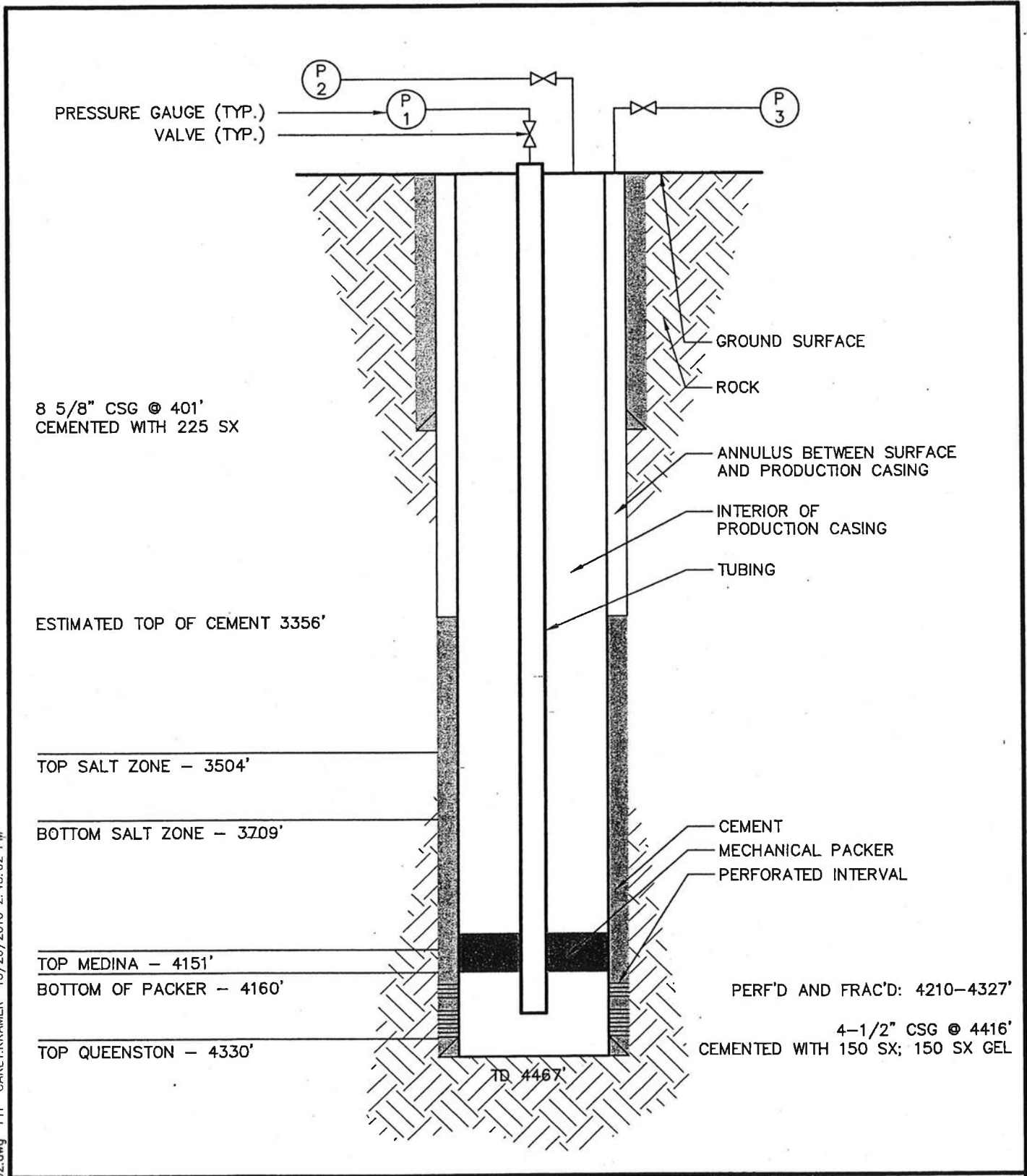
WELL NO. #2   LEASE R. Trisket   TICKET NO. 896925-7

CUSTOMER U.S. Energy   PAGE NO. 1.

JOB TYPE Water Frac w/N2   DATE 01/05/90

CHART NO.	TIME	RATE (BPM)	VOLUME (BBL) (GAL)	PUMPS T	PUMPS C	PRESSURE (PSI) TUBING	PRESSURE (PSI) CASING	DESCRIPTION OF OPERATION AND MATERIALS
								Saftey meeting
	1410				4			Pick up Pomp
	12½				2		4176	Test Lines
	14		2402		4		600	Load Hole
	30¾				4		3367	Pad
	35 ¼		2856		1		3868	Start Sand 80/100 1PPG
	43	↑	5000				3830	Inc Sand 80/100 2PPG
	46¾		7630				3206	Start Sand 20/40 2PPG
	59½		5000				3575	Inc Sand 3PPG
	1508	16.7	15000				3595	Inc Sand 4PPG
	12		17856				3523	Sand on Bottom
	15¾		20450				3439	Finish Sand
	19½	↓	2856				380	Finish Flush
	16½						2100	Isip
	24½						2180	5min

Ave Psi 360
HHP 1480

PRESSURE GAUGE (TYP.)
VALVE (TYP.)

GROUND SURFACE

ROCK

8 5/8" CSG @ 401'
CEMENTED WITH 225 SX

ANNULUS BETWEEN SURFACE
AND PRODUCTION CASING

INTERIOR OF
PRODUCTION CASING

TUBING

ESTIMATED TOP OF CEMENT 3356'

TOP SALT ZONE – 3504'

BOTTOM SALT ZONE – 3709'

CEMENT
MECHANICAL PACKER
PERFORATED INTERVAL

TOP MEDINA – 4151'
BOTTOM OF PACKER – 4160'

PERF'D AND FRAC'D: 4210-4327'

4-1/2" CSG @ 4416'
CEMENTED WITH 150 SX; 150 SX GEL

TOP QUEENSTON – 4330'

TD 4467'

R:\2984\rigures\2984FG002.dwg   PIT   CARLY.KRAMER   10/26/2010 2:48:02 PM

TETRA TECH	**BEAR LAKE PROPERTIES, LLC**

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661 ANDERSEN DRIVE – FOSTER PLAZA 7
PITTSBURGH, PA 15220
T: (412) 921-7090 | F: (412) 921-4040

BITTINGER #1
INJECTION WELL CONFIGURATION
SCALE: NOT TO SCALE

DATE:	9-30-10
PROJECT NO.:	112C02984
DESIGNED BY:	
DRAWN BY:	CK
CHECKED BY:	
SHEET: 1 OF 1	

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FIGURE

Appendix A

Appendix A contains well records and information for groundwater wells in the area surrounding Bittinger No. 1. There are no groundwater wells located within 1 mile of the Bittinger No. 1 well, as listed in the following table. Well records for all groundwater wells located within Columbus Township, Warren County, Pennsylvania are provided in Appendix A-1.

APPENDIX A

GROUNDWATER WELLS WITHIN 1 MILE

Bittinger Area; Columbus Twp; Warren County, PA
Wells w/in 1 mile radius of Bittinger #1

Proposed Injection and Monitoring Wells

	API #	TD	Drilling Completed	Last Csg	Csg depth	Completion	Comments
Bittinger #1	123-33914	4467	12/29/1983	4.5	4416	Perf'd & Frac'd: 4210-4327'	
Bittinger #4	123-39874	4496	8/15/1987	4.5	4455	Perf'd & Frac'd: 4285-4302'; & 4352-4365'	Subject of separate UIC Class II permit application

Water Wells

None							