
 United States Environmental Protection Agency Underground Injection Control Permit Application <i>(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, 40 CFR 144)</i>					I. EPA ID Number <div style="border: 1px solid black; height: 20px; width: 100%;"></div>				
					T/A	C			
Read Attached Instructions Before Starting For Official Use Only									
Application approved mo day year		Date received mo day year		Permit Number	Well ID	FINDS Number			
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>		<div style="border: 1px solid black; height: 20px; width: 100%;"></div>		<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>	<div style="border: 1px solid black; height: 20px; width: 100%;"></div>			
II. Owner Name and Address				III. Operator Name and Address					
Owner Name Bear Lake Properties, LLC				Owner Name Bear Lake Properties, LLC					
Street Address 3000 Village Run Road, Unit 103, #223				Street Address 3000 Village Run Road, Unit 103, #223					
Phone Number (724) 444-7501				Phone Number (724) 444-7501					
City Wexford		State PA		ZIP CODE 15090					
IV. Commercial Facility		V. Ownership		VI. Legal Contact		VII. SIC Codes			
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No		<input checked="" type="checkbox"/> Private <input type="checkbox"/> Federal <input type="checkbox"/> Other		<input type="checkbox"/> Owner <input checked="" type="checkbox"/> Operator		1389 - Oil and Gas Field Services, Not Elsewhere Classified			
VIII. Well Status (Mark "x")									
<input type="checkbox"/> A Operating		Date Started mo day year <div style="border: 1px solid black; height: 20px; width: 100%;"></div>		<input checked="" type="checkbox"/> B. Modification/Conversion		<input type="checkbox"/> C. Proposed			
IX. Type of Permit Requested (Mark "x" and specify if required)									
<input checked="" type="checkbox"/> A. Individual <input type="checkbox"/> B. Area		Number of Existing Wells 1		Number of Proposed Wells		Name(s) of field(s) or project(s) Bittinger #4			
X. Class and Type of Well (see reverse)									
A. Class(es) (enter code(s)) II		B. Type(s) (enter code(s)) D		C. If class is "other" or type is code 'x,' explain		D. Number of wells per type (if area permit)			
XI. Location of Well(s) or Approximate Center of Field or Project									
Latitude Deg Min Sec 41 59 50.5		Longitude Deg Min Sec 79 32 27.5		Township and Range Sec Twp Range 1/4 Sec Feet From Line Feet From Line					
XII. Indian Lands (Mark "x")									
<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No									
XIII. Attachments									
(Complete the following questions on a separate sheet(s) and number accordingly; see instructions) For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.									
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)									
A. Name and Title (Type or Print) Karl Kimmich, President					B. Phone No. (Area Code and No.) (724) 444-7501				
C. Signature 					D. Date Signed 10/29/2010				

Well Class and Type Codes

Class I	Wells used to inject waste below the deepest underground source of drinking water.	
Type	"I"	Nonhazardous industrial disposal well
	"M"	Nonhazardous municipal disposal well
	"W"	Hazardous waste disposal well injecting below USDWs
	"X"	Other Class I wells (not included in Type "I," "M," or "W")
Class II	Oil and gas production and storage related injection wells.	
Type	"D"	Produced fluid disposal well
	"R"	Enhanced recovery well
	"H"	Hydrocarbon storage well (excluding natural gas)
	"X"	Other Class II wells (not included in Type "D," "R," or "H")
Class III	Special process injection wells.	
Type	"G"	Solution mining well
	"S"	Sulfur mining well by Frasch process
	"U"	Uranium mining well (excluding solution mining of conventional mines)
	"X"	Other Class III wells (not included in Type "G," "S," or "U")
Other Classes	Wells not included in classes above.	
	Class V wells which may be permitted under §144.12.	
	Wells not currently classified as Class I, II, III, or V.	

Attachments to Permit Application

Class	Attachments
I new well	A, B, C, D, F, H – S, U
existing	A, B, C, D, F, H – U
II new well	A, B, C, E, G, H, M, Q, R; optional – I, J, K, O, P, U
existing	A, E, G, H, M, Q, R, – U; optional – J, K, O, P, Q
III new well	A, B, C, D, F, H, I, J, K, M – S, U
existing	A, B, C, D, F, H, J, K, M – U
Other Classes	To be specified by the permitting authority

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INSTRUCTIONS - Underground Injection Control (UIC) Permit Application

Paperwork Reduction Act: The public reporting and record keeping burden for this collection of information is estimated to average 224 hours for a Class I hazardous well application, 110 hours for a Class I non-hazardous well application, 67 hours for a Class II well application, and 132 hours for a Class III well application. Burden means the total time, effort, or financial resource expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal Agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to the collection of information; search data sources; complete and review the collection of information; and, transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to Director, Collection Strategies Division, U.S. Environmental Protection Agency (2822), 1200 Pennsylvania Ave., NW, Washington, DC 20460. Include the OMB control number in any correspondence. Do not send the completed forms to this address.

This form must be completed by all owners or operators of Class I, II, and III injection wells and others who may be directed to apply for permit by the Director.

- I. **EPA I.D. NUMBER** - Fill in your EPA Identification Number. If you do not have a number, leave blank.
- II. **OWNER NAME AND ADDRESS** - Name of well, well field or company and address.
- III. **OPERATOR NAME AND ADDRESS** - Name and address of operator of well or well field.
- IV. **COMMERCIAL FACILITY** - Mark the appropriate box to indicate the type of facility.
- V. **OWNERSHIP** - Mark the appropriate box to indicate the type of ownership.
- VI. **LEGAL CONTACT** - Mark the appropriate box.
- VII. **SIC CODES** - List at least one and no more than four Standard Industrial Classification (SIC) Codes that best describe the nature of the business in order of priority.
- VIII. **WELL STATUS** - Mark Box A if the well(s) were operating as injection wells on the effective date of the UIC Program for the State. Mark Box B if wells(s) existed on the effective date of the UIC Program for the State but were not utilized for injection. Box C should be marked if the application is for an underground injection project not constructed or not completed by the effective date of the UIC Program for the State.
- IX. **TYPE OF PERMIT** - Mark "Individual" or "Area" to indicate the type of permit desired. Note that area permits are at the discretion of the Director and that wells covered by an area permit must be at one site, under the control of one person and do not inject hazardous waste. If an area permit is requested the number of wells to be included in the permit must be specified and the wells described and identified by location. If the area has a commonly used name, such as the "Jay Field," submit the name in the space provided. In the case of a project or field which crosses State lines, it may be possible to consider an area permit if EPA has jurisdiction in both States. Each such case will be considered individually, if the owner/operator elects to seek an area permit.
- X. **CLASS AND TYPE OF WELL** - Enter in these two positions the Class and type of injection well for which a permit is requested. Use the most pertinent code selected from the list on the reverse side of the application. When selecting type X please explain in the space provided.
- XI. **LOCATION OF WELL** - Enter the latitude and longitude of the existing or proposed well expressed in degrees, minutes, and seconds or the location by township, and range, and section, as required by 40 CFR Part 146. If an area permit is being requested, give the latitude and longitude of the approximate center of the area.
- XII. **INDIAN LANDS** - Place an "X" in the box if any part of the facility is located on Indian lands.
- XIII. **ATTACHMENTS** - Note that information requirements vary depending on the injection well class and status. Attachments for Class I, II, III are described on pages 4 and 5 of this document and listed by Class on page 2. Place EPA ID number in the upper right hand corner of each page of the Attachments.
- XIV. **CERTIFICATION** - All permit applications (except Class II) must be signed by a responsible corporate officer for a corporation, by a general partner for a partnership, by the proprietor of a sole proprietorship, and by a principal executive or ranking elected official for a public agency. For Class II, the person described above should sign, or a representative duly authorized in writing.

Attachments to be submitted with permit application for Class I, II, III and other wells.

- A. **AREA OF REVIEW METHODS** - Give the methods and, if appropriate, the calculations used to determine the size of the area of review (fixed radius or equation). The area of review shall be a fixed radius of 1/4 mile from the well bore unless the use of an equation is approved in advance by the Director.
- B. **MAPS OF WELL/AREA AND AREA OF REVIEW** - Submit a topographic map, extending one mile beyond the property boundaries, showing the injection well(s) or project area for which a permit is sought and the applicable area of review. The map must show all intake and discharge structures and all hazardous waste treatment, storage, or disposal facilities. If the application is for an area permit, the map should show the distribution manifold (if applicable) applying injection fluid to all wells in the area, including all system monitoring points. Within the area of review, the map must show the following:

Class I

The number, or name, and location of all producing wells, injection wells, abandoned wells, dryholes, surface bodies of water, springs, mines (surface and subsurface), quarries, and other pertinent surface features, including residences and roads, and faults, if known or suspected. In addition, the map must identify those wells, springs, other surface water bodies, and drinking water wells located within one quarter mile of the facility property boundary. Only information of public record is required to be included in this map;

Class II

In addition to requirements for Class I, include pertinent information known to the applicant. This requirement does not apply to existing Class II wells;

Class III

In addition to requirements for Class I, include public water systems and pertinent information known to the applicant.

- C. **CORRECTIVE ACTION PLAN AND WELL DATA** - Submit a tabulation of data reasonably available from public records or otherwise known to the applicant on all wells within the area of review, including those on the map required in B, which penetrate the proposed injection zone. Such data shall include the following:

Class I

A description of each well's types, construction, date drilled, location, depth, record of plugging and/or completion, and any additional information the Director may require. In the case of new injection wells, include the corrective action proposed to be taken by the applicant under 40 CFR 144.55.

Class II

In addition to requirement for Class I, in the case of Class II wells operating over the fracture pressure of the injection formation, all known wells within the area of review which penetrate formations affected by the increase in pressure. This requirement does not apply to existing Class II wells.

Class III

In addition to requirements for Class I, the corrective action proposed under 40 CFR 144.55 for all Class III wells.

- D. **MAPS AND CROSS SECTION OF USDWs** - Submit maps and cross sections indicating the vertical limits of all underground sources of drinking water within the area of review (both vertical and lateral limits for Class I), their position relative to the injection formation and the direction of water movement, where known, in every underground source of drinking water which may be affected by the proposed injection. (Does not apply to Class II wells.)

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- E. **NAME AND DEPTH OF USDWs (CLASS II)** - For Class II wells, submit geologic name, and depth to bottom of all underground sources of drinking water which may be affected by the injection.
- F. **MAPS AND CROSS SECTIONS OF GEOLOGIC STRUCTURE OF AREA** - Submit maps and cross sections detailing the geologic structure of the local area (including the lithology of injection and confining intervals) and generalized maps and cross sections illustrating the regional geologic setting. (Does not apply to Class II wells.)
- G. **GEOLOGICAL DATA ON INJECTION AND CONFINING ZONES (Class II)** - For Class II wells, submit appropriate geological data on the injection zone and confining zones including lithologic description, geological name, thickness, depth and fracture pressure.
- H. **OPERATING DATA** - Submit the following proposed operating data for each well (including all those to be covered by area permits): (1) average and maximum daily rate and volume of the fluids to be injected; (2) average and maximum injection pressure; (3) nature of annulus fluid; (4) for Class I wells, source and analysis of the chemical, physical, radiological and biological characteristics, including density and corrosiveness, of injection fluids; (5) for Class II wells, source and analysis of the physical and chemical characteristics of the injection fluid; (6) for Class III wells, a qualitative analysis and ranges in concentrations of all constituents of injected fluids. If the information is proprietary, maximum concentrations only may be submitted, but all records must be retained.
- I. **FORMATION TESTING PROGRAM** - Describe the proposed formation testing program. For Class I wells the program must be designed to obtain data on fluid pressure, temperature, fracture pressure, other physical, chemical, and radiological characteristics of the injection matrix and physical and chemical characteristics of the formation fluids.
- For Class II wells the testing program must be designed to obtain data on fluid pressure, estimated fracture pressure, physical and chemical characteristics of the injection zone. (Does not apply to existing Class II wells or projects.)
- For Class III wells the testing must be designed to obtain data on fluid pressure, fracture pressure, and physical and chemical characteristics of the formation fluids if the formation is naturally water bearing. Only fracture pressure is required if the program formation is not water bearing. (Does not apply to existing Class III wells or projects.)
- J. **STIMULATION PROGRAM** - Outline any proposed stimulation program.
- K. **INJECTION PROCEDURES** - Describe the proposed injection procedures including pump, surge, tank, etc.
- L. **CONSTRUCTION PROCEDURES** - Discuss the construction procedures (according to §146.12 for Class I, §146.22 for Class II, and §146.32 for Class III) to be utilized. This should include details of the casing and cementing program, logging procedures, deviation checks, and the drilling, testing and coring program, and proposed annulus fluid. (Request and submission of justifying data must be made to use an alternative to packer for Class I.)
- M. **CONSTRUCTION DETAILS** - Submit schematic or other appropriate drawings of the surface and subsurface construction details of the well.
- N. **CHANGES IN INJECTED FLUID** - Discuss expected changes in pressure, native fluid displacement, and direction of movement of injection fluid. (Class III wells only.)
- O. **PLANS FOR WELL FAILURES** - Outline contingency plans (proposed plans, if any, for Class II) to cope with all shut-ins or wells failures, so as to prevent migration of fluids into any USDW.
- P. **MONITORING PROGRAM** - Discuss the planned monitoring program. This should be thorough, including maps showing the number and location of monitoring wells as appropriate and discussion of monitoring devices, sampling frequency, and parameters measured. If a manifold monitoring program is utilized, pursuant to §146.23(b)(5), describe the program and compare it to individual well monitoring.
- Q. **PLUGGING AND ABANDONMENT PLAN** - Submit a plan for plugging and abandonment of the well including: (1) describe the type, number, and placement (including the elevation of the top and bottom) of plugs to be used; (2) describe the type, grade, and quantity of cement to be used; and (3) describe the method to be used to place plugs, including the method used to place the well in a state of static equilibrium prior to placement of the plugs. Also for a Class III well that underlies or is in an exempted aquifer, demonstrate adequate protection of USDWs. Submit this information on EPA Form 7520-14, Plugging and Abandonment Plan.

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- R. **NECESSARY RESOURCES** - Submit evidence such as a surety bond or financial statements to verify that the resources necessary to close, plug or abandon the well are available.
- S. **AQUIFER EXEMPTIONS** - If an aquifer exemption is requested, submit data necessary to demonstrate that the aquifer meets the following criteria: (1) does not serve as a source of drinking water; (2) cannot now and will not in the future serve as a source of drinking water; and (3) the TDS content of the ground water is more than 3,000 and less than 10,000 mg/l and is not reasonably expected to supply a public water system. Data to demonstrate that the aquifer is expected to be mineral or hydrocarbon production, such as general description of the mining zone, analysis of the amenability of the mining zone to the proposed method, and time table for proposed development must also be included. For additional information on aquifer exemptions, see 40 CFR Sections 144.7 and 146.04.
- T. **EXISTING EPA PERMITS** - List program and permit number of any existing EPA permits, for example, NPDES, PSD, RCRA, etc.
- U. **DESCRIPTION OF BUSINESS** - Give a brief description of the nature of the business.



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:

$$\Delta p = 162.6 Q\mu / kh * [(\log(kt / \Phi\mu Cr^2) - 3.23)] \text{ where:}$$

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 = $3.0\text{e-}06$ 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 = $3.0\text{e-}06$ 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

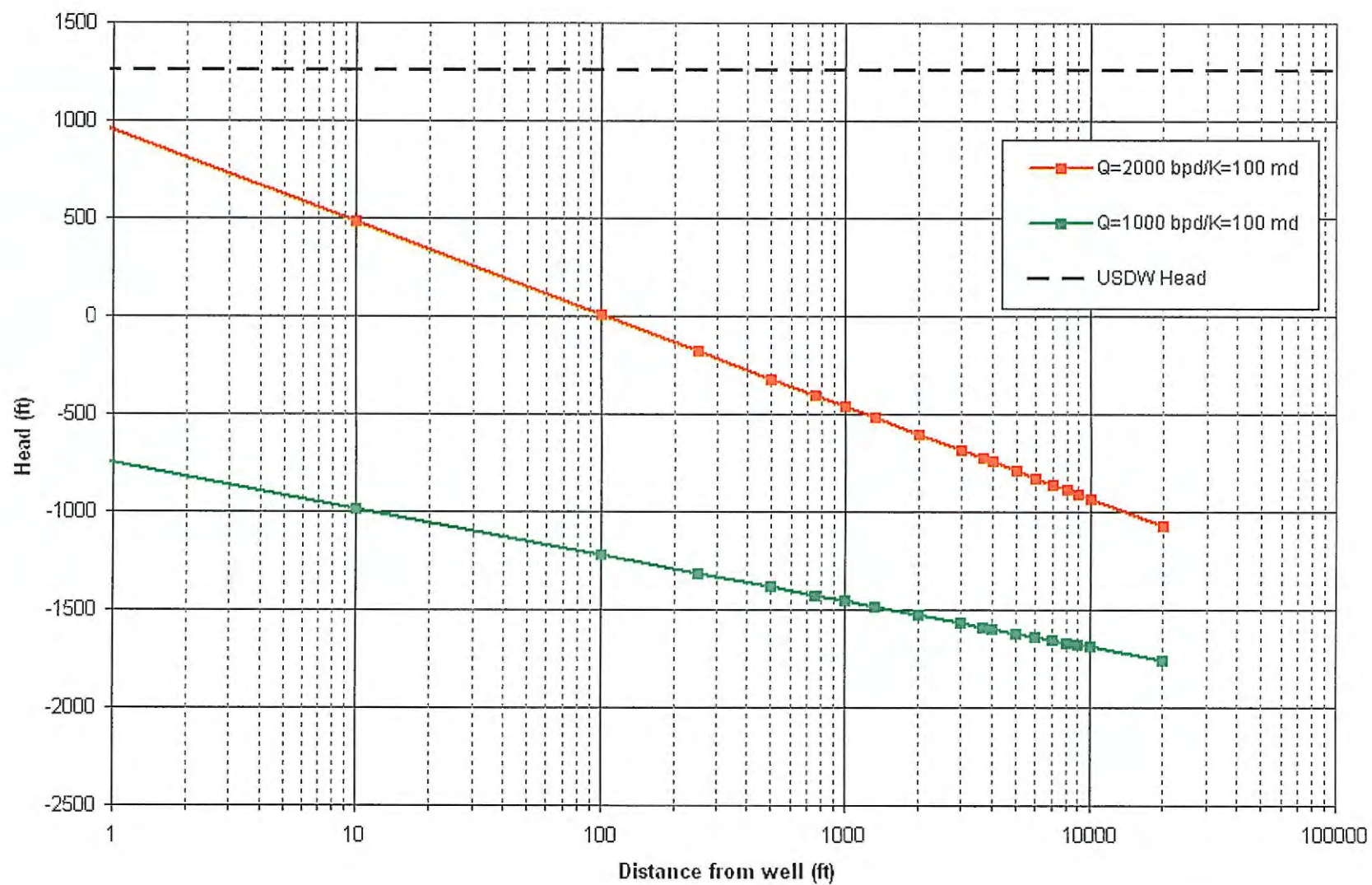


Figure 1. Feet of head of injection formation and USDW vs. distance from the well for Bittinger #1 and #4 well when both wells are injecting.

AREA OF REVIEW
WELLS WITHIN 0.25 MILES

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

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

Area of Review

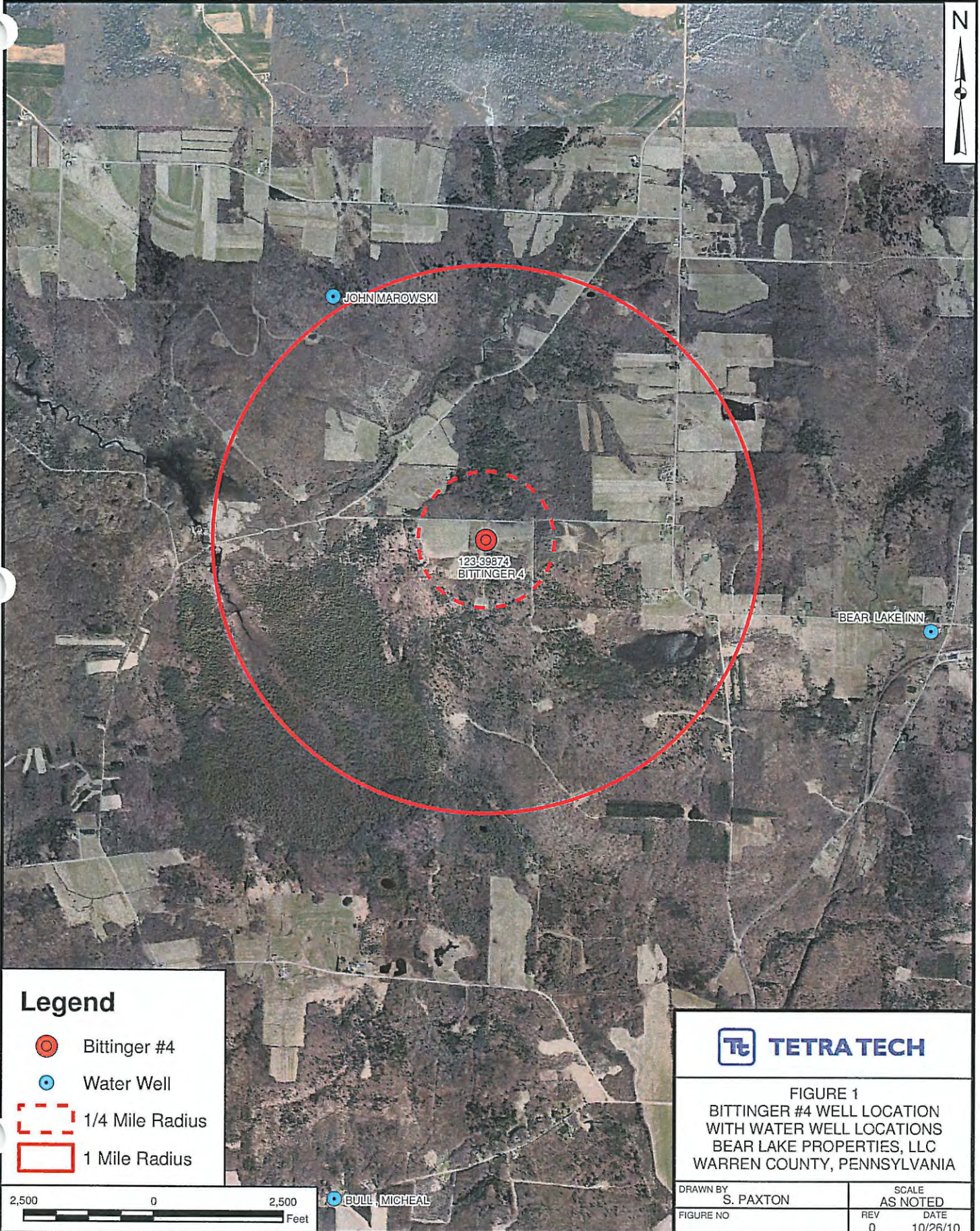
According to available records in the area, there are no intake or discharge structures, hazardous waste treatment, storage, or disposal facilities, mines, or quarries within one mile of the Bittering #4 well. An intermittent unnamed tributary (UNT) to Tamarack Swamp is located approximately 0.25 miles south of the Bittering #4 well. Tamarack Swamp is located approximately 0.75 to 1 mile west-southwest, Brokenstraw Creek is located approximately 0.5 miles northwest, and an UNT to Pine Valley Creek is located approximately 0.75 miles southeast of Bittering #4.

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

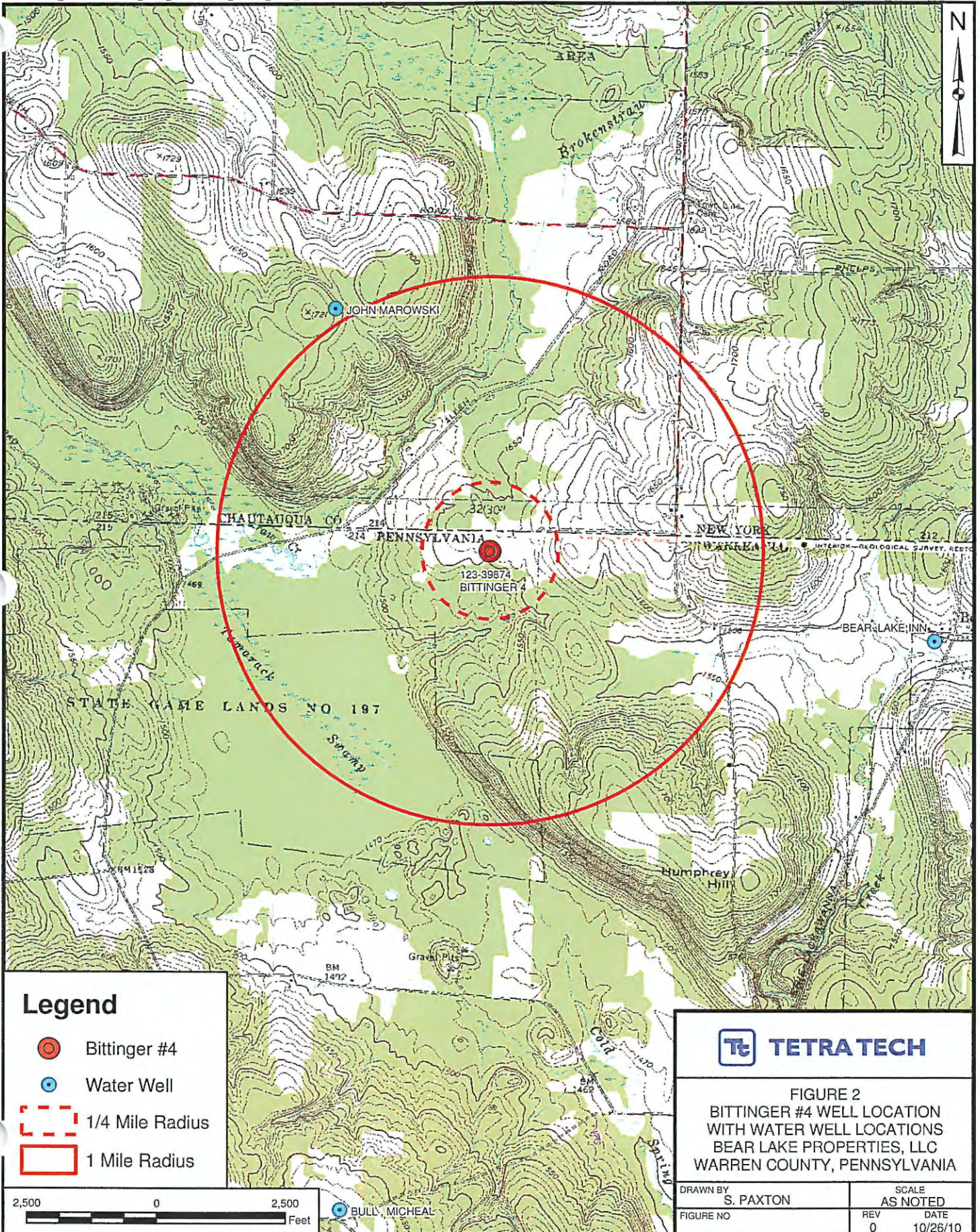
The names and addresses of residents located within $\frac{1}{4}$ mile of the proposed injection well are provided in Appendix B.

AREA OF REVIEW MAPS
GROUNDWATER WELLS

P:\GIS\BEAR_LAKE\MXD\BEAR_LAKE_BITTINGER#4_WATER_WELL_AERIAL.MXD 10/26/10 TW



P:\GIS\BEAR_LAKE\MXD\BEAR_LAKE_BITTINGER#4_WATER_WELL_TOPO.MXD 10/26/10 TW



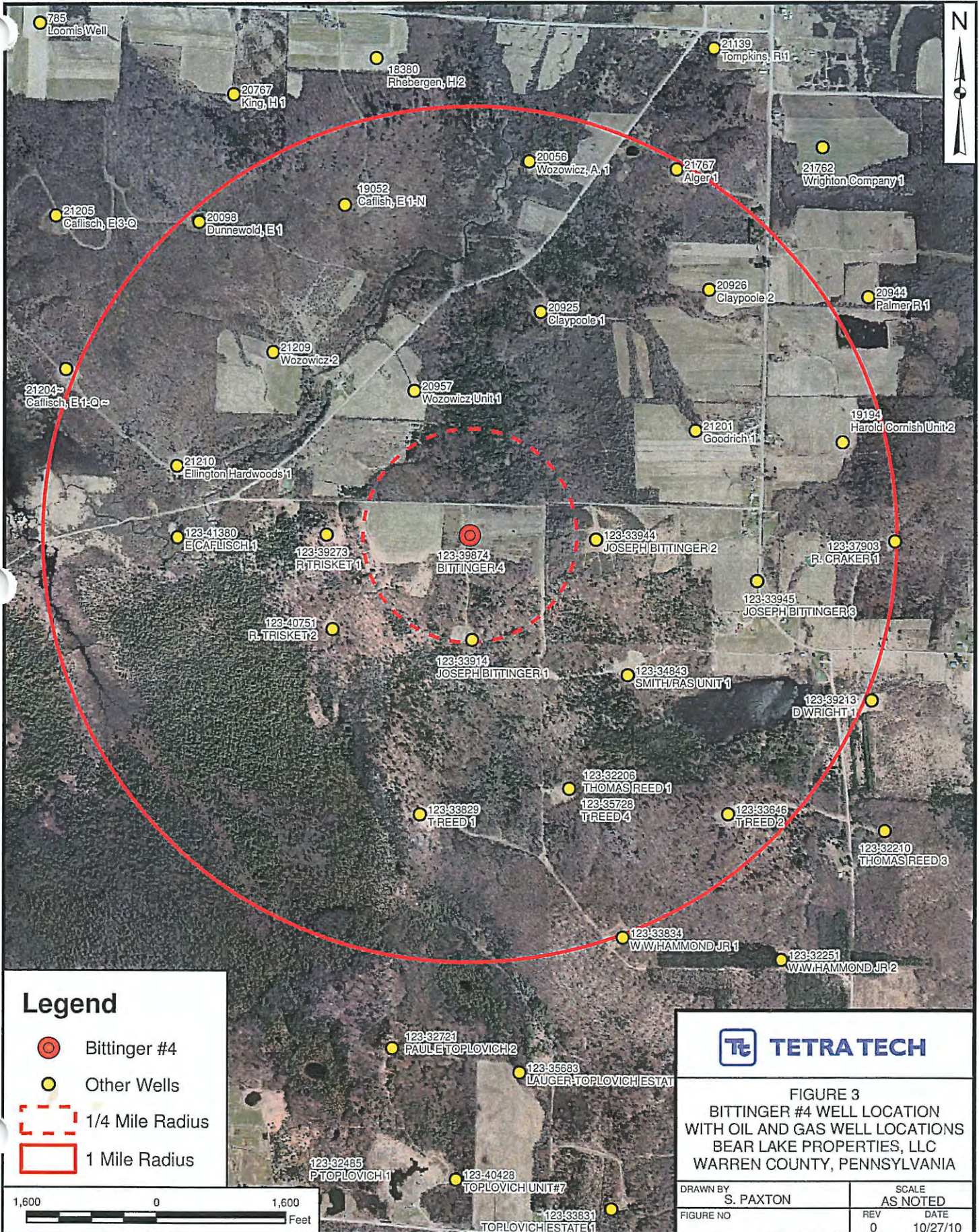
AREA OF REVIEW MAPS

OIL AND GAS WELLS

STATELINE
RA
41°59'54.2" 079°31'41.1"

For assistance in accessing this document, please contact R3_UIC_Mailbox@epa.gov

P:\GIS\BEAR_LAKE\MXD\BEAR_LAKE_BITTINGER#4_OG_WELL_AERIAL.MXD 10/27/10 TW



Corrective Action Plan and Well Data

According to available records of oil and gas wells, there are no existing, or plugged and abandoned wells within a ¼ mile radius area of review of the proposed injection point at Bittinger No. 4, with the exception of Bittinger No. 1 which is approximately ¼ mile south of the proposed injection point. Bittinger No. 1 is the subject of a separate injection well permit application and therefore is not slated for corrective action.

The Bittinger No. 1 well will be used as a monitoring well until such time as the well is put into production. While being used as a monitoring well, if the fluid level is observed to rise up to within 100 feet of the base of the USDW, disposal operations in Bittinger No. 4 well will be stopped immediately, EPA will be notified, and operating conditions will be evaluated in order to control the fluid levels.

Existing Oil and Gas Wells within the Area of Review

Well completion records are required to be submitted for all wells located within the area of review in order to evaluate the need for corrective action specific to each well. The well log for Bittinger No. 1 is provided as an attachment. No corrective action is needed for this well because it is also the subject of a separate injection well permit.

Plugged and Abandoned Wells

There are no plugged and abandoned wells located within the ¼ mile area of review for the Bittinger No. 4 well. Therefore, the no plugging records or well logs are provided as part of the corrective action plan.

Underground Sources of Drinking Water – Bittinger No. 4/Columbus Township,
Warren County, PA

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 outwash deposits, which includes valley train, river terrace, and lake deposits. Outwash deposits consist primarily of bedded sand, silt, clay, and mixed sand and gravel. The well log for Bittinger No. 4 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) and the New York State Department of Environmental Conservation databases were accessed to determine the sources of groundwater sources in the site area. The Pennsylvania data base contained a total of 1 groundwater wells and the New York database listed 4 groundwater wells within a one-mile radius of Bittinger #4 well. These wells range from 60 to 125 feet deep. The depth to bedrock ranges from 14 to 98 feet below ground surfaces. The wells were all completed within the bedrock unit. The listed information for these wells is provided in Appendix A. Although there are 5 total 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 18 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. Bittering No. 4 has surface casing to a depth of 506 feet below ground surface, providing a buffer of approximately 350 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 4362 to 44459 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.

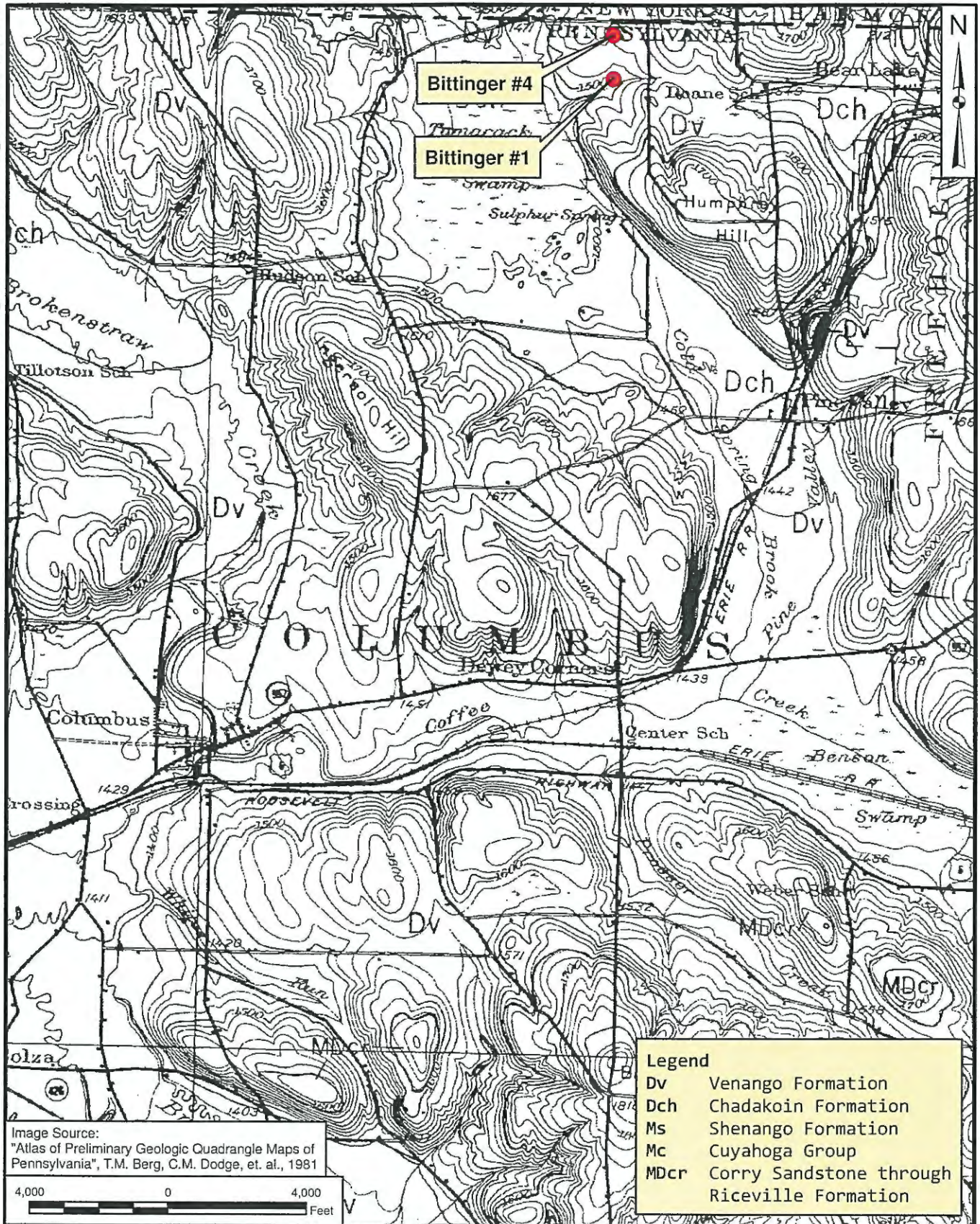
PADER, 1982. "Engineering Characteristics of the Rocks of Pennsylvania". Environmental Geology Report 1.

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 Occurance and Development, Warren County, Northwestern Pennsylvania." Scientific Investigations Report 2006-5263.

**UNDERGROUND SOURCES OF DRINKING WATER
BEDROCK MAP**

PGH P:\GIS\BEAR_LAKE\MAPDOCS\MXD\BITTINGER_BEDROCK.MXD 10/26/10 TW

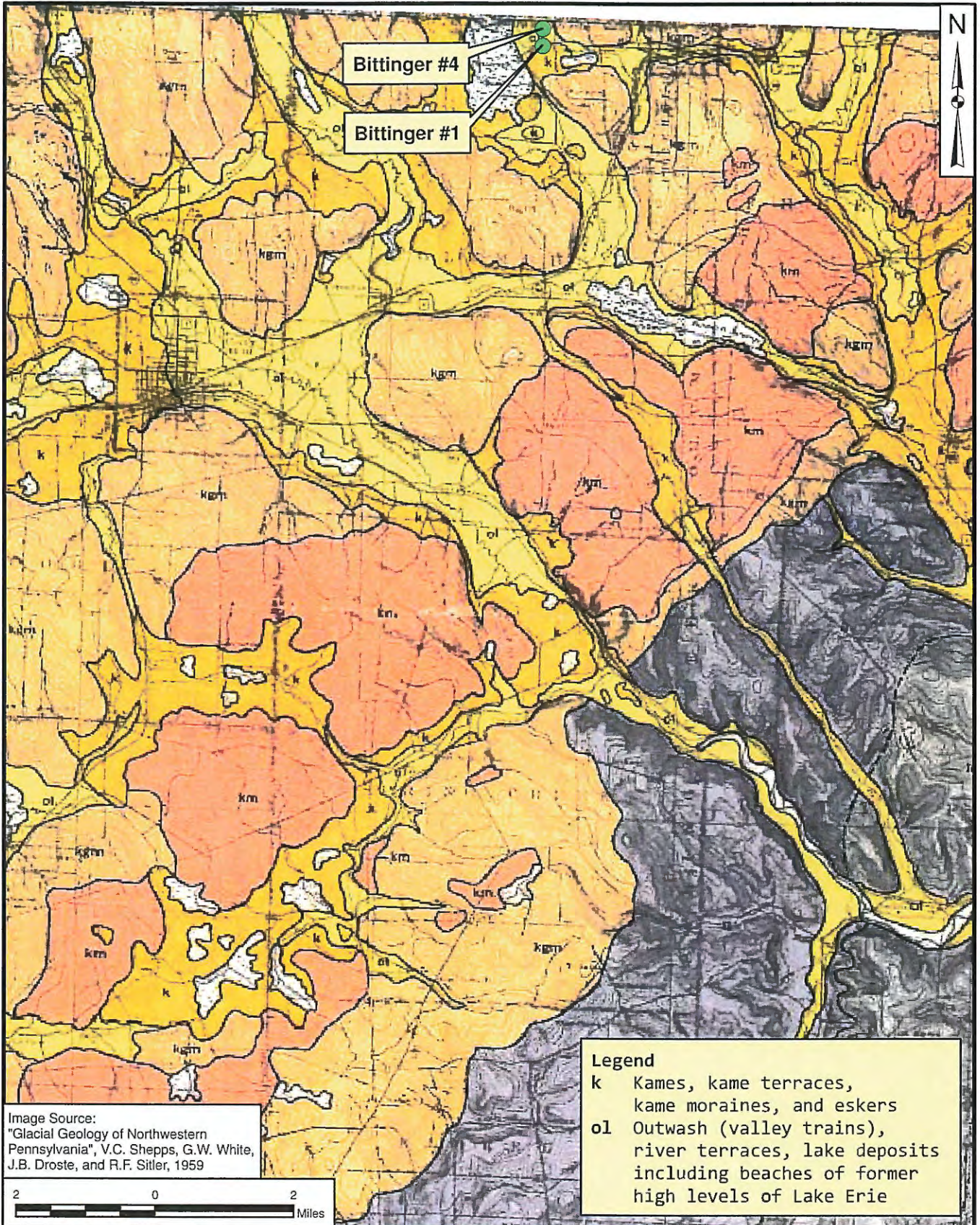


BEDROCK MAP
BITTINGER #1 AND #4 WELLS
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

SCALE AS NOTED	
DRAWN BY	DATE
J. ENGLISH	09/28/10
REV	DATE
0	
FIGURE NUMBER	
FIGURE NO.	

UNDERGROUND SOURCES OF DRINKING WATER
GLACIAL MAP

PGH:\GIS\BEAR_LAKE\MAPDOCS\WYD\BITTINGER_GLACIAL.MXD 10/26/10 TW



GLACIAL MAP
BITTINGER #1 AND #4 WELLS
BEAR LAKE PROPERTIES, LLC
WARREN COUNTY, PENNSYLVANIA

SCALE AS NOTED	
DRAWN BY	DATE
J. ENGLISH	09/29/10
REV	DATE
0	
FIGURE NUMBER	
FIGURE NO.	

Section 5 – Geologic Data On Injection and Confining Zone

Revised Pages

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

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

R. Trisket #1

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

Where:

ISIP = 2150 psi

SG = 1.0

D = 4253

R. Trisket #2

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

Where:

ISIP = 2100 psi

SG = 1.0

D = 4254 ft

Well	ISIP (psi)*	Hydrostatic Factor (psi/ft)	SG	D (ft)	Fracture Gradient (psi/ft)
R. Trisket #1	2150	0.433	1.0	4253	0.939
R. Trisket #2	2100	0.433	1.0	4254	0.927
Average Frac Gradient					0.933

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

$$MIP = [FG - (.433 \times SG)] \times D$$

	Bittering #1	Bittering #4	
Depth:			
Top Perf	4210	4285	Top of Perforations Used For Calculation
Bottom Perf	4327	4365	
Difference	117	80	
Mid-Point	4269	4325	

		Hydrostatic Factor (psi/ft)	SG	D (ft)	Fracture Gradient (psi/ft)	MIP (Surface)
Bittering #1	-	0.433	1.218	4210	0.933	1706
Bittering #4	-	0.433	1.218	4285	0.933	1736

Section 5 – Geologic Data On Injection and Confining Zone

Revised Pages

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

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

R. Trisket #1

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

Where:

ISIP = 2150 psi

SG = 1.0

D = 4253

R. Trisket #2

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

Where:

ISIP = 2100 psi

SG = 1.0

D = 4254 ft

Well	ISIP (psi)*	Hydrostatic Factor (psi/ft)	SG	D (ft)	Fracture Gradient (psi/ft)
R. Trisket #1	2150	0.433	1.0	4253	0.939
R. Trisket #2	2100	0.433	1.0	4254	0.927
Average Frac Gradient					0.933

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

$$MIP = [FG - (.433 \times SG)] \times D$$

Bittering #1 Bittering #4

Depth:

Top Perf	4210	4285	Top of Perforations Used For Calculation
Bottom Perf	4327	4365	
Difference	117	80	
Mid-Point	4269	4325	

		Hydrostatic Factor (psi/ft)	SG	D (ft)	Fracture Gradient (psi/ft)	MIP (Surface)
Bittering #1	-	0.433	1.218	4210	0.933	1706
Bittering #4	-	0.433	1.218	4285	0.933	1736

Section 6 – Operating Data

Revised Pages

Operating Data

The proposed commercial brine disposal well will primarily be utilized to inject produced and flowback water from wells completed in the Marcellus Shale, the Medina Group and other natural gas and oil producing formations. Other oil and gas related wastewaters associated with the production of oil and natural gas or natural gas storage operations, which are approved by EPA for injection under a UIC Class II D injection well, may also be injected. According to Title 40 Chapter I Sec. 144.6 (b)(1), such fluids include those "Which are brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection."

Injection Rate

Injectivity testing performed on the Bittering #4 well, which is located approximately ¼ mile to the north of the Bittering #1 well, indicated the well may be capable of sustaining injection rates on at least a short-term basis on the order of 3 bbl/min or approximately 4,300 bbl/day. Considering this was a relatively short-term test, a maximum injection rate of 2,000 bbl/day is proposed for operation of the facility, with an average injection rate of 1,000 bbl/day expected.

Maximum Allowable Surface Injection Pressure (MASIP) and Average Surface Injection Pressure

MASIP calculations based on EPA approved equations are included in the "Geologic Data" section of this application. Based on these calculations, the proposed MASIP is 1706 psi. It is estimated that the average surface injection pressure will be approximately 1000 psi.

Laboratory Analysis of Injection Fluid Samples

Laboratory samples representative of the types of brine which will be injected into the proposed injection well are attached. Samples were collected from produced water generated from gas wells in the vicinity of the injection well. The samples are characterized by chloride concentrations in the 200,000 mg/L range and specific gravity of approximately 1.2.

Monitoring of Injection Fluid Samples and Well

The following identifies the UIC Class II underground injection well regulatory requirements and operational procedures which will be conducted to meet the subject requirements:

1. **Monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics.** An initial sample of fluid will be collected and analyzed from initial loads proposed for disposal from new disposal customers. In addition, samples will be collected for analysis from new types of sources (e.g., from different geologic formations, geographic regions, etc.) which would be expected to differ significantly from brine previously characterized for disposal at the facility. Samples will be analyzed for the following parameters at a minimum: specific gravity, total dissolved solids, total organic carbon, and pH.
2. **Observation of injection pressure, flow rate, and cumulative volume at least weekly based on the regulatory requirements for produced fluid disposal operations.** Injection pressures, flow rate, and cumulative volume will be continuously recorded electronically.

3. **A demonstration of mechanical integrity pursuant to 40 CFR Sec. 146.8 at least once every five years during the life of the injection well.** A mechanical integrity test will be performed prior to initiating injection and at least once every five years.
4. **Maintenance of the results of all monitoring until the next permit review.** All monitoring records will be maintained throughout the life of the well.

Reporting requirements consist of the following:

An annual report will be submitted to EPA summarizing the results of the required monitoring, including monthly records of injected fluids, and any major changes in characteristics or sources of injected fluid.

Proposed Annulus Fluid

The proposed annulus fluid for the proposed injection well will consist of fresh water and a water soluble corrosion inhibitor. The corrosion inhibitor will be mixed in accordance with the manufacturer's recommendations then loaded into the well annulus prior to conducting injection operations. Product information for the type of corrosion inhibitor which will be utilized is attached. A similar type product may be used instead of the example product referenced.

Facility Layout and Operation

As indicated in the attached facility layout diagram, the injection well facility will include a truck unloading area and holding tanks connected by piping with associated valves, all of which will be situated in a diked containment area. The containment area will be properly sized to account for the entire volume of the largest container, plus 10% freeboard, in the event of a leak. The brine will be transferred to the injection well utilizing injection pumps situated in the Equipment Shed along with filters and monitoring equipment. Automatic shut-off valves will be incorporated into the tank design to prevent overflow during filling operations. The facility will be surrounded by a fence having locking entrance and exit gates. A security camera will also be strategically situated on the site. The facility will be continually manned during unloading and injection operations. As indicated above, injection rate, cumulative volume and pressures will be continuously measured and recorded.

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 4,285 to 4,302 and 4,352 to 4,365 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 #4 completion record,
- Maximum Injection Pressure (MIP) calculations based on Instantaneous Shut-In Pressure (ISIP) data for two nearby wells (R. Trisket #1 and #2),
- Bittinger #1 completion record and geophysical log,
- 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				18	18	
Upper Devonian	Venango		Shale/sandstone	2741	2723	
Upper Devonian		Chadakoin	Shale			
Upper Devonian	Bradford		Shale			
Upper Devonian	Elk		Shale			
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, including 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
BITTINGER #4 COMPLETION RECORD

ER-0G-4, Rev. 1/82

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS REGULATION
PITTSBURGH, PENNSYLVANIA 15222

REG-I/1111

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WELL RECORD

PERMIT NO 37-123-39874-00

PROJECT NO DEET

TYPE OF WELL Gas

COLUMBUS FIELD, DEWEY CORNERS POOL DEU

WELL OPERATOR
U. S. Energy Development CorporationTELEPHONE NO
(716)856-9764ADDRESS
670 Statler Towers, Buffalo, NY 14202-9990

ZIP

FARM NAME
BittingerFARM NO
4

SERIAL NO

ACRES
62TOWNSHIP
ColumbusCOUNTY
WarrenDRILLING COMMENCED
8/11/87

DRILLING COMPLETED

8/15/87

ELEVATION
1561'QUADRANGLE
Columbus☒ 7 1/2' ☐ 15'

CASING AND TUBING RECORD

PIPE SIZE	AMOUNT IN WELL	MATERIAL BEHIND PIPE		PACKER			DATE RUN
		CEMENT (SKS)	GEL (SKS)	TYPE	SIZE	DEPTH	
13 3/8"	30'	NA					8/11/87
8 5/8"	506'	220	5				8/12/87
4 1/2"	4454.9'	265					11/5/87
		T.D.	B.D.	D.P.I.	Class	O G	Lease
		4496		4362	D	O I	1

PERFORATION RECORD

STIMULATION RECORD

DATE	INTERVAL PERFORATED		DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
	FROM	TO					
8/19	4459'	4362'	8/20/87	Same	840bbls.	67,000#	20.7

NATURAL OPEN FLOW

3000 MCF

NATURAL ROCK PRESSURE

NA

HRS

AFTER TREATMENT OPEN FLOW

6,600 MCFD

AFTER TREATMENT ROCK PRESSURE

1100

HRS

72 4444/

REMARKS

MEDINA

RECEIVED

SEP 30 1988

PA GEOLOGICAL SURVEY
Oil & Gas Geology Division

(Information on reverse side)

A WELL RECORD SHALL BE FILED WITHIN 30 DAYS OF CESSATION OF DRILLING. IF THE WELL IS NOT COMPLETED WITHIN 30 DAYS OF CESSATION OF DRILLING, AN UPDATED WELL RECORD MUST BE SUBMITTED UPON COMPLETION OF THE WELL.

CDM
3-18-88

122-39877

FORMATIONS						
NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA
Unconsolidated Gravel	0	18'				Driller's Record & Geophysical Logs
Devonian Shale	18'	2741'				
Tully Limestone	2741'	2848'				
Hamilton Shale	2848'	3018'				
Onondaga Limestone	3018'	3182'				
Bois Blanc	3182'	3211'				
Akron Dol	3211'	3292'				
Camillus	3292'	3366'				
Syracuse	3366'	3547'				
Salt	3547'	3896'				
Lockport Dol	3896'	4067'			Salt water	
Rochester Shale	4067'	4151'				
Parker Shell	4151'	4189'				
Grimsby Sandstone	4189'	4304'	Gas			
Power Glen Shale	4304'	4350'				
Whirlpool Sandstone	4350'	4367'	Gas			
Queenston Shale	4367'	4496'				
		T.D.				

DATE August 30 1987
APPROVED BY *[Signature]*
TITLE *[Signature]*
RECEIVED
PA GEOLOGICAL SURVEY
104 & 1st Geology Division

GEOLOGIC DATA

MAXIMUM INJECTION PRESSURE CALCULATIONS

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

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

R. Trisket #1

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

Where:

ISIP = 2150 psi

SG = 1.218

D = 4253

R. Trisket #2

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

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

$$MIP = [FG - (.433 \times SG)] \times D$$

	Bittering #1	Bittering #4
Depth:		
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)
Bittering #1	-	0.433	1.218	4210	1.027	2103
Bittering #4	-	0.433	1.218	4285	1.027	2141

GEOLOGIC DATA

BITTINGER #1 WELL RECORD

FORMATIONS						
NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA
Unconsolidated Gravel	0'	37'			Fresh @ 25'	Driller's record and geophysical logs
Devonian Shale	37'	2679'				
"Tully" Ls	2679'	2785'				
Hamilton Shales	2785'	2955'				
Onondaga	2955'	3129'				
Unconformity Interval	3129'	3145'				
Akron-Bertie	3145'	3220'			Salt @ 3935'	
Camillus	3220'	3298'				
Syracuse	3298'	3525'				
Vernon	3525'	3784'				
Salt Zone	3504'	3709'	4430'			
Lockport	3784'	4009'				
Rochester	4009'	4113'				
Irondequoit-Reynales	4113'	4150'				
Grimsby	4150'	4265'				
Power Glen	4265'	4316'				
Whirlpool	4316'	4331'				
Queenston	4331'	TD				
TD	4431					

June 21, 1984
DATE

Douglas K. Walch
APPROVED BY Douglas K. Walch

Geophysicist
TITLE

GEARHART

COMPENSATED DENSITY
SIDE WALL NEUTRON
LOG
BOREHOLE VOLUME

FILING NO.

COMPANY U.S. ENERGY DEVELOPMENT CORPORATION

WELL BITTINGER NO. 1

FIELD COLUMBUS

COUNTY WARREN STATE PENNSYLVANIA

LOCATION PERMIT NO: WAR-33914

Other Services
GR-DLL
LASERLOG-
(WEL)SEC COLUMBUS
TWP RGE

G.L.

Elev.

Elev. K.B.

D.F.

G.L.

K.B.

10 Ft. Above Perm. Datum

Drilling Measured from K.B.

Date 12-29-83

Run No. ONE

Depth - Driller 4467

Depth-Logger 4431

In logged interval 4429

Top logged interval 411

Type fluid in hole SALT BRINE

Density N.A.

pH N.A.

Max rec. temp., deg F. 104

Source of Samples N.A.

Rm @ Meas. Temp. N.A.

Rmf @ Meas. Temp. N.A.

Rmc @ Meas. Temp. N.A.

Source Rmf N.A.

End Circulation N.A.

Logger on Bottom 2:31

Recorded By S. CASS

Witnessed By MR. HALL

Run No. Bit

Hole Record

To

Size

Wat.

Casing Record

From

EQUIPMENT DATA

LOGGING UNIT	LOCATION	DENSITY				SIDE WALL NEUTRON			
		GAMMA RAY TOOL NO.	TOOL NO.	Source No.	TYPE	STG.	TOOL NO.	Source No.	TYPE
7528	MEADVILLE	4285	2643	CSV-306	CS 137	2 CI	7153	711-1-321	AMBE
									241

CALIBRATION DATA

GAMMA RAY		DENSITY				SIDE WALL NEUTRON			
BKG. CPS	STD CPS	MAGNESIUM		ALUM/NUM		TEST BLOCK		CALIPER	
		LS	SS	LS	SS	LS	SS	4"	8"
131.4	586.8	1099.2	620.4	246.7	429.7			1166	4060
								23	260
								751	411

LOGGING DATA

GENERAL			GAMMA RAY		DENSITY			SIDE WALL NEUTRON						
DEPTH IM	TO	SPEED FPM	TC	API/CD	TC	MATRIX DENSITY	FLUID DENSITY	TC	MATRIX TYPE	A	FIXED BIAS	TEMP. GRAO.	SALTS NACL PPM	MUD WT.
29	4144	30	AUTO	20	AUTO	2.68	1.1	AUTO	LS	2	.97	1.2	100,000	9.0
44	3300	45	AUTO	20	AUTO	2.83	1.1	AUTO	LS	2	.97	1.2	100,000	9.0
00	411	45	AUTO	20	AUTO	2.71	1.1	AUTO	LS	2	.97	1.2	100,000	9.0

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1-29-83


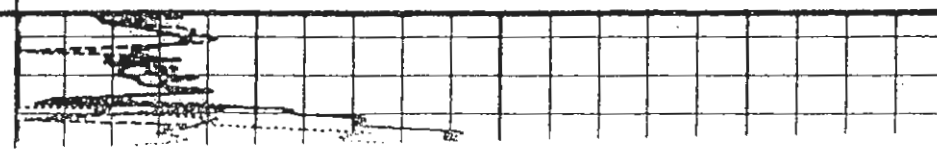
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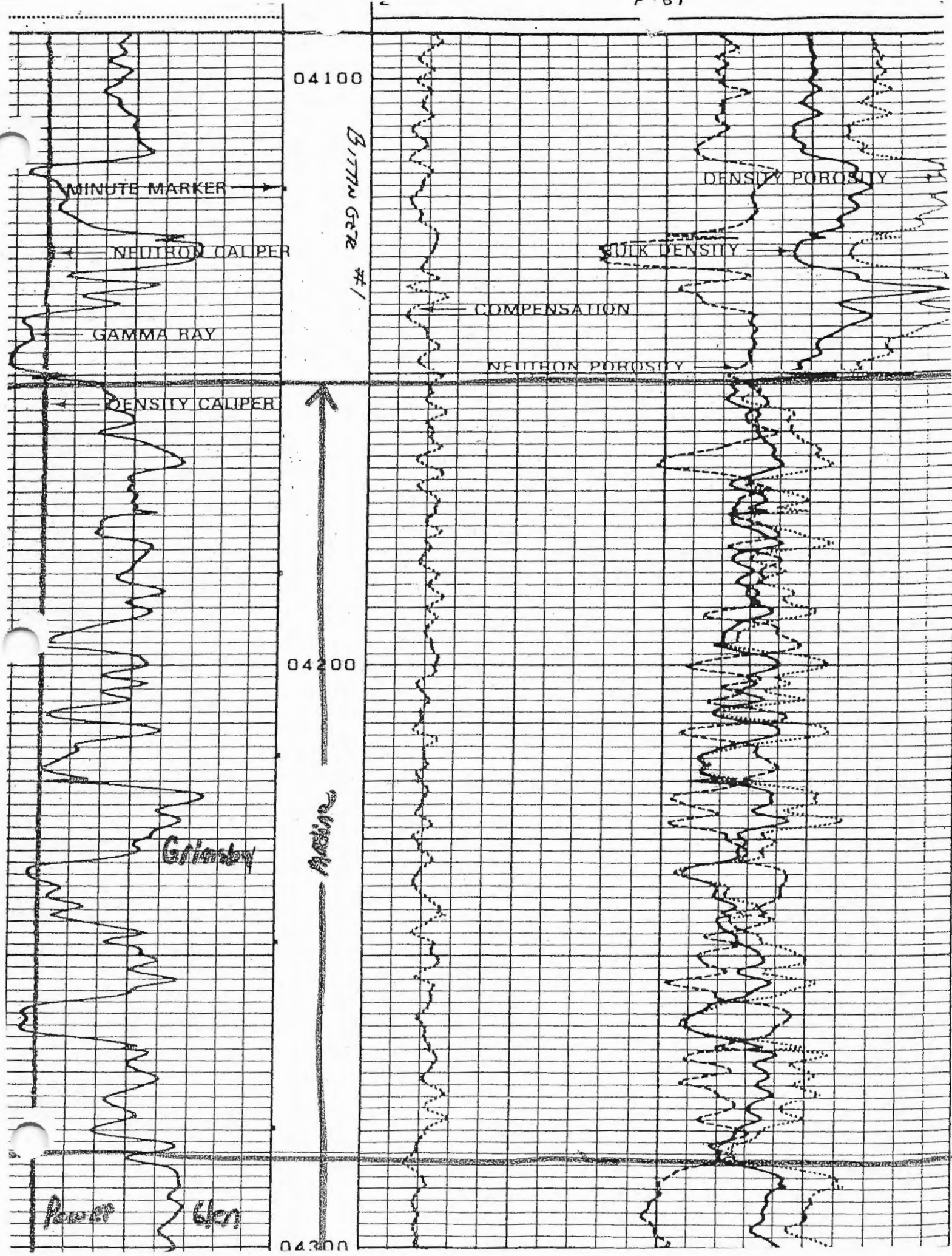
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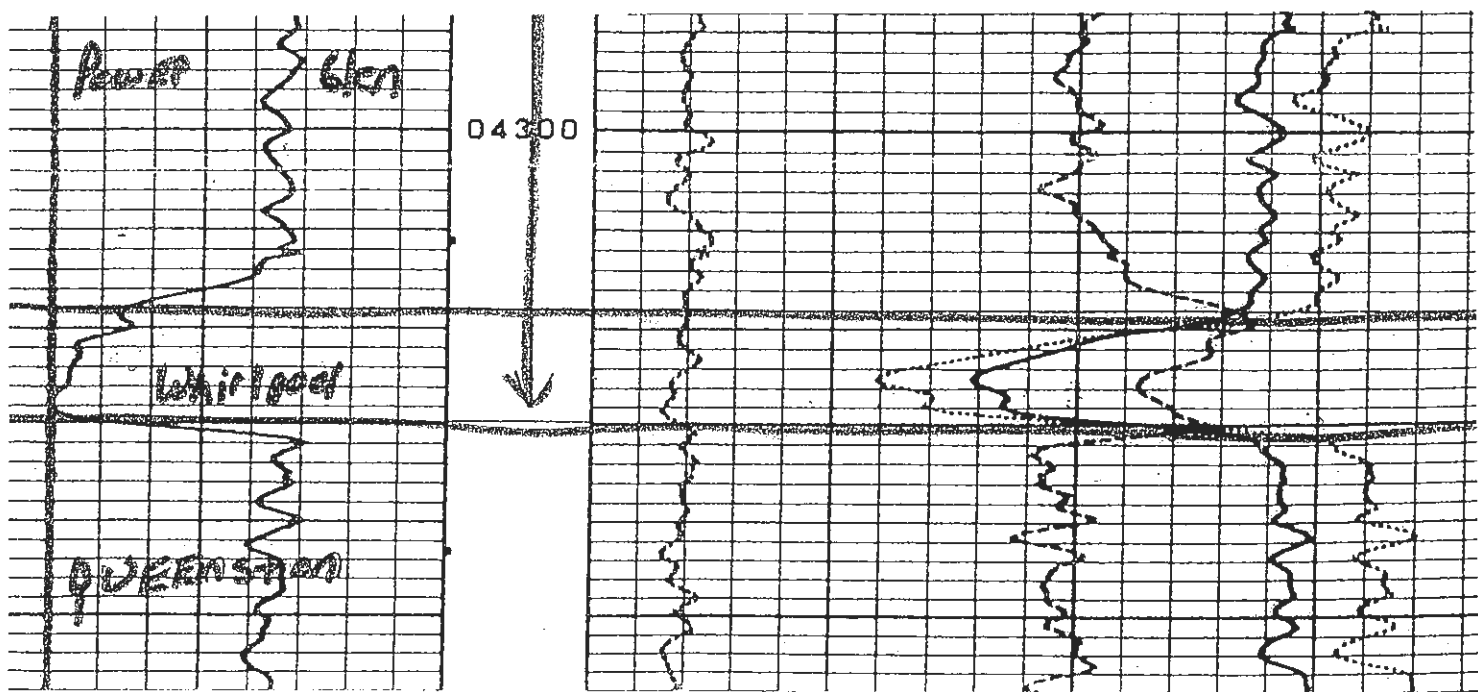
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0008-02

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GR API	200	-0.05	ΔP	0.45
GR API	400	30	ϕ (SNL)	-
Y - CAL	16	30	ϕ (CDL)	-
X - CAL	16	2	P (B)	
				





GEOLOGIC DATA

R. TRISKET #1 WELL DATA

WORKOVER TREATMENT REPORT

WELL NAME: R. TRISKET #1 ACCT. # 9288 PROGRAM BAYLON/DOMAC '84

DATE WORK PERFORMED: 9/11/91

WORKOVER PERORMED:

7 A.M. - S.R. crew at our shop

Move rig to R. Trisket #1

7:30 - R.U. open well to tank

8:30 - Start out with tubing

11:30 - Tubing out

12 Noon - Swabbed - checked T.D. SL TD = 4325' 11' pocket

12:15 - Swab casing - Fl = 4100'

3 P.M. - Swabbed back 25 bbls.

3:30 - R.D.

4:30 - Shut down

Water swabbed back is black with sulfur smell

Well Name & No. R. TRISKET #1 Loc. _____
Permit No. WAR-39273 COLUMBUS Twp., WARREN Co., PA

PERFORATION RECORD

Company N.L. MCCULLOUGH Formation MEDINA/WHIRLPOOL Date 12/21/84

Pumped in 500 gal. acid and 500 gal. water, ran Gamma Ray and collar log.
PBTB 4402 ft. Perf. as follows:

4191 - 4251 w/ 10 shots - 4308 - 4314 w/ 4 shots
- - - w/ - shots - - - w/ - shots
- - - w/ - shots - - - w/ - shots

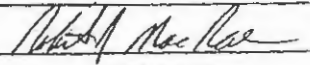
Size of shots .42 Total Shots 14

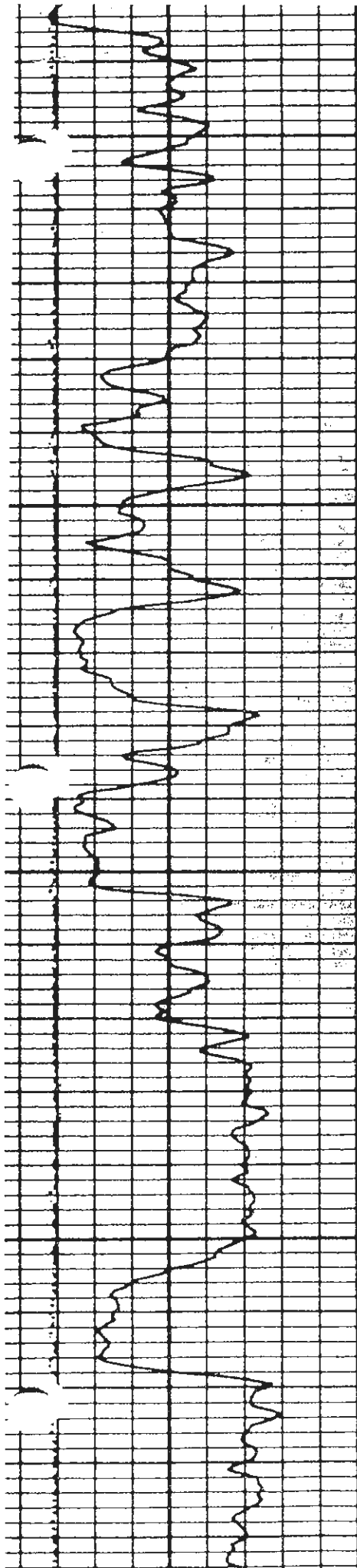
Company DOWELL FRAC JOB Date 12/21/84
Loaded hole. Broke formation @ 2500 # Back to 1750 #. Pumped in 500 gals.
15% Acid @ 27 BPM @ 3400 #, waited 5 min. & fraced as follows:

	BBLs./min.		# Per Gal.	SAND Size	BPM	Press.
1.	<u>0</u> - <u>96</u>	<u>Pad</u>	<u>- - - -</u>	<u>25</u>	<u>3300</u>	
2.						
3.	<u>96</u> - <u>248</u>	<u>1#</u>	<u>80/100</u>	<u>25</u>	<u>3300</u>	
4.	<u>248</u> - <u>304</u>	<u>2#</u>	<u>80/100</u>	<u>24.5</u>	<u>3400</u>	
5.	<u>304</u> - <u>426</u>	<u>2#</u>	<u>20/50</u>	<u>24.5</u>	<u>3200</u>	
6.	<u>426</u> - <u>591</u>	<u>3#</u>	<u>20/50</u>	<u>27</u>	<u>3150</u>	
7.	<u>591</u> - <u>814</u>	<u>4#</u>	<u>20/50</u>	<u>27</u>	<u>3000</u>	
8.	<u>814</u> - <u>886</u>	<u>Flush</u>	<u>- - - -</u>	<u>27</u>	<u>3100</u>	
9.						
10.						
11.						
12.						
13.						
14.						
15.						
16.						
17.						
18.						
19.						
20.						

ISIP 2150 # 5 MIN. 2050 # Job complete 4:45 P.M.
Open to pit 5:15 PM Flowed back 24 hrs. Total water 886 bbls.
60,000 # 20/40 & 10,000 # 80/100. Avg. pump rate 26 BPM @ 3200 # Press.
HHP used 2039. Nitrogen used 145,000 SCF

REMARKS: Increase rate at 480 bbls. to 27 BPM - Increase Nitrogen to 4800SCF per minute.


ENGINEER



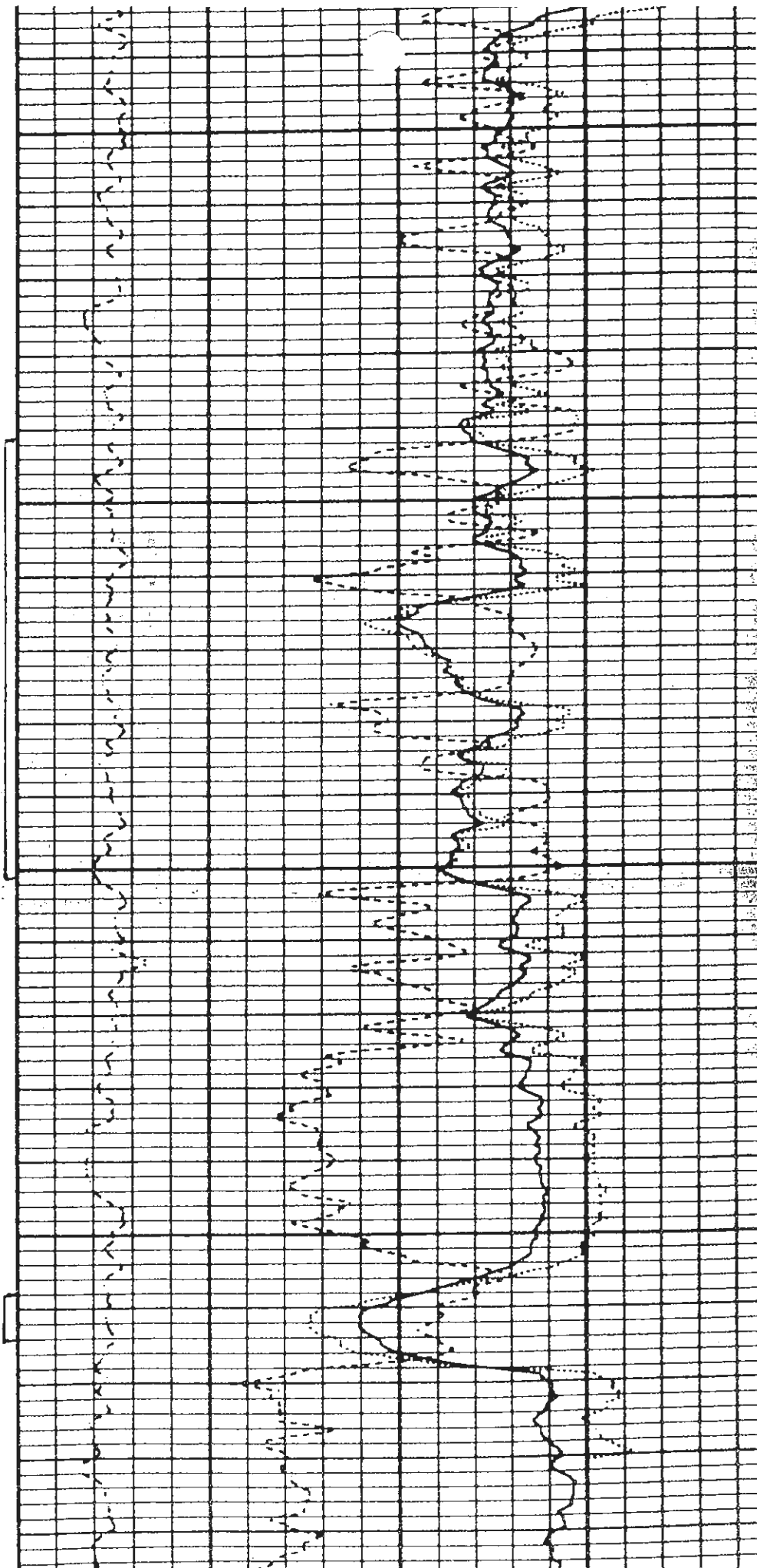
R. T. 13R 577 #1

4200

105

4300

4/3



WELL TREATMENT REPORT

WAK-37813

WELL PRINTED IN U.S.A.

DOWELL DIVISION OF DOW CHEMICAL U.S.A.

DATE

12/21/94

WELL NAME AND NUMBER

P. TRISKET #1

LOCATION (LEGAL)

Columbus Lp.

DOWELL LOCATION

Cory LA

TREATMENT NUMBER

01-16-8007

PAGE

OF

PAGES

ALLOWABLE PRESSURE

TUBING

CASING

ANNULUS

TBG:

CSG:

VAPOR PSI

OIL

GAS

WATER

INJ.

AGE OF WELL

TOTAL DEPTH

BHT. (LOG)

NEW WELL

REWORK

4423'

CASING SIZE

WT.

DEPTH

TUBING SIZE

WT.

DEPTH

TYPE OR GRADE

TYPE OR GRADE

LINER SIZE

WT.

TOP-BOTTOM

PACKER TYPE

PACKER DEPTH

OPEN HOLE

CASING VOL.

TUBING VOL.

ANNULAR VOL.

PERFORATED INTERVALS

TOP	TO	BOTTOM	NO. OF HOLES	TOP	TO	BOTTOM	NO. OF HOLES
4191	TO	4318	14		TO		
	TO				TO		
	TO				TO		
	TO				TO		

COUNTY / PARISH

WALLEN.

STATE

NY. P.B.

TYPE OF SERVICE

Acidizing

Sand Control

Fracturing

Other

SERVICE NAME

WT 30 w/r 2.

CUST. NAME

U.S. ENERGY

ADDRESS

680 Statler Bld.

CITY, STATE

ZIP CODE

Buffalo N.Y.

SERVICE INSTRUCTIONS:

FOR CONVERSION PURPOSES 24 BBLs EQUALS 1000 GALLONS

ARRIVED ON LOCATION: 14:00 LEFT LOCATION: 17:00

DIAMETER OF PERFORATIONS = .42

TIME (0001 to 2400)	INJECTION RECORD							PRESSURE		NOTATIONS
	RATE BPM	TYPE OF FLUID	DENSITY	INCREMENT VOL. BBLs	CUM. VOL. BBLs	PROP. TYPE	PROP. #/GAL	CSG.	TBG.	
14:00										Pre-Job Safety Meeting
15:10										Pre-Job Pressure Test To 3000 psi
15:30	23	wt 30			0			2500	1750	break down.
16:00	0							1750		shot down.
16:32	27							3450		estab. rate displacement
16:33	25	wt 30 w/r 2			18			3400		start fract.
16:36	25				96	100	1#	3300		start sand
16:42	24				246	11	2#	3250		increase sand.
16:44	24.5				296	20	2#	3300		10000# 100 in. st. 20%
16:49	26				428		3#	3150		increase sand.
16:50	27						11	3000	3150	" Rate. up 4000#
16:55	27				540		4#	3200		increase sand.
17:00	27						11	3100		
17:02	28	—			814			3000		10000# 100 in. 14500# 100 in. st. flush.
17:05	27				882			3150		flush in, shot down.

FRAC. GRADIENT,

AVG. INJECTION RATES

MATERIALS CHARGED FOR:

TOTAL FLUID

LIQ

26 BPM.

W/PROP

26 BPM.

2886

BBLs

TOTAL PROP

70000#

LBS

TREATING PRESSURE SUMMARY

3500

FINAL 3150

AVG 3200

2150

2050

IMMED. S.D.P.

45 MIN. SIP

MTRL

QUANTITY

MTRL

QUANTITY

200 sand.

10000#

J-818

55#

200 sand.

6000#

L-56

150#

J-866

950#

M-76

15 gal.

L-55

45 gal.

F75N

45 gal.

PRODUCTION PRIOR TO THIS TR.

Test

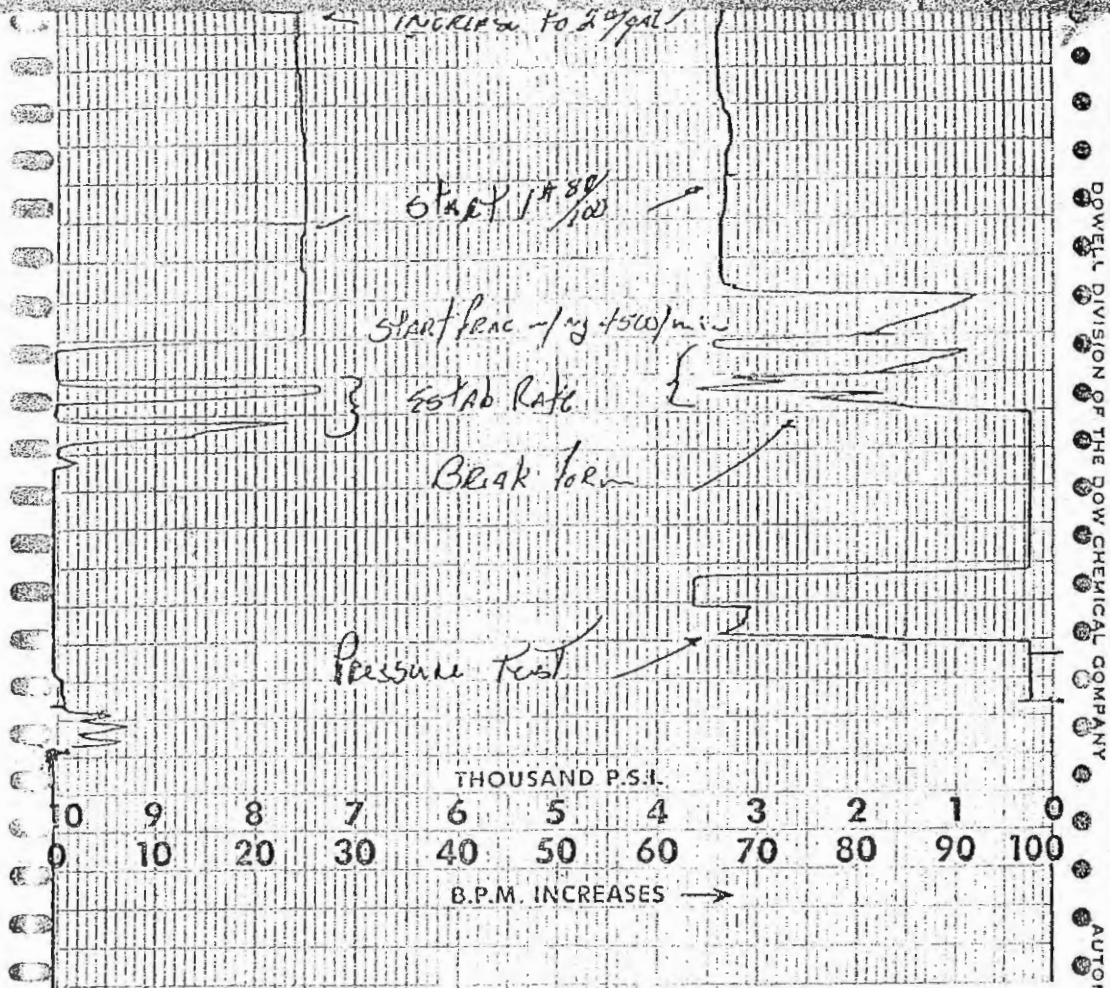
Stabilized

CUSTOMER REPRESENTATIVE

DOWELL SERVICE SUPERVISOR

R. McRAE

J.R. Schuffel.



DOWELL DIVISION OF DOW CHEMICAL U.S.A.

RECORDED SERVICE TREATMENT NO. 01-16-8707

TYPE OF SERVICE wt 30-1 mg DATE 12/21/84

OWNER <u>U.S. Energy</u>	WELL NAME AND NUMBER <u>R. Trisket #1</u>
OWNER'S REPRESENTATIVE <u>B. McRae</u>	SERVICE ENGINEER <u>J. R. Schubert</u>

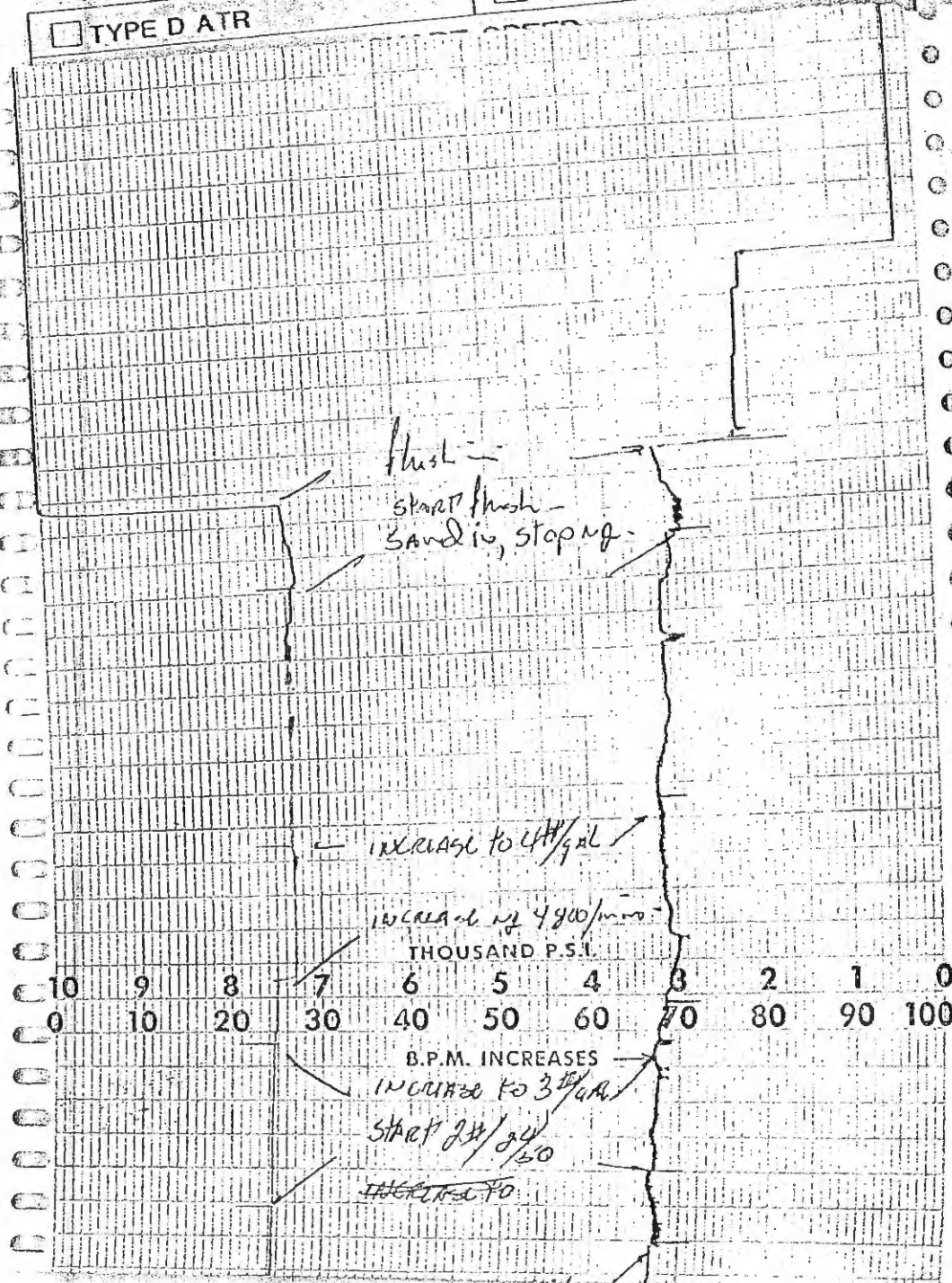
REMARKS:

DOWELL DIVISION OF THE DOW CHEMICAL COMPANY
AUTOMATIC TREATMENT RECORD - 1" CH

PLEASE CHECK APPROPRIATE BOXES

☐ TYPE D ATR

☐ TYPE C ATR



GEOLOGIC DATA

R. TRISKET #2 WELL DATA

HALLIBURTON SERVICES

HALLIBURTON
DIVISION

Pittsburgh, Pa

HALLIBURTON
LOCATION

Bradford, Pa

STIMULATING SERVICE TREATING REPORT

R. TRISKETT #2

BILLED ON
TICKET NO. 896925-7

WELL DATA

Well Name Columbus Sec. _____ Twp. _____ Rng. _____ County Warren State Pa

Formation Name _____ Type _____

Formation Thickness _____ From _____ To _____

Initial Prod: Oil _____ Bpd. Water _____ Bpd. Gas _____ Mcfd.

Current Prod: Oil _____ Bpd. Water _____ Bpd. Gas _____ Mcfd.

Completion Tool # _____ Mandrel Size _____ Extensions _____ In.

Well Type _____ Set At _____

Bottom Hole Temp. _____ RBP@ _____

Well Or Flange _____ Pstd _____

	NEW USED	WEIGHT	SIZE	FROM	TO	MAXIMUM PSI ALLOWABLE
CASING	N	10.5	4 1/2	0	4389	
LINER						
TUBING						
OPEN HOLE						SHOTS/FT.
PERFORATIONS			.39	4201	4307	8
PERFORATIONS						
PERFORATIONS						

MATERIALS

JOB DATA

Water Fluid H₂O Density 8.33 Lb./Gal. @ API

Oil Fluid H₂O Density 8.33 Lb./Gal. @ API

Proppant Type Sand Size 80/100 Lb. 162,000

Proppant Type Sand Size 20/40 Lb. 10,000

Radioactive Tracer _____ Carrier _____ Units-MCI

Surfactant Type _____ Gal. _____ @ _____ /1000 Gal.

Surfactant Type _____ Gal. _____ @ _____ /1000 Gal.

Fluid Loss Type _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Sealing Agent _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Sealing Agent LGC-IV Gal.-Lb. 280 @ _____ /1000 Gal.

Drill Bit Type GBW-30 Gal.-Lb. 4 @ _____ /1000 Gal.

Drill Bit Type _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Drill Bit Type _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Drill Bit Type _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Drill Bit Type Citric Acid Gal.-Lb. 200 @ _____ /1000 Gal.

Drill Bit Type ARF-4 Gal.-Lb. 38 @ _____ /1000 Gal.

Drill Bit Type Classta XP Gal.-Lb. 10 @ _____ /1000 Gal.

Drill Bit Type Classta II Gal.-Lb. 80 @ _____ /1000 Gal.

Drill Bit Type _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Drill Bit Type _____ Qty. _____ Size _____ S.G. _____

CALLER OUT DATE	ON LOCATION DATE	JOB STARTED DATE	JOB COMPLETED DATE
01/05/90	01/05/90	01/05/90	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	3298 H400	
R. Wheeler	2683 H400	
K. Thompson	5997 m50	
L. Calts	8892 I 400	
Caldwell	3305 56P	
M. English	3302 56D	
J. Piscarella	9911 TD	
J. Gould	3905 46C	
		RBP cantland

ACID DATA

Acid Type _____ % _____ Gal.-Bbl.

Acid Type _____ % _____ Gal.-Bbl.

Surfactant Type _____ Gal. _____ @ _____ /1000 Gal.

Surfactant Type _____ Gal. _____ @ _____ /1000 Gal.

Sealing Agent Type _____ Gal. _____ @ _____ /1000 Gal.

Drill Bit Control Type _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Corrosion Inhibitor _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Corrosion Inhibitor _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Sealing Inhibitor _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Sequester _____ Gal.-Lb. _____ @ _____ /1000 Gal.

Drill Bit Reducer _____ Gal.-Lb. _____ @ _____ /1000 Gal.

PRESSURES IN PSI

SUMMARY

VOLUMES

Fracture Displacement 3601

Fracture Maximum 4600

Fracture Gradient 2100

Fracture 5 Min. 2180 10 Min. _____ 15 Min. _____

Fracture 1500 Available 2180 Used 1480

AVERAGE RATE IN BPM

Displ. 16.7 Overall 16.7

Preflush: Bbl.-Gal. _____ Type _____

Load & Bkdn: Bbl.-Gal. 5318 Pad: Scf-Bbl.-Gal. _____

Treatment: Bbl.-Gal. 20460 Displ: Bbl.-Gal. 2860

Gas Assist _____ Tons-Scf _____ @ _____ Scf./Bbl.

Foam Quality _____ % Total Volume Foam _____ Bbl.-Gal.

Total Volume: Bbl.-Gal. 28624 Fluid-Foam _____

REMARKS

WATER FRACTURING

DATE 01/05

WILLIBURTON SERVICES
JOB LOG
WELL NO. #2 LEASE R. TrisketTICKET NO. 896925-7CUSTOMER U.S. EnergyPAGE NO. 1

IRM 2013 R-2

JOB TYPE Water Frac upDATE 01/05/90

CHART NO.	TIME	RATE (BPM)	VOLUME (BBL) (GAL)	PUMPS		PRESSURE (PSI)		DESCRIPTION OF OPERATION AND MATERIALS
				T	C	TUBING	CASING	
								Safety meeting
	1410			4				Pick up Pump
	12 1/2			2		4176		Test Lines
	14		2462	4		570		Lead Hole
	30 3/4			4		3367		Pad
	35 1/4		2856			3868		Start Sand 80/100 1 PPG
	43		5000			3830		Inc Sand 80/100 2 PPG
	46 3/4		7630			3206		Start Sand 20/40 2 PPG
	59 1/2		5000			3551		Inc Sand 3 PPG
	1508		15000			3551		Inc Sand 4 PPG
	12		17856			3523		Sand on Bottom
	15 3/4		20450			3939		Finish Sand
	19 1/2		2856			380		Finish Flush
	19 1/2					2100		FSIP
	24 1/2					2180		5 min

Avg Psi 360

HHP 1480

ALLEGHENY

NUCLEAR

SURVEYS INC.

U.S. ENERGY DEV. CORP.

R. TRISKET # 2

DENSITY / NEUTRON

LOCATION COLUMBUS QUAD. PRVNC/CO. WARREN FIELD COLUMBUS TWP. WELL, R. TRISKET # 2 COMPANY: U.S. ENERGY DEV. CORP.	COMPANY U.S. ENERGY DEV. CORP.			
	WELL R. TRISKET # 2			
	FIELD COLUMBUS TWP.			
	PROVINCE/COUNTY WARREN			
COUNTRY/STATE USA / PA				
PERMIT NUMBER 37-123-40751				
LOCATION COLUMBUS QUAD.				OTHER SERVICES ANALYSIS DFE
LSD	SEC	TWP	RCE	
PERMANENT DATUM GROUND LEVEL . ELEVATION 1508				ELEVATIONS:
LOG MEASURED FROM KB 12 FT. ABOVE PERMANENT DATUM				KB 1520
DRILLING MEASURED FROM K.B.				DF 1519
				CL 1508
DATE	18-DEC-89			
RUN NUMBER	ONE			
DEPTH-DRILLER	4425			
DEPTH-LOGGER	4429			
FIRST READING	4419			
LAST READING	0			
CASING-DRILLER	522			
CASING-LOGGER	516			
BIT SIZE	7 7/8			
HOLE FLUID TYPE	BRINE			
DENS./VISC.				
PH/FLUID LOSS				
SAMPLE SOURCE				
RM @ MEAS TEMP				
RMF @ MEAS TEMP				
RMC @ MEAS TEMP				
SOURCE: RMF/RMC				
RM @ BHT				
TIME SINCE CIRC				
MAX REC TEMP				
EQUIPMENT/BASE	"267"	PA		
RECORDED BY	C. SHERRELL			
WITNESSED BY	T. ROBERTS			
WITNESSED BY	D. VALCH			

LOGGED 9-OCT-89

PROCESSED

PLOTTED 10-FEB-89

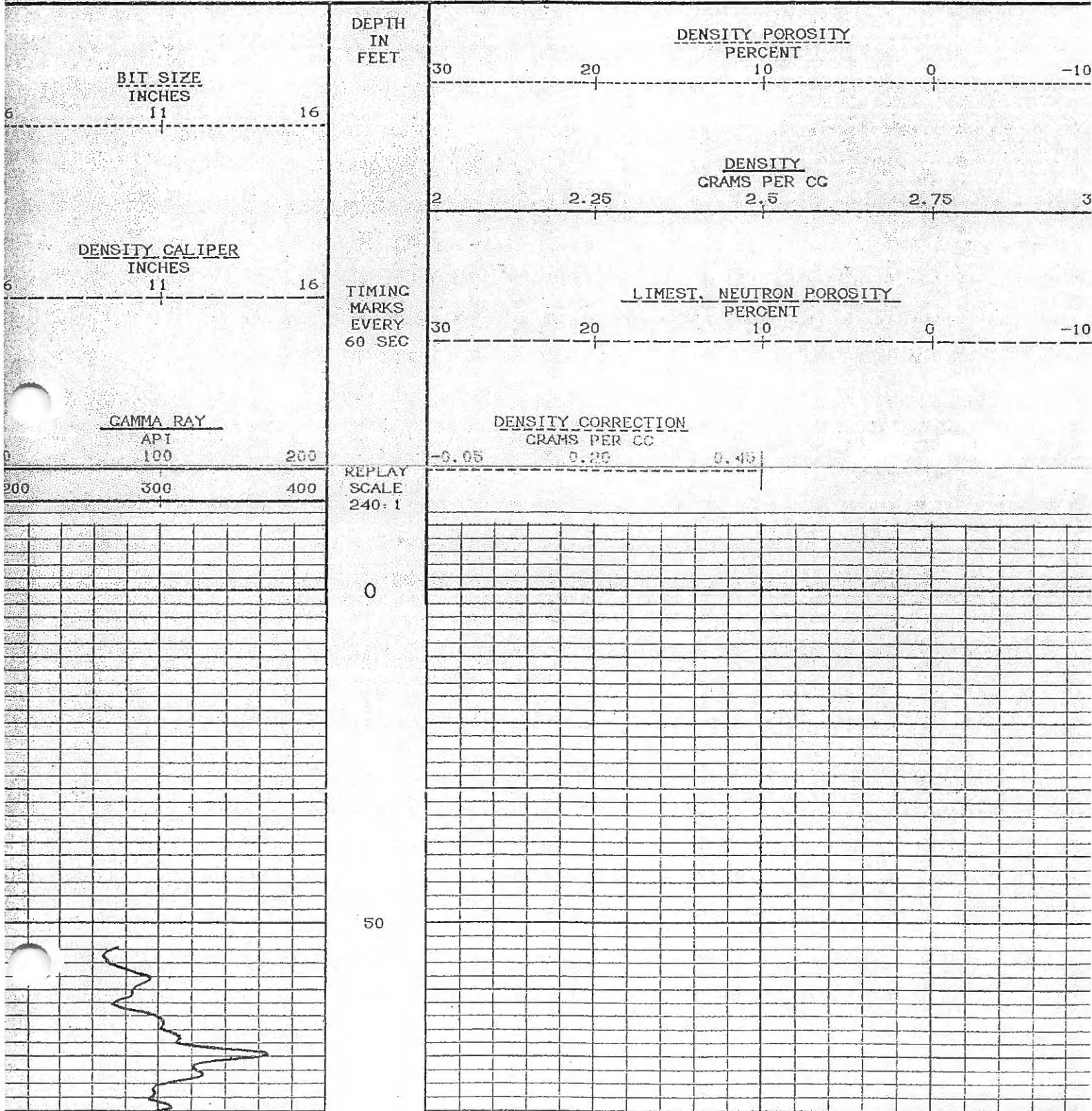
ALL INTERPRETATIONS ARE OPINIONS BASED ON INFERENCES FROM ELECTRICAL OR OTHER MEASUREMENTS AND WE CANNOT, AND DO NOT, GUARANTEE THE ACCURACY OR CORRECTNESS OF ANY INTERPRETATIONS. AND WE SHALL NOT, EXCEPT IN THE CASE OF GROSS OR WILFUL NEGLIGENCE ON OUR PART, BE LIABLE OR RESPONSIBLE FOR ANY LOSS, COSTS, DAMAGES OR EXPENSES INCURRED OR SUSTAINED BY ANYONE RESULTING FROM ANY INTERPRETATION MADE BY OUR OFFICERS, AGENTS OR EMPLOYEES. THESE INTERPRETATIONS ARE ALSO SUBJECT TO OUR GENERAL CONDITIONS AS SET OUT IN OUR CURRENT PRICE SCHEDULE.

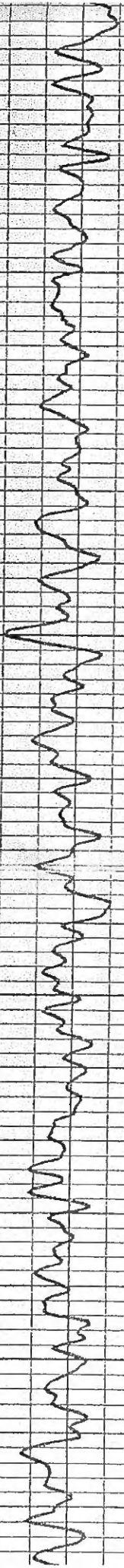
MAIN LOG

DEPTH BASED DATA - MAXIMUM SAMPLING INCREMENT 10.0 CMS. . RECORDED @ 18-DEC-89 17:57:11

PLOTTED ON 18-DEC-89, FILE # 2, ID: MAIN LOG

TAPE ID: DENSITY / NEUTRON



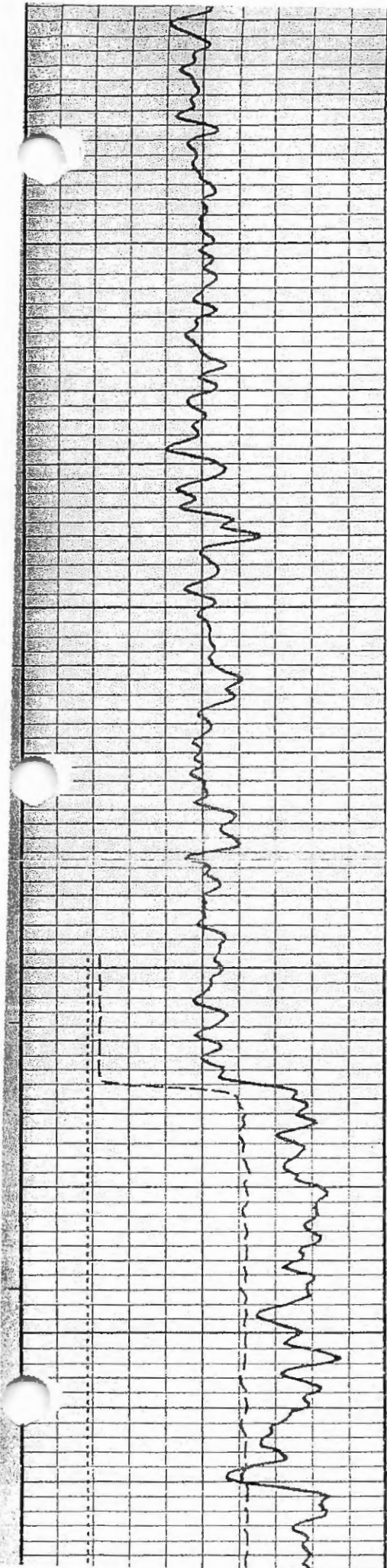


150

200

250

300

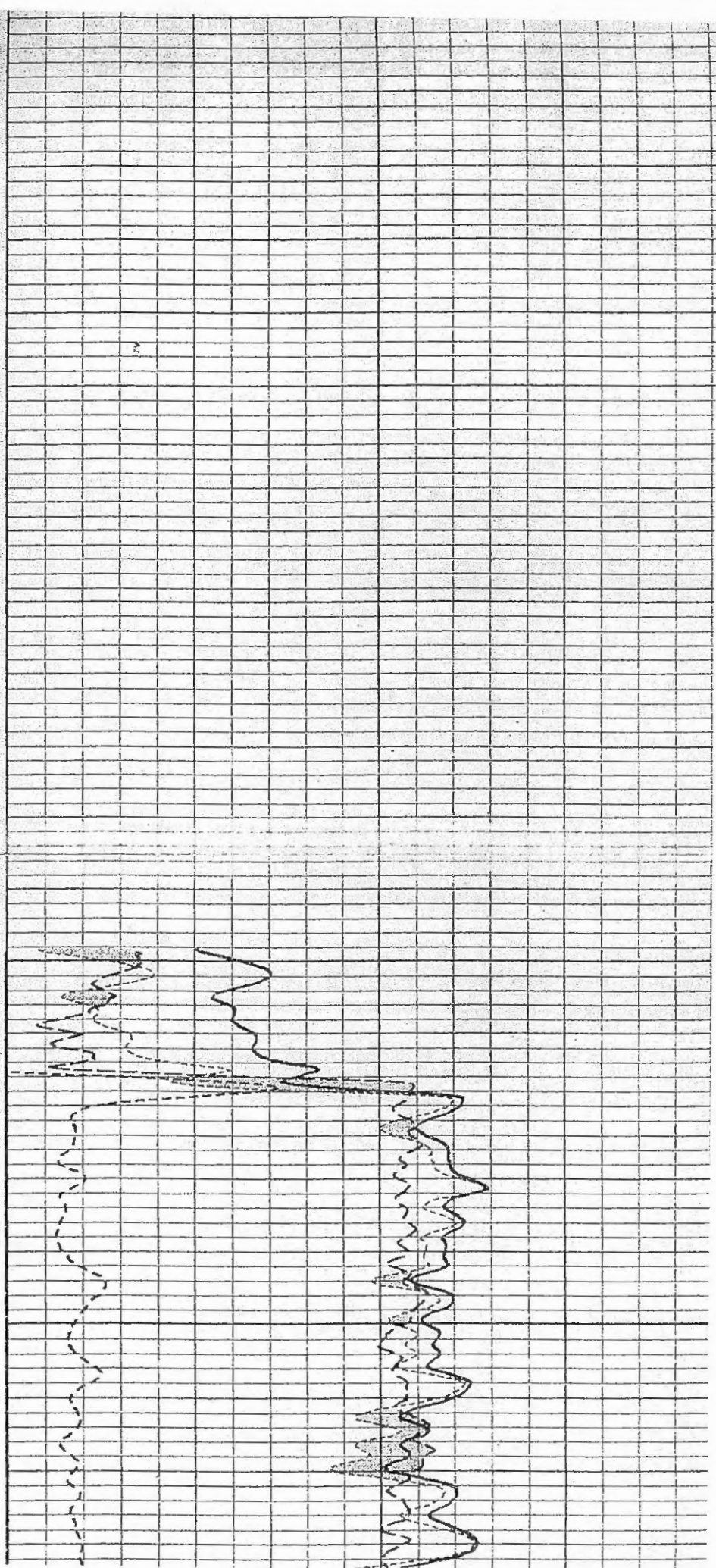


400

450

500

550



Operating Data

The proposed commercial brine disposal well will primarily be utilized to inject produced and flow-back water from wells completed in the Marcellus Shale, the Medina Group and other natural gas and oil producing formations. Other oil and gas related wastewaters associated with the production of oil and natural gas or natural gas storage operations, which are approved by EPA for injection under a UIC Class II D injection well, may also be injected. According to Title 40 Chapter I Sec. 144.6 (b)(1), such fluids include those "Which are brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection."

Injection Rate

Injectivity testing performed on the proposed injection well (Bittinger #4) indicated the well may be capable of sustaining injection rates on at least a short-term basis on the order of 3 bbl/min or approximately 4,300 bbl/day. Considering this was a relatively short-term test, a maximum injection rate of 2,000 bbl/day is proposed for operation of the facility, with an average injection rate of 1,000 bbl/day expected.

Maximum Allowable Surface Injection Pressure (MASIP) and Average Surface Injection Pressure

MASIP calculations based on EPA approved equations are included in the "Geologic Data" section of this application. Based on these calculations, the proposed MASIP is 2141 psi. It is estimated that the average surface injection pressure will be approximately 1000 psi.

Laboratory Analysis of Injection Fluid Samples

Laboratory samples representative of the types of brine which will be injected into the proposed injection well are attached. Samples were collected from produced water generated from gas wells in the vicinity of the injection well. The samples are characterized by chloride concentrations in the 200,000 mg/L range and specific gravity of approximately 1.2.

Monitoring of Injection Fluid Samples and Well

The following identifies the UIC Class II underground injection well regulatory requirements and operational procedures which will be conducted to meet the subject requirements:

1. **Monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics.** An initial sample of fluid will be collected and analyzed from initial loads proposed for disposal from new disposal customers. In addition, samples will be collected for analysis from new types of sources (e.g., from different geologic formations, geographic regions, etc.) which would be expected to differ significantly from brine previously characterized for disposal at the facility. Samples will be analyzed for the following parameters at a minimum: specific gravity, total dissolved solids, and pH.
2. **Observation of injection pressure, flow rate, and cumulative volume at least weekly based on the regulatory requirements for produced fluid disposal operations.** Injection pressures, flow rate, and cumulative volume will be continuously recorded electronically.

3. **A demonstration of mechanical integrity pursuant to 40 CFR Sec. 146.8 at least once every five years during the life of the injection well.** A mechanical integrity test will be performed prior to initiating injection and at least once every five years.
4. **Maintenance of the results of all monitoring until the next permit review.** All monitoring records will be maintained throughout the life of the well.

Reporting requirements consist of the following:

An annual report will be submitted to EPA summarizing the results of the required monitoring, including monthly records of injected fluids, and any major changes in characteristics or sources of injected fluid.

Proposed Annulus Fluid

The proposed annulus fluid for the proposed injection well will consist of fresh water and a water soluble corrosion inhibitor. The corrosion inhibitor will be mixed in accordance with the manufacturer's recommendations then loaded into the well annulus prior to conducting injection operations. Product information for the type of corrosion inhibitor which will be utilized is attached. A similar type product may be used instead of the example product referenced.

Facility Layout and Operation

As indicated in the attached facility layout diagram, the injection well facility will include a truck unloading area and holding tanks connected by piping with associated valves, all of which will be situated in a diked containment area. The containment area will be properly sized to account for the entire volume of the largest container, plus 10% freeboard, in the event of a leak. The brine will be transferred to the injection well utilizing injection pumps situated in the Equipment Shed along with filters and monitoring equipment. Automatic shut-off valves will be incorporated into the tank design to prevent overflow during filling operations. The facility will be surrounded by a fence having locking entrance and exit gates. A security camera will also be strategically situated on the site. The facility will be continually manned during unloading and injection operations. As indicated above, injection rate, cumulative volume and pressures will be continuously measured and recorded.

OPERATING DATA
TYPICAL BRINE LABORATORY ANALYSIS



August 26, 2010

Larry Drane
Tetra Tech NUS
661 Andersen Drive
Foster Plaza 7
Pittsburgh, PA 15220

RE: Project: Bittinger
Pace Project No.: 3032291

Dear Larry Drane:

Enclosed are the analytical results for sample(s) received by the laboratory on August 12, 2010. The results relate only to the samples included in this report. Results reported herein conform to the most current NELAC standards, where applicable, unless otherwise narrated in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Rachel D Christner

Rachel Christner for
Timothy Reed
timothy.reed@pacelabs.com
Project Manager

Enclosures

REPORT OF LABORATORY ANALYSIS

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CERTIFICATIONS

Project: Bittinger
Pace Project No.: 3032291

Pennsylvania Certification IDs

1638 Roseytown Road Suites 2,3&4, Greensburg, PA 15601
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California/NELAC Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH 0694
Delaware Certification
Florida/NELAC Certification #: E87683
Guam/PADEP Certification
Hawaii/PADEP Certification
Idaho Certification
Illinois/PADEP Certification
Indiana/PADEP Certification
Iowa Certification #: 391
Kansas/NELAC Certification #: E-10358
Kentucky Certification #: 90133
Louisiana/NELAC Certification #: LA080002
Louisiana/NELAC Certification #: 4086
Maine Certification #: PA0091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457

Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nevada Certification
New Hampshire/NELAC Certification #: 2976
New Jersey/NELAC Certification #: PA 051
New Mexico Certification
New York/NELAC Certification #: 10888
North Carolina Certification #: 42706
Oregon/NELAC Certification #: PA200002
Pennsylvania/NELAC Certification #: 65-00282
Puerto Rico Certification #: PA01457
South Dakota Certification
Tennessee Certification #: TN2867
Texas/NELAC Certification #: T104704188-09 TX
Utah/NELAC Certification #: ANTE
Virgin Island/PADEP Certification
Virginia Certification #: 00112
Washington Certification #: C1941
West Virginia Certification #: 143
Wisconsin/PADEP Certification
Wyoming Certification #: 8TMS-Q

Indiana Certification IDs

7726 Moller Road, Indianapolis, IN 46268
Illinois/NELAC Certification #: 100418
Indiana Certification #: C-49-06
Kansas Certification #: E-10247

Kentucky Certification #: 0042
Ohio VAP: CL0065
Pennsylvania: 68-00791
West Virginia Certification #: 330

REPORT OF LABORATORY ANALYSIS

Page 2 of 14

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SAMPLE ANALYTE COUNT

Project: Bittinger
Pace Project No.: 3032291

Lab ID	Sample ID	Method	Analysts	Analytes	
				Reported	Laboratory
3032291001	Bittinger #4	EPA 200.7	SAB	1	PASI-PA
		ASTM D5057	DDM	1	PASI-I
		EPA 9251	DJT	1	PASI-PA
		ASTM D516-90,02	BKH	1	PASI-PA

REPORT OF LABORATORY ANALYSIS

Page 3 of 14

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PROJECT NARRATIVE

Project: Bittinger
Pace Project No.: 3032291

Method: EPA 200.7
Description: 200.7 Metals, Total
Client: Tetra Tech NUS
Date: August 26, 2010

General Information:

1 sample was analyzed for EPA 200.7. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Sample Preparation:

The samples were prepared in accordance with EPA 200.7 with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: MPRP/4378

A matrix spike and matrix spike duplicate (MS/MSD) were performed on the following sample(s): 3032227008, 3032454001

M0: Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.

- MS (Lab ID: 204064)
- Iron

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS

Page 4 of 14

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PROJECT NARRATIVE

Project: Bittinger
Pace Project No.: 3032291

Method: ASTM D5057
Description: Specific Gravity/Bulk Density
Client: Tetra Tech NUS
Date: August 26, 2010

General Information:

1 sample was analyzed for ASTM D5057. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS

Page 5 of 14

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PROJECT NARRATIVE

Project: Bittinger
Pace Project No.: 3032291

Method: EPA 9251
Description: 9251 Chloride
Client: Tetra Tech NUS
Date: August 26, 2010

General Information:

1 sample was analyzed for EPA 9251. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

REPORT OF LABORATORY ANALYSIS

Page 6 of 14

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PROJECT NARRATIVE

Project: Bittinger

Pace Project No.: 3032291

Method: ASTM D516-90,02

Description: ASTM D516-9002 Sulfate Water

Client: Tetra Tech NUS

Date: August 26, 2010

General Information:

1 sample was analyzed for ASTM D516-90,02. All samples were received in acceptable condition with any exceptions noted below.

Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

Method Blank:

All analytes were below the report limit in the method blank with any exceptions noted below.

Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: WETA/5039

A matrix spike and matrix spike duplicate (MS/MSD) were performed on the following sample(s): 3032270002

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 206381)

- Sulfate

Duplicate Sample:

All duplicate sample results were within method acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

REPORT OF LABORATORY ANALYSIS

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ANALYTICAL RESULTS

Project: Bittinger
Pace Project No.: 3032291

Sample: Bittinger #4		Lab ID: 3032291001	Collected: 08/10/10 22:00	Received: 08/12/10 08:45	Matrix: Water			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
200.7 Metals, Total	Analytical Method: EPA 200.7 Preparation Method: EPA 200.7							
Iron	203000	ug/L	500	10	08/16/10 13:16	08/26/10 11:55	7439-89-6	
Specific Gravity/Bulk Density	Analytical Method: ASTM D5057							
Density	1.2	g/mL	0.50	1		08/22/10 16:30		
9251 Chloride	Analytical Method: EPA 9251							
Chloride	242000	mg/L	15000	5000		08/25/10 16:42	16887-00-6	
ASTM D516-9002 Sulfate Water	Analytical Method: ASTM D516-90,02							
Sulfate	191	mg/L	50.0	5		08/21/10 17:11	14808-79-8	

Date: 08/26/2010 05:04 PM

REPORT OF LABORATORY ANALYSIS

Page 8 of 14

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QUALITY CONTROL DATA

Project: Bitlinger
Pace Project No.: 3032291

QC Batch: MPRP/4378 Analysis Method: EPA 200.7
QC Batch Method: EPA 200.7 Analysis Description: 200.7 Metals, Total
Associated Lab Samples: 3032291001

METHOD BLANK: 204058 Matrix: Water
Associated Lab Samples: 3032291001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Iron	ug/L	ND	50.0	08/18/10 10:57	

LABORATORY CONTROL SAMPLE: 204059

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Iron	ug/L	5000	4830	97	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 204061 204062

Parameter	Units	3032454001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Qual
Iron	ug/L	30300	5000	5000	36100	35300	116	101	75-125	2	

MATRIX SPIKE SAMPLE: 204064

Parameter	Units	3032227008 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Iron	ug/L	210000	5000	201000	-168	75-125 M0	

SAMPLE DUPLICATE: 204060

Parameter	Units	3032454001 Result	Dup Result	RPD	Qualifiers
Iron	ug/L	30300	30800	2	

SAMPLE DUPLICATE: 204063

Parameter	Units	3032227008 Result	Dup Result	RPD	Qualifiers
Iron	ug/L	210000	200000	4	

QUALITY CONTROL DATA

Project: Bittinger

Pace Project No.: 3032291

QC Batch: WET/6579

Analysis Method: ASTM D5057

QC Batch Method: ASTM D5057

Analysis Description: Spec.Gravity/Bulk Density,ASTM D5057

Associated Lab Samples: 3032291001

SAMPLE DUPLICATE: 468560

Parameter	Units	3032311001 Result	Dup Result	RPD	Qualifiers
Density	g/mL	1.0	1.0	0	

QUALITY CONTROL DATA

Project: Bittinger
Pace Project No.: 3032291

QC Batch: WETA/5063 Analysis Method: EPA 9251
QC Batch Method: EPA 9251 Analysis Description: 9251 Chloride
Associated Lab Samples: 3032291001

METHOD BLANK: 207248 Matrix: Water
Associated Lab Samples: 3032291001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	ND	3.0	08/25/10 00:00	

LABORATORY CONTROL SAMPLE: 207249

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	40	39.6	99	85-115	

MATRIX SPIKE SAMPLE: 207250

Parameter	Units	3032433007 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Chloride	mg/L	31.9	20	49.1	86	85-115	

SAMPLE DUPLICATE: 207251

Parameter	Units	3032433007 Result	Dup Result	RPD	Qualifiers
Chloride	mg/L	31.9	32.4	1	

QUALITY CONTROL DATA

Project: Bittinger
Pace Project No.: 3032291

QC Batch: WETA/5039 Analysis Method: ASTM D516-90,02
QC Batch Method: ASTM D516-90,02 Analysis Description: ASTM D516-9002 Sulfate Water
Associated Lab Samples: 3032291001

METHOD BLANK: 206379 Matrix: Water
Associated Lab Samples: 3032291001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Sulfate	mg/L	ND	10.0	08/21/10 16:17	

LABORATORY CONTROL SAMPLE: 206380

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	30	29.0	97	85-115	

MATRIX SPIKE SAMPLE: 206381

Parameter	Units	3032270002 Result	Spike Conc.	MS Result	MS % Rec	% Rec Limits	Qualifiers
Sulfate	mg/L	90.0	40	119	72	85-115	M1

SAMPLE DUPLICATE: 206382

Parameter	Units	3032270002 Result	Dup Result	RPD	Qualifiers
Sulfate	mg/L	90.0	89.9	.1	

QUALIFIERS

Project: Bittinger
Pace Project No.: 3032291

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to changes in sample preparation, dilution of the sample aliquot, or moisture content.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

S - Surrogate

1,2-Diphenylhydrazine (8270 listed analyte) decomposes to Azobenzene.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is NELAP accredited. Contact your Pace PM for the current list of accredited analytes.

LABORATORIES

PASI-I Pace Analytical Services - Indianapolis

PASI-PA Pace Analytical Services - Greensburg

ANALYTE QUALIFIERS

M0 Matrix spike recovery and/or matrix spike duplicate recovery was outside laboratory control limits.

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: Bittinger
Pace Project No.: 3032291

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
3032291001	Bittinger #4	EPA 200.7	MPRP/4378	EPA 200.7	ICP/3942
3032291001	Bittinger #4	ASTM D5057	WET/6579		
3032291001	Bittinger #4	EPA 9251	WETA/5063		
3032291001	Bittinger #4	ASTM D516-90,02	WETA/5039		

Date: 08/26/2010 05:04 PM

REPORT OF LABORATORY ANALYSIS

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WATER • AIR • WASTES • FOOD • PHARMACEUTICALS • NUTRACEUTICALS

CERTIFICATE OF ANALYSIS

KCS LENAPE RESOURCES CORP.

9489 ALEXANDER ROAD

ALEXANDER

NY 14005

LAUBER-TEPLONICA

Permit No

Cust P.O.

Date Reported 8/10/01

Date Received 7/13/01

Order No 9931-00207

Invoice No 008010

Cust # K011

Sampled Date 7/09/01

Sampled Time 00:00

Sample Id

Subject: LION ENERGY - BRINE SAMPLE SUBMITTED 7/13/01

IMP	TEST	METHOD	RESULT	UNITS	DATE	TECH
1	LION ENERGY	BRINE SAMPLE				
	% BY WGT SALTS IN BRINE				7/23/01	ERI
	CLION		53.600	MG/L	7/23/01	ERI
	CHLORIDE		165.000	MG/L	7/23/01	ERI
	POTASSIUM		1910	MG/L	7/23/01	ERI
	MAGNESIUM		3130	MG/L	7/23/01	ERI
	SODIUM		89,160	MG/L	7/23/01	ERI
	SPECIFIC GRAVITY		1.215		7/23/01	ERI
	CALCIUM CHLORIDE		7.55	% BY WGT.	7/23/01	ERI
	SODIUM CHLORIDE		16.82	% BY WGT.	7/23/01	ERI
	POTASSIUM CHLORIDE		9.30	% BY WGT.	7/23/01	ERI
	MAGNESIUM CHLORIDE		1.07	% BY WGT.	7/23/01	ERI
	TOTAL CHLORIDES		25.84	% BY WGT.	7/23/01	ERI
	CALCIUM CHLORIDE		6.775	LBS/GAL.	7/23/01	ERI
	SODIUM CHLORIDE		1.707	LBS/GAL.	7/23/01	ERI
	POTASSIUM CHLORIDE		0.010	LBS/GAL.	7/23/01	ERI
	MAGNESIUM CHLORIDE		0.165	LBS/GAL.	7/23/01	ERI
	TOTAL CHLORIDES		2.62	LBS/GAL.	7/23/01	ERI
	WEIGHT OF 1 GALLON OF BRINE		10.15	LBS/GAL.	7/23/01	ERI

ANALYSIS BY NYS LAB: 10121

$$S.G. = \frac{10.15 \text{ #/GAL}}{8.33 \text{ #/GAL}} = \underline{1.218}$$

Certificate Of Analysis Continued On Next Page

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USDA-EPA-NIOSH Testing Food Sanitation Consulting Chemical and Microbiological Analyses and Research

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CERTIFICATE OF ANALYSIS

KCS LENAPE RESOURCES CORP.

9489 ALEXANDER ROAD

ALEXANDER NY 14005

Permit No
Cust P.O.

Date Reported 8/10/01
Date Received 7/13/01
Order No 9931-00207
Invoice No 008010
Cust # K011
Sampled Date 7/09/01
Sampled Time 00:00
Sample Id

Subject: LION ENERGY - BRINE SAMPLE SUBMITTED 7/13/01

IMP	TEST	METHOD	RESULT	UNITS	DATE	TECH
-----	------	--------	--------	-------	------	------

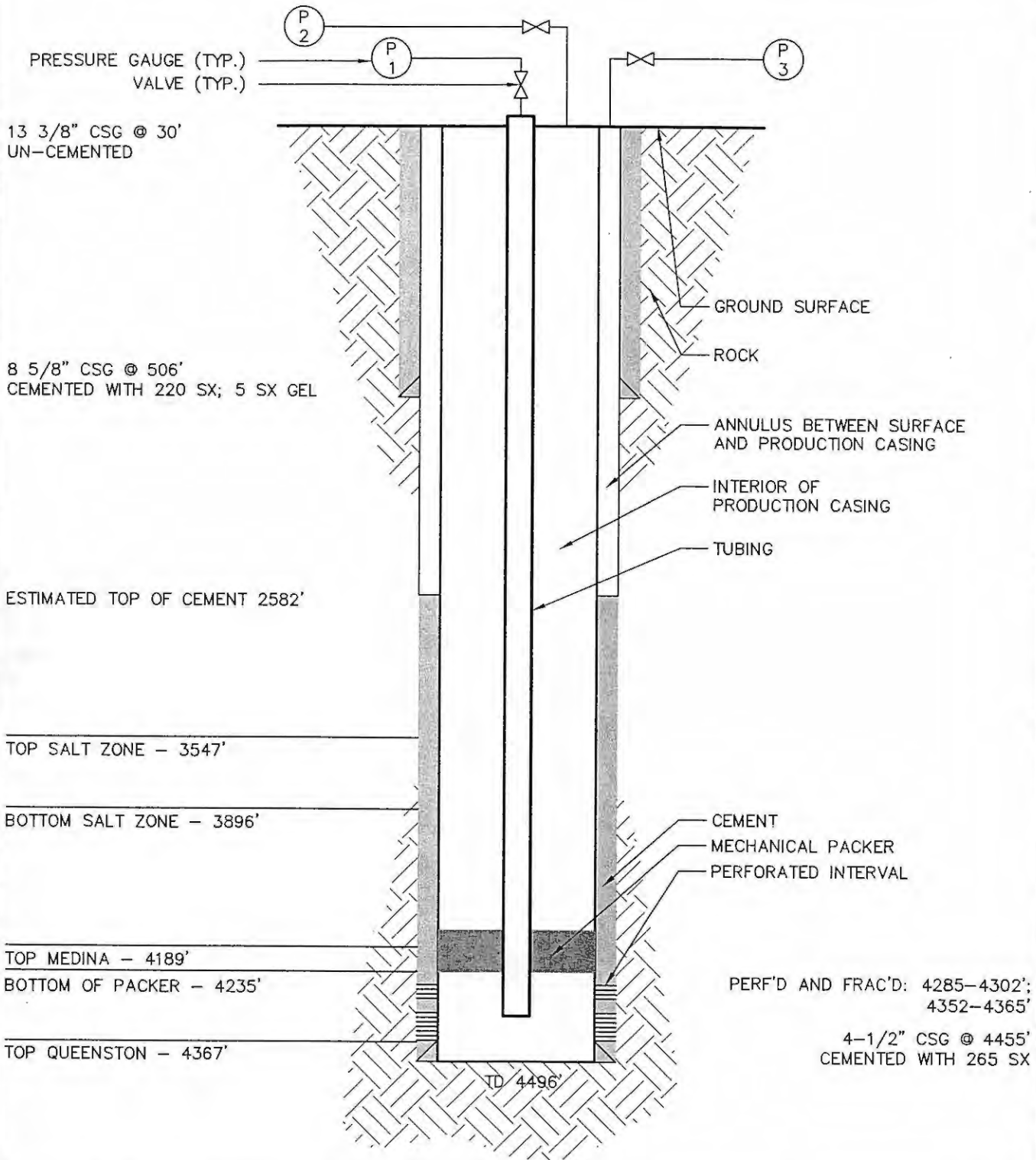
April E. Long
MICROBAC BRADFORD DIVISION

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MEMBER
ACIL

WELL CONSTRUCTION
INJECTION WELL CONFIGURATION



R:\2984...ures\2984FG001.dwg PIT CARLY KRAMER 10/26/2010 2:44:22 PM



TETRA TECH

WWW.TETRATECH.COM

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

BEAR LAKE PROPERTIES, LLC

BITTINGER #4

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
COPYRIGHT TETRA TECH INC.	
FIGURE	

WELL CONSTRUCTION

BITTINGER #4 COMPLETION RECORD

ER-OG-4, Rev. 11/82

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
BUREAU OF OIL AND GAS REGULATION
PITTSBURGH, PENNSYLVANIA 15222

REG-I/NLD

Office Use Only

WELL RECORD

PERMIT NO

37-123-39874-00

PROJECT NO

DEET

TYPE OF WELL

Gas

COLUMBUS FIELD, DEWEY CORNERS POOL

DEV

WELL OPERATOR

U. S. Energy Development Corporation

TELEPHONE NO

(716)856-9764

ADDRESS

670 Statler Towers, Buffalo, NY 14202-9990

ZIP

FARM NAME

Hittinger

FARM NO

4

SERIAL NO

ACRES

62

TOWNSHIP

Columbus

COUNTY

Warren

DRILLING COMMENCED

8/11/87

DRILLING COMPLETED

8/15/87

ELEVATION

1561'

QUADRANGLE

Columbus

☒ 7 1/2'☐ 15'

CASING AND TUBING RECORD

PIPE SIZE	AMOUNT IN WELL	MATERIAL BEHIND PIPE		PACKER			DATE RUN												
		CEMENT (SKS)	GEL (SKS)	TYPE	SIZE	DEPTH													
13 3/8"	30'	NA					8/11/87												
8 5/8"	506'	220	5				8/12/87												
4 1/2"	4454.9'	265					11/5/87												
<table><tr><td>T.D.</td><td>D.B.</td><td>D.P.I.</td><td>Class</td><td>O'G</td><td>Lease</td></tr><tr><td>4496</td><td></td><td>4362</td><td>D</td><td>O'G</td><td>1</td></tr></table>								T.D.	D.B.	D.P.I.	Class	O'G	Lease	4496		4362	D	O'G	1
T.D.	D.B.	D.P.I.	Class	O'G	Lease														
4496		4362	D	O'G	1														

PERFORATION RECORD

STIMULATION RECORD

DATE	INTERVAL PERFORATED		DATE	INTERVAL TREATED	AMOUNT FLUID	AMOUNT SAND	INJECTION RATE
	FROM	TO					
8/19	4459'	4362'	8/20/87	Same	840bbbls.	67,000#	20.7

NATURAL OPEN FLOW

3000 MCF

NATURAL ROCK PRESSURE

NA

HRS

AFTER TREATMENT OPEN FLOW

6,600 MCFD

AFTER TREATMENT ROCK PRESSURE

1100

HRS

72 8/25/87

REMARKS:

MEDINA

RECEIVED

SEP 30 1988

PA GEOLOGICAL SURVEY
FOR & GAS GEOLOGY DIVISION

(FORMATION ON THE WEST SIDE)

A WELL RECORD SHALL BE FILED WITHIN 30 DAYS OF CESSATION OF DRILLING. IF THE WELL IS NOT COMPLETED WITHIN 30 DAYS OF CESSATION OF DRILLING, AN UPDATED WELL RECORD MUST BE SUBMITTED UPON COMPLETION OF THE WELL.

CDM
3-18-88

122-39877

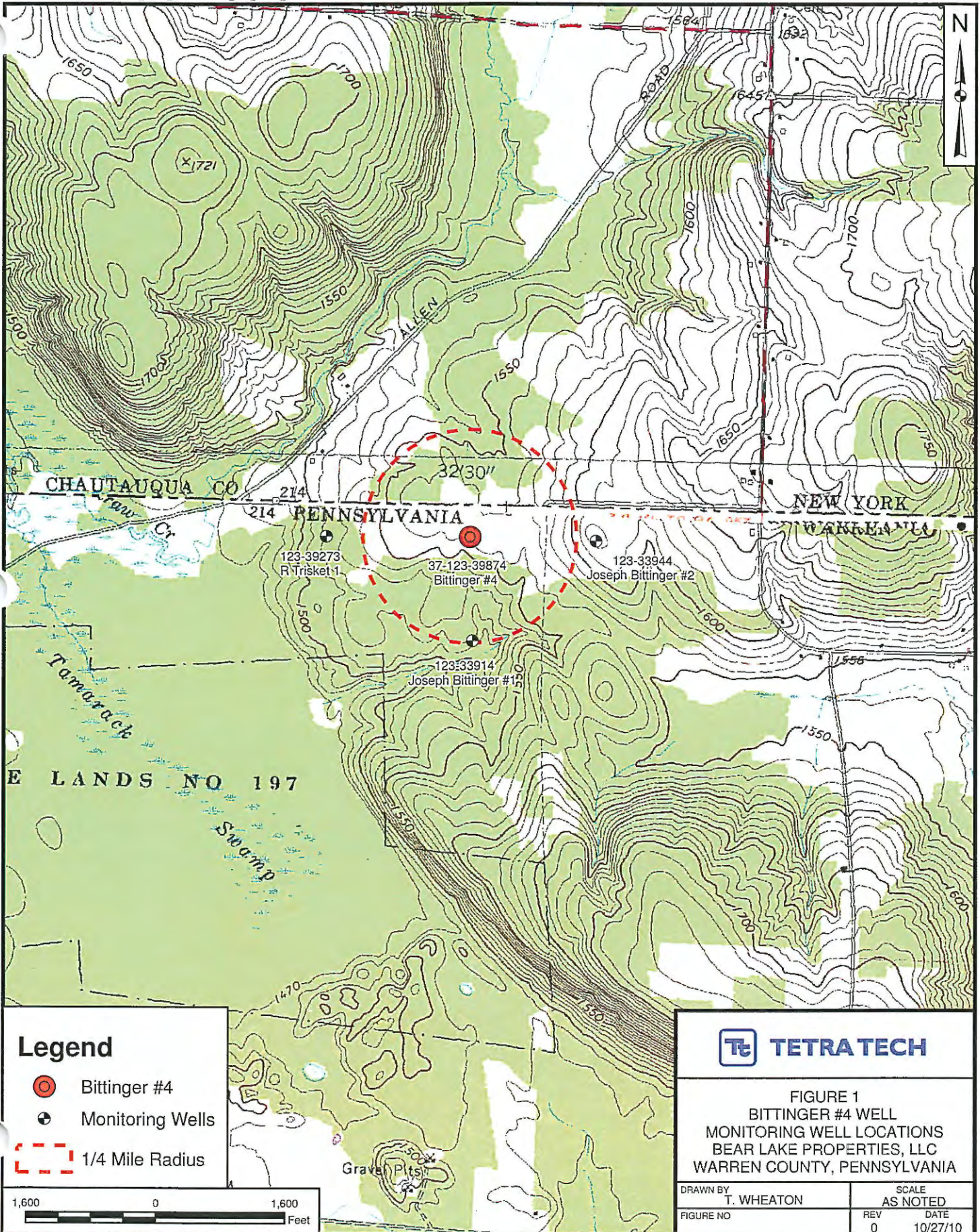
FORMATIONS						
NAME	TOP	BOTTOM	GAS AT	OIL AT	WATER AT (FRESH OR SALT WATER)	SOURCE OF DATA
Unconsolidated Gravel	0	18'				Driller's Record & Geophysical Logs
Devonian Shale	18'	2741'				
Tully Limestone	2741'	2848'				
Hamilton Shale	2848'	3018'				
Onondaga Limestone	3018'	3182'				
Bois Blanc	3182'	3211'				
Akron Dol	3211'	3292'				
Camillus	3292'	3366'				
Syracuse	3366'	3547'				
Salt	3547'	3896'				
Lockport Dol	3896'	4067'			Salt water	
Rochester Shale	4067'	4151'				
Packer Shell	4151'	4189'				
Grimsby Sandstone	4189'	4304'	Gas			
Power Glen Shale	4304'	4350'				
Whirlpool Sandstone	4350'	4367'	Gas			
Queenston Shale	4367'	4496'				
		T.D.				

August 30 1987
RECEIVED
DATE August 30 1987
APPROVED BY [Signature]
TITLE Geologist
104 & Gas Geology Division

Monitoring Program

The liquid levels in nearby depleted natural gas wells will be measured and recorded semi-annually, at a minimum. For the Bittinger No. 4 well the Bittinger No. 1, R. Trisket 1, and the Joseph Bittinger 2 wells will be monitored. Bittinger No. 1 will be monitored until such time as the well is placed into operation as an injection well.

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



Section 9 – Plugging and Abandonment Plan

Revised Pages



United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

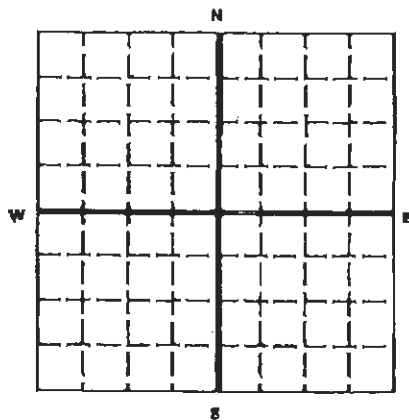
Name and Address of Facility

Bear Lake Properties, LLC
Columbus Township, PA

Name and Address of Owner/Operator

Bear Lake Properties, LLC
3000 Village Run Road, Unit 103, #223, Wexford, PA 15090

Locate Well and Outline Unit on
Section Plat - 640 Acres



State

PA

County

Warren

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.

TYPE OF AUTHORIZATION

- ☒ Individual Permit
☐ Area Permit
☐ Rule

Number of Wells

License Name

Bitinger

WELL ACTIVITY

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

Well Number Bitinger #4

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			30	
8 5/8			506	
4 1/2			2435 (after cutting)	

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
Size of Hole or Pipe in which Plug Will Be Placed (inches)	4 1/2	7 7/8	7 7/8	8 5/8	8 5/8		
Depth to Bottom of Tubing or Drill Pipe (ft)	4286	2000	900	550	50		
Bags of Cement To Be Used (each plug)	32	30	48	30	14		
Slurry Volume To Be Pumped (cu. ft.)	37.8	35.4	50.7	35.4	16.5		
Calculated Top of Plug (ft.)	4085	1900	750	450	0		
Measured Top of Plug (if tagged ft.)	4085	1900	750	450	0		
Slurry Wt. (Lb./Gal.)	15.6	15.6	15.6	15.6	15.6		
Type Cement or Other Material (Class III)	Class A	Class A	Class A	Class A	Class A		

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

From	To	From	To
1506	2000 (open hole - csg cut)		

Estimated Cost to Plug Wells

\$30,000

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 144.22)

Name and Official Title (Please type or print)

Karl Kimmich, President

Signature

Karl C. Kimmich

Date Signed

12/07/2010

UNIVERSAL

WELL SERVICES, INC.



Mr. Dale Skoff
Tetra Tech
661 Anderson Drive
Foster Plaza 7
Pittsburgh, Pa. 15220

Dear Dale,

This bid is the Approximate Cost and Procedure to plug this well. Actual plug as follows

4286 to 4085 feet	Cement plug to plug off perforations	32 Sacks
4085 to 2000 feet	Bentonite gel 6% spacer	
2000 feet	cut 4 1/2 inch casing or above salt	
2000 to 1900 feet	Cement plug	30 Sacks
1900 to 900 feet	Bentonite gel 6% spacer	
900 to 750 feet	Cement plug over shale zone	43 Sacks
750 to 550 feet	Bentonite gel 6% spacer	
550 to 450 feet	Cement plug 50 ft in open hole 50 ft inside 8 5/8 casing	30 Sacks
450 to 50 feet	fill up with pea gravel	
50 to 0 feet	Cement plug to surface	15 Sacks

P.S. If there is any Ononadaga in this well it will require a plug also.
Bentonite is mixed 100 lbs to 6 bls water

Sincerley,

David Cook
Field Sales Rep.

Prepared for
Tetra Tech
661 Anderson Drive
Foster Plaza 7
Pittsburgh, Pa. 15220
December 7, 2010
Bid #0006133



Prepared by
Daniel R Simmons
159 Northwood Dr.
Meadville, PA 16335
(814) 337-1115
Dan.Simmons@univwell.com

Plug to abandon well.
Plug to abandon Medina well in N. Warren county.

Product #	Description	Qty	Units of Sale	Unit Price	Total Price
A0035	MISCELLANEOUS PUMP 1ST 4 HRS	1.0	EA	\$2,410.00	\$2,410.00
T0002	EQUIPMENT MILEAGE CHARGE	40.0	TRK/MI	\$7.50	\$300.00
M0001	CEMENT - CLASS A	150.0	SK	\$17.50	\$2,625.00
M0040	BENTONITE GEL	25.0	CWT	\$33.50	\$837.50
M0050	UNICELE	25.0	LB	\$4.00	\$100.00
F0032	CEMENT BLENDING CHARGE	150.0	SK	\$2.35	\$352.50
T0003	CEMENT DELIVERY CHARGE	540.0	SK-MI/10	\$1.10	\$594.00

Gross Price: \$7,219.00

20.00% Special Discount Applied: \$5,775.20

Comments:

- Plug to abandon Medina well in northern Warren county. We would use Class A cement. Overtime would start after 4 hour at the rate of \$590.00 per hour. The lease name is Bittinger # 4.
- Payment Terms: 30days with credit
- This price quote is valid through 12/31/2010. Actual job scheduling is based upon equipment availability.

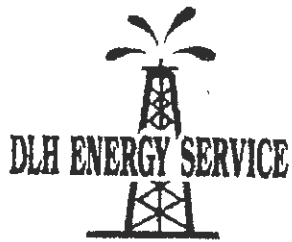
Plugging and Abandonment Plan

At the point when the well is no longer used, the well will be abandoned in accordance with EPA and PADEP regulations. With regard to PADEP regulations, this currently includes providing a "Notice of Intent to Plug a Well" no less than 3 days and no more than 30 days prior to abandoning the well, to allow a PADEP inspector to be present during the plugging procedure. The PADEP may waive the notification period. The notification will include well location plat, well logs, production logs, injection logs, construction details, and proposed abandonment method. After receiving approval from PADEP to proceed, the well will be abandoned and the abandonment procedures will be documented on a "Certificate of Plugging".

The USEPA will be notified of the plugging activity at least 45 days prior to commencing activities. This notification will include USEPA Form No. 7514-20. A proposed plugging plan (Form 7514-20) is attached based on the current PADEP and USEPA regulations. However, this may be modified prior to plugging in order to meet the requirements at the time of the plugging activity. A contractor cost estimate to perform plugging and abandonment according to the proposed plugging plan is attached. The contractor estimate is \$30,000 for these services.

PLUGGING AND ABANDONMENT PLAN

PLUGGING AND ABANDONMENT ESTIMATED COSTS



PO Box 40, 5296 Bly Hill Road
Ashville, NY 14710
Phone 716-410-0204 or 716-410-0028
Fax 716-526-4080

October 13, 2010

To: Mr. Karl Kimmich
Bear Lake Properties, LLC

Re: Estimated plugging cost

The estimated cost to plug to abandon your Bittinger # 1 and 4 wells is \$30,000.00 per well.

Please see attached itemized estimate.

Thank You for the opportunity to be of service to Bear Lake Properties.

Regards,
Chuck DuBose
DLH Energy Service, LLC

DLH Energy Service, LLC

Project		Projected Plug to Abandon Cost		Date: 10/12/2010	
AFE Number:		Lease Name: Bittering		Well Number: 1 & 4	
Billing Code No.	Description of the Billing Codes	Contractor's Company Name	Contractor's Bid Cost	In - House Cost	Cost Per Billing Code No.
100-01	Intang - Legal				\$0.00
100-02	Intang - Engineering				\$0.00
100-03	Intang - Geology				\$0.00
100-04	Intang - Supervision		\$1,000.00		\$1,000.00
100-05	Intang - Permits			\$500.00	\$500.00
100-06	Intang - Surveying				\$0.00
100-07	Intang - Water Testing				\$0.00
100-08	Intang - Environmental Assessment				\$0.00
100-09	Intang - Road & Loc. Construction	Roustabout	\$1,000.00		\$1,000.00
100-10	Intang - Timbering				\$0.00
100-11	Intang - Drilling				\$0.00
100-12	Intang - Cement Casing		\$9,100.00		\$9,100.00
100-13	Intang - Wire line Logging		\$6,500.00		\$6,500.00
100-14	Intang - Notching				\$0.00
100-15	Intang - Perforating				\$0.00
100-16	Intang - Fracturing				\$0.00
100-17	Intang - Water Pumping				\$0.00
100-18	Intang - Water Hauling		\$1,600.00		\$1,600.00
100-19	Intang - Service Rig Notching				\$0.00
100-20	Intang - Service Rig Frac				\$0.00
100-21	Intang - Water Disposal		\$1,000.00		\$1,000.00
100-22	Intang - Service Rig Completion	Plugging	\$4,100.00		\$4,100.00
100-23	Intang - Trucking		\$1,700.00		\$1,700.00
100-24	Intang - Dozer / Excavator		\$500.00		\$500.00
100-25	Intang - Site Restoration		\$500.00		\$500.00
100-26	Intang - Gathering Line Installation				\$0.00
100-27	Intang - Electric line / Transformer Install				\$0.00
100-28	Intang - Well head / Jack Install				\$0.00
100-29	Intang - Rentals tanks/frac pipe/tbg				\$0.00
100-30	Intang - Frac Packer Re - Dress				\$0.00
100-31	Intang - Prod Equip & Tank Battery Install				\$0.00
100-32	Intang - MISC		\$2,500.00		\$2,500.00
200-01	Tang - Materials Road & Location				\$0.00
200-02	Tang - Casing Conductor				\$0.00

200-03	Tang - Casing Surface				\$0.00
200-04	Tang - Casing Production				\$0.00
200-05	Tang - Frac Packer				\$0.00
200-06	Tang - Tubing				\$0.00
200-07	Tang - Rods				\$0.00
200-08	Tang - Rod Pump/Downhole Equip				\$0.00
200-09	Tang - Well head / Valves / Fittings				\$0.00
200-10	Tang - Pump Jack				\$0.00
200-11	Tang - Electric Motor / Panel				\$0.00
200-12	Tang - Plumbing Fittings / Valves				\$0.00
200-13	Tang - Tank Battery				\$0.00
200-14	Tang - Oil / Water Separator				\$0.00
200-15	Tang - Gas Separator				\$0.00
200-16	Tang - Gathering Line Material				\$0.00
200-17	Tang - Electric Line				\$0.00
200-18	Tang - Gas Sales Meter				\$0.00
200-19	Tang - Pump Off Controller				\$0.00
200-20	Tang - MISC				\$0.00
Contractor's Total Costs			\$29,500.00		
			In House Total Costs	\$500.00	
			Grand Total		\$30,000.00



10/6/2010

Mr. Dale Skoff
Tetra Tech
661 Anderson Drive
Foster Plaza 7
Pittsburgh, Pa. 15220

Dear Dale;

This bid is the approximate cost and procedure to plug this well. Actual
PLUG AS FOLLOWS

4286 to 4085 feet	Cement plug to plug off perforations.	32 sacks
4085 to 2000 feet	Bentonite gel 6% spacer	
2000 feet cut 4 1/2 inch casing 0r above the salt.		
2000 to 1900 feet	Cement plug	30 sacks
1900 to 900 feet	Bentonite spacer	
900 to 750 feet	Cement plug over shale zone	43 sacks
750 to 550 feet	Bentonite spacer	
550 to 450 feet	Cement plug 50ft. In open hole and 50 ft. inside 8 5/8 casing	30 sacks
450 to surface	Fill up with pea gravel	

P. S. --- If there is any Ononadaga in this well it will require a plug also.
Bentonite is mixed 100 pounds to 6 bis. Water

Sincerely,

Daniel R. Simmons
Sales Rep.

Prepared for
Tetra Tech
661 Anderson Drive
Foster Plaza 7
Pittsburgh, Pa. 15220
October 6, 2010
Bid #0006133



Prepared by
Daniel R Simmons
159 Northwood Dr.
Meadville, PA 16335
(814) 337-1115
Dan.Simmons@univwell.com

Plug to abandon well.
Plug to abandon Medina well in N. Warren county.

Product #	Description	Qty	Units of Sale	Unit Price	Total Price
A0035	MISCELLANEOUS PUMP 1ST 4 HRS	1.0	EA	\$2,410.00	\$2,410.00
T0002	EQUIPMENT MILEAGE CHARGE	40.0	TRK/MI	\$7.50	\$300.00
M0001	CEMENT - CLASS A	135.0	SK	\$17.50	\$2,362.50
M0040	BENTONITE GEL	25.0	CWT	\$33.50	\$837.50
M0050	UNICELE	25.0	LB	\$4.00	\$100.00
F0032	CEMENT BLENDING CHARGE	135.0	SK	\$2.35	\$317.25
T0003	CEMENT DELIVERY CHARGE	540.0	SK-MI/10	\$1.10	\$594.00

Gross Price: \$6,921.25

20.00% Special Discount Applied: \$5,537.00

Comments:

- Plug to abandon Medina well in northern Warren county. We would use Class A cement. Overtime would start after 4 hour at the rate of \$590.00 per hour. The lease name is Bittering # 4.
- Payment Terms: 30days with credit
- This price quote is valid through 12/31/2010. Actual job scheduling is based upon equipment availability.

PLUGGING AND ABANDONMENT PLAN

EPA FORM 7520-14

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

PLUGGING AND ABANDONMENT PLAN**Name and Address of Facility**

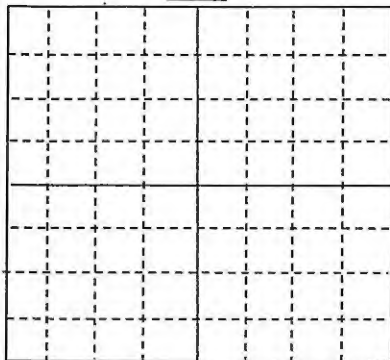
Bear Lake Properties, LLC
Columbus Township, PA

Name and Address of Owner/Operator

Bear Lake Properties, LLC
3000 Village Run Road, Unit 103, #223
Wexford, PA 15090

Locate Well and Outline Unit on
Section Plat - 640 Acres

☒ N



State

PA

County

Warren

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

TYPE OF AUTHORIZATION

☒ Individual Permit

☐ Area Permit

☐ Rule

Number of Wells 1

Lease Name Bittinger

**WELL
ACTIVITY**

☐ Class I

☐ Hazardous

☐ Nonhazardous

☐ Class II

☒ Brine Disposal

☐ Enhanced Recovery

☐ Hydrocarbon Storage

☐ Class III

Well Number Bittinger #4

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
13/38			30	
8 5/8			506	
4 1/2			2455 (after cutting)	

METHOD OF EMPLACEMENT OF CEMENT PLUGS

☒ Balance Method

☐ Dump Bailer Method

☐ Two Plug Method

☐ Other

CEMENT TO PLUG AND ABANDON DATA:

	Plug #1	Plug #2	Plug #3	Plug #4	Plug #5	Plug #6	Plug #7
Size of Hole or Pipe in Which Plug Will Be Placed (inches)	4 1/2	7 7/8	7 7/8	8 5/8			
Depth to Bottom of Tubing or Drill Pipe (ft)	4286	2000	900	550			
Sacks of Cement To Be Used (each plug)	32	30	43	30			
Slurry Volume To Be Pumped (cu. Ft.)	37.8	35.4	50.7	35.4			
Calculated Top of Plug (ft.)	4085	1900	750	450			
Measured Top of Plug (if tagged, ft.)	4085	1900	750	450			
Slurry Weight (Lb./Gal.)	15.6	15.6	15.6	15.6			
Type of Cement or Other Material (Class III)	Class A	Class A	Class A	Class A			

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

From

506

To

2000 (open hole - csg cut)

From

To

Estimated Cost to Plug Wells

\$30,000

CERTIFICATION

I certify under the penalty of law that I have 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)

Signature

Date Signed

Necessary Resources

Bear Lake Properties, LLC will obtain a Letter of Credit to verify that they have the resources necessary to plug and abandon the well. This documentation will be provided under a separate cover at a later date.

Plan for Well Failures

The pressure in the annulus between the tubing and production (4 1/2 inch) casing in the injection well will be continuously monitored. Likewise, the pressure between the 4 1/2 and 8 5/8 inch casing will be continuously monitored. Should a pressure increase occur in either monitored space, injection will cease and EPA will be verbally notified within 24 hours and notified in writing within 7 days. The cause of the pressure increase will be investigated by Bear Lake Properties and remedial measures implemented following discussions with EPA on the proposed approach.

Section 11 – Plans for Well Failures

Revised Pages

Plan for Well Failures

The pressure in the annulus between the tubing and production (4 ½ inch) casing in the injection well will be continuously monitored. A minimum pressure of approximately 100 psi will be maintained on the annulus. The pressure between the 4 ½ and 8 5/8 inch casing will also be continuously monitored. The annulus will be equipped with an automated well shut-off device which will shut down the well if pressure indicative of well failure occurs. Should a pressure change indicative of well failure occur in either monitored space, injection will cease and EPA will be verbally notified within 24 hours and notified in writing within 7 days. The cause of the pressure change will be investigated by Bear Lake Properties and remedial measures implemented following discussions with EPA on the proposed approach.

Set of Revisions

Bitteringer #4 UIC Class II-D Permit Application

Appendix A

Appendix A contains well records and information for groundwater wells in the area surrounding Bittinger No. 4. Groundwater wells located within 1 mile of the Bittinger No. 4 well are listed in the following table, and well records data is provided in Appendix A-1 (Pennsylvania) and A-2 (New York). Well records for all groundwater wells located within Columbus Township, Warren County, Pennsylvania are provided in Appendix A-3.

APPENDIX A

GROUNDWATER WELLS WITHIN 1 MILE

Bittering Area; Columbus Twp; Warren County, PA
Wells w/in 1 mile radius of Bittering #4

	API #	TD	Drilling Completed	Last Csg	Csg depth	Completion	Comments
Proposed Injection and Monitoring Wells							
Bittering #1	123-33914	4467	12/29/1983	4.5	4416	Perf'd & Frac'd: 4210-4327'	Subject of separate UIC Class II permit application
Bittering #4	123-39874	4496	8/15/1987	4.5	4455	Perf'd & Frac'd: 4285-4302'; & 4352-4365'	
Water Wells							
John Marowski	423207	60	8/18/2003	8	39	Perforated or Slotted	Drilled by Action Drilling Inc. Lat: 42.01002 Long: -79.55246 Water Bearing Zone 1: 37 - 39 feet
Brownell Rd	CU1709	125	Unknown	Unknown	100	Unknown	Depth to Bedrock: 98 ft DTW: 110 ft Lat: 42 01 58.3 Long: 79 34 28.1
Clymer Hill Rd	CU2266	100	Unknown	Unknown	81	Unknown	Depth to Bedrock: 50 ft DTW: 79 ft Lat: 42 03 30.3 Long: 79 36 44
Clymer Sherman Rd	CU2229	107	Unknown	Unknown	18	Unknown	Depth to Bedrock: 14 ft Lat: 42 02 15.8 Long: 79 37 46.6
Rt 474	CU1124	105	Unknown	Unknown	80	Unknown	Depth to Bedrock: 90 ft DTW: 100 ft Lat: 42 04 37 Long: 79 32 22.3

APPENDIX A-1

**PENNSYLVANIA GROUNDWATER INFORMATION SYSTEM
WELL RECORDS WITHIN 1 MILE**

DETAILS FOR WELL 423207

Menu

New Selection

Email comments to [Topo Geo.](#)**Record: 1 of 1****(There is a total of 1 Wells in the list.)**

First Well

Prev Well

Return to Summary List

Well Driller: **ACTION DRILLING, INC.**PA Well ID: **423207**License: **2323**Driller Well ID: **0331**Type of Activity: **New Well**

Original Well By:

Date Drilled: **8/18/2003**Drilling Method: **CABLE TOOL**Owner: **JOHNMAROWSKI**Address of Well: **LAKE PLEASANT RD**

Zipcode:

County: **ERIE**Municipality: **GREENE TWP.**

Quadrangle:

Latitude: **42.01002**Longitude: **-79.55246**Well Depth (ft): **60**Well Finish: **PERFORATED
OR SLOTTED**Depth to Bedrock(ft): **37**

Did Not Encounter Bedrock:

Well Yield (gpm): **5**Yield Measure Method: **BAILER**Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well: **WITHDRAWAL**Use of Water: **DOMESTIC****DRILLER'S LOG****DEPTH OF UNIT DESCRIPTION OF UNITS PENETRATED**Beginning Depth: **0**Unit 1: **BROWN TIL**Base of Unit 1: **10**Unit 2: **GREY TIL**Base of Unit 2: **37**Unit 3: **SHALE**

Base of Unit 3: 60

BOREHOLE

Top Bottom Diameter

SECTION 1: 0 60 8

CASING

CASING 1: Top: 0 Bottom: 39 Diameter: 8 Material: STEEL

WATER BEARING ZONE

WATER BEARING ZONE 1: Top: 37 Bottom: 39 Yield: 5

Record: 1 of 1

(There is a total of 1 Wells in the list.)

First Well

Prev Well

Return to Summary List

APPENDIX A-2

NEW YORK GROUNDWATER WELL DATABASE
WELL RECORDS WITHIN CLYMER, NY

Water Well Information - Search Results

Search By County Name: Chautauqua

Search By Town/City/Village Name: Clymer

* = No value available.

NR = Rock was not encountered.

Town/ City/ Village	County	Well#	FOIL Address	Latitude (D/M/S)	Longitude (D/M/S)	Well Depth (FT)	Rock Depth (FT)	GW Depth (FT)	Casing Length (FT)	Screen Used	Yield (GPM)	Registration Number
Clymer	Chautauqua	CU1709	BROWNELL RD	42 01 58.3	79 34 28.1	125	98	110.0	100.0	NO	3.0	NYRD10203
Clymer	Chautauqua	CU2266	CLYMER HILL RD	42 03 30.3	79 36 44.0	100	50	79.0	81.0	NO	30.0	NYRD10203
Clymer	Chautauqua	CU2229	CLYMER SHERMAN RD	42 02 15.8	79 37 46.6	107	14	*	18.0	NO	16.0	NYRD10084
Clymer	Chautauqua	CU1124	RT 474	42 04 37.0	79 32 22.3	105	90	100.0	80.0	NO	25.0	NYRD10084

Records 1 through 4 of 4

[Water Well Search Home](#)[Search for Contractors](#)[Search for Wells](#)[Contact Us](#)

APPENDIX A-3

**PENNSYLVANIA GROUNDWATER INFORMATION SYSTEM
WELL RECORDS WITHIN COLUMBUS TOWNSHIP, PA**

PA Topographic & Geologic Survey

PaGWIS

SELECTED WELLS

Menu

New Selection

Email comments to [Topo Geo.](#)

You have selected 35 Well(s). To create a comma separated list of all these wells, click **Create List**. If you want to limit the list, place check marks next to the wells you want to have included, and then click **Create List**.

Create List

Page 1 of 2

Next Page

Record	PA Well ID	Driller	Driller Well ID	Date Drilled	Owner	County	Municipality	Image
<input type="checkbox"/> 1	405210	ELIASON WATER WELL DRILLING		2/7/1994		WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 2	33539	ALFRED L BURCH		5/1/1966	ALLEN, BRUCE C	WARREN	COLUMBUS TWP.	No Image
<input type="checkbox"/> 3	405201	MCCRAY WELL DRILLING		10/1/1998	AYERS	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 4	405194	CLEARWATER DRILLING COMPANY		11/18/2002	BECKWITH	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 5	33614	YORK WATER WELL DRILLING CO INC		6/1/1979	BEDJORSKI, C	WARREN	COLUMBUS TWP.	No Image
<input type="checkbox"/> 6	33629	ACKERMAN DRILLING		10/1/1980	BULL, MICHEAL	WARREN	COLUMBUS TWP.	No Image
<input type="checkbox"/> 7	405195	SAXTON WELL SERVICE, INC.		1/1/2002	BYERS	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 8	405213	MCCRAY WELL DRILLING		7/1/1990	CORTER	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 9	33531	JOHNSON'S DRILLING		4/1/1986	EASTMAN, S	WARREN	COLUMBUS TWP.	No Image
<input type="checkbox"/> 10	146667	MCCRAY WELL DRILLING		6/1/1988	FRONTERY DAVID	WARREN	COLUMBUS TWP.	No Image
<input type="checkbox"/> 11	405216	JOHNSON DRILLING		4/25/1994	GADES	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 12	405208	JOHNSON DRILLING		7/1/1997	HILL FARM	WARREN	COLUMBUS TWP.	View Image

<input type="checkbox"/>	13	405205	DANIEL P HORNBURG		9/1/1998	HORNBURG	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/>	14	405202	JEFFREY COBB DRILLING		7/15/1999	JENSON	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/>	15	405198	CLEARWATER DRILLING COMPANY		6/21/2000	JOGAITH	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/>	16	405203	DANIEL P HORNBURG		8/3/1998	LAWSON	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/>	17	405200	DANIEL P HORNBURG		6/18/1999	MCCLAIN	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/>	18	405212	JENNINGS & SON DRILLING		5/1/1991	MCGURK	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/>	19	405196	MCCRAY WELL DRILLING		10/1/2001	MICK	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/>	20	405214	MCCRAY WELL DRILLING		9/1/1993	MIKE	WARREN	COLUMBUS TWP.	View Image

PA Topographic & Geologic Survey

PaGWIS

SELECTED WELLS

Menu

New Selection

Email comments to [Topo Geo.](#)

You have selected 35 Well(s). To create a comma separated list of all these wells, click **Create List**. If you want to limit the list, place check marks next to the wells you want to have included, and then click **Create List**.

Create List

Page 2 of 2

Prev. Page

Record	PA Well ID	Driller	Driller Well ID	Date Drilled	Owner	County	Municipality	Image
<input type="checkbox"/> 21	146668	JOHNSON DRILLING		8/1/1988	MILLER LAWRENCE	WARREN	COLUMBUS TWP.	No Image
<input type="checkbox"/> 22	405197	CLEARWATER DRILLING COMPANY		9/21/2001	MOWAR	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 23	405211	MCCRAY WELL DRILLING		7/1/1992	NAGEL	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 24	146665	YORK WATER WELL DRILLING CO INC		5/1/1979	PEHY D	WARREN	COLUMBUS TWP.	No Image
<input type="checkbox"/> 25	405199	GILLIS BROTHERS INC		9/1/1986	RAYMOND	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 26	405217	MCCANDLESS WELL DRILLING INC		7/30/1996	RAYMOND	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 27	33599	YORK WATER WELL DRILLING CO INC		5/1/1985	REIFF, WILLIAM	WARREN	COLUMBUS TWP.	No Image
<input type="checkbox"/> 28	405206	JOHNSON DRILLING		4/1/1999	SCAMENS	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 29	405207	JOHNSON DRILLING		8/1/1998	SEYMOUR	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 30	405218	JOHNSON DRILLING		12/1/1993	SINGH	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/> 31	405209	MCCRAY WELL DRILLING			SONDSTROM	WARREN	COLUMBUS TWP.	View Image
		MCCRAY			STOCTON,		COLUMBUS	No

PaGWIS List Of Selected Wells

<input type="checkbox"/>	32	<u>33584</u>	BROS		12/1/1979	CHARLES	WARREN	TWP.	Image
<input type="checkbox"/>	33	<u>405204</u>	DANIEL P HORNBERG		9/1/1998	TAYDUS	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/>	34	<u>405215</u>	MCCRAY WELL DRILLING		6/1/1993	TRESSLEY	WARREN	COLUMBUS TWP.	View Image
<input type="checkbox"/>	35	<u>146666</u>	YORK WATER WELL DRILLING CO INC		5/1/1985	ZEIH C	WARREN	COLUMBUS TWP.	No Image

PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405210[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 1 of 35

(There is a total of 35 Wells in the list.)

[Next Well](#)[Last Well](#)[Return to Summary List](#)

Well Driller: ELIASON WATER WELL DRILLING

PA Well ID: 405210

License: 2094

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 2/7/1994

Drilling Method:

Owner:

Address of Well: 20 ACRE QUADRIN

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 1 of 35

(There is a total of 35 Wells in the list.)

[Next Well](#)[Last Well](#)[Return to Summary List](#)

PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 33539[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 2 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **ALFRED L BURCH**PA Well ID: **33539**License: **0975**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **5/1/1966**Drilling Method: **CABLE TOOL**Owner: **ALLEN , BRUCE C**

Address of Well:

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**Quadrangle: **COLUMBUS**Latitude: **41.90667**Longitude: **-79.55778**Well Depth (ft): **58**Well Finish: **UNKNOWN**

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm): **12**Yield Measure Method: **BAILER**Static Water Level: **12**
(ft below land surface)Water level after yield test: **18**
(ft below land surface)Length of Yield Test: **2**
(minutes)

Saltwater Zone(ft):

Use of Well: **WITHDRAWAL**Use of Water: **DOMESTIC**

Description of Well Location and Other Notes:

SAMPLE 9203230**BOREHOLE**

Top Bottom Diameter

SECTION 1: 0 58 6**CASING****CASING 1: Top: 0 Bottom: Diameter: 6 Material: UNKNOWN****SCREENS/SLOTS****SCREEN 1: Top: 54 Bottom: Diameter:**Type: **OTHER**Material: **UNKNOWN** Slot Size: **0**

Record: 2 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405201[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)**Record: 3 of 35****(There is a total of 35 Wells in the list.)**[First Well](#)[Prev. Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **MCCRAY WELL DRILLING**PA Well ID: **405201**License: **1664**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **10/1/1998**

Drilling Method:

Owner: **AYERS**Address of Well: **SC HILL RD, COLUMBUS**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 3 of 35**(There is a total of 35 Wells in the list.)**[First Well](#)[Prev. Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)

Microbac

CHAIN OF CUSTODY RECORD

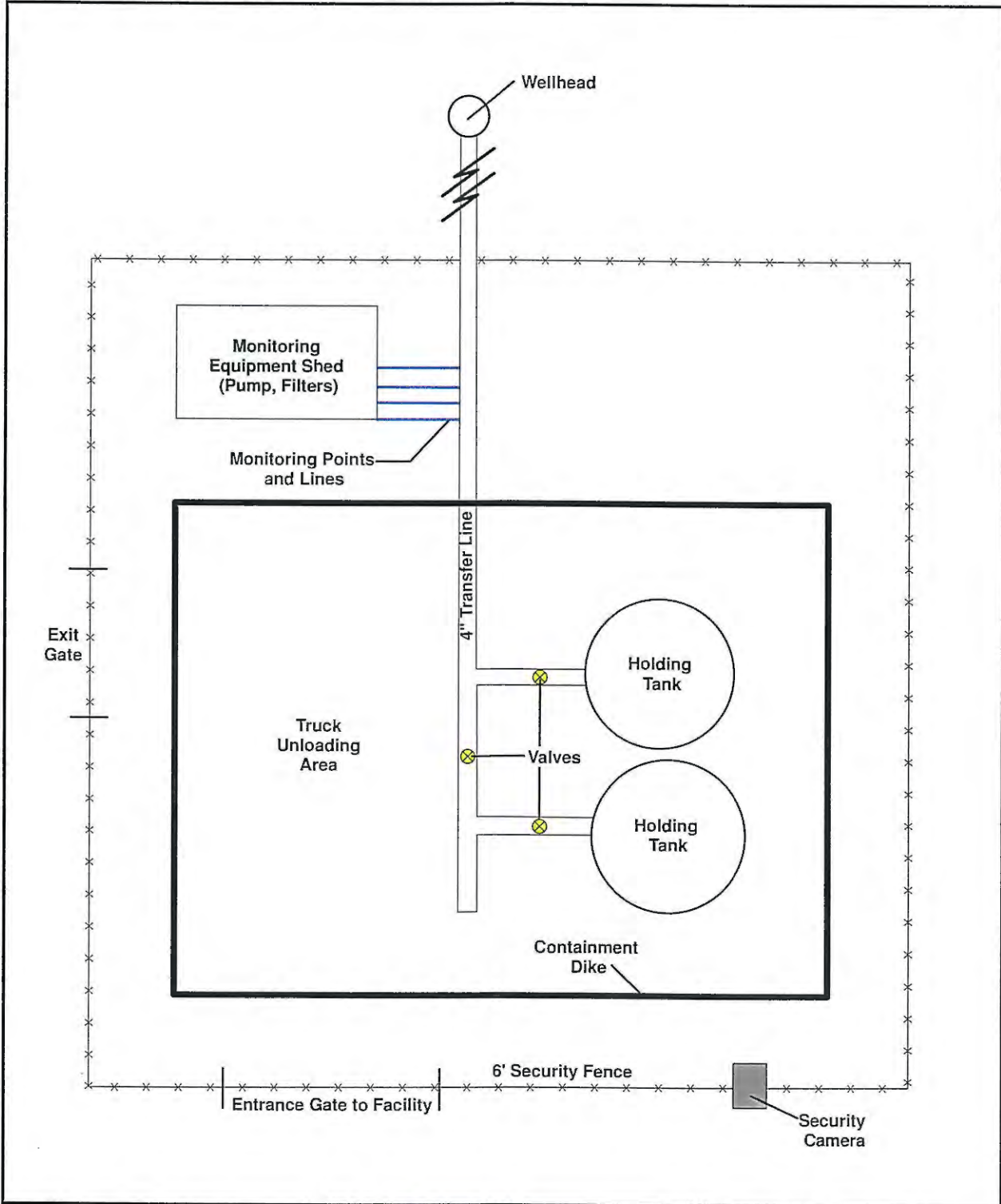
PAGE 1 OF 1


P.O. #		CLIENT NAME		PROJECT / LOCATION		WATER COMPOSITE SAMPLING DATA					
SAMPLERS (Signature)		SEND REPORT TO:		PHONE ()		_____ AUTOMATIC _____ DISCRETE BEGIN: _____ END: _____ TEMP _____ _____ TIME DATE _____ DATE _____ TOTAL FLOW _____ _____ CONTINUOUS TIME _____ TIME _____ TECH _____ _____ FLOW FLOW _____ FLOW _____ _____ PROPORTIONED INTERVAL _____ MLS / Sample _____ # samples _____					
MICROBAC DIVISION		Sample Chest Chest Temp. _____ °C		Sample Temp. _____ °C		Method of Shipment: _____ Date _____ Time _____					
LAB ID	SAMPLE NO.	SAMPLE DESCRIPTION / LOCATION		COLLECTED DATE	TIME	COMP	SAMPLE TYPE GRAB	MATRIX	NO. OF CONTAINERS	CONTAINER TYPE / PRESERVATIVE	ANALYSES REQUESTED
0931-207		Bore		7/9/01							
Delivered to Microbac/Ente by Tom Miller of Lion Energy. Forward to Bradford for analysis & billing per Pat Sanders @ Lenape. (716) 344-1230 x 236.											

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
<i>[Signature]</i>	1	7/11/12 3:25		2	
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
<i>[Signature]</i>	3	7/12 10:10		4	
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	5			6	
Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Date	Time
	7			8	

Comments or Special Hazards: *Darlen,*
pH-Field: *This is the sample*
we discussed on phone 7/11/01.
Customer wants
chlorides & cations - see our
package - attached 1000 -

OPERATING DATA
SURFACE FACILITY SCHEMATIC



DRAWN BY T. WHEATON	DATE 09/21/10	 TETRA TECH BEAR LAKE PROPERTIES, LLC SURFACE FACILITY SCHEMATIC BITTINGER #1 AND #4 DISPOSAL WELLS WARREN COUNTY, PENNSYLVANIA	CONTRACT NUMBER _____	
CHECKED BY J. BUCKLEY	DATE 10/26/10		APPROVED BY _____	DATE _____
REVISED BY _____	DATE _____		APPROVED BY _____	DATE _____
SCALE NOT TO SCALE			FIGURE NO. FIGURE 1-1	REV 0

OPERATING DATA
TYPICAL CORROSION INHIBITOR

AQUACLEAR

PRODUCT INFORMATION

408 Virginia Street East Charleston, WV 25301-3199
(304) 343-4792 Fax (304) 343-3635



HOME



PRODUCTS



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RESOURCES



ABOUT



Corrosion Inhibitor SticksT

WHAT ARE CORROSION INHIBITOR STICKST?

Corrosion Inhibitor SticksT are water soluble or oil soluble sticks that contain a blend of Imidazolines which have excellent filming characteristics and low emulsion tendencies. This unique blend gives effective corrosion control for most oil field corrosion problems.

CORROSION INHIBITOR STICK™ USES

Corrosion Inhibitor Sticks™ are primarily used to control common corrosion problems found in producing oil and gas well systems. They can be used to treat hard to reach 'dead' areas such as the annulus space above the packer, rat-hole, or the bottom of water supply tanks.

ADVANTAGES OF CORROSION INHIBITOR STICKST

Corrosion Inhibitor SticksT can provide corrosion control throughout the entire production system. Regular usage will help control corrosion at the point they begin - down-hole.

They are available in two different formulations (oil soluble and water dispersable) or (water soluble and oil dispersable). The oil soluble type is soluble in oil, condensate and wet gas and can slowly disperse inhibitor into the water phase. The water soluble type is soluble in water and can slowly disperse inhibitor into the oil phase.

Corrosion Inhibitor SticksT can effectively inhibit corrosion in wells that produce both water and distillate or oil phases. In this case, it may be desirable to treat the well with both types of sticks by first dropping water soluble sticks and allowing them to fall through the oil into the water, thus dissolving and releasing inhibitor in

TREATMENT DETERMINATION

The number of Corrosion Inhibitor SticksT used is based on the volume of total fluid produced (oil or condensate plus water). Field experience indicates that for most corrosive environments the best results are achieved by using a larger initial slug treatment (80 PPM daily) until the problem is under control then reduce to smaller periodic treatments (40 PPM daily) thereafter. EXAMPLE: An initial slug treatment of 80 PPM would require 0.64 lbs of Corrosion Inhibitor Stick™ per 24 BBL (1000 gallons) of total fluid produced.

COR. INH. STICK™ SIZES	STICKS PER BBL
SENIOR (1 5/8" x 18")	1 per 58 bbls
JUNIOR (1 3/8" x 16")	1 per 40 bbls
JUNIOR (1 1/4" x 15")	1 per 29 bbls
THRIFTY (1" x 15")	1 per 18 bbls
MIDGET (5/8" x 15")	1 per 7 bbls

NOTE: To successfully control any corrosion problem, the inhibitor insertion into the fluid stream must be constant. For intermittent treatment or extreme corrosive environments increase the number of sticks accordingly.

THE MOST COMMON PROCEDURE for producing wells is to shut-in well and drop sticks through lubricator. Leave well shut until sticks fall to the bottom. The time in minutes for the sticks to fall to the bottom (assuming well is shut-in with fluid at surface) is equal to the depth divided by 100. (Time, min. = Depth, ft / 100).

FOR WATER INJECTION SYSTEMS drop the sticks into the water supply tank to inhibit more of the system.

the water column). Then drop the oil soluble sticks which will "FLOAT" at where the oil and water contact thus slowly dissolving and releasing inhibitor in the oil column.

The sticks are economical when compared to conventional corrosion control operations and therefore save investment in pumps, drums of chemical, and equipment maintenance.

Corrosion Inhibitor Sticks™ may be used in wells with bottom hole temperatures (BHT) of up to 375 degrees Fahrenheit.

PRODUCTION SPECIFICATIONS

OIL SOLUBLE: The stick will dissolve in 20 to 120 minutes (in moving diesel) depending on temperature, salt content, and relative fluid motion. The stick will melt at 135 degrees Fahrenheit and the specific gravity is 0.95.

WATER SOLUBLE: The stick will dissolve in 12 to 24 hours (in 60,00 PPM moving brine water) depending on temperature, salt content, and relative fluid motion. The stick will melt at 125 degrees Fahrenheit and the specific gravity is 1.10.

PRODUCT PACKAGING

SENIOR	1.55 lb/stick	24/case	31/pail	48/chest
JUNIOR(1)	1.20 lb/stick	36/case	n/a	72/chest
JUNIOR(2)	0.76 lb/stick	36/case	52/pail	72/chest
THRIFTY	0.49 lb/stick	49/case	72/pail	98/chest
MIDGET	0.19 lb/stick	108/case	204/pail	216/chest

WHERE TO BUY

All good oil field supply stores carry Aqua-Clear, Inc. Corrosion Inhibitor Sticks™, but you can also buy direct from us.

Ordering Information

Should you wish to speak to a sales representative about any of our products, you can call or email Tommy Halloran Jr., Ronald "Buster" Wilson, or Russell Cook directly:

Tommy Halloran Jr.

W 304-343-4792

H 304-345-5152

C 304-546-8526

tom@aquaclear-inc.com

Ronald "Buster" Wilson

W 304-546-8518

H 304-965-7996

Fax 304-965-2713

buster@aquaclear-inc.com

Russell Cook

W 304-546-2940

H 304-842-7050

Fax 304-842-7050

russell@aquaclear-inc.com

PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405194[Menu](#)[New Selection](#)Email comments to [Topo Geo.](#)

Record: 4 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev. Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **CLEARWATER DRILLING COMPANY**PA Well ID: **405194**License: **2073**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **11/18/2002**

Drilling Method:

Owner: **BECKWITH**Address of Well: **BOX 22, BEAR LAKE**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 4 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 33614

Menu

New Selection

Email comments to [Topo Geo.](#)

Record: 5 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: YORK WATER WELL DRILLING CO INC

PA Well ID: 33614

License: 1378

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 6/1/1979

Drilling Method: OTHER/UNKNOWN

Owner: BEDJORSKI, C

Address of Well:

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle: COLUMBUS

Latitude: 41.95139

Longitude: -79.50417

Well Depth (ft): 130

Well Finish: OPEN HOLE

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm): 50

Yield Measure Method: REPORTED,
METHOD NOT
KNOWNStatic Water Level: 60
(ft below land surface)Water level after yield test: 60
(ft below land surface)Length of Yield Test: 0.3
(minutes)

Saltwater Zone(ft):

Use of Well: WITHDRAWAL

Use of Water: DOMESTIC

CASING

CASING 1: Top: 0 Bottom: 39 Diameter: 6 Material: UNKNOWN

Record: 5 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 33629

Menu

New Selection

Email comments to [Topo Geo.](#)

Record: 6 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: ACKERMAN DRILLING

PA Well ID: 33629

License: 1094

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 10/1/1980

Drilling Method: OTHER/UNKNOWN

Owner: BULL, MICHEAL

Address of Well:

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle: COLUMBUS

Latitude: 41.96222

Longitude: -79.55083

Well Depth (ft): 65

Well Finish: OPEN HOLE

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm): 30

Yield Measure Method: BAILER

Static Water Level: 13
(ft below land surface)Water level after yield test: 45
(ft below land surface)Length of Yield Test: 3
(minutes)

Saltwater Zone(ft):

Use of Well: WITHDRAWAL

Use of Water: DOMESTIC

BOREHOLE

Top Bottom Diameter

SECTION 1: 0 65 0

CASING

CASING 1: Top: 0 Bottom: 12 Diameter: 6 Material: UNKNOWN

Record: 6 of 35

(There is a total of 35 Wells in the list.)

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PaGWIS

DETAILS FOR WELL 405195[Menu](#)[New Selection](#)Email comments to [Topo Geo.](#)

Record: 7 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: SAXTON WELL SERVICE, INC.

PA Well ID: 405195

License: 2272

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 1/1/2002

Drilling Method:

Owner: BYERS

Address of Well: RD 1 BOX 34 I, SPRINGCREEK

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 7 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405213

Menu

New Selection

Email comments to [Topo Geo.](#)

Record: 8 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: MCCRAY WELL DRILLING

PA Well ID: 405213

License: 1664

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 7/1/1990

Drilling Method:

Owner: CORTER

Address of Well: RD 1 BOX 31, COLUMBUS

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 8 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 33531[Menu](#)[New Selection](#)Email comments to [Topo Geo.](#)

Record: 9 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev. Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **JOHNSON'S DRILLING**PA Well ID: **33531**License: **1708**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **4/1/1986**Drilling Method: **OTHER/UNKNOWN**Owner: **EASTMAN, S**

Address of Well:

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**Quadrangle: **COLUMBUS**Latitude: **41.90778**Longitude: **-79.56583**Well Depth (ft): **70**Well Finish: **OPEN HOLE**

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm): **11.8**Yield Measure Method: **BAILER**Static Water Level: **30**
(ft below land surface)Water level after yield test: **70**
(ft below land surface)Length of Yield Test: **0.3**
(minutes)

Saltwater Zone(ft):

Use of Well: **WITHDRAWAL**Use of Water: **DOMESTIC****BOREHOLE**

Top Bottom Diameter

SECTION 1: 0 70 6

CASINGCASING 1: Top: 0 Bottom: 60 Diameter: 6 Material: **STEEL****WATER BEARING ZONE**

WATER BEARING ZONE 1: Top: 62 Bottom: Yield:

WATER BEARING ZONE 2: Top: 68 Bottom: Yield:

Record: 9 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 146667[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 10 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: MCCRAY WELL DRILLING

PA Well ID: 146667

License: 1664

Driller Well ID:

Type of Activity: New Well

Original Well By:

Date Drilled: 6/1/1988

Drilling Method:

Owner: FRONTERY DAVID

Address of Well:

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle: COLUMBUS

Latitude: 41.89722

Longitude: -79.56528

Well Depth (ft): 59

Well Finish: OPEN HOLE

Depth to Bedrock(ft): 20

Did Not Encounter Bedrock:

Well Yield (gpm): 10

Yield Measure Method: BAILER

Static Water Level: 20
(ft below land surface)Water level after yield test: 35
(ft below land surface)Length of Yield Test: 1
(minutes)

Saltwater Zone(ft):

Use of Well: WITHDRAWAL

Use of Water: DOMESTIC

CASING

CASING 1: Top: 0 Bottom: 21 Diameter: 6 Material:

SEAL 1 Top: Bottom:

Type: NONE

Record: 10 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405216

Menu

New Selection

Email comments to [Topo Geo.](#)

Record: 11 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: **JOHNSON DRILLING**PA Well ID: **405216**License: **0761**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **4/25/1994**

Drilling Method:

Owner: **GADES**Address of Well: **SIMMONS RD, COLUMBUS**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 11 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405208[Menu](#)[New Selection](#)Email comments to [Topo Geo.](#)

Record: 12 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev. Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **JOHNSON DRILLING**PA Well ID: **405208**License: **0761**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **7/1/1997**

Drilling Method:

Owner: **HILL FARM**Address of Well: **RD 2 BOX 121, CORRY**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 12 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405205[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 13 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **DANIEL P HORNBERG**PA Well ID: **405205**License: **2043**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **9/1/1998**

Drilling Method:

Owner: **HORNBERG**Address of Well: **COLUMBUS**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 13 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405202[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 14 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **JEFFREY COBB DRILLING**PA Well ID: **405202**License: **2273**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **7/15/1999**

Drilling Method:

Owner: **JENSON**Address of Well: **BOX 109**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 14 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405198[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 15 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev. Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **CLEARWATER DRILLING COMPANY**PA Well ID: **405198**License: **2073**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **6/21/2000**

Drilling Method:

Owner: **JOGAITH**Address of Well: **RD 2 BOX 283**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 15 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405203[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 16 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **DANIEL P HORNBURG**PA Well ID: **405203**License: **2043**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **8/3/1998**

Drilling Method:

Owner: **LAWSON**Address of Well: **RD 1, COLUMBUS**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 16 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405200[Menu](#)[New Selection](#)Email comments to [Topo Geo.](#)

Record: 17 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: DANIEL P HORNBURG

PA Well ID: 405200

License: 2043

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 6/18/1999

Drilling Method:

Owner: MCCLAIN

Address of Well: BOX 99M, COLUMBUS

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 17 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405212[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 18 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)

Well Driller: JENNINGS & SON DRILLING

PA Well ID: 405212

License: 0067

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 5/1/1991

Drilling Method:

Owner: MCGURK

Address of Well: RD 2 BOX 249, CORRY

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 18 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405196

Menu

New Selection

Email comments to [Topo Geo.](#)

Record: 19 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: MCCRAY WELL DRILLING

PA Well ID: 405196

License: 1664

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 10/1/2001

Drilling Method:

Owner: MICK

Address of Well: HERDFORD RD

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 19 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405214[Menu](#)[New Selection](#)Email comments to [Topo Geo.](#)

Record: 20 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)

Well Driller: MCCRAY WELL DRILLING

PA Well ID: 405214

License: 1664

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 9/1/1993

Drilling Method:

Owner: MIKE

Address of Well: 9696 BAKER HILL RD

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 20 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 146668[Menu](#)[New Selection](#)Email comments to [Topo Geo.](#)

Record: 21 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: JOHNSON DRILLING

PA Well ID: 146668

License: 0761

Driller Well ID:

Type of Activity: New Well

Original Well By:

Date Drilled: 8/1/1988

Drilling Method:

Owner: MILLER LAWRENCE

Address of Well:

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle: COLUMBUS

Latitude: 41.9725

Longitude: -79.60667

Well Depth (ft): 62

Well Finish: OPEN HOLE

Depth to Bedrock(ft): 6

Did Not Encounter Bedrock:

Well Yield (gpm): 20

Yield Measure Method: BAILER

Static Water Level: 12
(ft below land surface)Water level after yield test: 40
(ft below land surface)Length of Yield Test: 1.42
(minutes)

Saltwater Zone(ft):

Use of Well: WITHDRAWAL

Use of Water: STOCK

CASING

CASING 1: Top: 0 Bottom: 23 Diameter: 8 Material:

SEAL 1 Top: Bottom:

Type: UNKNOWN

WATER BEARING ZONE

WATER BEARING ZONE 1: Top: 32 Bottom: Yield:

WATER BEARING ZONE 2: Top: 46 Bottom: Yield:

Record: 21 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405197[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)**Record: 22 of 35****(There is a total of 35 Wells in the list.)**[First Well](#)[Prev Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **CLEARWATER DRILLING COMPANY**PA Well ID: **405197**License: **2073**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **9/21/2001**

Drilling Method:

Owner: **MOWAR**Address of Well: **RT 417 W PO BOX 189**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 22 of 35**(There is a total of 35 Wells in the list.)**[First Well](#)[Prev Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)

PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405211[Menu](#)[New Selection](#)Email comments to [Topo Geo.](#)

Record: 23 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: MCCRAY WELL DRILLING

PA Well ID: 405211

License: 1664

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 7/1/1992

Drilling Method:

Owner: NAGEL

Address of Well: COTTAGE PARK, COLUMBUS

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 23 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 146665

Menu

New Selection

Email comments to [Topo Geo.](#)

Record: 24 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: YORK WATER WELL DRILLING CO INC

PA Well ID: 146665

License: 1378

Driller Well ID:

Type of Activity: New Well

Original Well By:

Date Drilled: 5/1/1979

Drilling Method:

Owner: PEHY D

Address of Well:

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle: COLUMBUS

Latitude: 41.91778

Longitude: -79.50445

Well Depth (ft): 100

Well Finish: OPEN HOLE

Depth to Bedrock(ft): 77

Did Not Encounter Bedrock:

Well Yield (gpm): 7

Yield Measure Method: VOLUMETRIC,
WATCH &
BUCKETStatic Water Level: 60
(ft below land surface)Water level after yield test: 60
(ft below land surface)Length of Yield Test: 0.25
(minutes)

Saltwater Zone(ft):

Use of Well: WITHDRAWAL

Use of Water: DOMESTIC

Description of Well Location and Other Notes:

3/4 WAY UP HILL SIDE LOT 3322

CASING

CASING 1: Top: 0 Bottom: 78.7 Diameter: 6 Material:

WATER BEARING ZONE

WATER BEARING ZONE 1: Top: 77 Bottom: Yield:

WATER BEARING ZONE 2: Top: 90 Bottom: Yield:

Record: 24 of 35

(There is a total of 35 Wells in the list.)

PaGWIS List Of Selected Wells

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405199[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 25 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **GILLIS BROTHERS INC**PA Well ID: **405199**License: **0649**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **9/1/1986**

Drilling Method:

Owner: **RAYMOND**Address of Well: **COLUMBUS RD, COLUMBUS**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 25 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405217[Menu](#)[New Selection](#)Email comments to [Topo Geo.](#)

Record: 26 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: MCCANDLESS WELL DRILLING INC

PA Well ID: 405217

License: 1393

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 7/30/1996

Drilling Method:

Owner: RAYMOND

Address of Well: COLUMBUS

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 26 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 33599

Menu

New Selection

Email comments to [Topo Geo.](#)

Record: 27 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: YORK WATER WELL DRILLING CO INC

PA Well ID: 33599

License: 1378

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 5/1/1985

Drilling Method: OTHER/UNKNOWN

Owner: REIFF, WILLIAM

Address of Well:

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle: COLUMBUS

Latitude: 41.94361

Longitude: -79.56973

Well Depth (ft): 60

Well Finish: OPEN HOLE

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level: 9.7
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well: WITHDRAWAL

Use of Water: DOMESTIC

BOREHOLE

Top Bottom Diameter

SECTION 1: 0 60 0

CASING

CASING 1: Top: 0 Bottom: 37 Diameter: 6 Material: STEEL

Record: 27 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405206[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 28 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **JOHNSON DRILLING**PA Well ID: **405206**License: **0761**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **4/1/1999**

Drilling Method:

Owner: **SCAMENS**Address of Well: **RD 1 BLUE EYE RD, COLUMBUS**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 28 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405207[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 29 of 35

(There is a total of 35 Wells in the list.)

[First Well](#)[Prev. Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **JOHNSON DRILLING**PA Well ID: **405207**License: **0761**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **8/1/1998**

Drilling Method:

Owner: **SEYMOUR**Address of Well: **RR 1 BOX 30A PINE VALLEY RD,
COLUMBUS**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 29 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405218

Menu

New Selection

Email comments to [Topo Geo.](#)

Record: 30 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: **JOHNSON DRILLING**PA Well ID: **405218**License: **0761**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: **12/1/1993**

Drilling Method:

Owner: **SINGH**Address of Well: **BESE LAKE**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 30 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405209[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)**Record: 31 of 35****(There is a total of 35 Wells in the list.)**[First Well](#)[Prev. Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)Well Driller: **MCCRAY WELL DRILLING**PA Well ID: **405209**License: **1664**

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled:

Drilling Method:

Owner: **SONDSTROM**Address of Well: **SPENCER RD**

Zipcode:

County: **WARREN**Municipality: **COLUMBUS TWP.**

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 31 of 35**(There is a total of 35 Wells in the list.)**[First Well](#)[Prev. Well](#)[Next Well](#)[Last Well](#)[Return to Summary List](#)

PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 33584

Menu

New Selection

Email comments to [Topo Geo.](#)

Record: 32 of 35

(There is a total of 35 Wells in the list.)

First Well

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Well Driller: MCCRAY BROS

PA Well ID: 33584

License: 0224

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 12/1/1979

Drilling Method: CABLE TOOL

Owner: STOCTON, CHARLES

Address of Well:

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle: COLUMBUS

Latitude: 41.93444

Longitude: -79.58167

Well Depth (ft): 42

Well Finish: UNKNOWN

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm): 2

Yield Measure Method: VOLUMETRIC,
WATCH &
BUCKETStatic Water Level: 20
(ft below land surface)Water level after yield test: 40
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well: WITHDRAWAL

Use of Water: DOMESTIC

BOREHOLE

Top Bottom Diameter

SECTION 1: 0 42 0

CASING

CASING 1: Top: 0 Bottom: 42 Diameter: 8 Material: UNKNOWN

Record: 32 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405204[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 33 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: DANIEL P HORNBERG

PA Well ID: 405204

License: 2043

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 9/1/1998

Drilling Method:

Owner: TAYDUS

Address of Well: RD 1, COLUMBUS

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 33 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 405215[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 34 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: MCCRAY WELL DRILLING

PA Well ID: 405215

License: 1664

Driller Well ID:

Type of Activity:

Original Well By:

Date Drilled: 6/1/1993

Drilling Method:

Owner: TRESSLEY

Address of Well: RD 1, COLUMBUS

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle:

Latitude:

Longitude:

Well Depth (ft):

Well Finish:

Depth to Bedrock(ft):

Did Not Encounter Bedrock:

Well Yield (gpm):

Yield Measure Method:

Static Water Level:
(ft below land surface)Water level after yield test:
(ft below land surface)Length of Yield Test:
(minutes)

Saltwater Zone(ft):

Use of Well:

Use of Water:

Record: 34 of 35

(There is a total of 35 Wells in the list.)

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PA Topographic & Geologic Survey

PaGWIS

DETAILS FOR WELL 146666[Menu](#)[New Selection](#)[Email comments to Topo Geo.](#)

Record: 35 of 35

(There is a total of 35 Wells in the list.)

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Well Driller: YORK WATER WELL DRILLING CO INC

PA Well ID: 146666

License: 1378

Driller Well ID:

Type of Activity: New Well

Original Well By:

Date Drilled: 5/1/1985

Drilling Method:

Owner: ZEIH C

Address of Well:

Zipcode:

County: WARREN

Municipality: COLUMBUS TWP.

Quadrangle: COLUMBUS

Latitude: 41.94361

Longitude: -79.57

Well Depth (ft): 60

Well Finish: OPEN HOLE

Depth to Bedrock(ft): 35

Did Not Encounter Bedrock:

Well Yield (gpm): 9

Yield Measure Method: VOLUMETRIC,
WATCH &
BUCKETStatic Water Level: 48
(ft below land surface)Water level after yield test: 48
(ft below land surface)Length of Yield Test: 0.33
(minutes)

Saltwater Zone(ft):

Use of Well: WITHDRAWAL

Use of Water: DOMESTIC

CASING

CASING 1: Top: 0 Bottom: 37 Diameter: 6 Material:

WATER BEARING ZONE

WATER BEARING ZONE 1: Top: 45 Bottom: Yield:

WATER BEARING ZONE 2: Top: 51 Bottom: Yield:

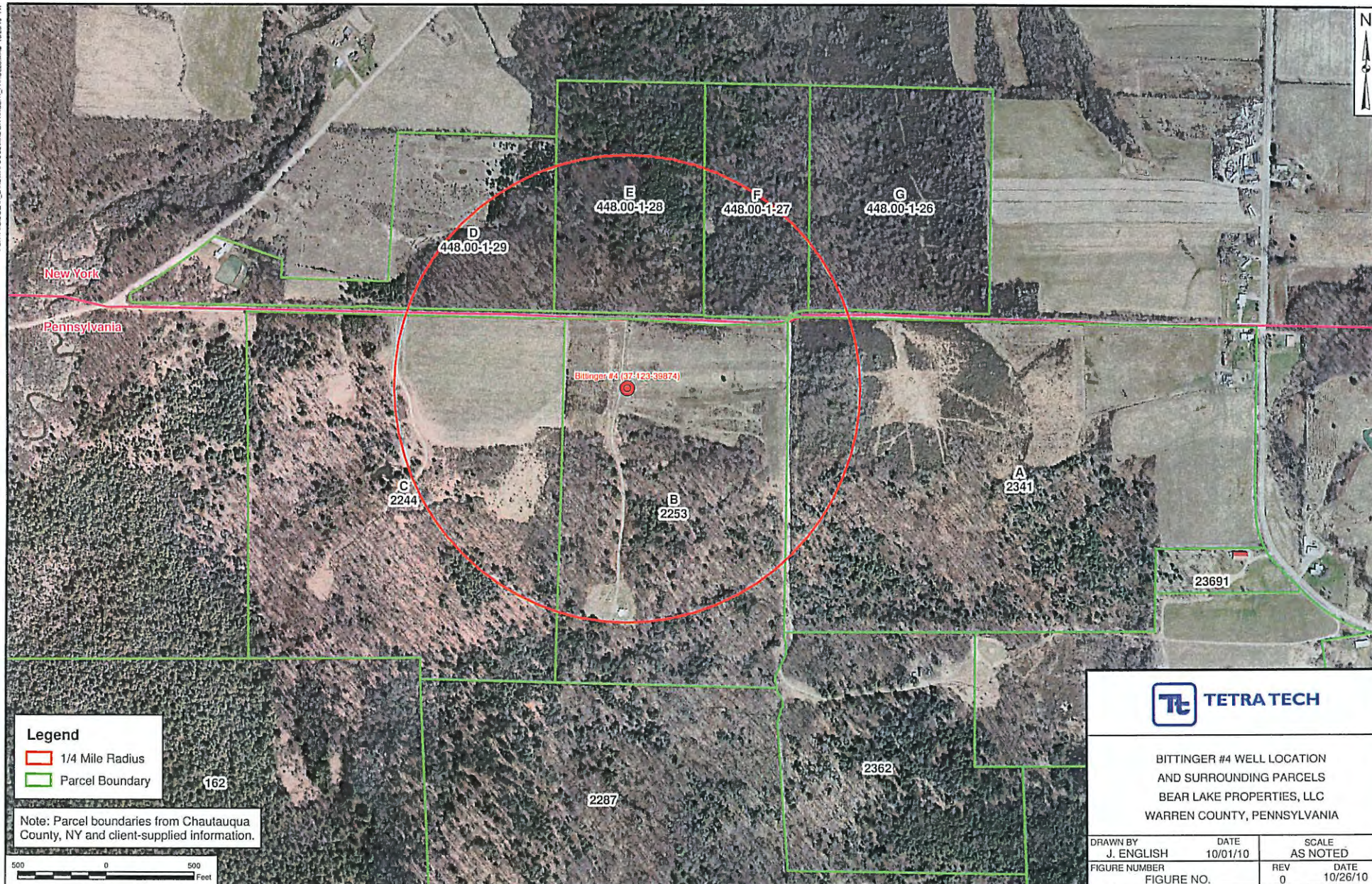
Record: 35 of 35

(There is a total of 35 Wells in the list.)

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Appendix B

Appendix B contains the names and address of residents located within $\frac{1}{4}$ mile of the proposed injection well.



	PARCEL #	OWNER	ADDRESS
A	2341	Bear Lake Properties, LLC	3010 Village Run, Suite 103, Wexford, PA 15090
B	2253	Miles and Joyce Sampsel	8353 Pagan Road, Erie, PA 16509
C	2244	John R. and Kathryn Triskett	P.O. Box 88, Ashville, NY 14710
D	448.00-1-29	David Beres	4318 Oakwood Ave, Blasdell, NY 14219
E	448.00-1-28	David Beres	4318 Oakwood Ave, Blasdell, NY 14219
F	448.00-1-27	David Beres	4318 Oakwood Ave, Blasdell, NY 14219
G	448.00-1-26	Kenneth Stefanski	473 Fairmont Ave N., Tonawanda, NY 14120

DOCUMENTATION OF CEMENT RETURNS ON SURFACE CASING

Cement EVALUATION LOG ON 4 1/2"

STATUS OF MONITORING WELLS - ARE THEY ACTIVE WILL THEY BE
ACTIVE, Siphon STRINGS

Semi-ANNUAL? FOR MONITORING WELLS

QUARTERLY MAY BE MORE APPROPRIATE

1.0 FRAC GRAPHS

4285' TOP OF PERFS

BOTTOM HOLE

3994 BOTTOM HOLE PRESSURE

1726 SURFACE PRESSURE

AT -

Section 6 – Operating Data

Revised Pages

Operating Data

The proposed commercial brine disposal well will primarily be utilized to inject produced and flow-back water from wells completed in the Marcellus Shale, the Medina Group and other natural gas and oil producing formations. Other oil and gas related wastewaters associated with the production of oil and natural gas or natural gas storage operations, which are approved by EPA for injection under a UIC Class II D injection well, may also be injected. According to Title 40 Chapter I Sec. 144.6 (b)(1), such fluids include those "Which are brought to the surface in connection with natural gas storage operations, or conventional oil or natural gas production and may be commingled with waste waters from gas plants which are an integral part of production operations, unless those waters are classified as a hazardous waste at the time of injection."

Injection Rate

Injectivity testing performed on the proposed injection well (Bittinger #4) indicated the well may be capable of sustaining injection rates on at least a short-term basis on the order of 3 bbl/min or approximately 4,300 bbl/day. Considering this was a relatively short-term test, a maximum injection rate of 2,000 bbl/day is proposed for operation of the facility, with an average injection rate of 1,000 bbl/day expected.

Maximum Allowable Surface Injection Pressure (MASIP) and Average Surface Injection Pressure

MASIP calculations based on EPA approved equations are included in the "Geologic Data" section of this application. Based on these calculations, the proposed MASIP is 1736 psi. It is estimated that the average surface injection pressure will be approximately 1000 psi.

Laboratory Analysis of Injection Fluid Samples

Laboratory samples representative of the types of brine which will be injected into the proposed injection well are attached. Samples were collected from produced water generated from gas wells in the vicinity of the injection well. The samples are characterized by chloride concentrations in the 200,000 mg/L range and specific gravity of approximately 1.2.

Monitoring of Injection Fluid Samples and Well

The following identifies the UIC Class II underground injection well regulatory requirements and operational procedures which will be conducted to meet the subject requirements:

1. **Monitoring of the nature of injected fluids at time intervals sufficiently frequent to yield data representative of their characteristics.** An initial sample of fluid will be collected and analyzed from initial loads proposed for disposal from new disposal customers. In addition, samples will be collected for analysis from new types of sources (e.g., from different geologic formations, geographic regions, etc.) which would be expected to differ significantly from brine previously characterized for disposal at the facility. Samples will be analyzed for the following parameters at a minimum: specific gravity, total dissolved solids, total organic carbon, and pH.
2. **Observation of injection pressure, flow rate, and cumulative volume at least weekly based on the regulatory requirements for produced fluid disposal operations.** Injection pressures, flow rate, and cumulative volume will be continuously recorded electronically.

3. **A demonstration of mechanical integrity pursuant to 40 CFR Sec. 146.8 at least once every five years during the life of the injection well.** A mechanical integrity test will be performed prior to initiating injection and at least once every five years.
4. **Maintenance of the results of all monitoring until the next permit review.** All monitoring records will be maintained throughout the life of the well.

Reporting requirements consist of the following:

An annual report will be submitted to EPA summarizing the results of the required monitoring, including monthly records of injected fluids, and any major changes in characteristics or sources of injected fluid.

Proposed Annulus Fluid

The proposed annulus fluid for the proposed injection well will consist of fresh water and a water soluble corrosion inhibitor. The corrosion inhibitor will be mixed in accordance with the manufacturer's recommendations then loaded into the well annulus prior to conducting injection operations. Product information for the type of corrosion inhibitor which will be utilized is attached. A similar type product may be used instead of the example product referenced.

Facility Layout and Operation

As indicated in the attached facility layout diagram, the injection well facility will include a truck unloading area and holding tanks connected by piping with associated valves, all of which will be situated in a diked containment area. The containment area will be properly sized to account for the entire volume of the largest container, plus 10% freeboard, in the event of a leak. The brine will be transferred to the injection well utilizing injection pumps situated in the Equipment Shed along with filters and monitoring equipment. Automatic shut-off valves will be incorporated into the tank design to prevent overflow during filling operations. The facility will be surrounded by a fence having locking entrance and exit gates. A security camera will also be strategically situated on the site. The facility will be continually manned during unloading and injection operations. As indicated above, injection rate, cumulative volume and pressures will be continuously measured and recorded.

Section 9 – Plugging and Abandonment Plan

Revised Pages



United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

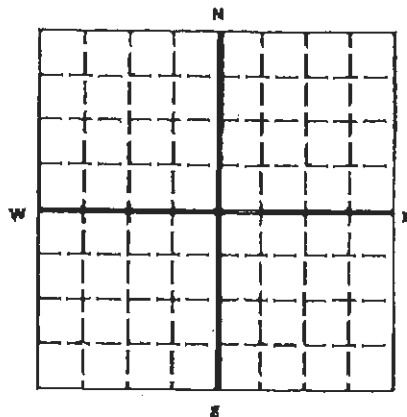
Name and Address of Facility

Bear Lake Properties, LLC
Columbus Township, PA

Name and Address of Owner/Operator

Bear Lake Properties, LLC
3000 Village Run Road, Unit 103, #223, Wexford, PA 15090

Locate Well and Outline Unit on
Section Plat - 640 Acres



State

PA

County

Warren

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.

TYPE OF AUTHORIZATION

- ☒ Individual Permit
☐ Area Permit
☐ Rule

Number of Wells

Lease Name

Biringer

WELL ACTIVITY

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

Well Number

Biringer #4

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			30	
8 5/8			506	
4 1/2			2455 (after cutting)	

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
Size of Hole or Pipe in which Plug Will Be Placed (inches)	4 1/2	7 7/8	7 7/8	8 5/8	8 5/8		
Depth to Bottom of Tubing or Drill Pipe (ft)	4286	2000	900	550	50		
Bags of Cement To Be Used (each plug)	32	30	43	30	14		
Slurry Volume To Be Pumped (cu. ft.)	37.8	35.4	50.7	35.4	16.5		
Calculated Top of Plug (ft.)	4085	1900	750	450	0		
Measured Top of Plug (if tagged ft.)	4085	1900	750	450	0		
Slurry Wt. (lb./gal.)	15.6	15.6	15.6	15.6	15.6		
Type Cement or Other Material (Class III)	Class A	Class A	Class A	Class A	Class A		

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

From	To	From	To
506	2000 (open hole - csg cut)		

Estimated Cost to Plug Wells

\$30,000

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)

Karl Kimmich, President

Signature

Karl C. Kimmich

Date Signed

12/07/2010

UNIVERSAL

WELL SERVICES, INC.



Mr. Dale Skoff
Tetra Tech
661 Anderson Drive
Foster Plaza 7
Pittsburgh, Pa. 15220

Dear Dale,

This bid is the Approximate Cost and Procedure to plug this well. Actual plug as follows

4286 to 4085 feet	Cement plug to plug off perforations	32 Sacks
4085 to 2000 feet	Bentonite gel 6% spacer	
2000 feet	cut 4 1/2 inch casing or above salt	
2000 to 1900 feet	Cement plug	30 Sacks
1900 to 900 feet	Bentonite gel 6% spacer	
900 to 750 feet	Cement plug over shale zone	43 Sacks
750 to 550 feet	Bentonite gel 6% spacer	
550 to 450 feet	Cement plug 50 ft in open hole 50 ft inside 8 5/8 casing	30 Sacks
450 to 50 feet	fill up with pea gravel	
50 to 0 feet	Cement plug to surface	15 Sacks

P.S. If there is any Ononadaga in this well it will require a plug also.
Bentonite is mixed 100 lbs to 6 bls water

Sincerley,

David Cook
Field Sales Rep.

Prepared for
Tetra Tech
661 Anderson Drive
Foster Plaza 7
Pittsburgh, Pa. 15220
December 7, 2010
Bid #0006133



Prepared by
Daniel R Simmons
159 Northwood Dr.
Meadville, PA 16335
(814) 337-1115
Dan.Simmons@uniwell.com

Plug to abandon well.
Plug to abandon Medina well in N. Warren county.

Product #	Description	Qty	Units of Sale	Unit Price	Total Price
A0035	MISCELLANEOUS PUMP 1ST 4 HRS	1.0	EA	\$2,410.00	\$2,410.00
T0002	EQUIPMENT MILEAGE CHARGE	40.0	TRK/MI	\$7.50	\$300.00
M0001	CEMENT - CLASS A	150.0	SK	\$17.50	\$2,625.00
M0040	BENTONITE GEL	25.0	CWT	\$33.50	\$837.50
M0050	UNICELE	25.0	LB	\$4.00	\$100.00
F0032	CEMENT BLENDING CHARGE	150.0	SK	\$2.35	\$352.50
T0003	CEMENT DELIVERY CHARGE	540.0	SK-MI/10	\$1.10	\$594.00

Gross Price: \$7,219.00

20.00% Special Discount Applied: \$5,775.20

Comments:

- Plug to abandon Medina well in northern Warren county. We would use Class A cement. Overtime would start after 4 hour at the rate of \$590.00 per hour. The lease name is Bittinger # 4.
- Payment Terms: 30days with credit
- This price quote is valid through 12/31/2010. Actual job scheduling is based upon equipment availability.

Section 11 – Plans for Well Failures

Revised Pages

Plan for Well Failures

The pressure in the annulus between the tubing and production (4 ½ inch) casing in the injection well will be continuously monitored. A minimum pressure of approximately 100 psi will be maintained on the annulus. The pressure between the 4 ½ and 8 5/8 inch casing will also be continuously monitored. The annulus will be equipped with an automated well shut-off device which will shut down the well if pressure indicative of well failure occurs. Should a pressure change indicative of well failure occur in either monitored space, injection will cease and EPA will be verbally notified within 24 hours and notified in writing within 7 days. The cause of the pressure change will be investigated by Bear Lake Properties and remedial measures implemented following discussions with EPA on the proposed approach.