ILLINOIS DEPARTMENT OF NATURAL RESOURCES

Office of Oil and Gas Resource Management
One Natural Resources Way Springfield, Illinois 62702-1271

HIGH VOLUME HORIZONTAL HYDRAULIC FRACTURING PERMIT APPLICATION HVHHF-10

References to "1-xx" or "§1-xx" are to the Hydraulic Fracturing Regulatory Act., 225 ILCS 732/1-1 et seq. References to "240.xxx" and "245.xxx" are to 62 Ill. Admin. Code 240 and 245, respectively.

Attachment:WaterQualityMonitoringWorkPlan

Please save attachment and use the file name above.

Water Quality Monitoring Work Plan §1-80(a); 245.210(a)(20), 245.600(a). 245.610.

(a) Identify all water sources within the range of testing under §1-80(a)(1) of the Act

See Attachment

(b) Attach the work plan to ensure accurate and complete water quality sampling and testing as set forth in §1-80(a) and 245.600(a), reviewed and certified by a professional engineer or professional geologist. The plan must notify the Department at least 7 calendar days before sample collection and must at minimum provide the following:

i. the name and contact information of the independent third party, under the supervision of a professional engineer or professional geologist, designated to conduct sampling to establish a baseline per §1-80(a)(3);

ii. the name and contact information of the independent third party, under the supervision of a professional engineer or professional geologist, designated to conduct sampling to establish compliance with monitoring per §1-80(a)(4);

iii. the name and contact information of an independent testing laboratory accredited or certified by the Agency to perform the required laboratory method and to conduct the analysis required under Section 1-80(a)(5). When no laboratory has been accredited or certified by the Agency to analyze a particular substance requested, the laboratory must be accredited or certified by another State agency

or an agency of the federal government, if the standards used for the accreditation or certification of that laboratory are substantially equivalent to the accreditation standard under Section 4(o) of the Illinois Environmental Protection Act [415 ILCS 5];

iv. proof of access to (and the right to test within) the area for testing prescribed within subsections (b) and (c) (Section 1-80(a)(6) of the Act)

v. copies of any non-disclosure agreements made with landowners, if applicable

vi. any documentation, if applicable, that a landowner of private property declines, expressly and in writing, to provide access or permission for sampling; if this documentation is unavailable, provide logs, copies of communications, and any other evidence of the good faith efforts made to secure such documentation

vii. proof that you provided each landowner referenced in subsections iv, v, and vi, above with a notice of water sampling rights under the Act pursuant to a form prescribed by the Department and prior to the landowner's execution of any document regarding water sampling

viii. identification of practicable contingency measures, including provision for alternative drinking water supplies, which could be implemented in the event of pollution or diminution of a water source.

(c) Identify the professional engineer or professional geologist who has reviewed and certified this plan: Gerald E. Quindry, P.E., Sigma Plus Enginerring, LLC

Water Quality Monitoring Work Plan

This Water Quality Monitoring Work Plan is submitted to identify the surface water bodies and underground aquifers that will be monitored as required by the HVHHF regulations, to describe the monitoring to be conducted, and the assessment process for the evaluation of analytical results.

(a) Identify all water sources within the range of testing under §1-80(a) of the Act

Existing water sources within the range of testing include one surface impoundment used for stock watering, and one water well, reportedly used to supply the stock watering surface impoundment. Community water systems in the vicinity of the proposed HVHHF well supply water through interconnections with regional water suppliers, with those supplied from surface water storage in Rend Lake, some 30 miles west of the oil well location, or water wells along the Wabash River, more than 10 miles east of the proposed oil well. None of the community water supply sources are within the range of testing under §1-80(a) of the Act. Three water supply wells are planned for installation as part of the oil well drilling and hydraulic fracturing program, and these wells will be within the range of testing required by the Act. A single residence is located within the range of testing, but the house does not have a private well, and is served with piped-in water by the local water district.

(b) Attach the work plan to ensure accurate and complete water quality sampling and testing as set forth in §1-80(a) and 245.600(a), reviewed and certified by a professional engineer or professional geologist. The plan must notify the Department at least 7 calendar days before sample collection and must at a minimum provide the following:

i. The name and contact information of the independent third party, under the supervision of a professional engineer or professional geologist, designated to conduct sampling to establish a baseline per §1-80(a)(3).

Sampling will be conducted by:

Shawnee Professional Services

104 South 4th St.; P.O. Box 125
Vienna, Illinois 62995-0125
618.658.6065

Professional Engineer supervising:

Billy Abernathy, P.E.
Shawnee Professional Services
104 South 4th St.; P.O. Box 125
Vienna, Illinois 62995-0125
618.658.6065

ii. The name and contact information of the independent third party, under the supervision of a professional engineer or professional geologist, designated to conduct sampling to establish compliance with monitoring per §1-80(a)(4).

The sampling program extends over a period of years. Initial sampling will be conducted by the firm named below, but it may be necessary to substitute the firm or supervising engineer during the program compliance period. Any substitution shall be with a similarly qualified firm or professional engineer/geologist.

Sampling will be conducted by:

Shawnee Professional Services
104 South 4th St.; P.O. Box 125
Vienna, Illinois 62995-0125
618.658.6065

Professional Engineer supervising:

Billy Abernathy, P.E.
Shawnee Professional Services
104 South 4th St.; P.O. Box 125
Vienna, Illinois 62995-0125
618.658.6065

iii. The name and contact information of an independent testing laboratory accredited by the Agency to perform the required laboratory method and to conduct the analysis required under §1-80(a)(5).

The analytical program extends over a period of years. Initial analyses will be conducted by the laboratories named below, but it may be necessary to substitute different companies during the program compliance period. Any substitution shall be with a similarly qualified laboratory approved by the Illinois EPA or another State agency, or an agency of the federal government, if the standards used for the accreditation or certification of that laboratory are substantially equivalent to the accreditation standard under Section 4(0) of the Illinois Environmental Protection Act (415 ILCS 5).

No individual laboratory within timely sample delivery range of the HVHHF drilling site is qualified to conduct all of the required analyses. The primary laboratory designated below will conduct all those analyses for which they are accredited, and distribute samples to subcontract laboratories for the remaining analyses. In any case, all analyses will be conducted by a laboratory properly accredited to perform the analyses required.

Laboratory Name	Status	Location
ARDL, Inc.	Primary Laboratory	Mt. Vernon, Illinois
tbd	Subcontract Laboratory	
tbd	Subcontract Laboratory	
tbd	Subcontract Laboratory	
ECS Lab Sciences	Primary Laboratory Alternate	Mt. Juliet, Tennessee

iv. Proof of Access to (and the right to test within) the area for testing prescribed within subsections (b) and (c) (Section 1-80a of the Act)

Landowner declines to provide permissions for sampling.

v. copies of any non-disclosure agreements made with landowners, if applicable.

Not Applicable

vi. any documentation, if applicable, that a landowner of a private property declines, expressly and in writing, to provide access or permission for sampling; if this documentation is unavailable, provide logs, copies of communications, and any other evidence of the good faith efforts made to secure such documentation.

vii. Proof that you provided each landowner referenced in subsections iv, v, and vi, above with a notice of water sampling rights under the Act pursuant to a form prescribed by the Department and prior to the landowner's execution of any document regarding water sampling.

viii. Identification of practicable contingency measures, including provision for alternative drinking water supplies, which could be implemented in the event pollution or diminution of a water source.

The area is served by a public water supply agency and water distribution system. There is no drinking water supply that uses the local surface or groundwater, thus no need to provide any alternate human drinking water supplies. In the unlikely event that the surface impoundment stock pond, or the water well supplying that stock pond, were to be polluted or otherwise diminished, a stock watering tank could be provided, using the public water system as the supply.

(c) Identfy the professional engineer or professional geologist that has reviewed and certified this plan:

Gerald E. Quindry, P.E.
Sigma Plus Engineering, LLC
P.O. Box 554
Fairfield, Illinois 62837

Water Quality Monitoring Work Plan

The water sources included under this plan include both underground aquifers (one existing, and three proposed HVHHF water supply wells) and a surface water body (a stock pond). A fourth potentially required water supply well may be drilled, and, if completed, will be included in this monitoring program. No perennial streams are within the applicable range of the testing program. Analytes for each well and the surface impoundment shall include the following:

Table 1. Groundwater Analyses to be Performed				
Analyte	Method	Bottle Requirements	Preservative	Holding Time
Arsenic	6010	500 mL Plastic	Nitric	6 Months
Barium	6010	--	--	6 Months
Cadmium	6010	--	--	6 Months
Calcium	6010	--	--	6 Months
Chromium	6010	--	--	6 Months
Iron	6010	--	--	6 Months
Lead	6010	--	--	6 Months
Magnesium	6010	--	--	6 Months
Manganese	6010	--	--	6 Months
Selenium	6010	--	--	6 Months
Silver	6010	--	--	6 Months
Mercury	7470	--	--	28 days
BTEX	8260	3 x 40 mL	Hydrochloric	14 days
Dissolved propane	RSK-175	3 x 40 mL	Hydrochloric	14 days
Dissolved methane	RSK-175	--	--	14 days
Dissolved ethane	RSK-175	--	--	14 days
Chloride	300.0	500 mL Plastic	Unpreserved	28 days
Sulfide	376.x / SM4500 S2-F	250 mL Plastic	NaOH & ZnOAc	7 days
Sulfate	300.0	--	--	28 days
Gross Alpha particles	900.0	500 mL Plastic	Nitric	na
Gross Beta particles	900.0	--	--	na
Total Dissolved Solids	160.1 / SM2540C	1 L Plastic	Unpreserved	7 days
Alkalinity	310.x / SM2320B	--	--	14 days
Specific conductance pH (at time of collection)	120.1 / SM 2510B	--	--	28 days immediate

Table 2. Surface Water Analyses to be Performed

Analyte	Method	Bottle Requirements	Preservative	Holding Time
Arsenic	6010	500 mL Plastic	Nitric	6 Months
Barium	6010	--	--	6 Months
Cadmium	6010	--	--	6 Months
Calcium	6010	--	--	6 Months
Chromium	6010	--	--	6 Months
Iron	6010	--	--	6 Months
Lead	6010	--	--	6 Months
Magnesium	6010	--	--	6 Months
Manganese	6010	--	--	6 Months
Selenium	6010	--	--	6 Months
Silver	6010	--	--	6 Months
Mercury	7470	--	--	28 days
VOCs (including BTEX)	8260	3 x 40 mL	Hydrochloric	14 days
Dissolved propane	RSK-175	3 x 40 mL	Hydrochloric	14 days
Dissolved methane	RSK-175	--	--	14 days
Dissolved ethane	RSK-175	--	--	14 days
Chloride	300.0	500 mL Plastic	Unpreserved	28 days
Sulfide	376.x / SM4500 S2-F	250 mL Plastic	NaOH & ZnOAc	7 days
Nitrate	300.0	500 mL Plastic	Unpreserved	48 Hours
Nitrite	300 / SM 4500 NO3 F	500 mL Plastic	Unpreserved	48 Hours
Sulfate	300.0	500 mL Plastic	Unpreserved	28 days
Gross Alpha particles	900.0	500 mL Plastic	Nitric	na
Gross Beta particles	900.0	--	--	na
Total Dissolved Solids	160.1 / SM2540C	1 L Plastic	Unpreserved	7 days
Total Suspended Solids	160.2 / SM2540D	1 L Plastic	Unpreserved	7 days
Turbidity	110.1 / SM 2130B	--	--	48 Hours
Alkalinity	310.x / SM2320B	--	--	14 days
Specific conductance	120.1 / SM 2510B	--	--	28 days
pH (at time of collection)				immediate

IDNR shall be notified of sampling events with 7 calendar days prior notice. Sampling procedures will comply with the following field procedures:

Surface Water:

To the extent possible, the sample location shall be located such that the water is representative of the overall water body being sampled. The location shall be surveyed to allow repeated sampling from the same location in follow-on sampling events. The location shall be photographed as an additional means of location in future sampling events.

Groundwater:

Groundwater shall be sampled at a point as close to the source as is feasible. In the case of water wells with down-hole pumps, the existing pumping system shall be employed, and a sample collected before any water softening, ion exchange, chemical addition, filtering, or pressure tank that could alter water quality. If no water sampling port is available that meets this criterion, a professional engineer shall be consulted to establish an appropriate sampling point, or a sampling port meeting the criterion may be installed with the owner's permission.

Wells that are open for subsurface sampling shall be sampled by use of bailers or down-hole sampling pump and tubing. Any sampling equipment to be used (including sample bailer cable or string and sample tubing) shall be either be clean and unused, or cleaned and decontaminated on-site prior to use. Wells shall be purged by bailing/pumping at least three well volumes prior to collection of samples if bailers or temporary sampling pumps are used.

Sampling Procedure:

Water Sample bottles shall be provided by the analytical laboratory with preservatives included in the bottles. Prior to sampling, all necessary water sample bottles will be clearly labeled in indelible ink, with identification of the project, sample location, date, time, analytical method(s), and initials of the individual collecting the samples. Water shall be retrieved from the water source in a clean, unused bailer or similar device such that the water is representative of the water quality with as little disturbance or aeration as possible. The water will then be distributed to the sample bottles in a manner that minimizes the potential for aeration or contamination. Sample bottles, with the exception of volatile organic samples, shall be filled to approximately 90 percent of full, to allow for expansion of the contents. Samples collected for volatile organics analysis (including dissolved gasses) shall be collected in VOA bottles and filled completely, with no headspace. Immediately after collection, the individual samples bottles shall be placed in individual zipper-lock plastic bags which shall be labeled with their contents. The bagged sample bottles shall then immediately be placed in a cooler or ice chest containing either bagged ice or 'blue ice' type coolants. The chain of custody documents shall be filled out in the field as the samples are collected, and accompany the samples

throughout their journey from the field to the analytical laboratory. At all times until surrender to the analytical laboratory, the samples shall be in the positive control of the original sampler as listed on the sample bottle, or the listed recipient as acknowledged on the chain-of-custody document.

Sampling Frequency:

Prior to HVHHF operations each source shall be sampled a minimum of three times to establish baseline conditions. After HVHHF operations have been completed, all sources shall be sampled repeatedly, per the schedule described below:

Sample Event	Timing
Prior to HVHHF operations	A minimum of 3 events after permit approval and before HVHHF operations
First Post-HVHHF samples	6 months after HVHHF operations [1]
Second Post-HVHHF samples	18 months after HVHHF operations [1]
Third Post-HVHHF samples	30 months after HVHHF operations [1]

[1] Source sampling in the previous month can be substituted for the scheduled sampling event

Data Analysis Procedure:

Water quality in naturally occurring sources varies with season and other natural conditions. Also, water sampling and analysis have unavoidable variances in results, even if actual water quality is unchanged. For these reasons, it is necessary to employ multiple sampling events, and statistical methods to assess whether or not a water source has been degraded or diminished because of some external force, such as nearby hydraulic fracturing conducted beneath the surface. A baseline is established by sampling before the HVHHF events thus clearly not influenced by future events. Post-HVHHF sampling is then conducted and compared to the baseline.

There are a number of different ways to assess the data resulting from a sampling program. An appropriate method of statistical comparison needs to be established prior to conducting the assessment. Otherwise, it would be possible to select a method that achieves the desired result, rather than one providing a fair assessment of the data. The method to be used under this plan is based on U.S. EPA methodology established for the assessment of contaminants in environmental samples, and is

described in Chapter 9 of USEPA publication 846.[1] We propose to use a data analysis plan based on that methodology. That methodology can be used to establish:

- A statistically valid range for the mean value of baseline sample data, based on a presumed level of confidence. (We propose using a 90 % level of confidence, the same as USEPA.)
- A statistically valid range for the mean value of post-HVHHF operations samples.
- If the confidence interval for the mean baseline results, compared to the mean post-HVHHF results do not overlap, the conclusion to be drawn is that the two sampling periods have different sample results. Thus forming a conclusion that the HVHHF operations may have impacted water quality; and further investigation is warranted. Such further investigation may include additional sampling or data gathering.

It should be noted that the methodology described above leaves doubt as to the actual results. No statistical method is perfect. In this case, we are assuming a 90 percent confidence level, which is the same as selected by USEPA for similar assessments. That means, that for any specific comparison, there is a 90 percent possibility of an accurate result, a 5 percent possibility of a false positive result, and a 5 percent chance of a false negative result. But increasing the confidence level would broaden the range of each mean such that they would be nearly meaningless and allow findings of impairment or degradation to go undetected. Reducing the confidence level would have similar, but opposite results, and lead to many more false positives, where the sampling results would indicate environmental degradation that, in reality, did not occur. As a middle ground, we have chosen the USEPA standard range.

A finding of a potential environmental impairment shall be reported to IDNR. The permit applicant shall then assist IDNR and IEPA in evaluating the issue by conducting a thorough review of well operations, sample collection and analysis history, and, if requested, collecting additional samples from the potentially impacted sources. Thus, a more detailed examination of available data shall be made by IDNR and IEPA, allowing other factors other than the three baseline and post-HVHHF samples to be considered.

[1] Test Methods for Evaluating Solid Waste: Physical/Chemical Methods Compendium (SW-846), US EPA, available online at https://www.epa.gov/hw-sw846/sw-846-compendium

FEB 02 2017

WOOLSEY OPERATING COMPANY, LLC

125 N. MARKET STREET, SUITE 1000, WICHITA, KANSAS 67202-1729 (316) 267-4379
FAX (316) 267-4383
woolsey@woolseyco.com

January 25, 2017

Alice, Scott and Kent Woodrow
[redacted]

Re: IDNR HVHHFACT & Rules Water Sampling 62 III
Code 245.600(a)(6)
1,500 Ft of Woodrow #1H Horizontal Well
W/2 E/2 Section 31-T4South, R8East White County, IL

Dear Woodrow's:

This letter is sent requesting your election as to the IDNR Requirements pertaining to the above Rules has been prepared to satisfy said IDNR Water Sampling Requirements.

As a Landowner, the above referenced Act, which is enclosed for your review, provides you the following rights:

. Right to allow access or permission for water quality sampling with no conditions; or ☐
. Right to deny access or permission for water quality sampling; or ☒
. Right to condition access or permission under a non-disclosure agreement with the permittee ☐

We are respectfully asking that you make your election as to one of the above by marking in the that box to the right of that certain Landowner Right.

Further, please sign your individual names where indicated and return one original to me in the enclosed return envelope.

Sincerely,
WOOLSEY OPERATING COMPANY, LLC
[redacted]

Garry D. Walker,CPL
VP Land and Legal

LANDOWNERS:
[redacted]
Alice Woodrow
[redacted]
Scott Woodrow
[redacted]
Kent Woodrow

Signed this 30 day of JAN., 2017

ILLINOIS DEPARTMENT OF NATURAL RESOURCES
Office of Oil and Gas Resource Management
1 Natural Resources Way
(217) 558-2028 Springfield, Illinois 62702-1271

WATER SAMPLING RIGHTS HVHHF-32

PERMITEE: Woolsey Operating Company, LLC REGISTRATION #: HVHHF- 00003

WELL NAME: Woodrow 1H-310408-4193 PERMIT #: TBD

LOCATION: 1,990' South and 1,650' West of the NE NE NE NE Quarter REFERENCE # TBD

COUNTY: White SECTION: 31 TOWNSHIP: 4S RANGE: 8E

COMPANY: Woolsey Operating, LLC

CONTRACTOR / DESIGNEE NAME: NA

CONTRACTOR / DESIGNEE SIGNATURE: NA DATE:

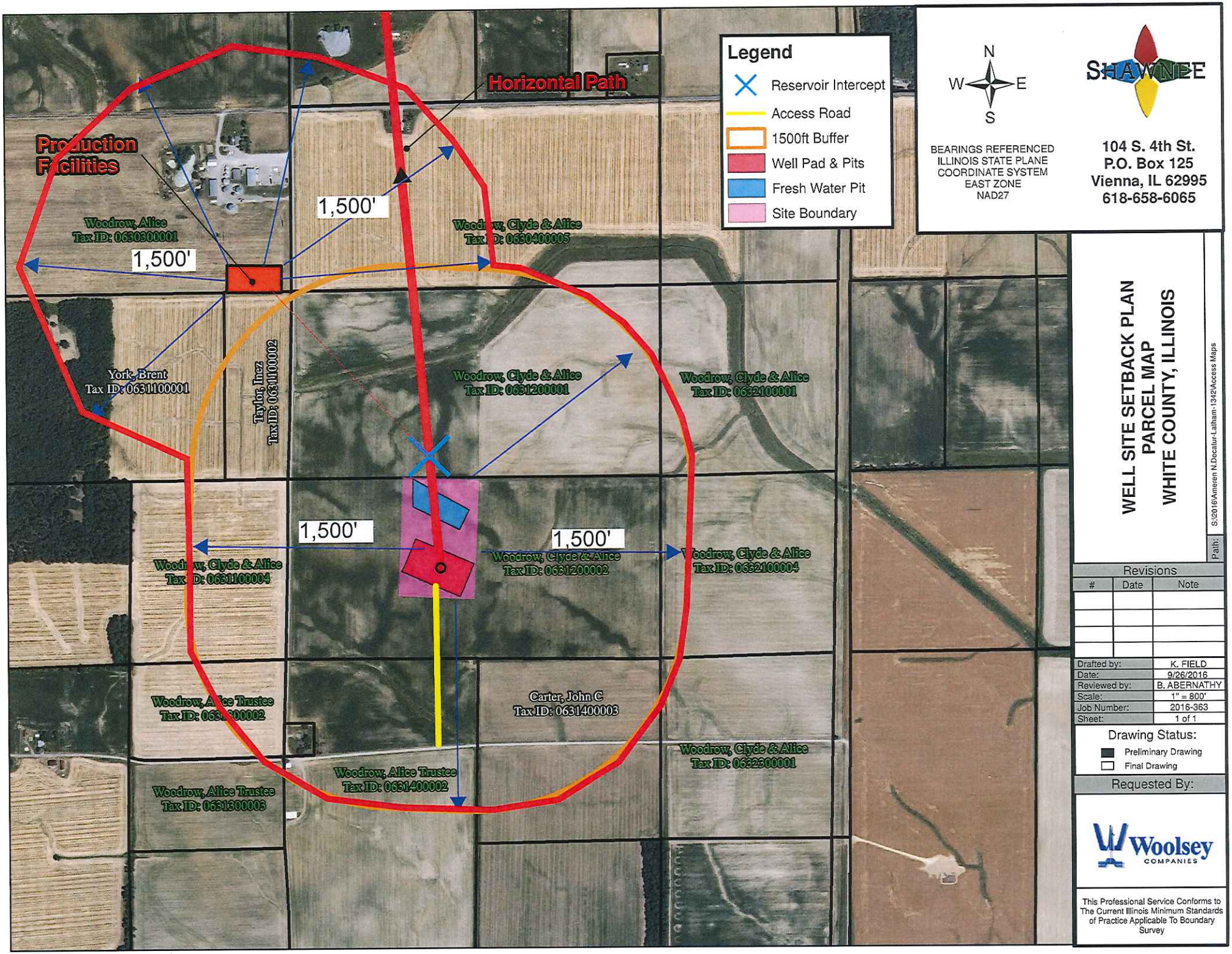
CERTIFICATION

"I certify, under penalty of perjury as provided by law and under penalty of refusal, suspension, or revocation of a high volume horizontal hydraulic fracturing permit, that I have provided each landowner with notice of their water sampling rights, using the form (provided by the Department) known as the Notice of Water Sampling Rights under the Hydraulic Fracturing Regulatory Act and pursuant to 62 Ill. Adm. Code §245.600(a)(6)."

[redacted]

Woolsey Operating Company, LLC
Company Name

Manager
Job Title


Horizontal Path
Production Facilities
1,500'
1,500'
1,500'
1,500'
Woodrow, Alice
Tax ID: 0630300001
Woodrow, Clyde & Alice
Tax ID: 0630400005
York, Brent
Tax ID: 0631100001
Taylor, Inez
Tax ID: 0631100002
Woodrow, Clyde & Alice
Tax ID: 0631200001
Woodrow, Clyde & Alice
Tax ID: 0632100001
Woodrow, Clyde & Alice
Tax ID: 0631100004
Woodrow, Clyde & Alice
Tax ID: 0631200002
Woodrow, Clyde & Alice
Tax ID: 0632100004
Woodrow, Alice Trustee
Tax ID: 0631300002
Carter, John C
Tax ID: 0631400003
Woodrow, Clyde & Alice
Tax ID: 0632300001
Woodrow, Alice Trustee
Tax ID: 0631400002
Woodrow, Alice Trustee
Tax ID: 0631300003
Legend
Reservoir Intercept
Access Road
1500ft Buffer
Well Pad & Pits
Fresh Water Pit
Site Boundary
N
W
E
S
BEARINGS REFERENCED
ILLINOIS STATE PLANE
COORDINATE SYSTEM
EAST ZONE
NAD27
SHAWNEE
104 S. 4th St.
P.O. Box 125
Vienna, IL 62995
618-658-6065
WELL SITE SETBACK PLAN
PARCEL MAP
WHITE COUNTY, ILLINOIS
Path: S:\2016\Ameren N.Decatur-Latham-1342\Access Maps
Revisions
| Date | Note
Drafted by: K. FIELD
Date: 9/26/2016
Reviewed by: B. ABERNATHY
Scale: 1" = 800'
Job Number: 2016-363
Sheet: 1 of 1
Drawing Status:
Preliminary Drawing
Final Drawing
Requested By:
Woolsey COMPANIES
This Professional Service Conforms to The Current Illinois Minimum Standards of Practice Applicable To Boundary Survey