



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

**UNDERGROUND INJECTION CONTROL PERMIT NUMBER VAS2D955BBUC
AUTHORIZATION TO OPERATE A CLASS II-D INJECTION WELL**

In compliance with provisions of the Safe Drinking Water Act, as amended, 42 U. S. C. §§ 300f et seq. ("SDWA"), and the SDWA implementing regulations promulgated by the U. S. Environmental Protection Agency at Parts 144 - 147 of Title 40 of the Code of Federal Regulations, this permit authorizes:

EnerVest Operating, L.L.C.
300 Capitol Street
Suite 200
Charleston, West Virginia 25301

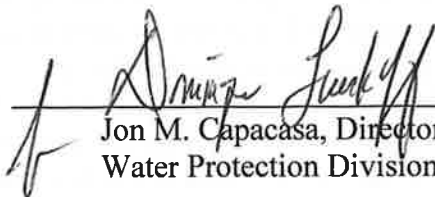
as the Permittee, to construct and operate a disposal Class II-D injection well # 900146, (hereinafter, "Injection Well") which includes injection of fluid produced solely in association with oil and gas production from EnerVest Operating, L.L.C. ("Permittee"), in accordance with the provisions of this Permit. The Injection Well will be located at the Nora and Oakwood Fields, Prater District, Buchanan County, Virginia, into the Weir Formation in accordance with the conditions set forth herein. The coordinates for the Injection Well are: Latitude 37° 11' 38" and Longitude -82° 12' 15".

All references to Title 40 of the Code of Federal Regulations are to all regulations that are in effect on the date that this Permit becomes effective.

This Permit shall become effective on January 14, 2016.

This Permit shall remain in effect until midnight May 14, 2025.

Signed this 14 day of January, 2016.


Jon M. Capacasa, Director
Water Protection Division

PART I

A. Effect of Permit

Permittee is allowed to engage in underground injection at the Injection Well in accordance with the conditions of this Permit. The Permittee shall not allow the underground injection activity, otherwise authorized by this Permit, to cause or contribute to the movement of fluid containing any contaminant into any underground source(s) of drinking water ("USDW"), if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 C.F.R. Part 141, or if it may otherwise adversely affect the health of persons. Any underground injection activity not authorized in this Permit or otherwise authorized by permit or rule is prohibited. Issuance of this Permit does not convey property rights or mineral rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations. Compliance with the terms of this Permit does not constitute a defense to any action brought under Part C of the SDWA, or the imminent and substantial endangerment provisions of Part D of the SDWA, or any other common or statutory law for any breach of any applicable legal duty.

B. Permit Actions

This Permit can be modified, revoked and reissued, or terminated for cause or upon request as specified in 40 C.F.R. §§ 124.5, 144.12, 144.39 and 144.40. Also, this Permit is subject to minor modifications as specified in 40 C.F.R. § 144.41. The filing of a request for a permit modification, revocation and reissuance, or termination, or the notification of planned changes, or anticipated noncompliance on the part of the Permittee shall not stay the applicability or enforceability of any Permit condition.

C. Severability

The provisions of this Permit are severable, and if any provision of this Permit or the Permittee's application is held invalid by a court order, the Permittee shall remain bound to comply with all remaining provisions.

D. General Requirements

1. Duty to Comply. The Permittee shall comply with all applicable Underground Injection Control ("UIC") regulations, including 40 C.F.R. Parts 124, and 144-147, and with the conditions of this Permit, except to the extent and for the duration that EPA authorizes any noncompliance by an emergency permit issued under 40 C.F.R. § 144.34. Any Permit noncompliance constitutes a violation of the SDWA and is grounds for enforcement action, Permit termination, revocation and reissuance or modification, or for denial of a Permit renewal application.
2. Need to Halt or Reduce Activity not a Defense. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this Permit.

3. Duty to Mitigate. The Permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this Permit.
4. Proper Operation and Maintenance. The Permittee shall at all times properly operate and maintain all facilities and systems of treatment and control and related appurtenances which are installed or used by the Permittee to achieve compliance with the conditions of this Permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, adequate security to prevent unauthorized access and operation of the Injection Well and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of this Permit.
5. Duty to Provide Information. The Permittee shall furnish to the Director of the Water Protection Division ("Director"), within a time specified by the Director, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this Permit, or to determine compliance with this Permit. The Permittee shall also furnish to the Director, upon request, copies of records required to be kept by this Permit. If the Permittee becomes aware of any incomplete or incorrect information in the Permit Application or subsequent reports, the Permittee shall promptly submit information addressing these deficiencies. For purposes of this Permit, reports that are required to be submitted "in writing", or in "written" format may be submitted electronically through email or facsimile, unless otherwise specified herein.
6. Inspection and Entry. The Permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by the law to:
 - a. Enter upon the Permittee's premises where the Facility or activity is located or conducted, or where records must be kept under the conditions of this Permit;
 - b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this Permit;
 - c. Inspect at reasonable times the Facility, equipment (including monitoring and control equipment), practices, or operations regulated or required under this Permit; and
 - d. Sample or monitor at reasonable times any substances or parameters at any location for the purposes of assuring Permit compliance or as otherwise authorized by the SDWA.
7. Penalties. Any person who violates a requirement of this Permit is subject to administrative or civil penalties, fines and other enforcement actions under the SDWA. Any person who willfully violates conditions of this Permit may be subject to criminal prosecution.

8. Transfer of Permits. This Permit is not transferable to any person except after notice is sent on EPA Form 7520-7, approval is received from the Director, and the requirements of 40 C.F.R. § 144.38 are satisfied. The Director may require modification or revocation of this Permit to change the name of the Permittee and incorporate such other requirements as may be necessary under the SDWA or its implementing regulations. The transferee is not authorized to inject under this Permit unless and until the Director notifies the transferee that the transferee is so authorized through issuance of a revised permit identifying the transferee as the Permittee.
9. Signatory Requirements.
 - a. The Permittee shall sign all reports required by this Permit and other information requested by the Director as follows:
 - 1) for a corporation, by a responsible corporate officer of at least the level of vice-president;
 - 2) for a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
 - 3) for a Municipality, State, Federal, or other public agency by either a principal executive officer or a ranking elected official.
 - b. A duly-authorized representative of the person designated in paragraph a. above may also sign only if:
 - 1) the authorization is made in writing by a person described in paragraph a. above;
 - 2) the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated Facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or a position of equivalent responsibility. A duly authorized representative may thus be either a named individual or any individual occupying a named position; and
 - 3) the written authorization is submitted to the Director.
 - c. If an authorization under Paragraph b. of this section is no longer accurate because a different individual or position has responsibility for the overall operation of the Facility, a new authorization satisfying the requirements of Paragraph b. of this section must be submitted to the Director prior to or together with any reports, information or applications to be signed by an authorized representative.
 - d. Any person signing a document under Paragraph a. or b. of this section shall make the following certification:

"I certify under the penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person(s) who manage the system, or those persons directly responsible for gathering the information, the information submitted is to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

10. Confidentiality of Information.

- a. In accordance with 40 C.F.R. Part 2 (Public Information) and § 144.5, any information submitted to the Director pursuant to this Permit may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, EPA may make the information available to the public without further notice. If a claim is asserted, the information will be treated in accordance with the procedures in 40 C.F.R. Part 2.
- b. In accordance with 40 C.F.R. §§ 2.304(f) and 144.5, EPA will deny any claims of confidentiality for the following information:
 - 1) The name and address of any permit applicant or permittee.
 - 2) Information which deals with the existence, absence, or level of contaminants in drinking water.

11. State Laws. Nothing in this Permit shall be construed to preclude the institution of any legal action or relieve the Permittee from any responsibilities, liabilities, or penalties established pursuant to any applicable State law or regulation.

12. Reapplication. If the Permittee wishes to continue an activity regulated by this Permit after the expiration date of this Permit, the Permittee must submit a complete application for a new permit at least one hundred (100) days before this Permit's expiration date.

PART II

A. General

The Permittee shall sign and certify copies of all reports and notifications required by this Permit in accordance with the requirements of Section D.9 of Part I, and shall submit such information to the Director at the following address:

Ground Water & Enforcement Branch (3WP22)
Office of Drinking Water and Source Water Protection
U. S. Environmental Protection Agency
Region III

1650 Arch Street
Philadelphia, Pennsylvania 19103

B. Monitoring Requirements

1. Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The Permittee shall obtain representative sample(s) of the fluid to be analyzed and conduct analysis(es) of the sample(s) in accordance with the approved methods and test procedures provided in 40 C.F.R. § 136.3, or methods and test procedures otherwise approved by the Director. The Permittee shall identify in its monitoring records the types of tests and methods used to generate the monitoring data.
2. The Permittee shall continuously monitor and record surface injection pressure, annular pressure, flow rate and cumulative volume in the Injection Well beginning on the date the Injection Well commences operation and concluding when the Injection Well is plugged and abandoned. The Injection Well shall be equipped with an automatic shut-off device which would be activated in the event of a mechanical integrity failure. The Permittee shall also monitor the specific gravity of the injection fluid and confirm that it does not exceed 1.075. If the injection fluid is greater than 1.075, it shall be adjusted by adding a diluting fluid to it so that the resulting specific gravity is 1.075 or less. The Permittee shall compile the monitoring data monthly to complete the Annual Report referenced in paragraph II.D.7 of this Permit.
3. The Permittee shall monitor the nature and composition of the injected fluid by sampling, analyzing and recording the injected fluid for the parameters listed below at the initiation of the injection operation and every two years and whenever the operator anticipates a change in the composition of the injection fluid.

-pH	- Manganese
- Specific Gravity	- Total Dissolved Solids
- Specific Conductance	- Barium
- Sodium	- Hydrogen Sulfide
- Chloride	- Alkalinity
- Iron	- Dissolved Oxygen
- Magnesium	- Hardness
- Total Organic Carbon	

4. The Permittee shall verbally report, to the Director, analytical results for specific gravity that are greater than 1.075 within twenty-four hours of obtaining the analytical results. Within five business days, the substance of that report shall be reduced to writing and provided to EPA pursuant to the submission requirements of I.D.5 of this Permit.
5. The Permittee shall make a demonstration of mechanical integrity in accordance with 40 C.F.R. § 146.8 at least once every five years. In addition to the above requirement, the Permittee shall conduct a mechanical integrity test demonstration on the Injection Well when the protective casing or tubing is removed from the Injection Well, the packer is resealed, or a well failure is likely, or as requested by the Director. The Permittee may continue operation of the Injection Well only if the Permittee has

demonstrated the mechanical integrity of the Injection Well to the Director's satisfaction. The Permittee shall cease injection operations if a loss of mechanical integrity becomes evident or if the Permittee cannot demonstrate mechanical integrity.

6. The Permittee shall perform all environmental measurements required by the permit, including, but not limited to; measurements of pressure, temperature, mechanical integrity (as applicable) and chemical analyses in accordance with EPA guidance on quality assurance.

C. Record Retention

1. The Permittee shall retain records of all monitoring and other information required by this Permit, including the following (if applicable), for a period of at least five years from the date of the sample, measurement, report or application, unless such records are required to be retained for a longer period of time as specified by this Permit. The Director may extend this record retention time period at any time. If the Director extends the record retention time period, the Permittee shall comply with the new record retention time period.
 - a. All data required to complete the Permit Application form for this Permit and any supplemental information submitted under 40 C.F.R. § 144.31;
 - b. Calibrations and maintenance records and all original strip chart recordings for continuous monitoring instrumentation;
 - c. Copies of all reports required by this Permit.
2. The Permittee shall retain records concerning the nature and composition of all injected fluids, as listed in Paragraph II.B.3, above, of this Permit, until three years after the completion of any plugging and abandonment procedures. At the end of the record retention period, the Permittee shall either continue to retain these records, or deliver the records to the Director, or obtain written approval from the Director to discard such records.
3. Records of monitoring information shall include:
 - a. The date, exact place, and the time of sampling or measurements;
 - b. The individual(s) who performed the sampling or measurements;
 - c. A precise description of both sampling methodology and the handling (custody) of samples;
 - d. The date(s) analyses were performed;
 - e. The individual(s) who performed the analyses;
 - f. The analytical techniques or methods used;

- g. The results of such analyses.

D. Reporting and Notification Requirements

1. Report on Permit Review. Within thirty (30) days of receipt of this Permit, the Permittee shall ensure that the person designated pursuant to Paragraph I.D.9 of this Permit reports to the Director that he or she has read and is personally familiar with all terms and conditions of this Permit.
2. Commencing Injection. The Permittee shall not commence injection until construction or well rework is complete and all of the following conditions have been satisfied:
 - a. The Permittee has submitted notice of completion of construction (EPA Form 7520-10) to the Director;
 - b. The Permittee has demonstrated to EPA that the Injection Well has mechanical integrity in accordance with 40 C.F.R. § 146.8 and the Permittee has received written notice from the Director that such demonstration is satisfactory;
 - c. The Director has inspected or otherwise reviewed the Injection Well and finds it is in compliance with the conditions of this permit, *or* the Permittee has not received notice from the Director of his or her intent to inspect or otherwise review the Injection Well within 13 days of the date of the notice in paragraph II.D.2.a. of this permit, in which case, prior inspection or review is waived and the Permittee may commence injection.
3. Twenty-four Hour Reporting.
 - a. The Permittee shall report to the Director any noncompliance which may endanger, or has endangered health or the environment. The Permittee shall provide such report orally [phone numbers: (215) 814-5445 or (215) 814-5462] within twenty-four hours from the time the Permittee becomes aware of the circumstances. The Permittee shall include the following information in the oral report:
 - 1) Any monitoring or other information which indicates that any contaminant may endanger, or has endangered an underground source of drinking water.
 - 2) Any noncompliance with a Permit condition, malfunction of the injection system which may cause, or has caused, fluid migration into or between underground sources of drinking water, or failure of mechanical integrity test demonstrations.
 - b. The Permittee shall provide a written submission within five (5) days of the time the Permittee becomes aware of the circumstances described in Paragraph II.D.3.a., above. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including

exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

4. Anticipated Noncompliance. The Permittee shall give advance written notice to the Director of any planned changes in the permitted Facility or activity which may result in noncompliance with Permit requirements.
5. Other Noncompliance. The Permittee shall report all other instances of noncompliance to the Director in writing within ten (10) days of the time the Permittee becomes aware of the circumstances. The reports shall contain the information listed in Paragraph II.D.3 of this Permit.
6. Planned Changes. The Permittee shall provide written notice to the Director as soon as possible of any planned physical alterations or additions to the permitted Facility.
7. Conversion. The Permittee shall provide written notice to the Director thirty (30) days prior to the conversion of the Injection Well to an operating status other than an injection well.
8. Annual Report. The Permittee shall submit a written Annual Report to the Director summarizing the results of the monitoring required in Paragraph II.B, above, of this Permit. This report shall include monthly monitoring records of injected fluids, the results of any mechanical integrity test(s), and any major changes in characteristics or sources of injected fluids. The Permittee shall complete and submit this information with its Annual Report EPA Form 7520-11 (Annual Disposal Injection Well Monitoring Report). The Permittee shall submit the Annual Report to the Director no later than January 31st of each year, summarizing the activity of the calendar year ending the previous December 31st.
9. Plugging and Abandonment Reports and Notifications.
 - a. The Permittee shall notify the Director in writing at least forty-five (45) days before plugging and abandonment of any Injection Well as described in Paragraph III.C of this Permit. The Director may allow a shorter notice period upon written request.
 - b. The Permittee shall submit any revisions to the Plugging and Abandonment Plan attached to and incorporated into this Permit (Attachment 1) to the Director no less than forty-five (45) days prior to plugging and abandonment on EPA Plugging and Abandonment Form 7520-14. The Permittee shall not commence plugging and abandonment until it receives written approval of the revisions to the Plan from the Director.
 - c. To the extent that any unforeseen circumstances occur during plugging and abandonment of any Injection Well that cause the Permittee to believe the Plugging and Abandonment Plan should be modified, the Permittee shall obtain written approval from EPA of any changes to the Plugging and Abandonment Plan prior to plugging the Injection Well.

- d. Within sixty (60) days after plugging any Injection Well, the Permittee shall submit a Plugging and Abandonment Report to the Director which shall consist of either:
 - 1) A statement that the Injection Well was plugged in accordance with the EPA-approved Plugging and Abandonment Plan; or
 - 2) Where actual plugging differed from the Plugging and Abandonment Plan previously approved by EPA, the Permittee shall provide to the Director an updated version of Form 7520-14 specifying the different procedures used.
- e. The Permittee shall ensure that the Plugging and Abandonment Report is certified as accurate by the owner or operator and by the person who performed the plugging operation (if other than the owner or operator).
- 10. Compliance Schedules. The Permittee shall submit reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this Permit no later than thirty (30) days following each schedule date.
- 11. Mechanical Integrity Tests. The Permittee shall notify the Director in writing at least thirty (30) days prior to conducting Mechanical Integrity Testing on the Injection Well.
- 12. Cessation of Injection Activity. After cessation of injection into the Injection Well for two years, the Permittee shall plug and abandon the Injection Well in accordance with the Plugging and Abandonment Plan (Attachment 1) unless:
 - a. The Permittee provides written notice to the Director that describes actions and/or procedures, including compliance with the technical requirements applicable to the Injection Well, that are necessary to ensure that the Injection Well will not endanger any USDW during any period of temporary abandonment, unless waived, in writing, by the Director;
 - b. The Permittee receives approval from the Director that the actions and/or procedures described in the notice are satisfactory; and
 - c. The Permittee implements such EPA approved actions and/or procedures.

E. Mechanical Integrity

- 1. Standards. The Permittee shall maintain the mechanical integrity of the permitted Injection Well pursuant to 40 C.F.R. § 146.8.
- 2. Request from Director. The Director may by written notice require the Permittee to demonstrate mechanical integrity of the Injection Well at any time during the term of this Permit and the Permittee shall comply with the Director's request.

PART III

A. Continuing Construction Requirements

1. Confining Zone. Notwithstanding any other provision of this Permit, the Permittee shall inject through the Injection Well only into a formation which is separated from any Underground Source of Drinking Water by a confining zone, as defined in 40 C.F.R. § 146.3, that is free of known open faults or fractures within the Area of Review, as required in 40 C.F.R. § 146.22.
2. Casing and Cementing. The Permittee shall maintain:
 - a. casing and cementing in the Injection Well to prevent the movement of fluids into or between underground sources of drinking water and in accordance with 40 C.F.R. § 146.22.
 - b. casing and cement designed for the life expectancy of the well;
 - c. surface casing in the Injection Well from the ground surface to a depth of approximately 2,350 feet, and at least 50 feet below the base of the lowermost USDW;
 - d. cement in the entire length of the casing in the Injection Well back to the surface;
 - e. isolation of the injection zone by placing long string casing from the surface to the top of the injection zone and cement this casing from the top of the injection zone to a minimum of 100 feet above the injection zone; and
 - f. the Injection Well with a tubing string with packer set inside the long string casing.
3. Logs and Tests. In accordance with 40 C.F.R. § 146.22(f), the Permittee shall prepare logs and perform tests as follows during the drilling and construction or rework of the Injection Well: electric, gamma ray and caliper logs in the open hole, a cement bond, temperature or density log on the surface casing (if cement returns are not achieved), and a cement bond log/variable density log on the long string casing. The Permittee shall submit to the Director, for all Injection Wells, cement records, a narrative report that interprets the well log(s) and test results, which specifically relate to the results of the cementing operation, and a detailed description of the rationale used to make these interpretations. The narrative report shall be prepared by a knowledgeable log analyst and submitted to the Director. The Director may prescribe additional logs or waive logging requirements in the future should field conditions so warrant.
4. Mechanical Integrity. The Permittee is prohibited from conducting injection operations in any Injection Well until it demonstrates: (1) the mechanical integrity of the Injection Well in accordance with the provisions of Condition D.2. of Part II of this Permit; and (2) the Permittee has received notice from the Director that such a demonstration is satisfactory in accordance with Condition D.2 of Part II of this Permit.

5. Corrective Action. The Permittee is prohibited from conducting injection operations in any Injection Well until it has completed corrective action by plugging and abandoning any “abandoned wells”, as defined at 40 C.F.R. § 146.3, located within the one-quarter mile area of review that could provide conduits for fluid migration into USDWs. If an abandoned well is discovered within the area of review after injection commences, the permittee shall notify the Director upon discovery, and within five (5) days of such discovery, the Permittee shall submit to the Director for approval a plan for corrective action, consistent with the requirements of 40 C.F.R. Parts 144-147.

B. Operating Requirements

1. Injection Formation. The Permittee shall inject only into the Weir Formations in the subsurface intervals between approximately 4,250 feet and 4,500 feet below surface elevation.
2. Injection Fluid. The Permittee shall not inject any hazardous substances, or hazardous waste, as defined by 40 C.F.R. Part 261 or any other fluid, other than produced fluid obtained from Permittee’s production operations.
3. Injection Volume Limitation. Injection volume shall not exceed 30,000 barrels per month. A barrel consists of 42 gallons.
4. Injection Pressure Limitation. The Permittee shall not exceed a surface injection pressure maximum of 708 psi and bottom hole pressure of 2,686 psi. This pressure calculation is based on the specific gravity of the injection fluid not exceeding 1.075. If the specific gravity of the injection fluid is greater than 1.075, the Permittee shall reduce the surface injection pressure by an appropriate amount such that the bottom hole pressure does not exceed 2,686 psi. The Permittee is prohibited from injecting at a pressure which initiates new fractures or propagates existing fractures in the confining zone adjacent to USDWs or which causes the movement of injection or formation fluids into an USDW. Site-specific geological information attained during the completion of the Injection Well may provide a basis for a change in the maximum injection pressure in this permit.
5. The Permittee is prohibited from injecting between the outermost casing protecting USDWs and the well bore, and also from injecting into any USDW.

C. Plugging and Abandonment

1. The Permittee shall plug and abandon the Injection Well in accordance with the approved plugging and abandonment plan in Attachment 1 hereto.
2. The Permittee shall conduct plugging and abandonment in such a manner that fluids shall not be allowed to move into or between USDWs.

D. Financial Responsibility

1. The Permittee shall maintain financial responsibility and resources to close, plug and abandon the underground injection well in accordance with 40 C.F.R. Section 144.52(a)(7) in the amount of no less than \$35,000. If the circumstances regarding the acceptability of the Surety Bond and Standby Trust Agreement submitted to EPA to demonstrate financial responsibility should change, the Permittee shall provide advance notification to the Director, and the Director may seek an alternative financial demonstration from the Permittee.
2. The Permittee shall not substitute an alternative demonstration of financial responsibility for that which the Director has approved, unless he or she has previously submitted evidence of that alternative demonstration to the Director and the Director notifies him or her that the alternative demonstration of financial responsibility is acceptable. The Director may require the Permittee to submit a revised demonstration of Financial Responsibility if the Director has reason to believe that the original demonstration is no longer adequate to cover the costs of plugging and abandonment.

Attachment 1


 United States Environmental Protection Agency
 Washington, DC 20460

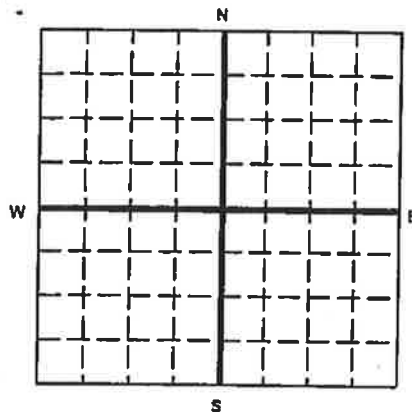
PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility

 Class II-D Injection Well 900146
 Prater District, Buchanan County, VA

Name and Address of Owner/Operator

 EnerVest Operating, LLC
 300 Capitol Street, Suite 200, Charleston, WV 25301

 Locate Well and Outline Unit on
 Section Plat - 640 Acres

 State
 VA

 County
 Buchanan

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
WELL ACTIVITY

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

Lease Name W.C. Owens (Tr. 377.12ac)

Well Number 900146

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	37	44	44	17 1/2
9.625	26	400	400	12 3/8
7.00	19	2350	2350	8 3/4
4.50	9.5	4600	2400	6 1/4

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- ☒ The Balance Method
☐ The Dump Baller 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)	4.5	4.5 / 7	7.0				
Depth to Bottom of Tubing or Drill Pipe (ft)	4300	2300	120				
Sacks of Cement To Be Used (each plug)	23	27	23				
Slurry Volume To Be Pumped (cu. ft.)	27	32	27				
Calculated Top of Plug (ft.)	4200	2100	Surface				
Measured Top of Plug (if tagged ft.)	----	----	----				
Slurry Wt. (Lb./Gal.)	15.6	15.6	15.6				
Type Cement or Other Material (Class III)	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
4300	4400	Projected Weir	Perforated Interval

Estimated Cost to Plug Wells

\$35,000

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)

James McKinney, Senior VP & General Manager

Signature

Date Signed

PLUGGING AND ABANDONMENT PLAN

ATTACHMENT

Q

1.0 PLUGGING AND ABANDONMENT PLAN

The plugging and abandonment plan to be used to abandon proposed UIC well 900146 is illustrated by Figure Q-1 at the end of this attachment. A review of this schematic along with the following procedure outlines the plugging plan:

- ☐ Move in service rig and cement service company.
- ☐ Rig up cement service company and pump Class A cement down the injection tubing for Plug #1. Mix and pump enough cement to cover from injection perforations back to the bottom of tubing plus 100% excess to squeeze and shut off the formation perforations.
- ☐ Displace cement out the bottom of the injection tubing.
- ☐ Let cement set until adequate compressive strength has been obtained to allow completion of Plug #1.
- ☐ Release the packer and pull tubing and packer out of the hole. If injection tubing cannot be pulled, cut the tubing off just above the packer and pull the tubing. Run back in hole with tubing only.
- ☐ Using the tubing, finish Plug #1 by spotting 100 foot of Class A cement on top of the existing cement that was used to shut off the perforations.
- ☐ Using the tubing, fill the 4 ½-inch production casing with bentonite gel from top of Plug #1 to 100 foot below the top of the cement in the 4 ½ inch x 7 inch annulus as verified by the cement bond log. Pull the tubing out of the hole.
- ☐ Run in the hole with wireline tools and cut off the 4 ½-inch casing just above the top of the cement in the 4 ½-inch x 7 inch annulus. Pull the 4½-inch casing out of the hole.
- ☐ Run back in the hole with the 2 ¾-inch tubing to the top of the bentonite gel. Pump Class A cement for Plug #2 to fill the 4 ½-inch

casing from the top of the bentonite gel to the top of the cutoff 4 ½ inch casing and then from the top of the cutoff 4 ½ inch casing to 100 feet above the cutoff 4½-inch casing for a total minimum plug length of 200 feet.

- ☐ Pull the 2 ¾-inch tubing above the top of Plug #2 and fill the 7 inch casing with bentonite gel from the top of the cement plug to 120 feet below surface.
- ☐ Pull the tubing above the bentonite gel at 120 feet and fill the 7 inch casing from 120 feet to the surface with Class A cement for Plug #3.
- ☐ Install monument as per Virginia Division of Gas and Oil requirements on the top of the 7-inch casing.
- ☐ The cement to be used will be Class A or Type 1 cement. The fluid between the cement plugs will be 6% bentonite gel slurry.

2.0 PLUGGING AND ABANDONMENT FORM

The completed and signed Plugging and Abandonment Plan Form is presented at the end of this section. Following the Plugging and Abandonment Plan Form is Figure Q-1, a schematic of the proposed UIC well 900146 Plugging and Abandonment Plan.

