

In re Core Energy LLC
Appeal No. UIC 07-02
U.S. EPA Region 5
Response to Petition

ATTACHMENT 5

Core Energy LLC
Final UIC Permit
MI-137-5X25-0001
State-Charleton #4-30

U.S. ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT
CLASS V

TABLE OF CONTENTS

	<u>Page No.</u>
AUTHORITY	1
I. GENERAL PERMIT COMPLIANCE	2
A. EFFECT OF PERMIT	2
B. PERMIT ACTIONS	2
1. Modifications, Revocation, Reissuance and Termination	2
2. Transfer of Permits	2
C. SEVERABILITY	2
D. CONFIDENTIALITY	2
E. DUTIES AND REQUIREMENTS	3
1. Duty to Comply	3
2. Penalties for Violations of Permit Conditions	3
3. Continuation of Expiring Permits	3
4. Need to Halt or Reduce Activity Not a Defense	4
5. Duty to Mitigate	4
6. Proper Operation and Maintenance	4
7. Duty to Provide Information	5
8. Inspection and Entry	5
9. Records	5
10. Monitoring	6
11. Signatory Requirements	6
12. Reporting Requirements	6
F. PLUGGING AND ABANDONMENT	8
1. Notice of Plugging and Abandonment	8
2. Plugging and Abandonment	8
3. Temporary Abandonment	9
4. Revision of Plugging and Abandonment Plan	9
G. MECHANICAL INTEGRITY	9
1. Standards	9
2. Periodic Mechanical Integrity Testing	9
3. Prior Notice and Reporting	10
4. Gauges	10
5. Loss of Mechanical Integrity	10
6. Mechanical Integrity Testing on Request from Director	10
H. FINANCIAL RESPONSIBILITY	10
1. Financial Responsibility	10

2.	Insolvency	11
3.	Notification	11
4.	Establishing Other Coverage	11
I.	CORRECTIVE ACTION	11
1.	Corrective Action Plan	11
2.	Prohibition of Movement of Fluids into USDWs	12
J.	COMMENCING INJECTION	12
1.	Formation Testing	12
2.	Mechanical Integrity	12
3.	Corrective Action	12
4.	Authorization to Inject	12
II.	WELL SPECIFIC CONDITIONS	13
A.	CONSTRUCTION	13
1.	Siting	13
2.	Casing and Cementing	13
3.	Tubing and Packer Specifications	13
4.	Wellhead Specification	13
B.	OPERATIONS	13
1.	Injection Pressure Limitation	13
2.	Additional Injection Limitation	13
3.	Annulus Fluid	13
4.	Annulus/Tubing Pressure Differential	14
5.	Automatic Warning and Automatic Shut-off System	14
6.	Precautions to Prevent Well Blowouts	14
C.	MONITORING	14
1.	Sampling Point	14
2.	Continuous Monitoring Devices	14
D.	REPORTING REQUIREMENTS	15
1.	Monthly Reports	15
2.	Quarterly Reports	15
3.	Reports on Well Tests and Workovers	16
III.	ATTACHMENTS	17
A.	SUMMARY OF OPERATING, MONITORING AND REPORTING REQUIREMENTS	
B.	PLUGGING AND ABANDONMENT PLAN	
C.	FINANCIAL ASSURANCE MECHANISM	
D.	CONTINGENT CORRECTIVE ACTION	
E.	CONSTRUCTION DETAILS	
F.	SOURCE AND ANALYSIS OF INJECTATE	



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
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Page 1 of 17

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY UNDERGROUND
INJECTION CONTROL PERMIT: CLASS V EXPERIMENTAL TECHNOLOGY

Permit Number: MI-137-5X25-0001

Facility Name: State-Charlton #4-30

Pursuant to the Underground Injection Control regulations of the U.S. Environmental Protection Agency codified at Title 40 of the Code of Federal Regulations (40 CFR), Parts 124, 144, 146, and 147,

Core Energy, LLC of Traverse City, Michigan

is hereby authorized to convert and operate a Class V injection well located in Otsego County, T31N, R1W, Section 30, SW Quarter Section, for injection of Carbon Dioxide (CO₂) as a supercritical fluid into the Bois Blanc Formation and Bass Islands Dolomite at depths between 3190 feet and 3515 feet upon the express condition that the permittee meet the restrictions set forth herein. Injection shall not commence until the operator has received authorization in accordance with Part I(J) of this permit.

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 is effective. The following attachments are incorporated into this permit: A, B, C, D, E and F.

SEP 23 2007

This permit shall become effective on _____, and shall remain in full force and effect, unless this permit is revoked, terminated, modified or reissued pursuant to 40 CFR §§144.39, 144.40 or 144.41. This permit shall also remain in effect upon delegation of primary enforcement responsibility to the State of Michigan, unless that State chooses to adopt this permit as a State permit. This permit will expire in one (1) year if the permittee fails to commence construction, unless a written request for an extension of this one (1) year period has been approved by the Director.

This permit and authorization to inject shall expire at midnight one year from the effective date unless terminated prior to the expiration date.

Signed and Dated: August 23, 2007

Cheryl Newton

Cheryl Newton
Acting Director, Water Division

**PART I
GENERAL PERMIT COMPLIANCE**

A. EFFECT OF PERMIT

The permittee is allowed to engage in underground injection in accordance with the conditions of this permit. Notwithstanding any other provisions of this permit, the permittee authorized by this permit shall not construct, operate, maintain, convert, plug, abandon, or conduct any other injection activity in a manner that allows the movement of injection, annulus or formation fluids into underground sources of drinking water (USDWs). The objective of this permit is to prevent the introduction of contaminants into USDWs if the presence of that contaminant may cause a violation of any primary drinking water regulation under 40 CFR Part 141 or may otherwise adversely affect the health of persons. Any underground injection activity not specifically authorized in this permit is prohibited. For purposes of enforcement, compliance with this permit during its term constitutes compliance with Part C of the Safe Drinking Water Act (SDWA). Such compliance does not constitute a defense to any action brought under Section 1431 of the SDWA or any other common or statutory law other than Part C of the SDWA. Issuance of this permit does not convey property 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. Nothing in this permit shall be construed to relieve the permittee of any duties under applicable regulations.

B. PERMIT ACTIONS

1. **Modification, Revocation, Reissuance and Termination** - The Director of the Water Division of the United States Environmental Protection Agency (USEPA), hereinafter, the Director, may, for cause or upon request from the permittee, modify, revoke and reissue, or terminate this permit in accordance with 40 CFR 144.12, 144.39, and 144.40. The permit is also subject to minor modifications for cause as specified in 40 CFR 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 does not stay the applicability or enforceability of any permit condition.
2. **Transfer of Permits** - This permit is not transferable to any person except in accordance with 40 CFR 144.38.

C. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit or the application of any provision of this permit to any circumstance is held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

D. CONFIDENTIALITY

In accordance with 40 CFR Part 2 and Section 144.5, any information submitted to the USEPA 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, the USEPA may make the information available to the public without further notice. If a claim is asserted, the validity of the claim will be assessed in accordance with the procedures in 40 CFR Part 2 (Public Information). Claims of confidentiality for the following information will be denied:

1. The name and address of the permittee; and
2. Information which deals with the existence, absence or level of contaminants in drinking water.

E. DUTIES AND REQUIREMENTS

1. **Duty to Comply** - The permittee shall comply with all applicable Underground Injection Control (UIC) Program regulations and conditions of this permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit issued in accordance with 40 CFR 144.34. Any permit noncompliance constitutes a violation of the SDWA and is grounds for enforcement action, permit termination, revocation and reissuance, modification, or for denial of a permit renewal application.
2. **Penalties for Violations of Permit Conditions** - Any person who violates a permit requirement is subject to civil penalties, fines and other enforcement action under the SDWA. Any person who willfully violates permit conditions may be subject to criminal prosecution.
3. **Continuation of Expiring Permits**
 - (a) **Duty to Reapply** - 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 60 calendar days before this permit expires. The permit application must include a revised calculation of the lateral extent of injection effects if the projected volume of injectate has increased.
 - (b) **Permit Extensions** - The conditions of an expired permit may continue in force in accordance with 5 U.S.C. 558(c) and 40 CFR 144.37.
 - (c) **Effect** - Permits continued under 5 U.S.C. 558(c) and 40 CFR 144.37 remain fully effective and enforceable.
 - (d) **Enforcement** - When the permittee is not in compliance with the conditions

of the expiring or expired permit, the Director may choose to do any or all of the following:

- (1) Initiate enforcement action based upon the permit which has been continued;
 - (2) Issue a notice of intent to deny the new permit in which case the owner or operator would then be required to cease the activities authorized by the continued permit or be subject to enforcement action for operation without a permit;
 - (3) Issue a new permit under 40 CFR Part 124 with appropriate conditions; or
 - (4) Take other actions authorized by the UIC regulations.
- (e) **State Continuation** - A USEPA-issued permit does not continue in force beyond its expiration date under Federal law if at that time a State has primary enforcement responsibility under the SDWA. A State authorized to administer the UIC program may continue either USEPA or State-issued permits until the effective date of the new permits, if State law allows. Otherwise, the facility or activity is operating without a permit from the time of expiration of the old permit to the effective date of the State-issued new permit. Furthermore, if the State does not continue the USEPA permit upon obtaining primary enforcement responsibility, the permittee must obtain a new State permit or be authorized to inject by State rule. Failure to do so while continuing to operate the well constitutes unauthorized injection and is a violation subject to enforcement action.
4. **Need to Halt or Reduce Activity Not a Defense** - It shall not be a defense for the permittee in an enforcement action to claim that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.
 5. **Duty to Mitigate** - The permittee shall take all timely and reasonable steps necessary to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.
 6. **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, 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.

7. **Duty to Provide Information** - The permittee shall furnish to the Director, within a time specified, 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 or the UIC regulations. The permittee shall also furnish to the Director, upon request, copies of records required to be kept by this permit.

8. **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 law, to:
 - (a) Enter, at reasonable times, upon the permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this permit;
 - (b) Have access to and copy, at reasonable times, any records that are kept under the conditions of this permit;
 - (c) Inspect, at reasonable times, any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
 - (d) Sample or monitor, at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the SDWA, any substances or parameters at any facilities, equipment or operations regulated or required under this permit.

9. **Records**
 - (a) The permittee shall retain records and all monitoring information, including all calibration and maintenance records and all original chart recordings for continuous monitoring instrumentation and copies of all reports required by this permit for a period of at least three (3) years from the date of the sample, measurement or report, unless these materials are submitted to the Director as part of reporting requirements under this permit.
 - (b) The permittee shall maintain records of all data required to complete the permit application form for this permit and any supplemental information submitted under 40 CFR 144.27 and 144.31 for a period of at least three (3) years from the date the permit application was signed.
 - (c) The permittee shall retain records concerning the nature and composition of all injected fluids until three (3) years after the completion of plugging and abandonment of this injection well.

(d) The retention period specified in Part I(E)(9)(a) through (c) of this permit may be extended by request of the Director at any time. The permittee shall continue to retain records after the retention period specified in Part I(E)(9)(a) through (c) of this permit or any requested extension thereof expires unless the permittee delivers the records to the Director or obtains written approval from the Director to discard the records.

(e) Records of monitoring information shall include:

- (1) The date, exact place, and time of sampling or measurements;
- (2) The name(s) of individual(s) who performed the sampling or measurements;
- (3) A precise description of both sampling methodology and the handling of samples;
- (4) The date(s) analyses were performed;
- (5) The name(s) of individual(s) who performed the analyses;
- (6) The analytical techniques or methods used; and
- (7) The results of such analyses.

10. **Monitoring** - Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity. The permittee shall use the methods described in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (available from National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road Springfield, VA 22161, or at <http://www.epa.gov/epaoswer/hazwaste/test/main.htm>), or equivalent methods approved by the Director, to take representative samples. Monitoring results shall be reported at the intervals contained in Part II(D) and Part III(A) of this permit.

(a) Testing of samples from monitoring wells shall comply with applicable analytical methods cited and described in Table I of 40 CFR 136.3 or in certain circumstances by other methods that have been approved by the Director.

11. **Signatory Requirements** - All reports or other information, required to be submitted by this permit or requested by the Director shall be signed and certified in accordance with 40 CFR 144.32.

12. **Reporting Requirements**

- (a) **Planned Changes** - The permittee shall give written notice to the Director, as soon as possible, of any planned physical alterations or additions to the permitted facility other than minor repair/replacement, maintenance activities, or changes in the injection fluids. Within ten (10) days prior to injection, an analysis of the new injection fluids shall be submitted to the Director for review and approval.

- (b) **Anticipated Noncompliance** - The permittee shall give at least 30 days advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

- (c) **Compliance Schedules** - Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted by the permittee no later than thirty (30) calendar days following each schedule date.

- (d) **Transfer of Permits** - This permit is not transferable to any person except after notice is sent to the Director at least thirty (30) days prior to transfer and the requirements of 40 CFR §144.38 have been met. The Director will require modification or revocation of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the SDWA.

- (e) **Twenty-four Hour Reporting**
 - (1) The permittee shall report to the Director any permit noncompliance which may endanger human health or the environment. See, e.g., Part I(G)(5) of this permit. Any information shall be provided orally within twenty-four (24) hours from the time the permittee becomes aware of the circumstances. Such reports shall include, but not be limited to the following information:
 - (i) Any monitoring or other information which indicates that any contaminant may cause an endangerment to a USDW; and
 - (ii) Any noncompliance with a permit condition, or malfunction of the injection system, which may cause fluid migration into or between USDWs
 - (iii) Any failure to maintain mechanical integrity; and
 - (iv) Any release of gas to the atmosphere.

 - (2) A written submission shall also be provided by mail, email, or facsimile within five (5) working days of the time the permittee

becomes aware of the circumstances. 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.

- (f) **Other Noncompliance** - The permittee shall report all other instances of noncompliance not otherwise reported at the time monitoring reports are submitted. The reports shall contain the information listed in Part I(E)(12)(e)(2) of this permit.
- (g) **Other Information** - When the permittee becomes aware of failure to submit any relevant facts in the permit application or that incorrect information was submitted in a permit application or in any report to the Director, the permittee shall submit such facts or corrected information within ten (10) calendar days in accordance with 40 CFR 144.51(I)(8).
- (h) **Report on Permit Review** - Within thirty (30) calendar days of receipt of this permit, the permittee shall certify to the Director that he or she has read and is personally familiar with all terms and conditions of this permit.

F. **PLUGGING AND ABANDONMENT**

1. **Notice of Plugging and Abandonment** - The permittee shall notify the Director at least sixty (60) calendar days before conversion or abandonment of the well. At the discretion of the Director, a shorter notice period may be allowed.
2. **Plugging and Abandonment** - The permittee must receive the approval of the Director before plugging the well and shall plug and abandon the well in accordance with 40 CFR 144.52(a)(6) and 146.10, as provided in the Plugging and Abandonment Plan contained in Part III(B) of this permit. Within sixty (60) calendar days after plugging a well, the permittee shall submit a Plugging and Abandonment report to the Director. The report shall be certified as accurate by the permittee and by the person who performed the plugging operation (if other than the permittee), and shall consist of either:
 - (a) A statement that the well was plugged in accordance with the Plugging and Abandonment Plan previously approved by the Director; or
 - (b) If the actual plugging differed from the approved plan, a statement defining the actual plugging and explaining why the Director should approve such deviation. If the Director determines that a deviation from a previously approved plan may endanger underground sources of drinking water, the permittee shall replug the well as required by the Director.

3. **Temporary Abandonment** - If the permittee ceases injection into the well for more than twenty-four (24) consecutive months, the well is considered to be in temporary abandoned status, and the permittee shall plug and abandon the well in accordance with the approved plan and 40 CFR 144.52 (a)(6), or make another demonstration of non-endangerment (e.g., a standard annulus pressure test). During any periods of temporary abandonment or disuse, the well will be tested to ensure that it maintains mechanical integrity, according to the requirements and frequency specified in Part I(G)(2) of this permit. If the well loses mechanical integrity prior to the next test due date, then the well must either be plugged or repaired and retested within 30 days of losing mechanical integrity. The permittee shall continue to comply with the conditions of this permit, including all monitoring and reporting requirements according to the frequencies outlined in the permit.
4. **Revision of Plugging and Abandonment Plan** - If the permittee finds it necessary to change a Plugging and Abandonment Plan, a revised plan shall be submitted to the Director for approval at the time of the next monthly report.

G. MECHANICAL INTEGRITY

1. **Standards** - The injection well must have and maintain mechanical integrity consistent with 40 CFR 146.8(a)(1) and (2). Mechanical integrity demonstrations must be witnessed by an authorized representative of the Director or approved by the Director in advance to conduct an unwitnessed test.
2. **Periodic Mechanical Integrity Testing [§146.8]** - The permittee shall conduct the mechanical integrity testing as follows:
 - (a) Long string casing, injection tubing and annular seal shall be tested by means of an approved pressure test in accordance with 40 CFR 146.8(b)(2). This test shall be performed upon completion of this well, and at least once every twelfth month beginning with the date of the last approved demonstration and whenever there has been a well workover in which tubing is removed from the well, the packer is reset, or when loss of mechanical integrity becomes suspected during operation;
 - (b) An approved temperature, noise, oxygen activation, or other approved log shall be run upon completion of this to test for movement of fluid along the bore hole. The Director may require such tests whenever the well is worked over. The permittee must submit logging procedures to the Director for approval before running logs for the purpose of meeting this requirement. A descriptive report interpreting the results of such logs and tests shall be prepared by a knowledgeable log analyst and submitted to the Director.
 - (c) The permittee may request the Director to use any other test approved by the Director in accordance with the procedures in 40 CFR 146.8(d).

3. **Prior Notice and Reporting** - The permittee shall notify the Director of his or her intent to demonstrate mechanical integrity at least thirty (30) calendar days prior to such demonstration. At the discretion of the Director a shorter time period may be allowed. Reports of mechanical integrity demonstrations which include logs must include an interpretation of results by a knowledgeable log analyst. The permittee shall report the results of a mechanical integrity demonstration within forty-five (45) calendar days after completion thereof.
4. **Gauges** - The permittee shall calibrate all gauges used in mechanical integrity demonstrations to an accuracy of not less than one-half (0.5) percent of full scale, prior to each required test of mechanical integrity. A copy of the calibration certificate shall be submitted to the Director or his or her representative at the time of demonstration and every time the gauge is calibrated. The gauge shall be marked in increments of no greater than five (5) psi.
5. **Loss of Mechanical Integrity** - If the permittee or the Director finds that the well fails to demonstrate mechanical integrity during a test, or fails to maintain mechanical integrity during operation, or that a loss of mechanical integrity as defined by 40 CFR 146.8(a)(1) and (2) is suspected during operation, the permittee shall halt the operation immediately and follow the reporting requirements as directed in Part I(E)(12) of this permit. The permittee shall not resume operation until mechanical integrity is demonstrated and the Director gives approval to recommence injection.
6. **Mechanical Integrity Testing on Request From Director** - The permittee shall demonstrate mechanical integrity at any time upon written notice from the Director.

H. FINANCIAL RESPONSIBILITY

1. **Financial Responsibility** - The permittee shall maintain financial responsibility and resources to close, plug, and abandon the underground injection operation in a manner consistent with 40 CFR 144.52(a)(7). The approved financial assurance mechanism is found in the Administrative Record for this permit.
 - (a) The permittee must maintain a written cost estimate, in current dollars, for the Plugging and Abandonment Plan as specified in 40 CFR 144.52(a)(7). The plugging and abandonment cost estimate at any point in the life of the facility operation must equal the maximum cost of plugging and abandonment at that time.
 - (b) The permittee must adjust the cost estimate of plugging and abandonment for inflation within thirty (30) calendar days after each anniversary of the first estimate. The inflation factor is the result of dividing the latest published annual Oil and Gas Field Equipment Cost Index by the index for the previous year.

- (c) The permittee must revise the plugging and abandonment cost estimate whenever a change in the Plugging and Abandonment Plan increases the cost of plugging and abandonment.
 - (d) If the revised plugging and abandonment estimate exceeds the current amount of the financial assurance mechanism, the permittee shall submit a revised mechanism to cover the increased cost within thirty (30) calendar days after the revision specified in Part I(H)(1)(b) and (c) of this permit.
 - (e) The permittee must keep on file at the facility a copy of the latest plugging and abandonment cost estimate prepared in accordance with 40 CFR 144.52(a)(7), during the operating life of the facility.
2. **Insolvency** - The permittee must notify the Director within ten (10) business days of any of the following events. Failure to do so will result in the termination of this permit pursuant to 40 CFR 144.40(a)(1).
- (a) The bankruptcy of the trustee or issuing institution of the financial mechanism; or
 - (b) Suspension or revocation of the authority of the trustee institution to act as trustee; or
 - (c) The institution issuing the financial mechanism losing its authority to issue such an instrument.
3. **Notification** - The permittee must notify the Director by certified mail of the commencement of voluntary or involuntary proceedings under Title 11 (Bankruptcy), U.S. Code naming the owner or operator as debtor, within ten (10) business days after the commencement of the proceeding. A guarantor of a corporate guarantee must make such a notification if he or she is named as debtor, as required under the terms of the guarantee.
4. **Establishing Other Coverage** - The owner or operator must establish other financial assurance or liability coverage acceptable to the Director, within sixty (60) calendar days of the occurrence of the events in Part I(H)(2) or (3) of this permit.

I. CORRECTIVE ACTION

- 1. **Corrective Action Plan** - The permittee shall shut in the injection well whenever he/she or USEPA determines that operation thereof may be causing upward fluid migration through the well bore of any improperly plugged or unplugged well in the area of review and shall take such steps as he/she can to properly plug the offending well(s). Any operation of the well which may cause upward fluid migration from an improperly plugged or unplugged well will be considered a violation of this permit.

2. **Prohibition of Movement of Fluids into USDWs [§144.12]** Should upward migration of fluids through the confining zone of this permitted well be discovered within the area of review due to injection activities at this facility, and should this migration of fluids cause the introduction of any contaminant into a USDW pursuant to 40 CFR 144.12, the permittee shall immediately cease injection into this well until the situation has been corrected and reauthorization to inject has been given by the Director.

J. COMMENCING INJECTION

The permittee may not commence injection until the following conditions are met:

1. **Formation Testing** - Results of the formation testing and logging program as specified in the administrative record of this permit must be submitted to and approved by the Director.
2. **Mechanical Integrity** - Mechanical integrity of the well must be demonstrated in accordance with 40 CFR 146.8(a)(1) and (2) and in accordance with Part.I(G)(1) through (3) of this permit.
3. **Corrective Action** - All required corrective action must be taken in accordance with 40 CFR 144.55 (b)(2).
4. **Authorization to inject** - Written authorization to commence injection must have been granted by the Director.

PART II
WELL SPECIFIC CONDITIONS FOR UIC PERMITS

A. CONSTRUCTION

1. **Siting** - The injection well shall inject only into a formation which is separated from any USDW by a confining zone that is free of known open faults or fractures within the area of review. At no time shall injection occur into a formation which is or is above the lowermost formation containing an underground source of drinking water within the area of review as defined in the administrative record.
2. **Casing and Cementing** - Notwithstanding any other provisions of this permit, the permittee shall case and cement the well in such a manner so as to prevent the movement of fluids into or between USDWs for the expected life of the well. The casing and cement used in the construction of this well are shown in Part III(E) of this permit and in the administrative record for this permit. Any change shall be submitted for approval by the Director before installation.
3. **Tubing and Packer Specifications** - The permittee shall inject only through tubing with a packer set within the long string casing at a point within or below the confining zone. The tubing and packer used in the well are represented in engineering drawings contained in Part III(E) of this permit. Any changes shall be submitted by the permittee for the approval of the Director before installation.
4. **Wellhead Specification** - The permittee shall install and maintain a female coupling and valve on the wellhead to be used for independent injection pressure readings.

B. OPERATIONS [§146.13]

1. **Injection Pressure Limitation** - Except during stimulation, the permittee shall not cause or permit the injection pressure at the wellhead to exceed the maximum limitation which is specified in Part III(A) of this permit. In no case shall injection pressure initiate fractures or propagate existing fractures in the confining zone or cause the movement of injection or formation fluids into a USDW.
2. **Additional Injection Limitation** - No injectate other than that identified in Part III(A) of this permit shall be injected. The permittee shall submit a certified statement attesting to compliance with this requirement upon expiration of the permit.
3. **Annulus Fluid** - The permittee shall fill the annulus between the tubing and the long string casing with a fluid approved by the Director and identified in the administrative record of this permit. Any change in the annulus fluid, except during workovers or times of annulus maintenance, shall be submitted by the permittee for the approval of the Director before replacement.

4. **Annulus/Tubing Pressure Differential** - Except during workovers or times of annulus maintenance, the permittee shall maintain, over the entire length of the tubing, a pressure differential between the tubing and annulus as specified in Part III(A) of this permit.

5. **Automatic Warning and Automatic Shut-off System** - The permittee shall continuously operate and maintain an automatic warning and automatic shut-off system to stop injection in any of the following situations:
 - (a) Pressure changes in the annulus or annulus/tubing differential signifying or identifying possible deficiencies in mechanical integrity; or
 - (b) Injection pressure, annulus pressure, or annulus/tubing differential pressure reaches the pressure limits as specified in Part III(A) of this permit.

In the event that the automatic warning and automatic shut-off system is triggered, a trained operator will be immediately notified and dispatched to the well. The permittee must test the automatic warning and automatic shut-off system at least every twelfth month. This test must involve subjecting the system to simulated failure conditions and must be witnessed by the Director or his or her representative.

6. **Precautions to Prevent Well Blowouts** - The permittee shall maintain on the well at all times a pressure which will prevent the return of the injection fluid to the surface. The well bore must be filled with a high specific gravity fluid during workovers to maintain a positive (downward) gradient and/or a plug shall be installed which can resist the pressure differential. A blowout preventer must be installed and kept in proper operational condition whenever the wellhead is removed to work on the well. The permittee shall follow the procedures below to assure that a backflow or blowout does not occur:
 - (1) Limit the temperature, pH or acidity of the injectate; and
 - (2) Develop procedures necessary to assure that pressure imbalances do not occur.

C. MONITORING

1. **Sampling Point** - The injection fluid samples shall be taken at the sampling location as specified in Part III(A) of this permit.

2. **Continuous Monitoring Devices** - The permittee shall maintain continuous monitoring devices and use them to monitor injection pressure, flow rate, and the pressure on the annulus between the tubing and the long string of casing. If the well's annulus system is equipped with a fluid level indicator, the permittee shall monitor the fluid level daily. The monitoring results shall be submitted to the Director as specified in Part II(D) of this permit. The permittee shall maintain at the facility for USEPA's inspection an appropriately scaled, continuous record of these

monitoring results as well as original copies of any digitally recorded information pertaining to these operations.

D. REPORTING REQUIREMENTS [§146.13(c)]

The permittee shall submit all required reports to the Director at:

United States Environmental Protection Agency
77 West Jackson Boulevard (WU-16J)
Chicago, Illinois 60604-3590
ATTN: UIC Branch, Direct Implementation

1. **Monthly Reports** - The permittee shall submit monthly reports of the following information no later than the end of the month following the reporting period:
 - (a) A tabulation in digital form of daily maximum observed injection pressure, daily maximum observed injection rate, a daily measurement of annulus tank fluid level (if well is constructed with an annulus tank system), and minimum differential between simultaneous measurements of injection pressure and annulus pressure for each day of the month;
 - (b) A statement of the total volume of the fluid injected: to date (i.e., since injection of the permitted material first started); in the current calendar year; and the current month;
 - (c) A tabulation of the dates, amounts and types of liquid added to, or removed from, the annulus system during the month;
 - (d) Actual quantity (or estimated quantity if actual quantity is unknown), of any CO₂ released to the atmosphere or that escaped the injection zone. Quantities should be reported in pounds of CO₂.
 - (e) The results of any formation or groundwater fluid analysis conducted during the reporting period; and
 - (f) Any noncompliance with conditions of this permit, including but not limited to:
 - (1) Any event that exceeds operating parameters for annulus pressure or injection pressure or annulus/tubing differential as specified in the permit; or
 - (2) Any event which triggers an alarm or shutdown device required in Part II(B)(5) of this permit.
2. **Quarterly Reports** - The permittee shall submit quarterly reports of the following

information no later than the end of the month following the reporting period:

- (a) Injectate analysis results per the method used to perform the original fluid analyses contained in the administrative record. Laboratory reports must be submitted with the first monthly monitoring report following their receipt by the operator. This report must include the information specified in Part I(E)(9)(e) of this permit, and a statement showing that the requirements of Part I(E)(10) have been met.

- 3. **Reports on Well Tests and Workovers** - Within forty-five (45) calendar days after the activity, the permittee shall report to the Director the results of demonstrations of mechanical integrity, any well workover, and/or results of other tests required by this permit.

**PART III
ATTACHMENTS**

These attachments include, but are not limited to, permit conditions and plans concerning operating procedures, monitoring and reporting, as required by 40 CFR Parts 144 and 146. The permittee shall comply with these conditions and adhere to these plans as approved by the Director, as follows:

- A. SUMMARY OF OPERATING, MONITORING AND REPORTING REQUIREMENTS (ATTACHED)**
- B. PLUGGING AND ABANDONMENT PLAN (ATTACHED)**
- C. CONTINGENT CORRECTIVE ACTION (ATTACHED)**
- D. FINANCIAL ASSURANCE MECHANISM (ATTACHED)**
- E. CONSTRUCTION DETAILS (ATTACHED)**
- F. SOURCE AND ANALYSIS OF INJECTATE (ATTACHED)**

A. SUMMARY OF OPERATING, MONITORING AND REPORTING REQUIREMENTS

CHARACTERISTIC	LIMITATION	MINIMUM MONITORING FREQUENCY	MINIMUM REPORTING FREQUENCY
Injection Pressure	1197 psig maximum*	continuous**	monthly
Annulus Pressure	100 psig minimum	continuous**	monthly
Annulus/Tubing Differential	100 psig minimum above operating injection pressure	continuous**	monthly
Flow Rate		continuous**	monthly
Annulus Fluid Level		daily	monthly
Cumulative Volume		continuous**	monthly
Annulus Fluid Loss		monthly	monthly
CO ₂ released to the atmosphere (in pounds)		per release	monthly
CO ₂ released from the injection zone (in pounds)		per release	monthly
Physical Characteristics of Injected Fluids		quarterly	quarterly
Formation fluid or groundwater analysis		annually	monthly, if performed

Sampling Location: Samples shall be taken at the wellhead.

* The maximum injection pressure was determined using the following formula: $[(0.80 \text{ psi/ft} - (0.433 \text{ psi/ft})(\text{specific gravity})) \times \text{depth}] - 14.7 \text{ psi}$. The maximum injection pressure is dependent upon the fracture gradient of the injection zone, the depth and the specific gravity of the injection fluid. The Bois Blanc Formation at 3190 feet was used as the depth. A specific gravity of 0.92 was used for the injection fluid. The fracture gradient of 0.80 psi/ft is used as a default value, unless a site-specific value is determined pursuant to Part III(A)(1) of this permit, in which case the maximum injection pressure will be modified to reflect the specific value of the fracture gradient in

this well. Such modification shall be considered a minor modification as allowed for at 40 CFR §144.41(f). The limitation on injection pressure will serve to prevent injection-formation fracturing.

** Continuous monitoring by electronic equipment is defined as one reading every 15 seconds during injection, one reading every 60 minutes when the well is shut in.

1. **Maximum Injection Pressure (40 CFR §146.13)**

- (a) Prior to injection in this well, the permittee shall determine if the maximum injection pressure as specified at Part III(A) of this permit allows sufficient operational flexibility. If sufficient flexibility is allowed by the maximum injection pressure, the permittee may opt not to proceed with additional testing and the requirements of Part III(A)(1) of this permit shall be met. If the maximum injection pressure calculated prior to direct testing proves insufficient, or another need is identified that requires modifying the maximum injection pressure, the permittee shall conduct one or more of the following tests to ensure that the maximum injection pressure exerted during operation will not propagate existing or open new fractures in any part of the injection zone. In all cases where testing is to be performed, the permittee shall submit a plan for the Director's approval which describes the detailed procedures to be followed during any test designed to determine maximum injection pressure. Modification of the maximum permitted injection pressure following a test conducted under Part III(A)(1) of this permit shall follow the procedures set forth for minor permit modifications, as specified at 40 CFR §144.41(f).

(1) **In-Situ Stress Tests**

The permittee shall isolate zones for testing the fracturing pressure by means of a straddle packer assembly, or other comparable means. The zones chosen for testing shall be those predicted to have the lowest fracturing value. The permittee shall use either fresh water to conduct this test or a fluid that is permissible for injection into this well as allowed by this permit. At a minimum, the permittee shall measure the test fluid for its specific gravity and viscosity during the In-Situ Stress test. The results of this test shall be submitted to the USEPA as specified at Part III(A)(1)(b) of this permit. Failure to report test results shall be considered grounds to deny a requested permit modification.

(2) **Step Rate Test**

The permittee shall isolate the entire injection zone by means of a packer assembly, or other comparable means. The permittee shall inject either fresh water for this test or a fluid that is permissible for injection into this well as allowed for in this permit. At a minimum,

the permittee shall measure the test fluid for its specific gravity and viscosity during the Step Rate Test. The permittee shall inject into the well at increasing rates, holding the length of each rate step constant. Each rate step shall span the same amount of time (at least 30 minutes per rate step is recommended). The permittee shall attempt to inject at three (3) rates which result in a pressure higher than the injection zone fracture pressure during this test. All measured times, rates, and pressures and a Cartesian plot of rate against the final stabilized pressure at each step shall be included as part of the data package submitted to the U.S. EPA. The results of this test shall be submitted to the U.S. EPA as specified at Part III(A)(1)(b) of this permit. Failure to report test results shall be considered grounds to deny a requested permit modification.

(3) Other Test(s) Approvable by the Director

The permittee may choose to conduct test(s) other than the two described in Parts III(A)(1)(a)(1) and (2) of this permit. If so, the permittee shall submit a plan to conduct alternative test(s) to the Director for approval prior to conducting the test(s).

(b) Reporting Maximum Injection Pressure Determination

The permittee shall report the results of the measurements, tests and determinations conducted in Parts III(A)(1)(a) of this permit within 30 days of their completion.

2. Injection fluid

- (a) The injectate is limited to CO₂, as a supercritical fluid, with the chemical composition indicated in Part III(F) of this permit.

ATTACHMENT B
PLUGGING AND ABANDONMENT PLAN

Q- PLUGGING AND ABANDONMENT PLAN

Upon completion of injection testing and monitoring, a service rig will mobilize to the site and rig up over the Charlton 4-30 test well.

- Pressure measurements will be taken at the wellhead to ensure that the pressures in the well have stabilized
- The packers will be released and the injection tubing will be removed from the borehole
- A 5½" cement retainer will then be run into the wellbore and set above the perfs in the 5½" casing
- The perfs will be squeezed with 50 sx of cement
- Tubing will then be pulled from the retainer and cement plugs will be placed inside the 5 ½" casing, from the top of the retainer to the top of the 5 ½" liner (3540-5400)
- An 8 5/8" retainer will then be run in the hole to approximately 3420'
- The retainer will be set and 50 sx of cement will be squeezed through to squeeze off perfs in the 8 5/8" casing
- Cement plugs will then be placed inside the 8 5/8" casing from the top of the 8 5/8" retainer to surface
- The wellhead will then be removed and 1/2" steel plate will be welded on top of the 8 5/8" casing, at least 4' below ground level

Charlton 3-30A

- In the monitoring well (St. Charlton 3-30A), a 5 ½" retainer will be placed above perfs in the wellbore
- Cement will be squeezed through the retainer and also left on top of the retainer
- Additional cement plugs will be placed inside the 5 ½" casing as required
- The 5 ½" casing will then be cut 4' below ground level and capped with a 12" steel plate



United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility State Chariton 4-30 Otsego County, MI	Name and Address of Owner/Operator Core Energy, LLC 954 Business Park Drive, Ste 1, Traverse City, MI 49686
---	--

Locate Well and Outline Unit on Section Plat - 640 Acres 	State Michigan	County Otsego	Permit Number 57916
Surface Location Description NE 1/4 of Sw 1/4 of Sw 1/4 of 1/4 of Section 30 Township 31n Range 1W			
Locate well in two directions from nearest lines of quarter section and drilling unit Surface Location 886 ft. from (N/S) S Line of quarter section and ___ ft. from (E/W) W Line of quarter section.			
TYPE OF AUTHORIZATION <input checked="" type="checkbox"/> Individual Permit <input type="checkbox"/> Area Permit <input type="checkbox"/> Rule Number of Wells <u>1</u>		WELL ACTIVITY <input type="checkbox"/> CLASS I <input type="checkbox"/> CLASS II <input type="checkbox"/> Brine Disposal <input type="checkbox"/> Enhanced Recovery <input type="checkbox"/> Hydrocarbon Storage <input type="checkbox"/> CLASS III Well Number * OTHER - VX25	
Lease Name _____			

CASING AND TUBING RECORD AFTER PLUGGING					METHOD OF EMPLACEMENT OF CEMENT PLUGS			
SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE				
16"	cond	72'	72'	DRIVEN	<input checked="" type="checkbox"/> The Balance Method <input type="checkbox"/> The Dump Bailer Method <input type="checkbox"/> The Two-Plug Method <input type="checkbox"/> Other			
11 3/4"	47	804'	800'	14 3/4"				
8 5/8"	32	3615'	3611'	10 5/8"				
5 1/2"	15.5	3538-5800'	2262'	7 7/8"				

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)		5.5"	5.5"	8 5/8"	8 5/8"			
Depth to Bottom of Tubing or Drill Pipe (ft)		5400'	5395'	3400'	3395'			
Sacks of Cement To Be Used (each plug)		50	210	50	990			
Slurry Volume To Be Pumped (cu. ft.)		59	248	59	1168			
Calculated Top of Plug (ft.)		5400'	3520'	3400'	SURF			
Measured Top of Plug (if tagged ft.)		RET	RET	RET				
Slurry Wt. (Lb./Gal.)		15.6	15.6	15.6	15.6			
Type Cement or Other Material (Class III)		TYPE 1	TYPE 1	TYPE 1	TYPE 1			

LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)			
From	To	From	To
PERFS 5462'	5486'		
PERFS 3442' EST	3515' EST		

Estimated Cost to Plug Wells

\$16,000	CEMENT	\$8,700	CIPB (2)	\$3,500
	RIG	\$2,800	MISC	\$1,000

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) Joe Herpst, Operations Manager	Signature 	Date Signed 05/16/2007
---	----------------------	----------------------------------

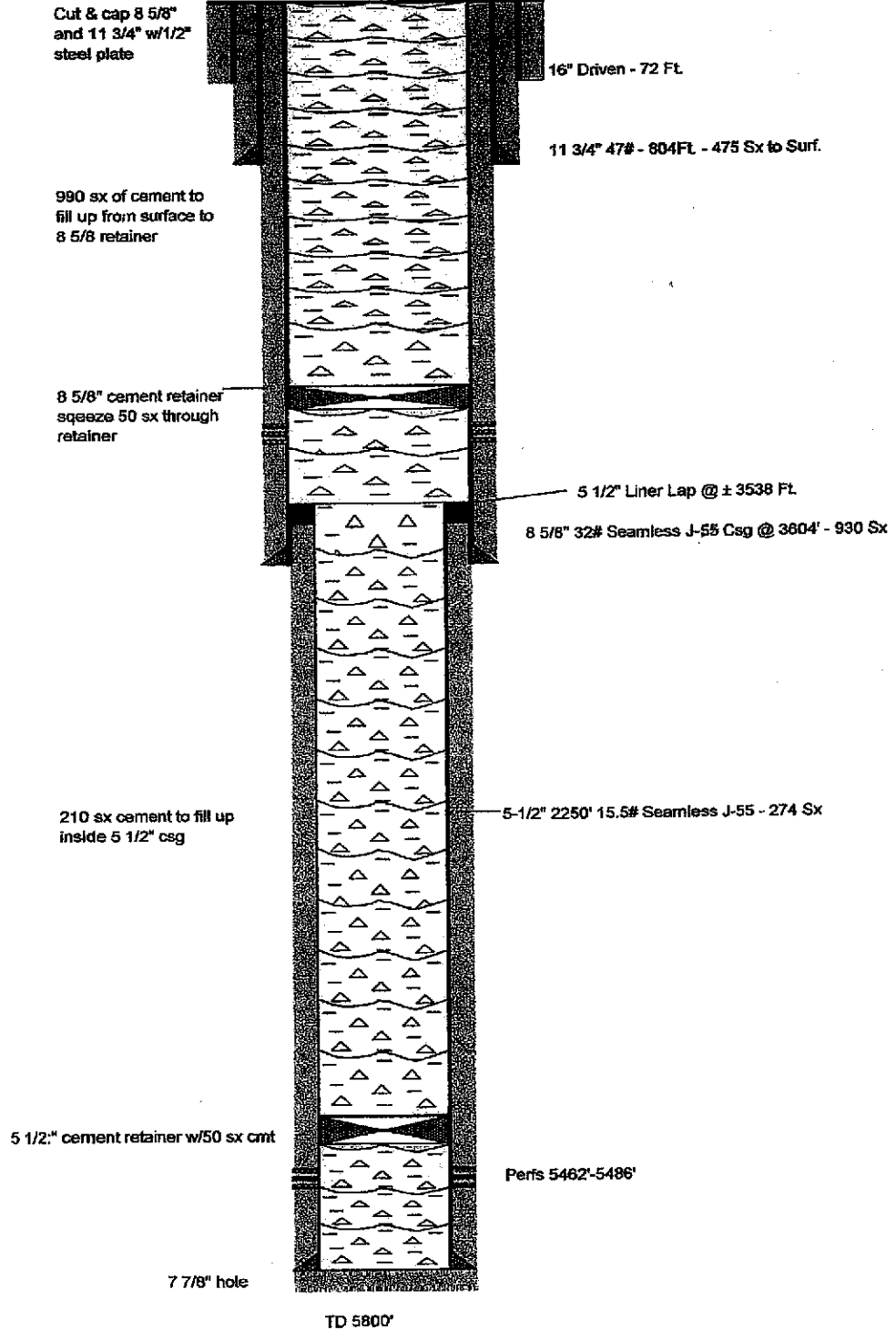


Charlton 30/31 Field

State Charlton #4-30
Permit No. 57916

Otsego County
S30 T31N R1W

Wellbore After Plugging



**ATTACHMENT C
CONTINGENT CORRECTIVE ACTION**

No corrective action is required at this time.

ATTACHMENT D
FINANCIAL ASSURANCE MECHANISM

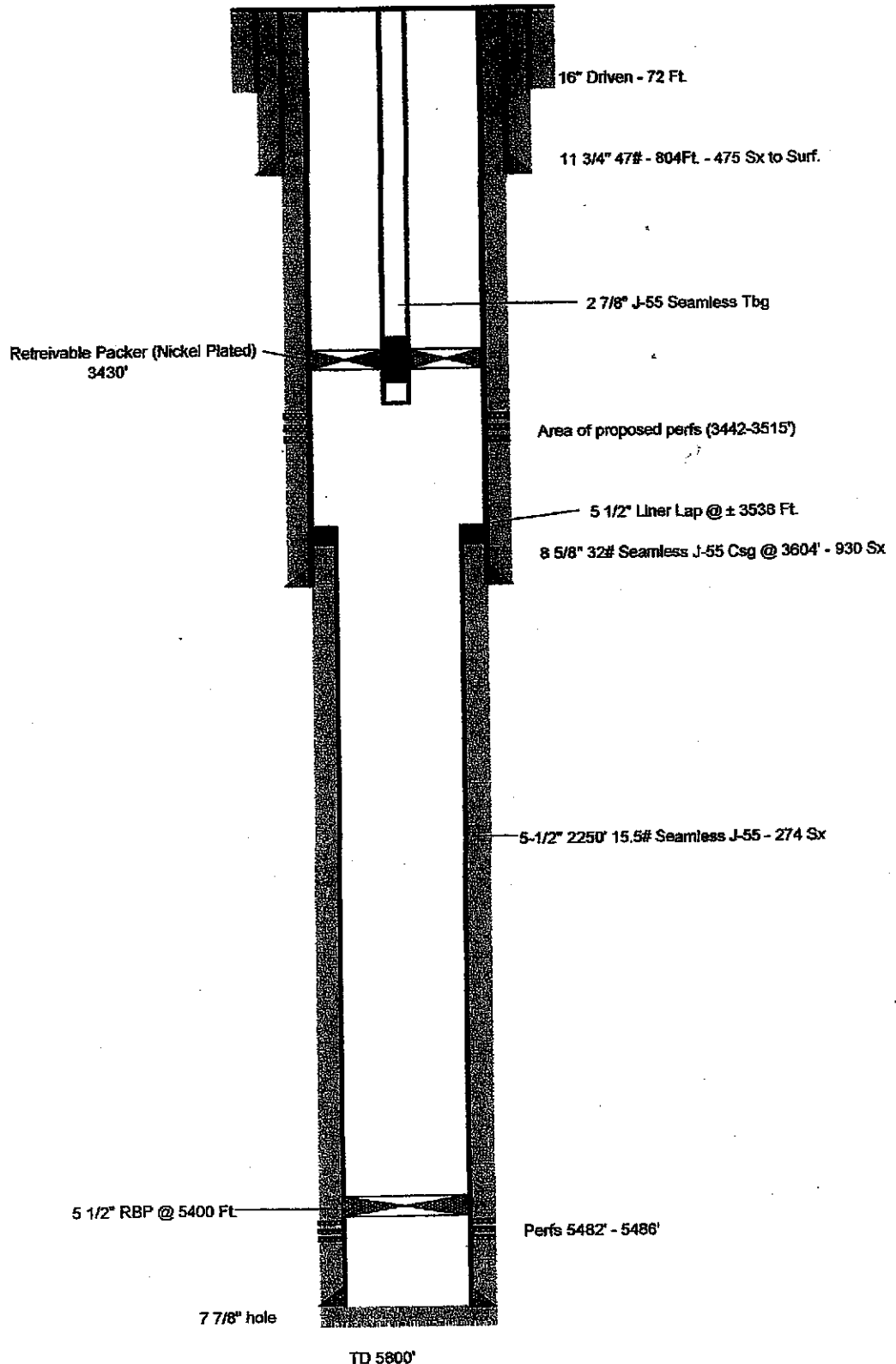
Core Energy, LLC has demonstrated adequate financial responsibility to properly plug and abandon the Class I non-hazardous well. A blanket bond in the amount of \$250,000 has been established at Chase Bank for this purpose.

ATTACHMENT E CONSTRUCTION DETAILS

State Charlton #4-30
Permit No. 57916

Otsego County
S30 T31N R1W

Injection Test Configuration



ATTACHMENT F
SOURCE AND ANALYSIS OF INJECTATE

The source of the CO₂ is from the Core DTE Turtle Lake gas processing plant. The CO₂ is removed from natural gas produced from Antrim shales with an amine stripping process. Once separated, the CO₂ is either vented or used for enhanced oil recovery floods in Niagaran reefs. Prior to pipeline transmission, the CO₂ is dried and compressed at the Core Energy Chester 10 compression facility to a supercritical state. The resulting CO₂ is 99.9% pure as indicated in the laboratory analyses of CO₂ discharge from the gas processing plant and compressor. Injection is limited to CO₂ of which the laboratory analyses are representative.

Certificate of Analysis from DTE Turtle Lake Gas Processing Facility MI-137-5X25-0001
Page F-2 of 3



E. Mitchell
 MICHIGAN LABORATORY
 450 HUGHES DRIVE
 TRAVERSE CITY, MICHIGAN 49886
 PHONE (231) 947-5777
 FAX (231) 947-7455
 www.spl-inc.com

Certificate of Analysis No. MI-0704014-01
 Page 1 of 1

DTE GAS & OIL
 1501 Cass Street, Suite B
 Traverse City, MI 49684
 ATTN: Ray Mitchell

DATE: 04/04/2007

LOCATION: TURTLE LAKE CO2 PLANT SAMPLE OF: GAS
 FIELD: TURTLE LAKE CO2 PLANT SAMPLE DATE: 04/03/07
 SUBMITTED BY: (PG) SPL, INC. DATE RECEIVED: 04/03/07
 CONDITIONS: 7 psia at 120 °F SAMPLE POINT: CO2 VENT STACK

PARAMETER	ANALYTICAL DATA	
	MOL %	GPM at 14.696 psia
Nitrogen	NIL	
Carbon Dioxide	99.892	
Methane	0.108	
Ethane	NIL	NIL
Propane	NIL	NIL
Iso-Butane	NIL	NIL
n-Butane	NIL	NIL
Iso-Pentane	NIL	NIL
n-Pentane	NIL	NIL
Hexane	NIL	NIL
Heptane Plus	NIL	NIL
	100.000	

Specific Gravity of real gas at 60°F (air = 1) 1.5267

Calculated B.T.U./cu. ft. @ 14.696 psia and 60 °F

Dry basis 1
 Wet basis 1

Z factor 0.9943

ANALYZED BY: PG DATE/TIME: 04/04/2007
 METHOD: GPA 2261-90, Gas Analysis Chr. Heptane +

REMARKS:

QUALITY ASSURANCE: GPA Standards

Certificate of Analysis from discharge of CO₂ compressor Core Energy Chester 10
Compression Facility



RECEIVED
SEP 15 2003

SOUTHERN LABORATORY
489 HUGHES DRIVE
TRAVERSE CITY, MICHIGAN 49684
PHONE 231 947-5077
FAX 231 947-7485

Certificate of Analysis No. 09197 03

Company: DIAMOND PETROLEUM
Location: CHESTER 10
Sample of: GAS
Sample point: DISCHARGE OF CO₂ COMPRESSOR
Conditions: 1160 psig at 104 deg.F.
Sampled by: (JC) DIAMOND PETROLEUM
Sample date: 09/09/03
Remarks: TIME 16:20

For: DIAMOND PETROLEUM
P.O. BOX 6649
TRAVERSE CITY, MI 49698-4449
ATTN: LOU MCCORMICK

September 11, 2003

Analysis:	Mol %	SPM at 14.696 psia
Carbon dioxide	99.91	
Methane	.09	
Ethane	NIL	NIL
Propane	NIL	NIL
iso-butane	NIL	NIL
n-butane	NIL	NIL
iso-pentane	NIL	NIL
n-pentane	NIL	NIL
Hexanes	NIL	NIL
Heptanes plus	NIL	NIL
	-----	-----
	100.00	.000

Specific Gravity at 60 deg.F. (air=1) 1.5243

Calculated B.T.U./cu. ft. @ 14.696 psia and 60 deg.F.
Dry basis 1
Wet basis 1

Southern Petroleum Laboratories, Inc.