



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5

77 WEST JACKSON BOULEVARD

CHICAGO, IL 60604-3590

**STATEMENT OF BASIS FOR ISSUANCE OF
UNDERGROUND INJECTION CONTROL (UIC) DRAFT PERMIT**

Permit Number: MI-025-2R-0012

Facility Name: Marshell #1-35

Jordan Development Company, L.L.C. of Traverse City, Michigan, has applied for a U. S. Environmental Protection Agency (EPA) permit for the Marshell #1-35 injection well to be used for enhanced oil recovery in the Lee 26 field, Calhoun County, Michigan.

Review of the permit application indicates that no significant environmental impact should result from the proposed injection. EPA, therefore, intends to issue a permit for this well. Under the authority of Title 40 of the Code of Federal Regulations (40 C.F.R.) Parts 144 and 146, EPA permits must specify conditions for construction, operation, monitoring, reporting, and plugging and abandonment of injection wells so as to prevent the movement of fluids into any Underground Source of Drinking Water (USDW). General provisions for EPA UIC permit requirements are found at 40 C.F.R. Parts 144 and 146, while regulations specific to Michigan injection operations are found at 40 C.F.R. Part 147 Subpart X. In accordance with 40 C.F.R. § 124.7, general information and highlighted permit conditions specific to this well are as follows:

Area of Review (AOR) and Corrective Action: In accordance with 40 C.F.R. §§ 144.55, 146.6 and 146.7, this is the area surrounding the well within which the applicant must research wells which penetrate the injection zone. If any of these wells are improperly sealed, completed or abandoned, and might provide a conduit for fluid migration, the applicant must develop a corrective action plan as shown in Part III(C) of the permit to address the deficiency. The applicant has provided documentation on the well population within 1/4 mile of the injection well (i.e., the AOR). There are 0 producing, 0 injection, 0 temporarily abandoned, and 11 plugged and abandoned wells within the 1/4 mile radius AOR which penetrate the injection zone. Based on current information, there are no inadequately constructed wells within the AOR, so there is no need for a corrective action plan.

Underground Sources of Drinking Water (USDWs): USDWs are defined by the UIC regulations as aquifers or portions thereof which contain less than 10,000 milligrams per liter of total dissolved solids and which are being or could be used as a source of drinking water. The base of the lowermost possible USDW in the vicinity of the injection well has been identified at approximately 424 feet below ground surface. This water-bearing formation is the Marshall Sandstone.

Injection and Confining Zone: Injection for enhanced oil recovery is limited by the permit to the Trenton Formation and Black River Group in the interval between 4228 and 4837 feet below ground surface. This injection zone is separated from the lowermost USDW by approximately 3804 feet of rock strata. The confining zone is composed of the rocks of the Utica Shale between 3946 and 4228 feet below ground surface.

Construction Requirements: The proposed conversion of the existing production well to an injection well meets the regulatory criteria of 40 C.F.R. § 146.22. This requires that all converted wells that inject fluids which are brought to the surface in connection with oil or natural gas production, or for enhanced recovery of oil or natural gas, be sited so that they inject into a formation which is separated from any USDW by a confining zone free of known open faults or fractures within the AOR. All Class II wells must also be cased and cemented to prevent the movement of fluids into or between USDWs. The permittee shall not commence conversion of any new well until a final permit has been issued.

Injection Fluid: The injected fluid is limited by the permit to produced gas and brine from production wells owned or operated by Jordan Development Company, L.L.C. The expected maximum daily volume of produced gas to be injected is 5 million cubic feet. The expected maximum daily volume of produced brine to be injected is 10,000 barrels.

Maximum Injection Pressure: The maximum injection pressure shall be limited to 1061 pounds per square inch gauge (psig). EPA calculated this limit using the formula on page A-1 of the draft permit. This limitation will ensure that the pressure during injection does not initiate fractures in the confining zone adjacent to the lowermost USDW during injection operations. This in turn ensures that the injection pressure will not cause the movement of injection or formation fluids into a USDW as prohibited by 40 C.F.R. § 146.23(a)(1).

Response to a Seismic Event: In accordance with 40 C.F.R. §§144.52(a)(9) and 144.52(b)(1), the Director has the authority to include additional conditions in the permit, where necessary to prevent the migration of fluids into USDWs or to provide for and assure compliance with Safe Drinking Water Act (SDWA) requirements, respectively.

In 2015, a geologic fault approximately 20 miles from the proposed injection well produced earthquakes of Moment Magnitudes (M_m) of 3.3 and 4.2. M_m measures the actual strength, or force, of the earthquake. Speaking generally, most people can feel an earthquake with an M_m of 3.5. Such a quake can cause minor damage, such as cracking plaster or pictures falling off a wall. Speaking generally, everyone can feel an earthquake with an M_m of 5.0. Such a quake can cause damage to structures, depending on their construction.

EPA examined the U.S. Geological Survey (USGS) *50-year Earthquake Probability Map and Assessment of Hazard Values* for the area near the proposed well. EPA concludes that there is a negligible probability of an earthquake of M_m 5.0 or greater in the area of the proposed well. Based upon recent seismic history, however, there could be felt earthquakes of lesser strength. Accordingly, under authority of 40 C.F.R. §§144.52(a)(9) and 144.52(b)(1), EPA is imposing additional permit conditions to protect USDWs from the risk of seismic damage to the injection well and to assure the well's compliance with SDWA and its regulations. There is no expectation

that injection into the well will induce any earthquakes.

Part III(A) of the draft permit contains conditions requiring action if USGS seismic monitoring (see <https://sslearthquake.usgs.gov/ens/register>) detects an earthquake of M_m 3.5 or greater within 62 miles of the proposed injection well. EPA does not believe that injection into the well will induce any earthquakes. The first step would be to stop injecting immediately, then the Permittee must notify the Director within 24 hours of the event. The next steps depend upon the strength of the earthquake. Please see Part III(A) of the draft permit for more details.

Monitoring and Reporting Requirements: In accordance with 40 C.F.R. §§ 144.54 and 146.23, the applicant will be responsible for observing and recording injection pressure, flow rate, annulus pressure, and cumulative volume on a weekly basis and reporting this to EPA on a monthly basis. The applicant will also be responsible for observing, recording, and reporting annulus liquid loss on a quarterly basis. An analysis of the injected fluid must be submitted on an annual basis. In addition, the applicant is required to conduct and pass a two-part Mechanical Integrity Test (MIT), in accordance with 40 C.F.R. § 146.8, before authorization to inject is granted, and after the well is completed. The applicant also is required to repeat the annulus pressure test, which is the first part of the MIT, at least once every five years thereafter. If a temperature or noise log or another method as approved by the Director is used to determine the second part of the MIT (i.e., the absence of fluid movement), then the applicant will be required to repeat this test at least once every five years thereafter. These tests will provide EPA with an evaluation of the integrity of the tubular goods (casing, tubing and packer) as well as documentation as to the absence or presence of fluid movement behind the casing.

Plugging and Abandonment: In accordance with 40 C.F.R. §§ 146.10 and 146.24(d), the permit includes a plugging and abandonment plan for an environmentally protective well closure at the time of cessation of operations. Jordan Development Company, L.L.C. has demonstrated adequate financial responsibilities to close, plug, and abandon this underground injection operation. A state bond in the amount of \$53,000 has been established for this purpose with The Bank of Northern Michigan.

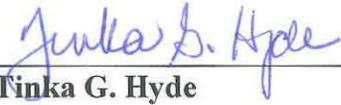
Issuance and Effective Date of Permit: In accordance with 40 C.F.R. § 124.15, the permit will become effective immediately upon issuance if EPA receives no public comments requesting a change in the draft permit. If EPA receives public comments requesting a change in the draft permit, and EPA issues a final permit, then the permit will become effective 45 days after the date of issuance unless the permit is appealed. In accordance with 40 C.F.R. § 144.36(a), the permit will be in effect for the life of the facility, unless it is otherwise modified, revoked and reissued, or terminated as provided at 40 C.F.R. §§ 144.39, 144.40, and 144.41. The permit will expire in one year if the permittee fails to commence construction, unless a written request for an extension of this one year period has been approved by the Director. The permit will be reviewed by EPA at least once every five years from its effective date for consistency with new or revised Federal regulations.

Questions and requests for additional information may be submitted to Stephen Roy at (312) 886-6556 or roy.stephen@epa.gov via the internet. The date for closure of the comment period includes the required 30 days for public comment and an additional three days for the delay caused by mailing. The public comment period will close as described in the Public

Notice. Requests for a hearing must be submitted in writing. If EPA determines that there is significant public interest in the draft permit, a public notice of a scheduled hearing will be published locally and mailed to interested parties.

To preserve your right to appeal any final permit decision that may be made in this matter under 40 C.F.R. Part 124, you must either send in written comments or participate in a public hearing on the draft permit decision. (A hearing is not planned at this time.) The first appeal must be made to the Environmental Appeals Board; only after all agency review procedures have been exhausted may you file an action in the appropriate Circuit Court of Appeals for review.

**U.S. Environmental Protection Agency
Region 5 (WU-16J)
77 West Jackson Boulevard
Chicago, Illinois 60604-3590**



Tinka G. Hyde
Director, Water Division

5-19-16

Date



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
UNDERGROUND INJECTION CONTROL PERMIT: CLASS II

Permit Number: MI-025-2R-0012

Facility Name: Marshall #1-35

Pursuant to the provisions of the Safe Drinking Water Act, as amended 42 U.S.C. §§ 300f et seq., (commonly known as the SDWA) and implementing regulations promulgated by the U.S. Environmental Protection Agency at Parts 124, 144, 146, and 147 of Title 40 of the Code of Federal Regulations (40 C.F.R.),

Jordan Development Company, L.L.C. of Traverse City, Michigan

is hereby authorized to convert and operate an injection well located in Michigan, Calhoun County, T1S, R5W, Section 36, NW 1/4 Section, for injection into the Trenton Formation and Black River Group at depths between 4228 and 4837 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(E)(10) of this permit.

The injection shall be limited to enhanced oil recovery using produced gas and brine from production wells owned or operated by Jordan Development Company, L.L.C.

All references to 40 C.F.R. are to all regulations that are in effect on the date that this permit is effective. All terms used in this permit shall have the meaning set forth in the SDWA and implementing regulations at 40 C.F.R. Parts 124, 144, 146, and 147.

This permit shall become effective on _____ and shall remain in full force and effect during the operating life of the well, unless this permit is otherwise revoked and reissued, terminated, or modified pursuant to 40 C.F.R. §§ 144.39, 144.40, and 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. The permit will expire in one year if the permittee fails to commence construction, unless a written request for an extension of this one year period has been approved by the Director. The permittee may request an expiration date sooner than the one year period, provided no construction on the well has commenced. This permit will be reviewed at least every five years from the effective date specified above.

Signed and dated: _____

DRAFT

Tinka G. Hyde

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. The underground injection activity, otherwise authorized by this permit or rule, shall not allow the movement of fluid containing any contaminant into underground sources of drinking water, if the presence of that contaminant may cause a violation of any Primary Drinking Water Regulation pursuant to 40 C.F.R. Part 142 or may otherwise adversely affect the health of persons. Any underground injection activity not specifically authorized in this permit or otherwise authorized by permit or rule is prohibited. 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. Compliance with the terms of this permit does not constitute a defense to any action brought under Section 1431 of the Safe Drinking Water Act (SDWA), or any other law governing protection of public health or the environment.

B. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated for cause as specified in 40 C.F.R. §§ 144.39, 144.40, and 144.41. The filing of a request for a permit modification, revocation and reissuance, 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.

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 C.F.R. Part 2 and § 144.5, any information submitted to EPA 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 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 conditions of this permit, except to the extent and for the duration such non-compliance is authorized by an emergency permit pursuant to 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.

2. Penalties for Violations of Permit Conditions

Any person who operates this well in violation of permit conditions is subject to civil penalties, fines, and other enforcement action under the SDWA and may be subject to such actions under the Resource Conservation and Recovery Act. Any person who willfully violates a permit condition is subject to criminal prosecution.

3. Need to Halt or Reduce Activity not a Defense

It shall not be a defense for a permittee in an enforcement action to state that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

4. 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.

5. 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) that 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 the permit.

6. **Duty to Provide Information**

The permittee shall furnish to the Director, by the date 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 by this permit to be retained.

7. **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 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 must be retained under the conditions of this permit;
- c. Inspect, at reasonable times, any facilities, equipment (including monitoring equipment), practices, or operations, regulated or required under this permit; and
- d. Sample or monitor the injected fluids, at reasonable times, for the purposes of assuring permit compliance, or as otherwise authorized by the SDWA, at any location.

8. **Records**

- a. The permittee shall retain records of all monitoring information, including all calibration and maintenance records and copies of all records required by this permit, for a period of at least three years from the date of the sample, measurement or report. The permittee shall also maintain records of all data required to complete this permit application and any supplemental information submitted under 40 C.F.R. §§ 144.31 and 144.51. These periods may be extended by request of the Director at any time by written notice to the permittee.
- b. The permittee shall retain records concerning the nature and composition of all injected fluids until three years after the completion of plugging and abandonment in accordance with the plugging and abandonment plan, contained in Part III(B) of this permit. The owner or operator shall continue to retain the records after the three year retention period unless he delivers the records to the Regional Administrator or obtains written approval from the Regional Administrator to discard the records.

- c. Records of monitoring information shall include:
- (i) The date, exact place, and the time of sampling or measurements;
 - (ii) The name(s) of the individual(s) who performed the sampling or measurements;
 - (iii) A precise description of both sampling methodology and the handling of samples;
 - (iv) The date(s) analyses were performed;
 - (v) The name(s) of the individual(s) who performed the analyses;
 - (vi) The analytical techniques or methods used; and,
 - (vii) The results of such analyses.

9. **Notification Requirements**

- a. **Planned Changes** - The permittee shall notify and obtain the Director's approval at least 30 days prior to any planned physical alterations or additions to the permitted facility, or changes in the injection fluids. Within 10 days prior to injection, an analysis of new injection fluids shall be submitted to the Director for approval in accordance with Parts II(B)(2) and II(B)(3) of this permit.
- 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. **Transfer of Permits** - This permit is not transferable to any person except after notice is sent to the Director at least 30 days prior to transfer and the requirements of 40 C.F.R. § 144.38 have been met. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the SDWA.
- d. **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 to the Director no later than 30 days following each schedule date.

e. **Twenty-Four Hour Reporting**

- (i) The permittee shall report to the Director any noncompliance which may endanger health or the environment. This information shall be provided orally within 24 hours from the time the permittee becomes aware of the circumstances, and shall include the following information:
 - (a) Any monitoring or other information that indicates that any contaminant may cause an endangerment to an underground source of drinking water; or,
 - (b) Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.
- (ii) A written submission shall also be provided as soon as possible but no later than five days from 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.
- (iii) The permittee shall report to the Director any seismic events as required by Part III(A). This information shall be provided verbally within 24 hours from the time the permittee becomes aware of the circumstances.

f. **Other Noncompliance** - All other instances of noncompliance shall be reported at the time when monthly reports are submitted under Part II(B)(3)(a) of this permit. 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.

g. **Other Information** - If or when the permittee becomes aware that the permittee failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Director, the permittee shall promptly submit such facts or corrected information in accordance with 40 C.F.R. § 144.51(l)(8).

- h. **Report on Permit Review** - Within 30 days of receipt of the final issued permit, the permittee shall report to the Director that the permittee has read and is personally familiar with all terms and conditions of this permit.

10. **Commencing Injection**

The permittee shall not commence injection into any newly drilled or converted well until:

- a. The permittee has certified to the Director that the permittee has subscribed to the U.S. Geological Survey Earthquake Notification Service as required by Part III(A);
- b. Formation data and injection fluid analysis have been submitted in accordance with Parts II(A)(6) and II(B)(2), respectively;
- c. A report on any logs and tests required under Parts II(A)(5) and Part III(C) of this permit have been submitted;
- d. Mechanical integrity of the well has been demonstrated in accordance with Part I(E)(17);
- e. Any required corrective action has been performed in accordance with Parts I(E)(16) and III(C); and,
- f. Construction is complete and the permittee has submitted to the Permit Writer, by certified mail with return receipt requested, a notice of completion of construction using EPA Form 7520-10 and either:
 - (i) The Director has inspected or otherwise reviewed the new injection well and finds it is in compliance with the conditions of the permit; or,
 - (ii) The permittee has not received, within 13 days of the date of the Director's receipt of the report required above, notice from the Director of his or her intent to inspect or otherwise review the new injection well, in which case prior inspection or review is waived and the permittee may commence injection.

11. **Signatory Requirements**

All reports required by this permit and other information requested by the Director shall be signed and certified according to 40 CFR § 144.32.

12. **Notice of Plugging and Abandonment**

The permittee shall notify the Director at least 45 days before conversion or abandonment of the well.

13. **Plugging and Abandonment**

The permittee shall plug and abandon the well as provided in the plugging and abandonment plan contained in Part III(B) of this permit. Plugging shall occur as soon as practicable after operation ceases but not later than two years thereafter. During the period of non-operation, the well must be tested to ensure that it maintains mechanical integrity, unless the permittee fulfills the other requirements under 40 C.F.R. § 144.52(a)(6), prior to expiration of the two-year period. The permittee shall notify the Director of plugging and abandonment in accordance with the reporting procedures in Part I(E)(12) of this permit.

14. **Financial Responsibility**

The permittee shall maintain financial responsibility and resources to plug and abandon the underground injection well in accordance with 40 C.F.R. § 144.52(a)(7) as provided in Attachment R of the permit application corresponding to this permit action which is hereby incorporated by reference as if it appeared fully set forth herein. The permittee shall not substitute an alternative demonstration of financial responsibility from that which the Director has approved, unless the permittee has previously submitted evidence of that alternative demonstration to the Director and the Director has notified the permittee in writing that the alternative demonstration of financial responsibility is acceptable. The financial responsibility mechanism shall be updated periodically, upon request of the Director, except when Financial Statement Coverage is used as the financial mechanism, this coverage must be updated on an annual basis.

15. **Insolvency**

- a. In the event of the bankruptcy of the trustee or issuing institution of the financial mechanism, or a suspension or revocation of the authority of the trustee institution to act as trustee or the institution issuing the financial mechanism to issue such an instrument, the permittee must submit an alternative demonstration of financial responsibility acceptable to the Director within 60 days after such event. Failure to do so will result in the termination of this permit pursuant to 40 C.F.R. § 144.40(a)(1).
- b. An owner or operator must also 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 10 business days after the commencement of the proceeding. A guarantor

of a corporate guarantee must make such a notification if he/she is named as debtor, as required under the terms of the guarantee.

16. **Corrective Action**

The permittee shall shut in the injection well whenever he/she or EPA 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 that may cause upward fluid migration from an improperly plugged or unplugged well will be considered a violation of this permit. If the permittee or EPA determines that the permitted well is not in compliance with 40 C.F.R. § 146.8, the permittee will immediately shut in the well until such time as appropriate repairs can be effected and written approval to resume injection is given by the Director. In addition, the permittee shall not commence injection until any and all corrective action has been taken in accordance with any plan contained in Part III(C) of this permit and the requirements in Part I(E)(10) of this permit have been met.

17. **Mechanical Integrity**

- a. The permittee must establish (prior to receiving authorization to inject), and shall maintain mechanical integrity of this well, in accordance with 40 CFR § 146.8.
- b. A demonstration of mechanical integrity, in accordance with 40 C.F.R. § 146.8, shall be performed at least every five years from the date of the last approved demonstration and when required by Part III(A) of this permit. The permittee shall notify the Director of his/her intent to demonstrate mechanical integrity at least 30 days prior to such demonstration.
- c. The permittee shall demonstrate the mechanical integrity of the well by pressure testing whenever:
 - (i) the tubing is removed from the well or replaced;
 - (ii) the packer is reset; or,
 - (iii) a loss of mechanical integrity occurs. Operation shall cease whenever one of the aforementioned conditions occurs and not resume until the Director gives approval to recommence injection.
- d. The permittee shall cause all gauges used in mechanical integrity demonstrations to be calibrated prior to the demonstration.

- e. The Director may, by written notice, require the permittee to demonstrate mechanical integrity at any time.
- f. The permittee shall cease injection if a loss of mechanical integrity occurs or is discovered during a test, or a loss of mechanical integrity as defined by 40 C.F.R. § 146.8 becomes evident during operation. Operations shall not be resumed until the Director gives approval to recommence injection.
- g. The permittee shall notify the Director of the loss of mechanical integrity, in accordance with the reporting procedures in Parts II(B)(3)(d) and I(E)(9)(e) of this permit.
- h. The permittee shall report the result of a satisfactory mechanical integrity demonstration as provided in Part II(B)(3)(d) of this permit, except the first such result after permit issuance, which shall be sent to the Permit Writer.

18. **Restriction on Injected Substances**

The permittee shall be restricted to the injection of fluids brought to the surface in connection with oil or natural gas production or those fluids used in the enhancement of oil and gas production as specified in 40 C.F.R. § 146.5(b). Further, no fluids other than those from sources noted in the administrative record for this permit and approved by the Director shall be injected.

PART II**WELL SPECIFIC CONDITIONS FOR
UNDERGROUND INJECTION CONTROL PERMITS****A. CONSTRUCTION REQUIREMENTS****1. Siting**

Notwithstanding any other provision of this permit, 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 the review.

2. Casing and Cementing

Injection wells shall be cased and cemented to prevent the movement of fluids into or between underground sources of drinking water. The casing and cement to be used in the construction of the well shall be as contained in Attachments L and M of the permit application corresponding to this permit action which is hereby incorporated by reference as if they appeared fully set forth herein.

3. Tubing and Packer Specifications

Injection shall only take place through tubing with a packer set in the long string casing within or below the nearest cemented and impermeable confining system immediately above the injection zone. Tubing and packer specifications shall be as represented in engineering drawings contained in Attachments L and M of the permit application corresponding to this permit action which are hereby incorporated by reference as if they appeared fully set forth herein. Any proposed changes shall be submitted by the permittee in accordance with Part I(E)(9)(a) and (b) of this permit.

4. Wellhead Specifications

For every injection well, the operator shall provide a female fitting, with a cutoff valve, to the tubing at the wellhead, so that the amount of injection pressure being used may be measured by a representative of EPA by attaching a gauge having a male fitting.

5. Logs and Tests

Upon approval of the surface casing and cementation records by the Director, any logs and tests noted in Part III of this permit shall be performed, unless already provided. Prior to commencement of injection, the permittee shall submit a descriptive report prepared by a knowledgeable log analyst interpreting the results

of those logs and tests to the Director for approval along with the notice of completion required in Part I(E)(10) of this permit.

6. **Formation Data**

If not already provided, the permittee shall determine or calculate the following information concerning the injection formation and submit it to the Director for review and approval, prior to operation:

- a. Formation fluid pressure;
- b. Fracture pressure; and,
- c. Physical and chemical characteristics of the formation.

7. **Prohibition of Unauthorized Injection**

Any underground injection, except as authorized by permit or rule issued under the UIC program, is prohibited. The construction, including drilling, of any well required to have a permit is prohibited until the permit has been issued.

B. OPERATING, MONITORING, AND REPORTING REQUIREMENTS

1. **Operating Requirements**

- a. Beginning on the effective date of this permit, the permittee is authorized to operate the injection well, subject to the limitations and monitoring requirements set forth herein. The injection pressure and injected fluid shall be limited and monitored as specified in Parts I(E)(18) and III(A) of this permit.
- b. Injection at a pressure that initiates fractures in the confining zone or causes the movement of injection or formation fluids into or between underground sources of drinking water is prohibited.
- c. Injection between the outermost casing protecting underground sources of drinking water and the well bore is prohibited.
- d. The annulus between the tubing and the long string casing shall be filled with a liquid designed to inhibit corrosion. The annulus liquid will be monitored in accordance with Parts II(B)(2)(d) and II(B)(3)(b) of this permit. Any specific annulus requirements are contained in Part III(A) of this permit.

2. **Monitoring Requirements**

- a. Samples and measurements, taken for the purpose of monitoring as required in Part II(B)(3), shall be representative of the monitored activity. Grab samples shall be used to obtain a representative sample of the fluid to be analyzed. Part III(A) of this permit describes the sampling location and required parameters for injection fluid analysis. The permittee shall identify the types of tests and methods used to generate the monitoring data. The monitoring program shall conform to the one described in Part III(A) of this permit.
- b. **Analytical Methods** - Monitoring of the nature of injected fluids shall comply with applicable analytical methods cited and described in Table I of 40 C.F.R. § 136.3 or in Appendix III of 40 CFR Part 261 or by other methods that have been approved by the Director.
- c. **Injection Fluid Analysis** - The nature of the injection fluids shall be monitored as specified in Part III(A) of this permit. An initial analysis of the injection fluid is contained in Appendix 5 of the permit application corresponding to this permit action which is hereby incorporated by reference as if it appeared fully set forth herein. The Director may, by written notice require the permittee to sample and analyze the injected fluid at any time.
- d. **Injection Pressure, Annulus Pressure, Annulus Liquid Loss, Flow Rate, and Cumulative Volume** - Injection pressure, annulus pressure, flow rate and cumulative volume shall be recorded at least weekly and shall be reported monthly as specified in Part III(A) of this permit. Annulus liquid loss shall be recorded at least quarterly and shall be reported in accordance with the provisions of Part II(B)(3)(b), as the volume of liquid added to the annulus to keep it filled in accordance with Part II(B)(1)(d). All gauges used in monitoring shall be calibrated in accordance with Part I(E)(17)(e) of this permit.

3. **Reporting Requirements**

Copies of the monitoring results and all other reports shall be submitted to the Director at the following address:

**U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, Illinois 60604-3590
Attn: UIC Branch, (WU-16J)**

- a. **Monthly Reports** - Monitoring results obtained during each week shall be recorded on a form that has been signed and certified according to 40 C.F.R. § 144.32. The first report shall be postmarked no later than the 10th day of the month after authorization to inject has been granted. Thereafter, forms shall be submitted at the end of each month and shall be postmarked no later than the 10th day of the month following the reporting period. This report shall include the weekly measurements of injection pressure, annulus pressure, flow rate, and cumulative volume as required in Parts II(B)(2)(d) and III(A) of this permit.
- b. **Quarterly Reports** - Monitoring results obtained each quarter shall include the measurement of annulus liquid loss as required in Parts II(B)(2)(d) and III(A) of this permit. Reports shall be submitted at the end of each quarter and shall be postmarked no later than the 10th day of the first month of the following quarter.
- c. **Annual Reports** - Monitoring results obtained each year shall include the measurements of injected fluid characteristics as required in Part III(A) of this permit. Reports shall be submitted at the end of each anniversary year and shall be postmarked no later than the 10th day of the first month of the following year.
- d. **Reports on Well Tests, Workovers, and Plugging and Abandonment** - The applicant shall provide the Director with the following reports and test results within 60 days of completion of the activity:
 - (i) Mechanical integrity tests, except tests which the well fails in which case 24 hour reporting under Part I(9)(e) is applicable;
 - (ii) Logging or other test data;
 - (iii) Well workovers (using EPA Form 7520-12); and
 - (iv) Plugging and abandonment.

PART III**SPECIAL CONDITIONS**

These special conditions include, but are not limited to plans for maintaining correct operating procedures, monitoring conditions and reporting, as required by 40 C.F.R. Parts 144 and 146. These plans are described in detail in the permittee's application for a permit, and the permittee is required to adhere to these plans as approved by the Director, as follows:

- A. OPERATING, MONITORING, AND REPORTING REQUIREMENTS
- B. PLUGGING AND ABANDONMENT PLAN
- C. CORRECTIVE ACTION PLAN

PART III(A)

OPERATING, MONITORING, AND REPORTING REQUIREMENTS

Characteristic	Limitation	Minimum Monitoring Requirements		Minimum Reporting Requirements
		Frequency	Type	Frequency
*Injection Pressure	1061 psig (maximum)	weekly		monthly
Annulus Pressure		weekly		monthly
Flow Rate		weekly		monthly
Cumulative Volume		weekly		monthly
Annulus Liquid Loss		quarterly		quarterly
**Chemical Composition of Injection Fluid		annually	grab	annually

SAMPLING LOCATION: The sample location is at the well head.

*The limitation on wellhead pressure serves to prevent confining-formation fracturing. The maximum injection pressure is dependent upon the fracture gradient of the rock, the depth of the injection zone, and the specific gravity of the injected fluid. The formula used to calculate the maximum injection pressure is:

$$[\{\text{fracture gradient} - (0.433 \text{ psi/ft})(\text{specific gravity})\} \times \text{depth}] - 14.7 \text{ psi}$$

The fracture gradient is 0.80 *psi/ft*. The top of the Trenton Formation at 4228 feet was used as the depth and a specific gravity of 1.26 was used for the injected fluid.

**Chemical composition analysis for produced brine shall include, but not be limited to, the following: Sodium, Calcium, Magnesium, Barium, Total Iron, Chloride, Sulfate, Carbonate, Bicarbonate, Sulfide, Total Dissolved Solids, pH, Resistivity (ohm-meters @ 75°F), and Specific Gravity.

Chemical composition analysis for produced gas shall include, but not be limited to, the following: Hydrogen Sulfide, Nitrogen, Carbon Dioxide, Methane, Ethane, Propane, Iso-butane, N-butane, Iso-pentane, N-pentane, Hexanes, Heptanes plus, Specific Gravity, and Temperature.

SEISMIC EVENT RESPONSE

Prior to commencing injection, the permittee shall subscribe to the U.S. Geological Survey Earthquake Notification Service to receive notification of seismic events within 100 kilometers

(62 miles) of the well. The midpoint between the surface-hole and bottom-hole locations shall be used as the center of the circle. The appropriate response to seismic events depends on the Moment Magnitude (M_m) of the seismic event according to the following protocol.

1. Seismic events not recorded or $M_m < 3.5$. Continue normal operations.
2. Seismic events with $3.5 \leq M_m < 5.0$ observed within a 100 km (62 miles) radius of the site. Injection operations must cease. The permittee will notify the Director of any such event verbally within 24 hours, providing information on the physical integrity of the injection system. Within 45 days, the permittee will perform a Standard Annulus Pressure Test (or other test approved by the Director) (Part 1 Mechanical Integrity) pursuant to 40 C.F.R. § 146.8. If the well passes this mechanical integrity test, the permittee must submit the results and any other required documentation as required by Part II(B)(3)(d). Injection operations shall not resume until the Director gives written approval to recommence injection. If the well fails the test or the permittee identifies any problems with the injection system that might impact an underground source of drinking water (USDW), the injection well must remain shut-in and the permittee must submit a written report as soon as possible but no later than five days from the time the permittee becomes aware of the failure or problem. The written submittal shall contain a description of the failure or problem and if the failure or problem has not been corrected, the anticipated time it is expected to continue, and steps taken or planned to reduce or eliminate the failure or problem. Upon completion of the steps to restore mechanical integrity and a subsequent test which demonstrates that the well has mechanical integrity, the permittee must submit the results and any other required documentation as required by Part II(B)(3)(d). Injection operations shall not resume until the Director gives written approval to recommence injection.
3. M_m 5.0 or greater seismic events are observed within a 100 km (62 miles) radius of the site. Injection operations must cease. The permittee will notify the Director of any such event verbally within 24 hours, providing information on the physical integrity of the injection system. Within 45 days, the permittee will perform a Standard Annulus Pressure Test (or other test approved by the Director) (Part 1 Mechanical Integrity) and evaluate the external mechanical integrity of the well (Part 2 Mechanical Integrity) pursuant to 40 C.F.R. § 146.8. If the well passes these mechanical integrity tests, the permittee must submit the results and any other required documentation as required by Part II(B)(3)(d). Injection operations shall not resume until the Director gives written approval to recommence injection. If the well fails either mechanical integrity test or the permittee identifies any problems with the injection system that might impact a USDW, the injection well must remain shut-in and the permittee must submit a written report as soon as possible but no later than five days from the time the permittee becomes aware of the failure or problem. The written submittal shall contain a description of the failure or problem and if the failure or problem has not been corrected, the anticipated time it is expected to continue, and steps taken or planned to reduce or eliminate the failure or problem. Upon completion of the steps to restore mechanical integrity and subsequent tests that demonstrates the well has internal and external mechanical integrity, the permittee must submit the results and any other required documentation as required by Part II(B)(3)(d). Injection operations shall not resume until the Director gives written approval to recommence injection.

OMB No. 2040-0042 Approval Expires 12/31/2011



United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility Lee 26	Name and Address of Owner/Operator Jordan Development Company & West Bay Exploration 1503 Garfield Rd. N., Traverse City, MI 49696
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Locate Well and Outline Unit on Section Plat - 640 Acres 	State MI	County Calhoun	Permit Number pending
	Surface Location Description se 1/4 of nw 1/4 of nw 1/4 of nw 1/4 of Section 36 Township 1S Range 5W		
	Locate well in two directions from nearest lines of quarter section and drilling unit Surface Location 390 ft. frm (N/S) N Line of quarter section and 383 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 <input type="text"/>		WELL ACTIVITY <input type="checkbox"/> CLASS I <input checked="" type="checkbox"/> CLASS II <input type="checkbox"/> Brine Disposal <input checked="" type="checkbox"/> Enhanced Recovery <input type="checkbox"/> Hydrocarbon Storage <input type="checkbox"/> CLASS III	
Lease Name <u>Marshall</u>		Well Number <u>1-35</u>	

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	65#		47	Driven	<input checked="" type="checkbox"/> The Balance Method	
11-3/4	42#		557	14-3/4	<input type="checkbox"/> The Dump Bailer Method	
8-5/8	24#		2500	10-5/8	<input type="checkbox"/> The Two-Plug Method	
5-1/2	15.5#		4975	7-7/8	<input type="checkbox"/> 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 (inche)	5-1/2	8-5/8	11-3/4				
Depth to Bottom of Tubing or Drill Pipe (ft)	4800	2030	596				
Sacks of Cement To Be Used (each plug)	34	30	339				
Slurry Volume To Be Pumped (cu. ft.)	40	35	400				
Calculated Top of Plug (ft.)	4550	1930	Surface				
Measured Top of Plug (if tagged ft.)	NA	NA	NA				
Slurry Wt. (Lb./Gal.)	15.6	15.6	15.6				
Type Cement or Other Material (Class III)	A	A	A				

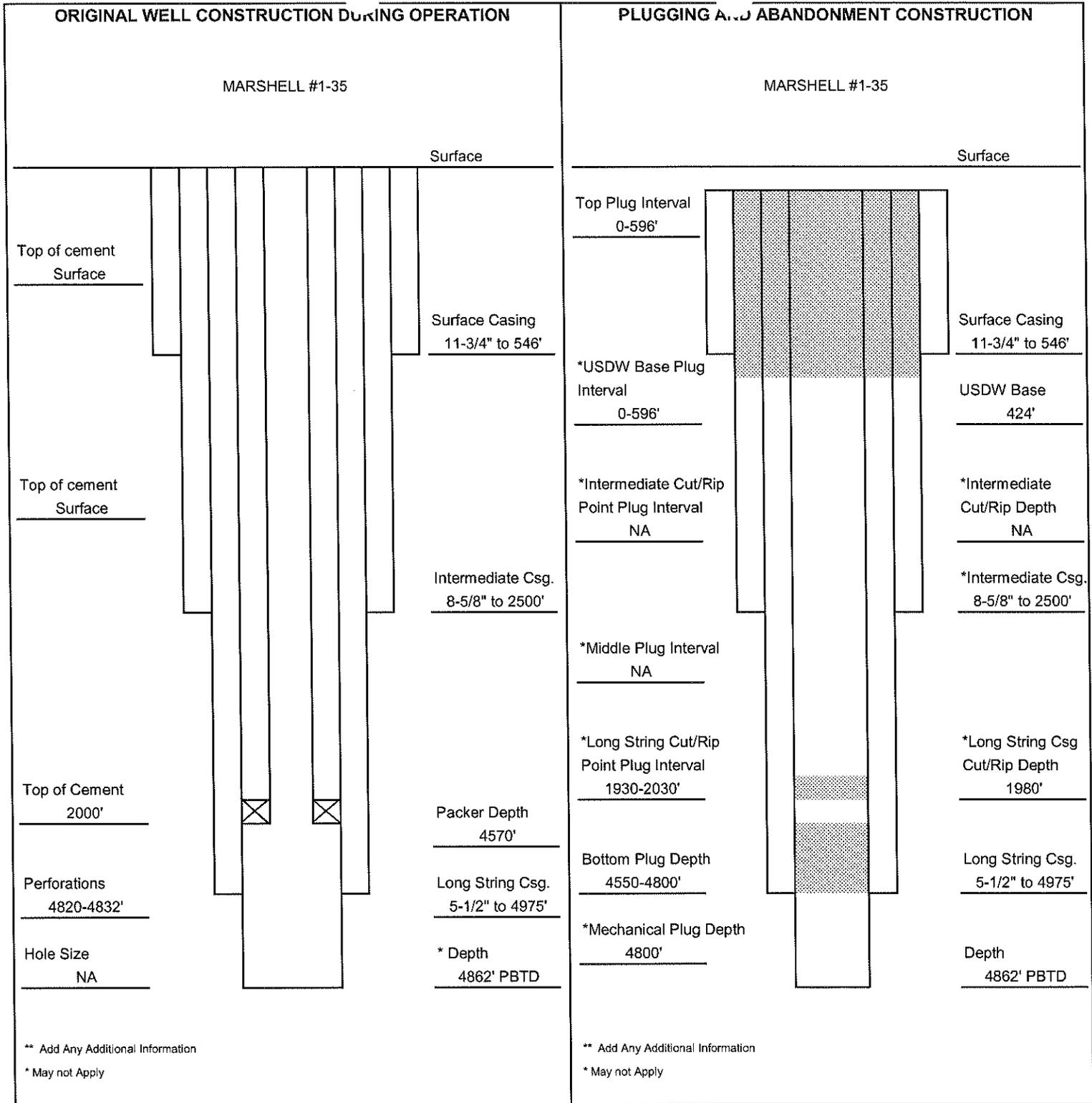
LIST ALL OPEN HOLE AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED (if any)			
From		To	
4820'		4832'	

Estimated Cost to Plug Wells
\$53,000.00

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) Troy E. Molby, P.E. Authorized Agent	Signature 	Date Signed 06/15/2015
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LIST OF ALL OPEN AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED

Specify Open Hole/ Perforations/ Varied Casing	From	To	Formation Name
Perforations	4820'	4832'	Black River

PART III(C)

CORRECTIVE ACTION PLAN

No corrective action is required at this time.