Beeland Group, LLC

PART 625 MINERAL WELL PERMIT APPLICATION

Non-Hazardous Injection Well

Beeland Group, LLC

Alba, Michigan Facility

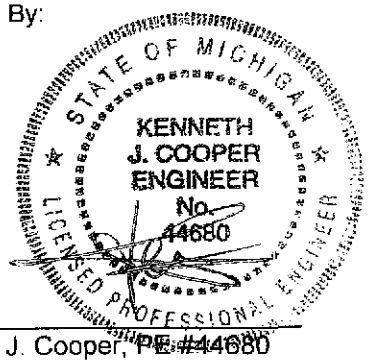
Antrim County

T30N, R5W, Section 14, SE ¼ Section

MDEQ Permit # TBD

January 5, 2007

Prepared By:



Kenneth J. Cooper, P.E. #44680

Petrotek

10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127-4239
303-290-9414
www.petrotek.com

A. Well Identification and Project Description

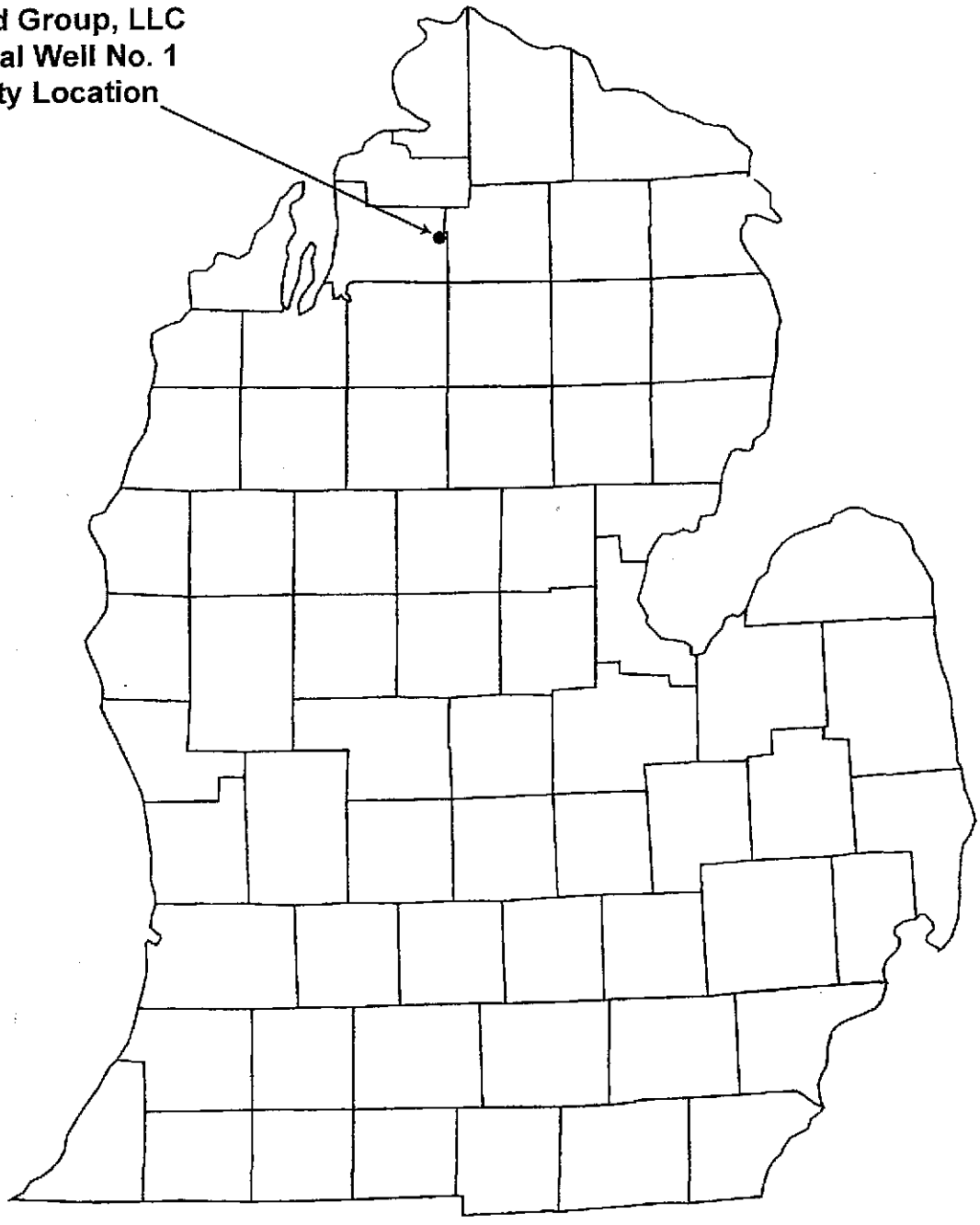
A.1. Describe in detail the purpose of the well and its anticipated life expectancy

Through the submittal of this application, Beeland Group, LLC, requests authorization from the Michigan Department of Environmental Quality (MDEQ) to install and operate a non-hazardous disposal well located at their Alba, Michigan facility pursuant to the applicable MDEQ Mineral Well regulations as specified in the Natural Resources and Environmental Protection Act No. 451, Part 625 (as amended). The well is to be located in Antrim County, Michigan within the limits of Star Township, approximately 495 feet from the south line and 1,320 feet from the east line of the southeast corner of Section 14, T30N, R5W. A map identifying the facility location is included as Figure 1 at the end of this section.

All applicable information, figures and forms as identified by the MDEQ Permit Application Instructions for Disposal, Storage, or Brine Production Wells are included in this document. **Section A** includes all information pertaining to Well Identification and Project Description, including items 1-13 (i.e. purpose of the well through description of the planned coring program). **Section B** includes all additional information required for an application for a permit to drill and operate a disposal well, including items 1-17 (i.e. Form EQP 7200-14 through inquiring if the well is to be a multisource commercial hazardous well). Note that the application is not being sought to drill and operate a storage well or for the production of brine (or conversion of wells for this purpose), and this is also addressed in **Section B.** Figures and forms referenced in each subsection (e.g.Section A.1) are included at the end of that subsection. Also note that the guidance showed two item B.2, both numbered "2", so this document presents 17 elements under Section B, not 16 as numbered in the Guidance (http://www.michigan.gov/deq).

The Beeland Group of Jackson, Michigan intends to operate a single Non-Hazardous Disposal Well in Alba, Michigan for underground injection of fluids from a groundwater remediation project. Fresh water aquifers in the vicinity of this well are to be protected by multiple strings of casing and cement. Injected fluids will be delivered to the Dundee Formation injection interval under gravity feed or positive pressure flow through tubing and a packer. The well is to have one cemented long string protective casing extending into the injection interval. The wellbore is to be an openhole completion within the injection interval. The annulus area between the protective casing and injection tubing string is to be filled with inhibited fresh water. Annulus pressure will be continuously monitored to detect any leaks in the tubing or casing and annulus pressure is to be maintained at levels of more than 100 psi above the tubing pressure.

Beeland Group LLC intends to operate this well for a period of up to 20 years. Project life may be altered based on future information acquired during the operation of the groundwater remediation project.



Petrotek Engineering Corporation	
Figure 1	
Beeland Group, LLC. Alba, Michigan Facility	
SITE LOCATION MAP	
SCALE: NONE	DATE: 01/07

A.2. Notification: At the same time as submitting the permit application, mail via first-class United States mail, a copy of the first page of the permit application and cover letter to the clerk of the township and the surface owner of record of the land on which the well is to be located.

A letter has been prepared and submitted to the Clerk of Star Township conveying a copy of the first page of the permit application. The permit applicant is the owner of the land on which the well is to be located, and therefore no submittal to the landowner is required.

At the end of this Section (A.2), a copy of the Cover Letter is presented, notifying the Clerk of Star Township that an Application for Permit to Drill/Deepen/Convert, and Operate a Well has been submitted for the following address:

10577 Alba Highway,
Alba, Michigan 49611

Beeland Group, LLC

One Energy Plaza Jackson, Michigan 49201

Ms. Marilyn Rypkowski
Star Township Clerk
P.O. Box 947
Alba Michigan 49611

Dear Ms. Rypkowski:

The Beeland Group, LLC has submitted an Application to Drill/Deepen/Convert and Operate a Mineral Well for non-hazardous fluid disposal to the Michigan Department of Environmental Quality. The well will be located at the following address:

10577 Alba Highway
Alba, Michigan 49611

The Beeland Group owns this property and intends to only manage fluids it generates from a groundwater clean-up in the well it drills. As required by Part 625 of Act 451 PA 1994, as amended, attached please find a copy of the first page of the permit application for your records. Please contact me at the following address and telephone number should you have any questions or if we can be of assistance.

Dave Dowan
Beeland Group, LLC
One Energy Plaza
Jackson, Michigan 49201
517-778-9045

Sincerely,

Beeland Group , LLC
David J. Dowan
Commercial Director

cc: Ray Vugrinovich, Michigan Department of Environmental Quality

A.3. Form EQP 7200-1, Application for Permit to Drill, Deepen, Operate, with an original signature from the applicant or the applicant's agent. See instructions on reverse of form.

The Application for Permit to Drill Deepen, or Operate the Beeland Group Disposal Well No. 1 is presented on Form EQP 7200-01. A Completed and Signed Form is attached at the end of this Section (A.3).

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

APPLICATION FOR PERMIT TO: ☒ DRILL ☐ DEEPEN ☐ CONVERT AND OPERATE A WELL

By authority of Part 615 or Part 625 of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

1a. Part 615 Supervisor of Wells
☐ Oil and Gas
☐ Brine Disposal
☐ Hydrocarbon Storage
☐ Injection for Secondary Recovery

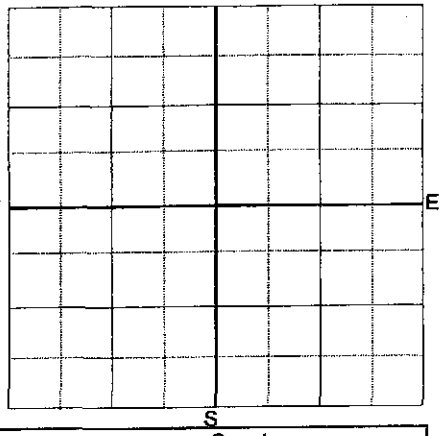
1b. Part 625 Mineral Wells
☒ Waste Disposal
☐ Brine Production
☐ Processed brine disposal
☐ Storage
☐ Test, fee sched. on rev.

1c. Fee enclosed
☒ Yes
☐ No, revision of application
☐ No, leg of horz drainhole

2. List all previous permit numbers: NA

3. Fed. Employer ID. No. or Soc. Security No.: 20-5321543

Locate well and outline drilling unit on section plat



4. Conformance bond ☐ Blanket ☒ Single well

5. ☒ Attached ☐ On file

6. Bond number: Letter of Credit

7. Bond amount: $40,000

8. Applicant (name of permittee as bonded): Beeland Group, LLC

9. Address: facility:10577 Alba Highway, Alba, Michigan 49611
mailing:One Energy Plaza, Jackson, Michigan 49201

Phone: 517 778 9045

I authorize DEQ 4 additional days to process this application. ☒ Yes ☐ No

10. Lease or well name (be as brief as possible): Beeland Disposal Well

Well number: No. 1

11. Surface owner: Beeland Group, LLC

12. Surface location: E 1/4 of SW 1/4 of SE 1/4 of Sec 14 T 30N R 5W — Township: Star — County: Antrim

13. If directional, bottom hole location: 1/4 of 1/4 of 1/4 of Sec T R — Township — County

14. The surface location for this well is 495 feet from nearest (N/S) S section line AND 1320 feet from nearest (E/W) E section line

15. Is this a directional well? ☐ No ☐ Yes If yes, complete line15. The bottom hole location for this well is _____ feet from nearest (N/S) _____ section line AND _____ feet from nearest (E/W) _____ section line

16. The bottom hole location (whether straight or directional) of this well is 495 feet from nearest (N/S) S drilling unit line AND 1320 feet from nearest (E/W) E drilling unit line

17. Kind of tools: ☒ Rotary ☐ Cable ☐ Combination

18. Is sour oil or gas expected? ☒ No ☐ Yes ☐ H_2S Cont. plan enclosed

19. Base of lowest known fresh water aquifer: Formation Glacial Till — Depth App. 850

20. Intended total depth: MD 2450 TVD 2450

21. Formation at total depth: Detroit River/Dundee

22. Producing/injection formation(s): Dundee

23. Objective pool, field, or project: injection into Dundee

24. PROPOSED DRILLING, CASING AND CEMENTING AND SEALING PROGRAM

HOLE			CASING			CEMENT			MUD	
Depth (MD)	Geol. Formation	Bit Dia.	O.D. Size	Wt/Ft Grade Condition	Depth (MD)	Sacks	T.O.C.	W.O.C	Wt.	Vis.
0-174	Alluvium	driven?	13 3/8"	54.5 to 60 lb/ft.driven to	175	n/a				
0-950	Till/Miss./Dev.	12 1/4"	9 5/8"	36 lb/ft K-55 or J-55	950	249	GL	12		
950-2150	Miss-Penn	8 1/2"	7"	23 to 26 lb/ ft K-55 or J-	2150	264	GL	12		
2150-2350	Dundee	6 1/4"	4 1/2 "	11.6 lb/ft J-55 or K-55	2350					
2350-2450	Detroit River	6 1/4"	N/A	rathole	2450					

25. DETAIL CEMENTING PROGRAM. IDENTIFY ALL CEMENT CLASSES, ADDITIVES, AND VOLUMES (IN CU. FT.) FOR EACH CASING STRING.

Surface N/A

Intermediate Class A or equivalent, 323 cubic feet

Production/Injection Class A or equivalent, 312 cubic feet

26. Send correspondence and permit to

Name Dave Dowhan E-mail _____

Address One Energy Plaza Jackson, MI 49201 Phone 517-768-7517

CERTIFICATION "I state that I am authorized by said applicant. This application was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Enclose permit fee of $300 for all Part 615 wells; $2,500 for a Part 625 waste disposal well; or $500 for a brine production, processed brine disposal, or storage well. Make checks payable to State of Michigan.

27. Application prepared by (print or type) Phone

Signature Date

DEQ Cashier use only.

Office of Geological Survey Use Only

Permit number	API number	Date issued	Owner number

EQP 7200-1 (rev. 1/2005) SEE INSTRUCTIONS FOR MAILING ON REVERSE

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

INSTRUCTIONS FOR COMPLETING FORM 7200-1

Line 1a/b PART 615 SUPERVISOR OF WELLS or PART 625 MINERAL WELLS. Identify which statute this well will be permitted under and what type of well it will be.

Line 1c PERMIT FEE. For Part 615, Supervisor of Wells, the permit fee for all drilling and deepening permits is $300. For Part 625, Mineral Wells, different fees apply to different types of wells: The permit fee is $2500.00 for a Waste Disposal well; and $500 for a Brine Production, Processed Brine Disposal or Storage Well. Individual test well (greater than 250' deep) permit fees are $500. Permit fees for blanket test well permits (between 50' and 250' deep) are $75 for 1-24 wells, $150 for 25-49 wells, $300 for 50-74 wells, and $600 for 75-200 wells. No fee is required if you are revising an existing application. Make checks payable to "State of Michigan", bank drafts are not accepted. An application to revise the surface location of an existing permit must be accompanied by the original permit and a new fee. If application is for a leg of a horizontal drainhole, check that box. No new fee is required. See line 14 of form EQC 7200 for further instructions.

Line 2 PRIOR PERMITS. Identify all permit numbers of any wells drilled from the same surface location.

Line 3 FEDERAL IDENTIFICATION NUMBER or a SOCIAL SECURITY NUMBER. Use the federal identification number for a company or social security number if the permittee is an individual.

Lines 4-7 BOND. If the permittee as shown on line 8 is a partnership, all persons named share equal responsibility for the well. The bond submitted must be identical to and include all parties shown on line 8 as the permittee. Separate bonds for individuals in a partnership are not accepted. The bond number (line 6) is the Surety, Certificate of Deposit or Letter of Credit number which identifies that instrument. Refer to R 324.212 for bond amounts (line 7) under Part 615. Under Part 625, bonds for a disposal, storage, or brine wells are $30,000 for a single well or $400,000 for blanket coverage (50 wells maximum). Refer to R299.2332 for bond amounts for Part 625 test wells. For additional information regarding bonding options and amounts contact the Permits and Bonding Unit at (517) 241-1529.

Line 8 APPLICANT. A permittee should be an owner of the well. If you are a new applicant, have changed address, or changed officers, or changed corporate structure, submit form EQP 7200-13, Well Permittee Organization Report.

Line 9 Provide the address and phone number of the permittee, this may be different than the address to mail the permit on Line 26. Check yes if the permittee authorizes the DEQ an additional 4 days to process the permit (per PA 325 of 2004). In some cases this may prevent a permit from being denied if there are corrections or revisions pending to make a permit decision. Otherwise check no.

Line 10 LEASE or WELL NAME AND WELL NUMBER. Wherever possible a single word lease name is preferable. (1) Last names first. Use comma after the last name when a first name is used. (2) Use "&" to join names (e.g. Doe & Hall not Doe-Hall,) (3) Please do not include project names in the name of the well. Generally the first word should be chosen so that it will put the well name where one would expect to find it. (4) If the drilling unit contains State or Federally owned minerals, include "State" and Township name or "USA" in the well name (e.g. State Chester & Smith, or USA & Smith).

Line 11 SURFACE OWNER. Identify the surface owner(s) at the well site.

Line 12 SURFACE LOCATION. Identify the surface location of the well site by describing it in a quarter, quarter, quarter section (10 acre) spot within its township and range. Also identify the county and township name.

Line 13 BOTTOM HOLE LOCATION. Fill in this line only if this is a directionally drilled well. Identify the location of the endpoint of the borehole in the same manner as on line 12.

Line 14. Identify the surface location of the well measured from nearest **section lines** (as identified in line 2, form EQP 7200-2).

Line 15. If the well is directionally drilled, identify the location of the endpoint of the well bottom hole location measured from the from nearest **section lines** (as identified in line 3 form EQP 7200-2).

Line 16. Identify the bottom hole location of the well (same as surface location for straight holes) measured from the nearest **drilling unit lines** or **property lines** for Part 625 wells (as identified in line 4 form EQP 7200-2).

Line 17 KIND OF TOOLS. Identify if the well will be drilled with Rotary, Cable, or Combination tools.

Line 18 SOUR OIL OR GAS. Indicate if the well is located in an area where sour (containing hydrogen sulfide, H_2S) oil and gas is likely to be encountered. If so drilling and operation of the well must follow special requirements. For details consult the Hydrogen Sulfide Management General Provisions, R324.1101-R 324.1129. Indicate if an H_2S contingency plan is enclosed.

Line 19 BASE OF LOWEST KNOWN FRESH WATER AQUIFER. Identify the formation and the depth where the base of the lowest known fresh water aquifer is expected to be encountered.

Line 20 INTENDED TOTAL DEPTH. For straight holes show the total depth of the well as measured depth (MD). For directionally drilled wells identify the measured depth (MD) and true vertical depth (TVD) at total depth.

Line 21 FORMATION AT TOTAL DEPTH. What is the geological formation at total depth of the well?

Line 22 PRODUCING/INJECTING FORMATION. Identify the intended producing formation for oil, gas or brine wells. For injection wells, identify the intended injection interval. For storage wells, identify the storage formation. For test wells, identify the formation to be examined. Identify or discuss further in attachments if more than one target is anticipated

Line 23 OBJECTIVE POOL, FIELD OR PROJECT. If this is an exploratory well, indicate "exploratory". If this is a development well, identify the producing field. If it is an Antrim project well identify the project or Uniform Spacing Plan (USP) name.

Line 24 PROPOSED DRILLING, CASING, CEMENTING AND SEALING PROGRAM. Provide all casing and sealing data applicable to the proposed drilling. If the proposed program of drilling, casing, cementing, and sealing does not conform with those established by rule, or special order, then requests for exceptions must accompany an application for permit. For drilling through gas storage fields, refer to R 324.413 of Part 615. a) Depths: For directionally drilled wells use the measured depth to identify the depth of hole drilled and the depth where casing is set. b) Casing: For non-API grades of casing, provide data identifying rated or tested burst and collapse pressures. c) Cement: Identify the number of sacks of cement for each string of casing. Identify the expected depth of the top of cement behind each casing under T.O.C. Identify the number of hours cement will be left undisturbed before commencing drilling under W.O.C. d) Mud: Indicate weights and viscosities of drilling fluid during each phase of drilling. If drilling muds are not added and the drilling fluid is essentially water, indicate fresh water (FW) or salt water (SW).

Line 25 DETAIL CEMENTING PROGRAM. Identify all cement classes, additives, and volumes (in cu. ft.) for each string of casing to be run. Identify the amount of excess cement (if any).

Line 26 Identify the individual who can serve as a contact for the applicant and the mailing address to send the permit to.

Line 28 At least one copy of form EQP7200-01 must have an original signature of the individual authorized by the applicant to file the application.

Mail application packet to:

PERMITS AND BONDING UNIT
OFFICE OF GEOLOGICAL SURVEY
DEPARTMENT OF ENVIRONMENTAL QUALITY
PO BOX 30256
LANSING MI 48909-7756

See further instructions on EQC 7200 for preparing a complete application or call 517-241-1528

A.4. EQP 7200-2, Survey Record of Well Location signed and sealed by a surveyor licensed in the state of Michigan which identifies:

A. A readily visible stake or marker must be set at the well location. If the well will be directionally drilled also identify the bottom hole location.
B. A flagged route or explanation of how the well location may be reached.
C. Footages of the surface location (and if directionally drilled, the bottom hole location) from the nearest property and section lines.
D. Identification of the existing local zoning designation of the surface location of the well.
E. The surveyor must include an attached plat that shows all of the following information relative to the approximate distances and directions from the stake or marker to special hazards or conditions, including all of the following:

i. Surface waters and other environmentally sensitive areas within 1,320 feet of the proposed well.
ii. Floodplains associated with surface waters within 1,320 feet of the proposed well.
iii. Wetlands, as identified by the provisions of Part 303 of the NREPA, within 1,320 feet of the proposed well.
iv. Natural rivers, as identified by the provisions of Part 305 of the NREPA, within 1,320 feet of the proposed well.
v. Threatened or endangered species, as identified by the provisions of Part 365 of the NREPA, within 1,320 feet of the proposed well.
vi. All buildings, recorded fresh water wells and reasonably identifiable fresh water wells utilized for human consumption, public roads, railroads, pipelines, power lines and other man-made objects that lie within 600 feet of the proposed well location.
vii. All public water supply wells identified as type I and IIa that lie within 2,000 feet of the proposed well location and type IIb and III that lie within 800 feet of the proposed well location, as defined in Act No. 399 of the Public Acts of 1976, as amended, being §325.1001 et seq. of the Michigan Compiled Laws.

Form EPQ 7200-02, singed and sealed by a State of Michigan Surveyor is included at the end of Section A.4. The Survey Plat is included in Attachment A.

This Plat shows all of the required information, as do various diagrams or other data sources, as discussed below.

The survey plat as well as Figure 2 at the end of Section A.4 shows there to be a readily visible stake or marker set at the well location. The well will not be directionally drilled. Further, the plat shows the roadways near and to the facility. The Beeland Group, LLC facility is located east of Alba, Michigan in Antrim County. The facility is to be entered via a dedicated site access road from the north side of the Alba Highway, approximately five miles east of US 131. The site access road will lead to a concrete unloading pad, which will be installed with sufficient curbs and drainage slopes to allow the containment and collection of any possible leakage during transport unloading operations. All traffic entering and exiting the pad will pass an office/shop building on site and through a gate at the highway entrance, which will provide location security. The well will be located 495 feet north of the south section line and 1320 feet west of the east section, SE SW SE of Section 14, T30N R5W. The area is currently unzoned, but is used for agricultural and residential purposes. No local zoning requirements apply to the property.

i. Surface Waters and other environmentally sensitive areas within 1,320 feet of the proposed well.

Topographic data are provided on Figures 3 and 4 at the end of Section A.4. No surface water features were identified on these maps. Additionally, aerial photographs verify that the proposed well location, in the center of the open field, is not near visible surface waters or other environmentally sensitive areas [Figure 5, end of Section A.4]. Field verification of this information is included in the Survey (Form EPQ 7200-02 and Attachment A), which shows that there are no surface waters or environmentally sensitive areas within 1,320 feet of the proposed location.

ii. Floodplains associated with surface waters within 1,320 feet of the proposed wells.

As discussed under item "i" above, there are no visible surface water features within the required radius. FEMA maps verify that there are not identifiable floodplains within 1,320 feet of the proposed well. Field verification through survey activities (Attachment A) show no surface water features within 1,320 feet of the proposed location.

iii. Wetlands, as identified by the provisions of Part 303 of the NREPA, within 1,320 feet of the proposed well.

The aerial photograph and available topographic maps show no indication of wetlands within the specified radius, as verified through field analysis. Therefore,

no wetlands were identified in accordance with Part 303 within the specified radius of 1320 feet around the proposed well location.

iv. Natural rivers, as identified by the provisions of Part 305 of the NREPA, within 1,320 feet of the proposed well.

The aerial photograph shows no indication of natural rivers within the specified radius. Therefore, no natural surface waters were identified within the specified radius of 1,320 feet.

v. Threatened or endangered species, as identified by the provisions of Part 365 of the NREPA, within 1,320 feet of the proposed well.

Part 365 and related documentation indicate that the Bald Eagle (threatened), Eastern Massasauga rattlesnake (candidate), and Pitcher's thistle (threatened) may be present in Antrim County. Field verification by the property owner has not identified the presence of these within the specified radius of 1,320 feet.

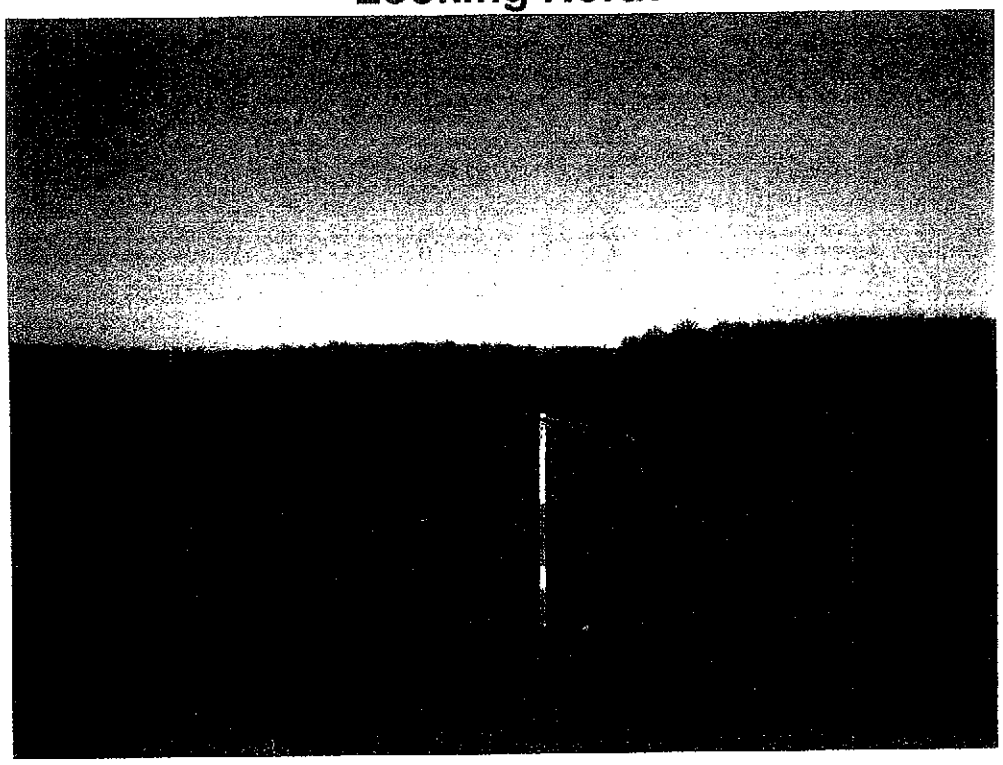
vi. All buildings, recorded fresh water wells, wells and reasonably identifiable fresh water wells utilized for human consumption, public roads, railroads, pipelines, power lines and other man-made objects that lie within 600 feet of the proposed well.

Available information indicates that there may be a single fresh water well (No. 99-524) within the specified 600 feet radius. Available data show there to be two structures and two roads (one public, one private) within the radius, but no railroads as verified by survey. Location maps showing the general location of groundwater wells are provided in Figures 4 and 6, at the end of Section A.4.

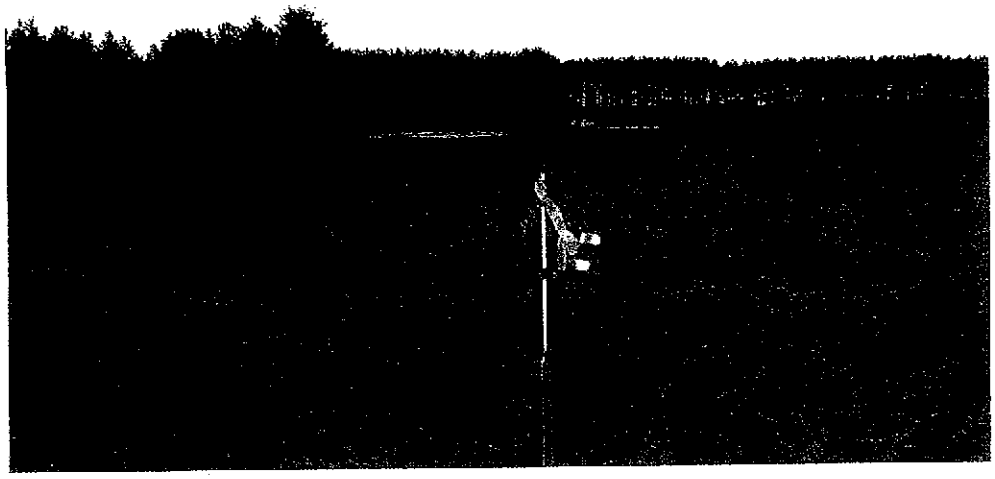
vii. All public water supply wells identified as Type I and IIa that lie within 2,000 feet of the proposed well location and Type IIb and III that lie within 800 feet of the proposed well location, as defined in Act No. 399 of the Public Acts of 1976, as amended, being part 325.1001 et. Seq., of the Michigan Compiled Laws.

Based on available data, no public water supply wells of any type have been identified within 2,000 feet of the proposed well location.

Looking North



Looking West

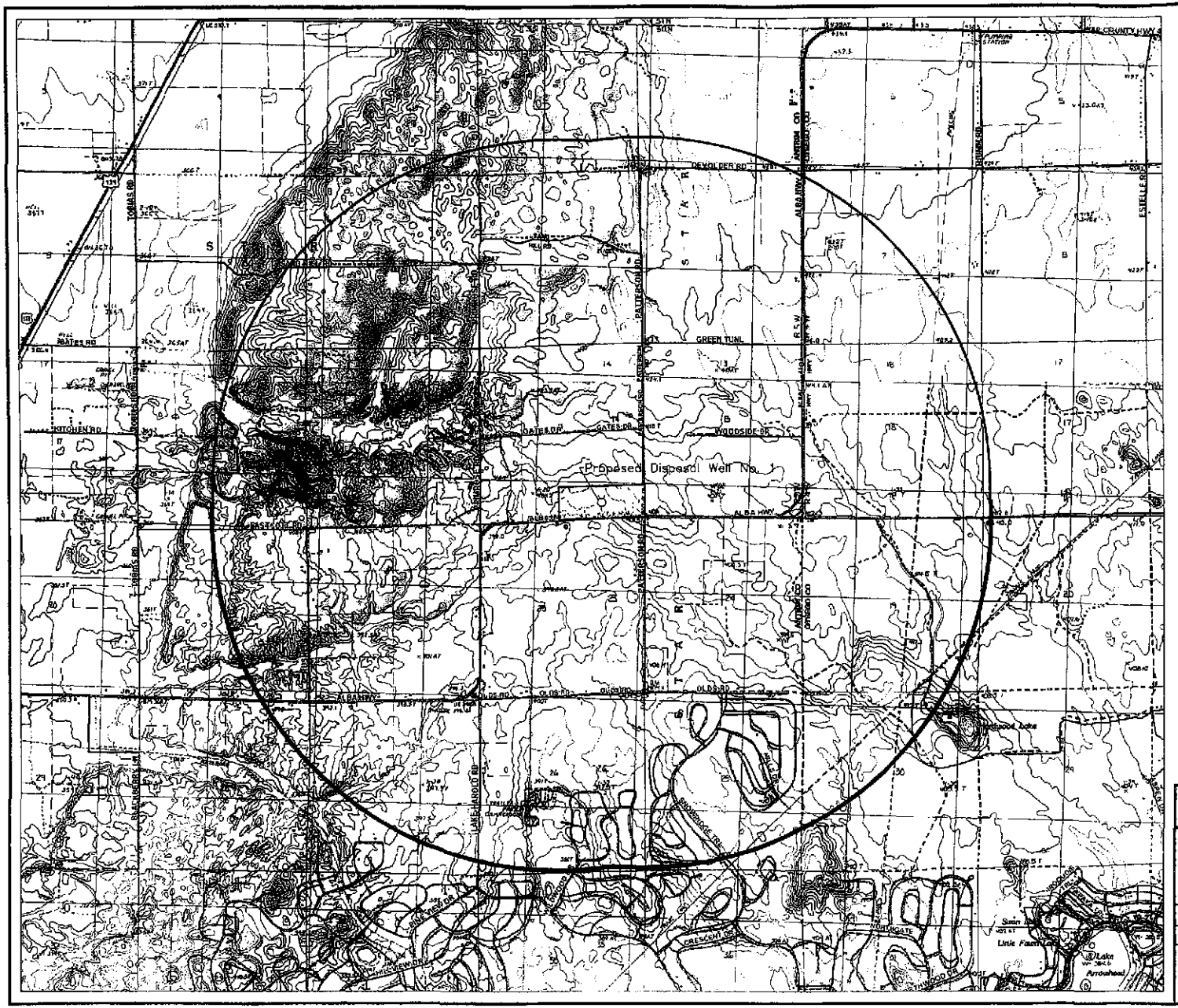


BEELAND GROUP, LLC
ALBA, MICHIGAN FACILITY

FIGURE 2
PHOTOGRAPH OF PROPOSED WELL LOCATION

PROJECT: 309-1	DATE: JANUARY 2007	
MDEQ Fig 2.dwg	BY: KS	CHECKED: KC

Petrotek
10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127
303-290-9414
www.petrotek.com



N

W — E

LEGEND

- Proposed Disposal Well No. 1
- 2-Mile Area of Review
- Site Property Boundary

0 0.25 0.5 1.0

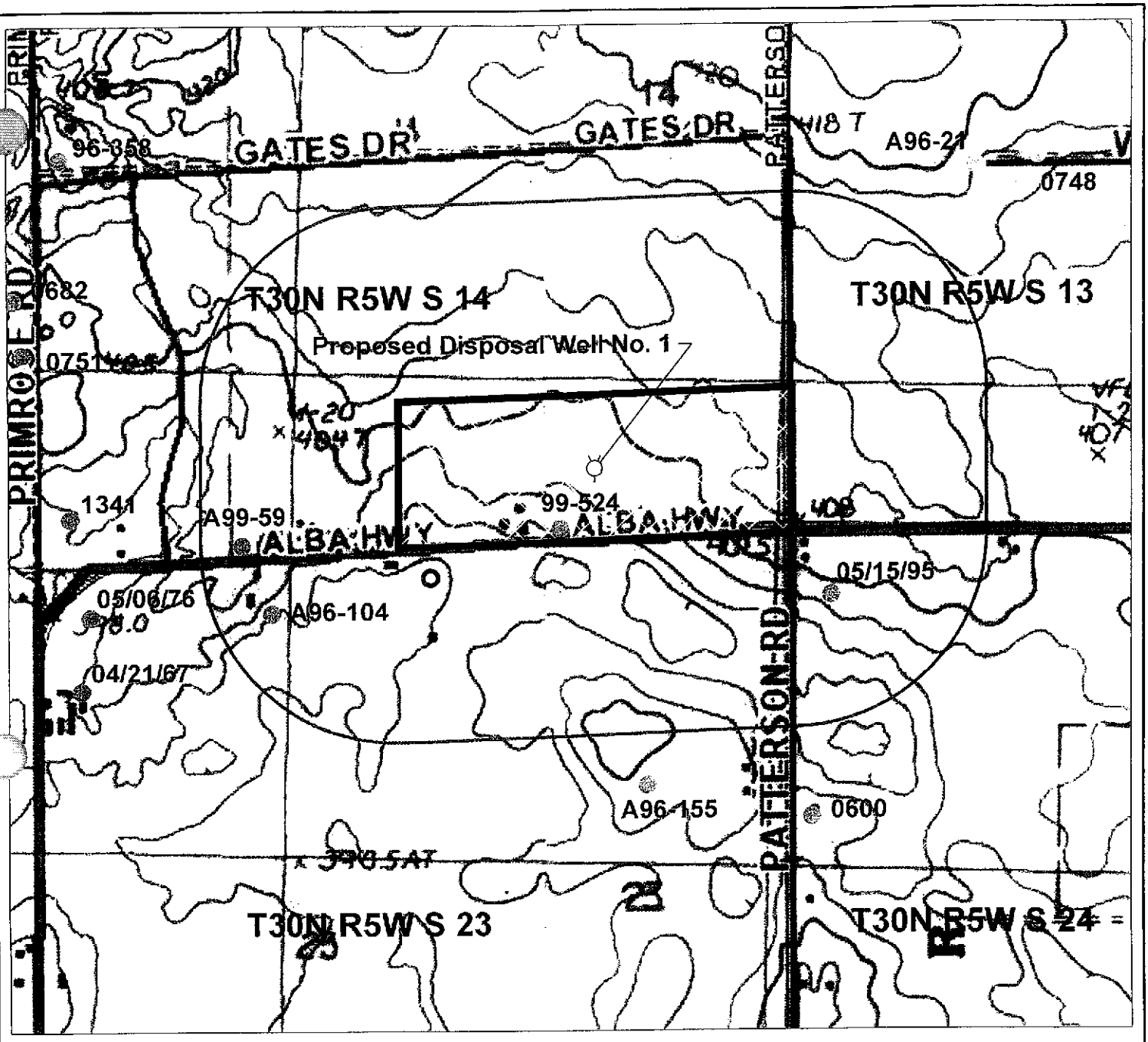
Scale in Miles

BEELAND GROUP, LLC
ALBA, MICHIGAN FACILITY

FIGURE 3
TOPOGRAPHIC MAP SHOWING PROPOSED WELL LOCATION AND AREA OF REVIEW

PROJECT: 309-1	DATE: JANUARY 2007	
Beeland No.1.dwg	BY: KS	CHECKED: KC

Petrotek
10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127
303-290-9414
www.petrotek.com



LEGEND

- Site Property Boundary
- Proposed Disposal Well No. 1
- 0.25–Mile Area of Review
- Water Well Location
- Water Well Location identified during Gates 1–23 Class II Permit Application. Well has not been field verified, and did not exist in http://wellviewer.rsgis.msu.edu database.

N
W — E

0 500 1000 2000
SCALE IN FEET

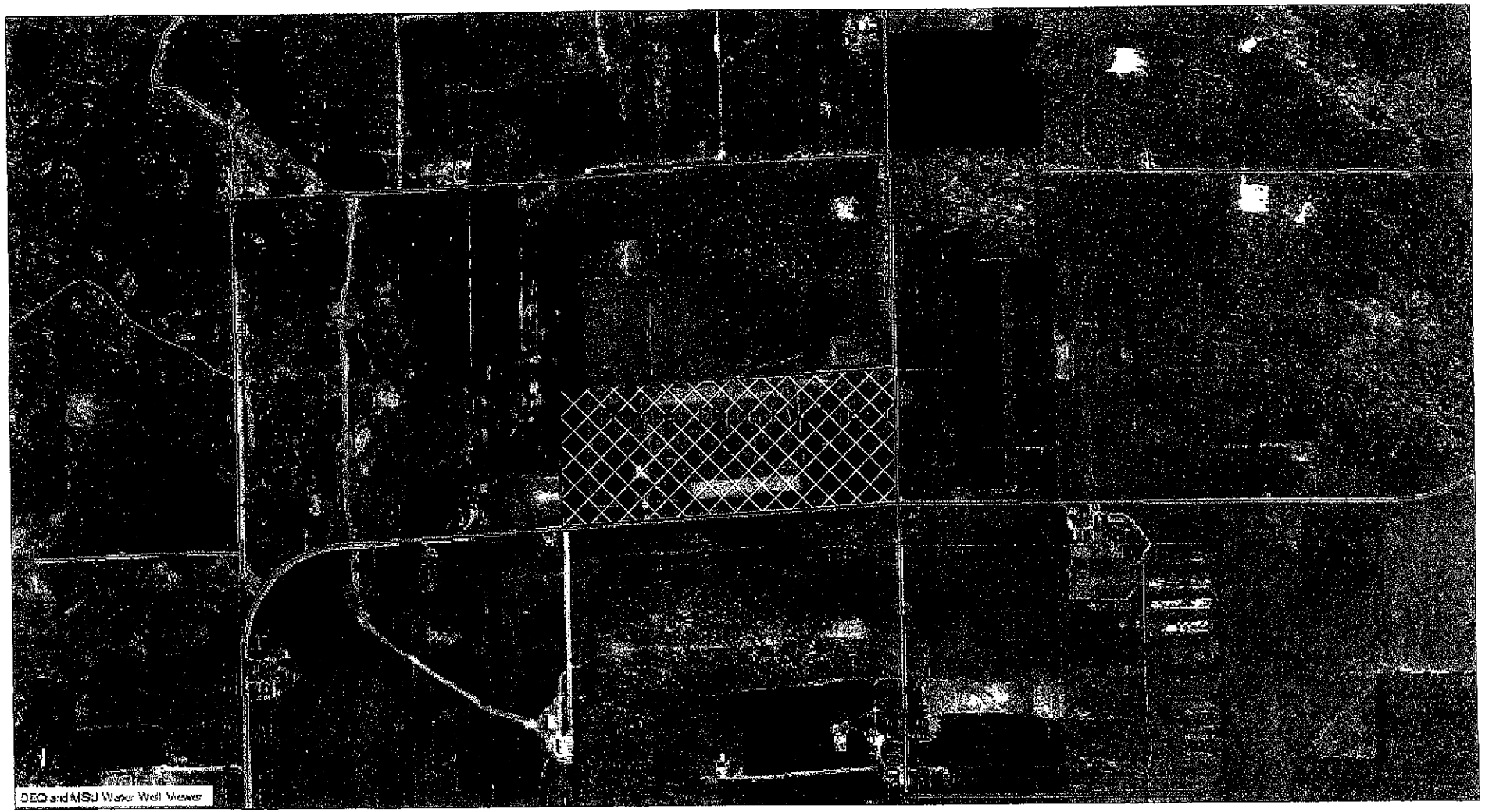
Water well data source: http://wellviewer.rsgis.msu.edu/ http://www.deq.state.mi.us

BEELAND GROUP, LLC
ALBA, MICHIGAN FACILITY

FIGURE 4
FRESH WATER PENETRATION
WELL LOCATION MAP

PROJECT: 309–1	DATE: JANUARY 2007
Beeland No.1.dwg	BY: KS CHECKED: KC

Petrotek
10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127
303-290-9414
www.petrotek.com



LEGEND

- Proposed Disposal Well No. 1
- Site Property Boundary

0 500 1000 2000

SCALE IN FEET

N

W — E

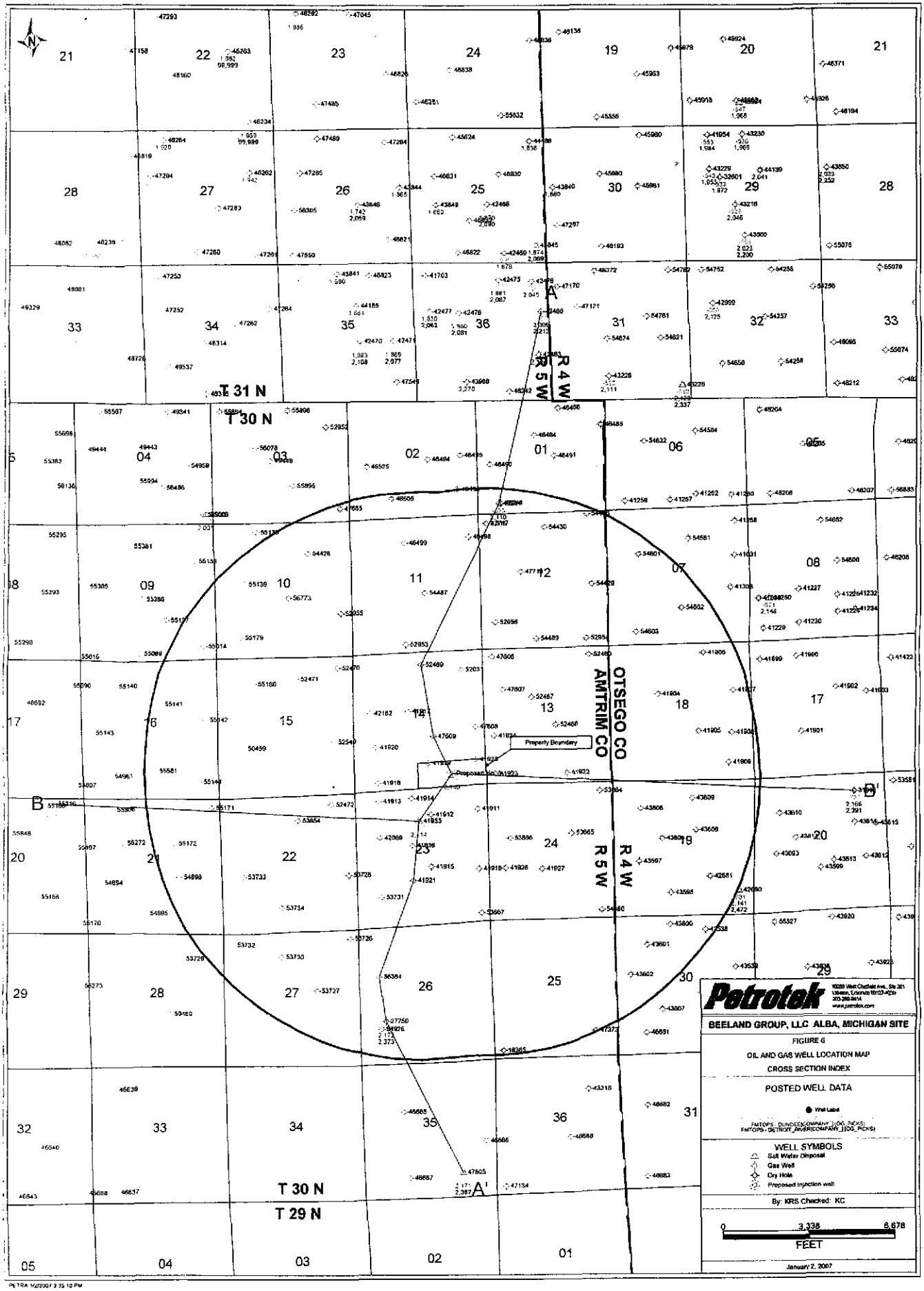
Source: *DEQ and MSU Water Well Server*

BEELAND GROUP, LLC
ALBA, MICHIGAN FACILITY

FIGURE 5
AERIAL PHOTOGRAPH OF BEELAND FACILITY

PROJECT: 309-1	DATE: JANUARY 2007	
Beeland No.1.dwg	BY: KS	CHECKED: KC

Petrotek
10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127
303-290-9414
www.petrotek.com



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DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

SURVEY RECORD OF WELL LOCATION

This information is required by authority of Part 615 Supervisor of Wells, or Part 625 Mineral Wells, of Act 451 PA 1994, as amended, in order to obtain a drilling permit.

Applicant: Beeland Group, LLC.

Well name and number: Beeland Group Disposal Well No.1

1a. Surface location: SE 1/4 of SW 1/4 of SE 1/4 of section 14 T 30N R 5W — Township: Star — County: Antrim

1b. If this is a directional well, bottom hole location will be ____ 1/4 of ____ 1/4 of ____ 1/4 of section ____ T ____ R ____ — Township ____ — County ____

Instructions: Outline drilling unit for oil/gas wells (Part 615) or property boundary for mineral wells (Part 625) and spot well location on plat shown. Locate the well in two directions from the **nearest** section, quarter section, and unit (or property, Part 625) lines.

2. **The surface location is**

495 ft. from nearest (N/S) S section line

1320 ft. from nearest (E/W) E section line

and

____ ft. from nearest (N/S) ____ quarter section line

____ ft. from nearest (E/W) ____ quarter section line

3. **Bottom hole will be (if directional)**

____ ft. from nearest (N/S) ____ section line

____ ft. from nearest (E/W) ____ section line

and

____ ft. from nearest (N/S) ____ quarter section line

____ ft. from nearest (E/W) ____ quarter section line

4. **Bottom hole will be (directional or straight)**

495 ft. from nearest (N/S) S drilling unit line

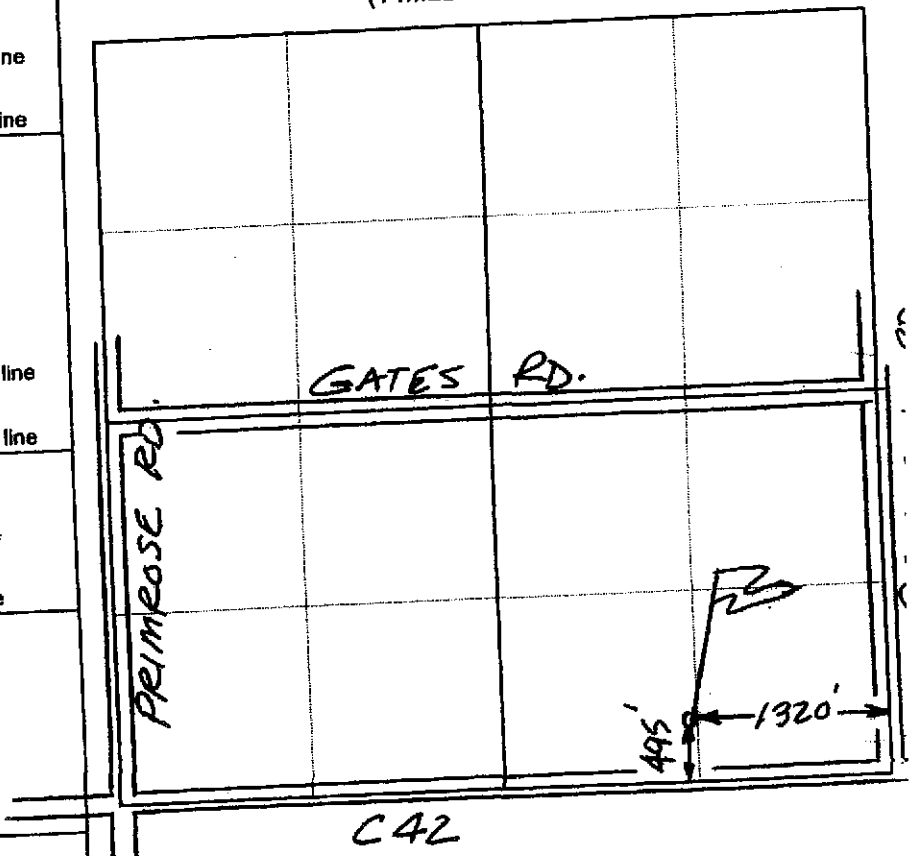
1320 ft. from nearest (E/W) E drilling unit line

5. Show access to stake on plat and describe if it is not readily accessible.

SECTION 14

PLAT BELOW REPRESENTS ONE FULL SECTION (1 MILE SQUARE)

N ↑



6. Zoning ☐ Residential, effective date ____ Initial date of residential zoning ____ ☒ Other Agricultural

ON SEPARATE PLAT OR PLOT PLAN, LOCATE, IDENTIFY AND SHOW DISTANCES TO:

A. All roads, power lines, buildings, residences, fresh water wells, and other man-made features, within 600 feet of the stake.

B. All lakes, streams, wetlands, drainage-ways, floodplains, environmentally sensitive areas, natural rivers, critical dune areas, and threatened or endangered species within 1320 feet of the stake.

C. All type I and IIa public water supply wells within 2000 feet and all type IIb and III public water supply wells within 800 feet of the well stake.

Name of individual who surveyed site: Gerald Lira — Company: Inland Seas Engineering — Date of survey: 12-19-2006

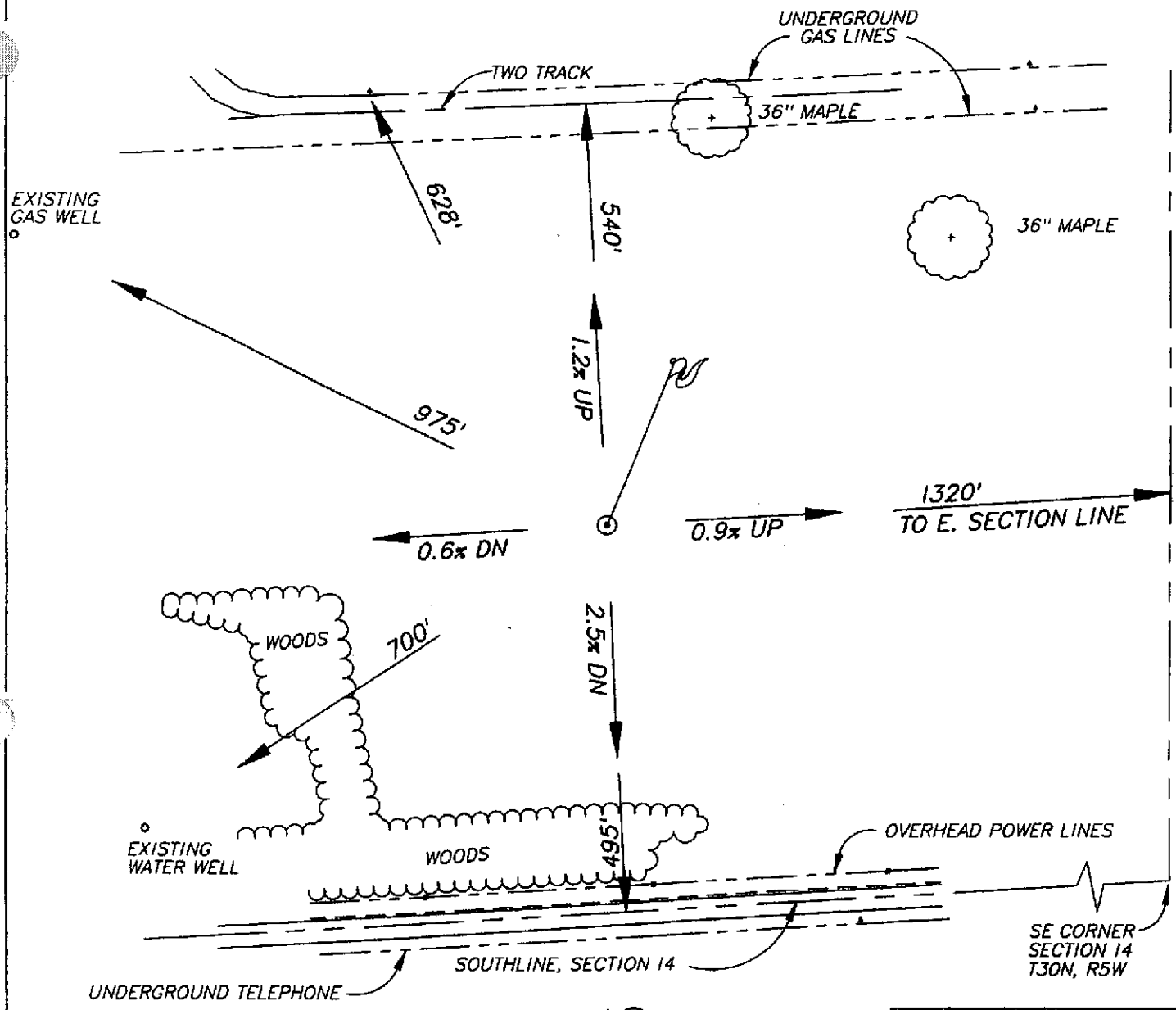
Address: PO Box 6820 / Traverse City / MI / 49696-6820 — Phone: (231) 933-4041

I CERTIFY THE ABOVE INFORMATION IS COMPLETE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Signature of licensed surveyor (affix seal): Stephen K. Smith — Date: 1-4-07

STATE OF MICHIGAN STEPHEN K. SMITH PROFESSIONAL SURVEYOR No. 36000 REGISTERED PROFESSIONAL SURVEYOR

EQP 7200-2 (rev. 01/2005) ENCLOSE WITH APPLICATION TO DRILL OR DEEPEN



Co.Rd. C-42

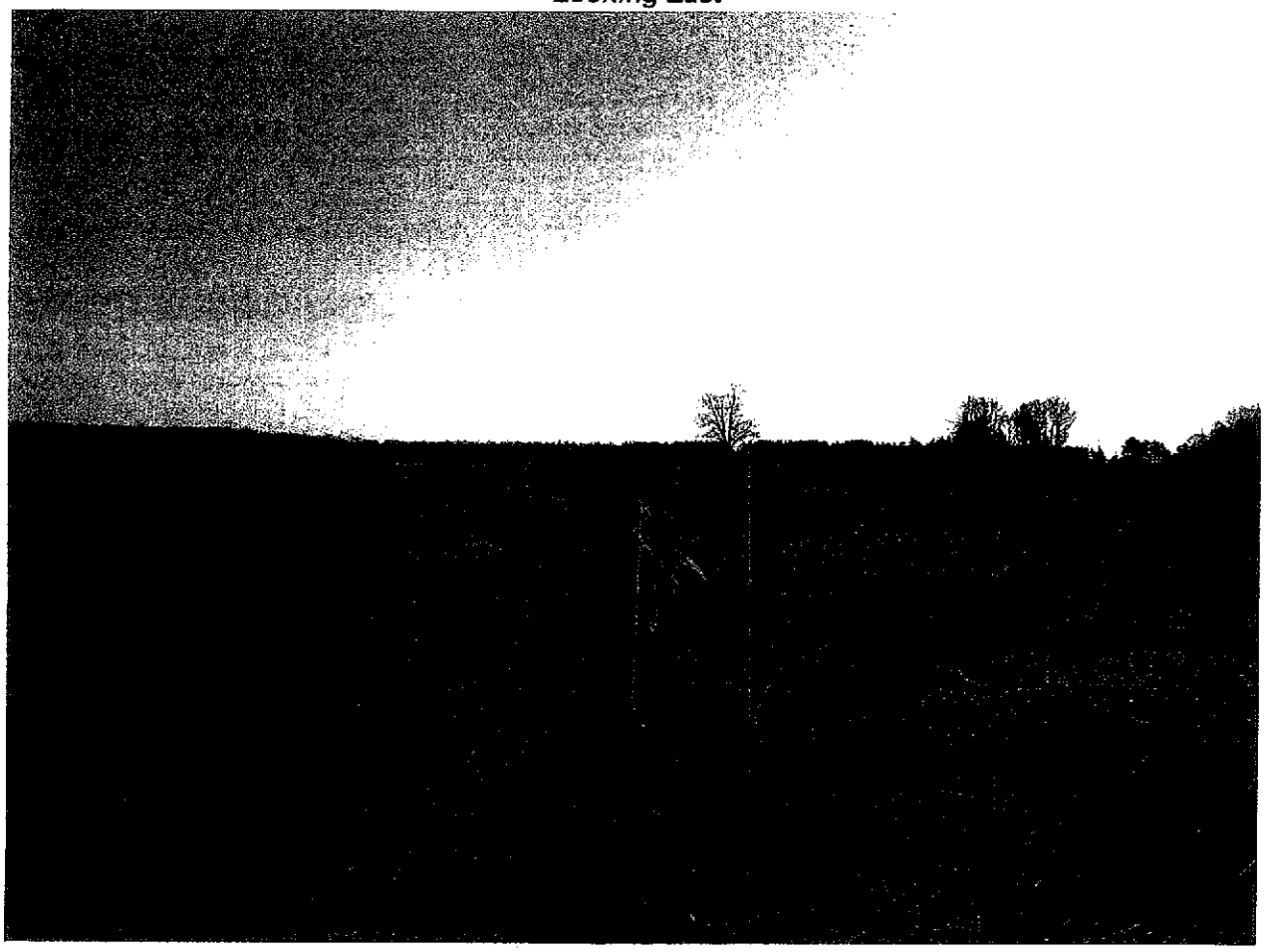
PROPOSED WELL: BEELAND DISPOSAL WELL NO. 1
LOCATION: 495' FROM THE SOUTH LINE AND 1320' FROM THE EAST LINE OF THE SE 1/4 OF SECTION 14, T30N, R5W, STAR TOWNSHIP, ANTRIM COUNTY, MICHIGAN

INLAND SEAS ENGINEERING, INC.
Traverse City, MI
231-933-4041
Flushing, MI
810-487-0555

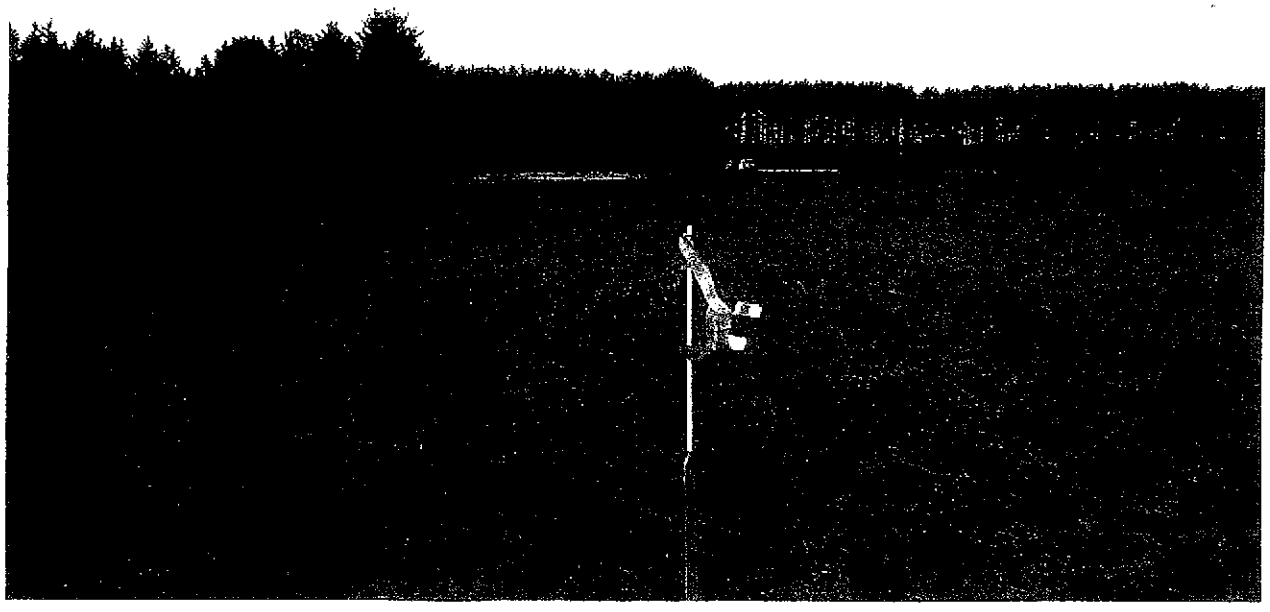
PLOT PLAN

SCALE : 1"= 200'	DRAWN BY : RJM
DATE : 1-2-07	CHECKED BY : SKS
PROJECT # : 0520004	1 OF 1
DRAWING : WELL	

Looking East



Looking West



Looking North

Looking South

A.5. Form EQP 7200-4, Wellhead Blowout Control System.

The blowout control system for the proposed well is presented in form EQP-7200-4, presented at the end of this Section (A.5). It is noted that no positive pressures are expected during the installation of this shallow (<2500') injection well.

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

WELLHEAD BLOWOUT CONTROL SYSTEM

Worksheet supplement for "Application for Permit to Drill or Deepen a Well

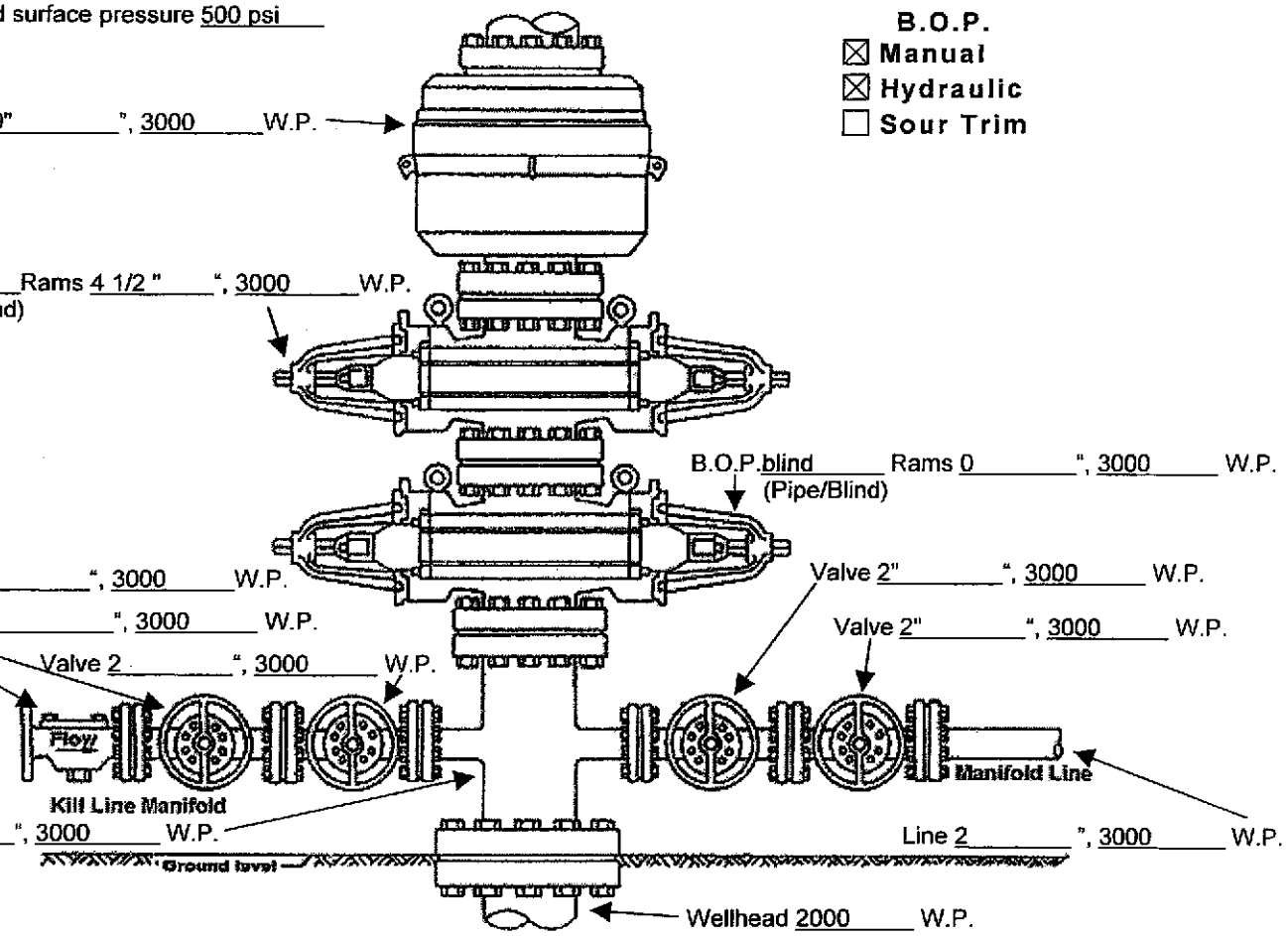
This information is required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, Act 451 PA 1994, as amended, in order to obtain a permit.

Applicant
Beeland Group, LLC
One Energy Plaza
Jackson, Michigan 49201

Well name and number
Beeland Disposal Well No. 1

Max. anticipated surface pressure 500 psi

B.O.P.
☒ **Manual**
☒ **Hydraulic**
☐ **Sour Trim**



Fill above blanks with applicable information. If not applicable, enter "N.A." or cross-out item shown.
Describe test pressures and procedure for conducting pressure test. Identify any exceptions to R324.406 being requested.

Standard pressure testing and verification of operation to be conducted prior to drilling below 250' BGL.

No exceptions to R324.406 requested at this time.

A.6. Form EQP 7500-3, Environmental Impact Assessment for Mineral Wells Surface Facilities

The Environmental Impact Assessment of Mineral Wells Surface Feature is presented in/on Form EQP 7500-3, presented at the end of this Section (A.6).

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

ENVIRONMENTAL IMPACT ASSESSMENT FOR MINERAL WELLS AND SURFACE FACILITIES

To be submitted with an application for a well permit pursuant to Part 625, 1994 PA 451, as amended (The Act) or prior to construction of associated surface facilities located more than 300 feet from the proposed well.

Check all boxes and fill in all blanks that apply to the proposed well(s) or proposed surface facility.

Submit a *Soil Erosion and Sedimentation Control Plan* (EQP 7200-18) for each drill site, surface facility and flowline identified in the EIA.

This EIA is for (check one)

- ☐ Well only. Complete Parts A, B, D, E, and F
- ☐ Surface facility only (to be constructed more than 300 feet from the well). Complete Parts A1, A2, C, D, E, and F
- ☒ Well and surface facility. Complete all Parts.

A. PROJECT DESCRIPTION

1. Applicant

Beeland Group, LLC One Energy Plaza, Jackson Michigan 49201

2. Well name and number

Beeland Disposal Well No. 1

3. Well type

- ☐ Artificial brine production well
- ☐ Natural brine production well
- ☐ Test well greater than 250' deep or penetrating below deepest freshwater aquifer
- ☐ Blanket test well(s) Number of proposed wells ___ Anticipated maximum depth _____
- ☐ Processed brine disposal well
- ☒ Single-source, non-commercial, waste disposal well
- ☐ Multi-source commercial non-hazardous waste disposal well
- ☐ Multi-source commercial hazardous waste disposal well
- ☐ Storage well

4. ☐ Yes ☒ No Is this well a replacement for an existing well?

If Yes, list

- Existing well name and number
- Current owner
- Existing well type and status
- Existing well location
- Reason for replacement
- Disposition of existing well

5. ☐ Yes ☒ No Is this well a reentry of an existing well?

If Yes, list

- Existing well name and number
- Current owner
- Existing well type and status

Reason for reentry

6. ☐ Yes ☒ No Is the well expected to encounter hydrogen sulfide (H_2S)?

If Yes, list formations expected to contain H_2S and anticipated depths to tops of formations

N/A

7. ☒ Yes ☐ No Is the well expected to encounter oil or gas?

If Yes, list formations expected to contain oil or gas and anticipated depths to tops of formations

Antrim and Traverse Limestone may possibly contain gas in the vicinity; target injection zone is below these intervals. Anticipated top of Antrim: 1200 ft BGL; Anticipated base Antrim: approx. 1350 ft BGL; Anticipated top Traverse Limestone: approx. 1400 ft BGL; Anticipated base Traverse Limestone: approx. 2050 ft BGL.

8. ☐ Yes ☒ No **Will the well be drilled from an existing drill pad?**
If Yes, list well name, number, permit number and status of all existing wells on the drill pad (if no wells, write "none")
N/A

See Attachment A for Plot Plan

Show proposed well and all existing wells on accompanying scale map identified as applying to Part A1 of the EIA.

B. DRILLSITE

1. **Drill site access route dimensions** 25 feet x app 600 feet.
Provide a detailed description of topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use for the drill site access route. Show route on accompanying scale map labeled **Part B1**. The drill site occurs in an area of relative flat topography, with no surface drainages. Soil types encountered will be the Kalskaska-Karlin Comples with less than 6% slopes. Soils are described as having a high infiltration rate (low run-off potential). Current land cover is grassland, and the present land use is agricultural.

2. **Drill site dimensions** 200 feet x 200 feet.
Provide a detailed description of topography, drainage, soil types(s), direction and percentage of slopes, land cover and present land use for the drill site. Show well site on accompanying scale map labeled **Part B2** The Survey Plat (Attachment A) serves as the Part B2 map (Attachment A is included in the MDEQ Application). Also see Section D of this form EQP 7500-3.

NOTE: If any "Yes" box in items B3, B4, B5, B6, B7 or B8 is checked, the corresponding feature(s) must be identified on an accompanying scale map identified as applying to Part B of the EIA.

3. ☐ Yes ☒ No **Are drain tiles present on the drill site?**
If Yes, how they will be handled if they are encountered?
N/A

4. **Are any of the following located within 600 feet of the proposed wellhead?**
☒ Yes ☐ No Buildings
☒ Yes ☐ No Domestic fresh water wells
☒ Yes ☐ No Public roads
☐ Yes ☒ No Railroads
☒ Yes ☐ No Power lines
☐ Yes ☒ No Pipelines
☐ Yes ☒ No Other man-made features (list individual features)
See Attachment A of the MDEQ Application, Survey Record of Well Location form.

5. **Are any of the following located within 800 feet of the proposed wellhead?**
☐ Yes ☒ No Type IIB public water wells Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year.
☐ Yes ☒ No Type III public water wells Type III is a public water supply which is neither Type I nor type II.

6. **Are any of the following located within 1320 feet of the proposed wellhead?**
☐ Yes ☒ No Surface waters and other environmentally sensitive areas
☐ Yes ☒ No Floodplains associated with surface waters
☐ Yes ☒ No Wetlands, as identified by sections 30301 to 30323 of the Act.
☐ Yes ☒ No Natural rivers, as identified by sections 30501 to 30515 of the Act
☐ Yes ☒ No Threatened or endangered species as identified by sections 36501 to 36507 of the Act

7. **Are any of the following located within 2000 feet of the proposed wellhead?**
☐ Yes ☒ No Type I public water wells
Type I is a community water supply with year-round service, ≥ 15 living units or ≥ 25 residents.
☐ Yes ☒ No Type IIA public water wells Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year.

8. ☐ **Yes** ☒ **No** **Are Great Lakes shorelines located within 1500 feet of the proposed wellhead?**

9. ☒ **Yes** ☐ **No** **Will fresh water be used to drill this well?**
If Yes, will the water be supplied from
☐ A "permanent" water well, to be retained after final completion OR used for drinking water (to be drilled and installed pursuant to Part 127 of 1979 PA 368, as amended) **OR**
☐ A "temporary" water well, to be plugged upon final completion and not used for drinking water **OR**
☒ Another source (identify) offsite oilfield contractor supplier, as required
If No, identify the drilling fluid to be used.

10. **Drilling fluid pit location and handling and disposal of drill cuttings, muds and fluids**
Anticipated depth to groundwater <200 ft Depth determined by local well logs
Pit type
☐ On site in-ground pit. Anticipated dimensions: L ___ W ___ D ___
Show proposed pit location on accompanying scale map labeled **Part B10**.

☐ Remote in-ground pit. Anticipated dimensions: L ___ W ___ D ___
Attach approval of landowner and show remote pit location on accompanying scale map labeled **Part B10**.
☒ On-site steel tanks with no in-ground pits (complete 10a and 10d below, do not complete 10b and 10c)

a. ☐ **Yes** ☒ **No** **Will the well be drilled into or through bedded salt deposits?**
If Yes,
☐ Yes ☒ No Will the drill cuttings contain solid salt?
If Yes, describe plans for handling and disposing of drill cuttings.
N/A

b. ☐ **Yes** ☐ **No** **Will the drilling fluid pit contents be solidified after drilling?**
If Yes, identify the pit solidification contractor and pit solidification method.
Not completed as per Item 10, above.

c. ☐ **Yes** ☐ **No** **Will the drilling fluid pit contents be removed after drilling?**
If Yes, identify the site for disposal of the removed material.
Not completed as per Item 10, above.

d. ☒ **Yes** ☐ **No** **Will any pit fluid be disposed by a licensed liquid waste hauler?**
If Yes, identify the waste hauler.
Northern A-1 or other suitable equivalent

If No, describe disposal plans for pit fluids.
N/A

C. SURFACE FACILITY

1. ☒ Yes ☐ No **Will the well have associated surface facilities?**
   If No, Do not complete the remainder of Part C.
   If Yes,
   ☐ Yes ☒ No **Does a surface facility currently exist?**
   If Yes, show facility location relative to the wellhead on a scale map labeled Part C1. Do not complete the remainder of Part C.
   If No,
   ☒ Yes ☐ No **Has a location for the surface facility *been chosen*?**
   If Yes, complete Parts C2 through C10
   If No, at least 60 days prior to beginning construction, submit an EIA for the Surface Facility (this form), a facility plan, and a Soil Erosion and Sedimentation Control Plan (EQP 7200-18) to the Office of Geological Survey District Supervisor.

2. ☐ Yes ☒ No **Is the proposed surface facility site more than 300 feet from the wellhead?**
   If Yes, complete Parts C3 through c10 and submit a map showing the location of the surface facility site relative to the wellhead.
   If No, do not complete the remainder of Part C.

3. **Dimensions of surface facility access road:** 20 feet x <600 feet.
   Describe the topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use:
   Topography is generally flat, with no visible drainage. Kalkaska-Karlin soil complex 0-6% slope is present comprised of well/excessively drained soils in upland plains. Surface layer consists of sand/loan with a 26-27 inch subsoil; rapid to moderately rapid permeability. Present land use is woodlands and crop/agricultural areas.

4. **Dimensions of surface facility site:** <200 feet x <200 feet.
   Describe the topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use:
   Topography is generally flat, with no visible drainage. Kalkaska-Karlin soil complex 0-6% slope is present comprised of well/excessively drained soils in upland plains. Surface layer consists of sand/loan with a 26-27 inch subsoil; rapid to moderately rapid permeability. Presen land use is woodlands and crop/agricultural areas

NOTE: If any "Yes" box in items C5, C6, C7, C8, C9, or C10 is checked, the corresponding feature(s) must be identified on an accompanying scale map identified as applying to the appropriate section of Part C of the EIA.

☐ Yes ☒ No **Are drain tiles present on the proposed surface facility site**?
If Yes, discuss how they will be handled if they are encountered?
N/A

6. **Are any of the following located within 600 feet of the proposed surface facility site?**
   ☒ Yes ☐ No Buildings
   ☒ Yes ☐ No Domestic fresh water wells
   ☒ Yes ☐ No Public roads
   ☐ Yes ☒ No Railroads
   ☐ Yes ☒ No Power lines
   ☐ Yes ☒ No Pipelines
   ☐ Yes ☒ No Other man-made features (list individual features)

Are any of the following located within 800 feet of the proposed surface facility site?
☐ Yes ☒ No Type IIB public water wells. Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year.
☐ Yes ☒ No Type III public water wells. Type III is a public water supply which is neither Type I nor type II.

8. **Are any of the following located within 1320 feet of the proposed surface facility site?**

☐ Yes	☒ No	Surface waters and other environmentally sensitive areas
☐ Yes	☒ No	Floodplains associated with surface waters
☐ Yes	☒ No	Wetlands, as identified by sections 30301 to 30323 of the Act.
☐ Yes	☒ No	Natural rivers, as identified by sections 30501 to 30515 of the Act
☐ Yes	☒ No	Threatened or endangered species as identified by sections 36501 to 36507 of the Act

9. **Are any of the following located within 2000 feet of the proposed surface facility site?**

☐ **Yes**	☒ **No**	Type I public water wells. Type I is a community water supply with year-round service, ≥ 15 living units or ≥ 25 residents.
☐ **Yes**	☒ **No**	Type IIA public water wells Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year.

10. ☐ **Yes** ☒ **No** **Are Great Lakes shorelines located within 1500 feet of the proposed surface facility site?**

D. FLOWLINE

☒ **Yes** ☐ **No** **Will the well have an associated flow line?**

If Yes,

Flow line rout dimensions app.200 feet x app.200

Show flow line route from well to the surface facility, junction with an existing flowline or gathering system, on a scale map labeled **Part C2.**

Anticipated maximum operating pressure (psig): 150

Describe leak detection program, including schedules of periodic pressure testing and periodic flowline patrols.

Flowlines will be visually inspected, once per week.

Flow line material: carbon steel

Describe the topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use along the flow line route. Topography is generally flat, with no visible drainage. Kalkaska-Karlin soil complex 0-6% slope is present comprised of well/excessively drained soils in upland plains. Surface layer consists of sand/loan with a 26-27 inch subsoil; rapid to moderately rapid permeability. Present land use is woodlands and crop/agricultural areas.

☒ **Yes** ☐ **No** **Will the flowline be buried?**

If Yes

Burial depth: >4 feet

Describe flowline route marking scheme.

Labeled steel posts (.2' in height) minimum every 50 feet.

If No, describe measures to protect flowline from vehicular damage.

Where flowline is elevated above ground, concret or steel post bollasters will be used to isolate from roadways.

E. MITIGATION OF IMPACTS FROM DRILLING AND/OR OPERATION

Describe measures to be taken to protect environmental and/or land use values at the well/surface facility sites(s)

The well will be installed on private property and will be over 500 feet from any other property line. Any property disturbed during initial well drilling will be used as part of the ultimate operation or will be restored to it's original state as practicable. Further, while truck traffic may increase in the area, these vehicles will enter the site at an anticipated frequency of less than 20 per day, which will not appreciably increase traffic in the area. Apropriate surface load/unload facilities will be constructed in compliance with the current enviromental regulations, and the surface facilities will include secondary spill protection (curbing) and other safeguard measures.

F. CERTIFICATION

"I state that I am authorized by said applicant to prepare this document. It was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Kenneth Cooper, Consultant/Petrotek Eng Corp		01/05/07
Name and title (printed or typed)	Authorized Signature	Date

Enclose with *Application For Permit To Drill*

A.7. Form EQP 7200-18, Soil Erosion and Sedimentation Control Plan

The Soil erosion and Sediment Control Plan is presented in/on Form EQP 7200-18, presented at the end of this Section (A.7).

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – OFFICE OF GEOLOGICAL SURVEY

SOIL EROSION & SEDIMENTATION CONTROL PLAN

By authority of Part 91, and Part 615 or Part 625 of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

☐ Part 615 Oil/Gas Well ☒ Part 625 Mineral Well

1. Name and address of applicant
Beeland Group, LLC
One Energy Plaza
Jackson, Michigan 49201
Facility Location: 10577 Alba Highway, Alba MI 49611
Phone: (517)788-9045 Fax: (517) 788-0136

2. Well or project name:
Beeland Group Disposal Well No.1

3. Well or project location:
Section(s) 14 T30N R5W

4. Name and address of County or local Enforcement Agent (CEA)
Ms. Heidi Lang
Antrim Conservation District
4820 Stover Road
Bellaire, MI 49615
Phone: (231) 533-8363 Fax: (231) 533-6388

5. Township
Star

6. County
Antrim

7. Date earth changes expected to start
Spring, 2007

8. Date of expected completion
Summer, 2007

9. Name and address of person responsible for earth change:
Dave Dowhan
Beeland Group, LLC
One Energy Plaza
Jackson, MI 49201
Phone: (517) 768-7517 Fax: (517) 788-0136

10. Name and address of person responsible for maintenance:
Dave Dowhan
Beeland Group, LLC
One Energy Plaza
Jackson, MI 49201
Phone: (517)768-7515 Fax: (517) 768-0136

11. Send copies of supplemental plat required by Part 615, R 324.201(2)(b) or R 324.504(4), and this form and all attachments, to CEA.

Date sent to CEA _____ For plats and maps see Appendix A and Figure 3 of Section A.4

EARTH CHANGE ACTIVITIES

12. Project description: (Project activities may be permitted sequentially.)

a. Number of well sites 1, <1.0 acres
b. Number of surface facility sites 1, <0.5 acres
c. New access roads 600 feet, <0.5 acres
d. Flow line(s) trenched in off well site* <200 feet, <0.1 acres
e. Flow line(s) plowed in off well site* N/A feet, 0 acres
*Contact CEA for fee schedule

13. Describe sites for which permits are being sought under Part 301 (Inland Lakes & Streams) none
Describe sites for which permits are being sought under Part 303 (Wetlands) none
List file numbers if known N/A

14 Areas requiring control structures
Will earth changes occur in areas with slopes of 10% or greater, areas where runoff water is likely, such as runs greater than 500' of moderate slope (5% to 10%), narrow valley bottoms, etc.; areas within 500' of a lake or stream; or other areas where sedimentation to a wetland or drainage way may occur?

☐ Yes Attach detail map at scale of 1"=200' or larger, with contour lines at a minimum of 20' intervals OR percent slope descriptions.
Also indicate any of the following erosion control structures that will be utilized. Identify location on map and attach detail plan.
Indicate on plan whether erosion control structures are temporary or permanent.
☐ Diversions ☐ Culverts ☐ Sediment basins ☐ Silt fences ☐ Rip-rap ☐ Berms ☐ Check dams ☐ Other _____

☒ No

15. Site restoration
☒ Topsoil will be segregated from subsoil and stockpiled OR ☐ No topsoil on site
☒ Recontour and revegetate as soon as weather permits. Seed mix DNR mix if applicable, most disturbance to be permanently used for operations
☐ Describe other proposed methods of restoration _____

16. Application prepared by (name) Signature Date 01/05/07

FOR USE OF COUNTY OR LOCAL ENFORCING AGENT

INSTRUCTIONS TO COUNTY OR LOCAL ENFORCMENT AGENT: Return this form to the applicable field or district office of the Office of Geological Survey within 30 days of receipt. Explain reasons for recommendation or disapproval and conditions required for approval. Include copies of any revisions to the plan.

17. Comments

☐ Conducted on site inspection Date _____
☐ Inspected site with representative of applicant Date _____

18. ☐ Approved ☐ Disapproved

CEA signature _____ Date _____

A.8. Provide a conformance bond. For information regarding bonding options see the link to mineral well bonds at http://www.michigan.gov/deqogs and click on Mineral Wells or contact David Davis at 517-241-1529.

The Beeland Group, LLC has secured a Letter of Credit in the amount of $40,000.00 with the Michigan Department of Environmental Quality Office of Geologic Survey designated as the beneficiary. A copy of this document is provided at the end of Section A.8, along with a copy of the letter submitted to USEPA requesting that this financial assurance be accepted simultaneously for satisfying federal requirements.

Beeland Group, LLC

One Energy Plaza Jackson, Michigan 49201

October 5, 2006

Rebecca L. Harvey, Chief
Underground Injection Control Branch
U.S. Environmental Protection Agency
77 West Jackson Boulevard, WU-16J
Chicago, Illinois 60604-3590

Dear Ms. Harvey:

This letter requests that the attached Letter of Credit submitted to the State of Michigan in the total amount of $40,000 be considered an acceptable mechanism for meeting the Federal Underground Injection Control program financial responsibility requirement for the following well:

1. Well Name:	Beeland Disposal Well No. 1
2. Well Location:	Township 30N Range 5W SE 1/4 of Section 14 Antrim County, Michigan
3. UIC Application:	Pending
4. Owner/Operator Name:	Beeland Group, LLC
5. Address:	One Energy Plaza Jackson, Michigan 49201
6. Phone:	(517) 788-9045

I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document 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)

Joseph P Tomasik — 10/5/06

Joseph Tomasik, Vice-President
Beeland Group, LLC

Date Signed

cc: Thomas Wellman, Michigan Department of Environmental Quality

IRREVOCABLE STANDBY LETTER OF CREDIT NUMBER SM222293W

LETTER OF CREDIT AMOUNT	ISSUE DATE	EXPIRY DATE
USD 40,000.00	10/05/06	10/04/07

BENEFICIARY:
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF GEOLOGICAL SURVEY
525 WEST ALLEGAN ST.
1ST FLOOR, SOUTH TOWER
LANSING, MI 48933

APPLICANT:
CMS ENERGY ON BEHALF OF
BEELAND GROUP LLC
ONE ENERGY PLAZA EP10-431
JACKSON, MI 49201

WE HEREBY ISSUE OUR IRREVOCABLE LETTER OF CREDIT IN YOUR FAVOR ON BEHALF OF BEELAND GROUP LLC, HEREINAFTER KNOWN AS THE COMPANY, FOR A SUM OF $40,000.00 (USD FORTY THOUSAND AND 00/100'S), AVAILABLE BY YOUR DRAFTS AT SIGHT DRAWN ON OUR INSTITUTION WACHOVIA BANK, NATIONAL ASSOCIATION. 401 LIEDEN STREET, WINSTON-SALEM, NORTH CAROLINA 27101, ATTN: STANDBY LETTER OF CREDIT UNIT. DRAFTS MUST BE MARKED "DRAWN UNDER WACHOVIA BANK, NATIONAL ASSOCAITION LETTER OF CREDIT NO. SM222293W DATED 10/05/06.

THIS LETTER OF CREDIT IS ISSUED TO PROVIDE FINANCIAL ASSURANCE TO THE STATE OF MICHIGAN FOR THE WELL KNOWN AS BEELAND DISPOSAL NO. 1.

THE SUPERVISOR OF WELLS MAY DRAW ON THIS LETTER OF CREDIT IN THE EVENT (1) THAT THE DEPARTMENT OF ENVIRONMENTAL QUALITY ISSUES THAT CERTAIN NOTICE OF VIOLATION INDICATING THAT THE COMPANY HAS FAILED TO COMPLY WITH THE PROVISIONS OF THAT CERTAIN PART 615 SUPERVISOR OF WELLS, 1994 PA 451, AS AMENDED IN THE FINAL COMPLETION OF ITS WELL OR WELLS. "FINAL COMPLETION" MEANS THE LOCATING, DRILLING, COMPLETING, PRODUCING, REWORKING, PLUGGING, FILLING OF PITS, AND CLEAN-UP OF WELL SITE, INCLUDING THE FILING OF PRESCRIBED RECORDS AND APPROVAL THEREOF BY THE SUPERVISOR OF WELLS; OR (2) THAT THE COMPANY FAILS TO PROVIDE THE SUPERVISOR OF WELL WITH AN EXTENSION OF THIS LETTER OF CREDIT OR OTHER FINANCIAL ASSURANCE OR (3) THAT THE COMPANY IS ADJUDGED INSOLVENT OR BANKRUPT. THE COMPANY SHALL BE DEEMED, FOR PURPOSES OF THIS LETTER OF CREDIT, ADJUDGED BANKRUPT UPON ANY PETITION UNDER THAT CERTAIN TITLE 11 OF THE UNITED STATES CODE, FILED ON THE DEBTORS BEHALF, AND AN ORDER FOR RELIEF GRANTED BY ANY OF THE UNITED STATES DISTRICT OR BANKRUPTCY COURTS.

IF ANY PROVISION OF THIS LETTER OF CREDIT IS CONSTRUED AS INEFFECTIVE BY A COURT OF COMPETENT JURISDICTION, ALL OTHER PROVISIONS OF THIS LETTER OF CREDIT SHALL REMAIN IN FULL EFFECT AND BE ENFORCEABLE PURSUANT TO THE EFFECTIVE PROVISIONS CONTAINED HEREIN.

THIS LETTER OF CREDIT IS SUBJECT TO THE UNIFORM CUSTOMS AND PRACTICES FOR DOCUMENTARY LETTERS OF CREDITS", 1993 REVISION OF THE INTERNATIONAL CHAMBER OF COMMERCE, PUBLICATION NO. 500, AND AS TO MATTERS NOT GOVERNED BY THE UNIFORM CUSTOMS AND PRACTICE FOR DOCUMENTARY CREDITS, AFOREMENTIONED, SHALL BE GOVERNED BY, AND CONSTRUED IN ACCORDANCE WITH THE UNIFORM COMMERCIAL CODE OF THE STATE OF MICHIGAN.

CONTINUED ON NEXT PAGE WHICH FORMS AN INTEGRAL PART OF THIS LETTER OF CREDIT

IRREVOCABLE STANDBY LETTER OF CREDIT NO. SM2222299W PAGE NO. 1 10/01/06

PARTIAL DRAWINGS ARE PERMITTED WITHOUT CANCELLING THE LETTER OF CREDIT BALANCE. THIS ORIGINAL LETTER OF CREDIT MUST BE SUBMITTED TO US TOGETHER WITH ANY DRAWINGS THEREUNDER FOR OUR ENDORSEMENT OF ANY PAYMENTS AFFECTED BY US AND OF CANCELLATION.

IT IS A CONDITION OF THIS LETTER OF CREDIT THAT IT SHALL BE AUTOMATICALLY EXTENDED FOR ADDITIONAL TERMS OF ONE (1) YEAR FROM THE PRESENT OR EACH FUTURE EXPIRATION DATE UNLESS WE GIVE THE SUPERVISOR OF WELLS AND THE COMPANY, AT LEAST NINETY (90) DAYS BEFORE SAID EXPIRATION DATE, WRITTEN NOTICE BY CERTIFIED MAIL, RETURN RECEIPT REQUESTED, COURIER OR HAND DELIVERY, THAT WE ELECT TO TERMINATE THIS CREDIT AT THE END OF ITS THEN CURRENT TERM.

IN THE EVENT WE GIVE NOTICE OF OUR ELECTION TO TERMINATE THIS LETTER OF CREDIT AND BEELAND GROUP LLC FAILS TO REPLACE THIS LETTER OF CREDIT WITH OTHER FINANCIAL ASSURANCES ACCEPTABLE TO THE DEPARTMENT, YOU MAY DRAW ON THIS LETTER OF CREDIT, UP TO THE AGGREGATE AMOUNT, LESS ANY PRIOR DRAFTS PRESENTED BY THE DEPARTMENT AND PAID BY US, NOT SOONER THAN THIRTY (30) DAYS AFTER THE DATE OF SUCH NOTICE BY PRESENTATION OF A DRAFT MARKED DRAWN UNDER,WACHOVIA BANK, NATIONAL ASSOCIATIONLETTER OF CREDIT NO. SM2222299W, ACCOMPANIED BY A STATEMENT PURPORTEDLY SIGNED BY AN AUTHORIZED REPRESENTATIVE OF THE DEPARTMENT READING AS FOLLOWS:

THE MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY IS MAKING THIS DRAWING BECAUSE BEELAND GROUP LLC , HAS FAILED TO REPLACE THIS LETTER OF CREDIT WITH OTHER FINANCIAL ASSURANCES ACCEPTABLE TO THE DEPARTMENT.

WE HEREBY ENGAGE WITH YOU THAT DRAFTS IN CONFORMITY WITH THE TERMS OF THIS LETTER OF CREDIT SHALL BE DULY HONORED UPON PRESENTATION AND DELIVERY OF DOCUMENTS AS SPECIFIED TO OUR OFFICE LOCATED AT 401 LINDEN STREET, WINSTON-SALEM, NORTH CAROLINA 27101, ATTN: STANDBY LETTER OF CREDIT UNIT, ON OR AFTER OCTOBER 4, 2007 OR ANY FUTURE EXPIRATION DATE. THE AMOUNT OF EACH DRAFT MUST BE ENDORSED ON THE REVERSE OF THIS LETTER OF CREDIT BY THE NEGOTIATING FINANCIAL INSTITUTION.

_____

FINANCIAL INSTITUTION AUTHORITY SIGNATURE

_____

FINANCIAL INSTITUTION AUTHORITY NAME

_____

FINANCIAL INSTITUTION AUTHORITY TITLE

PLEASE DIRECT ANY CORRESPONDENCE INCLUDING DRAWING OR INQUIRY QUOTING OUR REFERENCE NUMBER TO:

WACHOVIA BANK, NATIONAL ASSOCIATION

WACHOVIA

IRREVOCABLE STANDBY LETTER OF CREDIT NUMBER SM222299W

LETTER OF CREDIT AMOUNT	ISSUE DATE	EXPIRY DATE
USD 40,000.00	10/05/06	10/04/07

BENEFICIARY:
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF GEOLOGICAL SURVEY
525 WEST ALLEGAN ST.
[illegible] FLOOR, SOUTH TOWER
LANSING, MI 48933

APPLICANT:
CMS ENERGY ON BEHALF OF
BEELAND GROUP LLC
ONE ENERGY PLAZA [illegible]
JACKSON, MI 49201

WE HEREBY ISSUE OUR IRREVOCABLE LETTER OF CREDIT IN YOUR FAVOR ON BEHALF OF BEELAND GROUP LLC, HEREINAFTER KNOWN AS THE COMPANY, FOR A SUM OF $40,000.00 (USD FORTY THOUSAND AND 00/100'S), AVAILABLE BY YOUR DRAFTS AT SIGHT DRAWN ON OUR INSTITUTION WACHOVIA BANK, NATIONAL ASSOCIATION, 401 LINDEN STREET, WINSTON-SALEM, NORTH CAROLINA 27101, ATTN: STANDBY LETTER OF CREDIT UNIT. DRAFTS MUST BE MARKED "DRAWN UNDER WACHOVIA BANK, NATIONAL ASSOCIATION LETTER OF CREDIT NO. SM222299W DATED 10/05/06."

THIS LETTER OF CREDIT IS ISSUED TO PROVIDE FINANCIAL ASSURANCE TO THE STATE OF MICHIGAN FOR THE WELL KNOWN AS BEELAND DISPOSAL NO. [illegible]

THE SUPERVISOR OF WELLS MAY DRAW ON THIS LETTER OF CREDIT IN THE EVENT (1) THAT THE DEPARTMENT OF ENVIRONMENTAL QUALITY ISSUES THAT CERTAIN NOTICE OF VIOLATION INDICATING THAT THE COMPANY HAS FAILED TO COMPLY WITH THE PROVISIONS OF THAT CERTAIN PART 615 SUPERVISOR OF WELLS, 1994 PA 451, AS AMENDED IN THE FINAL COMPLETION OF ITS WELL OR WELLS. "FINAL COMPLETION" MEANS THE LOCATING, DRILLING, COMPLETING, PRODUCING, REWORKING, PLUGGING, FILLING OF PITS, AND CLEAN-UP OF WELL SITE, INCLUDING THE FILING OF PRESCRIBED RECORDS AND APPROVAL THEREOF BY THE SUPERVISOR OF WELLS; OR (2) THAT THE COMPANY FAILS TO PROVIDE THE SUPERVISOR OF WELL WITH AN EXTENSION OF THIS LETTER OF CREDIT OR OTHER FINANCIAL ASSURANCE OR (3) THAT THE COMPANY IS ADJUDGED INSOLVENT OR BANKRUPT. THE COMPANY SHALL BE DEEMED, FOR PURPOSES OF THIS LETTER OF CREDIT, ADJUDGED BANKRUPT UPON ANY PETITION UNDER THAT CERTAIN TITLE 11 OF THE UNITED STATES CODE, FILED ON THE DEBTORS BEHALF, AND AN ORDER FOR RELIEF GRANTED BY ANY OF THE UNITED STATES DISTRICT OR BANKRUPTCY COURTS.

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CONTINUED ON NEXT PAGE WHICH FORMS AN INTEGRAL PART OF THIS LETTER OF CREDIT

Jean

WACHOVIA

PARTIAL DRAWINGS ARE PERMITTED WITHOUT CANCELING THE LETTER OF CREDIT BALANCE. THE ORIGINAL LETTER OF CREDIT MUST BE SUBMITTED TO US TOGETHER WITH ANY DRAWINGS THEREUNDER FOR OUR ENDORSEMENT OF ANY PAYMENTS AFFECTED BY US AND/OR CANCELLATION.

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IN THE EVENT WE GIVE NOTICE OF OUR ELECTION TO TERMINATE THIS LETTER OF CREDIT AND ZEELAND GROUP LLC FAILS TO REPLACE THIS LETTER OF CREDIT WITH OTHER FINANCIAL ASSURANCES ACCEPTABLE TO THE DEPARTMENT, YOU MAY DRAW ON THIS LETTER OF CREDIT, UP TO THE AGGREGATE AMOUNT, LESS ANY PRIOR DRAFTS PRESENTED BY THE DEPARTMENT AND PAID BY US, NOT SOONER THAN THIRTY (30) DAYS AFTER THE DATE OF SUCH NOTICE BY PRESENTATION OF A DRAFT MARKED DRAWN UNDER WACHOVIA BANK, NATIONAL ASSOCIATIONLETTER OF CREDIT NO. SM222298W, ACCOMPANIED BY A STATEMENT PURPORTEDLY SIGNED BY AN AUTHORIZED REPRESENTATIVE OF THE DEPARTMENT READING AS FOLLOWS:

THE MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY IS MAKING THIS DRAWING BECAUSE ZEELAND GROUP LLC HAS FAILED TO REPLACE THIS LETTER OF CREDIT WITH OTHER FINANCIAL ASSURANCES ACCEPTABLE TO THE DEPARTMENT.

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Sharon P. Peace

FINANCIAL INSTITUTION AUTHORITY SIGNATURE

Sharon P. Peace

FINANCIAL INSTITUTION AUTHORITY NAME

Assistant Vice President

FINANCIAL INSTITUTION AUTHORITY TITLE

PLEASE DIRECT ANY CORRESPONDENCE INCLUDING DRAWING OR INQUIRY QUOTING OUR REFERENCE NUMBER TO:

WACHOVIA BANK, NATIONAL ASSOCIATION

WINSTON SALEM, NORTH CAROLINA 27101

WACHOVIA

OUR CUSTOMER CARE PHONE NUMBER FOR ANY QUERIES IS 800-776-3862

YOUR FAX NUMBER IS 336-735-0999

A.9. The permit application fee as specified by statute:

• Disposal well for disposal of waste products	$ 2,500.00
• Disposal well for processed brine	500.00
• Storage well	500.00
• Natural or artificial brine production well	500.00

A check in the amount of $2500 for the permit application fee is attached to the cover letter transmitting this application.

A.10.An organization report, form EQP 7200-13, if a current organization report is not on file with the supervisor.

The Organization Report presenting the current corporate organizational status of Beeland Group, LLC is presented on form EQP 7200-13, at the end of this Section (A.10).

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

WELL PERMITTEE ORGANIZATION REPORT

Required by authority of Part 615 SUPERVISOR OF WELLS and Part 625 MINERAL WELL, Natural Resources and Environmental Protection Act, 1994 PA 451, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

PURPOSE FOR FILING: ☒ New ☐ Change of Principal or Agent ☐ Address Correction ☐ Name Change

ORGANIZATION Enter the complete organization name, plan, and current business addresses and phone number.

Company name (as shown on permit to drill)	Beeland Group L.L.C.	2. If organization shown in 1 is a subsidiary or an assumed name (dba), give name and address of associated or parent company or person
Mailing Address	One Energy Plaza	CMS Land Company
City, State, Zip	Jackson, MI 49201	One Energy Plaza Jackson, MI 49201
Street Address		
City, State, Zip		
Phone	517-788-9045	517-788-9045
Fed. ID or Soc. Sec. No.	20-5321543	38-2810979

3. Current Organization Plan (check one)

☐ Corporation ☐ Joint Venture ☐ Limited Partnership ☒ Limited Liability Company
☐ Partnership ☐ Trust ☐ Sole Proprietorship ☐ Other

4. If reorganization or name change, name & address of previous organization

PRINCIPALS List all corporate officers, directors, incorporators, partners, or shareholders who have the authority to or responsibility for making operational decisions including siting, drilling, operating, producing, reworking, and plugging of wells. Attach extra sheet if needed.

5. Full Name	Title	Address, if different from address in 1 above
See attached list.		

AGENTS List names of persons, other than employees of the organization, who are authorized to submit applications, workplans, or records pursuant to the above cited Act.

6. Full Name	Company	Address or Phone

Certification "I state that I am authorized to make this report. This report was prepared under my supervision and direction. The facts stated herein are true, accurate and complete to the best of my knowledge."

Name & Title (printed or typed)	Authorized Signature	Date
Joseph P. Tomasik Vice President	Joseph P. Tomasik	November 20, 2006

QP 7200-13 (rev. 8/2004) Mail original and one copy to: OFFICE OF GEOLOGICAL SURVEY
MICHIGAN DEPT OF ENVIRONMENTAL QUALITY
PO BOX 30256 LANSING MI 48909-7756

Officers – Beeland Group LLC

David W. Joos, Chief Executive Officer

Thomas W. Elward, President and Chief Operating Officer

James E. Brunner, Senior Vice President and General Counsel

John M. Butler, Senior Vice President

Carol A. Isles, Vice President and Controller

Sharon A. McIlnay, Vice President

Laura L. Mountcastle, Vice President and Treasurer

Catherine M. Reynolds, Vice President and Secretary

Joseph P. Tomasik, Vice President

Theodore J. Vogel, Vice President and Chief Tax Counsel

Jane M. Kramer, Assistant Secretary

Joyce H. Norkey, Assistant Secretary

Beverly S. Burger, Assistant Treasurer

James L. Loewen, Assistant Treasurer

A.11. Description of the drilling program, including the drilling fluid and mud program, how the fluids will be handled and ultimate disposition of the drilling fluids. Include a discussion of whether overpressured zones are anticipated and how the mud program will be modified to accommodate such a condition.

The proposed Beeland Well No. 1 is to be a newly installed Class I well. Well No. 1 will be located in the Southeast 1/4 of Section 14, Township 30 North, Range 5 West, Antrim County, Michigan. Ground level is estimated to be approximately 1,335 feet above sea level (ASL) with Kelly Bushing (KB) that will be dependent on type of rig available. The well will be drilled to a Total Depth (TD) of no greater than 2,450 feet BGL, into the top of the Detroit River Group, and will be completed openhole in the Dundee Formation and the top of the Detroit River Group.

Drilling, Casing and Testing Program

The conductor casing, 13-3/8-inch, 54.5 lb/ft to 61 lb/ft, J-55 or K-55 grade, ST&C, or suitable equivalent will be drilled and cemented or driven to refusal in the Glacial Drift to a maximum depth of approximately 175 feet BGL.

After a rotary rig is brought to the location, a 12¼-inch hole will be drilled out of the surface casing to a depth of approximately 950 feet. The intermediate casing shoe will be targeted at a minimum of 100 feet below the base of the Glacial Drift. After the shallow openhole logging program is complete (see attached table), the hole will be conditioned and minimum 9 5/8-inch, 36 lb/ft, J-55 or K-55, LT&C, or suitable equivalent surface casing will be installed to a depth of approximately 950 feet. The cementing program will be determined based on field conditions, but will likely consist of a mixture of 249 sacks (based on a gauge hole) of Michigan equivalent Class A standard cement with 3 percent $CaCl_2$ and additives. Appropriate excess cement will be pumped based on field conditions. It is anticipated that a float shoe will be used plus a float collar one joint up from the bottom and that centralizers are to be placed a minimum of one every fifth joint.

After the intermediate casing string has been cemented, a cement bond log will be conducted to document cement circulation to surface. The cement will be drilled out of the intermediate string and an 8 1/2-inch hole will then drilled to approximately 2,150 feet BGL. The top of the Dundee injection formation will be penetrated in this stage of the drilling process. After the deep openhole logging program is complete (see attached table), the hole will be conditioned and minimum 7-inch, 23 lb/ft to 26 lb/ft, K-55 or J-55 grade, LT&C, or suitable equivalent long-string casing will be installed to a depth of approximately 2,150 feet. The cementing program for the long string will be determined based on field conditions, but will likely consist of a mixture of 264 sacks (based on a gauge

hole) of Michigan equivalent Class A standard cement with 3 percent CaCl2 and additives. Appropriate excess cement will be pumped based on field conditions. It is anticipated that a float shoe will be used plus a float collar one joint up from the bottom and that centralizers are to be placed a minimum of one every fifth joint.

The final stage of drilling will be conducted using a 6-1/4-inch drill bit to drill out cement and complete the well as an openhole to a depth of approximately 2,450 feet. After drilling is complete, additional openhole logging will be conducted to obtain data regarding the Dundee injection interval. A cement bond log and a baseline casing inspection log will be conducted in the long-string casing, and a directional survey will be conducted to ascertain the bottomhole location and trajectory of the wellbore. A packer will be set at a depth of approximately 2,100 feet inside the 7-inch long string casing. Four and one-half inch injection tubing is proposed for the completion. Fluid will then be swabbed from the well to obtain a sample of injection interval fluids. A radioactive tracer survey and a temperature log will then be conducted to establish baseline conditions and initial external mechanical integrity. A pressure transient test will also be conducted to derive estimates of formation pressure and properties. A proposed schematic for the Beeland Well is presented in Figure 7, presented at the end of Section A.11.

No over-pressured zones are anticipated during drilling of the Beeland well. If under-pressured zones are encountered (as is likely), lost-circulation materials will be utilized to control fluid loss as necessary based on well conditions. Fresh water will be trucked to the site using local oilfield suppliers or a pre-existing water well already located on the property will be used to supply water during drilling and testing of this well. Fresh water will be used as the drilling fluid, and will be held in on-site tanks with no in-ground pits. It is not anticipated that the well will encounter dry bedded salts during drilling. Upon completion of drilling operations, remaining fluids and solids will be disposed of off-site by a licensed waste hauler, such as Northern A-1 or a suitable equivalent contractor.

(○) CEMENT, VOLUMES, FLUIDS and HOLE SIZE

[ ] TUBULARS and COMPONENTS

(A) 12 1/4" Hole, Cemented to Surface with 249 sacks Class A

(B) 8 1/2" Hole, Cemented to Surface with 264 sacks Class A

(C) Annulus Fluid: Fresh water with Inhibitor and scavenger

(D) Completion: 6 1/4" Open Hole, total depth @ +/-2,450'

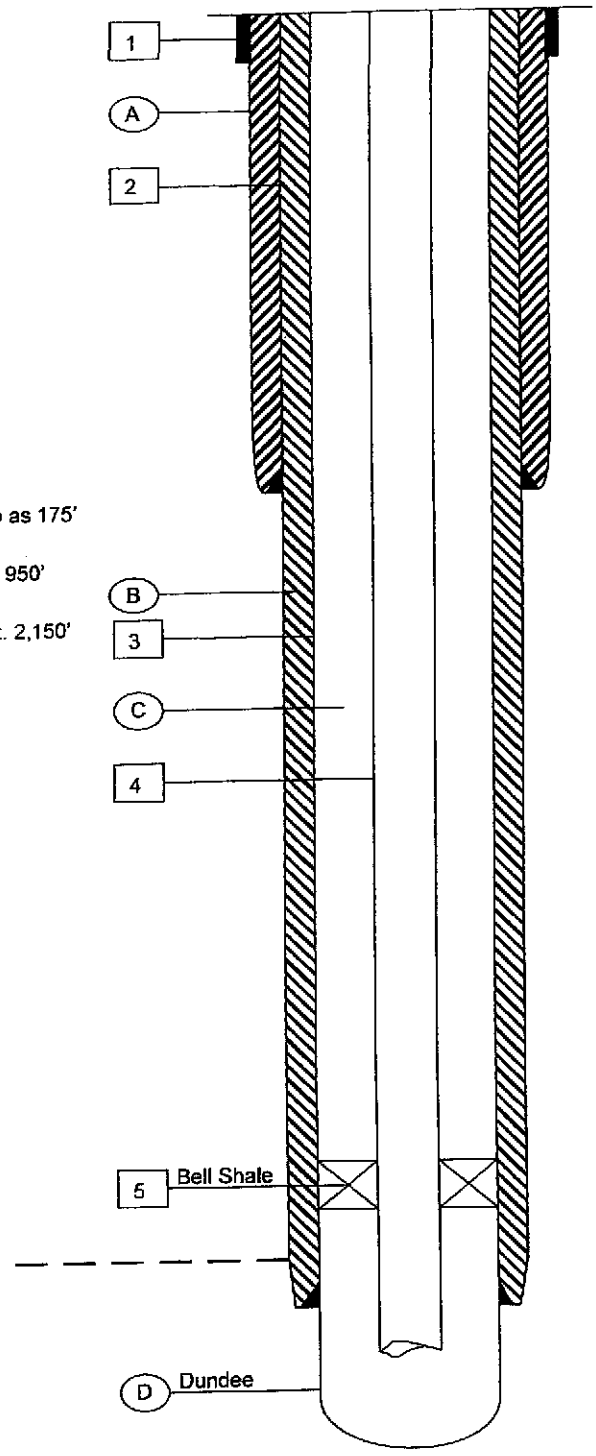
[1] Surface Casing: 13 3/8", 54.5 to 61#/ft., Driven to refusal as deep as 175'

[2] Intermediate Casing: 9 5/8", 36 lb/ft., K-55 or J-55, Set @ approx. 950'

[3] Long String Casing: 7", 23 to 26 lb/ft., J-55 or K-55, Set @ approx. 2,150'

[4] Injection Tubing: 4 1/2", 11.6 lb/ft., J-55 or K-55

[5] Packer: 7" x 4 1/2" Large Bore, Set @ approximately 2,100'



Petrotek Engineering Corporation

Figure 7

Beeland Group, LLC.
Alba, Michigan Facility

WELL SCHEMATIC
DISPOSAL WELL NO. 1

SCALE: NONE DATE:01/07

A.12 Description of the cementing program including the type, properties and compressive strength of cement to be used on each casing string. Indicate if DV tools will be used.

Figure 7 (end of Section A.11) presents the well completion diagram and also includes information pertaining to the cementing program. As shown on this diagram, approximately 249 sacks (294 cubic feet) of Michigan equivalent Class A type cement with 3 percent $CaCl_2$ additives will be used to set the intermediate casing from 950 ft BGS to ground surface. Also, approximately 264 sacks (312 cubic feet) of Michigan equivalent Class A type cement with 3 percent $CaCl_2$ additives will be used to set the long string casing from about 2150 ft BGS to ground surface. At 60° F and 0 psi (standard surface conditions), a minimum ultimate compressive strength of 1500 psi will be targeted. No DV tools will be used.

A.13.Description of the proposed wireline logging program.

The proposed wireline logging program is summarized in Table 1, below.

TABLE 1 LIST OF PROPOSED LOGS BEELAND GROUP, LLC WELL NO. 1

Description	Depth Run
Dual Laterolog Gamma Ray, Formation Density, and Caliper Logs (openhole before intermediate casing)	100-950'
Cement Bond Log (intermediate casing)	surf-950'
Dual LateroLog, SP, Gamma Ray, Formation Density, Compensated Neutron, and Caliper Log (openhole before long string casing and in openhole completion)	950- TD(2,450')
If required, Fracture Finder ID Log (openhole before long-string casing)	1,950-2,150'
Cement Bond Log, Casing Inspection Log and Directional Survey (long-string casing)	surf-2,150'
Temperature Log	surf-TD (2,450')
Radioactive Tracer Log	long string casing
Pressure/Temperature Gradient and Pressure Transient Falloff test	2,150'

A.14.Description of the testing program, including pressure tests on casing strings, and any planned drill stem tests.

The Beeland Disposal Well No. 1 is to be installed and tested in 2007 according to applicable regulations and permit requirements. Static pressure of the Dundee and estimates of various injection interval characteristics are to be determined via pressure transient testing, while native brine chemistry and characteristics are to be determined based on acquisition of a fluid sample. Characteristics of the injection interval are also to be evaluated based on conducting geophysical well logging. No core sampling is currently planned. Additional details regarding the well logging are presented in Response 13 of this application, geophysical logging details.

After the open hole has been drilled, but prior to conducting any injection testing, injection interval fluid will be produced from the well using either a submersible pump or swabbing equipment. Based on fluid loss experienced during drilling and field conditions, target production volumes for obtaining representative samples will be adjusted in the field. In any case, a minimum of 100 bbls of fluid will be produced before sampling is conducted. Field parameters including pH and conductivity will also be monitored at surface as fluid is recovered to determine when representative sampling is practical. Fluid will be subjected to analysis for the following parameters: Alkalinity, Arsenic, Barium, Bicarbonate, Cadmium, Calcium, Carbonate, Chloride, Chromium, Conductivity, Copper, Hardness, Iron, Lead, Magnesium, Manganese, Molybdenum, Nickel, Nitrate, as (N), pH, Potassium, Radium 226, Radium 228, Selenium, Silica as SiO2, Sodium, Specific Gravity, Strontium, Sulfur, TDS, TSS, and Zinc. See Attachment B, the WAP, for sampling information.

Prior to drilling out of the intermediate and the long string casings, casing pressure tests will be conducted to generally ascertain the condition of the string. At a minimum, pressure tests of a 30-minute duration, with a minimum pressure gradient of 0.6 psi/ft will be conducted prior to continued drilling.

Initial mechanical integrity testing for the Beeland well will include reservoir monitoring as specified in 40 CFR 146.13 (d) in addition to static annulus pressure testing. Beeland will provide MDEQ a minimum of 30 days notice of annual testing. Notice is to include proposed procedures for testing. Although test procedures or methods may be changed based on approval by future MDEQ staff, the following procedure will be utilized for the first such testing to be performed:

1. Conduct Wellsite Safety Meeting
   A. Prior to commencement of field activities, conduct safety meeting with contractors and personnel to be involved with field services

and MIT testing. Ensure that all safety procedures are understood and review days work activities.

2. Conduct Fall-Off Test
   A. Record data regarding test well injection at typical operating conditions (constant rate). Rate, temperature and specific gravity versus time will be sampled and recorded during the injection period. Cumulative volume injected should also be recorded. Continue injection for a minimum of approximately five hours. Note that significant rate variations may yield poor quality data or require more complicated analysis techniques.
   B. Rig-up pressure gauge.
   C. Obtain final stabilized injection pressure for a minimum of one hour. Ensure that the gauge temperature readings have also stabilized.
   D. After gauge recordings are stable, cease injection and monitor pressure fall-off. Instantaneous shut-in yields best results. Continue monitoring pressure for a minimum of five hours or until a valid observation of fall-off curve is observed.
   E. Stop test data acquisition, rig-down and release equipment.
3. Annulus Pressure Test
   A. Stabilize well pressure and temperature.
   B. Arrangements will be made for a representative from the USEPA to be present to witness this testing.
   C. Install ball valve or similar type "bleed" valve on annulus gate valve. Pressurize annulus to a minimum of 100 psig with liquid and shut-in pump side gate valve. If typical operating annulus pressures are above 100 psi, higher pressures acceptable to the agency and compatible with the well completion configuration will be utilized in this testing. Pressure to be used will be detailed in proposed procedures supplied with notification of testing. Install certified gauge on "bleed" type valve. The annulus may need to be pressurized and bled off several times to ensure an absence of air. Monitor and record pressure for one hour. Pressure may not fluctuate more than 3 percent during the one-hour test. At the conclusion of the test, lower the annulus pressure to normal operating pressure.

A.15.Description of any planned coring program.

No coring program is currently planned for implementation during the drilling of Beeland Group Disposal Well No. 1.

B. Additional information required for an application for a permit to drill and operate a disposal well or to convert a previously drilled well to such a well:

B.1. Form EQP 7200-14, Injection Well Data.

Injection Well Data is presented on form EQP 7200-14, which is attached at the end of this Section (B.1).

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

INJECTION WELL DATA

Supplemental information for drilling or converting to an injection well

By authority of Part 615 or Part 625 of Act 451 PA 1994, as amended. Non-submission and/or falsification of this information may result in fines and/or imprisonment.

Applicant: Beeland Group, LLC One Energy Plaza Jackson MI 49201

Well name and number: Beeland Group Disposal Well No. 1

INSTRUCTIONS: Complete all portions of form which apply to this well. **Attach supplemental documents as needed.**

1. File a separate plat which identifies the depth and location of this proposed well and all producing, abandoned, or drilling wells within 1320 feet of it. Also identify the permittee of each producing well within 1320 feet of this proposed well.
2. Enclose a copy of the completion reports for all wells and the plugging records for all plugged wells shown on the plat. Identify what steps will be necessary to prevent injected fluids from migrating up or into inadequately plugged or completed wells.
3. If this is an existing well to be converted to an injection well, enclose this form with an Application To Change Well Status (form EQP 7200-6). Also enclose a copy of the completion report and geologic description and electric logs for this well.
4. Injection wells (except for gas storage) must receive a mechanical integrity test every 5 years pursuant to Rule 324.805.

5. Type of fluids to be injected
☒ Brine ☐ Natural Gas (omit #7 & #12)
☐ Fresh Water (omit #12) ☒ Other Non haz. remediation waste

6. Maximum expected injection rate 200 gpm

7. Specific gravity of injected fluid 1.01-1.05 (max calc. 1.15)

8. Maximum expected injection pressure 150 psi

9. Maximum bottom hole injection pressure 1221
Show calculations 150+1.15*0.433*2150

10. Fracture pressure of confining formation 1720 at base
Show calculations 0.8*2150
Eaton method: 1259 psi, see Section B.12

11. Fracture pressure of injection formation 1720 at base
Show calculations 0.8*2150
Eaton method: 1259 psi, see Section B.12

12. Chemical analysis of representative samples of injected fluid
Specific conductance TBD

Cation (mg/l)		Anions (mg/l)	
Calcium	12.1	Chloride	1,730
Sodium	889	Sulfate	14,500
Magnesium	<0.5	Bicarbonate	1,620
Potassium	13,800		

What was the source of this representative sample? Injectate from Bay Harbor Michigan Remediation, source of injectate, DW

13. Is this well to be completed in a potential or previous oil or gas producing formation? ☐ Yes ☒ No
If yes, provide a list of all offset permittees and proof of service of notification of this application to all permittees by certified mail.

14. Attach proposed plugging and abandonment plan. OR Briefly list depths, volumes and types of cement and mechanical plugs and depths where casing will be recovered.
See attached plan and Figure Q-1 from October 2006 EPA permit application for this well.

Schematic of wellbore construction

Complete bottom of diagram as needed to conform with proposed construction (e.g. show rat hole below casing, open hole completion, packer loc. etc.)

Fresh water fms., name & depth
Glacial Drift 0-app. 850 ft BGS

Base of freshwater, name & depth
Glacial Drift 0-app. 850 ft BGS

Surface casing 13 3/8 "x 175 '
Amount of cement — sacks
T.O.C. driven to refusal from ground surface

Intermediate casing (if applicable)
9 5/8 "x 950 '
Amount of cement 249 sacks
T.O.C. ground surface

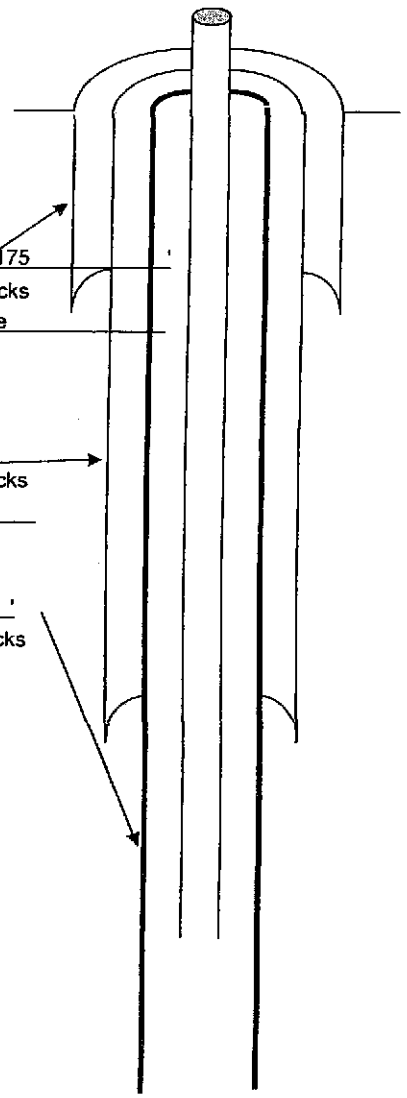
Long string casing 7 "x 2,150 '
Amount of cement 264 sacks
T.O.C. ground surface

Confining formation(s) Bell Shale
Depth to top 2,050
Depth to base 2,150

Injection formation(s) Dundee
Depth to top 2,150
Depth to base 2,350

Tubing 4 1/2 " x >2150 '
Packer Depth app.2100

Bottom TD or PBTD 2,450 ft.



15. Application prepared by (print or type): Kenneth Cooper, PE: Consultant/Petrotek Engineering Corporation

Date: 01/05/07

EQP 7200-14 (rev. 8/2004) Enclose with *APPLICATION FOR PERMIT TO DRILL* or *APPLICATION TO CHANGE WELL STATUS*

(A) CEMENT, VOLUMES, FLUIDS and HOLE SIZE

[1] TUBULARS and COMPONENTS

(A) 12 1/4" Hole, Cemented to Surface with 273 sacks

(B) 8 1/2" Hole, Cemented to Surface with 264 sacks

(C) 291 Sacks Cement, 2,100' to surface

(D) 7 Sacks Cement, 2,150' - 2,100'

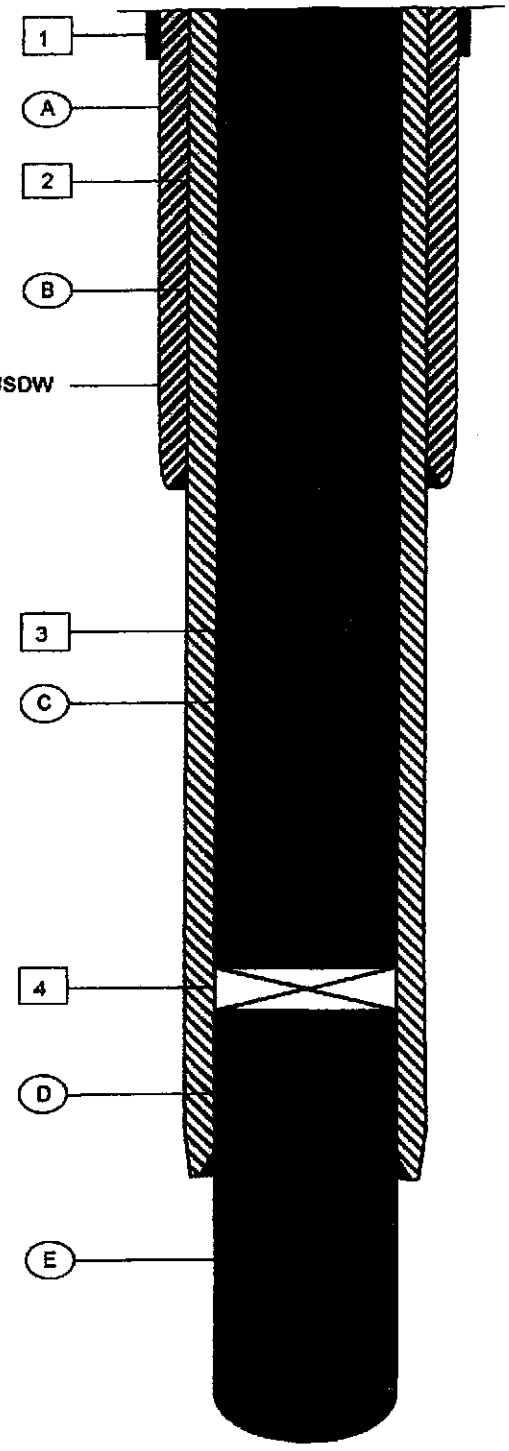
(E) 48 Sacks Cement, 2,450' - 2,150'

[1] Surface Casing: 13 3/8", Driven to refusal

[2] Intermediate Casing: 9 5/8", 36 lb/ft., K-55 or J-55, Set @ 950'

[3] Long String Casing: 7", 26 lb/ft., J-55 or K-55, Set @ 2,150'

[4] Mechanical Plug: Set @ 2,100' on top of cement retainer or original packer



Petrotek Engineering Corporation

Figure Q-1

Beeland Group, LLC.
Alba, Michigan Facility

WELL SCHEMATIC
DISPOSAL WELL NO. 1

SCALE: NONE DATE: 10/06

2.Q PLUGGING AND ABANDONMENT PLAN

Submit a plan for plugging and abandonment of the well Including (1) describe the type, number, and placement (including the elevation of the top and bottom) of plugs to be used; (2) describe the type, grade, and quantity of cement to be used; and (3) describe the method to be used to place plugs, including the method used to place the well in a state of static equilibrium prior to placement of the plugs. Also, for a Class III well that underlies or is in an exempted aquifer, demonstrate adequate protection of USDWs. Submit this information on USEPA Form 7520-14, Plugging and Abandonment Plan.

RESPONSE

The following completed copy of US EPA Form 7520-14, Plugging and Abandonment Plan, are submitted to satisfy this requirement. The modifications made to this form are to provide consistency with all available and current information. The plan for the well is also summarized in graphical form (Figure Q-1) in this response. Costs associated with the plugging and abandonment of the well per the following procedures is presented in the completed plugging forms and in Response 2.R of this document.

The following is the proposed plan for plugging and abandonment of the proposed Beeland Group, LLC non-hazardous Class I Well.

1. Install a test gauge on the annulus to perform a static pressure test. Ensure that the annulus is fluid filled and that the well has been shut-in for a minimum of 24 hours. Pressurize annulus to approximately 500 psig and isolate from the annulus system. Monitor annular pressure for one hour. The test will be successful if the pressure change is less than 3 percent of the starting pressure.

2. Prepare well and location for plugging. Remove wellhouse, well monitoring equipment and wellhead injection piping.

3. Move in and rig-up workover rig, mud pump, circulating pit and pipe racks as necessary. Flush well with approximately 100 bbl fresh water.

4. Remove wellhead and release slips.

5. Release injection packer. Displace annular fluid from well into injection formation by flushing with approximately 100 bbl fresh water.

6. Pull and lay down the injection tubing and packer.

7. Run cement retainer to approximately 2,100 feet.

8. Pump approximately 55 sacks of Class A cement with 4 percent bentonite (14.1 ppg, 1.55 cf/sx yield) below cement retainer and into 6 ¼-inch openhole.

9. Tag cement on top of retainer at approximately 2,100 feet.

10. Stage cement remainder of casing to surface in approximately 500 foot stages using the balanced plug method. Pump approximately 291 sacks of Class A cement with 4 percent bentonite (14.1 ppg, 1.55 cf/sx yield).

11. Cut off wellhead approximately 3 feet BGL and weld cap with permanent marker on casing.

12. Rig down and move out pulling unit and equipment.

13. Submit required plugging records to USEPA and MDEQ.

Post-Closure Care Requirements

Beeland will provide notification of closure to USEPA, Region 5, the MDEQ and the local zoning authorities. Included with the notification will be information regarding the nature of the injected waste stream, identification of the depths of the injection and confining zones, well schematics and plugging records. Beeland will retain, for a period of three years following the well closure, records reflecting the nature, composition and volume of all injected fluids. At the discretion of the director of USEPA, Region 5, Beeland will then deliver the records to the director at the conclusion of the retention period, or dispose of such records upon written approval of the director.

Petrotek Engineering Corporation 9088 South Ridgeline Boulevard, Suite 105 Littleton, Colorado 80129 USA (303) 290-9414 FAX (303) 290-9580

October 5, 2006

Ms. Lisa Perenchio
US EPA, Region 5
UIC Section, (WU-16J)
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

RE: **Plugging and Abandonment Costs for Class I Well**
Proposed Beeland Group, LLC Disposal Well No. 1 Alba, Michigan

Dear Ms. Perenchio:

Petrotek has prepared procedures and a cost estimate for the plugging and abandonment of the proposed Beeland Group, LLC Class I Non-Hazardous injection well at Alba, Michigan in Antrim County. This well is to be completed as a Dundee injector at a depth of approximately 2,150' to 2,450' BGL. It is to be located in reasonably close proximity to oilfield contractor service companies in the northern Michigan Basin.

This cost estimate has been prepared based on satisfying minimum federal requirements for plugging and does not include budget for any additional integrity testing or the decommissioning of any related surface facilities. Copies of the EPA Form 7520-14 have been provided that summarize the plan. Required financial assurance amounts for this proposed well are estimated as $26,700. Adjustments may be necessary based on actual conditions encountered during completion of the well. This includes line item budgeting as follows:

$ 12,900	Cement
$ 2,500	Rig or Pulling Unit
$ 500	Welder
$ 6,800	Cement Retainer and Top Plug
$ 4,000	Miscellaneous
$ 26,700	Total

As always, if you have any questions or require further information regarding any issues related to the wells, feel free to contact any of us at Petrotek.

Sincerely,

Petrotek Engineering Corporation
Ken Cooper, PE

OMB No. 2040-0042 Approval Expires 1/31/05

EPA

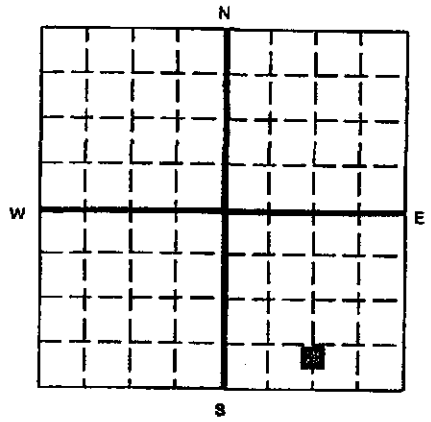
United States Environmental Protection Agency
Washington, DC 20460

PLUGGING AND ABANDONMENT PLAN

Name and Address of Facility
Beeland Group, LLC
10577 Alba Highway Alba, Michigan 49611

Name and Address of Owner/Operator
Beeland Group, LLC
One Energy Plaza Jackson, MI 49201

Locate Well and Outline Unit on Section Plat - 640 Acres



State Michigan | **County** Antrim | **Permit Number**

Surface Location Description
___ 1/4 of ___ 1/4 of S 1/4 of SE 1/4 of Section 14 Township 30N Range 5W

Locate well in two directions from nearest lines of quarter section and drilling unit

Surface Location 495 ft. frm (N/S) S Line of quarter section
and 132 ft. from (E/W) E Line of quarter section.

TYPE OF AUTHORIZATION
- [x] Individual Permit
- [ ] Area Permit
- [ ] Rule

Number of Wells 1

WELL ACTIVITY
- [x] CLASS I
- [ ] CLASS II
  - [ ] Brine Disposal
  - [ ] Enhanced Recovery
  - [ ] Hydrocarbon Storage
- [ ] CLASS III

Lease Name ____ Well Number Beeland Disposal No. 1

CASING AND TUBING RECORD AFTER PLUGGING

SIZE	WT (LB/FT)	TO BE PUT IN WELL (FT)	TO BE LEFT IN WELL (FT)	HOLE SIZE
13 3/8"	61#	--	175	driven
9 5/8"	36#	--	950	12 1/4"
7"	26#	--	2130	8 1/2"

METHOD OF EMPLACEMENT OF CEMENT PLUGS
- [ ] The Balance Method
- [ ] The Dump Bailer Method
- [ ] The Two-Plug Method
- [x] 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	6 1/4"	7"	7"				
Depth to Bottom of Tubing or Drill Pipe (ft	2450, TD	2150	2100				
Sacks of Cement To Be Used (each plug)	48	7	291				
Slurry Volume To Be Pumped (cu. ft.)	74	11	451				
Calculated Top of Plug (ft.)	2150	2100	surface				
Measured Top of Plug (if tagged ft.)	--	--	--				
Slurry Wt. (Lb./Gal.)	14.1	14.1	14.1				
Type Cement or Other Material (Class III)	A, 4% be	A, 5% be	A, 5% be				

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

From	To	From	To
none			

Estimated Cost to Plug Wells
Estimated cost of workover rig, cement and equipment: $26,700.00 DRAFT

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)*	Signature	Date Signed
Joseph Tomasik, Vice President	Joseph P Tomasik	10/05/2006

EPA Form 7520-14 (Rev. 8-01)

B.2. A calculation of the area of review in the injection interval over the anticipated life of the well. "Area of review" means either of the following:

A. For a well disposing of non-hazardous waste, that area the radius of which is the greater of 1/4 mile or the lateral distance in which the pressures in the injection zone are sufficient to increase hydrostatic head in the injection zone above the base of the lowermost underground source of drinking water, but not more than 2 miles.

B. For a well disposing of hazardous waste that area the radius of which is the greater of 2 miles or the lateral distance in which the pressures in the injection zone are sufficient to increase hydrostatic head in the injection zone above the base of the lowermost underground source of drinking water.

The radius of investigation used in this permit request has been based on standard practices applied historically in Michigan. The area of review (AOR) for this non-hazardous injection well has been defined as the maximum fixed radius of two-miles for the evaluation of all non-fresh water penetrations. This distance is substantially greater than the calculated cone-of-influence (COI) for operation of the proposed well as an injector. A fixed radius of one-quarter mile for the circumscribing area around the disposal well has been defined for the evaluation of fresh-water artificial penetrations. Area of review radii have been applied from the property boundaries for the well facility. Fresh water well data for penetrations located within the area around a ¼-mile radius have been identified from state files and submitted. Maps generated from Michigan Department of Environmental Quality (MDEQ) data have been submitted to summarize these data. See Figure 4 at the end of Section A.4 for a summary of shallow fresh water penetrations and Figure 6 at the end of Section A.4 for a summary of all deep penetrations.

The cone-of-influence for injection is defined as that area around a well within which increased injection zone pressures caused by injection could be sufficient to drive fluids into an underground source of drinking water (USDW). The pathway for this theoretical fluid movement is assumed to be a hypothetical, open abandoned well which penetrates the confining zone for injection. Information used in the following calculations has been estimated from logs and available neighboring well information summarized in this document.

Critical Pressure Rise

To calculate the COI, a value must first be assigned for the pressure increase in the injection interval that would be sufficient to cause injection zone brine to rise in an open pathway to the base of the lowermost USDW. This critical pressure rise, Pc, is assigned as indicated in Figure 8, below.

The pressure required at the top of the injection interval to support injection zone brine in the configuration indicated is, in psi units:

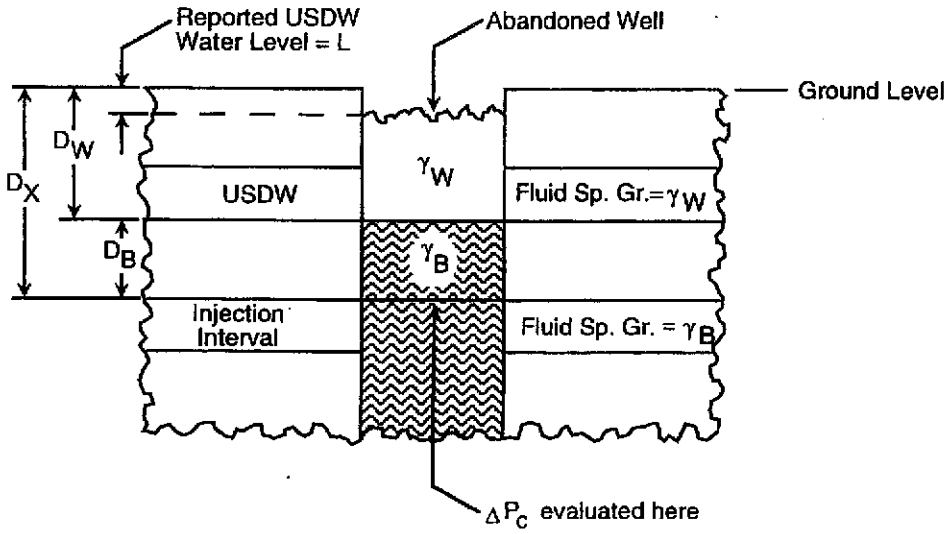
$$P = 0.433\ [\gamma_B D_B + \gamma_w(D_w - L)]$$

where: $D_B = D_x - D_w$

and the pressure rise is then:

$$Pc = 0.433\ [\gamma_B D_B + \gamma_w(D_w - L)] - Po$$

FIGURE 8 CRITICAL PRESSURE RISE



where Po is the original, pre-injection value for pressure at the top of the injection interval expressed in psi units.

Original pressure in the Dundee has been estimated from typical fluid gradients found in northern Michigan for this formation. For the estimated top of the

injection interval of 2,150 feet, a gradient of 0.35 psi/ft yields a pressure of 752 psi at the top of the Dundee.

In assigning the critical pressure rise and calculating the cone-of-influence at this site, the base of the lowermost USDW has been conservatively assigned as 900 feet. The lowest potentiometric surface of the water table within 2 miles of the Beeland well is projected to be closer than 100 feet from ground level. In these calculations, it is assumed that the water table is at approximately 200 feet below ground level, which is larger than anticipated drawdown, and is deeper that the total depth of most water wells in the area. Critical calculation parameters are presented in Table 2, below.

TABLE 2 CRITICAL PRESSURE CALCULATION PARAMETERS

Parameter	Value
Original pressure, Po	752 psi @ 2150 feet
Depth to base of USDW, D_w	900 feet
Depth to top of injection zone, D_X	2150 feet
Depth to USDW fluid level, L	200 feet
Density of USDW fluids, y_w	1.0
Density of injectate or injection zone brine, y_B	1.05

These values were used in the above equation to compute the critical pressure rise as follows:

$$Pc = 0.433[1.05(2150-900) + 1.0(900-200)] - 752 \text{ psi}$$

or:

$$Pc = 119 \text{ psi}$$

Cone-of-Influence

Based on the calculated value for the critical pressure rise, the cone-of-influence can be calculated for the Beeland well over a twenty-year period of injection. At the proposed Beeland well, there is projected to be no cone-of-influence for continuous injection at a rate of 200 gpm (6,857 bwpd). This value can be confirmed by examination of the following calculation (oilfield units) of pressure rise in the reservoir at a distance of five feet from the injection well:

$$dP = -70.6\ Bq\mu\ /kh * \ln ([\ 1{,}688\ \phi\ \mu c_t r^2\ /kt\ ] - 2s)$$

where the values listed in Table 3 have been assigned based on site-specific information.

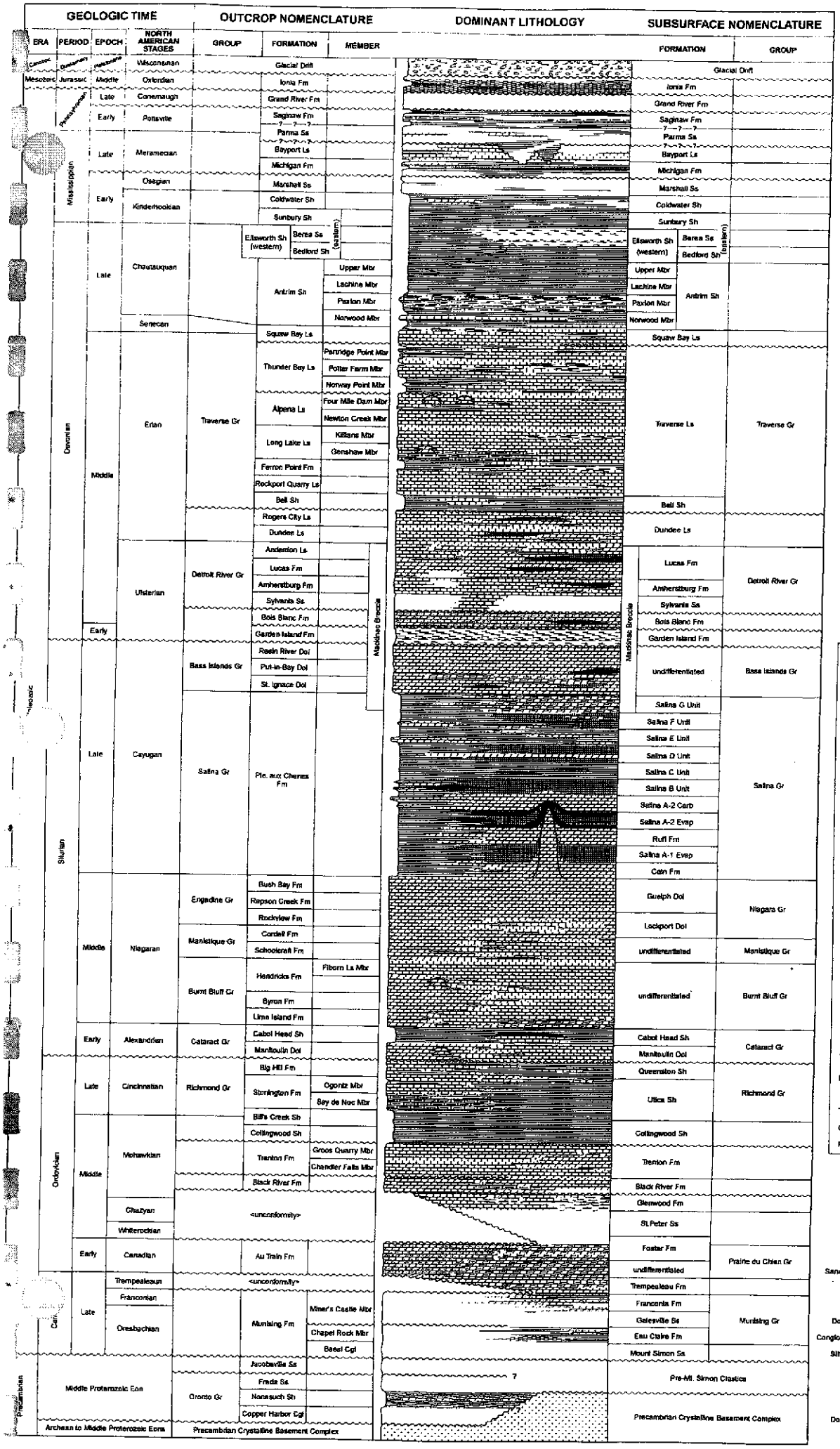
The above calculation for pressure rise due to twenty years of injection at a rate of 200 gpm yields an increase of approximately 115 psi. This value is smaller than the conservatively calculated critical pressure, Pc, of 119 psi which would be necessary before there is potential for upward fluid movement to the base of a USDW if an open pathway were present. Therefore the cone-of-influence at this site is less than 5 feet, even under a conservative scenario. Due to the relatively high permeability and relatively low original pressure of the Dundee Limestone injection formation at this site, there exists no potential for contamination of USDW resources due to improperly completed or abandoned wells within the statutory minimum 2-mile radius area of review.

TABLE 3 CONE-OF-INFLUENCE PARAMETERS

Parameter	Calculation	Value
Flow rate, q	200 gpm *1440 min/day* bbl/42 gal	6,857 bbl/d
Thickness, h	-	100 feet
Formation Volume Factor, B	-	1.015
Porosity, ϕ	-	0.10
Permeability, k	-	1,000 millidarcies
Viscosity, μ	-	1.05 centipoise @ 72 degrees F
Total Compressibility, C_t	3.2×10^{-6} psi^{-1} + 4.8×10^{-6} psi^{-1}	8×10^{-6} psi^{-1}
Radius, r	-	5 feet
Time, t	20 years x 365.25 days/yr * 24hr/day	175,320 hours

B.3. A discussion of the affect of injection on the present and potential mineral resources in the area of review.

Mineral resources in the AOR may include natural gas reservoirs within the Antrim Shale and/or Traverse Limestone. Figure 9 at the end of this Section (B.3) presents the stratigraphic column in the area, and shows the proximity of these potential gas bearing zones to the injection zone. As shown in this Figure and as verified through well construction (Figure 7, Section A.11), the Disposal Well will be cased and cemented through both the Antrim and Traverse Limestone prior to drilling to the Dundee. This action will sufficiently isolate these potential gas bearing zones, so the well will have no affect on the zones during drilling. Regular mechanical integrity testing and monitoring will verify proper well function during waste injection, also ensuring that zones with potential mineral resources are unaffected by well operations. Well abandonment, upon cessation of the use of the well for injection will be performed in accordance with applicable state and federal regulations.



STRATIGRAPHIC NOMENCLATURE FOR MICHIGAN

Michigan Dept. of Environmental Quality
Geological Survey Division
Harold Fitch, State Geologist
and
Michigan Basin Geological Society

Stratigraphic Nomenclature Project Committee:
Dr. Paul A. Catacosinos, Co-chairman
Mr. Mark S. Wollensak, Co-chairman

Principal Authors:
Dr. Paul A. Catacosinos
Dr. William B. Harrison III
Mr. Robert F. Reynolds
Dr. David B.Westjohn
Mr. Mark S. Wollensak

2000

Acknowledgements

This work is the product of the combined efforts of the geological communities of Michigan and the surrounding states and provinces. Below are given just a representative few of the contributors:

Academia: Dr. Auriel T. Cross, Michigan State University; Dr. Robert H. Dott, Jr., University of Wisconsin; Mr. William D. Everham, Ph.D. Candidate, Michigan Technological University.

Government: Dr. Terry R. Carter, Ontario Ministry of Natural Resources; Mr. John M. Esch, Michigan Department of Environmental Quality; Dr. Brian D. Keith, Indiana Geological Survey; Mr. Lawrence H Wickstrom, Ohio Geological Survey.

Industry: Mr. Donald J. Bailey, Consultant; Mr. Jimmy R. Myles, Scot Energy; Mr. Dan E. Pfeiffer, Pfeiffer Exploration Services.

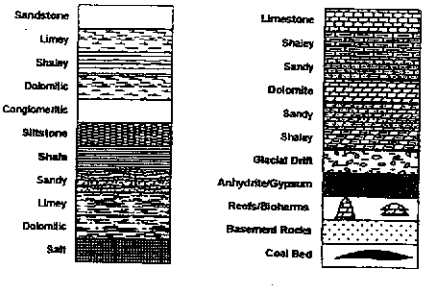
A complete listing of all contributors will be found in the Stratigraphic Lexicon for Michigan, of which this column is an integral part.

RELATED TERM CORRELATION

STRATIGRAPHIC POSITION	RELATED TERMS
Ionia Fm	Jurassic Red Beds
Michigan Fm	Clare Dolomite, Brown Lime, Stray Dolomite, Stray Sandstone, Stray-Stray Sandstone, Stray-Sany-Stray Sandstone, Triple Gyp
Coldwater Sh	Coldwater Red Rock, Speckled Dolomite, Weir Sand
Antrim Sh	Charlton Black Shale Member, Ellsrim, Chester Black Shale Member, Upper Black Shale, Light Antrim, Lower Black, Lower Antrim Middle Antrim, Middle Gray Antrim, Dark Antrim, Middle Gray Shale, Unit 1A, Unit 1B, Unit 1C, Crappo Creek Grey Shale Member
Dundee Ls	Read City Member/Dolomite/Anhydrite
Lucas Fm	Frier Sandstone, Hamer Member, Nobi Member, Massive Salt/Anhydrite, Sour Zone, Big Anhydrite, Richfield Zone/Member/Sandstone, Big Salt
Amherstburg Fm	Filer Sandstone, Meldrum Member, Black Lime
St. Ignace Dolomite	Salina H Unit
Salina B Unit	Big Salt, B Salt
Ruff Formation	Salina A-1 Carbonate, Rabbit Ears Anhydrite,
Cain Fm	Salina A-0 Carbonate
Guelph Dolomite	Brown Niagara, Niagaran Reef, Pinnacle Reef, Engadine Dolomite
Lockport Dolomite	Gray Niagara, White Niagara
Burnt Bluff Gr	Clinton Formation
Trenton Fm	Cap Dolomite
Black River Fm	Van Wert Zone, Sneaky Peak, Black River Shale
Glenwood Fm	Goodwell Unit, Zone of Unconformity
St. Peter Sandstone	Bruggers Sandstone, Jordan Sandstone, Knox Sandstone, Massive Sand
Prairie du Chien Gr	Foster Formation, New Richmond Sandstone, Lower Knox Carbonate, St. Lawrence Formation, TPDC, Oneota Dolomite, Brazna Shale
Trempealeau Fm	Lodi Formation
Galesville Ss	Dresbach Sandstone
Pre-Mt. Simon Clastics	Precambrian "Red Beds"

Figure 9

LEGEND



B.4. A plat which shows the location and total depth of the proposed well, shows each abandoned, producing, or dry hole within the area of influence, and each operator of a mineral or oil and gas well within the area of influence.

Figures 4 and 6 show the location of water wells and oil and gas wells in the vicinity of the proposed Disposal Well, as presented in Section A.4.

B.5. If a well is proposed to be converted to a disposal well, a copy of the completion report, together with the written geologic description log or record and borehole and stratum evaluation logs for the well.

Conversion of an existing well is not proposed. Upon installation of the new well, copies of the written geologic description and all log data collected from the well will be submitted to MDEQ.

B.6. Plugging records of all abandoned wells and casing, sealing, and completion records of all other wells and artificial penetrations within the area of influence of the proposed well location and a map identifying all such artificial penetrations. An applicant shall also submit a plan reflecting the steps or modifications believed necessary to prevent proposed injected waste products from migrating up, into, or through inadequately plugged, sealed, or completed wells.

Topographic Map

A copy of the USGS Topographic map available from the area of review with the outline of the minimum two-mile radius area of review and an injection well symbol representing the facility superimposed on the map is included as Figure 3 (see Section A.4).

This topographic map extends in excess of 1 mile beyond the Beeland site in all directions. The Beeland property encompasses an irregular rectangular area of approximately 60 acres in the southeast quarter of Section 14. In addition, the map shows the location of all known surface bodies of water, springs, mines, quarries, residencies and roads. Separate additional maps submitted in this Response present water wells and deeper artificial penetrations. A listing of neighboring property owners within a ½ mile radius has been also been developed and submitted with this application for the well permit. No known hazardous waste treatment storage or disposal facilities are present within the AOR based on available state of Michigan permit information.

Artificial Penetrations

There are a number of artificial penetrations identified in the area of review conducted for a two-mile radius surrounding the proposed Beeland disposal well. However, a vast majority of the wells permitted and/or drilled in the vicinity of the Beeland well only penetrate the Antrim shale for the purpose of gas production. These wells are typically drilled to a depth of between 1,250 and 1,750 feet below ground level (BGL) and are not potential pathways for fluid migration out of the permitted injection zone, since they do not penetrate through the confining, arrestment or injection intervals. An examination of all available records at the Michigan Department of Environmental Quality (MDEQ) has been accomplished as of October 2006 to evaluate these wells. Data for all deep wells which have been drilled within a two-mile radius of the Beeland well are summarized in the Tables 4 and 5 and copies of pertinent MDEQ completion or plugging records regarding wells which penetrate into the injection interval of the proposed Beeland well are also presented at the end of this section and in Attachment C.

Figure 6 (Section A.4), a map generated with the PETRA software program from data provided by the state of Michigan in October of 2006, shows the location of all non-fresh water artificial penetrations in the state oil and gas well database within the required two-mile AOR. Permit numbers are shown at each well symbol. The Proposed Beeland Well No. 1 is designated as an injection well (also labeled with the well name), and is located in the southeast quarter of Section 14. General geographic features and the outline of the required two-mile AOR are also shown on the map. Index lines showing cross sections are also shown, with summaries of relevant formation tops from the MDEQ database. The "legend" on this map contains pertinent information designating all other wells with the area of review.

Figure 4 (Section A.4), a map modified from data generated by the state of Michigan in October of 2006, presents the location of all local freshwater well penetrations in the state water well database. Note that fresh water penetrations in the area of review typically range from approximately 50 to 200 feet, and are not critical with regard to the fluid injection at the Proposed Well No. 1. Copies of selected water well records for freshwater penetrations are submitted here.

According to the MDEQ records, there are 109 wells located within the two-mile AOR. Only four of these wells penetrated into the Bell Shale or the Dundee Limestone. Three of these penetrations are active Class II brine disposal wells (#41955, #42680, and #46244), and one well was plugged in 1969 as a dry hole (#27750). The remaining 105 wells only penetrate to the Antrim or Traverse Group, and do not penetrate the arrestment or injection interval for the proposed Beeland well. There have been no Class I disposal wells drilled within the area of review. Well #27750 in Section 26 of T30N-R5W, which had been listed as a dry Niagaran exploratory well with a TD of 6,550 feet, was plugged according to applicable state standards and a plugging record is available for this well. The Dundee is isolated from deeper formations by cement plugs, and is isolated from shallower formations by multiple cement plugs and cemented casing that was left in the well. Class II brine disposal wells (#41955, #42680, and #46244), are each completed according to current state and federal regulatory requirements and have long-string casing cemented to isolate the Dundee injection interval from overlying formations and fresh water resources. Records for Permit #56773 in Section 10 of T30N R5W are presented showing that the formation at TD is the Traverse Limestone despite a total depth of 2,200' reported in the MDEQ database.

Due to the small pressure rise associated with projected injection activities and the corresponding limited cone-of-influence, it is noted that none of the wells within the regulatory minimum two-mile AOR could have the potential for causing any endangerment to USDW resources in the vicinity.

Corrective Action

A corrective action plan is not required for any of the artificial penetrations within the proposed Beeland well AOR because, based on calculations, there is no cone-of-influence and there are no artificial penetrations to the injection zone within the area of review that have the potential for allowing injection activities to have an impact on the USDW. If a corrective action plan for any neighboring well becomes necessary in the future, it will be developed according to appropriate regulatory standards and guidelines.

The corrective action plan which would be proposed by Beeland, should the potential for fluid migration to occur through the confining layer develop via any future well, will include the following:

1. Beeland Group, LLC injection well will be shut-in.
2. The USEPA, Region 5 UIC Section and the MDEQ will be notified.
3. Following well shut-in, waste will be shipped to alternative permitted facilities for off-site treatment and/or disposal as necessary.
4. A contingency plan will be prepared as follows:
   a. Locate well and identify present operator or owner, if any.
   b. Identify mode of failure.
   c. Prepare remedial plan outlining course of action.
   d. The remedial plan will be submitted to the USEPA, Region 5 and MDEQ for approval.
   e. Upon authorization, the remediation plan will be implemented.

Area of Review Oil and Gas Well Data

Data regarding artificial penetrations collected for wells within the area of review have been categorized and are listed by well type. Oil and gas industry (non-fresh water) well locations are shown on Figure 6 (See Section A.4). Oil and gas permitted wells drilled into or deeper than the injection zone and subsequently abandoned, wells drilled through the injection zone that are still active producers, and temporarily abandoned wells that penetrate to the injection zone are listed in Table 4. Wells are labeled with MDEQ permit numbers. Following this table is a listing of oil and gas wells permitted by the MDEQ that have been drilled to depths, which do not penetrate the injection zone (Table 5). Typically, these wells are Antrim gas wells that reached a total depth within the Antrim Shale or the top of the Traverse Limestone. Data presented in this table regarding wells within the area of review include MDEQ permit number, location, total depth, status, construction, and completion or plugging date. Figures 10 through 13 at the end of this Section (B.6) present summaries of the wellbore configurations for each of the wells that penetrate to the proposed injection interval.

Copies of well records are presented in Attachment C for all non-freshwater penetrations that reached the top of the arrestment interval (Bell Shale) within the area of review.

TABLE 4 ARTIFICIAL PENETRATIONS: MDEQ OIL & GAS PERMITS WELLS PENETRATING TO INJECTION ZONE IN AOR

MDEQ Permit #	Location (T-R)	Section	Well Status	Formation at TD	Total Depth (ft. BGL)	Date of Completion or Plugging
27750	30N-5W	26	Dry	CABOT HEAD	6550	08-Oct-69
41955	30N-5W	23	SWD	DUNDEE	2114	16-May-89
42680	30N-4W	19	SWD & Gas	DETROIT RIVER	2472	14-Dec-00
46244	30N-5W	1	SWD	DETROIT RIVER ANHY	2315	10-Nov-92

Notes:
Date Completion or plugging
dry Dry hole, plugged
swd Class II brine disposal well
& Gas Dual completion to also produce Antrim gas

TABLE 5 ARTIFICIAL PENETRATIONS: MDEQ OIL & GAS PERMITS SHALLOW AND ANTRIM WELLS IN AOR

MDEQ Permit #	Location (T-R)	Section	Well Status	Formation at TD	Total Depth (ft. BGL)
18385	30N-5W	25	Dry Hole	TRAVERSE LIMESTONE	1442
41904	30N-4W	18	Natural Gas Well	ANTRIM	1167
41906	30N-4W	18	Natural Gas Well	ANTRIM	1251
41907	30N-4W	18	Natural Gas Well	ANTRIM	1182
41908	30N-4W	18	Natural Gas Well	ANTRIM	1183
41909	30N-4W	18	Natural Gas Well	ANTRIM	1185
41910	30N-5W	23	Natural Gas Well	ANTRIM DARK	1241
41911	30N-5W	23	Natural Gas Well	ANTRIM DARK	1207
41912	30N-5W	23	Natural Gas Well	ANTRIM	1185
41913	30N-5W	23	Natural Gas Well	ANTRIM DARK	1195
41914	30N-5W	23	Natural Gas Well	TRAVERSE LIMESTONE	1376

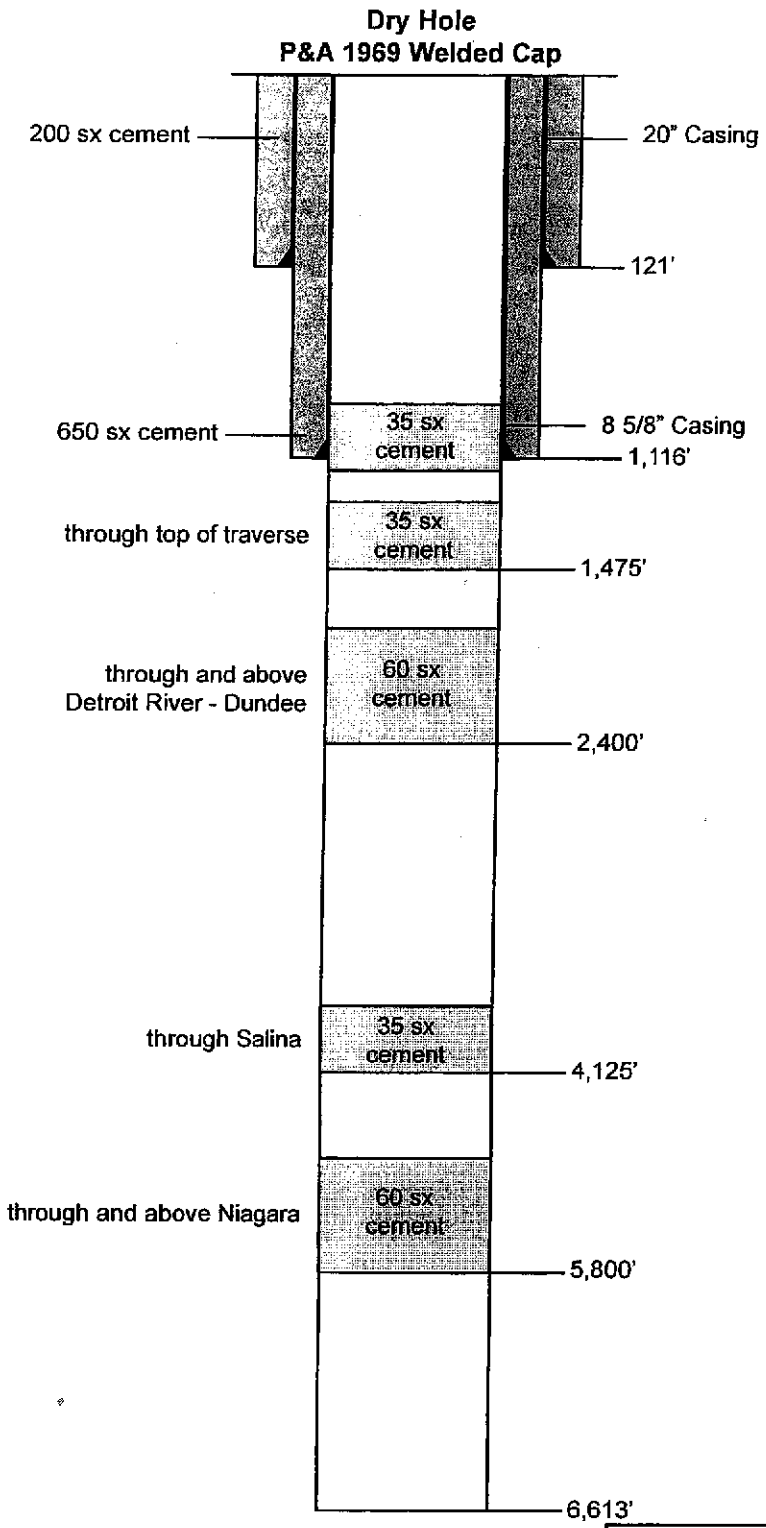
MDEQ Permit #	Location (T-R)	Section	Well Status	Formation at TD	Total Depth (ft. BGL)
41915	30N-5W	23	Natural Gas Well	ANTRIM DARK	1193
41916	30N-5W	23	Natural Gas Well	ANTRIM DARK	1205
41917	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1432
41918	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1389
41919	30N-5W	14	Natural Gas Well	ANTRIM DARK	1193
41920	30N-5W	14	Natural Gas Well	ANTRIM DARK	1218
41921	30N-5W	23	Natural Gas Well	TRAVERSE LIMESTONE	1394
41922	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1368
41923	30N-5W	13	Natural Gas Well	ANTRIM DARK	1190
41924	30N-5W	13	Natural Gas Well	ANTRIM DARK	2101
41925	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1390
41926	30N-5W	24	Natural Gas Well	ANTRIM DARK	1188
41927	30N-5W	24	Natural Gas Well	ANTRIM DARK	1172
42069	30N-5W	23	Natural Gas Well	ANTRIM	1187
42162	30N-5W	14	Natural Gas Well	ANTRIM DARK	1214
42681	30N-4W	19	Natural Gas Well	TRAVERSE FORMATION	1341
43538	30N-4W	30	Natural Gas Well	TRAVERSE LIMESTONE	1384
43539	30N-4W	30	Natural Gas Well	ANTRIM	1222
43597	30N-4W	19	Natural Gas Well	TRAVERSE LIMESTONE	1397
43598	30N-4W	19	Natural Gas Well	TRAVERSE LIMESTONE	1368
43600	30N-4W	30	Natural Gas Well	TRAVERSE LIMESTONE	1367
43601	30N-4W	30	Natural Gas Well	TRAVERSE LIMESTONE	1395
43602	30N-4W	30	Natural Gas Well	TRAVERSE LIMESTONE	1415
43603	30N-4W	19	Natural Gas Well	TRAVERSE FORMATION	1344
43606	30N-4W	19	Natural Gas Well	TRAVERSE FORMATION	1332
43608	30N-4W	19	Natural Gas Well	TRAVERSE LIMESTONE	1402
43609	30N-4W	19	Natural Gas Well	TRAVERSE FORMATION	1353
46241	30N-5W	1	Natural Gas Well	TRAVERSE LIMESTONE	1385
46496	30N-5W	2	Natural Gas Well	TRAVERSE LIMESTONE	1360
46498	30N-5W	11	Natural Gas Well	TRAVERSE LIMESTONE	1368
46499	30N-5W	11	Natural Gas Well	TRAVERSE LIMESTONE	1405
46505	30N-5W	2	Natural Gas Well	TRAVERSE LIMESTONE	1429
47373	30N-5W	25	Natural Gas Well	TRAVERSE LIMESTONE	1469
47606	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1408
47607	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1398

MDEQ Permit #	Location (T-R)	Section	Well Status	Formation at TD	Total Depth (ft. BGL)
47608	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1399
47609	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1411
47655	30N-5W	3	Natural Gas Well	TRAVERSE LIMESTONE	1411
47717	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1329
47718	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1358
50459	30N-5W	15	Natural Gas Well	TRAVERSE LIMESTONE	1324
52031	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1407
52467	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1385
52468	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1387
52469	30N-5W	14	Natural Gas Well	TRAVERSE LIMESTONE	1422
52470	30N-5W	15	Natural Gas Well	TRAVERSE LIMESTONE	1405
52471	30N-5W	15	Natural Gas Well	TRAVERSE LIMESTONE	1398
52472	30N-5W	22	Natural Gas Well	TRAVERSE LIMESTONE	1366
52480	30N-5W	13	Natural Gas Well	TRAVERSE LIMESTONE	1354
52540	30N-5W	15	Natural Gas Well	TRAVERSE LIMESTONE	1400
52953	30N-5W	11	Natural Gas Well	TRAVERSE LIMESTONE	1410
52954	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1357
52955	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	1419
52956	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1370
53654	30N-5W	22	Natural Gas Well	TRAVERSE LIMESTONE	1403
53664	30N-5W	24	Natural Gas Well	TRAVERSE LIMESTONE	1376
53665	30N-5W	24	Natural Gas Well	TRAVERSE LIMESTONE	1378
53666	30N-5W	24	Natural Gas Well	TRAVERSE LIMESTONE	1379
53667	30N-5W	23	Natural Gas Well	TRAVERSE LIMESTONE	1418
53726	30N-5W	27	Natural Gas Well	TRAVERSE LIMESTONE	1397
53727	30N-5W	27	Natural Gas Well	TRAVERSE LIMESTONE	1411
53728	30N-5W	22	Natural Gas Well	TRAVERSE LIMESTONE	1389
53729	30N-5W	28	Natural Gas Well	TRAVERSE LIMESTONE	1382
53730	30N-5W	27	Natural Gas Well	TRAVERSE LIMESTONE	1395
53731	30N-5W	23	Natural Gas Well	TRAVERSE LIMESTONE	1388
53732	30N-5W	27	Natural Gas Well	TRAVERSE LIMESTONE	1395
53733	30N-5W	22	Natural Gas Well	TRAVERSE LIMESTONE	1417
53734	30N-5W	22	Natural Gas Well	TRAVERSE LIMESTONE	1403
54380	30N-5W	24	Natural Gas Well	TRAVERSE LIMESTONE	1397
54428	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	1404

MDEQ Permit #	Location (T-R)	Section	Well Status	Formation at TD	Total Depth (ft. BGL)
54429	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1371
54430	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1354
54487	30N-5W	11	Natural Gas Well	TRAVERSE LIMESTONE	1407
54488	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1351
54489	30N-5W	12	Natural Gas Well	TRAVERSE LIMESTONE	1378
54601	30N-4W	7	Natural Gas Well	TRAVERSE LIMESTONE	1379
54602	30N-4W	7	Natural Gas Well	TRAVERSE LIMESTONE	1371
54603	30N-4W	7	Natural Gas Well	TRAVERSE LIMESTONE	1359
54896	30N-5W	21	Natural Gas Well	TRAVERSE LIMESTONE	1376
54926	30N-5W	26	Natural Gas Well	TRAVERSE LIMESTONE	1423
55014	30N-5W	9	Natural Gas Well	TRAVERSE LIMESTONE	1367
55138	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	1428
55139	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	1449
55141	30N-5W	16	Natural Gas Well	TRAVERSE LIMESTONE	1286
55142	30N-5W	16	Natural Gas Well	TRAVERSE LIMESTONE	1295
55144	30N-5W	16	Natural Gas Well	TRAVERSE LIMESTONE	1406
55171	30N-5W	21	Natural Gas Well	TRAVERSE LIMESTONE	1437
55172	30N-5W	21	Natural Gas Well	TRAVERSE LIMESTONE	1407
55179	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	1429
55180	30N-5W	15	Natural Gas Well	TRAVERSE LIMESTONE	1367
55581	30N-5W	16	Natural Gas Well	TRAVERSE LIMESTONE	1274
56364	30N-5W	26	Natural Gas Well	TRAVERSE LIMESTONE	1430
56773	30N-5W	10	Natural Gas Well	TRAVERSE LIMESTONE	2200

Water Wells Within ¼ Mile AOR

As shown on Figure B-3, there are four water wells located inside the ¼ mile AOR radius in the available MDEQ databases. Another well likely exists within ¼ mile of the property boundary based on unconfirmed data presented in a previous Class II permit application. No public data is available regarding this well. A copy of data from freshwater wells in the vicinity of the proposed well are presented as part of the characterization of the USDW in the vicinity of the proposed well included in Attachment C.



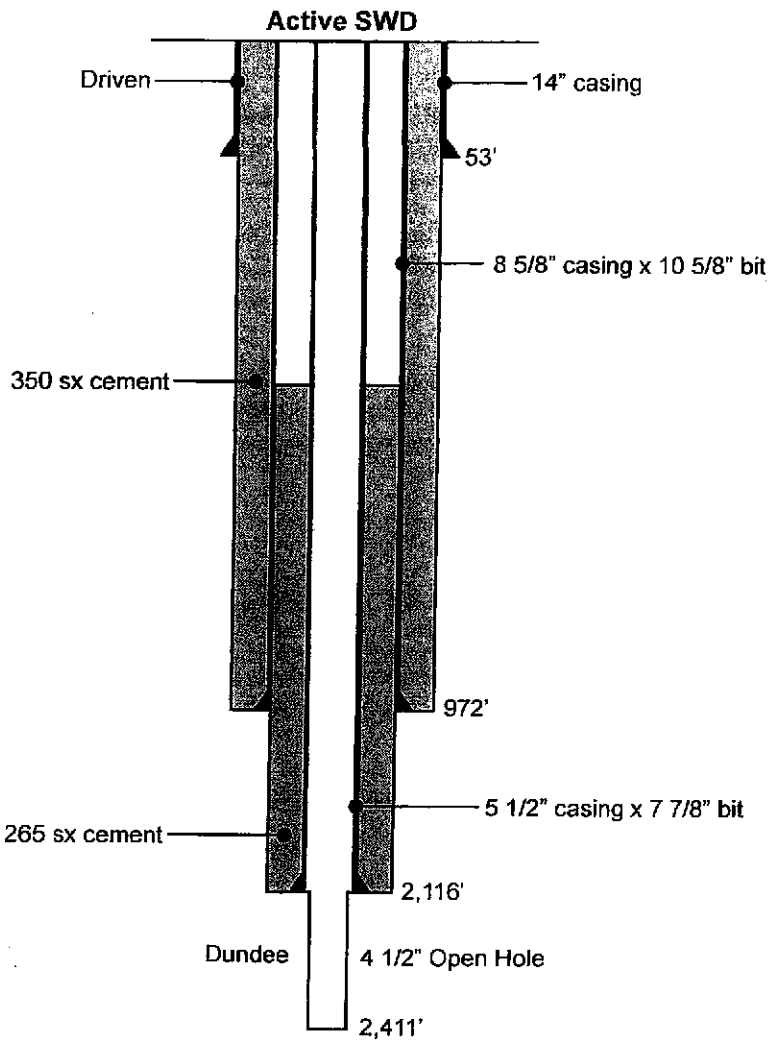
Petrotek Engineering Corporation

Figure 10

Beeland Group, LLC.
Alba, Michigan Facility

AOR WELL SCHEMATIC
WELL # 27750
SHELL OIL; GATES 1-26

SCALE: NONE DATE: 01/07

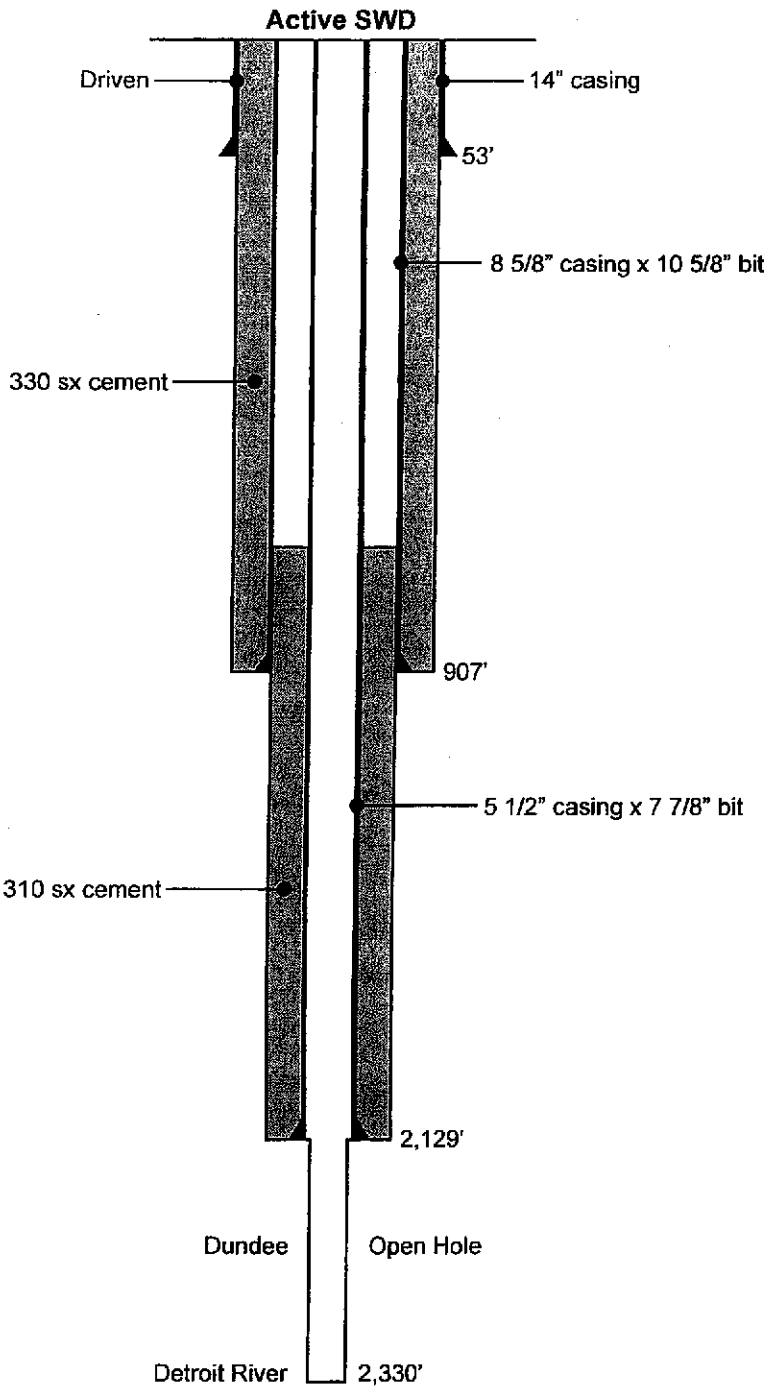


Assume cement yield of only 1.18 ft^3/sx

5.7719 ft/ft^3 * 265 sx * 1.18 ft^3/sx = 1,805 ft

4.7622 ft/ft^3 * 350 * 1.18ft^3/sx = 1,967 ft

Petrotek Engineering Corporation
Figure 11
Beeland Group, LLC. Alba, Michigan Facility
AOR WELL SCHEMATIC WELL # 41955 TERRA; GATES # 1-23 SWD
SCALE: NONE DATE:01/07



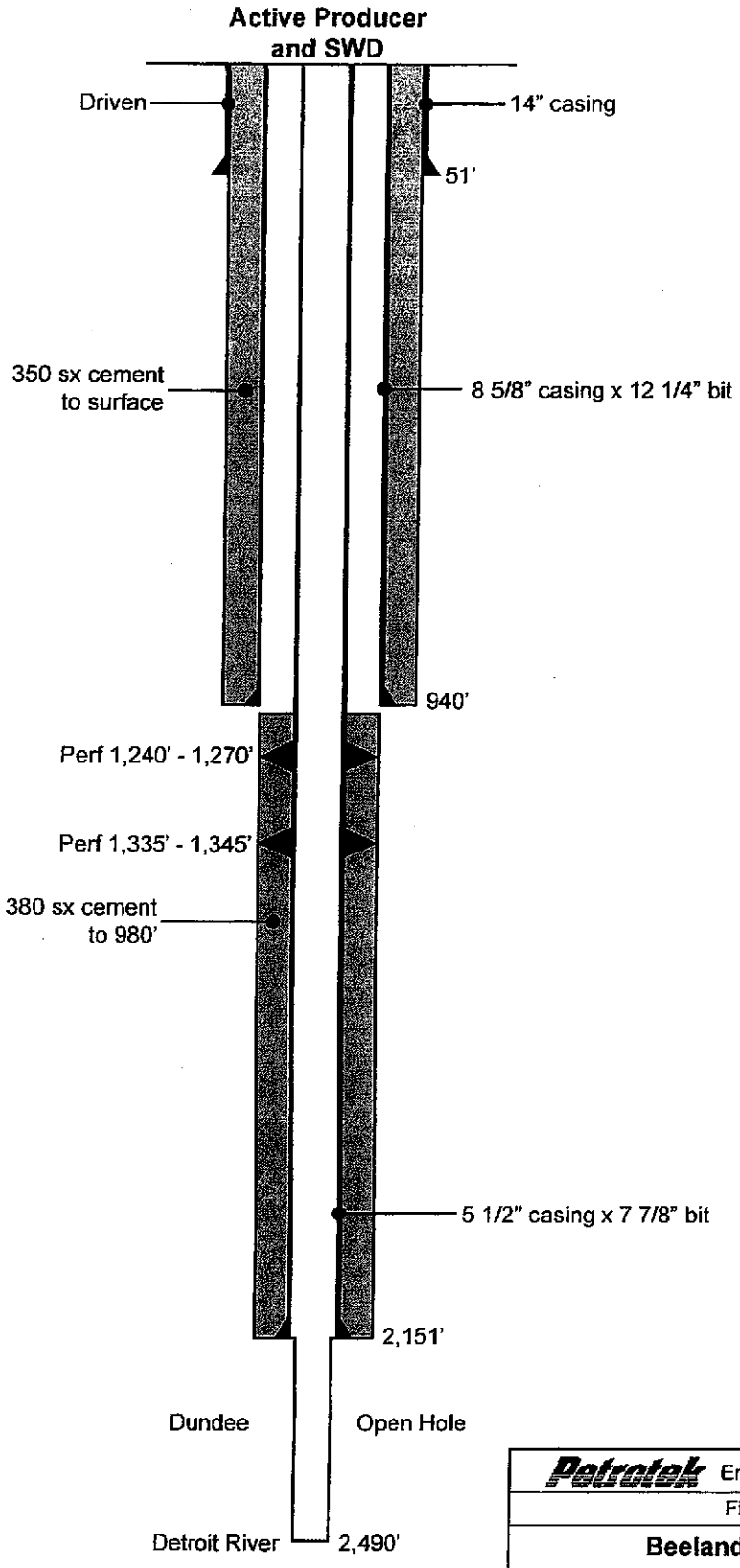
Petrotek Engineering Corporation

Figure 12

Beeland Group, LLC.
Alba, Michigan Facility

AOR WELL SCHEMATIC
WELL # 46244
TERRA; ESTELLE D1-1SWD

SCALE: NONE DATE:01/07



Petrotek Engineering Corporation

Figure 13

Beeland Group, LLC.

Alba, Michigan Facility

AOR WELL SCHEMATIC

WELL # 42680

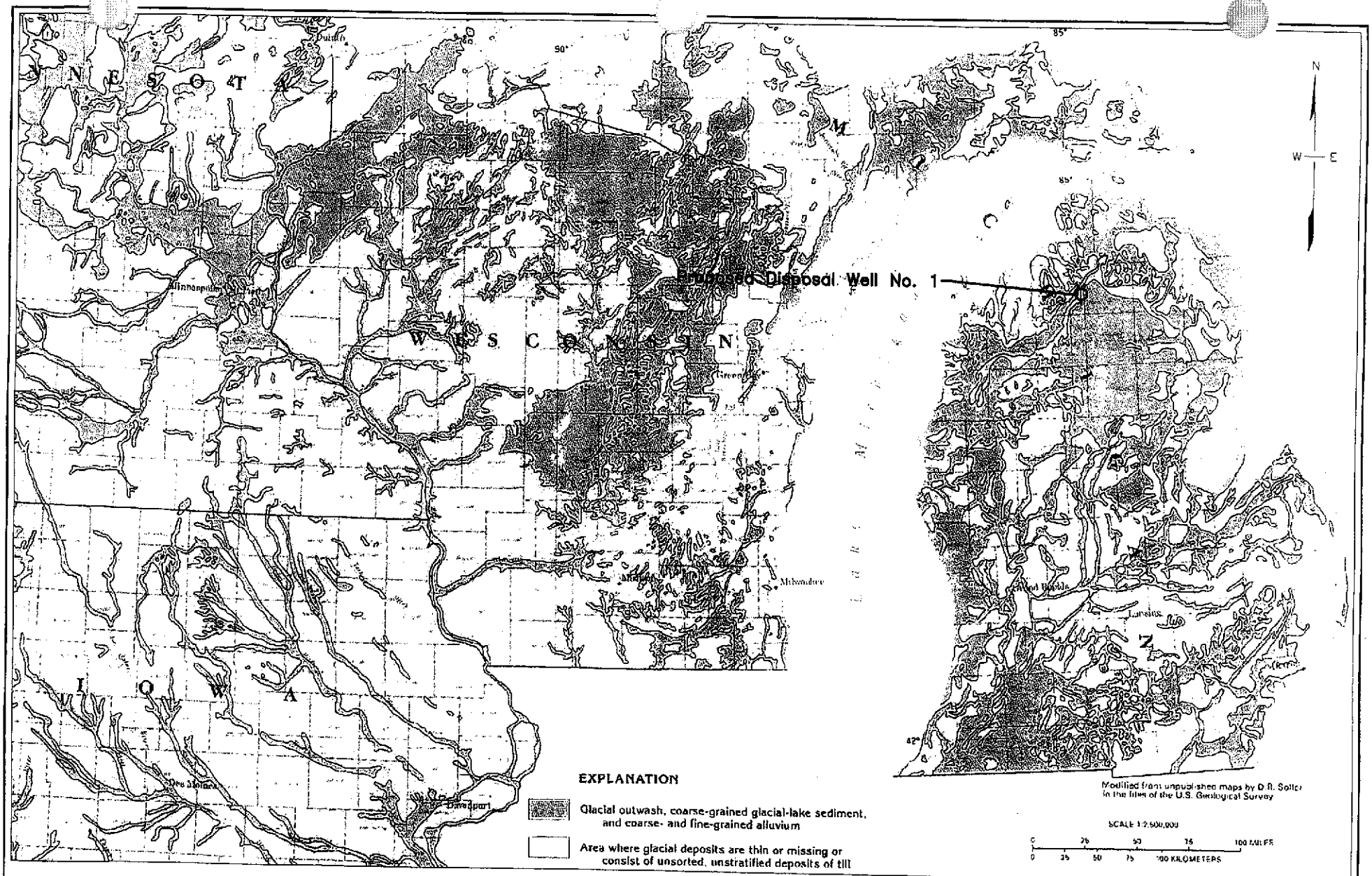
TERRA; CAPLE #1-19

SCALE: NONE DATE:01/07

B.7. A map showing the vertical and areal extent of surface waters and subsurface aquifers containing water with less than 10,000-ppm total dissolved solids. A summary of the present and potential future use of the waters must accompany the map.

Figure 3 (Section A.4) is a topographic map of the disposal well area, and shows there to be no mappable surface water features. Absence of surface water features was verified through survey (Attachment A). Figure 9 (Section B.3) presents the stratigraphic column underlying the Disposal Well area. The Michigan Groundwater Atlas discusses aquifers present in Michigan (Olcott, 1992). Data from this source indicates that the Beeland Site is underlain by the fresh water Glacial Till aquifer, Figure 14 at the end of this Section (B.7), but there are no Cretaceous through Mississippian rocks present due to erosional removal of these units. The next water bearing interval below the Glacial Till is the Siluro-Devonian units, but as shown on Figure 15 at the end of this Section (B.7), this unit exhibits TDS greater than 10,000 ppm in the Disposal Well area.

In Michigan, the Glacial Till and/or unconsolidated material is a source of fresh water for domestic, industrial, and agricultural purposes (Olcott, 1992). Based on available data, this unit is anticipated to be the lowermost USDW. This will be confirmed during installation of the proposed well.



LEGEND

☿ Proposed Disposal Well No. 1

BEELAND GROUP, LLC
ALBA, MICHIGAN FACILITY

FIGURE 14
GLACIAL TILL AQUIFER

PROJECT: 309-1	DATE: JANUARY 2007
Beeland No.1.dwg	BY: KS CHECKED: KC

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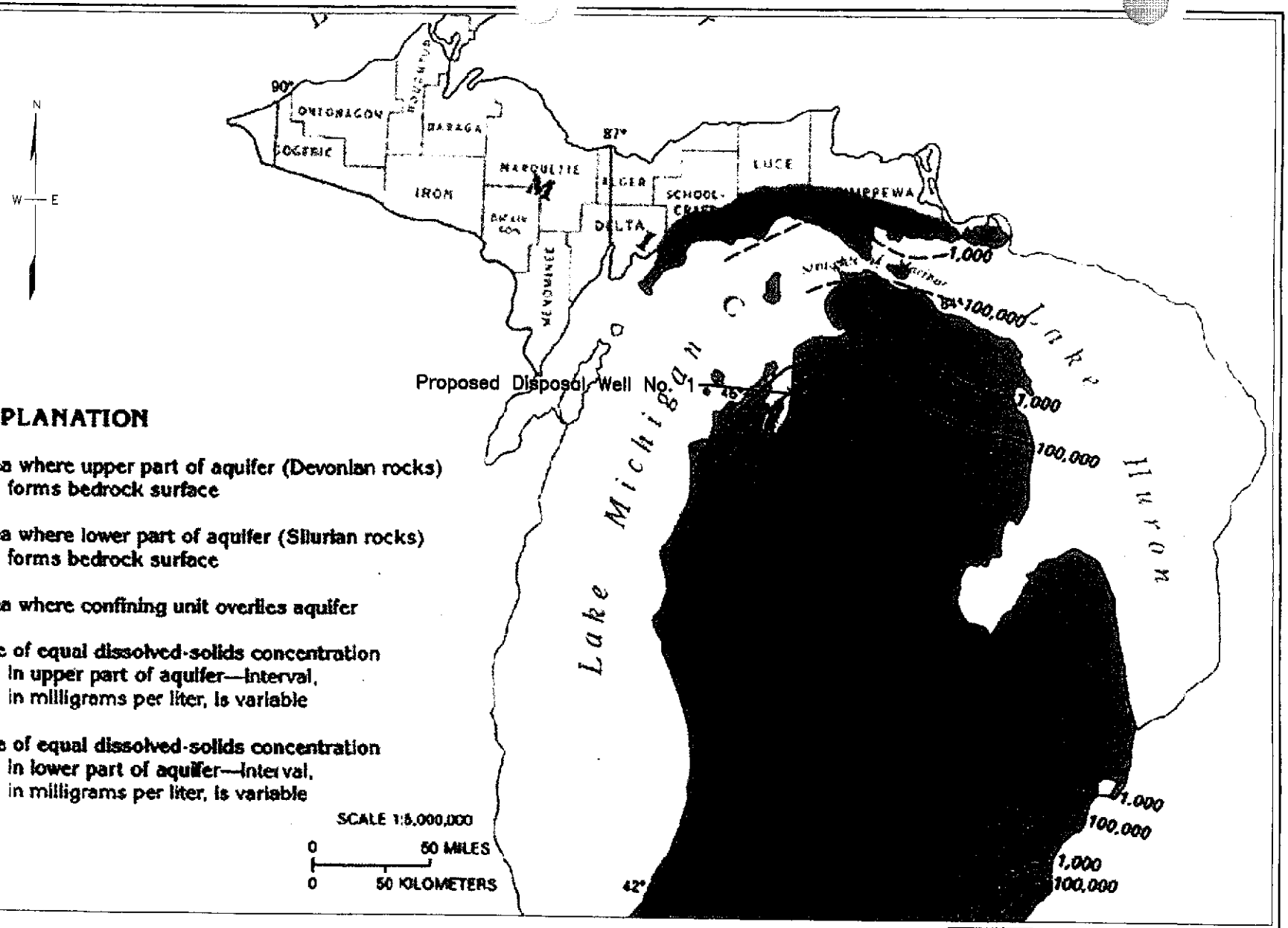
10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127
303-290-9414
www.petrotek.com



LEGEND

Proposed Disposal Well No. 1

Source: USGS 1970 and Western Michigan University, 1981

BEELAND GROUP, LLC
ALBA, MICHIGAN FACILITY

FIGURE 15
WATER QUALITY MAP
SILURO–DEVONIAN SECTION

PROJECT: 309–1	DATE: JANUARY 2007	
Beeland No.1.dwg	BY: KS	CHECKED: KC

Petrotek
10288 West Chatfield Ave., Ste 201
Littleton, Colorado 80127
303-290-9414

B.8. Geologic maps and stratigraphic cross sections of the local and regional geology.

The proposed Beeland Disposal Well No. 1 is to be located in the northwestern Michigan Basin in an area extensively explored for oil and gas resources. A variety of literature and public well data are available regarding the nature of the structure and stratigraphy in Antrim County.

Stratigraphy and Lithology

The strata in this region consist of almost fifteen thousand feet of sandstones, shales, limestones, conglomerates and clays. The relatively extensive knowledge of the deep geology of the northeastern portion of the Michigan Basin is primarily based on data gathered from the installation of many oil and gas exploration wells that have been drilled since the 1920's in this vicinity of Michigan. Figure 9 (Section B.3) presents an MDEQ figure showing the stratigraphic column in Michigan. Table 6 presents a listing of projected depths (BGL) to top of formations based on a ground level of approximately 1,335 feet as determined by interpretation of data from surrounding wells by state of Michigan Geologic and Land Management Division personnel.

TABLE 6. PROPOSED BEELAND NO. 1 WELL PROJECTED FORMATION DEPTH SUMMARY

UNIT	Mich. GLMD (feet) BGL
GLACIAL DRIFT	0
ELLSWORTH*	850-950
ANTRIM – (UPPER MBR)	1,200
TRAVERSE FORMATION	1,350
TRAVERSE LIMESTONE	1,400
BELL SHALE	2,050
DUNDEE	2,150
DETROIT RIVER GROUP	2,350
BASS ISLANDS	3,700

* Coldwater and Sunbury Shales have also been reported in this part of the stratigraphic column

Figures 16 through 19 at the end of this Section (B.8) are presented to provide additional information regarding the regional geologic setting, and the injection

and arrestment intervals. Figures 20 and 21 at the end of this Section (B.8) present local cross-sections to the base of the proposed injection interval based on data from the MDEQ well database. An index of these cross-section orientations is presented in Figure 6 (Section A.4). From the base of the injection zone upward, the following major intervals are anticipated to be penetrated at the Proposed Beeland Well No. 1 location:

Detroit River Group (lower injection and arrestment)

It has been customary to include the Devonian-age Bois Blanc, Sylvania, Amherstburg, Lucas and Anderdon Formations in the Detroit River Group. The base of the openhole completion of the Beeland Well No. 1 will be completed within the Detroit River Group above the top of the Amherstburg Formation. The Amherstburg is typically a dark brown to black carbonaceous limestone. It is poorly bedded, dense and may be up to 200 feet thick in the vicinity of the proposed well. Where dominated by limestone, it is an aquiclude and typically has low effective porosities and permeability. General practice has been to call the portion of the column between the top of the Amherstburg and the base of the Dundee Limestone the "Detroit River" although it is also known as the Lucas and/or Anderdon Formations to the east of the site and includes a wide variety of lithologies and several distinct members. For example, the Richfield Zone has been described as a basal member of the Lucas/Detroit River sequence and is comprised of interbedded limestone dolomite and anhydrite. Above the Richfield is the Massive Anhydrite that is, in turn, overlain by a thick halite-bearing evaporite sequence, the Horner Member of the Lucas Formation. In the vicinity of the Beeland well, the Horner Member likely consists of a series of limestone and anhydrite layers with limited dolomite stringers. The dolomite stringers can have low, but measurable permeability, but the majority of the interval that is comprised of limestone, anhydrite and halite serves as an excellent confining unit. The top of the Detroit River can be difficult to determine both on logs and in samples. In the local vicinity of the Beeland Well No. 1 area, the units immediately below the Dundee (i.e. upper Detroit River of Lucas) have been described as light to dark brown limestones and dolomites that are micro crystalline to very finely crystalline with traces of intercrystalline porosity.

<u>Dundee Limestone (injection interval)</u>
The Devonian age Dundee is predominately a carbonate section ranging from dense, fine-grained, light colored limestones on the east side of the state to coarse-textured bioclastic limestone (with portions secondarily dolomitized) in the central part of the state. The top of the Dundee is easily picked on geophysical logs in the area of the proposed well because the Bell Shale is present. In the vicinity of the Proposed WDW Beeland Well No. 1, the Dundee has been reported as a predominantly limestone formation that ranges from a light to dark brown with a basal dolomite section. Figures 16 and 17 at the end of this Section present regional Dundee information.

Bell Shale (arrestment interval)
The Devonian age Bell Shale is typically a soft, gray, gummy and silty shale containing scattered fossil fragments. In the local vicinity, the Bell Shale is projected to be comprised of almost 75 to 100 feet of medium green to green-gray shale overlain by a sequence that transitions to a limestone and dolomite dominated sequence. Transmissive fractures are not known to be present in this shale.

Traverse Group

The Traverse Group occurs above the Bell shale, and includes what is locally described as the Traverse Limestone and Traverse Formation. Figures 18 and 19 present regional Traverse information. Both formations are described below.

Traverse Limestone
In the western part of the State, the Devonian-age Traverse Limestone is dominantly gray to gray-grown limestone with lesser gray shales. A few anhydrite stringers may also be present. To the east, the Traverse Limestone becomes increasingly shaley, and in southeastern Michigan the unit is composed almost entirely of shale. The Traverse Limestone is a poor marker both on logs and in samples. In the vicinity of the proposed Beeland Well No.1 , the Traverse Limestone is described as a thin buff to brown, medium to very finely crystalline layer that overlies a 350-foot plus clean, thick tan to brown very fine to microcrystalline limestone with a trace crystalline porosity and trace of pyrite.

Traverse Formation
Above the Traverse Limestone is the Traverse Formation, which is comprised of a 50-foot thick interbedded limestone and shale that is described as gray-tan and calcareous. Within the Traverse Formation there exist limestone stringers that may make picking the underling Traverse Limestone difficult, and the Traverse Formation is also sometimes interbedded with the overlying Antrim shale.

Antrim Shale
The Devonian age Antrim Shale is typically a black to brown, brittle, platy shale. It is characterized by high radioactivity and is easily recognized on gamma ray logs, and can be identified on electric logs by its unusually high resistivity. In the southeastern part of the state, several large tongues or interbeds of gray shale are present in the middle part of the Antrim. Locally, near the proposed Beeland Well No. 1 location, the Antrim (sometimes referred to as the Antrim-Dark) is gray-brown to gray-green and blocky, with both silt interbeds and significant limestone interbeds. The upper member of the Antrim is reported as a 100-foot plus thick blocky gray-brown shale, pyritic, with scattered tasmanites.

Devonian-Mississippian Shales

Local geologic data suggest that a shale sequence occurs between the tops of the Antrim and base of the Glacial Drift. Available geologic data indicate that the Ellsworth (Bedford) shale is likely present immediately above the Antrim, and suggest that the Ellsworth may either extend to the Glacial Drift, or may be capped by the Coldwater/Sunbury Shales. Both the Ellsworth and Coldwater/Sunbury are described below, noting that regardless of nomenclature, both units are predominantly shale and provide additional confinement between the Dundee Formation and Glacial till.

Ellsworth (Bedford)

The Devonian Ellsworth is a greenish-gray shale that occurs in the western portion of the state. The Bedford shale occurs in the eastern portion of the state, and may inter-tongue with the Ellsworth Shale in the vicinity of Alba several miles from the proposed Beeland Well No. 1 location. The Bedford is a gray shale immediately overlying the radioactive Antrim shale in the eastern half of the basin. The Bedford has a fairly uniform, moderate shale response on gamma ray curves. Although the Bedford is listed here under the Devonian, it may well be of Mississippian age.

Coldwater and Sunbury Shales

The Mississippian age Sunbury and Coldwater shales are described as two distinct intervals. The Coldwater is locally an interbedded light to medium gray firm, flaky and platy shale with a trace of pyrite and a brown very finely crystalline argillaceous limestone at its base in the vicinity. The deeper Sunbury, where present in the vicinity of the proposed Beeland Well No. 1 location, is likely to be a dark brown firm, brittle, carbonaceous shale with a trace of fluorescence.

Faulting

There is no evidence of significant faulting in the immediate vicinity of the Proposed Beeland Well No. 1. The Hydrogeologic Atlas of Michigan (Plate 16) is referenced regarding this matter. Additionally, Ryder (1996) constructed a structure contour map on the Traverse in Antrim County. This map showed there to be no mappable faults transecting the Traverse at the proposed well location.

Seismic Activity

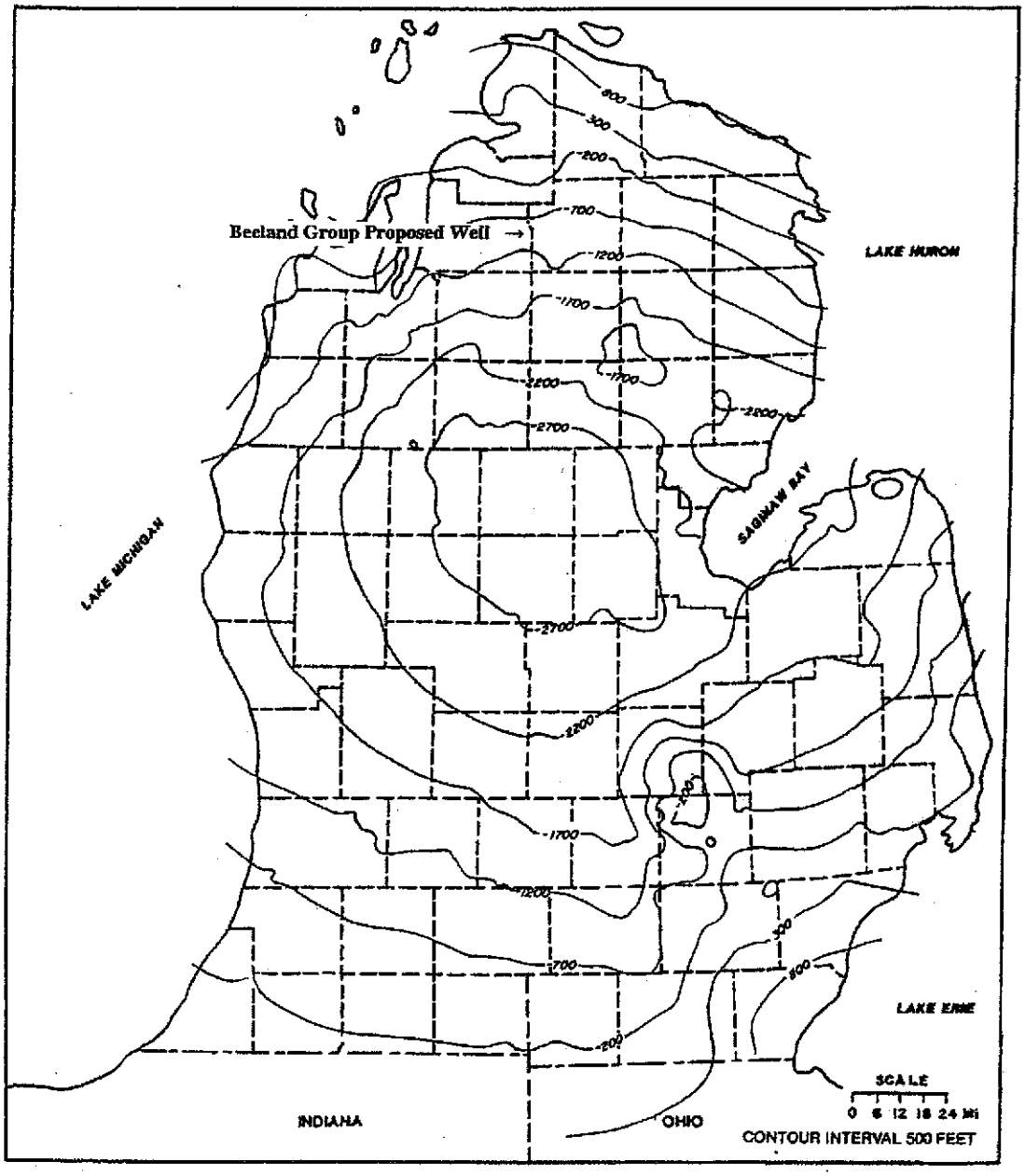
The Alba area of northwestern Michigan Basin has been designated as a relatively minor seismic risk area by the USGS as presented at the website: http://earthquake.usgs.gov/regional/states/michigan/hazards.php. The proposed area has a peak acceleration of 0-2 percent g, and no earthquakes have been identified in the Alba area over the past 100 years. A category VI earthquake

occurred in southern Michigan in 1947, but USGS data do not suggest that this event was felt north of Cadillac, Michigan.

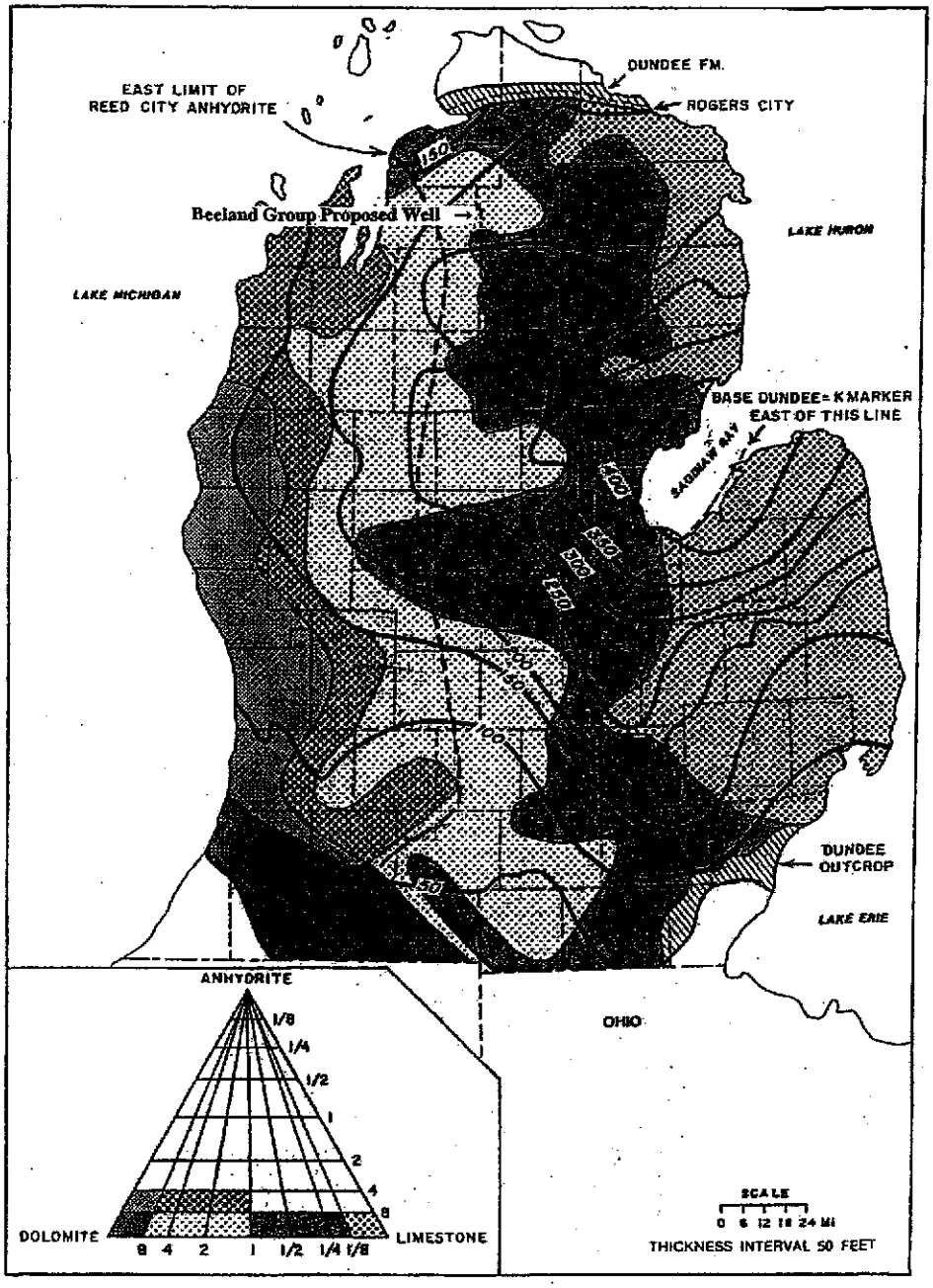
References:

Ryder, Robert T, Fracture Patterns and their Origin in the Upper Devonian Antrim Shale Gas Reservoir of the Michigan Basin: a Review, USGS Open File Report 96-23, 1996.

Ground Water Atlas of the United States, Iowa, Michigan, Minnesota, Wisconsin, USGS Document HA 730-J, Perry G. Olcott, 1992



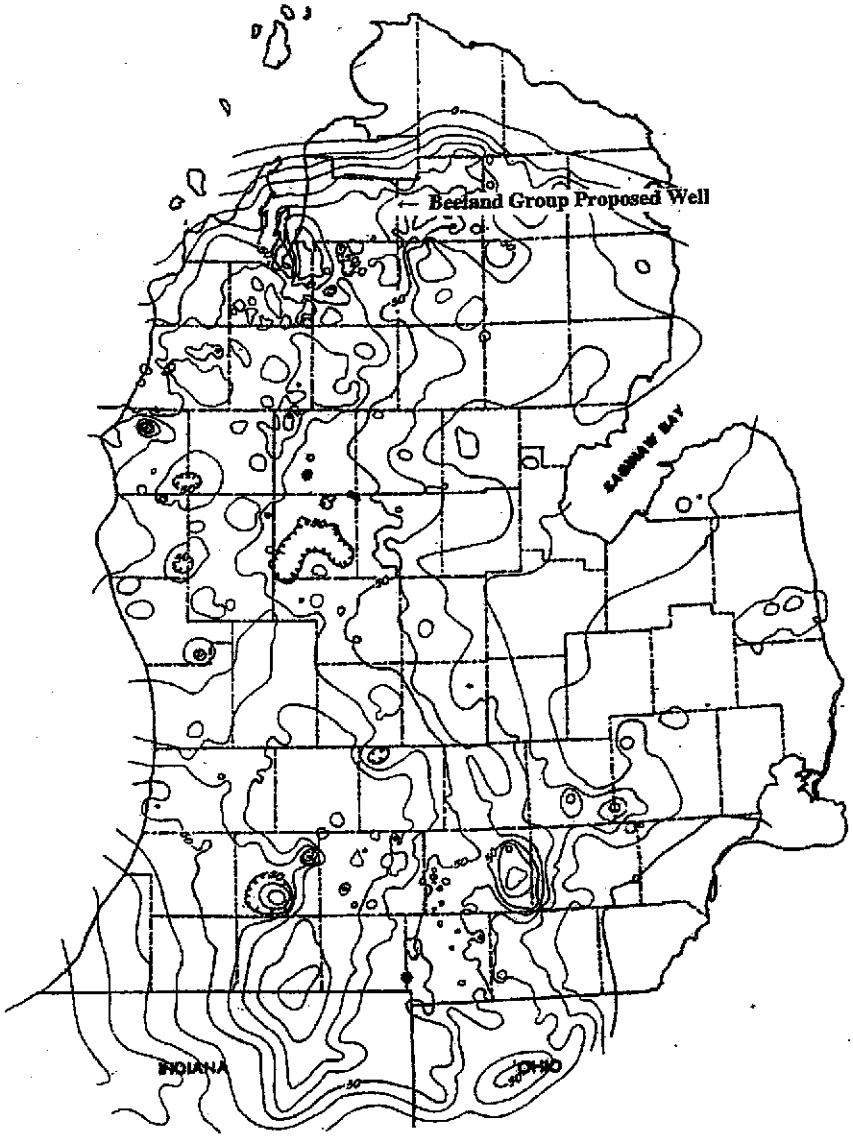
Petrotek Engineering Corporation
Figure 16
Beeland Group, LLC Alba, Michigan Facility
Regional Michigan Dundee Structure (from Fisher, 1980) DISPOSAL WELL # 1
SCALE: NOTED DATE 01-07



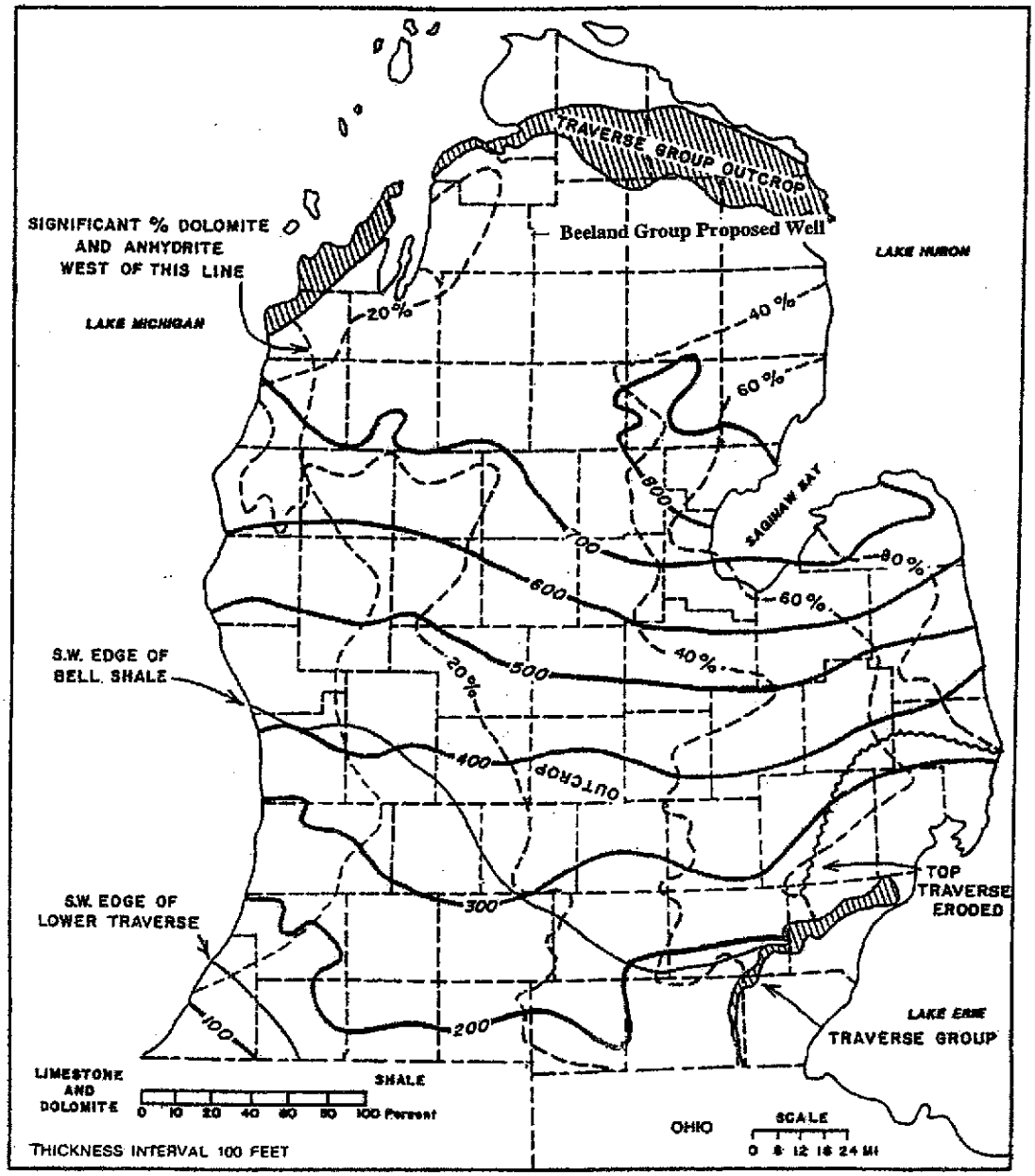
Thickness - Lithofacies of the Dundee Formation

(From Gardner, 1974. Reproduced with permission from the Michigan Basin Geological Society.)

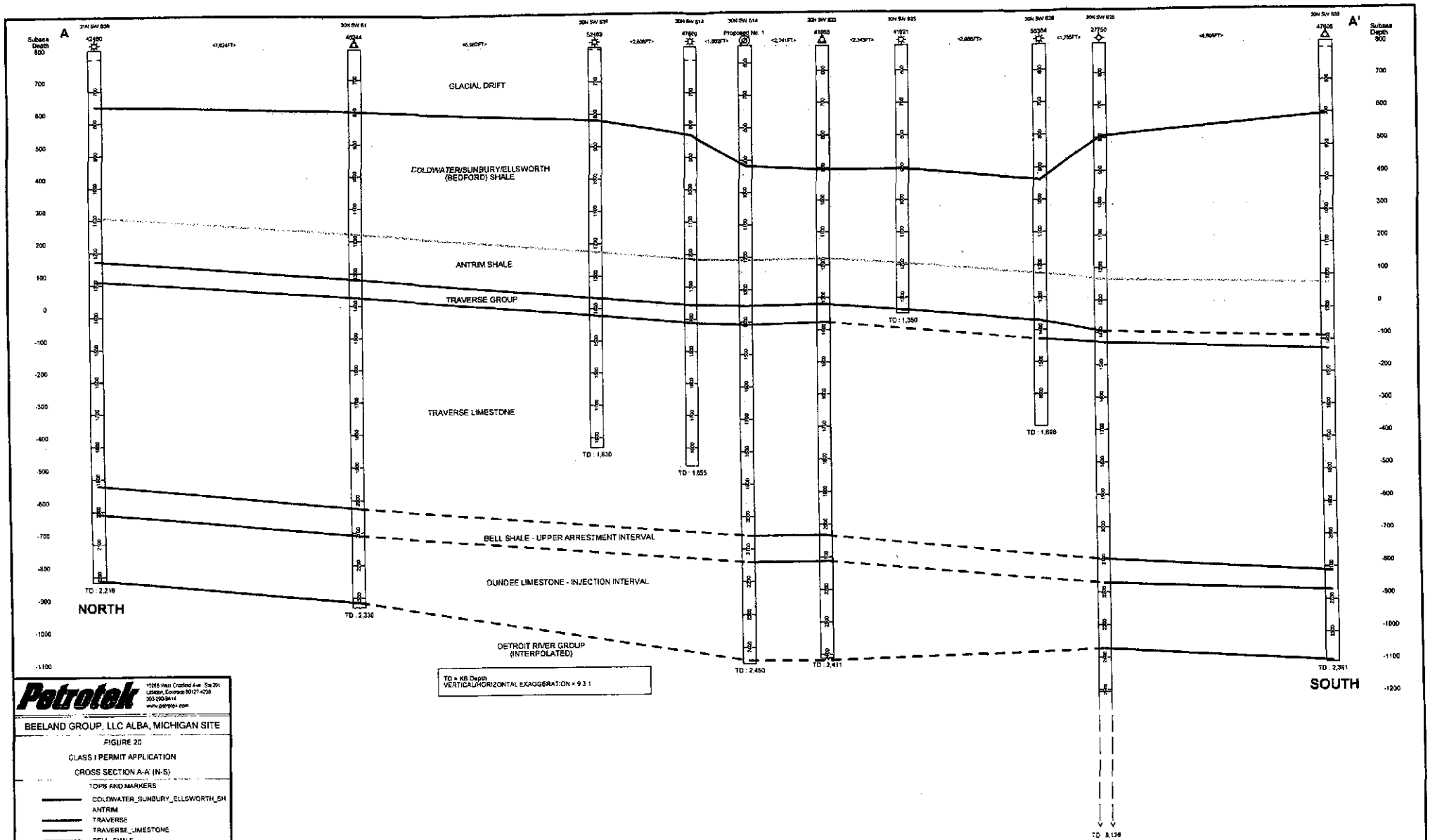
Petrotek Engineering Corporation
Figure 17
Beeland Group, LLC
Alba, Michigan Facility
Regional Michigan Dundee Thickness Lithofacies Map (from Gardner, 1974)
DISPOSAL WELL # 1
SCALE: NOTED DATE 01-07



Petrotek Engineering Corporation
Figure 18
Beeland Group, LLC Alba, Michigan Facility
Regional Michigan Traverse Thickness (from Fisher, 1980)
DISPOSAL WELL # 1
SCALE: NOTED DATE 01-07



Petrotek Engineering Corporation	
Figure 19	
Beeland Group, LLC Alba, Michigan Facility	
Regional Michigan Traverse Group Shale Percentage Thickness (from Gardner, 1974) DISPOSAL WELL # 1	
SCALE: NOTED	DATE 01-07



Petrotek

BEELAND GROUP, LLC ALBA, MICHIGAN SITE

FIGURE 20

CLASS I PERMIT APPLICATION

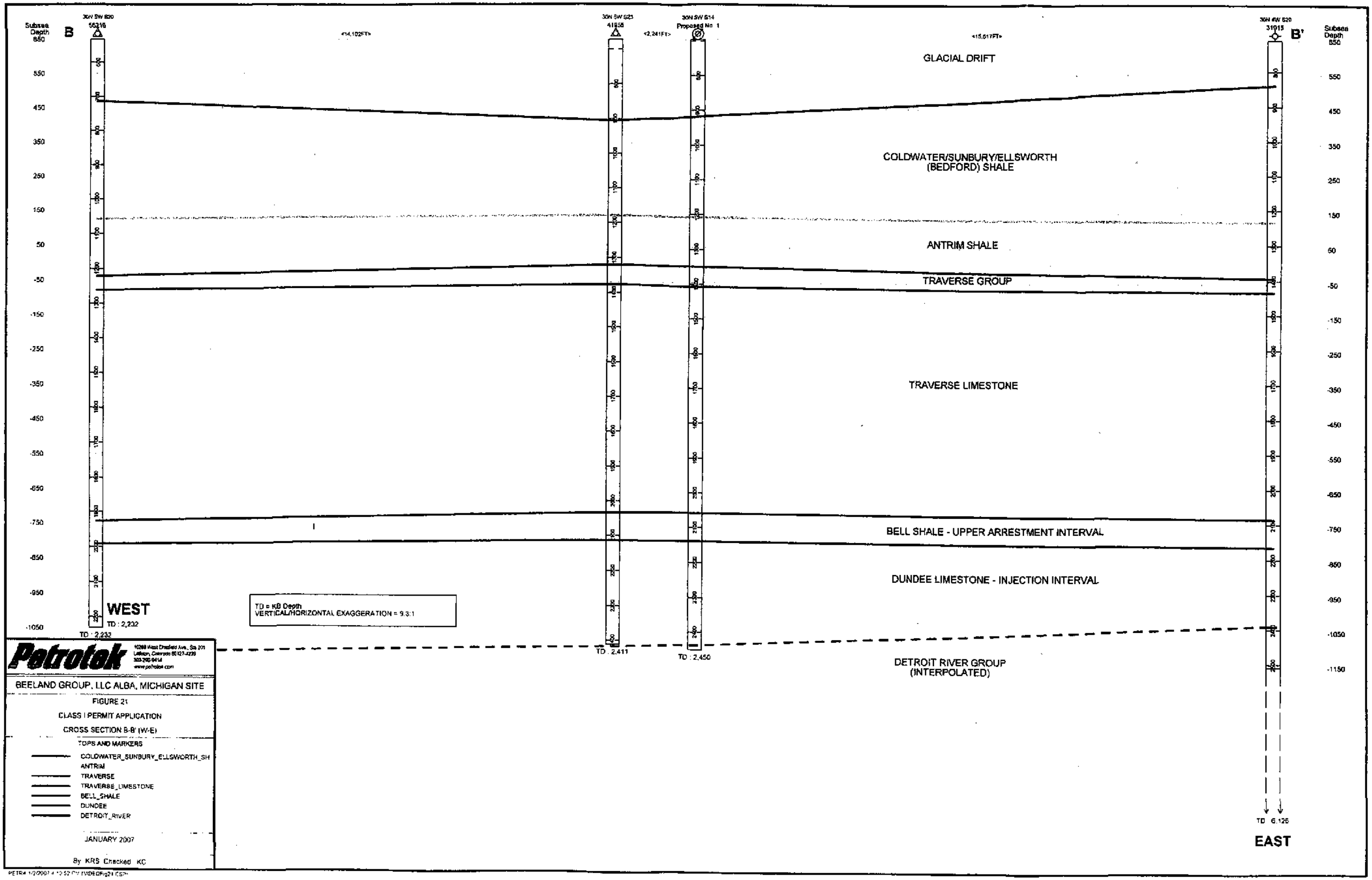
CROSS SECTION A-A' (N-S)

TOPS AND MARKERS

- COLDWATER_SUNBURY_ELLSWORTH_SH
- ANTRIM
- TRAVERSE
- TRAVERSE_LIMESTONE
- BELL_SHALE
- DUNDEE
- DETROIT_RIVER

JANUARY 2007

By KRS Checked KC



Petrotek

BEELAND GROUP, LLC ALBA, MICHIGAN SITE

FIGURE 21

CLASS I PERMIT APPLICATION

CROSS SECTION B-B' (W-E)

TOPS AND MARKERS

- COLDWATER_SUNBURY_ELLSWORTH_SH
- ANTRIM
- TRAVERSE
- TRAVERSE_LIMESTONE
- BELL_SHALE
- DUNDEE
- DETROIT_RIVER

JANUARY 2007

By KRS Checked KC

B.9. *Chemical, physical and bacteriological characterizations of the waste stream before and after treatment and/or filtration.* Include a characterization of the compatibility of the injectate with the injection zone and the fluid in the injection zone along with a characterization of the potential for multiple waste streams to react in the well bore or in the injection zone.

Injectate Characteristics

The proposed injectate is non-hazardous waste from a groundwater remediation project that will be brought to the Alba, Michigan facility from a single remediation project/area. Fluid from the remediation project will be sampled on a quarterly basis as specified in the attached Waste Analysis Plan (see Attachment B). Typical injectate composition for the remediation project fluids with regard to chemical and physical characteristics is presented in Tables 7A and 7B. Historically, fluids from this remediation project have been managed as non-hazardous via both injection into an offsite non-hazardous disposal well and surface discharge through a POTW after treatment. Fluids typically have contained various levels of total dissolved solids and are expected to range from 2,500 mg/l to 25,000 mg/l. As noted in the following tables, only limited suspended solids have historically been encountered. Specific gravity is expected to range from 1.00 to 1.05, and pH is typically expected to range from approximately 7.0 to 10.0.

TABLE 7A EXAMPLE ANALYSIS OF INJECTATE FROM BAY HARBOR, MICHIGAN REMEDIATION, 2004

Parameter	Units	Results	Method	Date	Analyst
Oxidation Reduction Potential	mV	296	Field	9/28/2004	EB
PH	s.u.	7.42	Field	9/28/2004	EB
Temperature	°C	19.1	Field	9/28/2004	EB
Alkalinity-Phenolphthalein	mg/L	0	310.1	9/30/2004	REG
Alkalinity-Total	mg/L	1,620	310.1	9/30/2004	REG
Carbonate Alkalinity	mg/L	0	Calc.	9/30/2004	REG
Bicarbonate Alkalinity	mg/L	1,620	Calc.	9/30/2004	REG
Hydroxide Alkalinity	mg/L	0	Calc.	9/30/2004	REG
Total Organic Carbon	mg/L	260	415.1	10/5/2004	BA
Total Inorganic Carbon	mg/L	88	415.1	10/5/2004	BA
Total Dissolved Solids	mg/L	32,800	160.1	9/29/2004	REG
Total Suspended Solids	mg/L	123	160.2	9/29/2004	REG
Biochemical Oxygen	mg/L	*	405.1	10/8/2004	PJC
Chemical Oxygen Demand	mg/L	992	410.1	9/30/2004	REG
Total Phosphorus	mg/L	1.4	365.2	9/30/2004	REG
Phosphate, Orhto	mg/L	< 1	300	9/29/2004	DMJ
Nitrate-Nitrogen	mg/L	0.97	300	9/29/2004	DMJ
Nitrite-Nitrogen	mg/L	0.74	300	9/29/2004	DMJ
Ammonia-Nitrogen	mg/L	8.5	350.1	10/1/2004	BEK
Total Kjeldahl Nitrogen	mg/L	29	351.2	10/1/2004	BA
Aluminum	mg/L	19.8	6020	10/3/2004	EB
Antimony	mg/L	< 0.05	6020	10/3/2004	EB
Arsenic	mg/L	0.237	6020	10/3/2004	EB
Barium	mg/L	0.017	6020	10/3/2004	EB
Beryllium	mg/L	< 0.005	6020	10/3/2004	EB
Cadmium	mg/L	< 0.001	6020	10/3/2004	EB
Chromium, Total	mg/L	0.029	6020	10/3/2004	EB
Cobalt	mg/L	< 0.015	6020	10/3/2004	EB
Copper	mg/L	0.024	6020	10/3/2004	EB
Iron	mg/L	1.42	6020	10/3/2004	EB
Lead	mg/L	< 0.001	6020	10/3/2004	EB

Parameter	Units	Results	Method	Date	Analyst
Mercury	mg/L	0.0008	245.1	10/20/2004	Merit
Manganese	mg/L	0.088	6020	10/3/2004	EB
Nickel	mg/L	0.223	6020	10/3/2004	EB
Selenium	mg/L	0.063	6020	10/3/2004	EB
Silver	mg/L	0.0005	6020	10/3/2004	EB
Strontium	mg/L	0.034	6020	10/3/2004	EB
Zinc	mg/L	0.019	6020	10/3/2004	EB
Silica, Reactive as SiO2	mg/L	16.8	370.1	10/4/2004	REG
Total Silicon as SiO2	mg/L	66.3	6020	10/2/2004	EB
Calcium	mg/L	12.1	6020	10/3/2004	EB
Magnesium	mg/L	< 0.5	6020	10/3/2004	EB
Potassium	mg/L	13,800	6020	10/3/2004	EB
Sodium	mg/L	889	6020	10/3/2004	EB
Bromide	mg/L	15.2	300	9/29/2004	DMJ
Chloride	mg/L	1,730	300	9/29/2004	DMJ
Fluoride	mg/L	18.1	300	9/29/2004	DMJ
Sulfide	mg/L	1.29	376.2	10/5/2004	Merit
Sulfate	mg/L	14,500	300	9/29/2004	DMJ

TABLE 7B. EXAMPLE ANALYSES OF INJECTATE FROM BAY HARBOR, MICHIGAN REMEDIATION, 2006

Location	FRAC TANK	FRAC TANK	FRAC TANK	FRAC TANK	FRAC TANK
Date	4/26/2006	5/25/2006	6/2/2006	6/9/2006	6/15/2006
General Parameters (ug/L unless noted)					
Alkalinity, total	350000	310000	380000	380000	340000
Chloride	350000	310000	330000	320000	350000
Hardness, total	150000	110000	130000	92000	120000
Nitrogen Nitrate	560	410	390	59 *	190
Nitrogen total kjeldahl	4600	3900	4300	3900	4600
Nitrogen, ammonia as N	1100	960	1100	1000	1200
Phosphate, Ortho	48.0	<40.0 *	84.0 *	38	60
Phosphorus total	203	164	240	168	200
Solids, total dissolved	5710000	4800000	5220000	5120000	5540000
Solids, total suspended	6000	10000	17000	12000	11000
Sulfate	2300000	1900000	2200000	2100000	2300000
pH (standard units)	7.7 *	7.5 *	8.2 *	8.0 *	7.5 *
Specific Conductance (umhos@ 25oC)	7512	6569	6910	6990	7526
Carbon, total organic	35000	25000	28000	25000	27000
Carbon, total organic, unpreserved	54000	46000	46000	43000	48000
Metals (ug/L)					
Aluminum	2700	1400	6300	1500	1700
Antimony	<2.0	<2.0	8.4	<2.0	<2.0
Arsenic	27	21	30	20	21
Barium	<100	<100	<100	<100	<100
Beryllium	<1.0 *	<1.0	<1.0	<1.0	<1.0
Cadmium	<1.0	<1.0	<1.0 *	<1.0	<1.0
Calcium	44000	23000	27000	21000	23000
Chromium	12	<10	32	<10	<10
Copper	18	19	37	16	16
Iron	2300	1500	8500	1400	1600
Lead	<3.0 *	<3.0	5.5	<3.0	<3.0
Magnesium	12000	8100	11000	8500	8500
Manganese	<50	<50	94	<50	<50
Mercury	0.0726	0.0580	0.0963	0.062	0.0584
Nickel	54	41	54	39	39
Potassium	2200000 *	1800000	1900000	2100000	2200000
Selenium	8.4 *	8.4 *	17	14	9.3 *
Silicon	9200 *	8000	14000	9100	8000
Silver	0.21	<0.20	0.31	<0.20	<0.20
Sodium	190000 *	140000	150000	160000	170000
Strontium	<1000	<1000	<1000	<1000	<1000
Thallium	<2.0 *	<2.0	<2.0	<2.0	<2.0
Vanadium	38	36	51	35	34
Zinc	<50 *	<50	52	<50	<50

Operation as a dedicated industrial disposal well for fluids generated from the Bay Harbor remediation project will initially result in similar waste fluids being mixed in the disposal reservoir with fresh water testing and buffer fluids and then with the native Dundee brines. As the operation continues, contact between most recently injected fluids and native brines will decrease as the mixing zone expands. Since the Beeland well will be dedicated to a single waste source (Bay Harbor remediation project fluids), incompatibilities between multiple waste streams will not be a concern. As evidenced by historical operations of neighboring Class II injection wells completed in the Dundee, and the operation of a distant commercial Dundee disposal well to the east of this site that has successfully managed Bay Harbor remediation fluids, injection of the intended wastes into the Dundee would only be expected to cause limited plugging damage to the injection interval and the wellbore. Although slight decreases in injectivity have been historically been experienced in Dundee injectors, rates of up to several barrels per minute are often still injected "on vacuum" with no positive pressure at the wellhead.

Any compatibility problems encountered due to non-hazardous injection of the Bay Harbor remediation fluids would primarily be the injection or generation of particulate matter that could lead to such decreases in flow capacity. Bacterial issues do not appear to be overly problematic, but due to the composition of the waste stream periodic biocide treatments may be instituted to prevent the establishment of bacterial plugging issues. Such solids, compatibility or bacterial problems, if they do occur, would not be a containment issue, but would be an operations issue. The operator would then be required to reduce injection rates so that maximum pressure limits are not exceeded. To sustain rates if such a situation develops, periodic stimulations may be required. In this way such problems would not cause violations of regulatory requirements or generate concerns regarding physical containment. At this time, only neutralized, relatively low suspended solids wastes from the Bay Harbor facility will be accepted at the site. If additional solid loading becomes an issue, filtration will be installed to minimize the potential for wellbore plugging.

B.10. Information to characterize the proposed injection zone, including:

A. The geological name of the stratum or strata making up the injection zone and the top and bottom depths of the injection zone.
B. An isopach map showing thickness and areal extent of the injection zone
C. Lithology, grain mineralogy and matrix cementing of the injection zone.
D. Effective porosity of the injection zone including the method of determination.
E. Vertical and horizontal permeability of the injection zone and the method used to determine permeability. Horizontal and vertical variations in permeability expected within the area of influence.
F. The occurrence and extent of natural fractures and/or solution features within the area of influence.
G. Chemical and physical characteristics of the fluids contained in the injection zone and fluid saturations.

H. The anticipated bottom hole temperature and pressure of the injection zone and whether these quantities have been affected by past fluid injection or withdrawal.
I. Formation fracture pressure, the method used to determine fracture pressure and the expected direction of fracture propagation.
J. The vertical distance between the top of the injection zone from the base of the lowest fresh water strata.
K. Other information the applicant believes will characterize the injection zone.

Items A-C are addressed in Section B.7, above. Items D-K will be verified during the drilling and testing of the injector.

As indicated in Section B.7 above, the injection zone is the Devonian age Dundee limestone. The unit occurs from about 2,150' to 2,350' BGL and is therefore approximately 200 feet thick at the Disposal Well No.1 location. An isopach map of the unit, showing areal extent is presented as Figure 17 (Section B.8). The unit is predominately a carbonate section ranging from dense, fine-grained, light colored limestones on the east side of the state to coarse-textured bioclastic limestone (with portions secondarily dolomitized) in the central part of the state. The Dundee may have undergone some dolomitization. The effective porosity of the Dundee is estimated as approximately 10% but will be determined through well log calculations after the well is installed. Horizontal permeability of

the injection interval is estimated as approximately1 Darcy, and vertical permeability is unknown. The occurrence and extent of fracturing specific to the Disposal well location will be assessed through drilling and wireline logging of the hole. Likewise, formation fluid information will be obtained through sampling and analysis at the time of drilling, although the unit is expected to exhibit a TDS of much greater than 10,000 ppm (see Figure 15, which is from the Michigan Groundwater Atlas). The anticipated downhole temperature is estimated as approximately 77° F based on a temperature of 45°F below the seasonal effect and a temperature gradient of 1.5° F/100 feet of depth; downhole temperature will be verified after drilling. Formation fracture pressure is estimated as a minimum of 1,259 psi at 2,150 feet BGL. See Section B.11 for additional information. The top of the injection zone is over 1,000 feet below the base of the lowest fresh water aquifer; the top of the Dundee is projected to occur at about 2,150 ft BGS, while the base of the lowermost aquifer is projected to occur about 900 feet BGS (Glacial Till aquifer).

B.11. Information to characterize the proposed confining zone, including:

A. The geological name of the stratum or strata making up the confining zone and the top and bottom depths of the confining zone.
B. An isopach map showing thickness and areal extent of the confining zone
C. Lithology, grain mineralogy and matrix cementing of the confining zone.
D. Effective porosity of the confining zone including the method of determination.
E. Vertical and horizontal permeability of the confining zone and the method used to determine permeability. Horizontal and vertical variations in permeability expected within the area of influence.
F. The occurrence and extent of natural fractures and/or solution features within the area of influence.
G. Chemical and physical characteristics of the fluids contained in the confining zone and fluid saturations.
H. Formation fracture pressure, the method used to determine fracture pressure and the expected direction of fracture propagation.
I. The vertical distance between the top of the confining zone from the base of the lowest fresh water strata.
J. Other information the applicant believes will characterize the confining zone.

Items A-C are addressed in Section B.7, above. Items D-J will be verified through drilling. The confining zone includes all rock units from the Antrim to the top of the Dundee, including the base of the Antrim Shale, Traverse Group, Traverse Limestone, and Bell Shale. Lithologic characteristics of these units are described in section B.7, above. Effective porosities of each zone are estimated as between 2 and 20%. The vertical and horizontal permeability of the confining zone is estimated as being substantially less than 0.1 md. Formations included as part of the confining zone are expected to be laterally continuous in the Disposal Well No. 1 area, and are not expected to exhibit extreme variations in effective permeability within the area of influence. The occurrence and extent of natural fractures and/or solution features within the area of influence will be assessed through wireline logging during drilling. The vertical distance between the top of the confining zone to the base of the lowest fresh water strata is about 300 feet.

B.12. Information demonstrating injection of liquids into the proposed zone will not exceed the fracture pressure gradient and information showing injection into the proposed geological strata will not initiate fractures through the confining zone. Information showing the anticipated dispersion, diffusion and/or displacement of injected fluids and behavior of transient pressure gradients in the injection zone during and following injection.

Maximum Injection Pressure

The well has been designed for operation on a vacuum or with a small injection pump. It is probable that no injection pump will be required to dispose of desired volumes of fluid. However, a pump may be installed to increase capacity if necessary. Although no site specific data are available, Region 5 Guidance includes a value of 0.8 psi for the fracture gradient of the Dundee Limestone. If injection fluid is assumed to be comprised of a brine with a maximum specific gravity of 1.15 that fills the tubing from the surface to a depth of 2,150 feet, a maximum allowable wellhead injection pressure of 649 psi is calculated based on this Region 5 assigned gradient. No allowances for tubing friction are included in this calculation. Note that the average specific gravity is expected to be in the 1.01 to 1.05 range.

Based on a calculated wellhead fracture pressure value of 648 psi (assuming a maximum continuous specific gravity of 1.15), it is requested that a maximum wellhead injection pressure of 150 psi be authorized for future injection activities without additional testing.

Estimates of general conditions have been used with Eaton's formula to prepare a worst-case estimate of fracture pressure. This formula is widely referenced and discussion can be found regarding the formulation on page 291 of "Applied Drilling Engineering," Bourgoyne, A.T. et al, SPE, 1991. The pressure (P_{ff}) necessary to initiate a fracture is given as:

$$P_{ff} = P_r + \sigma_{min}$$

where: P_r is reservoir pore pressure (752 psi at 2,150 feet BGL) and σ_{min} is horizontal matrix stress defined as:

$$\sigma_{min} = \upsilon/(1-\upsilon)\ (+\sigma_{ob} - P_r)$$

where: υ = Poisson's ratio estimated as 0.3 a limestone in-situ and σ_{ob} estimated as depth times a minimum overburden gradient of 0.9 psi/ft. Historically, an overburden gradient of 1.0 psi/ft has been applied for oil and gas reservoirs on land (Bourgoyne, et al, 1991). Work by Eaton (1969) suggested that the overburden gradient could range from 0.85 psi/ft at a depth of 100 feet to 1.0

psi/ft at 20,000 feet; as a case example, the author stated that the overburden gradient in the Santa Barbara Channel ranges from 0.89 psi/ft at 100 feet to 1.02 psi/ft at 10,000 feet (Eaton, 1969). Since there are very few specific data on the Dundee gradient, a conservative overburden gradient of 0.90 psi/ft at 2,150 feet has been applied based on information presented in these two references. Based on this overburden gradient, at 2,150 feet BGL (approximate top of the Injection Interval at the Beeland Well), the calculated overburden pressure would be 1,935 psi.

Substituting 0.3 for Poisson's ratio and estimated original reservoir pressure of 752 psi, $P_{ff} = P_r + \sigma_{min}$ or $P_{ff} = 752 + 507 = 1,259$ psi. The maximum pressure exerted by injectate at the base of the casing (2,150 feet BGL) is not likely to exceed 978 psi, well below the calculated P_{ff} of 1,259 psi with friction losses neglected, thus offering a significant safety margin. Should an injection pump be utilized, a wellhead pressure of 281 psi would be acceptable (with a specific gravity injectate of 1.05) based on these calculations. A maximum pressure of 150 psi has been requested. Fracture pressure is included for completeness, since it is not a critical factor at the proposed Beeland facility with fluid likely to be injected "on vacuum" via gravity flow.

If necessary, subsequent testing may be conducted in the future to justify the use of pressures above 150 psi at the wellhead during future disposal operations. At the current time, it is believed that restriction to flow under gravity conditions are likely to provide for insufficient operational flexibility and could contribute to unwarranted compliance complications.

Average Rates, Volumes and Pressures

The range of injection rates and pressures is expected to fluctuate depending on the demands of the groundwater remediation project along with variables related to the well and the reservoir conditions. Injection rates are projected to average between 50 and 200 gpm based on continuous operations. However, injection may occur in a periodic or "batch mode" depending on demand.

Average injection pressures during active operations are expected to range from approximately –12 to 100 psi depending on the history of recent well capacity demands and the condition of the well and the injection reservoir.

The well is to be operated, and operating data reported, according to the following requirements:

TABLE 8 OPERATING, MONITORING AND REPORTING REQUIREMENTS BEELAND GROUP, LLC DISPOSAL WELL NO. 1

Characteristic	Value	Minimum Monitoring Frequency	Minimum Reporting Frequency
Average Injection Rate	6,857 bpd max.	Continuous	monthly
Instantaneous Injection Rate	10 bpm max.	Continuous	monthly
Cumulative Volume	6,857 bpd max.	Continuous	monthly
Max. Injection Pressure	150 psig	Continuous	monthly
Ave. Injection Pressure	0 psig	Continuous	monthly
Annulus Pressure	100 psig min.	Continuous	monthly
Annulus/Tubing Pressure Differential	100 psig min.	Continuous	monthly
Sight Glass Level	Visible	daily when operated	monthly
Annulus Fluid Addition Or Removal	Gal	Daily	monthly
Chemical Composition of Injected Fluids [1]	Concentration	Variable	within 30 days of sampling
Physical Characteristics of Injected Fluids [1]	Variable	Variable	within 30 days of sampling

[1] As specified in the Waste Analysis Plan, Attachment B.

Impact of Injection

Based on historical operating data from surrounding Class II injection wells in Antrim County, it appears that well capacity is likely to be sufficient for proposed disposal operations. Until actual data are obtained from testing conducted during installation of the well, conservative estimates of formation properties have been assigned, along with projected operational parameters, to generate an estimate of the fluid front for the Beeland well. Standard equations for the volume of a porous cylinder can be used with the following parameters to generate a piston-like displacement fluid front radius: 100-foot net thickness, 10 percent effective porosity, and 2,103,840,000 gallons of injectate estimated based on twenty years of continuous injection at a rate of 200 gpm. This yields a 100 percent injected fluid front radial distance of approximately 2,992 feet from the well. It is noted that "continuous" injection rates are more likely to be less than 125 gpm based on historical operation of the groundwater remediation project. Although dispersion will play a role in spreading this plume over a slightly larger area, even a relatively large dispersivity combined with a low concentration of interest would yield a plume that is less than one mile radially from the well. This is substantially smaller than the minimum two-mile AOR conducted for this site.

B.13.Proposed operating data including all of the following data:

A. The anticipated daily injection rates and pressures.

B. The types of fluids to be injected.

C. A plan for conducting mechanical integrity tests.

See Item B.8 and B.11 for information pertaining to daily injection rates/pressure and the types of fluids to be injected.

Mechanical integrity demonstration for the well will be accomplished via an approved test method(s) such as temperature log, or noise log, or oxygen activation log. The Beeland Group will provide the MDEQ with a notice of Part II testing to allow the agency to witness data collection activities. Although Beeland may utilize any acceptable method per MDEQ procedure approval, at this time it is proposed that temperature logging be utilized for future mechanical integrity testing. Differential temperature logging to be conducted as follows:

1. Conduct Differential Temperature Log.
   A. Shut-in well for stabilization (minimum of 24 hours) prior to running base temperature log.
   B. Rig-up temperature log and run base log from surface to total depth. Pull tool to surface and shut-in master valve.
   C. Rig down equipment and return the well to normal operations.

B.14. For a proposed disposal well to dispose of waste products into a zone that would likely constitute a producing oil or gas pool or natural brine pool, a list of all offset operators and certification that the person making application for a well has notified all offset operators of the person's intention by certified mail. If within 21 days after the mailing date an offset operator files a substantive objection with the supervisor, then the application shall not be granted without a hearing pursuant to part 12 of these rules. A hearing may also be scheduled by the supervisor to determine the need or desirability of granting permission for the proposed well.

While the Dundee has produced elsewhere in the state of Michigan, production from this interval has not been identified in the vicinity of the Disposal well. All neighboring use of the Dundee Formation is for Class II disposal of oilfield brines. Therefore, a list of offset operators is not required.

B.15.A proposed plugging and abandonment plan

The following is the proposed plan for plugging and abandonment of the proposed Beeland Group, LLC non-hazardous I Well.

1. Install a test gauge on the annulus to perform a static pressure test. Ensure that the annulus is fluid filled and that the well has been shut-in for a minimum of 24 hours. Pressurize annulus to approximately 500 psig and isolate from the annulus system. Monitor annular pressure for one hour. The test will be successful if the pressure change is less than 3 percent of the starting pressure.
2. Prepare well and location for plugging. Remove wellhouse, well monitoring equipment and wellhead injection piping.
3. Move in and rig-up workover rig, mud pump, circulating pit and pipe racks as necessary. Flush well with approximately 100 bbl fresh water.
4. Remove wellhead and release slips.
5. Release injection packer. Displace annular fluid from well into injection formation by flushing with approximately 100 bbls fresh water.
6. Pull and lay down the injection tubing and packer.
7. Run cement retainer to approximately 2,100 feet.
8. Pump approximately 55 sacks of Class A cement with 4 percent bentonite (14.1 ppg, 1.55 cf/sx yield) below cement retainer and into 6 ¼-inch openhole.
9. Tag cement on top of retainer at approximately 2,100 feet.
10. Stage cement remainder of casing to surface in approximately 500 foot stages using the balanced plug method. Pump approximately 291 sacks of Class A cement (Michigan Equivalent) with 4 percent bentonite (14.1 ppg, 1.55 cf/sx yield).
11. Cut off wellhead approximately 3 feet BGL and weld cap with permanent marker on casing.
12. Rig down and move out pulling unit and equipment.
13. Submit required plugging records to USEPA and MDEQ.

Post-Closure Care Requirements

Beeland will provide notification of closure to USEPA, Region 5, the MDEQ and the local zoning authorities. Included with the notification will be information regarding the nature of the injected waste stream, identification of the depths of the injection and confining zones, well schematics and plugging records. Beeland will retain, for a period of three years following the well closure, records reflecting the nature, composition and volume of all injected fluids. At the discretion of the MDEQ and the director of USEPA, Region 5, Beeland will then deliver the records to the appropriate regulatory entity at the conclusion of the retention period, or dispose of such records upon written approval of the MDEQ.

B.16. Identify the source or sources of proposed injected fluids. Identify if injected fluids will be considered hazardous or non-hazardous as defined by Part 111, Hazardous Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA)

The Beeland Group, LLC is a privately owned Michigan LLC that is wholly owned by CMS Land Company that in turn, wholly owned by CMS Energy . The limited liability company purchased the Beeland property near Alba, Michigan in 2006 for the sole purpose of installing and operating a non-commercial injection well. Approval is being requested to install this well to inject non-hazardous fluids generated from the remediation of groundwater and surface water at the Bay Harbor, Michigan facility.

Historically, fluids from this remediation project have been managed as non-hazardous via both injection via Class I (Mineral Well) disposal facilities and surface discharge after treatment to a POTW. Fluids typically have contained various levels of total dissolved solids and are expected to range from approximately 2,500 mg/l to 25,000 mg/l. Specific gravity is expected to range from 1.00 to 1.05, and pH is typically expected to range from 7.0 to 10.0.

B.17. Whether the well is to be a multisource commercial hazardous waste disposal well.

The well will be operated as a single source well, not as a multisource commercial hazardous waste disposal well.

B.18. Additional information required for an application for a permit to drill and operate a storage well or to convert a previously drilled well to such a well:

For an application to drill storage well or to convert a previously drilled well to a storage well, also submit the following information in addition to that submitted in the previous section for a disposal well. In the previous sections instructions, replace the term 'disposal' with 'storage' and 'waste' with 'stored product.'

1. The name and chemical formula of the product to be stored, and a characterization of the physical, chemical, and hazardous or toxic properties of the product.

2. The anticipated vertical and horizontal dimensions and volume of the completed underground storage cavity.

3. The anticipated operating life of the underground storage cavity.

4. The method to be used to create the underground storage cavity.

5. The name of the geological stratum in which the underground storage cavity will be created.

6. A schematic diagram of the well bore showing the proposed arrangement and specifications of the down hole well equipment.

7. If the underground storage cavity is to be formed by solution mining bedded salt, then all of the following information shall be included:

8. The plan for disposal of brine produced during solution mining of the underground storage cavity and for the operating life of the underground storage cavity.

9. The expected starting and ending dates of the solution mining.

10. The range of anticipated operating pressures of the underground storage cavity.

11. The anticipated range of operating injection pressure.

12. The proposed method of displacing stored product.

13. A plan for testing the mechanical integrity of the underground storage cavity as provided in R 299.2392 and R 299.2393.

N/A. This application is not being submitted for a permit to drill and operate a storage well or to convert a previously drilled well to such a well.

B.19. Additional information required for an application for a permit to drill and operate a well for the production of artificial brine or to convert a previously drilled well to such a well:

For an application to drill and operate a brine well for production of artificial brine or to convert a previously drilled well to a well for production of artificial brine, submit in addition to the information in the first section, all of the following proposed information:

1. If the well will be drilled into an existing cavern, the number of wells in the cavern, the present extent of the cavern, and the purpose of the proposed well.

2. The name of the geological stratum or strata to be mined, the top and bottom depths of the mined zone, the gross and net mineable thickness, and the mineral or minerals to be recovered by solution mining.

3. An isopach map showing thickness and areal extent of the strata to be mined.

4. A sketch showing the extent of the planned mine area.

5. The geological strata to be left in place for roof support.

6. A diagram showing the well bore with the proposed casing program and its relationship to the stratum or strata to be mined.

7. A plan for conducting subsidence monitoring as required in R 299.2407 or a rationale for not conducting subsidence monitoring.

N/A. This application is not being submitted for a permit to drill and operate a well for the production of artificial brine or to convert a previously drilled well to such a well.

A public hearing may be scheduled by the Supervisor of Mineral Wells to take public comment on the proposed well. If such a hearing is scheduled, the applicant will be responsible for the scheduling and preparation and publication of the notice.

Please collate the above documents into a set and mail the original and two copies of the application (total of 3 sets) plus 3 additional copies of form EQP 7200-1 to:

Department of Environmental Quality
Office of Geological Survey
P.O. Box 30256
Lansing, Michigan 48909

The above documents have been collated and appropriate numbers of document and form copies have been sent to the above address.

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

SURVEY RECORD OF WELL LOCATION

This information is required by authority of Part 615 Supervisor of Wells, or Part 625 Mineral Wells, of Act 451 PA 1994, as amended, in order to obtain a drilling permit.

Applicant: Beeland Group, LLC.

Well name and number: Beeland Group Disposal Well No.1

1a. Surface location: SE 1/4 of SW 1/4 of SE 1/4 of section 14 T 30N R 5W — Township: Star — County: Antrim

1b. If this is a directional well, bottom hole location will be: 1/4 of 1/4 of 1/4 of section T R — Township — County

Instructions: Outline drilling unit for oil/gas wells (Part 615) or property boundary for mineral wells (Part 625) and spot well location on plat shown. Locate the well in two directions from the nearest section, quarter section, and unit (or property, Part 625) lines.

2. **The surface location is**

495 ft. from nearest (N/S) S section line

1320 ft. from nearest (E/W) E section line

and

_____ ft. from nearest (N/S) _____ quarter section line

_____ ft. from nearest (E/W) _____ quarter section line

3. **Bottom hole will be** (if directional)

_____ ft. from nearest (N/S) _____ section line

_____ ft. from nearest (E/W) _____ section line

and

_____ ft. from nearest (N/S) _____ quarter section line

_____ ft. from nearest (E/W) _____ quarter section line

4. **Bottom hole will be** (directional or straight)

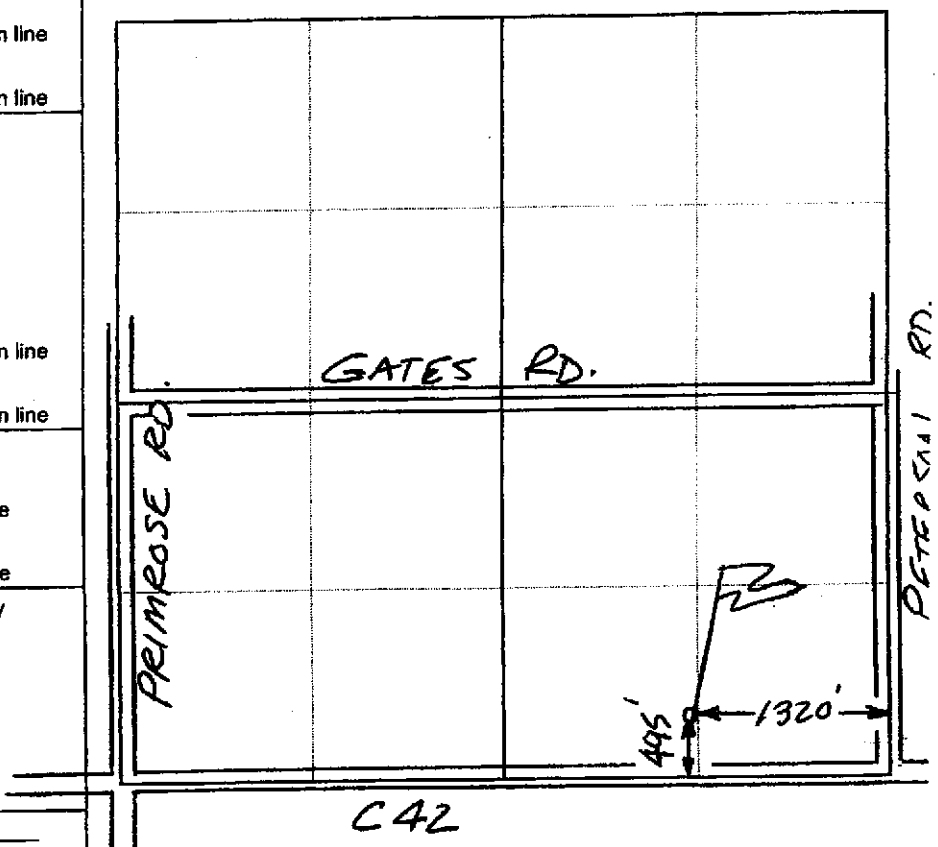
495 ft. from nearest (N/S) S drilling unit line

1320 ft. from nearest (E/W) E drilling unit line

5. Show access to stake on plat and describe if it is not readily accessible.

SECTION 14

PLAT BELOW REPRESENTS ONE FULL SECTION (1 MILE SQUARE)



6. Zoning ☐ Residential, effective date _____

Initial date of residential zoning _____

☒ Other Agricultural

ON SEPARATE PLAT OR PLOT PLAN, LOCATE, IDENTIFY AND SHOW DISTANCES TO:

A. All roads, power lines, buildings, residences, fresh water wells, and other man-made features, within 600 feet of the stake.

B. All lakes, streams, wetlands, drainage-ways, floodplains, environmentally sensitive areas, natural rivers, critical dune areas, and threatened or endangered species within 1320 feet of the stake.

C. All type I and IIa public water supply wells within 2000 feet and all type IIb and III public water supply wells within 800 feet of the well stake.

Name of individual who surveyed site: Gerald Lira — Company: Inland Seas Engineeri — Date of survey: 12-19-2006

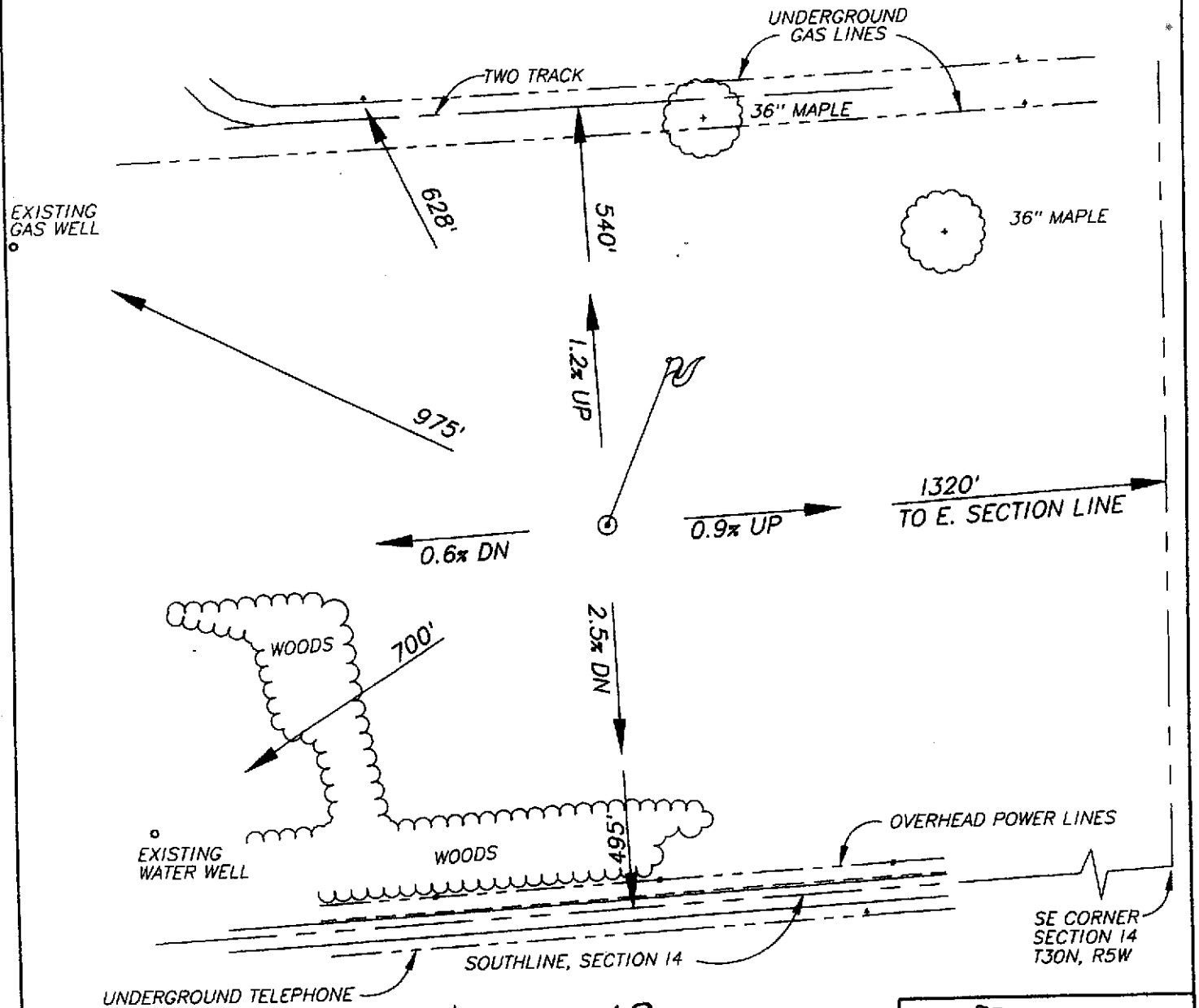
Address: PO Box 6820 / Traverse City / MI / 49696-6820 — Phone: (231) 933-4041

I CERTIFY THE ABOVE INFORMATION IS COMPLETE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

Signature of licensed surveyor (affix seal) — Date 1-4-07

STATE OF MICHIGAN STEPHEN K. [illegible] PROFESSIONAL SURVEYOR No. 36000 REGISTERED PROFESSIONAL SURVEYOR

EQP 7200-2 (rev. 01/2005) ENCLOSE WITH APPLICATION TO DRILL OR DEEPEN



Co.Rd. C-42

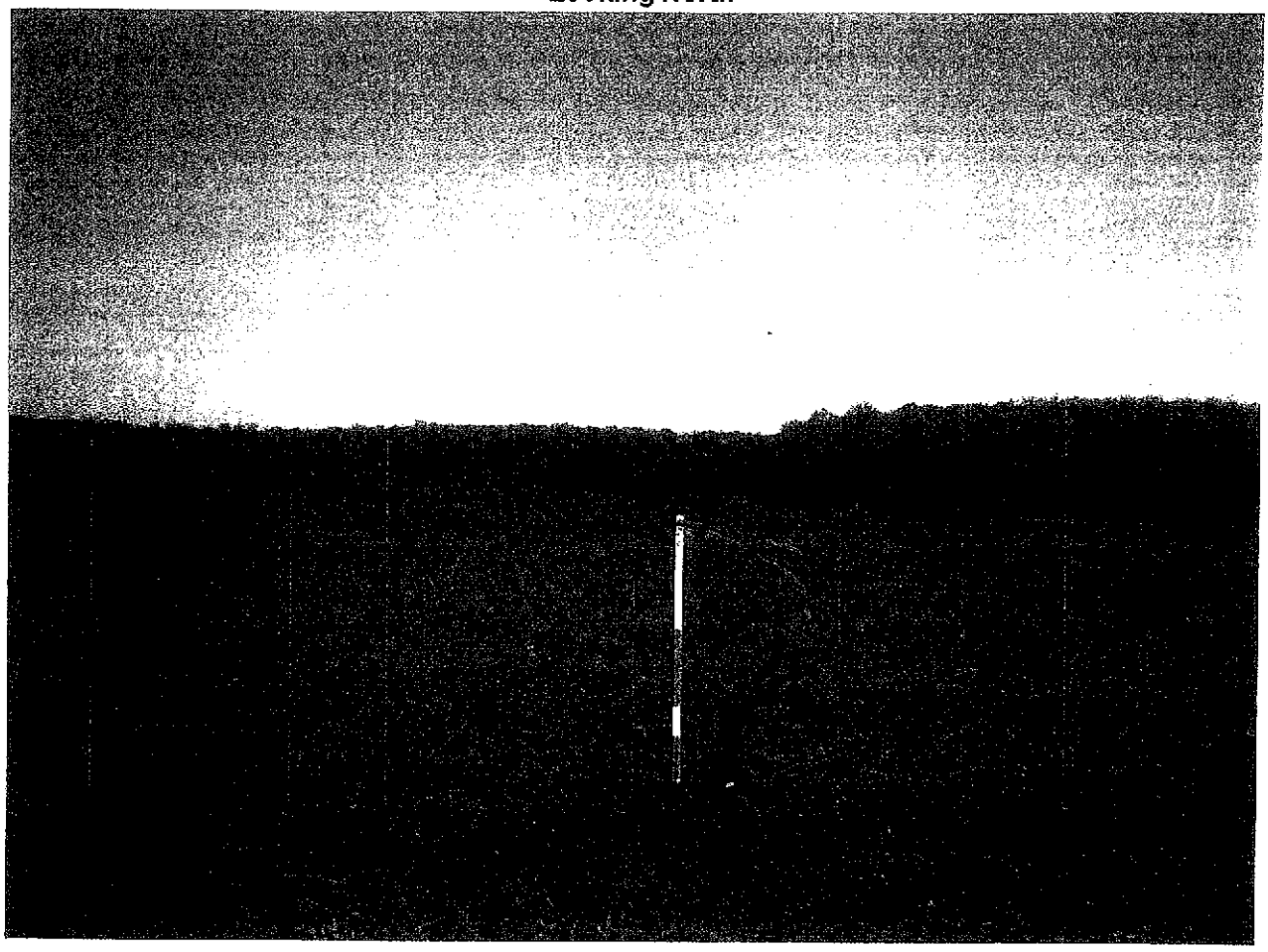
PROPOSED WELL: BEELAND DISPOSAL WELL NO. 1
LOCATION: 495' FROM THE SOUTH LINE AND 1320' FROM THE EAST LINE OF THE SE 1/4 OF SECTION 14, T30N, R5W, STAR TOWNSHIP, ANTRIM COUNTY, MICHIGAN

INLAND SEAS ENGINEERING, INC.
Traverse City, MI
231-933-4041
Flushing, MI
810-487-0555

PLOT PLAN

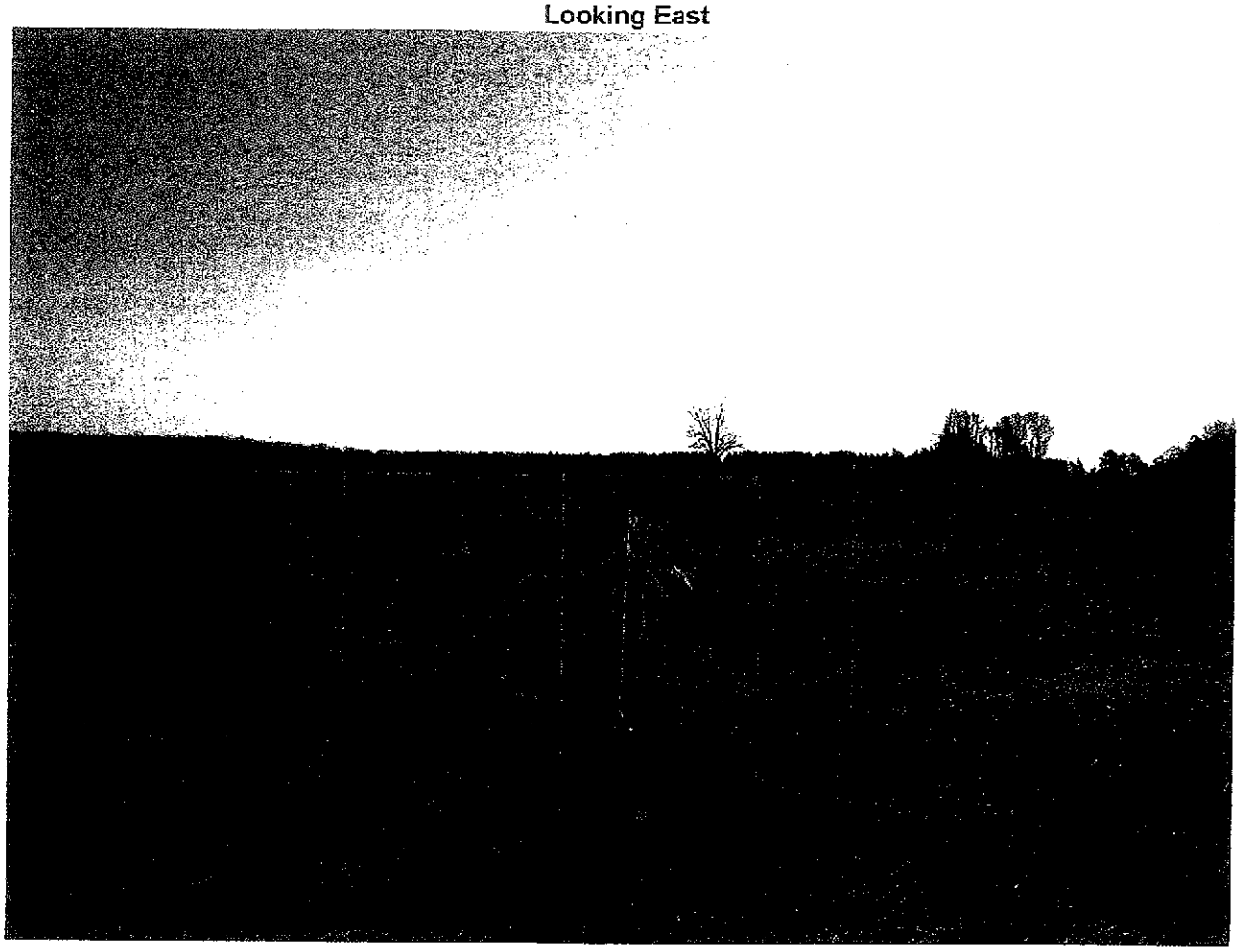
SCALE : 1"= 200'	DRAWN BY : RJM
DATE : 1-2-07	CHECKED BY : SKS
PROJECT # : 0520004	1 OF 1
DRAWING : WELL	

Looking North

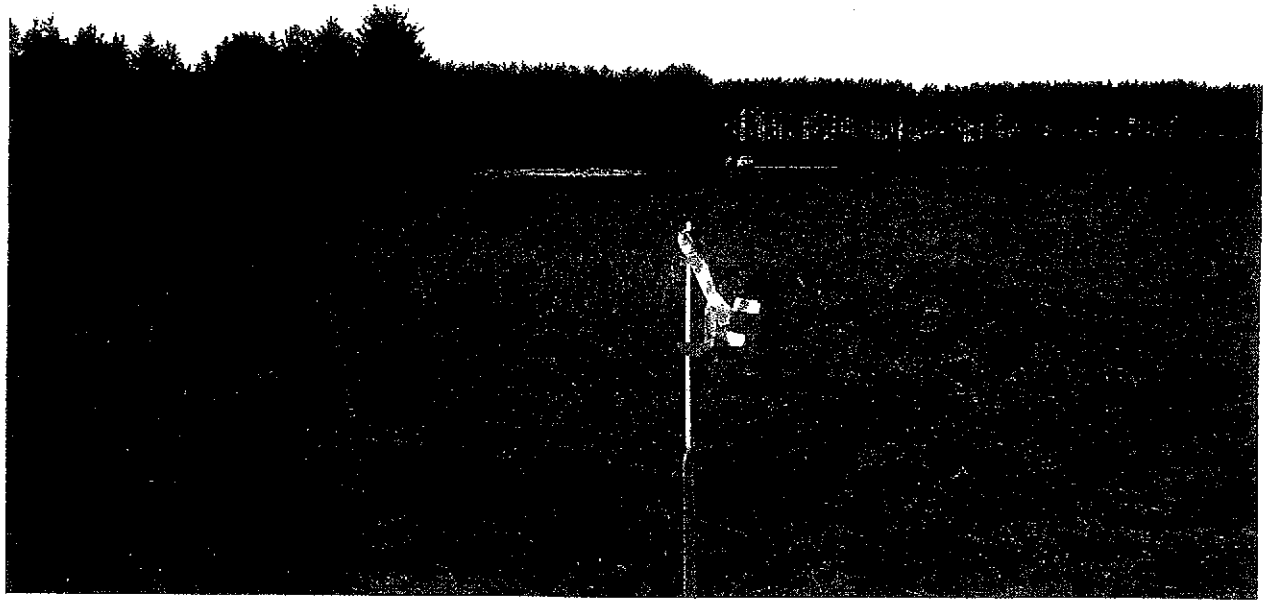


Looking South

Looking East



Looking West



WASTE ANALYSIS PLAN

Class I Non-Hazardous Injection Well

Beeland Group, LLC

Alba, Michigan Facility

Antrim County

T30N, R5W, Section 14, SE ¼ Section

EPA Permit # TBD

October 6, 2006

Prepared By:

Petrotek

Petrotek Engineering Corporation
9088 S. Ridgeline Boulevard, Suite 105
Littleton, Colorado 80129
Phone: (303) 290-9414
Fax: (303) 290-9580

TABLE OF CONTENTS

1.0 INTRODUCTION

1.A. Background

The purpose of this Waste Analysis Plan (WAP) is to characterize the non-hazardous waste-water that is injected into the proposed new Beeland Group, LLC (Beeland) No. 1 well at the Alba, Michigan facility. Beeland will be responsible for ensuring this WAP is implemented. The well is a proposed as a non-hazardous, non- commercial Class I industrial disposal well that is to be dedicated to the injection of fluids generated in association with a groundwater remediation project.

Beeland will operate the well under this Waste Analysis Plan in accordance with Title 40 of the Code of Federal Regulations (40 CFR), Section 146.13 that requires operators of Class I underground injection wells to monitor and analyze the fluids injected into the well "to yield representative data of their characteristics." This Waste Analysis Plan has been prepared to fulfill the specifications of 40 CFR 146.68 such that the plan presents parameters for which the waste will be analyzed, methods that will be used to test for these parameters, and methods that will be used to obtain a representative samples of the waste to be analyzed.

1.B. Waste Source

The Class I non-hazardous waste to be injected into the Beeland Well No. 1 under this Waste Analysis Plan include fluids that are to be recovered at the Bay Harbor, Michigan Remediation Project along with fluids generated at the disposal well facility operation itself. These fluids are to be comprised of recovered groundwater and surface waters, both treated and untreated, storm-water run-off from the Bay Harbor project and at the well facility, along with any fluids generated during the operation and maintenance of the Class I injection well and the related unloading pad and surface facilities. No commercial or oilfield waste is to be managed at the facility.

1.C. Summary

Major portions of the Beeland waste characterization and monitoring program related to the acceptance and injection of off-site fluids consist of:

Volume Monitoring
Generator Certification
Sampling and Analysis
Quality Assurance/Quality Control

The WAP may be reviewed and, if necessary, revised. Revisions to the WAP, upon approval, will become part of the administrative record and constitute a minor modification of the permit.

Compatibility problems between the waste and the injection or confining zone lithologies or with the well construction materials are not anticipated. The fluids have been previously managed at both POTW and injection well locations successfully. Limited filtration or additives may be required, and stimulation of the well may also be required.

Data appropriate to evaluate compatibility will be collected only when deemed necessary by Beeland through identification based on specific process or characterization data that is collected during operations. Possible issues could include the potential for scale and corrosion problems from wastes with high pH (above 10). However, the intended operating parameters include a pH range of 7 to 10. If problematic wastes are encountered on a regular basis, periodic metal thickness monitoring via coupons or non-invasive electrical or magnetic monitoring may be implemented. Economic and well performance issues regarding well flow rate capacity and maintenance will be addressed, if necessary, by utilizing additives, settling and/or filtration of the waste prior to injection. No waste treatment at the well site for regulatory purposes is anticipated.

2.0 PROCEDURES

2.A. Waste Unloading and Volume Monitoring

Offloading of fluid transports delivered from the Bay Harbor collection facilities will only be conducted with a trained operator physically present on site. A log sheet will be maintained on the site documenting that a trained well operator allowed waste to be unloaded. At a minimum, log sheet entries are to include operator name, date, time, approximate volume, truck or transport identification. *Similar data may* be obtained and recorded by filing manifest forms for the deliveries. The log sheet(s) and/or manifests will be considered part of the plant monitoring records regarding the injection well.

As discussed in the main text of the permit application, a recorder will be utilized to continuously monitor injection pressure, annulus pressure, flow rate and totalized cumulative volumes. A summary of recorded data will be provided to the EPA and/or MDEQ per applicable permit requirements. Records of daily volume accepted from the remediation project and any fluids managed from the onsite facility will be recorded and a total monthly volume of injectate calculated based on data maintained in the records will be noted in the monthly well reports made to EPA.

2.B. Waste Characterization

At a minimum, the following composition parameters will be monitored once quarterly for any quarterly period that fluid is injected. These parameters shall include:

pH
total dissolved solids
total suspended solids
specific gravity
specific conductance
total organic carbon
BTEX (if unloading pad fluids are being actively managed)
aluminum
arsenic
bicarbonate alkalinity
bromide
calcium
chloride
chromium
flouride
iron
mercury

potassium
silica
sodium
sulfate

For the purpose of this Waste Analysis Plan, the first quarter shall be considered the first three calendar months of the year, and the remaining quarters shall be considered subsequent divisions of the year into three-month segments. If fluids are not injected into the Beeland well during a calendar year, sample or analyses will be required.

2.C. Sampling and Analysis

Beeland, or contracted personnel will collect necessary waste stream samples. All sampling procedures will be conducted at the direction of the selected, certified analytical laboratory and in accordance with acceptable US EPA procedures. The sampler's name, sampling point, and date sampled will be documented in chain-of-custody paperwork. Samples will be collected with the grab method.

The table included below summarizes the analytical method and sampling frequency for typical parameters that may be included in the waste sampling for a particular waste source.

WASTE SAMPLING METHODS

Test Parameter	Test Method	Units
Total Dissolved Solids, TDS	EPA 160.1	mg/L
Total Suspended Solids, TSS	EPA 160.2	mg/L
Specific Gravity	ASTM 2710 F	-
Total Organic Carbon, TOC	415.1,415.2	mg/L
Specific Conductance	120.1	-
Sodium	EPA 6010B	mg/L
Calcium	EPA 6010B	mg/L
Bicarbonate	EPA 310.1	mg/L
Sulfate	EPA 300.0	mg/L
Chloride	EPA 325.3	mg/L
BTEX	EPA 5030/8020	ug/l
Iron (Fe)	EPA 200.7	mg/L

Mercury (Hg)	EPA 7470	mg/L
Arsenic (As)	EPA 6010B	mg/L
Chromium (Cr)	EPA 6010B	mg/L
Corrosivity (D002)	SW-846 1110,9045	pH units

Notes: Beeland reserves the right to select use of the cited method or method with equal or greater detection limit

Samples will be collected at the point of generation or at the Beeland facility from transport tanks prior to unloading wastes into the storage or injection facilities.

3.0 QUALITY ASSURANCE/QUALITY CONTROL

3.A. General Sampling and Analytical Information

The sampling protocol will be followed by properly trained personnel conducting the sample collection and analysis. Beeland will adhere to guidelines set forth in "Test Methods for Evaluating Solid Waste", SW-846 and 'Methods for Chemical Analysis of Water and Wastes", EPA 600/4-79/020 as appropriate. Approved sample preservation techniques from 40 CFR 136.3 will be followed as appropriate. These will include preservation in plastic or glass sample containers provided by the laboratory and storage in a sample refrigerator or cooler for shipment to the laboratory. Beeland reserves the option to choose suitable laboratories for testing provided equivalent QA/QC standards are met.

Standard chain of custody protocols will be followed for waste collection, transport and analysis. Below are summaries of the minimum sampling and analysis protocols which will be followed for each characterization parameter:

Labeling

1. Sample name, date and time
2. Name of sample collector; (include sampling company name if not Beeland);
3. Sample collection method;
4. Sample collection point;

Reporting

1. Sample preservation technique, as appropriate;
2. Analytical method for parameter detection/quantification;
3. Analytical method accuracy and quantification limits; and
4. Field documentation of sampling.

The following are QA/QC parameters which will be followed to ensure the adequacy of the sampling and analytical techniques for wellhead sampling and analysis described in this plan.

3.B. Sampling Controls

1. Equipment Blanks

If possible, samples will be obtained directly from the sample tap or valve being used to

access the tank or containment vessel and not be transferred to any secondary container or device before being stored in the sample container to be shipped to the laboratory. In this case, no equipment blanks will be required. If not, equipment blanks will be taken as deemed appropriate by Beeland for the purpose of detecting potential cross contamination due to improper decontamination of sampling equipment. After sampling, any secondary container or sampling device used will be decontaminated according to the sampling plan protocol. The sampling device will then be rinsed with deionized water and the rinsate collected in a sample container for transport to the laboratory for analysis of, at a minimum, the same parameters chosen in the sampling plan above.

2. Trip Blanks

In the case of suspect analysis from any laboratory, trip blanks will be used and will be sample containers filled with Type II reagent grade water at the laboratory, sealed at the laboratory, which accompany the sample containers used throughout the sampling event. The sample containers shall be handled in the same manner as the samples. Trip blank(s) will be sent to the laboratory for analysis of, at a minimum, the same parameters chosen in the sampling plan above. A minimum of one (1) trip blank per sampling event will be utilized, if necessary.

3. Sample Duplicates

On advance written demand of EPA, duplicate samples will be taken to assess the QA/QC of the laboratory conducting the analysis. Such samples will be drawn from the same site from which primary samples are taken. Duplicate samples, if taken, will be split from the original sample in a manner to emphasize sample representativeness. The duplicate will be labeled with a sample number that will not conflict with the other samples, but will not be discernable to the laboratory as a duplicate sample. If requested by EPA or MDEQ, one duplicate sample per sampling event will be taken and analyzed for the same parameters listed in the sampling plan.

4. Sample Chain-of-Custody Protocol

Sample chain-of-custody will be followed at all times during the sampling and subsequent analysis. Chain-of-custody will be used to document the handling and control necessary to identify and trace a sample from collection to final analytical results.

3.C. *Analytical Controls*

1. Equipment Calibration

Selected laboratories will maintain QA/QC data in accordance with that laboratory's Q/A plan regarding the frequency and type of instrument calibration performed at the laboratory and in the field. Any calibration of thermometers, gauges, chromatographs, spectrometers and other meters will be conducted according to appropriate instrument manufacturer specifications and manufacturer recommended frequencies or as dictated by applicable laboratory Q/A plans.

2. Data Reduction

The process of transcription of the raw data into the reportable units will be conducted by the laboratory in accordance with that laboratory's Q/A plan. Data reduction utilized in the analysis and reporting process will be presented in the reports to the US EPA for each sampling event and parameter tested by the specific laboratory used at the time.

3. Data Verification

Data verification will be conducted in accordance with the selected laboratory's Q/A plan after each sampling event by assigned laboratory personnel. Typical procedures will include review of chain-of-custody forms, equipment calibration records and data completeness. Spot checks of raw data versus reported data may be performed to review math accuracy, significant numbers and reporting units. In addition, certified laboratory standard quality assurance/quality control checklists will be utilized per the selected laboratory's Q/A plan for individual test methods such as blanks, standards, and comparisons of internal lab test duplicate results. Problems with any of these items will be indicated in the report to the agency.

4. Internal Quality Control

Certified quality control samples may be run periodically in accordance with the selected laboratory's Q/A plan with sample batches obtained from appropriate commercial sources, or appropriate regulatory entities. Internal quality control will be addressed as required by the selected laboratory's Q/A plan and will typically include disclosure of the laboratory's use of blanks, blind standards, matrix spikes and matrix spike duplicates, preparation of reagents, and laboratory duplicate or replicate analyses.

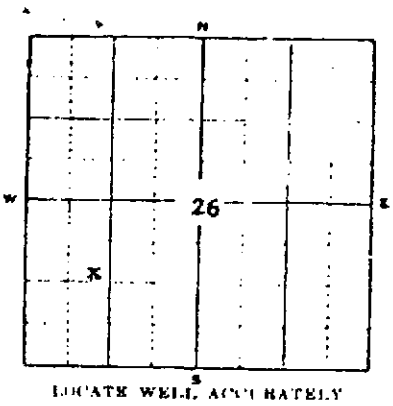
3.D. Actions

1. Corrective Actions

Corrective actions will be implemented by laboratories if the analytical or sampling method does not achieve laboratory standards or Beeland objectives. Actions may entail re-sampling the waste stream and/or re-analyzing the fluid for a particular parameter, re-calibrating an analytical device, or other appropriate actions. Action levels will be taken in accordance with SW 846 or other approved EPA methods.

2. Reports to US EPA, Region 5 and MDEQ

Reports to US EPA and MDEQ will contain results, data and sampling descriptions regarding the accuracy, completeness and repeatability of the reported analytical results. The report will contain a table that specifies the type of sample (blank, waste, etc.), sampling date, sampling location, analytical method, method detection limit and analytical result. The results of analyses and all accompanying data, including chain-of-custody forms, will be reported to US EPA with the next monthly operating report submitted to the agency after the receipt of the final sample analysis report from the laboratory. This submittal to the agency will typically be within sixty (60) days of the sampling event, unless prior arrangements have been made with the agency due to conditions beyond the control of the operator that prohibit such reporting.



LOCATE WELL ACCURATELY

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

NOV 6 1969

LOG OF OIL, GAS OR TEST WELL

TO BE FILED WITH SUPERVISOR OF WELLS WITHIN 30 DAYS AFTER COMPLETION OF WELL (ACT 61 P. A. 1939 AND ACT 326 P. A. 1937)

Permit No. 27750 Deepening No.

Owner or Operator. Shell Oil Company

Address. 1700 Broadway, Denver, Colorado 80202

Well No. 1-26 Farm. Gerald G. Gates

Township. Star County. Antrim

Location. SE¼NW¼SW¼ Sec. 26 Twp. 30N Range. 5W Elevation. 1306 KB

Footage. 1650 ft. from South line and 990 ft. from West line of quarter section

Type of well. Dry Hole Total depth. 6631 Completed in. Dry
(OIL, GAS, BRINE DISPOSAL, DRY HOLE)

Name of producing formation. Dry Top of formation.

Date drilling begun. 9-13-69 Date drilling completed. 10-9-69 Date well completed. 10-9-69

Drilling contractor. Calvert Eastern Address. 301 Orchard Street, St. Clair, Michigan

WATER ZONES

NAME	FROM	TO	AMOUNT
None			

OIL OR GAS ZONES

NAME	FROM	TO	AMOUNT
None			

DEVIATION SURVEY

RUN AT	DEGREES
1724'	1/4°
2234'	1°
2539'	1°
3305'	1/4°
3630'	1/4°
4200'	1°
4896'	3/4°
5179'	1 1/4°

CASING AND CEMENTING

SIZE	WHERE SET	CEMENT	AMT. PULLED
20"	121'	100 sx. light wt. followed by 100 sx. reg. All cmt. containg 2% $CaCl_2$ & ¼# flocele/sx.	None
8 5/8"	1116'	500 sx. reg. poz. w/4% gel. followed w/150 sx. reg. All cmt. containing 2% $CaCl_2$ & ¼# flocele/sx.	None

STEEL LINES RUN

RUN AT	CORRECTED TO	RUN BY

PERFORATIONS

DATE	FROM	TO	NO. HOLES
None			

ACID OR SHOOTING RECORD

DATE	FROM	TO	GALS. ACID OR QTS. NITRO

Rotary tools from 0 feet to 6631 feet. Cable tools from feet to feet.

Natural initial production first 24 hours. P&A Bbls. After acid or shot. Bbls.

If gas well, cu ft. per 24 hours. Rock pressure, lbs. per sq. in.

The above information is complete and correct.

Signed. D. L. Wantick

Date. October 27, 1969

Title. Division Drilling Superintendent

CONS. 7210
REV. 9/64

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

(Submit in Duplicate)

Sample Descriptions

Shell, Gates 1-26
SE NW SW Section 26, T 30 N, R 5 W
Antrim County, Michigan
Elev. 1305.8' KB

Set 8-5/8" surface casing 1116' KB. Samples start at surface. Permit No. 27750.

0-795	Drift

Base Drift - Top Bedford

795-1190	Shale, green-gray, blocky, dolomitic.
1120-1235	Shale, green-gray, blocky, dolomitic, with small amount light brown-gray.

Antrim

1235-1340	Shale, gray-brown, blocky, minutely micaceous, dolomitic, with scattered Tasmanites, pyritic.
1340-50	Limestone, gray-tan, dense to extremely finely crystalline, slightly fossiliferous, with interbedded light gray-green, calcareous shale.
1350-60	Shale, light gray-green, blocky, calcareous.
1360-70	Shale, dark gray-brown, blocky, scattered Tasmanites.
1370-90	Limestone, gray-tan, extremely finely crystalline, argillaceous, with interbedded light gray-green shale.
1390-95	Limestone, brown, extremely finely crystalline, argillaceous, with interbedded brown, calcareous, shale.

Traverse

1395-1420	Limestone, gray-tan, extremely finely crystalline, fossiliferous, argillaceous, with interbedded gray-tan, calcareous, shale.
1420-37	Limestone, tan to light brown, dense to extremely finely crystalline, fossiliferous, glauconitic.

Traverse Limestone

1437-50	Limestone, buff to brown, extremely finely to medium crystalline, dolomitic, fossiliferous.

1450-80	Limestone, gray-white to gray-brown, dense to finely crystalline, fossiliferous, argillaceous.
1480-90	Limestone, tan, dense, finely oolitic, with fair inter-oolitic porosity.
1490-1505	Limestone, buff to brown, dense to very finely crystalline, fossiliferous.
1505-20	Limestone, tan, dense, finely oolitic, with poor inter-oolitic porosity.
1520-25	Limestone, tan to brown, dense.
1525-30	Gypsum, white.
1530-60	Limestone, tan to light brown, dense.
1560-90	Shale, green-gray, blocky, very calcareous, minutely micaceous.
1590-1620	Limestone, buff to gray-brown, dense to extremely finely crystalline, argillaceous, fossiliferous, with interbedded brown-gray shale.
1620-40	Limestone, tan to brown, dense to extremely finely crystalline, fossiliferous.
1640-60	Limestone, buff to brown, dense to medium crystalline, fossiliferous.
1660-70	Limestone, tan to brown, dense to extremely finely crystalline, with tan to brown, semi-opaque to opaque chert.
1670-80	Limestone, buff to brown, dense to medium crystalline, fossiliferous, with fair, finely vugular porosity, corals, crinoids.
1680-1710	Limestone, buff to brown, dense to extremely finely crystalline, fossiliferous.
1710-20	Limestone, cream to gray-brown, dense to medium crystalline, fossiliferous, argillaceous, coral, crinoid.
1720-30	Limestone, tan, finely crystalline, coralline, scattered finely vugular porosity.
1730-40	Limestone, gray-brown, dense to very finely crystalline, scattered fossils, argillaceous with thin beds dark gray shale.
1740-50	Limestone, cream to brown, dense to medium crystalline, fossiliferous.
1750-80	Limestone, tan to light brown, dense to extremely finely crystalline, fossiliferous.

1780-1800	Limestone, cream to light brown, dense to finely crystalline, fossiliferous.
1800-20	Limestone, tan to brown, dense to extremely finely crystalline, fossiliferous.
1820-30	Limestone, tan to brown, dense, trace finely oolitic and finely vugular porosity.
1830-50	Limestone, tan to brown, dense to extremely finely crystalline, slightly fossiliferous.
1850-1975	Limestone, tan to gray-brown, dense to extremely finely crystalline, slightly fossiliferous, argillaceous, with dark gray shale partings.
1975-90	Shale, medium gray, blocky, very calcareous, minutely micaceous, trace glauconite.
1990-2070	Limestone, buff to brown, dense to finely crystalline, fossiliferous, crinoid, coral, with scattered argillaceous partings.
2070-80	Limestone, as above, with scattered quartz crystals from 2070 to 2090.
2080-98	Dolomite, brown, very finely sucrosic to finely rhombic, with scattered white medium to coarse crystals.

Bell

2098-2172	Shale, medium gray to green-gray, blocky, calcareous, fossiliferous.

Dundee

2172-2240	Limestone, buff to brown, dense, fossiliferous, crinoids, scattered "spore cases".
2240-50	Dolomite, brown, very finely to finely sucrosic, with trace intercrystalline and finely vugular porosity.
2250-60	Dolomite, buff to brown, very finely sucrosic, trace finely vugular porosity.
2260-70	Dolomite, brown, finely rhombic, with fair intercrystalline and vugular porosity.
2270-80	Dolomite, buff to tan, very finely sucrosic.
2280-90	Dolomite, buff to tan, finely sucrosic to finely rhombic, with zones of fair intercrystalline porosity.
2290-2300	Limestone, buff to brown, dense, slightly fossiliferous.

2780-98	Dolomite, tan to brown, very finely sucrosic, with scattered fine vugs, probably salt filled.
2798-2840	Salt.
2840-70	Anhydrite with interbedded dolomite, tan, very finely sucrosic.
2870-90	Anhydrite.
2890-2900	Dolomite, buff to tan, very finely sucrosic.
2900-90	Anhydrite.
2990-3020	Limestone, buff to light brown, dense, slightly dolomitic.
3020-3340	Dolomite, buff to brown, very finely sucrosic, anhydritic.
3340-80	Limestone, buff to gray-brown, dense to very finely crystalline, slightly dolomitic, fossiliferous, with scattered dark gray shale partings.
3380-3490	Limestone, buff to gray-brown, dense to very finely crystalline, fossiliferous, with white devitrified and buff to brown, opaque chert.
3490-3530	Limestone, buff to brown, dense to very finely crystalline, fossiliferous.
3530-60	Dolomite, buff to tan, very finely sucrosic.
3560-3620	Limestone, buff to brown, dense to very finely crystalline.
3620-40	Dolomite, tan to brown, very finely sucrosic.
3640-60	Limestone, buff to brown, dense to very finely crystalline, slightly fossiliferous with gray to buff to brown, opaque, spicular in part, chert and white tripolitic chert.
3660-90	Limestone, as above, trace glauconite from 3660-80.
3690-3710	Dolomite, tan, extremely finely sucrosic.
3710-40	Dolomite, tan to brown, very finely to finely sucrosic, with fair intercrystalline and finely vugular porosity.
3740-69	Dolomite, buff to light brown, very finely sucrosic.
Bass Island	
3769-80	Dolomite, gray-tan, dense.
3780-4072	Dolomite, tan to brown, dense to extremely finely crystalline.

4072-4100	Dolomite, green-gray, dense, earthy, very argillaceous.
Salina	
4100-4166	Dolomite, green-gray, dense, earthy, very argillaceous.
4166-4340	Salt.
4340-50	Anhydrite.
4350-66	Salt.
4366-85	Anhydrite.
4385-92	Salt.
4392-4410	Anhydrite.
4410-77	Salt.
4477-4503	Anhydrite.
4503-4634	Salt.
4634-52	Anhydrite.
4652-87	Salt.
4687-4718	Anhydrite.
4718-88	Salt.
4788-4822	Anhydrite.
4822-4912	Salt.
Salina E	
4912-58	Anhydrite, white to brown, with streaks of dolomite, tan to brown, dense to extremely finely sucrosic.
4958-66	Salt.
4966-5066	Anhydrite and dolomite, as at 4912.
Salina D	
5066-84	Salt.
Salina C	
5084-5204	Shale, light gray-green, blocky, dolomitic, anhydritic.

Salina B

5204-5512 Salt.

Salina A-2 Carbonate - Niagaran

5512-26 Dolomite, tan to brown, dense to extremely finely sucrosic, fine salt-filled vugs.

5526-5617 Dolomite, brown, dense to extremely finely sucrosic.

Core #1 - 5617-5706

5617-30 Dolomite, dense, very finely laminated, anhydritic lenses, occasional carbonate partings.

5630-40 Dolomite, as above, anhydritic shale partings in top foot.

5640-73 Dolomite, very thinly laminated, dips of 30°, filled fractures at 5662 and 5667, bleeding oil.

5673-81 Dolomite, light gray, mottled, finely to coarsely sucrosic.

5681-5706 Dolomite, as above, pen point to ½" vugs, occasional hairline fractures, grades from tight at top to porous at base.

Core #2 - 5706-5796

5706-27 Dolomite, finely to medium sucrosic, slightly anhydritic, fossiliferous, pin point porosity.

5727-45 Dolomite, as above, more fossiliferous, increasing porosity, algal, stylolitic, corals.

5745-50 Dolomite, as above, with pin point porosity, no fossils.

5750-61 Dolomite, as above, very fossiliferous, stylolotic, some anhydrite-filled vugs.

5761-72 Dolomite, as above, pin point porosity, no fossils.

5772-96 Dolomite, as above, fossiliferous, vuggy porosity.

Core #3 - 5796-5884

5796-5801 Dolomite, light gray-brown, finely crystalline, fossiliferous, stylolitic, vugs to ½".

5801-06 Dolomite, as above, no fossils, pin point to vugular porosity.

CONS 7229
Rev. 5/67

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION
SUPERVISOR OF WELLS

PERMIT TO PLUG AND ABANDON

PERMIT NO.	FIELD NAME
27730	Wildcat

OWNER OR OPERATOR: Shell Oil Company

WELL NAME: Gerald E. Gates — WELL NO.: 1-26

LOCATION	SECTION	TOWNSHIP	COUNTY
SE NW SW	26 T 30N R 5W	Star	Antrim

TYPE OF WELL (Oil, Gas, Dry Hole, etc.)	DATE COMPLETED	LAST PRODUCTION
Dry Hole	Oct. 8 19 69	19

LAST PRODUCTION (Amount per day) OIL, WATER, GAS

PLUGGING TO BE DONE BY	DATE PLUGGING WILL START
Halliburton or Dowell	Oct. 8 19 69
PLUGGING PERMIT REQUESTED BY (Well Owner or Authorized Representative): Bud Kennedy	DATE: Oct. 8 19 69

PERMIT MAILED TO: Shell Oil Company, % George Grignon,

ADDRESS: 1700 Broadway, Denver, Colorado

CASING AND CEMENTING RECORD			
SIZE CASING	DEPTH SET	NO. SACKS CEMENT	PERFORATIONS
20"	121	100+	
8"	1116	450+	

FORMATION TOPS AND OTHER DATA
(Formation & depth, Oil, Gas & Water Shows, etc.)

Electric logs were run
Elev. 1292.8 Gr.
Drift 908
No geological information was released.
TD. 6613

PLUGGING REQUIREMENTS:

Run drill pipe to 5800' and spot 60 sacks of cement through and above the Niagaran and to the A-2 zone. Pull drill pipe to 4125' and spot 35 sacks of cement through the Salina. Pull drill pipe to 2400' and spot 60 sacks of cement through and above the Dundee-Detroit River section. Pull drill pipe to 1475' and spot 35 sacks through the top of the Traverse. Pull drill pipe to 1130' and spot 35 sacks of cement to the base of the 8" surface pipe.

8" and 20" casings to be abandoned with the well. Cut casings off 3' below ground level and cap with steel plate and cement.

Plugging requirements outlined above are to be executed in accordance with the provisions of Act 61, P.A. 1939, and/or Act 326, P.A. 1937, and the rules and regulations issued and adopted thereunder. NOTE: THE PLUGGING OF THIS WELL CANNOT BE APPROVED UNTIL THE PLUGGING IS COMPLETED, CELLAR, RAT HOLE AND PITS FILLED AND THE LOCATION HAS BEEN CLEANED AND LEVELED.

PERMIT ISSUED BY	FIELD OFFICE	DATE
Kenneth White	Cadillac	Oct. 8 19 69

NOTE: WELL PLUGGING RECORD, Form CONS 7213, to be filed in TRIPLICATE within 30 days after completion.

Permit No. 27750

Co. Shell Oil Company
Farm Gerald G. Gates No. 1-26
Twp. Star Co. Antrim
Rge. SE NW SW Sec. 26 T 30N R 5W
* from * from line of ¼ Sec.
* from and * from property line

Elevation Halliburton or Dowell
Spud 10/8/69 Comp.

CASING RECORD

	Size	Length	Pulled
26	XK 20"	121 (100+)	
	18"		
	14"	1116 (550+)	
	8⅝"		
	6⅝"		

MUDDING AND CEMENTING RECORD

Date	Size	No. Sacks	Company
	18"		
	14"		
	8⅝"		
	6⅝"		

GEOLOGICAL FORMATION RECORD

Elevation 1292.8 Gr.
Drill to 908

Plug Dtls: 10/8/69

Pay plugged:

T D 6613
P B
I P (N) D & A
I P (A)
Plug. Comp.

Run DP to 5800' & spot 60 sax of cement t thru & above the Niag. & to the A-2 zone. Pull DP to 4125' & spot 35 sax of cement thru the Salina. Pull DP to 2400' & sp 60 sax cement thru & above Dd.-Det. Rvr. section. Pull DP to 1475' & spot 35 sax thru the top of the Trv. Pull DP to 1130' & spot 35 sax of cement to the base of the 8" surface pipe. 8" & 20" csgs. to be abandoned w/well. Cut csgs. off 3' below ground level & cap w/steel plate & cement.

GS-14

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION
P.O. BOX 30028, LANSING, MICHIGAN 48909

APR 14 1993

RECORD OF WELL DRILLING OR DEEPENING

APPROPRIATE BLOCKS, FOR ITEMS NOT LISTED SUBMIT ATTACHMENTS.

'IRED BY AUTHORITY OF:
CT 61, P.A. 1939, AS AMENDED. Submit 2 copies within 30 days of completion.)
☐ ACT 315, P.A. 1969, AS AMENDED. (Submit 2 copies within 60 days of completion.)

NON-SUBMISSION AND/OR FALSIFICATION OF THIS INFORMATION MAY RESULT IN FINES AND/OR IMPRISONMENT.

PERMIT NO./DEEPENING PERMIT NO.	TYPE OF WELL (after completion)
46244	Brine Disposal

FIELD/FACILITY NAME: BART STAR

WELL NAME & NUMBER: Estelle D1-1 SWD

SURFACE LOCATION: SE ¼ of SW ¼ of SW ¼ Section 1 T 30N R 5W

NAME AND ADDRESS OF OWNER
Terra Energy Ltd.
1503 N. Garfield Rd.
Traverse City, MI 49684

TOWNSHIP: Star | COUNTY: Antrim

FOOTAGES: NORTH/SOUTH: 339 Ft. from S Line and EAST/WEST: 769 Ft. from W Line of ¼ Sec.

NAME AND ADDRESS OF DRILLING CONTRACTOR
Bigard/Drillers Inc.
1315 N. Mission Rd.
Mt. Pleasant, MI 48858

SUBSURFACE LOCATION (if directionally drilled): NA ¼ of ¼ of ¼ Section T R

TOWNSHIP: NA | COUNTY: NA

DATE DRILLING BEGAN	DATE DRILL. COMPLETED	DATE WELL COMPLETED
10-19-92	10-24-92	11/10/92

FOOTAGES: NORTH/SOUTH: NA Ft. from Line and EAST/WEST: Ft. from . Line of ¼ Sec.

TOTAL DEPTH OF WELL	FORMATION AT T.D.	PROD. FORMATION(S)
Driller 2330 Log	Det. River Anhy	none

FEET DRILLED — CABLE TOOLS: From To

FEET DRILLED — ROTARY TOOLS: From 0 To 2330

DATE OF FIRST INJECTION	INJECTED FORMATION	SOLUTION FORMATION
12/23/92	Dundee	NA

ELEVATIONS: K.B. 1404 ft. | R.F. ft. | R.T ft. | Grd. 1394 ft.

CASING, CASING LINERS AND CEMENTING, OPERATING STRINGS

SIZE	WHERE SET	CEMENT	FT. PULLED
14	53	driven	
8 5/8	907	330	
5 1/2	2129	310	

PERFORATIONS

DATE	NUMBER HOLES	INTERVAL PERFORATED	OPEN YES	OPEN NO
		Open Hole Interval		
		2129 - 2330		

GROSS PAY INTERVALS

FORMATION	OIL OR GAS	FROM	TO
NA			

ALL OTHER OIL AND GAS SHOWS OBSERVED OR LOGGED

FORMATION	OIL OR GAS	DEPTH	WHERE OBSERVED (X) Samples	Odor	Pits	Mud Line	Gas Log	Fill Up
NA								

STIMULATION BY ACID OR FRACTURING

DATE	INTERVAL TREATED	MATERIALS AND AMOUNT USED
10/29/92	2129-2330	2000 gal 15% HCl

WATER FILL UP (F.U.) OR LOST CIRCULATION (L.C.) (X)

FORMATION	F.U.	L.C.	DEPTH	AMOUNT
NA				

MECHANICAL LOGS, LIST EACH TYPE RUN

BRAND	(X)	LOG TYPES	LOGGED INTERVALS
Schlumberger		no logs run	
Birdwell			
OTHER			

DEPTH CORRECTION

DEPTH	CORRECTION
none	

DEVIATION SURVEY

RUN AT	DEGREES

PLUGGED BACK

YES	NO	DEPTH

PRODUCTION TEST DATA

— Bbls/day	GRAVITY — °API	COND. Bbls/day	GAS — MCF/day	WATER — Bbls/day	H_2S — Grains/100 cu. ft.	B.H.P. AND DEPTH
NA	NA	NA	NA	NA	NA	NA

I AM RESPONSIBLE FOR THIS REPORT. THE INFORMATION IS COMPLETE AND CORRECT.

DATE	NAME AND TITLE (PRINT)	SIGNATURE
4/12/93	Stephen J. Savoie, Geologist	

NOTICE: REPORT COMPLETE SAMPLE AND FORMATION RECORD, CORING RECORD AND DRILL STEM TEST INFORMATION ON REVERSE SIDE.

PR 7200-5
Rev. 8/85

FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

#46244

ION USED: 1404 KB	GEOLOGIST NAME: Eric Taylor	TOPS TAKEN FROM: ☐ DRILLERS LOG ☒ SAMPLE LOG ☐ ELECTRIC LOG

IF WELL DIRECTIONALLY DRILLED, *ADD* TRUE VERTICAL DEPTH FORMATION TOPS WHERE APPROPRIATE.

OM	TO	FORMATION (TYPE, COLOR, HARDNESS)
1506	1522	Shale and limy Shale, gray, interbedded with Limestone, as above, dense
1522	1850	Limestone, brown tan gray, argillaceous in part, mostly fossiliferous, cherty in part, microcrystalline to extremely fine, dense
1850	2027	Shale and limy Shale, gray, interbedded with Limestone and shaly Limestone, dense
BELL SHALE		
2027	2110	Shale, gray, mostly non calcareous, soft texture
JNDEE LIMESTONE		
2110	2174	Limestone, brown brown-gray, argillaceous, mostly fossiliferous, trace residual hydrocarbon stain, microcrystalline to extremely fine, dense to poor porosity
2174	2222	Dolomite, tan buff , mostly clean, somewhat fossiliferous, sucrosic texture in part, vuggy in part- large white dolomite rhombs, extremely fine to microcrystalline, good to fair porosity
2222	2315	Dolomite and Limestone, brown tan, fairly clean, fossiliferous, finely sucrosic texture in part, microcrystalline to extremely fine, good to poor porosity
DETROIT RIVER ANHYDRITE		
2315	2330	Anhydrite, white

IF WELL WAS CORED, ATTACH CORE DESCRIPTION

DRILL STEM TEST DATA

LIST ATTACHMENTS:

GEOLOGICAL SURVEY USE ONLY

REVIEWED BY:

DATE OF REVIEW:

#46244

FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

ELEVATION USED:	GEOLOGIST NAME:	TOPS TAKEN FROM:
'04 KB	E. Taylor	☐ DRILLERS LOG ☒ SAMPLE LOG ☐ ELECTRIC LOG

NOTE: IF WELL DIRECTIONALLY DRILLED, *ADD* TRUE VERTICAL DEPTH FORMATION TOPS WHERE APPROPRIATE.

FROM	TO	FORMATION (TYPE, COLOR, HARDNESS)
		DRIFT
0	800	Sand, gravel and clay beds
		SUNBURY SHALE
800	950	Shale, black-very dark brown, carbonaceous, fissle
		ELLSWORTH SHALE
950	1180	Shale, gray-brown gray-green gray, very banded, silty in part
		ANTRIM SHALE
1180	1256	Shale, black-very dark brown, very carbonaceous, non-calcareous, grainy texture, fissle, trace disseminated pyrite, 1% to 10% gold spore fluorescence
1256	1296	Shale, gray brown-gray gray-green, limy in part, clay rich, carbonaceous in part, 1% gold spore fluor.
1296	1319	Shale, black, very carbonaceous, non-calcareous, grainy texture, fissle, minor disseminated pyrite, 10% to 20% gold spore fluor.
		TRAVERSE FORMATION
1319	1375	Shale, brown-gray, mostly calcareous, limy in part
		TRAVERSE LIMESTONE
1375	1404	Limestone, brown-gray, argillaceous, fossiliferous, microcrystalline, pyrite inclusions, dense
1404	1444	Shale and limy Shale, gray gray-brown, interbedded with shaly Limestone and Limestone, brown-gray, dense
1444	1506	Limestone, brown-gray, argillaceous, fossiliferous, cherty in part, algal mats, microcrystalline to extremely fine, dense

IF WELL WAS CORED, ATTACH CORE DESCRIPTION

DRILL STEM TEST DATA

LIST ATTACHMENTS:

GEOLOGICAL SURVEY USE ONLY

REVIEWED BY:

DATE OF REVIEW:

EPA

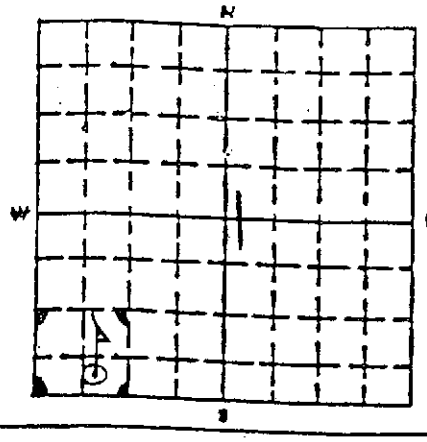
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

PLUGGING AND ABANDONMENT PLAN

WELL NAME & NUMBER, FIELD NAME, LEASE NAME & NUMBER
ESTELLE #D1-1 SWD
Bart Star Antrim Gas Project

NAME, ADDRESS, & PHONE NUMBER OF OWNER/OPERATOR
TERRA ENERGY LTD.
1503 N. Garfield Rd.
Traverse City, MI 49684

Locate Well And Outline Unit On Section Plat — 640 Acres



STATE	COUNTY	STATE PERMIT NUMBER
MI	ANTRIM	pending

SURFACE LOCATION DESCRIPTION
SE SW SW Section 1 T30N-R5W Star Twp.

LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND DRILLING UNIT
Surface Location 339 ft. From (N/S) S Line Of Quarter Section
And 769 ft. From (E/W) W Line Of Quarter Section

TYPE OF AUTHORIZATION
- [X] Individual Permit
- [ ] Rule
- [ ] Area Permit

Number of Wells in Area Permit ____
U.S. EPA Permit Number ____

WELL ACTIVITY
- [ ] Class I
  - [ ] Hazardous
  - [ ] Nonhazardous
- [X] Class II
  - [X] Brine Disposal
  - [ ] Enhanced Recovery
  - [ ] Hydrocarbon Storage
- [ ] Class III
- [ ] Class V

CASING/TUBING/CEMENT RECORD AFTER PLUGGING AND ABANDONMENT

Size	Weight (lb/ft.)	Setting Depth (ft.)	Sacks Cement Used	Hole Size (in.)	Amount Pulled (ft.)	Type
14	54#	50	50	NA	Driven	NA
8 5/8	20#	1000	1000	12 1/4	400	Poz A
5 1/2	15.5#	2125	2125	7 7/8	500	Poz A

METHOD OF EMPLACEMENT OF CEMENT PLUGS
- [X] The Balance Method
- [ ] The Dump Bailer Method
- [ ] The Two Plug Method
- [ ] Other, Explain:

CEMENT TO PLUG AND ABANDON DATA:	Plug # 1	Plug # 2	Plug # 3	Plug # 4	Plug # 5	Plug #	Plug #
Size of Hole or Pipe in Which Plug Will Be Placed (inches)	4 3/4	5 1/2	5 1/2	5 1/2			
Calculated Top of Plug (ft.)	2125	1875	850	surf			
Measured Top of Plug (ft.)	NA	NA	NA	NA			
Depth to Bottom of Plug (ft.)	2425	2125	1050	50			
Sacks of Cement To Be Used	37	30	24	6			
Slurry Volume To Be Used (cu. ft.)	44	35	28	7			
Slurry Weight (lb./gal.)	15.6	15.6	15.6	15.6			
Type of Cement, Spacer or Other Material Used	A	A	A	A			
Type of Fluid Used							

DESCRIPTION OF PLUGGING PROCEDURE

Circulate and balance hole, Thru tubing spot 37 sx cement plug at 2125, pull tubing to 1875 and spot 30 sx plug. Pull tubing to 850 and spot 24 sx plug. Pulltubing to 50 and spot 6 sx plug. Plug rat and mouse holes with cement. Cut casing 3 feet below ground level and weld on 1/2" steel plate.

ESTIMATED COST OF PLUGGING AND ABANDONMENT

Cement	$ 1800.00	Cast Iron Bridge Plug	$
Logging	$	Cement Retainer	$
Rig or Pulling Unit	$ 700.00	Miscellaneous	$ 700.00

CERTIFICATION

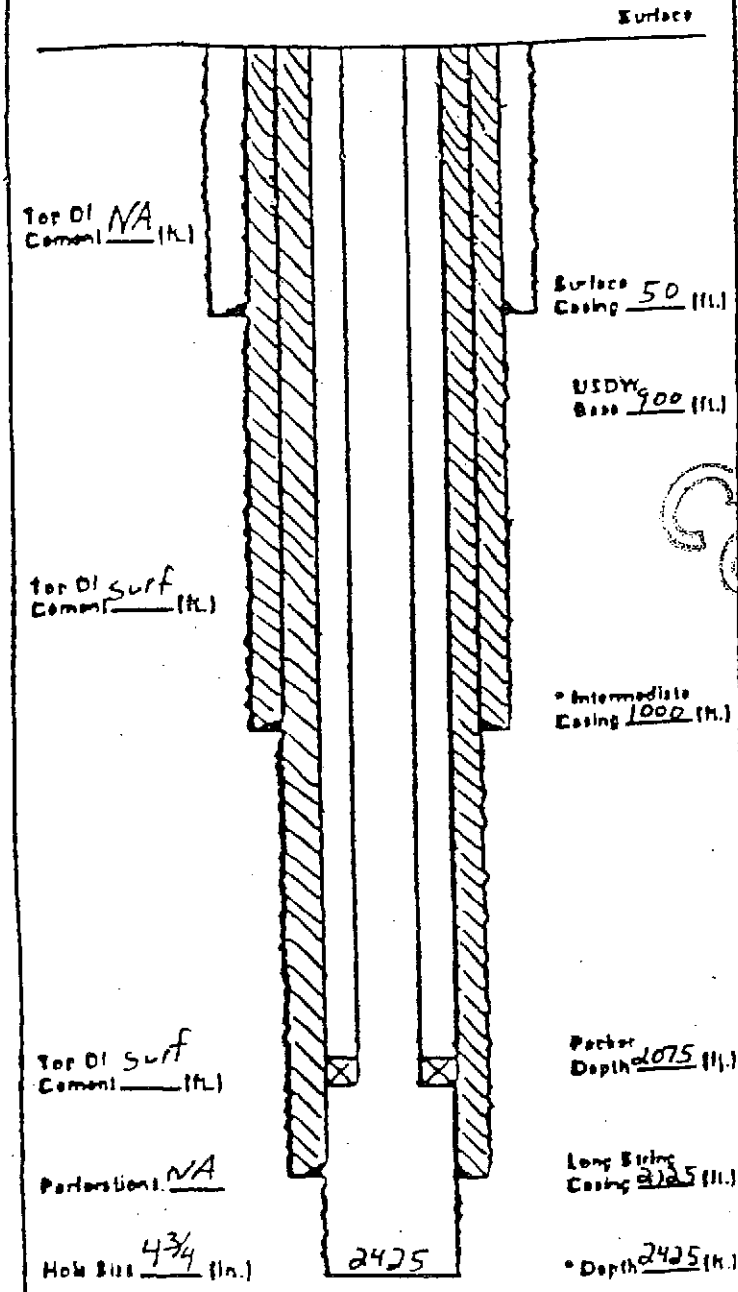
I certify under the penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, 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)	SIGNATURE	DATE SIGNED
Stephen J. Savoie, Geologist	Stephen J. Savoie	7/9/92

EPA Form 7520-14 (3-84)

ORIGINAL WELL CONSTRUCTION DURING OPERATION

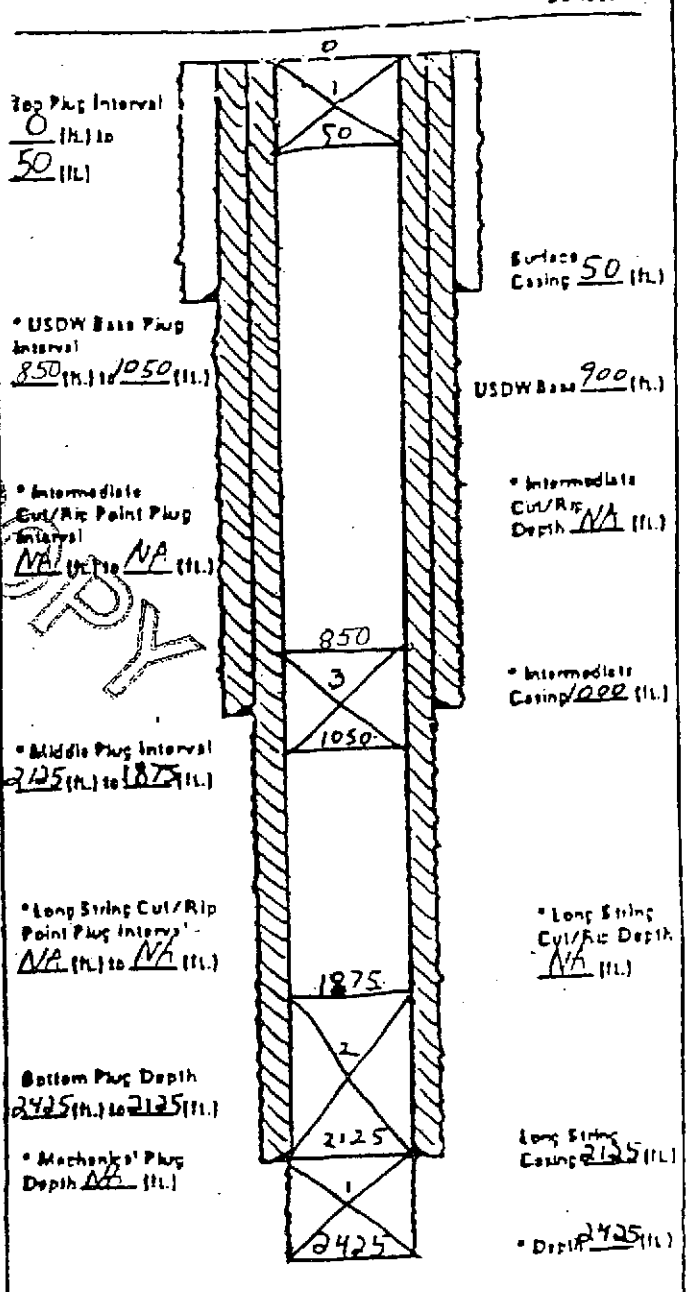
ESTELLE #D1-1 SWD



** Add Any Additional Information
* May Not Apply

PLUGGING AND ABANDONMENT CONSTRUCTION

ESTELLE #D1-1 SWD



** Add Any Additional Information
* May Not Apply

LIST OF ALL OPEN AND/OR PERFORATED INTERVALS AND INTERVALS WHERE CASING WILL BE VARIED

Specify Open Hole or Perforated Interval or Varied Casing	From	To	Formation Name
OPEN HOLE	2125	2425	Dundee/Det Riv Salt

FEB 06 1990

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION
P.O. BOX 30028 LANSING, MICHIGAN 48909

RECORD OF WELL DRILLING OR DEEPENING

USE APPROPRIATE BLOCKS FOR ITEMS NOT LISTED SUBMIT ATTACHMENTS

REQUIRED BY AUTHORITY OF

☐ ACT 61, P.A. 1939, AS AMENDED (Submit 2 copies within 30 days of completion)

☐ ACT 315, P.A. 1969, AS AMENDED (Submit 2 copies within 60 days of completion)

NON SUBM... FALSIFICATION OF THIS INFORMATION MAY RESULT IN FINES AND ... IMPRISONMENT

PERMIT NO./DEEPENING PERMIT NO.	42680
TYPE OF WELL (after completion)	GAS /DISPOSAL
FIELD/FACILITY NAME	CAPLE RANCH
WELL NAME & NUMBER	CAPLE #1-19
SURFACE LOCATION	NE ¼ of SE ¼ of SE ¼ Section 19 T30N R 4W
TOWNSHIP	HAYES
COUNTY	OTSEGO
FOOTAGES	970 Ft. from S Line and 495 Ft. from E Line of ¼ Sec
SUBSURFACE LOCATION (if directionally drilled)	¼ of ¼ of ¼ Section T R
TOWNSHIP	
COUNTY	
FOOTAGES	Ft. from Line and Ft. from Line of ¼ Sec.
FEET DRILLED — CABLE TOOLS	From To
FEET DRILLED — ROTARY TOOLS	From 0 To TD
ELEVATIONS	K.B. 1360 ft. R.F. ft. R.T ft. Grd. 1347 ft

NAME AND ADDRESS OF OWNER
TERRA ENERGY, LTD.
1503 N. GARFIELD ROAD
TRAVERSE CITY, MICHIGAN 49684

NAME AND ADDRESS OF DRILLING CONTRACTOR
James Bigard Drilling
P.O. Box 509, 1315 N. Mission Road
Mt. Pleasant, MI 48804

DATE DRILLING BEGAN	DATE DRILL COMPLETED	DATE WELL COMPLETED
11-13-89	11-19-89	12/11/89
TOTAL DEPTH OF WELL	**FORMATION AT T.D.**	**PROD. FORMATION(S)**
Driller 2490 Log	Det Riv Salt	Antrim
DATE OF FIRST INJECTION	**INJECTED FORMATION**	**SOLUTION FORMATION**
Pending	Dundee	

CASING, CASING LINERS AND CEMENTING, OPERATING STRINGS

SIZE	WHERE SET	CEMENT	FT. PULLED
14	51	Driven	
8 5/8	940	200 sx 35/65 poz	
		150 sx class A	
5 1/2	2151	100 sx 35/65 poz	
		280 sx class A	

PERFORATIONS

DATE	NUMBER HOLES	INTERVAL PERFORATED	OPEN YES	OPEN NO
12/8	66	1244-1247	X	
	22	1337-1347		

GROSS PAY INTERVALS

FORMATION	OIL OR GAS	FROM	TO
ANTRIM	GAS	1205	1284
		1320	1354

ALL OTHER OIL AND GAS SHOWS OBSERVED OR LOGGED

FORMATION	OIL OR GAS	DEPTH	Samples	Odor	Pits	Mud Line	Gas Log	Fill Up

STIMULATION BY ACID OR FRACTURING

DATE	INTERVAL TREATED	MATERIALS AND AMOUNT USED
12/11	1244-1274	279,000 Scf N2
	1337-1347	300 sx 20/40 sand
		100 sx 12/20 sand
		243 bbls fluid

WATER FILL UP (F.U.) OR LOST CIRCULATION (L.C.) (X)

FORMATION	F.U	L.C	DEPTH	AMOUNT

MECHANICAL LOGS, LIST EACH TYPE RUN

BRAND	(X)	LOG TYPES	LOGGED INTERVALS
Schlumberger		No logs run	
Birdwell			
Other			

DEPTH CORRECTION / DEVIATION SURVEY / PLUGGED BACK

DEPTH	CORRECTION	RUN AT	DEGREES	YES	NO	DEPTH

PRODUCTION TEST DATA

OIL — Bbls/day	GRAVITY — °API	COND Bbls/day	GAS — MCF/day	WATER — Bbls/day	H_2S — Grains/100 cu ft	BHP AND DEPTH
			39	13		

I AM RESPONSIBLE FOR THIS REPORT. THE INFORMATION IS COMPLETE AND CORRECT.

DATE	NAME AND TITLE (PRINT)	SIGNATURE
1/11/90	Stephen J. Savoie, Geologist	Stephen J. Savoie

NOTICE: REPORT COMPLETE SAMPLE AND FORMATION RECORD, CORING RECORD AND DRILL STEM TEST INFORMATION ON REVERSE SIDE

PR 7200-5

FORMATION RECORD

PN. 42680

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

ELEVATION USED	GEOLOGIST NAME	TOPS TAKEN FROM
KB 1360	Stephen J. Savoie	☐ DRILLERS LOG ☒ SAMPLE LOG ☐ ELECTRIC LOG

NOTE: IF WELL DIRECTIONALLY DRILLED, ADD TRUE VERTICAL DEPTH FORMATION TOPS WHERE APPROPRIATE.

FROM	TO	FORMATION (TYPE, COLOR, HARDNESS)
	833	Base of Drift
	1205	Dark Antrim
	1354	Traverse Fm
	1404	Traverse LS
	2061	Bell Shale
	2141	Dundee
	2472	Det Riv Salt
	2490	TD
833	1165	Shale, light to med gray, soft, firm, calc
1165	1205	Shale, med. to dark gray, firm, fissile, sl carb.
1205	1284	Shale, black, firm, fissile, carb.
1284	1320	Shale, light to med. gray firm, calc.
1320	1354	Shale, black, firm fissle, carb.
1354	1404	Shale, light gray, firm, calc.
1404	2061	Limestone, tan to light gray to white, with scattered beds of shale, light gray soft, calc.
2061	2141	Shale, light gray, soft, calc.
2141	2472	Limestone, gray to tan to brown with scattered dolomite & anhydrite beds.
2472	2490	Salt

FROM	TO	FORMATION (TYPE, COLOR, HARDNESS)

IF WELL WAS CORED, ATTACH CORE DESCRIPTION

DRILL STEM TEST DATA

LIST ATTACHMENTS:

GEOLOGICAL SURVEY USE ONLY

REVIEWED BY:

DATE OF REVIEW:

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION
BOX 30028
LANSING, MICHIGAN 48909

REQUIRED BY AUTHORITY OF
☐ ACT 61, P.A. 1939, AS AMENDED ☐ ACT 315, P.A. 1969, AS AMENDED

APPLICATION TO (Submit 4 copies):

☒ CHANGE WELL STATUS ☐ PLUG AND ABANDON

NON-SUBMISSION AND/OR FALSIFICATION OF THIS INFORMATION MAY RESULT IN FINES AND OR IMPRISONMENT

PERMIT NO	TYPE OF WELL
42680	Dry Hole

NAME AND ADDRESS OF WELL OWNER ☐ APPROVAL MAILED

TERRA ENERGY LTD
1503 North Garfield Road
Traverse City, Michigan 49684

FIELD/FACILITY NAME: WILDCAT

CHANGE OF WELL STATUS REQUESTED FOR:
☐ PLUG BACK ☐ EXTEND PLUGGING (T.A.) ☒ PERFORATE
☐ CONVERT TO INJECTION OR DISPOSAL WELL ☐ OTHER
☐ ACIDIZE (315 ONLY) ☒ FRACTURE (315 ONLY)

WELL NAME	WELL NO
CAPLE	1-19

WELL LOCATION: NE ¼ of SE ¼ of SE ¼ Section T 30N R 4W

LAST PRODUCTION / INJECTION AND TYPE OF FLUID (Amount per day & injection pressure)
Never Produced

TOWNSHIP	COUNTY
HAYES	OTSEGO

DATE DRILLING COMPLETED	DATE LAST PRODUCED/UTILIZED
11-19-89	NA

WORK TO BE DONE BY: ☐ APPROVAL MAILED
TERRA ENERGY LTD.

STARTING DATE: 12-1-89

CASING AND CEMENTING RECORD

HOLE DIA	CASING DIA & WT/FT	DEPTHS SET	CEMENT QUANTITY TYPE ADDITIVES	CMT TOP	PERFORATIONS
NA	14"	56'	Driven		
12 1/4"	8 5/8"	926'	200 sx 35/65 poz 150 sx class A	Surface	
7 7/8"	5 1/2" 15.5#	2151'	100 sx 35/65 poz 280 sx class A	980'	

FORMATION RECORD (Formation and depth, oil, gas and water shows, etc.)

BOD	833
Dark Antrim	1205
Trav Fm	1354
Trav Lm	1404
Bell Shale	2061
Dundee	2141
TD	2490

GEOLOGICAL SURVEY
AUG 15 1994
Permits & Bonding Unit

DETAIL PROPOSED PROCEDURES

Rig up completion rig and set retrievable bridge plug at 2100'. TIH with casing gun and perforate interval from 1240' to 1270' and 1335' and 1345' with 4jspf. TOH with casing gun and TIH with tubing to 1140'. Rig up fracturing equipment and fracture perfed formation with nitrogen and sand. Flow well back and test Antrim Fm for possible gas.

DNR ADDITIONAL REQUIREMENTS

NAME & SIGNATURE (Authorized Representative): William C. Quinlan, Geological Engineer — William C. Quinlan — DATE: 11/30/89

APPROVED BY: DNR	OFFICE: Gaylord	APPROVAL DATE: 12-7-89	TERMINATION DATE: NA

NOTE: THREE COPIES OF WELL PLUGGING OR REWORK (PR 7200-8) ARE TO BE FILED WITHIN 30 DAYS OF COMPLETION

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION
BOX 30028
LANSING, MICHIGAN 48909

USE APPROPRIATE BLOCKS. FOR ITEMS NOT LISTED SUBMIT ATTACHMENTS.
REQUIRED BY AUTHORITY OF:
☐ ACT 61, P.A. 1939, AS AMENDED ☐ ACT 315, P.A. 1969, AS AMENDED

NON-SUBMISSION AND/OR FALSIFICATION OF THIS INFORMATION MAY RESULT IN FINES AND/OR IMPRISONMENT.

RECORD OF WELL: ☐ **PLUGGING** ☒ **REWORK**
(MAIL THREE COPIES TO THE DISTRICT OFFICE WITHIN 30 DAYS AFTER COMPLETION OF PLUGGING OR REWORK)

PERMIT NO.	TYPE OF WELL
42680	Gas

FIELD/FACILITY NAME: Wildcat

WELL NAME & NUMBER: Caple #1-19

WELL LOCATION: NE ¼ of SE ¼ of SE ¼ Section 19 T 30N R 4W

TOWNSHIP	COUNTY
Hayes	Otsego

TOTAL DEPTH	FORMATION
2490	Detroit River Salt

...NG/REWORK STARTING DATE	PLUGGING/REWORK COMPLETION DATE
...07-89	12-12-89

...EPTH AFTER REWORK	MECHANICAL LOGS RUN
	GR/CCL

...MPLETED FOR	FORMATION AND ZONE
S	Antrim Shale

NAME AND ADDRESS OF WELL OWNER
Terra Energy Ltd.
1503 N. Garfield Road
Traverse City, MI 49684

To Well or
Update files

CASING SIZE	WHERE SET	AMOUNT RECOV
5-1/2	2151	NA

...IDGES OR PLUGS	DEPTH PLACED	SACKS OF CEMENT & ADDITIVES
...ridge plug	1425	NA

WERE TOOLS, TUBING, CASING, ETC. LOST OR LEFT IN THE HOLE BEFORE OR AFTER PLUGGING? IF YES, GIVE DETAILS.
NO

DID A SERVICE COMPANY PUMP MUD, SPOT CEMENT, OR SET BRIDGE PLUGS? IF YES, GIVE NAME AND ADDRESS.
Dowell Schlumberger
Kalkaska, MI 49646

WELL PLUGGING/REWORK CONTRACTOR AND ADDRESS
Phoenix Operating Company
1623 Northern Star DRive
Traverse City, MI 49684

PERMITEE'S PLUGGING WITNESS
Jack Lauber

NAME(S) OF DNR REPRESENTATIVE WHO:
Andrea Sullivan

☒ ISSUED PERMIT
☐ WITNESSED PLUGGING

WELL CASING RECORD — BEFORE REWORK

Casing Size	Casing Depth	Cement Sacks	Cement Type	Perforations From	Perforations To	Acid or Fracture Treatment Record	Perforations If plugged, how?
14	56	NA	NA				
8-5/8	926	200/150	POZ/A				
5-1/2	2151	110/280	POZ/A				

GEOLOGICAL SURVEY
AUG 17 1994
Permits & Bonding Unit

WELL CASING RECORD — AFTER REWORK (Indicate additions and changes only)

Casing Size	Casing Depth	Cement Sacks	Cement Type	Perforations From	Perforations To	Acid or Fracture Treatment Record	Perforations If plugged, how?
5-1/2	2141	100/280	POZ/A	1244	1274	Acidize open hole 2151-2490 with 2000 gal HCl acid. Frac perfs with 279,000 Scf N2, 300 sx 20/40 sand, 100 sx 12/20 sand 243 bbls fluid.	
				1337	1347		

DESCRIBE IN DETAIL HOW WELL WAS PLUGGED OR REWORKED.

Move in Pool rig, rig up. TIH with tubing and acidize open hole section with 1000 gal 15% HCl and 1000 gal 28% HCl acid. TIH with CIBP set at 1425'. TIH with perf gun and perf 5-1/2" casing from 1244-1274', 1337-1347', acidize perfs with 3400 gal Fe acid. Frac well with 279 MCF N2 foam, 300 sx 20/40 sand, 100 sx 12/20 sand, 243 bbls fluid. Flow back frac and shut in well.

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION
BOX 30028
LANSING, MICHIGAN 48909

USE APPROPRIATE BLOCKS. FOR ITEMS NOT LISTED SUBMIT ATTACHMENTS.
REQUIRED BY AUTHORITY OF:
☐ ACT 61, P.A. 1939, AS AMENDED ☐ ACT 315, P.A. 1969, AS AMENDED

NON-SUBMISSION AND/OR FALSIFICATION OF THIS INFORMATION MAY RESULT IN FINES AND/OR IMPRISONMENT.

RECORD OF WELL: ☐ PLUGGING ☒ REWORK
(MAIL THREE COPIES TO THE DISTRICT OFFICE WITHIN 30 DAYS AFTER COMPLETION OF PLUGGING OR REWORK)

PERMIT NO.	TYPE OF WELL
42680	Gas
FIELD/FACILITY NAME: Wildcat	
WELL NAME & NUMBER: Caple #1-19	
WELL LOCATION: NE ¼ of SE ¼ of SE ¼ Section 19 T 30N R 4W	
TOWNSHIP: Hayes	COUNTY: Otsego
TOTAL DEPTH: 2490'	FORMATION: Dundee
PLUGGING/REWORK STARTING DATE: 07-27-90	PLUGGING/REWORK COMPLETION DATE: 07-30-90
TOTAL DEPTH AFTER REWORK: 2490'	MECHANICAL LOGS RUN
WELL COMPLETED FOR: Gas/Disposal	FORMATION AND ZONE: Antrim

NAME AND ADDRESS OF WELL OWNER
Terra Energy Ltd.
1503 N. Garfield Road
Traverse City, MI 49684

CASING SIZE	WHERE SET	AMOUNT RECOVERED	SHOT OR RIPPED	TYPE OF BRIDGES OR PLUGS	DEPTH PLACED	SACKS OF CEMENT & ADDITIVES

RECEIVED GEOLOGICAL SURVEY
AUG 8 1990
Permits & Bonding Unit

WERE TOOLS, TUBING, CASING, ETC. LOST OR LEFT IN THE HOLE BEFORE OR AFTER PLUGGING? IF YES, GIVE DETAILS.

DID A SERVICE COMPANY PUMP MUD, SPOT CEMENT, OR SET BRIDGE PLUGS? IF YES, GIVE NAME AND ADDRESS.

WELL PLUGGING/REWORK CONTRACTOR AND ADDRESS

PERMITEE'S PLUGGING WITNESS

NAME(S) OF DNR REPRESENTATIVE WHO: ☐ ISSUED PERMIT ☐ WITNESSED PLUGGING

WELL CASING RECORD — BEFORE REWORK

Casing Size	Casing Depth	Cement Sacks	Cement Type	Perforations From	Perforations To	Acid or Fracture Treatment Record	Perforations if plugged, how?
14"	56'	NA	NA				
8-5/8	926'	200/150	POZ/CLA				
5-1/2	2151'	100/280	POZ/CLA				

WELL CASING RECORD — AFTER REWORK (Indicate additions and changes only)

Casing Size	Casing Depth	Cement Sacks	Cement Type	Perforations From	Perforations To	Acid or Fracture Treatment Record	Perforations if plugged, how?
14"	56'	NA	NA				
8-5/8	926'	200/150	POZ/CLA				
5-1/2	2151'	100/250	POZ/CLA	1244	1274	3560 gal Fe acid	1244 to 1274
						30,000# 20/40, 10,000#	1337 to 1347
						12/20 sand frac	

DESCRIBE IN DETAIL HOW WELL WAS PLUGGED OR REWORKED

Acidize Dd w/1000 gal 15% HCL and 1000 gal 25% HCL. TIH with CIBP to 1425' and set. Spot 250 gal 15% Fe at 1350'. TIH wtih perf gun and perf 1244' to 1274' and 1337' to 1347' with 4 jspf. Acidize perfs with 3400 gal 15% Fe. Flow back frac. Drill up CIBP at 1425'. TIH with Arrow XLW packer and set at 2096'. TIH with 29 jts 2-3/8" tubing, dual packer and 36 jts 1.9" tubing and sting into at 2096'. Set dual packer at 1202'. TIH with 36 jts 1.9" tubing and circulate corrosion inhibitor with tubing/casing annulus. Sting into dual packer.

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION
P.O. BOX 30028 LANSING MICHIGAN 48909

RECORD OF WELL DRILLING OR DEEPENING

USE APPROPRIATE BLOCKS FOR ITEMS NOT LISTED SUBMIT ATTACHMENTS

REQUIRED BY AUTHORITY OF
☐ ACT 61 P.A. 1939 AS AMENDED (Submit 2 copies within 30 days of completion.)
☐ ACT 315 P.A. 1969 AS AMENDED (Submit 2 copies within 60 days of completion.)

NON SUBMISSION AND/OR FALSIFICATION OF THIS INFORMATION MAY RESULT IN FINES AND/OR IMPRISONMENT

PERMIT NO. (LEAVE BLANK IF NO PERMIT) 41955

TYPE OF WELL (OIL, GAS, DRY HOLE, ETC.) Salt water disposal

FIELD, FACILITY NAME Star "23" Antrim Field

WELL NAME & NUMBER Gates #1-23 SWD

SURFACE LOCATION SE ¼ of NE ¼ of NW ¼ Section 23 T30N R5W

NAME AND ADDRESS OF OWNER
TERRA ENERGY, LTD.
1503 N. GARFIELD ROAD
TRAVERSE CITY, MICHIGAN 49684

TOWNSHIP STAR | COUNTY ANTRIM

FOOTAGES NORTH/SOUTH 1250 Ft from N Line and EAST/WEST 100 Ft from E Line of ¼ Sec

NAME AND ADDRESS OF DRILLING CONTRACTOR
McLachlan Drilling
P.O. Box 548
Evart, Michigan 49631

SUBSURFACE LOCATION (if directionally drilled) ¼ of ¼ of ¼ Section T R

TOWNSHIP | COUNTY

DATE DRILLING BEGAN	DATE DRILL COMPLETED	DATE WELL COMPLETED
5-10-89	5-15-89	5-16-89

FOOTAGES NORTH/SOUTH Ft from Line and EAST/WEST Ft from Line of ¼ Sec

TOTAL DEPTH OF WELL	FORMATION AT T.D.	PROD. FORMATION(S)
Driller 2411 Log	Dundee	None

FEET DRILLED — CABLE TOOLS From To | FEET DRILLED — ROTARY TOOLS From 0 To TD

DATE OF FIRST INJECTION	INJECTED FORMATION	SOLUTION FORMATION
Pending	Dundee	

ELEVATIONS K.B. 1321 ft | R.F. ft | R.T. ft | Grd. 1307 ft

CASING, CASING LINERS AND CEMENTING, OPERATING STRINGS

SIZE	WHERE SET	CEMENT	FT. PULLED
14"	53	Driven	
8 5/8	972	200 sx 35/65 poz	
		150 sx Class A	
5 1/2	2116	190 sx 35/65 poz	
		75 sx RFC	

PERFORATIONS

DATE	NUMBER HOLES	INTERVAL PERFORATED	OPEN YES	OPEN NO
		Open hole completion		

GROSS PAY INTERVALS

FORMATION	OIL OR GAS	FROM	TO

ALL OTHER OIL AND GAS SHOWS OBSERVED OR LOGGED

FORMATION	OIL OR GAS	DEPTH	WHERE OBSERVED (X) Samples	Odor	Pits	Mud Logs	Gas Logs	Other

STIMULATION BY ACID OR FRACTURING

DATE	INTERVAL TREATED	MATERIALS AND AMOUNT USED

WATER FILL UP (F.U.) OR LOST CIRCULATION (L.C.) (X)

FORMATION	F.U.	L.C.	DEPTH	AMOUNT
Traverse		X	1470	Unknown
Dundee		X	2260	Unknown

MECHANICAL LOGS, LIST EACH TYPE RUN

	BRAND	(X)	LOG TYPES	LOGGED INTERVALS
	Schlumberger			
	Brown			
OPEN	Halliburton	X	GR-Neutron	0-2155

DEPTH CORRECTION

DEPTH	CORRECTION

DEVIATION SURVEY

RUN AT	DEGREES

PLUGGED BACK

YES	NO	DEPTH

PRODUCTION TEST DATA

OIL — Bbls./day	GRAVITY — °API	COND. Bbls/day	GAS — MCF/day	WATER — Bbls./day	H_2S — Grains/100 cu. ft.	BHP AND DEPTH

I AM RESPONSIBLE FOR THIS REPORT. THE INFORMATION IS COMPLETE AND CORRECT.

DATE	NAME AND TITLE (PRINT)	SIGNATURE
6/2/89	Stephen J. Savoie, Geologist	

NOTICE: REPORT COMPLETE SAMPLE AND FORMATION RECORD, CORING RECORD AND DRILL STEM TEST(S) FORMATION ON REVERSE SIDE.

FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

F 41955

ELEVATION DATUM	GEOLOGIST NAME	TOPS TAKEN FROM
KB 1321	Stephen J. Savoie	☐ DRILLERS LOG ☒ SAMPLE LOG ☒ ELECTRIC LOG

NOTE IF WELL DIRECTIONALLY DRILLED, *ADD* TRUE VERTICAL DEPTH FORMATION TOPS WHERE APPROPRIATE

FROM	TO	FORMATION (TYPE COLOR HARDNESS)
	907	Base of drift
	907	Top of Ellsworth
	1180	Dark Antrim
	1320	Traverse Fm
	1376	Traverse LS
	2035	Bell Shale
	2114	Dundee
	2411	Total Depth
907	1125	Shale, light gray, soft, firm,calc.
1125	1180	Shale, light to med Gray, soft-firm, calc
1180	1257	Shale, black, firm fissile, carb.
1257	1194	Shale, light gray, firm,fissile,calc
1194	1320	Shale, black, firm, fissile, carb.
1320	1376	Shale, light gray, firm, calc., some limestone, white.
1376	2035	Limestone, white to tan to dk brown, some scattered shale, light gray, firm, calc.
2035	2114	Shale light to med blue gray, soft, calc.
2114	2250	Limestone, gray to tan to brown, tight with scattered dolomite beds
2250	2385	Dolomite, med to dk brown, porous
2385	2390	Anhydrite , white
2390	2411	Limestone, light gray tight with scattered beds of anhydrite and dolomite.

FROM	TO	FORMATION (TYPE COLOR HARDNESS)

IF WELL WAS CORED, ATTACH CORE DESCRIPTION

DRILL STEM TEST DATA

LIST ATTACHMENTS:

GEOLOGICAL SURVEY USE ONLY

REVIEWED BY:

SEC 23 30N 5W PERMIT 41955
MICH ANTRIM * 1250FNL 100FEL NW SE NE NW
TERRA ENERGY U U
1-23 GATES S W D
1321KB 1307GR MANCELONA E
API 21-009-41955-0000
SPUD 05/10/1989 COMP 05/16/1989 ROTARY SERVCE
PROJ DEPTH 2900 DUNDEE CONTR MCLACHLAN L M #2
DTD 2411 LTD 2155 FM/TD DUNDEE
5 7/8 MI N MANCELONA EAST FLD
10 1/2 MI NE MANCELONA, MI
DRLG UNIT: SEC 23 (NE,NW)
CSG 14 @ 53
CSG 8 5/8 @ 972 W/ 350 SACKS
CSG 5 1/2 @ 2116 W/ 265 SACKS

LOG	DRIFT			907 414
LOG	ELLSWRTH	907	414	
LOG	ANTRM DK	1180	141	
LOG	TRAVERSE	1320	1	
LOG	TRAV LM	1376	-55	
LOG	BELL	2035	-714	
LOG	DUNDEE	2114	-793	
	TD	2411	-1090	

DUNDEE OPENHOLE 2116- 2411
DISPOSAL RATE NA
NATURAL
LOGS 0- 2155 GRNL
NAMED TWP STAR

21 5

GEOL STEPHEN J SAVOIE
TERRA ENERGY
1503 N GARFIELD DR
TRAVERSE CITY, MI 49684
616-941-7919

03/01 LOC/1989/

08/14/89
21 5

TAX NO: 05-13-013-001-55

MICHIGAN DEPARTMENT OF PUBLIC HEALTH
WATER WELL AND PUMP RECORD

PERMIT NO: A96-21

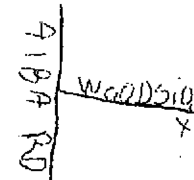
1. LOCATION OF WELL

County	Township Name	Fraction	Section No.	Town No.	Range No.
ANTRIM	Star	1/4 1/4 1/4	13	30N	5W

Distance and Direction from Road Intersection: From ALBA RD & WOODSIDE, go Down woodside About 3/4 Mi.

Street Address & City of Well Location

Locate with 'x' in Section Below — Sketch Map



3. OWNER OF WELL: Charles WestPhal
Address: 680 Sparr RD
11357 WooDSide
ALBA Mi
Address Same as Well Location: [X] Yes [ ] No

4. WELL DEPTH: 160 ft. Date Completed: 5/6/96 [X] New Well [ ] Replacement Well

5. [ ] Cable Tool [X] Rotary [ ] Driven [ ] Dug [ ] Hollow Rod [ ] Auger/Bored [ ] Jetted [ ]

6. USE: [X] Household [ ] Type I Public [ ] Type III Public [ ] Irrigation [ ] Type IIa Public [ ] Heat Pump [ ] Test Well [ ] Type IIb Public [ ]

2. FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Br SAND	5	5
CorsE TAN SAND	55	60
CorsE TAN SAND & SMAll gravel	100	160

USE A 2ND SHEET IF NEEDED

7. CASING: [ ] Steel [ ] Threaded [X] Plastic [ ] Welded [ ] Other
Height: (Above)/Below Surface: 1 ft
Diameter: 5 in. to 154 ft. depth; ___ in. to ___ ft. depth
Weight: ___ lbs/ft
BORE HOLE: Diameter: 8 in. to 160 ft. depth; ___ in. to ___ ft. depth
[ ] Drive Shoe [ ] Shale Packer

8. SCREEN: [ ] Not Installed [X] Gravel-Packed
Type: PVC Diameter: 4 IN
(Slot)/Gauze: 15 Length: 6 Feet
Set Between 154 ft. and 160 ft.
FITTINGS: [ ] K-Packer [ ] Bremer Check [ ] Blank Above Screen ___ ft Other: PVC Bell

9. STATIC WATER LEVEL: 130 ft. Below Land Surface [ ] Flowing

10. PUMPING LEVEL: Below Land Surface ___ ft. After ___ hrs. Pumping at 50 G.P.M.
[ ] Plunger [ ] Bailer [X] Air [ ] Test Pump

11. WELL HEAD COMPLETION: [X] Pitless Adapter [ ] 12" Above Grade [ ] Basement Offset [ ] Well House

12. WELL GROUTED? [ ] No [X] Yes From 0 to 144 ft.
[ ] Neat Cement [X] Bentonite [X] Other Grout Mix
No. of Bags 5 Additives ___

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION:
Type: Septic Distance: 60+ ft. Direction: NE
Type: ___ Distance: ___ ft. Direction: ___

14. PUMP: [ ] Not Installed [ ] Pump Installation Only
Manufacturer's Name: MEYERS
Model Number ___ HP 3/4 Volts 220
Length of Drop Pipe 155 ft. Capacity 12 G.P.M.
TYPE: [X] Submersible [ ] Jet [ ] Other
PRESSURE TANK:
Manufacturer's Name: XTRol
Model Number: 203 Capacity 9.9 Gallons 32

15. ABANDONED WELL PLUGGED? [ ] Yes [ ] No
Casing Diameter ___ in. Depth ___ ft.
PLUGGING MATERIAL: [ ] Neat Cement [ ] Bentonite Slurry [ ] Cement/Bentonite Slurry [ ] Concrete Grout [ ] Bentonite Chips
No. of Bags ___ Casing Removed? [ ] Yes [ ] No

16. REMARKS: (Elevation, Source of Data, etc.)

17. DRILLING MACHINE OPERATOR: [ ] Employee [ ] Subcontractor
Name ___

15. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Stephen E Johnson Water Well Drilling 69-1897
REGISTERED BUSINESS NAME — REGISTRATION NO.
Address: 1990 VAN Tyle RD Gaylord Mi 49735
Signed: Stephen E Johnson — AUTHORIZED REPRESENTATIVE Date: 5,12,96

GW-2-228 8/93

GEOLOGICAL SURVEY COPY

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Well ID: 05000000748

Tax No: 05-13-013-001-60	Permit No: A01-004	County: Antrim	Township: Star

Fraction	Section	Town/Range	French Claim	WSSN
NE¼ SW¼ U¼	13	30N 05W		

Well ID: 05000000748

Elevation:

Latitude: 44.99581562

Longitude: -84.86237975

Distance and Direction from Road Intersection:

Well Name:

Well Owner: Middleton, Green B.

Well Address:
11311 WOODSIDE DR.

Owner Address:
90 MCCOY RD.
GAYLORD MI 49735

Drilling Method: Auger/Bored

Well Depth: 161.00 ft. | Well Use: Household

Well Type: New | Date Completed: 3/20/2001

Casing Type: Steel - black
Casing Joint: Threaded & coupled
Diameter: 4.00 in. to 157.00 ft. depth

Bore Diameter 1: 5.00 in. to 165.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: None

Static Water Level: 140.00 ft. Below Grade(Not Flowing)
Yield Test Method: Test pump
Measurement Taken During Pump Test:
0.50 hrs. pumping at 22.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:
Abandoned well ID:

Screen Installed: Yes Well Intake:
Filter Packed: No
Screen Diameter: 3.00 in. Length: 4.00 ft.
Screen Material Type: Stainless steel-wire wrapped
Slot: 10.00 in. Set Between 157.00 ft. and 161.00 ft.
Blank:
Fittings:
Neoprene packer

Well Grouted: Yes Grouting Method: Unknown
No. of Bags: 4 Additives: None
Grouting Materials:
Bentonite slurry From 0.00 ft. to 150.00 ft.

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	60.00 ft.	North

Drilling Machine Operator Name: JACK

Employment: Subcontractor

Pump Installed: Yes
Pump Installation date:
Manufacturer: Goulds
Model Number:
Length of Drop Pipe: 154.00 ft.
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pump Installation only: No
HP: 0.75
Pump Type: Submersible
Pump Capacity: 12.00 GPM
Id of Well:

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Challenger
Model Number:
Tank Capacity: 20 Gallons
Pressure Relief Valve Installed: No

Formation Description	Thickness	Depth to Bottom
Sand	140.00	140.00
Sand Water Bearing	25.00	165.00

Geology Remarks:

Contractor Type: Water well drilling contractor
Registration Number: 1617
Business Name: JACK'S WELL DRILLING
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signature of Registered Representative Date

General Remarks:
OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

7/10/2002 12:38

WELL MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER & RADIOLOGICAL PROTECTION DIVISION

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978
Failure to comply is a misdemeanor

TAX NO.

PERMIT NO. 96-358

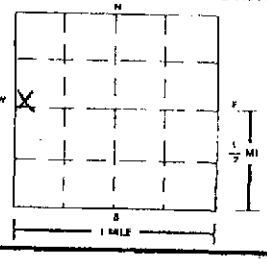
1. LOCATION OF WELL

County	Township Name	Fraction	Section No.	Town No.	Range No.
ANTRIM	STAR	SW 1/4 of NW 1/4 1/4	14	30	5

Distance and Direction from Road Intersection: on Primrose Road

Street Address & City of Well Location

Locate with 'x' in Section Below — Sketch Map



3. OWNER OF WELL
Address: Dale Gates
9991 Primrose Rd.
Elmira, MI 49730
Address Same as Well Location ☒ Yes ☐ No

4. WELL DEPTH: 160 ft. Date Completed 8/8/97 ☒ New Well ☐ Replacement Well

5. ☐ Cable Tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow Rod ☒ Auger/Bored ☐ Jetted ☐ _____

6. USE: ☒ Household ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat Pump ☐ Test Well ☐ Type IIb Public ☐ _____

7. CASING: ☒ Steel ☒ Threaded ☐ Plastic ☐ Welded ☐ Other _____
Diameter: 4" in. to _____ ft. depth; _____ in. to _____ ft. depth
BORE HOLE: Diameter: 7 in. to _____ ft. depth; _____ in. to _____ ft. depth
Height: Above/Below Surface: T ft
Weight: _____ lbs./ft.
☐ Drive Shoe ☐ Shale Packer

2. FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
SAND	140	140
WATER SAND	20	160

RECEIVED MICHIGAN DEPARTMENT ENVIRONMENTAL QUALITY AUG 29 97 GWRPD DRINKING WATER SUPPLY SEC.

USE A 2ND SHEET IF NEEDED

8. SCREEN: ☐ Not Installed ☐ Gravel-Packed
Type S-S Diameter 4"
Slot/Gauze 10 Length: 4'
Set Between 156 ft. and 160 ft.
FITTINGS: ☒ K-Packer ☐ Bremer Check
☐ Blank Above Screen _____ ft. Other _____

9. STATIC WATER LEVEL: 140 ft. Below Land Surface ☐ Flowing

10. PUMPING LEVEL: Below Land Surface
_____ ft. After 1/2 hrs. Pumping at 20 G.P.M.
☐ Plunger ☐ Bailer ☐ Air ☒ Test Pump

11. WELL HEAD COMPLETION:
☒ Pitless Adapter ☐ 12" Above Grade
☐ Basement Offset ☐ Well House

12. WELL GROUTED? ☐ No ☒ Yes From _____ to _____ ft.
☐ Neat Cement ☒ Bentonite ☐ Other _____
No. of Bags 9 Additives Slurry

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION:
Type Septic Distance 60 ft. Direction E
Type _____ Distance _____ ft. Direction _____

14. PUMP: ☐ Not Installed ☐ Pump Installation Only
Manufacturer's Name Goulds
Model Number _____ HP 3/4 Volts 220
Length of Drop Pipe 151 ft. Capacity 10 G.P.M.
TYPE: ☒ Submersible ☐ Jet ☐ Other _____
PRESSURE TANK:
Manufacturer's Name Challenger
Model Number _____ Capacity 20 Gallons

15. ABANDONED WELL PLUGGED? ☐ Yes ☐ No
Casing Diameter ____ in. Depth _____ ft.
PLUGGING MATERIAL: ☐ Neat Cement ☐ Bentonite Slurry ☐ Cement/Bentonite Slurry ☐ Concrete Grout ☐ Bentonite Chips
No. of Bags _____ Casing Removed? ☐ Yes ☐ No

16. REMARKS: (Elevation, Source of Data, etc.)

17. DRILLING MACHINE OPERATOR:
☒ Employee ☐ Subcontractor
Name Roger Sekowski

18. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Jack's Well Drilling (REGISTERED BUSINESS NAME) 1617 (REGISTRATION NO.)
Address Ellsworth
Signed Jack Sekowski (AUTHORIZED REPRESENTATIVE) Date 8-8-97

GEOLOGICAL SURVEY COPY

EQP 2017 (12/96)

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Well ID: 05000001341

Tax No: 05-13-014-008-15	Permit No: 03-111	County: Antrim	Township: Star

Well ID: 05000001341

Elevation:

Latitude: 44.98925512

Longitude: -84.88761098

Fraction:	Section:	Town/Range:	French Claim:	WSSN:
SW¼ SW¼ U¼	14	30N 05W		

Distance and Direction from Road Intersection: OFF PRIMROSE ROAD

Well Name:

Well Owner: Robert Sloan

Well Address:
MI

Owner Address:
5345 KORTASE
BOYNE CITY MI 49712

Drilling Method: Auger/Bored

Well Depth: 130.00 ft. | Well Use: Household

Well Type: New | Date Completed: 4/30/2003

Casing Type: Steel - unknown
Casing Joint: Threaded & coupled
Diameter: 4.00 in. to 126.00 ft. depth

Bore Diameter 1: 7.00 in. to 130.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: None

Static Water Level: 95.00 ft. Below Grade(Not Flowing)
Yield Test Method: Test pump
Measurement Taken During Pump Test:
100.00 ft. after 20.00 hrs. pumping at 12.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:
Abandoned well ID:

Screen Installed: Yes Well Intake:
Filter Packed: No
Screen Diameter: 3.00 in. Length: 4.00 ft.
Screen Material Type: Stainless steel-wire wrapped
Slot: 10.00 in. Set Between 126.00 ft. and 130.00 ft.
Blank:
Fittings:
Neoprene packer

Well Grouted: Yes Grouting Method: Unknown
No. of Bags: 5 Additives: None
Grouting Materials:
Bentonite slurry From 5.00 ft. to 110.00 ft.

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Unknown		
Unknown		

Drilling Machine Operator Name: JACK

Employment: Subcontractor

Pump Installed: Yes
Pump Installation date:
Manufacturer: Goulds
Model Number: BRUISER
Length of Drop Pipe: 120.00 ft.
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pump Installation only: No
HP: 0.75
Pump Type: Submersible
Pump Capacity: 12.00 GPM
Id of Well:

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Challenger
Model Number: PC66 Tank Capacity: 20 Gallons
Pressure Relief Valve Installed: No

Formation Description	Thickness	Depth to Bottom
Sand	95.00	95.00
Sand Water Bearing	35.00	130.00

Geology Remarks:

Contractor Type: Water well drilling contractor
Registration Number: 1617
Business Name: JACK'S WELL DRLG
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signature of Registered Representative Date

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

5/14/2003 09:31

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER & RADIOLOGICAL PROTECTION DIVISION

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978
Failure to comply is a misdemeanor

TAX NO: 05-13-014-007-00

PERMIT NO: A99-59

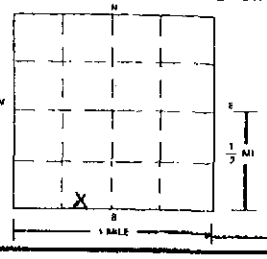
1. LOCATION OF WELL

County	Township Name	Fraction	Section No.	Town No.	Range No.
Antrim	Star	SW 1/4 SE 1/4 SW 1/4	14	30 N	5 W

Distance and Direction from Road Intersection

Street Address & City of Well Location: 10303 Alba Hwy.

Locate with 'x' in Section Below



Sketch Map: WELL X ← C-42 ... C-42 ... OLDS RD

3. OWNER OF WELL
Address: CHIPPA, MIKE
10303 ALBA HWY.
ELMIRA MI 49730
Address Same as Well Location ☑ Yes ☐ No

4. WELL DEPTH: 129 ft. Date Completed 5 / 18 / 99 ☐ New Well ☑ Replacement Well

5. ☐ Cable Tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow Rod ☑ Auger/Bored ☐ Jetted ☐ ____

6. USE: ☑ Household ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat Pump ☐ Test Well ☐ Type IIb Public ☐ ____

7. CASING: ☑ Steel ☑ Threaded ☐ Plastic ☐ Welded ☐ Other ____
Diameter: 4 in. to 125 ft. depth
____ in. to ____ ft. depth
BORE HOLE:
Diameter: 7 in. to 129 ft. depth
____ in. to ____ ft. depth
Height: Above/Below Surface: 1 ft
Weight: 11.00 lbs./ft.
☑ Drive Shoe ☐ Shale Packer

2. FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
SAND AND GRAVEL	129	129

RECEIVED
MICH DEPT OF ENVIRONMENTAL QUALITY
MAY 27 1999
DRINKING WATER & RADIOLOGICAL PROTECTION DIVISION
WELL CONSTRUCTION UNIT

USE A 2ND SHEET IF NEEDED

8. SCREEN: ☐ Not Installed ☐ Gravel-Packed
Type: TELESCOPE Diameter: 3"
Slot/Gauge: 10 Length: 4'
Set Between: 125 ft. and 129 ft.
FITTINGS: ☑ K-Packer ☐ Bremer Check
☑ Blank Above Screen 1 ft. 8 ft. Other 3" PLUG

9. STATIC WATER LEVEL:
97 ft. Below Land Surface ☐ Flowing

10. PUMPING LEVEL: Below Land Surface
125 ft. After 1 hrs. Pumping at ____ G.P.M.
☐ Plunger ☐ Bailer ☐ Air ☑ Test Pump

11. WELL HEAD COMPLETION:
☑ Pitless Adapter 50/4 ☐ 12" Above Grade
☐ Basement Offset ☐ Well House

12. WELL GROUTED? ☐ No ☑ Yes From 115 to 0 ft.
☐ Neat Cement ☑ Bentonite ☐ Other ____
No. of Bags 7 Additives K2-MUD

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION:
Type Septic Distance 65 ft. Direction E
Type ____ Distance ____ ft. Direction ____

14. PUMP: ☐ Not Installed ☐ Pump Installation Only
Manufacturer's Name: GOULDS 2-W
Model Number: 1SB-15422 HP 1½ Volts 230
Length of Drop Pipe 115 ft. Capacity ____ G.P.M.
TYPE: ☑ Submersible ☐ Jet ☐ Other ____
PRESSURE TANK:
Manufacturer's Name: FLEXCON
Model Number: WR-240 Capacity 81 Gallons 20-38

15. ABANDONED WELL PLUGGED? ☐ Yes ☑ No
Casing Diameter ____ in. Depth ____ ft.
PLUGGING MATERIAL: ☐ Neat Cement ☐ Bentonite Slurry ☐ Cement/Bentonite Slurry ☐ Concrete Grout ☐ Bentonite Chips
No. of Bags ____ Casing Removed? ☐ Yes ☐ No

16. REMARKS: (Elevation, Source of Data, etc.)

17. DRILLING MACHINE OPERATOR:
☑ Employee ☐ Subcontractor
Name: Ron Florenski II

18. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
RON'S WELL DRILLING, INC (REGISTERED BUSINESS NAME) 1234 (REGISTRATION NO.)
Address: BOX 18 ALBA, MICH 49611
Signed: Ron Florenski (AUTHORIZED REPRESENTATIVE) Date: 5-18-99

GEOLOGICAL SURVEY COPY

EQP 2017 (12/96)

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER & RADIOLOGICAL PROTECTION DIVISION

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978
Failure to comply is a misdemeanor

TAX NO:

PERMIT NO: 99-524

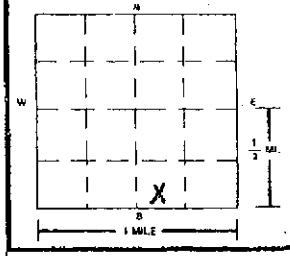
1. LOCATION OF WELL

County	Township Name	Fraction	Section No.	Town No.	Range No.
Antrim	Star	S W 1/4 S E 1/4 1/4	14	30	5E

Distance and Direction from Road Intersection: ON C42

Street Address & City of Well Location

Locate with 'x' in Section Below — Sketch Map



3. OWNER OF WELL: Warde Primrose
Address: 10577 Alba Hwy.
Elmira MI 49730
Address Same as Well Location: [X] Yes [ ] No

4. WELL DEPTH: 109 ft. Date Completed: 9-14-99 — [X] New Well [ ] Replacement Well

5. [ ] Cable Tool [ ] Rotary [ ] Driven [ ] Dug
[ ] Hollow Rod [X] Auger/Bored [ ] Jetted [ ]

6. USE: [X] Household [ ] Type I Public [ ] Type III Public
[ ] Irrigation [ ] Type IIa Public [ ] Heat Pump
[ ] Test Well [ ] Type IIb Public [ ]

7. CASING: [X] Steel [X] Threaded [ ] Plastic [ ] Welded [ ] Other
Diameter: 4 in. to 105 ft. depth
in. to ft. depth
BORE HOLE: Diameter: 7 in. to 110 ft. depth
in. to ft. depth
Height: Above/Below Surface: 1 ft
Weight: lbs./ft.
[ ] Drive Shoe [ ] Shale Packer

2. FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	85	85
Water Sand	25	110

RECEIVED
MICH DEPT OF ENVIRONMENTAL QUALITY
OCT 05 1999
Drinking Water & Radiological Protection Division
Ground Water Supply Section
WELL CONSTRUCTION UNIT

USE A 2ND SHEET IF NEEDED

8. SCREEN: [ ] Not Installed [ ] Gravel-Packed
Type: S-S Diameter: 4"
Slot/Gauze: 10 Length: 4'
Set Between: 105 ft. and 109 ft.
FITTINGS: [X] K-Packer [ ] Bremer Check
[ ] Blank Above Screen ft. Other

9. STATIC WATER LEVEL: 85 ft. Below Land Surface [ ] Flowing

10. PUMPING LEVEL: Below Land Surface
ft. After 1/2 hrs. Pumping at 20 G.P.M.
[ ] Plunger [ ] Bailer [ ] Air [X] Test Pump

11. WELL HEAD COMPLETION:
[X] Pitless Adapter [ ] 12" Above Grade
[ ] Basement Offset [ ] Well House

12. WELL GROUTED? [ ] No [X] Yes From to ft.
[ ] Neat Cement [ ] Bentonite [ ] Other
No. of Bags 3 Additives Well Start Slurry

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION:
Type Septic Distance 60 ft. Direction W
Type Distance ft. Direction

14. PUMP: [ ] Not Installed [ ] Pump Installation Only
Manufacturer's Name Goulds
Model Number HP 1/2 Volts 220
Length of Drop Pipe 106 ft. Capacity 10 G.P.M.
TYPE: [X] Submersible [ ] Jet [ ] Other
PRESSURE TANK:
Manufacturer's Name
Model Number Capacity Gallons

15. ABANDONED WELL PLUGGED? [ ] Yes [ ] No
Casing Diameter in. Depth ft.
PLUGGING MATERIAL: [ ] Neat Cement [ ] Bentonite Slurry
[ ] Cement/Bentonite Slurry [ ] Concrete Grout [ ] Bentonite Chips
No. of Bags Casing Removed? [ ] Yes [ ] No

16. REMARKS: (Elevation, Source of Data, etc.)

17. DRILLING MACHINE OPERATOR:
[ ] Employee [ ] Subcontractor
Name Roger

18. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Jacks well Drilling — REGISTERED BUSINESS NAME
1617 — REGISTRATION NO.
Address Elmira
Signed Jack Peranen — AUTHORIZED REPRESENTATIVE
Date 9-20-99

GEOLOGICAL SURVEY COPY

EQP 2017 (12/96)

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Well ID: 05000000682

Tax No: 05-13-015-003-05	Permit No: A00-597	County: Antrim	Township: Star

Well ID: 05000000682

Elevation:

Latitude: 44.99308632

Longitude: -84.88885784

Fraction:	Section:	Town/Range:	French Claim	WSSN
NE¼ SE¼ U¼	15	30N 05W		

Distance and Direction from Road Intersection:

Well Name:

Well Owner: Jeny & Wettlayfer Broods

Well Address:
Primrose

Owner Address:
11050 Sprucedale
Elmira MI 49730

Drilling Method: Auger/Bored

Well Depth: 150.00 ft. | Well Use: Household

Well Type: New | Date Completed: 10/11/2000

Casing Type: Steel - black
Casing Joint: Threaded & coupled
Diameter: 4.00 in. to 146.00 ft. depth

Bore Diameter 1: 8.00 in. to 150.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: None

Static Water Level: 125.00 ft. Below Grade(Not Flowing)
Yield Test Method: Test pump
Measurement Taken During Pump Test:
0.50 hrs. pumping at 22.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: Yes Well Intake:
Filter Packed: No
Screen Diameter: 3.00 in. Length: 4.00 ft.
Screen Material Type: Stainless steel-wire wrapped
Slot: 10.00 in. Set Between 146.00 ft. and 150.00 ft.
Blank:
Fittings:
Neoprene packer

Well Grouted: Yes Grouting Method: Unknown
No. of Bags: 4 Additives: None
Grouting Materials:
Bentonite dry granular From 0.00 ft. to 150.00 ft.

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	70.00 ft.	West

Drilling Machine Operator Name: Jack

Employment: Subcontractor

Pump Installed: Yes
Pump Installation date:
Manufacturer: Goulds
Model Number:
Length of Drop Pipe: 140.00 ft.
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pump Installation only: No
HP: 0.75
Pump Type: Submersible
Pump Capacity: 10.00 GPM
Id of Well:

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Challenger
Model Number: V-60 Tank Capacity: 20 Gallons
Pressure Relief Valve Installed: No

Formation Description	Thickness	Depth to Bottom
Sand	125.00	125.00
Sand Water Bearing	25.00	150.00

Geology Remarks:

Contractor Type: Water well drilling contractor
Registration Number: 1617
Business Name: Jack's Well Drilling
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signature of Registered Representative Date

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

6/20/2002 08:47

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978

Failure to comply is a misdemeanor.

Well ID. 05000000751

Tax No: 05-13-015-005-00	Permit No: A01-010	County: Antrim	Township: Star

Fraction	Section:	Town/Range:	French Claim:	WSSN:
U¼ U¼ U¼	15	30N 05W		

Well ID: 05000000751

Elevation:

Latitude: 44.99198635

Longitude: -84.8885592

Distance and Direction from Road Intersection:

Well Name:

Well Owner: Dennis Cross

Well Address:	Owner Address:
2576 PRIMROSE RD. ELMIRE MI 49730	2576 PRIMROSE RD. ELMIRE MI 49730

Drilling Method: Auger/Bored

Well Depth: 151.00 ft. | Well Use: Household

Well Type: New | Date Completed: 2/28/2001

Casing Type: Steel - black
Casing Joint: Threaded & coupled
Diameter: 4.00 in. to 147.00 ft. depth

Bore Diameter 1: 5.00 in. to 155.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height:
Casing Fitting: None

Pump Installed: Yes | Pump Installation only: No
Pump Installation date: | HP: 0.75
Manufacturer: Goulds | Pump Type: Submersible
Model Number: | Pump Capacity: 12.00 GPM
Length of Drop Pipe: 135.00 ft. | Id of Well:
Diameter of Drop Pipe:
Draw Down Seal Used: No

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Challenger
Model Number: | Tank Capacity: 20 Gallons
Pressure Relief Valve Installed: No

Static Water Level: 120.00 ft. Below Grade(Not Flowing)
Yield Test Method: Test pump
Measurement Taken During Pump Test:
0.50 hrs. pumping at 20.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Formation Description	Thickness	Depth to Bottom
Sand	120.00	120.00
Sand Water Bearing	35.00	155.00

Screen Installed: Yes | Well Intake:
Filter Packed: No
Screen Diameter: 3.00 in. | Length: 4.00 ft.
Screen Material Type: Stainless steel-wire wrapped
Slot: 10.00 in. Set Between 147.00 ft. and 151.00 ft.
Blank:
Fittings:
Neoprene packer

Well Grouted: Yes | Grouting Method: Unknown
No. of Bags: 5 | Additives: None
Grouting Materials:
Bentonite slurry | From 0.00 ft. to 135.00 ft.

Well Head Completion: Pitless adapter

Geology Remarks:

Nearest source of possible contamination:

Type	Distance	Direction
Unknown		
Unknown		

Contractor Type: Water well drilling contractor
Registration Number: 1617
Business Name: JACK'S WELL DRILLING
Business Address:

Drilling Machine Operator Name: JACK

Employment: Subcontractor

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signature of Registered Representative | Date

General Remarks:

OTHER REMARKS

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

7/10/2002 12:54

GEOLOGICAL SURVEY SAMPLE No. [ ]

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

1 LOCATION OF WELL

County	Twp.	Fraction	Section No.	Town	Range
ANTRIM	STAR	SW¼ NW¼ NW¼	23	30 N.	8 E.W.

Distance And Direction From Road Intersections: Easton 6 20 1/4 Mile Right 2 Blocks East 1 Block

OWNER No. [ ]

Street address & City of Well Location: alba Mich

3 OWNER OF WELL: Mr William Bates

Address: Vernon Mich

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand & Gravel	98	98

4 WELL DEPTH: (completed) 98 ft. Date of Completion: April 2 1967

5 ☐ Cable tool ☐ Rotary ☒ Driven ☐ Dug ☒ Hollow rod ☒ Jetted ☐ Bored ☐ ___

6 USE: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ___

7 CASING: Threaded ☒ Welded ☐

Diam. 2 in. to 93 ft. Depth

___ in. to ___ ft. Depth

Height: Above/~~Below~~ surface 1 ft.

Weight 3.25 lbs/ft.

Drive Shoe? Yes ☒ No ☐

8 SCREEN:

Type: Clayton Mesh Dia.: 1 1/4

~~Slot~~/Gauze 60 Length 4 ft 8 ft

Set between 98 ft. and 99 ft.

Fittings: Brown Check 3 1/2 T Loader

9 STATIC WATER LEVEL 75 ft. below land surface

10 PUMPING LEVEL below land surface

75 ft. after 1 hrs. pumping 14 g.p.m.

___ ft. after ___ hrs. pumping ___ g.p.m.

11 WATER QUALITY in Parts Per Million:

Iron (Fe) ___ Chlorides (Cl) ___

Hardness ___

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☐ Pitless Adapter ☒ 12" Above Grade

13 GROUTING:

Well Grouted? ☐ Yes ☒ No

Material: ☐ Neat Cement ☐ ___

Depth: From ___ ft. to ___ ft.

14 SANITARY:

Nearest Source of possible contamination

60 feet S Direction Old House Type

Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: Owner Installed

Manufacturer's Name ___

Model Number ___ HP ___

Length of Drop Pipe ___ ft. capacity ___ G.P.M.

Type: ☐ Submersible ☐ ___ ☐ Jet ☐ Reciprocating

16 Remarks, elevation, source of data, etc.

ADDED INFO. BY DRILLER, ITEM NO.

*CORRECTED BY:

**ADDITION BY:

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Boyton Well Drilling 0195

REGISTERED BUSINESS NAME REGISTRATION NO.

Address Elmira Mich 67

Signed Donald Boyton Date April 21 1967

AUTHORIZED REPRESENTATIVE

D67D 100M 6-66 JUL 20 1967

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY NO

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

PERMIT NUMBER: A 96 - 155

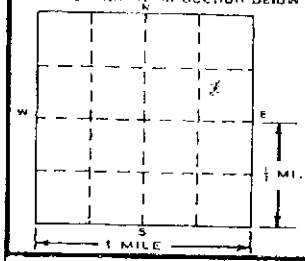
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Antrim	STAR	NE ¼ SE ¼ NW ¼	23	30 N/S	5 W

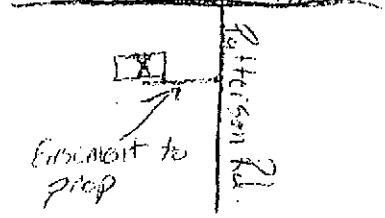
Distance And Direction From Road Intersection: E 47 West Turn South on Patterson Drive 3/10 miles Turn West go Two Basement 2/10 mile

Street Address & City of Well Location: Well on North Side Rd.

Locate with "X" in Section Below



Sketch Map: E 47 ALBA



3 OWNER OF WELL

Anthony Bradley

Address: 1491 S. Gaylord Mich. 49735

Address Same As Well Location? ☐ Yes ☑ No

4 WELL DEPTH

106 FT. | Date Completed: MO 00 DAY 6 YEAR 26 96 | ☑ New Well ☐ Replacement Well

5

☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug
☑ Hollow rod ☐ Auger ☐ Jetted ☐ _____

6 USE

☑ Domestic ☐ Type I Public ☐ Type III Public
☐ Irrigation ☐ Type IIa Public ☐ Heat pump
☐ Test Well ☐ Type IIb Public ☐ _____

7 CASING

Diameter: ☑ Steel ☐ Threaded ☐ Plastic ☐ Welded

4 in. to 100 ft. depth
_____ in. to _____ ft. depth

Grouted Drill Hole Diameter
4 in. to 100 ft. depth
_____ in. to _____ ft. depth

Height: Above/Below Surface 13" ft
Weight 11 lbs /ft
Drive Shoe ☑ Yes ☐ No

8 SCREEN

☐ Not Installed
Type [redacted] PVC Diameter 3"
Slot 10 Length 6'
Set between 100 ft. and 106 ft.
FITTINGS: ☑ K-Packer ☐ Lead Packer ☐ Bronner Check
☐ Blank above screen 1 ft. Other _____

9 STATIC WATER LEVEL

70 ft. below land surface ☐ Flow

10 PUMPING LEVEL: below land surface

72.00 ft after 2 hrs. pumping at 20 G.P.M.
_____ ft after _____ hrs. pumping at _____ G.P.M.

11 WELL HEAD COMPLETION

☐ Pitless adapter ☑ 12" above grade
☐ Basement offset ☐ Approved pit

12 WELL GROUTED?

☐ No ☑ Yes From 0 to 100 ft.
☐ Neat cement ☑ Bentonite ☐ Other _____
No. of bags of cement 3½ Additives _____

13 Nearest source of possible contamination

Type Septic Distance 70 ft. Direction W
Well disinfected upon completion? ☑ Yes ☐ No
Was old well plugged? ☐ Yes ☐ No

14 PUMP

☑ Not Installed ☐ Pump Installation Only
Manufacturer's name _____
Model number _____ HP _____ Volts _____
Length of Drop Pipe _____ ft. capacity _____ G.P.M.
TYPE: ☐ Submersible ☐ Jet _____
PRESSURE TANK:
Manufacturer's name _____
Model number _____ Capacity _____ Gallons

2 FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Fine & Med Sand	0	40
Fine Sand	40	70
Very Fine Sand	70	100
Coarse Sand	100	106

USE A 2ND SHEET IF NEEDED

RECEIVED
Mich Dept. of Public Health
OCT 10 1996
BUREAU OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH-GWQS

15. Remarks, elevation, source of data, etc

16. WATER WELL CONTRACTOR'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Kamins Well Drilling — REGISTERED BUSINESS NAME — 60-1545 REGISTRATION NO.

Address 1220 Airport Rd. Atlanta, Mich. 49709

Signed [signature] AUTHORIZED REPRESENTATIVE Date 9-30-96

17. Rig Operator's Name

Dan Kibler & Rick Kamins

D67d 2/89

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY COPY

GEOLOGICAL SURVEY SAMPLE No. [ ]

MAY 13 1976

WATER WELL RECORD

ACT 294 PA 1965

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

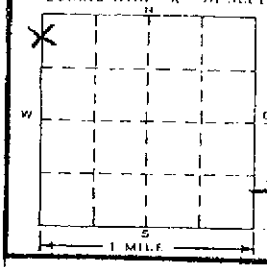
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
Antrim	Star	NW ¼ NW ¼ NW ¼	23	30 N/S.	5 E/W.

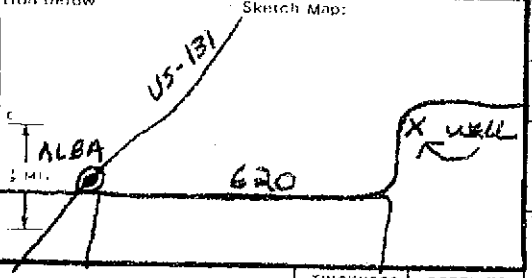
Distance And Direction from Road Intersections: 4 miles East and 1 mi North of Alba on County Rd 620.

Street address & City of Well Location:

Locate with "X" in section below



Sketch Map:



3 OWNER OF WELL: Leland Gates

Address: RR Elmira, Mich

4 WELL DEPTH: (completed) 113 ft. Date of Completion 5-6-76

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☐ Jetted ☒ Bored ☐ ____

6 USES: ☒ Domestic ☐ Public Supply ☐ Industry ☐ Irrigation ☐ Air Conditioning ☐ Commercial ☐ Test Well ☐ ____

7 CASING: Threaded ☒ Welded ☐ Diam. 4 in. to 109 ft. Depth; ____ in. to ____ ft. Depth. Height: Above/Below Surface 1 ft. Weight 1100 lbs./ft. Drive Shoe? Yes ☐ No ☒

2 FORMATION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand + Gravel	115	115

8 SCREEN: Howard-Smith 304 Type: Slush Dia.: 4" Slot/Gauge 10 Length 4' Set between 109 ft. and 113 ft. Fittings 4X3 K-Packer 3" plug 3X18 Nipple

9 STATIC WATER LEVEL 85 ft. below land surface

10 PUMPING LEVEL below land surface: 104 ft. after 1 hrs. pumping 30 g.p.m. ____ ft. after ____ hrs. pumping ____ g.p.m.

11 WATER QUALITY in Parts Per Million: Iron (Fe) ____ Chlorides (Cl) ____ Hardness ____ Other ____

12 WELL HEAD COMPLETION: ☐ In Approved Pit ☒ Pitless Adapter ☐ 12" Above Grade

13 Well Grouted? ☐ Yes ☒ No ☐ Neat Cement ☐ Bentonite ☐ ____ Depth: From ____ ft. to ____ ft.

14 Nearest Source of possible contamination: 80 feet N Direction Septic-tank Type. Well disinfected upon completion ☒ Yes ☐ No

15 PUMP: ☐ Not installed. Manufacturer's Name Goulds. Model Number 25EL1542 HP ½ Volts 230. Length of Drop Pipe 99 ft. capacity 30 G.P.M. Type: ☒ Submersible ☐ Jet ☐ Reciprocating

USE A 2ND SHEET IF NEEDED

16 Remarks, elevation, source of data, etc.

ADDED INFO BY DRILLER, ITEM NO.
*CORRECTED BY
**ADDITION BY
ELEVATION
~~DEPTH TO ROCK~~

17 WATER WELL CONTRACTOR'S CERTIFICATION:

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Ron's Well Drilling Inc. (REGISTERED BUSINESS NAME) 1234 (REGISTRATION NO.)

Address Box 18 Alba, Mich 49611

Signed Ron Florenstal (AUTHORIZED REPRESENTATIVE) Date 5-7-76

D67d 100M (Rev. 12-68)

GEOLOGICAL SURVEY COPY

TAX NO: ~~05-13-023-002-10~~

MICHIGAN DEPARTMENT OF PUBLIC HEALTH
WATER WELL AND PUMP RECORD

PERMIT NO: A96-104

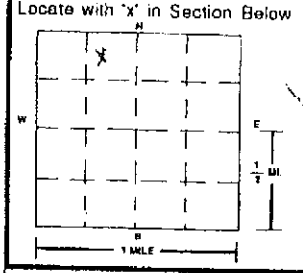
1. LOCATION OF WELL

County: Antrim | Township Name: Star | Fraction: ~~NW 1/4 NE 1/4 NW 1/4~~ | Section No.: 23 | Town No.: 30 | Range No.: 5W

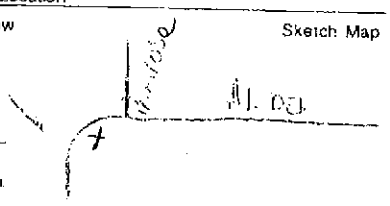
Distance and Direction from Road Intersection:
200 ft South of Alba Rd
⅛ mile East of Primrose Rd

Street Address & City of Well Location:

Locate with 'x' in Section Below



Sketch Map



3. OWNER OF WELL
Address: Chris and Karen Harvey
10266 Alba Hwy.
Elmira, MI 49730
Address Same as Well Location ☒ Yes ☐ No

4. WELL DEPTH: 129 ft. | Date Completed: 5 / 8 / 96 | ☐ New Well ☒ Replacement Well

5. ☒ Cable Tool ☐ Hollow Rod ☐ Rotary ☒ Auger/Bored ☐ Driven ☐ Jetted ☐ Dug ☐ ____

6. USE: ☒ Household ☐ Irrigation ☐ Test Well ☐ Type I Public ☐ Type IIa Public ☐ Type IIb Public ☐ Type III Public ☐ Heat Pump ☐ ____

7. CASING: ☒ Steel ☐ Plastic ☐ Other ____ ☒ Threaded ☒ Welded
Diameter: 4 in. to 125 ft. depth
____ in. to ____ ft. depth
BORE HOLE:
Diameter: ____ in. to ____ ft. depth
____ in. to ____ ft. depth
Height: Above/Below Surface: ____ ft
Weight: 11 lbs./ft.
☐ Drive Shoe ☐ Shale Packer

8. SCREEN: ☐ Not Installed ☐ Gravel-Packed
Type: Stainless Steel Diameter: 3
Slot/Gauge: ~~xxx~~ 10 Length: 4 ft
Set Between: 125 ft. and 129 ft.
FITTINGS: ☒ K-Packer ☐ Bremer Check
☒ Blank Above Screen 1½ ft. Other ____

9. STATIC WATER LEVEL:
96½ ft. Below Land Surface ☐ Flowing

10. PUMPING LEVEL: Below Land Surface
____ ft. After ____ hrs. Pumping at ____ G.P.M.
☐ Plunger ☐ Bailer ☐ Air ☐ Test Pump

11. WELL HEAD COMPLETION:
☒ Pitless Adapter ☐ Basement Offset ☒ 12" Above Grade ☐ Well House

12. WELL GROUTED? ☐ No ☒ Yes From ____ to ____ ft.
☒ Neat Cement ☐ Bentonite ☐ Other ____
No. of Bags 3 Additives ____

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION:
Type Septic Distance 60 ft. Direction East
Type ____ Distance ____ ft. Direction ____

14. PUMP: ☐ Not Installed ☐ Pump Installation Only
Manufacturer's Name: Meyers
Model Number: 2NFL52-12 HP: ½ Volts: 230
Length of Drop Pipe: 120 ft. Capacity: 12 G.P.M.
TYPE: ☒ Submersible ☐ Jet ☐ Other ____
PRESSURE TANK:
Manufacturer's Name: Amtrol
Model Number: WX202 Capacity ____ Gallons: 20

2. FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
top soil	1	1
red sandy gravel	6	7
white sand	23	30
red sandy gravel	10	40
white sandy gravel	60	100
medium brown water sand & gravel	29	129

USE A 2ND SHEET IF NEEDED

15. ABANDONED WELL PLUGGED? ☒ Yes ☐ No
Casing Diameter ____ in. Depth ____ ft.
PLUGGING MATERIAL: ☒ Neat Cement ☐ Bentonite Slurry ☐ Cement/Bentonite Slurry ☐ Concrete Grout ☐ Bentonite Chips
No. of Bags 2 Casing Removed? ☐ Yes ☐ No

16. REMARKS: (Elevation, Source of Data, etc.)

17. DRILLING MACHINE OPERATOR:
☐ Employee ☐ Subcontractor ☒ OWNER
Name [signature]

15. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
J.W. Morey Well Drilling — REGISTERED BUSINESS NAME
0193 — REGISTRATION NO.
Address: 72 Hayes Tower Rd Gaylord, MI 49735
Signed: [signature] — AUTHORIZED REPRESENTATIVE
Date: 5/8/96

GW-2-228 9/93

GEOLOGICAL SURVEY COPY

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY NO

MICHIGAN DEPARTMENT OF PUBLIC HEALTH
WATER WELL AND PUMP RECORD

PERMIT NUMBER

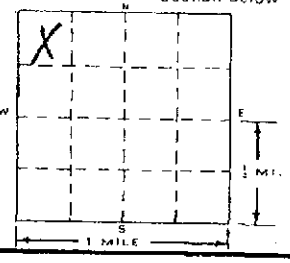
1 LOCATION OF WELL

County	Township Name	Fraction	Section Number	Town Number	Range Number
ANTRIM	Star	NW¼ NW¼ ¼ ¼	24	30 N/S	5 E/W

Distance And Direction From Road Intersection: On Olds Road

Street Address & City of Well Location:

Locate with "X" in Section Below — Sketch Map:



3 OWNER OF WELL:
Randy Ramsey
Address: 7140 Willowbrook Cr.
Mancelona, MI 49659
Address Same As Well Location? ☐ Yes ☒ No

4 WELL DEPTH: 109 FT. | Date Completed MO 5 / DAY 15 / YEAR 95 | ☒ New Well ☐ Replacement Well

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☒ Auger ☐ Jetted ☐

6 USE: ☒ Domestic ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat pump ☐ Test Well ☐ Type IIb Public ☐

7 CASING: Diameter 4 in. to ____ ft. depth; ____ in. to ____ ft. depth; Grouted Drill Hole Diameter ____ in. to ____ ft. depth; ____ in. to ____ ft. depth
☒ Steel ☐ Plastic ☒ Threaded ☐ Welded
Height Above/Below Surface 1 ft.; Weight ____ lbs /ft
Drive Shoe ☐ Yes ☐ No

8 SCREEN ☐ Not Installed
Type S-S Diameter 4"
Slot/Gauze 10 Length 4 Foot
Set between 105 ft. and 104 ft.
FITTINGS: ☒ K-Packer ☐ Lead Packer ☐ Bremer Check
☐ Blank above screen ____ ft. Other ____

9 STATIC WATER LEVEL: 90 ft. below land surface ☐ Flow

10 PUMPING LEVEL: below land surface
____ ft. after ½ hrs. pumping at 20 G.P.M
____ ft. after ____ hrs. pumping at ____ G.P.M.

11 WELL HEAD COMPLETION: ☒ Pitless adapter ☐ 12" above grade ☐ Basement offset ☐ Approved pit

12 WELL GROUTED? ☐ No ☒ Yes From ____ to ____ ft.
☐ Neat cement ☒ Bentonite ☐ Other Natural
No. of bags of cement ____ Additives ____

13 Nearest source of possible contamination
Type Septic Distance 50 ft. Direction N
Well disinfected upon completion? ☒ Yes ☐ No
Was old well plugged? ☐ Yes ☐ No

14 PUMP: ☐ Not Installed ☐ Pump Installation Only
Manufacturer's name Sturdafos
Model number ____ HP ½ Volts 220
Length of Drop Pipe 100 ft. capacity 10 G.P.M.
TYPE: ☒ Submersible ☐ Jet ____
PRESSURE TANK:
Manufacturer's name U G
Model number ____ Capacity 16 Gallons

2 FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	90	90
Water Sand	20	110

USE A 2ND SHEET IF NEEDED

RECEIVED
MICH. DEPT. OF PUBLIC HEALTH
JUN 15 95
BUREAU OF ENVIRONMENTAL
AND OCCUPATIONAL HEALTH

15. Remarks, elevation, source of data, etc.

17. Rig Operator's Name: Jack

16. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Jack Swell Drilling 1617
REGISTERED BUSINESS NAME — REGISTRATION NO.
Address Elmira
Signed Jack Swell — AUTHORIZED REPRESENTATIVE — Date 5-15-95

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

067d 2/89

GEOLOGICAL SURVEY COPY

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978.
Failure to comply is a misdemeanor.

Well ID: 05000000600

Tax No: 05-13-024-008-20	Permit No: 00-265	County: Antrim	Township: Star

Well ID: 05000000600

Elevation:

Latitude: 44.98354657

Longitude: -84.86856011

Fraction:	Section:	Town/Range:	French Claim:	WSSN
SW¼ SW¼ NW¼	24	30N 05W		

Distance and Direction from Road Intersection: 4/10 MILE SOUTH OF C-42

Well Name:

Well Owner: Harvey Britton

Well Address: 3455 PATTERSON ROAD

Owner Address: 5765 OLD ALBA ROAD GAYLORD MI 49735

Drilling Method: Other

Well Depth: 113.00 ft. | Well Use: Household

Well Type: New | Date Completed: 7/22/2000

Casing Type: Steel - black
Casing Joint: Welded
Diameter: 4.00 in. to 109.00 ft. depth

Bore Diameter 1: 7.00 in. to 113.00 ft. depth
Bore Diameter 2:
Bore Diameter 3:
Height: 1.00 ft. above grade
Casing Fitting: None

Static Water Level: 87.00 ft. Below Grade(Not Flowing)
Yield Test Method: Test pump
Measurement Taken During Pump Test:
88.00 ft. after 1.00 hrs. pumping at 16.00 GPM

Abandoned Well Plugged: No
Reason for not plugging Well:

Abandoned well ID:

Screen Installed: Yes Well Intake:
Filter Packed: No
Screen Diameter: 3.00 in. Length: 4.00 ft.
Screen Material Type: Stainless steel-wire wrapped
Slot: 10.00 in. Set Between 109.00 ft. and 113.00 ft.
Blank: 0.50 ft. Above
Fittings:
Neoprene packer

Well Grouted: Yes Grouting Method: Unknown
No. of Bags: 5 Additives: Other
Grouting Materials:
Bentonite slurry From 5.00 ft. to 99.00 ft.

Well Head Completion: Pitless adapter

Nearest source of possible contamination:

Type	Distance	Direction
Septic tank	70.00 ft.	Northeast

Drilling Machine Operator Name: KEN KOSCIELNIAK

Employment: Employee

Pump Installed: Yes
Pump Installation date:
Manufacturer: Goulds
Model Number: 105B05422
Length of Drop Pipe: 104.00 ft.
Diameter of Drop Pipe: Unknown in.
Draw Down Seal Used: No

Pump Installation only: No
HP: 0.75
Pump Type: Submersible
Pump Capacity: 10.00 GPM
Id of Well:

Pressure Tank Installed: Yes
Pressure Tank Type: Unknown
Manufacturer: Goulds
Model Number: V-60
Tank Capacity: 9999 Gallons
Pressure Relief Valve Installed: No

Formation Description	Thickness	Depth to Bottom
Brown Sand Medium	20.00	20.00
Brown Sand Medium W/Gravel	20.00	40.00
Yellow Sand Medium W/Gravel	20.00	60.00
Light Brown Sand Medium	27.00	87.00
Light Brown Sand Medium Water Bearing	11.00	98.00
Light Brown Sand Coarse Water Bearing	15.00	113.00

Geology Remarks:

Contractor Type: Water well drilling contractor
Registration Number: 617
Business Name: K&T DRLG, INC.
Business Address:

WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Signature of Registered Representative Date

General Remarks:

OTHER REMARKS Drilling Method: AUGER/BORED Additives: EZ-MUD

EQP 2017C (2/2000)

ATTENTION WELL OWNER: FILE WITH DEED

2/14/2002 08:16

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER & RADIOLOGICAL PROTECTION DIVISION

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978
Failure to comply is a misdemeanor

TAX NO:

PERMIT NO: 96-358

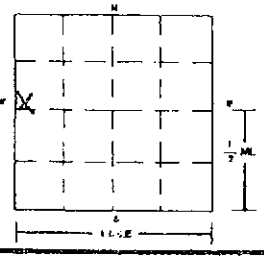
1. LOCATION OF WELL

County	Township Name	Fraction	Section No.	Town No.	Range No.
Antrim	Star	SW 1/4 NW 1/4 1/4	14	30	5

Distance and Direction from Road Intersection
on primrose Road

Street Address & City of Well Location

Locate with 'X' in Section Below — Sketch Map



3. OWNER OF WELL
Address: Dale Gates
9991 Primrose Rd.
Eimira, MI 49730
Address Same as Well Location ☒ Yes ☐ No

4. WELL DEPTH: 160 ft. | Date Completed 8/8/97 | ☒ New Well ☐ Replacement Well

5. ☐ Cable Tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow Rod ☒ Auger/Bored ☐ Jetted ☐ _____

6. USE: ☒ Household ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat Pump ☐ Test Well ☐ Type IIb Public ☐ _____

7. CASING: ☒ Steel ☒ Threaded ☐ Plastic ☐ Welded ☐ Other _____
Diameter: 4" in. to _____ ft. depth
_____ in. to _____ ft. depth
Height: Above/Below Surface: 1 ft
Weight _____ lbs./ft.
BORE HOLE:
Diameter: 7 in. to _____ ft. depth
_____ in. to _____ ft. depth
☐ Drive Shoe ☐ Shale Packer

2. FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
SAND	140	140
water SAND	20	160

RECEIVED
MICHIGAN DEPARTMENT OF
ENVIRONMENTAL QUALITY
AUG 29 97
DRINKING WATER SUPPLY SEC.

USE A 2ND SHEET IF NEEDED

8. SCREEN: ☐ Not Installed ☐ Gravel-Packed
Type S-S Diameter 4"
Slot/Gauze 10 Length 4'
Set Between 156 ft. and 160 ft.
FITTINGS: ☒ K-Packer ☐ Bremer Check
☐ Blank Above Screen _____ ft. Other _____

9. STATIC WATER LEVEL:
140 ft. Below Land Surface ☐ Flowing

10. PUMPING LEVEL: Below Land Surface
_____ ft. After 1/2 hrs. Pumping at 20 G.P.M.
☐ Plunger ☐ Bailer ☐ Air ☒ Test Pump

11. WELL HEAD COMPLETION:
☒ Pitless Adapter ☐ 12" Above Grade
☐ Basement Offset ☐ Well House

12. WELL GROUTED? ☐ No ☒ Yes From _____ to _____ ft.
☐ Neat Cement ☒ Bentonite ☐ Other _____
No. of Bags 9 Additives Slurry

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION:
Type Septic Distance 60 ft. Direction E
Type _____ Distance _____ ft. Direction _____

14. PUMP: ☐ Not Installed ☐ Pump Installation Only
Manufacturer's Name Goulds
Model Number _____ HP 3/4 Volts 220
Length of Drop Pipe 151 ft. Capacity 10 G.P.M.
TYPE: ☒ Submersible ☐ Jet ☐ Other _____
PRESSURE TANK:
Manufacturer's Name Challenger
Model Number _____ Capacity 20 Gallons

15. ABANDONED WELL PLUGGED? ☐ Yes ☐ No
Casing Diameter ___ in. Depth _____ ft.
PLUGGING MATERIAL: ☐ Neat Cement ☐ Bentonite Slurry
☐ Cement/Bentonite Slurry ☐ Concrete Grout ☐ Bentonite Chips
No. of Bags _____ Casing Removed? ☐ Yes ☐ No

16. REMARKS: (Elevation, Source of Data, etc.)

17. DRILLING MACHINE OPERATOR:
☒ Employee ☐ Subcontractor
Name Roger Sawanski

18. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Jack's well Drilling — REGISTERED BUSINESS NAME
1617 — REGISTRATION NO.
Address Elmira
Signed Jack Sawanski — AUTHORIZED REPRESENTATIVE
Date 8-8-97

GEOLOGICAL SURVEY COPY

EQP 2017 (12/96)

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER & RADIOLOGICAL PROTECTION DIVISION

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978
Failure to comply is a misdemeanor

TAX NO: 05-13-014-007-00

PERMIT NO: A99-59

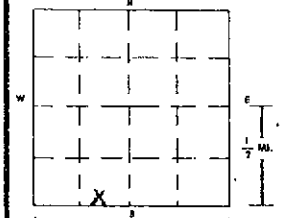
1. LOCATION OF WELL

County	Township Name	Fraction	Section No.	Town No.	Range No.
Antrim	Star	SW 1/4 SE 1/4 SW 1/4	14	30 N	5 W

Distance and Direction from Road Intersection

Street Address & City of Well Location: 10303 Alba Hwy.

Locate with 'x' in Section Below



Sketch Map: Well X ← C-42. C-42 Olds Rd

3. OWNER OF WELL
Address: CHIPPA, MIKE
10303 ALBA HWY.
ELMIRA MI 49730
Address Same as Well Location ☑ Yes ☐ No

4. WELL DEPTH: 129 ft. Date Completed 5/18/99 ☐ New Well ☑ Replacement Well

5. ☐ Cable Tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow Rod ☑ Auger/Bored ☐ Jetted ☐

6. USE: ☑ Household ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat Pump ☐ Test Well ☐ Type IIb Public ☐

7. CASING: ☑ Steel ☑ Threaded ☐ Plastic ☐ Welded ☐ Other
Diameter: 4 in. to 125 ft. depth
in. to ft. depth
BORE HOLE:
Diameter: 7 in. to 129 ft. depth
in. to ft. depth
Height: Above/Below Surface: 1 ft
Weight: 11 lbs./ft.
☑ Drive Shoe ☐ Shale Packer

2. FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
SAND AND GRAVEL	129	129

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MICH DEPT OF ENVIRONMENTAL QUALITY
MAY 27 1999
Drinking Water & Radiological Protection Division
Ground Water Supply Section
WELL CONSTRUCTION UNIT

USE A 2ND SHEET IF NEEDED

8. SCREEN: ☐ Not Installed ☐ Gravel-Packed
Type Telescope Diameter 3"
Slot/Gauge 10 Length 4'
Set Between 125 ft. and 129 ft.
FITTINGS: ☑ K-Packer ☐ Bremer Check
☑ Blank Above Screen 1 ft. Other 3" Plug

9. STATIC WATER LEVEL: 92 ft. Below Land Surface ☐ Flowing

10. PUMPING LEVEL: Below Land Surface
125 ft. After 1 hrs. Pumping at G.P.M.
☐ Plunger ☐ Bailer ☐ Air ☑ Test Pump

11. WELL HEAD COMPLETION:
☑ Pitless Adapter 50/4 ☐ 12" Above Grade
☐ Basement Offset ☐ Well House

12. WELL GROUTED? ☐ No ☑ Yes From 115 to 0 ft.
☐ Neat Cement ☑ Bentonite ☐ Other
No. of Bags 7 Additives EZ-MUD

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION:
Type Septic Distance 65 ft. Direction E
Type Distance ft. Direction

14. PUMP: ☐ Not Installed ☐ Pump Installation Only
Manufacturer's Name Goulds 2-W
Model Number 1SB8-15422 HP 1½ Volts 230
Length of Drop Pipe 115 ft. Capacity G.P.M.
TYPE: ☑ Submersible ☐ Jet ☐ Other
PRESSURE TANK:
Manufacturer's Name Flexcon
Model Number WR-240 Capacity 81 Gallons 20-28

15. ABANDONED WELL PLUGGED? ☐ Yes ☑ No
Casing Diameter in. Depth ft.
PLUGGING MATERIAL: ☐ Neat Cement ☐ Bentonite Slurry ☐ Cement/Bentonite Slurry ☐ Concrete Grout ☐ Bentonite Chips
No. of Bags Casing Removed? ☐ Yes ☐ No

16. REMARKS: (Elevation, Source of Data, etc.)

17. DRILLING MACHINE OPERATOR:
☑ Employee ☐ Subcontractor
Name Ron Florenski II

18. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Ron's Well Drilling, Inc (REGISTERED BUSINESS NAME) 1234 (REGISTRATION NO.)
Address Box 18 Alba, Mich 49611
Signed Ron Florenski (AUTHORIZED REPRESENTATIVE) Date 5-18-99

GEOLOGICAL SURVEY COPY

EQP 2017 (12/96)

DEQ MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
DRINKING WATER & RADIOLOGICAL PROTECTION DIVISION

WATER WELL AND PUMP RECORD

Completion is required under authority of Part 127 Act 368 PA 1978
Failure to comply is a misdemeanor

TAX NO:

PERMIT NO: 99-524

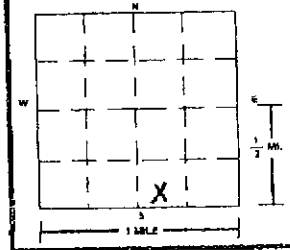
1. LOCATION OF WELL

County: Antrim | Township Name: Star | Fraction: S ½ 1/4 S E 1/4 1/4 | Section No.: 14 | Town No.: 30 | Range No.: 5E

Distance and Direction from Road Intersection: On C42

Street Address & City of Well Location

Locate with 'x' in Section Below — Sketch Map



3. OWNER OF WELL: Warde Primrose
Address: 10577 Alba Hwy.
Elmira MI 49730
Address Same as Well Location ☒ Yes ☐ No

4. WELL DEPTH: 109 ft. | Date Completed: 9-14-99 | ☒ New Well ☐ Replacement Well

5. ☐ Cable Tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow Rod ☒ Auger/Bored ☐ Jetted ☐ _____

6. USE: ☒ Household ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat Pump ☐ Test Well ☐ Type IIb Public ☐ _____

7. CASING: ☒ Steel ☒ Threaded ☐ Plastic ☐ Welded ☐ Other _____
Diameter: 4 in. to 103 ft. depth
_____ in. to _____ ft. depth
BORE HOLE: Diameter: 7 in. to 110 ft. depth
_____ in. to _____ ft. depth
Height: Above/Below Surface: 1 ft
Weight: _____ lbs./ft.
☐ Drive Shoe ☐ Shale Packer

8. SCREEN: ☐ Not Installed ☐ Gravel-Packed
Type: S-S Diameter: 4"
Slot/Gauze: 10 Length: 4'
Set Between: 105 ft. and 109 ft.
FITTINGS: ☒ K-Packer ☐ Bremer Check
☐ Blank Above Screen _____ ft. Other _____

9. STATIC WATER LEVEL: 85 ft. Below Land Surface ☐ Flowing

10. PUMPING LEVEL: Below Land Surface
_____ ft. After ½ hrs. Pumping at 20 G.P.M.
☐ Plunger ☐ Bailer ☐ Air ☒ Test Pump

11. WELL HEAD COMPLETION:
☒ Pitless Adapter ☐ 12" Above Grade
☐ Basement Offset ☐ Well House

12. WELL GROUTED? ☐ No ☒ Yes From _____ to _____ ft.
☐ Neat Cement ☐ Bentonite ☐ Other _____
No. of Bags 3 Additives Wellhead Slurry

13. NEAREST SOURCE OF POSSIBLE CONTAMINATION:
Type Septic Distance 60 ft. Direction W
Type _____ Distance _____ ft. Direction _____

14. PUMP: ☐ Not Installed ☐ Pump Installation Only
Manufacturer's Name: Goulds
Model Number _____ HP ½ Volts 220
Length of Drop Pipe 106 ft. Capacity 10 G.P.M.
TYPE: ☒ Submersible ☐ Jet ☐ Other _____
PRESSURE TANK:
Manufacturer's Name _____
Model Number _____ Capacity _____ Gallons _____

2. FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	85	85
Water Sand	25	110

RECEIVED
MICH DEPT OF ENVIRONMENTAL QUALITY
OCT 05 1999
Drinking Water & Radiological Protection Division
Ground Water Supply Section
WELL CONSTRUCTION UNIT

USE A 2ND SHEET IF NEEDED

15. ABANDONED WELL PLUGGED? ☐ Yes ☐ No
Casing Diameter _____ in. Depth _____ ft.
PLUGGING MATERIAL: ☐ Neat Cement ☐ Bentonite Slurry ☐ Cement/Bentonite Slurry ☐ Concrete Grout ☐ Bentonite Chips
No. of Bags _____ Casing Removed? ☐ Yes ☐ No

16. REMARKS: (Elevation, Source of Data, etc.)

17. DRILLING MACHINE OPERATOR:
☐ Employee ☐ Subcontractor
Name Roger

18. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Jacks well Drilling 1617
REGISTERED BUSINESS NAME REGISTRATION NO.
Address Elmira
Signed _____ Date 9-30-99
AUTHORIZED REPRESENTATIVE

GEOLOGICAL SURVEY COPY

EQP 2017 (12/96)

MAR 1 [illegible]

4-30-71

Layne NORTHERN COMPANY
INCORPORATED

INDIANAPOLIS • MISHAWAKA • LANSING

☐ TEST

☒ PERMANENT

Job No. L-32636

WELL LOG No. 1 CITY ALBA County ANTRIM

Owner AMERICAN CENTRAL CORPORATION Township STAR

Section 13, T30N, R5W

Location State MICHIGAN

From Land Description 1500' East & 2500' North S.W. Cor. Sec. 13.

From Street or Road NE 1/4 NE 1/4 SW 1/4

FORMATION FOUND – DESCRIBE FULLY	FROM NATURAL GROUND LEVEL			
	Depth to Top of Stratum	Depth to Bottom of Stratum	Thickness of Stratum	Static Water Level
Sand	0	23	23	
Fine gravel & sand	23	26	3	
Coarse gravel & sand	26	57	31	
Clay & gravel	57	61	4	
Clay very little gravel	61	69	8	
Clay & gravel	69	81	2	
Gravel & some clay	81	86	5	
Clay & gravel	86	103	17	
Coarse gravel very little clay	103	105	2	
Coarse clean gravel	105	136	31	25'-6"
Clay & gravel	136	143	7	

Hole 15 "Dia Drilled by: Cable Tool ____ Rotary X Jetting ____ Reverse Circ. ____ Bucket ____ Auger ____

Rotary Hole Grouted: Neat Cement ____ Drilling Mud ____ Other ____

Erwin H. A. Stahl, PE

Casing 10 3/4 "OD From 1-6 "above ground to 103 feet below ground. Weight 41 Pounds per foot

Screen 6 " Set from 105 to 135 feet Make JOHNSON Type S.S. Slot .030

Pumping test 500 GPM drawdown to 59 feet after 48 hours pumping

Date Completed 9/17/70 Driller C.P. JOHNSON

0550

GEOLOGICAL SURVEY NO

MICHIGAN DEPARTMENT OF PUBLIC HEALTH

WATER WELL AND PUMP RECORD

PERMIT NUMBER

1 LOCATION OF WELL

County: ANTRIM | Township Name: Star | Fraction: NW 1/4 NW 1/4 1/4 | Section Number: 24 | Town Number: 30 N/S | Range Number: 5 E/W

Distance And Direction From Road Intersection: On Olds Road

Street Address & City of Well Location

Locate with "X" in Section Below: X (NW corner) — Sketch Map

3 OWNER OF WELL:
Randy Ramsey
Address 7140 Willowbrook Cr.
Mancelona,MI 49659
Address Same As Well Location? ☐ Yes ☒ No

4 WELL DEPTH: 109 FT. Date Completed MO. 5 DAY 15 YEAR 95 ☒ New Well ☐ Replacement Well

5 ☐ Cable tool ☐ Rotary ☐ Driven ☐ Dug ☐ Hollow rod ☒ Auger ☐ Jetted ☐

6 USE: ☒ Domestic ☐ Type I Public ☐ Type III Public ☐ Irrigation ☐ Type IIa Public ☐ Heat pump ☐ Test Well ☐ Type IIb Public ☐

7 CASING: Diameter ☒ Steel ☒ Threaded ☐ Plastic ☐ Welded
4 in. to ___ ft. depth
___ in. to ___ ft. depth
Grouted Drill Hole Diameter ___ in. to ___ ft. depth; ___ in. to ___ ft. depth
Height: Above/Below Surface 1 ft. Weight ___ lbs./ft. Drive Shoe ☐ Yes ☐ No

2 FORMATION DESCRIPTION

FORMATION DESCRIPTION	THICKNESS OF STRATUM	DEPTH TO BOTTOM OF STRATUM
Sand	90	90
Water Sand	20	110

USE A 2ND SHEET IF NEEDED

RECEIVED MICH. DEPT. OF PUBLIC HEALTH JUN 15 95 BUREAU OF ENVIRONMENTAL AND OCCUPATIONAL HEALTH

8 SCREEN: ☐ Not installed
Type S-S Diameter 4" Slot/Gauze 10 Length 4 Foot
Set between 105 ft. and 104 ft.
FITTINGS: ☒ K-Packer ☐ Lead Packer ☐ Bremer Check ☐ Blank above screen ___ ft. Other ___

9 STATIC WATER LEVEL 90 ft. below land surface ☐ Flow

10 PUMPING LEVEL: below land surface
___ ft. after 1/2 hrs. pumping at 20 G.P.M.
___ ft. after ___ hrs. pumping at ___ G.P.M.

11 WELL HEAD COMPLETION: ☒ Pitless adapter ☐ 12" above grade ☐ Basement offset ☐ Approved pit

12 WELL GROUTED? ☐ No ☒ Yes From ___ to ___ ft.
☐ Neat cement ☒ Bentonite ☐ Other natural
No. of bags of cement ___ Additives ___

13 Nearest source of possible contamination
Type Septic Distance 50 ft. Direction N
Well disinfected upon completion? ☒ Yes ☐ No
Was old well plugged? ☐ Yes ☐ No

14 PUMP: ☐ Not installed ☐ Pump Installation Only
Manufacturer's name Grundfos
Model number ___ HP 1/2 Volts 220
Length of Drop Pipe 100 ft. capacity 10 G.P.M.
TYPE: ☒ Submersible ☐ Jet
PRESSURE TANK: Manufacturer's name U G
Model number ___ Capacity 16 Gallons

15. Remarks, elevation, source of data, etc.

16. WATER WELL CONTRACTOR'S CERTIFICATION:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Jack's Well Drilling — REGISTERED BUSINESS NAME — 1617 REGISTRATION NO.
Address Elmira
Signed Jack Sierzki (AUTHORIZED REPRESENTATIVE) Date 5-15-95

17. Rig Operator's Name: Jack

D87d 2/89

Authority: Act 368 PA 1978
Completion: Required
Penalty: Conviction of a violation of any provision is a misdemeanor.

GEOLOGICAL SURVEY COPY

Parcel 05-13-013-001-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): BIEHL LARRY R
Property Address: 11290 WOODSIDE STREET
ELMIRA, MI 49730
Mailing Address: 1070 SOUTH RIDGE
TRAVERSE CITY, MI 49686

Property Information

Current Taxable Value: $3,354

Current Assessment: $4,200
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $4,050
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $25
Village Tax: $0
Township Tax: $111

Property Sale Information

Sale Date: 6/19/1995
Sale Amount: $9,500
Liber and Page: 436-398

Legal Description

PARCEL 201-A..COM AT THE E 1/4 COR OF SEC 13; TH S 163.88 FT; TH N 88 DEG W 3539.36 FT TO POB; TH CONT N 88 DEG W 150.40 FT; TH S 200 FT; TH N 88 DEG E 150.40 FT; TH N 200 FT; TH S 88 DEG E 170 FT TO POB SEC 13 T30N R5W 0.69 A M/L

Parcel 05-13-013-001-55

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): WESTPHAL CHARLES E & AGNES V
Property Address: 11357 WOODSIDE STREET
ELMIRA, MI 49730
Mailing Address: 11357 WOODSIDE ST
ELMIRA, MI 49730

Property Information

Current Taxable Value: $36,595

Current Assessment: $51,250
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $48,350
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $278
Village Tax: $0
Township Tax: $579

Legal Description

PARCEL 121 COM AT E 1/4 COR, TH S 163.88 FT, TH N 88 DEG W 2759.1 FT FOR POB, TH N 1406 FT, TH N 88 DEG W 310.22 FT, TH S 1406 FT, TH S 88 DEG E 310.22 FT TO POB SEC 13 T30N R5W 10 A M/L

Parcel 05-13-013-001-58

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): WESTPHAL CHARLES E & AGNES V
Property Address: 11345 WOODSIDE STREET
ELMIRA, MI 49730
Mailing Address: 11357 WOODSIDE ST
ELMIRA, MI 49730

Property Information

Current Taxable Value: $4,459

Current Assessment: $12,500
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $11,500
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $34
Village Tax: $0
Township Tax: $70

Legal Description

PARCEL 122 COM AT E 1/4 COR, TH S 163.88 FT, TH N 88 DEG W 3069.32 FT FOR POB, TH N 1406 FT, TH N 88 DEG W 310.22 FT, TH S 1406 FT, TH S 88 DEG E 310.22 FT TO POB SEC 13 T30N R5W 10 A M/L

Parcel 05-13-013-001-60

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): MIDDLETON GREEN B & JACQUELINE
Property Address: 11311 WOODSIDE STREET
ELMIRA, MI 49730
Mailing Address: 11311 WOODSIDE ST
ELMIRA, MI 49730

Property Information

Current Taxable Value: $71,174

Current Assessment: $72,900
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $69,050
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $540
Village Tax: $0
Township Tax: $1,125

Property Sale Information

Sale Date: 6/27/2000
Sale Amount: $18,000
Liber and Page: 549-1127

Legal Description

PARCEL 123 COM AT E 1/4 COR, TH S 163.88 FT, TH N 88 DEG W 3379.54 FT FOR POB, TH N 1406 FT, TH N 88 DEG W 310.22 FT, TH S 1406 FT, TH S 88 DEG E 310.22 FT TO POB SEC 13 T30N R5W 10 A M/L

Parcel 05-13-013-001-63

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): BARRETT JULIE K & RODNEY A
Property Address: 11352 WOODSIDE STREET
ELMIRA, MI 49730
Mailing Address: 22503 DOWNING
ST CLAIR SHORES, MI 48080

Property Information

Current Taxable Value: $12,500

Current Assessment: $12,500
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $11,500
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $58
Village Tax: $0
Township Tax: $253

Property Sale Information

Sale Date: 9/24/2005
Sale Amount: $25,000
Liber and Page: 741-1156

Sale Date: 5/5/2003
Sale Amount: $10,000
Liber and Page: 664-433

Sale Date: 7/19/2000
Sale Amount: $10,000
Liber and Page: 615-374

Legal Description

PARCEL 202..COM AT THE E 1/4 COR OF SEC 13; TH S 0 DEG W 163.88 FT ALG E SEC LINE; TH N 88 DEG W 2996.60 FT TO POB; TH S 0 DEG W 1169.49 FT; TH N 88 DEG W 372.78 FT; TH N 0 DEG E 1170.51 FT; TH S 88 DEG E 372.80 FT TO POB SEC 13 T30N R5W 10.01 A M/L

Parcel 05-13-013-001-65

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): WORKMAN JIM F JR
Property Address: 11450 WOODSIDE STREET
ELMIRA, MI 49730
Mailing Address: 1328 S HOLLY RD
FENTON, MI 48430

Property Information

Current Taxable Value: $9,285

Current Assessment: $20,000
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $18,600
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $70
Village Tax: $0
Township Tax: $308

Property Sale Information

Sale Date: 8/18/1998
Sale Amount: $10,100
Liber and Page: 496-395

Legal Description

PARCEL 203 COM AT E 1/4 COR, TH S 163.88 FT, TH N 88 DEG W 2623.6 FT FOR POB, TH CONT N 88 DEG W 373 FT, TH S 1169.49 FT, TH S 88 DEG E 372.98 FT, TH N 1168.47 FT TO POB SEC 13 T30N R5W 10 A M/L

Parcel 05-13-013-001-68

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): PATTEN DAVID & KIMBERLY A
Property Address: 11560 WOODSIDE STREET
ELMIRA, MI 49730
Mailing Address: 11535 WILLIAM
TAYLOR, MI 48180

Property Information

Current Taxable Value: $7,736

Current Assessment: $15,200
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $14,050
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $59
Village Tax: $0
Township Tax: $256

Property Sale Information

Sale Date: 9/30/1995
Sale Amount: $11,000
Liber and Page: 434-791

Legal Description

PARCEL 204; COM AT E 1/4 COR, TH S 163.88 FT, TH N 88 DEG W 2250.1 FT FOR POB, TH CONT N 88 DEG W 393.5 FT, TH S 1168.47 FT, TH S 88 DEG E 373.48 FT, TH N 1167.35 FT TO POB SEC 13 T30N R5W 10 A M/L

Parcel 05-13-013-001-85

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): BIEHL LARRY R
Mailing Address: 1070 SOUTH RIDGE
TRAVERSE CITY, MI 49686

Property Information

Current Taxable Value: $4,761

Current Assessment: $9,400
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $8,400
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $36
Village Tax: $0
Township Tax: $158

Legal Description

PARCEL 201-B..COM AT THE E 1/4 COR OF SEC 13; TH S 163.88 FT; TH N 88 DEG W 3369.4 FT FOR POB; TH CONT N 88 DEG W 170 FT; TH S 200 FT; TH N 88 DEG W 150.40 FT; TH S 00 DEG W 971.39 FT; TH S 88 DEG E 320.33 FT; TH N 00 DEG E 1170.51 FT TO POB SEC 13 T30N R5W 7.92 A M/L

Parcel 05-13-013-002-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): GROLEAU LOUIS D
Mailing Address: 1822 HAMMOND RD EAST
TRAVERSE CITY, MI 49686

Property Information

Current Taxable Value: $83,600

Current Assessment: $83,600
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $83,600
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $655
Village Tax: $0
Township Tax: $2,862

Property Sale Information

Sale Date: 4/17/2004
Sale Amount: $1
Liber and Page: 709-1315

Legal Description

W 1/2 OF NW 1/4 SEC 13 T30N R5W 80 A.

Parcel 05-13-013-003-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): MARTELL KEITH R & CATHERINE L
Mailing Address: 205 ARROWHEAD TRL
GAYLORD, MI 49735

Property Information

Current Taxable Value: $17,682

Current Assessment: $83,600
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $83,600
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $134
Village Tax: $0
Township Tax: $586

Property Sale Information

Sale Date: 4/17/1995
Sale Amount: $65,000
Liber and Page: 426-158

Legal Description

W 1/2 OF SW 1/4 SEC 13 T30N R5W 80 A

Parcel 05-13-013-005-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): AVERY JAMES W - WILHELM JOANNE
Mailing Address: P O BOX 1232
GAYLORD, MI 49735

Property Information

Current Taxable Value: $8,077

Current Assessment: $38,000
Current Homestead: 100%
Current Property Class: 10 - Agricultural

Last Year's Assessment: $40,000
Last Year's Homestead: 100%
Last Year's Property Class: 10 - Agricultural

Property Tax Information

Taxable Year: 2005
Summer Tax: $61
Village Tax: $0
Township Tax: $128

Legal Description

SE 1/4 OF SW 1/4 SEC 13 T30N R5W 40 A.

Parcel 05-13-013-006-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): HINTZ LOUIS E & SHARLENE J
Property Address: 11405 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: 11405 ALBA HWY
ELMIRA, MI 49730

Property Information

Current Taxable Value: $49,345

Current Assessment: $53,800
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $49,000
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $374
Village Tax: $0
Township Tax: $780

Property Sale Information

Sale Date: 9/10/2003
Sale Amount: $15,000
Liber and Page: 684-35

Sale Date: 8/15/2003
Sale Amount: $85,000
Liber and Page: 680-1389

Sale Date: 7/30/2002
Sale Amount: $85,000
Liber and Page: 621-1388

Sale Date: 1/23/2002
Sale Amount: $0
Liber and Page: 601-1233

Sale Date: 8/21/2001
Sale Amount: $0
Liber and Page: 587-261

Legal Description

PARCEL A..BEG AT THE S 1/4 COR OF SEC 13; TH N 00 DEG E 420 FT ALG N-S 1/4 LINE; TH S 88 DEG E 300 FT; TH S 00 DEG W 420 FT; TH N 88 DEG W 300 FT ALG S SEC LINE & C/L OF ALBA HWY TO POB; BEING PART OF THE SW 1/4 OF THE SE 1/4 SEC 13 T30N R5W 2.892 A M/L

Parcel 05-13-013-006-50

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): STAPLETON JOHN C & ELAINE L
Mailing Address: 70827 ROMEO PLANK RD
ARMADA, MI 48005

Property Information

Current Taxable Value: $14,513

Current Assessment: $14,750
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $14,050
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $110
Village Tax: $0
Township Tax: $481

Property Sale Information

Sale Date: 1/12/2004
Sale Amount: $32,500
Liber and Page: 699-972

Legal Description

PARCEL F..COM AT THE S 1/4 COR OF SEC 13; TH N 00 DEG E 420 FT ALG N-S 1/4 LINE TO THE POB; TH CONT N 00 DEG E 906.89 FT; TH S 88 DEG E 483.02 FT; TH S 00 DEG W 776.30 FT; TH S 88 DEG E 136.26 FT; TH S 00 DEG W 130 FT; TH N 88 DEG W 685 FT TO THE POB; BEING PART OF THE SW 1/4 OF THE SE 1/4 SEC 13 T30N R5W 11.829 A M/L

Parcel 05-13-014-002-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): MARSHALL ROBIN & JACALYN J
Property Address: 2342 PATTERSON ROAD
ELMIRA, MI 49730
Mailing Address: 2342 PATTERSON RD
ELMIRA, MI 49730

Property Information

Current Taxable Value: $18,694

Current Assessment: $43,550
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $40,150
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $142
Village Tax: $0
Township Tax: $296

Property Sale Information

Sale Date: 3/24/2004
Sale Amount: $37,500
Liber and Page: 708-806

Sale Date: 10/5/1998
Sale Amount: $37,500
Liber and Page: 500-1378

Sale Date: 5/12/1998
Sale Amount: $132,000
Liber and Page: 488-936

Legal Description

COM 330 FT SOUTH OF NE COR OF SE 1/4 OF NE 1/4, TH W 330 FT, TH S 264 FT, TH E 330 FT, TH N TO POB SEC 14 T30N R5W 2 A M/L

Parcel 05-13-014-002-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): ACER PARADISE INC
Mailing Address: P O BOX 758
MANCELONA, MI 49659

Property Information

Current Taxable Value: $15,477

Current Assessment: $40,000
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $40,000
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $117
Village Tax: $0
Township Tax: $513

Property Sale Information

Sale Date: 5/12/1998
Sale Amount: $132,000
Liber and Page: 488-936

Legal Description

SE 1/4 OF NE 1/4 EXC COM 330 FT S OF NE COR FOR POB, TH W 330 FT, TH S 264 FT, TH E 330 FT, TH N TO POB SEC 14 T30N R5W 38 A M/L

Parcel 05-13-014-003-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): CHIPPA MICHAEL A & JANICE K
Mailing Address: 10303 ALBA HWY
ELMIRA, MI 49730

Property Information

Current Taxable Value: $8,530

Current Assessment: $38,000
Current Homestead: 100%
Current Property Class: 10 - Agricultural

Last Year's Assessment: $40,000
Last Year's Homestead: 100%
Last Year's Property Class: 10 - Agricultural

Property Tax Information

Taxable Year: 2005
Summer Tax: $65
Village Tax: $0
Township Tax: $135

Legal Description

SW 1/4 OF NE 1/4 SEC 14 T30N R5W 40 A.

Parcel 05-13-014-006-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): CROFT LLC
Mailing Address: 121 E FRONT ST STE 200
TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: $17,508

Current Assessment: $76,000
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $76,000
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $133
Village Tax: $0
Township Tax: $580

Property Sale Information

Sale Date: 12/31/2004
Sale Amount: $0
Liber and Page: 728-2462

Legal Description

S 1/2 OF NW 1/4 SEC 14 T30N R5W 80 A M/L

Parcel 05-13-014-007-00

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): CHIPPA MICHAEL A & JANICE K
Property Address: 10303 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: 10303 ALBA HWY
ELMIRA, MI 49730

Property Information

Current Taxable Value: $47,064

Current Assessment: $115,300
Current Homestead: 100%
Current Property Class: 10 - Agricultural

Last Year's Assessment: $113,350
Last Year's Homestead: 100%
Last Year's Property Class: 10 - Agricultural

Property Tax Information

Taxable Year: 2005
Summer Tax: $357
Village Tax: $0
Township Tax: $744

Legal Description

E 1/2 OF SW 1/4 SEC 14 T30N R5W 80 A.

Parcel 05-13-014-008-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): POMEROY PENNY
Property Address: 10085 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: 10085 ALBA HWY
ELMIRA, MI 49730

Property Information

Current Taxable Value: $36,646

Current Assessment: $39,600
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $36,300
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $278
Village Tax: $0
Township Tax: $579

Property Sale Information

Sale Date: 6/16/2003
Sale Amount: $0
Liber and Page: 669-320

Sale Date: 1/29/2002
Sale Amount: $67,900
Liber and Page: 603-905

Legal Description

COM AT THE SW COR OF THE W 1/2 OF THE SW 1/4 OF SEC 14; TH E 355 FT ALG S SEC LINE TO POB; TH N 350 FT; THE E 270 FT; TH S 350 FT; TH W 270 FT TO THE POB; BEING PART OF THE SW 1/4 OF THE SW 1/4 SEC 14 T30N R5W

Parcel 05-13-014-008-05

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): SLOAN DONNA J
Property Address: 2977 PRIMROSE ROAD
ELMIRA, MI 49730
Mailing Address: 2977 PRIMROSE RD
ELMIRA, MI 49730

Property Information

Current Taxable Value: $36,614

Current Assessment: $41,650
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $37,100
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $278
Village Tax: $0
Township Tax: $579

Property Sale Information

Sale Date: 8/28/2002
Sale Amount: $11,000
Liber and Page: 625-645

Legal Description

BEG AT THE SW COR OF THE W 1/2 OF THE SW 1/4 OF SEC 14; TH N 350 FT; TH E 355 FT; TH S 350 FT; TH W 355 FT TO POB; BEING PART OF THE SW 1/4 OF THE SW 1/4 SEC 14 T30N R5W 2.8 A M/L

Parcel 05-13-014-008-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): CROFT LLC
Mailing Address: 121 E FRONT ST STE 200
TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: $13,331

Current Assessment: $60,800
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $60,800
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $101
Village Tax: $0
Township Tax: $442

Property Sale Information

Sale Date: 12/31/2004
Sale Amount: $0
Liber and Page: 728-2462

Legal Description

THE W 1/2 OF THE SW 1/4 OF SEC 14, EXC COM AT THE SW COR OF W 1/2 OF SW 1/4 DESC AS COM AT THE SW COR OF SEC, TH N 350 FT, TH E 625 FT, TH S 350 FT, TH W 625 FT TO POB, ALSO EXC COM AT THE NW COR OF THE W 1/2 OF SW 1/4 SEC 14, TH E 860 FT, TH S PARA TO THE W LINE 540 FT, TH W 860 FT TO W SEC LINE, TH N TO POB, BEING PART OF THE W 1/2 OF THE SW 1/4 SEC 14, T30N, R5W 64.32 A M/L

Parcel 05-13-014-008-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): GATES DALE E
Property Address: 2525 PRIMROSE ROAD
ELMIRA, MI 49730
Mailing Address: 2525 PRIMROSE RD
ELMIRA, MI 49730

Property Information

Current Taxable Value: $44,530

Current Assessment: $65,600
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $62,050
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $338
Village Tax: $0
Township Tax: $704

Legal Description

COM AT THE NW COR OF THE W 1/2 OF THE SW 1/4 OF SEC 14 TH E 860 FT, TH S 540 FT, TH W 860 FT TO W LINE OF SEC, TH N 540 FT TO POB, BEING PART OF THE W 1/2 OF THE SW 1/4 SEC 14 T30N R5W 10.68 A M/L

Parcel 05-13-014-009-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): O'CONNELL RHONDA L DARRAH CHERYL - MASSEY ROBERT
Property Address: 10577 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: P O BOX 1
ALBA, MI 49611

Property Information

Current Taxable Value: $165,800

Current Assessment: $165,800
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $170,550
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $1,272
Village Tax: $0
Township Tax: $2,650

Property Sale Information

Sale Date: 7/26/2006
Sale Amount: $0
Liber and Page: 755-2327

Sale Date: 2/4/2002
Sale Amount: $0
Liber and Page: 603-535

Legal Description

SE 1/4 SEC 14 T30N R5W 160 A M/L

Parcel 05-13-023-001-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): VOELKER OREITHA M LIVING TRUST
Property Address: 10814 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: 105 BOUGHEY ST
TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: $18,688

Current Assessment: $81,650
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $84,400
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $142
Village Tax: $0
Township Tax: $619

Legal Description

N 1/2 OF NE 1/4 SEC 23 T30N R5W 80 A

Parcel 05-13-023-002-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): MARTIN TIMOTHY G
Property Address: 3384 PATTERSON ROAD
ELMIRA, MI 49730
Mailing Address: 3384 PATTERSON RD
ELMIRA, MI 49730

Property Information

Current Taxable Value: $41,650

Current Assessment: $41,650
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $39,000
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $211
Village Tax: $0
Township Tax: $439

Property Sale Information

Sale Date: 9/7/2005
Sale Amount: $90,000
Liber and Page: 740-56

Legal Description

PARCEL 9, COM AT THE E 1/4 COR OF SEC 23, TH S 88 DEG W ALG THE EW 1/4 LINE 1226 FT, TH N 0 DEG E 310.80 FT, TH N 88 DEG E 1225.86 FT TO THE E LINE OF SEC 23, TH S 0 DEG W ALG SD E LINE 310.80 FT TO THE POB SEC 23 T30N R5W 8.75 A M/L

Parcel 05-13-023-002-10

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): HOSTMAN DAVID J & ELIZABETH A
Property Address: 3298 PATTERSON ROAD
ELMIRA, MI 49730
Mailing Address: P O BOX 158
ELMIRA, MI 49730

Property Information

Current Taxable Value: $7,736

Current Assessment: $15,000
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $12,100
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $59
Village Tax: $0
Township Tax: $122

Property Sale Information

Sale Date: 12/5/1997
Sale Amount: $21,000
Liber and Page: 476-784

Sale Date: 5/6/1996
Sale Amount: $0
Liber and Page: 459-1222

Legal Description

PARCEL 7..COM AT THE E 1/4 COR OF SEC 23, TH N 0 DEG E ALG THE E LINE OF SEC 23 1000.8 FT TO THE POB, TH S 88 DEG W 569.85 FT, TH N 1 DEG E 333.3 FT, TH N88 DEG E 569.6 FT TO THE E LINE OF SEC, TH S 0 DEG W ALG THE SD E LINE 333.6 FT TO THE POB SEC 23 T30N R5W 4.36 A M/L

Parcel 05-13-023-002-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): HOSTMAN DAVID J & ELIZABETH A
Property Address: 3352 PATTERSON ROAD
ELMIRA, MI 49730
Mailing Address: P O BOX 158
ELMIRA, MI 49730

Property Information

Current Taxable Value: $15,001

Current Assessment: $22,900
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $19,550
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $114
Village Tax: $0
Township Tax: $237

Property Sale Information

Sale Date: 12/5/1997
Sale Amount: $21,000
Liber and Page: 476-784

Legal Description

PARCEL 6 COM AT E 1/4 CORNER, TH N 0 DEG E ALG EAST SEC LINE 667.2 FT TO POB, TH S 88 DEG W 570.63 FT, TH N 1 DEG E 333.3 FT, TH N 88 DEG E 569.85 FT TO E LINE OF SEC, TH S ALG E SEC LINE 333.6 FT TO POB SEC 23 T30N R5W 4.37 A M/L

Parcel 05-13-023-002-25

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): WARREN MICHAEL J & ROBIN R
Property Address: 3376 PATTERSON ROAD
ELMIRA, MI 49730
Mailing Address: 3376 PATTERSON RD
ELMIRA, MI 49730

Property Information

Current Taxable Value: $9,875

Current Assessment: $18,050
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $35,900
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $186
Village Tax: $0
Township Tax: $387

Property Sale Information

Sale Date: 2/28/1995
Sale Amount: $0
Liber and Page: 424-665

Legal Description

PARCEL 5-1..COM AT THE E 1/4 COR OF SEC 23; TH N 00 DEG E 310.80 FT ALG E SEC LINE TO POB; TH S 88 DEG W 1225.88 FT; TH N 01 DEG E 355.21 FT; TH N 88 DEG E 1025.03 FT; TH S 00 DEG W 150 FT; TH N 88 DEG E 200 FT TO E SEC LINE; TH S 00 DEG W 206.40 FT TO POB; BEING PART OF THE NE 1/4 SEC 23 T30N R5W 9.31 A M/L

Parcel 05-13-023-002-30

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): BRADLEY ANTHONY W
Property Address: 3322 PATTERSON ROAD
ELMIRA, MI 49730
Mailing Address: 3322 PATTERSON RD
ELMIRA, MI 49730

Property Information

Current Taxable Value: $24,159

Current Assessment: $33,400
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $31,850
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $183
Village Tax: $0
Township Tax: $801

Legal Description

PARCEL 11 COM AT THE E 1/4 COR OF SEC, TH S 88 DEG W ALG E-W 1/4 LINE 1226.6 FT, TH N 01 DEG E 666.01 FT TO POB, TH S 88 DEG W 655 FT, TH N 01 DEG E 665.42 FT, TH N 88 DEG E 655 FT, TH S 01 DEG W 666.01 FT TO THE POB SEC 23 T30N R5W 10.01 A M/L

Parcel 05-13-023-002-40

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): HOSTMAN DAVID J & ELIZABETH A
Mailing Address: P O BOX 158
ELMIRA, MI 49730

Property Information

Current Taxable Value: $5,057

Current Assessment: $11,000
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $10,500
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $38
Village Tax: $0
Township Tax: $168

Property Sale Information

Sale Date: 10/27/2004
Sale Amount: $8,500
Liber and Page: 725-1971

Sale Date: 9/24/1998
Sale Amount: $8,500
Liber and Page: 499-860

Legal Description

PARCEL 8 COM AT THE E 1/4 COR OF SEC 23, TH N 0 DEG E ALG E SEC LINE 667.2 FT, TH S 88 DEG W 570.63 FT TO THE POB, TH CONT S 88 DEG W 654.4 FT, TH N 01 DEG E 666.01 FT, TH N 88 DEG E 654.4 FT, TH S 01 DEG W 666.6 FT TO THE POB SEC 23 T30N R5W 10.01 A M/L

Parcel 05-13-023-002-50

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): KASSUBA EVELYN M
Mailing Address: 520 N TOWNLINE RD
GAYLORD, MI 49735

Property Information

Current Taxable Value: $2,489

Current Assessment: $11,000
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $10,500
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $19
Village Tax: $0
Township Tax: $82

Legal Description

PARCEL 10 COM AT THE E 1/4 COR OF SEC 23, TH S 88 DEG W ALG EW 1/4 LINE 1226.6 FT TO THE POB, TH CONT S 88 DEG W ALG EW 1/4 LINE 655 FT, TH N 01 DEG E 665.4 FT, TH N 88 DEG E 655 FT, TH S 01 DEG W 666.01 FT TO THE EW 1/4 LINE AND POB SEC 23 T30N R5W 10.01 A M/L

Parcel 05-13-023-002-60

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): LAMOREAUX DAWN
Mailing Address: 1906 SPRUCE ST
WEST POINT, GA 31833

Property Information

Current Taxable Value: $5,057

Current Assessment: $11,000
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $10,500
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $38
Village Tax: $0
Township Tax: $168

Property Sale Information

Sale Date: 5/15/2002
Sale Amount: $7,500
Liber and Page: 618-476

Sale Date: 9/4/1998
Sale Amount: $7,500
Liber and Page: 502-563

Sale Date: 9/16/1998
Sale Amount: $0
Liber and Page: 502-562

Legal Description

PARCEL 13 COM AT THE E 1/4 COR OF SEC 23, TH S 88 DEG W ALG EW 1/4 LINE 1881.6 FT TO THE POB, TH CONT S 88 DEG W ALG SD EW 1/4 LINE 655.6 FT TO THE CENTER 1/4 COR OF SD SEC, TH N 01 DEG E ALG THE NS 1/4 LINE 664.83 FT, TH N 88 DEG E 655.6 FT, TH S 01 DEG W 665.42 FT TO THE EW 1/4 LINE AND THE POB, BEING PART OF THE SW 1/4 OF THE NE 1/4 SEC 23 T30N R5W 10.01 A M/L

Parcel 05-13-023-002-70

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): KASSUBA EVELYN M
Mailing Address: 520 N TOWNLINE RD
GAYLORD, MI 49735

Property Information

Current Taxable Value: $2,489

Current Assessment: $11,000
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $10,500
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $19
Village Tax: $0
Township Tax: $82

Legal Description

PARCEL 12 COM AT THE E 1/4 COR OF SEC 23, TH S 88 DEG W ALG THE E-W 1/4 LINE OF SD SEC 655.6 FT TO THE N-S 1/4 LINE OF SEC, TH N 01 DEG E ALG N-S 1/4 LINE 664.83 FT, TH N 88 DEG E 655.6 FT, TH S 01 DEG W 665.23 FT TO THE POB SEC 23 T30N R5W 10.01 A M/L

Parcel 05-13-023-003-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): CROFT LLC
Property Address: 10426 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: 121 E FRONT ST STE 200
TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: $22,244

Current Assessment: $118,100
Current Homestead: 0%
Current Property Class: 30 - Industrial

Last Year's Assessment: $124,300
Last Year's Homestead: 0%
Last Year's Property Class: 30 - Industrial

Property Tax Information

Taxable Year: 2005
Summer Tax: $169
Village Tax: $0
Township Tax: $737

Property Sale Information

Sale Date: 12/31/2004
Sale Amount: $0
Liber and Page: 0-0

Legal Description

THE N 3/4 OF E 1/2 OF W 1/2 EXC COM AT THE N 1/4 POST OF SEC 23, TH S 87 DEG W 828.6 FT FOR POB, TH S 87 DEG W 436.28 FT, TH S 1 DEG W ON THE W 1/8 LINE OF SD SEC 500 FT, TH N 87 DEG E 436.28 FT, TH N 1 DEG E 500 FT TO THE POB, BEING PART OF THE NE 1/4 OF THE NW 1/4 EXC COM AT N 1/4 COR OF SEC 23, TH S 87 DEG W ALG N LINE 50.05 FT TO NE COR FOR POB, TH S 0 DEG W 295.17 FT, TH S 87 DEG W 295.17 FT, TH N 0 DEG E 295.17 FT TO A PT ON N LINE OF SD SEC 23, TH N 87 DEG E ALG N SEC LINE 295.17 FT TO POB..... SEC 23 T30N R5W.....113 A M/L

Parcel 05-13-023-003-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): CHIPPA MICHAEL A & REBECCA M
Property Address: 10266 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: 10266 ALBA HWY
ELMIRA, MI 49730

Property Information

Current Taxable Value: $30,835

Current Assessment: $34,300
Current Homestead: 100%
Current Property Class: 10 - Agricultural

Last Year's Assessment: $29,850
Last Year's Homestead: 100%
Last Year's Property Class: 10 - Agricultural

Property Tax Information

Taxable Year: 2005
Summer Tax: $234
Village Tax: $0
Township Tax: $487

Property Sale Information

Sale Date: 7/18/1997
Sale Amount: $7,000
Liber and Page: 466-1402

Sale Date: 2/23/1996
Sale Amount: $21,000
Liber and Page: 441-1164

Legal Description

COM AT THE N 1/4 POST OF SEC 23, TH S 87 DEG W ON SEC LINE 828.6 FT FOR POB, TH S 87 DEG W 436.28 FT, TH S 1 DEG W ON THE W 1/8TH LINE OF SD SEC 500 FT, TH N 87 DEG E 436.28 FT, TH N 1 DEG E 500 FT TO POB, BEING PART OF THE NE 1/4 OF THE NW 1/4 SEC 23 T30N SEC 23 T30N R5W 5 A M/L

Parcel 05-13-023-003-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): THURSTON TODD M & DEANNA L
Property Address: 10464 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: 615 W SHELDON ST
GAYLORD, MI 49735

Property Information

Current Taxable Value: $16,400

Current Assessment: $16,400
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $13,600
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $70
Village Tax: $0
Township Tax: $146

Property Sale Information

Sale Date: 12/27/2005
Sale Amount: $35,450
Liber and Page: 745-313

Sale Date: 12/17/2001
Sale Amount: $0
Liber and Page: 597-835

Sale Date: 3/16/2000
Sale Amount: $15,000
Liber and Page: 543-85

Legal Description

COM AT N 1/4 COR OF SEC 23, TH S 87 DEG W ALG N LINE OF SD SEC 50.05 FT FOR POB, TH S 0 DEG W 295.17 FT, TH S 87 DEG W 295.17 FT TH N 0 DEG E 295.17 FT TO A PT ON N SEC LINE, TH N 87 DEG E ALG N SEC LINE 295.17 FT TO POB, BEING PART OF NE 1/4 OF NW 1/4..... SEC 23 T30N R5W.....2 A M/L

Parcel 05-13-023-004-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): CROFT LLC
Mailing Address: 121 E FRONT ST STE 200
TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: $1,592

Current Assessment: $31,350
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $41,250
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $12
Village Tax: $0
Township Tax: $53

Property Sale Information

Sale Date: 12/31/2004
Sale Amount: $0
Liber and Page: 728-2464

Sale Date: 12/20/1996
Sale Amount: $0
Liber and Page: 457-1386

Legal Description

SW 1/4 OF THE NW 1/4; EXC THE N 1/2 OF THE N 1/2 OF THE SW 1/4 OF THE NW 1/4 SEC 23 T30N R5W 30 A M/L

Parcel 05-13-023-004-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): RAY JAMES L
Property Address: 9972 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: 9972 ALBA HWY
ELMIRA, MI 49730

Property Information

Current Taxable Value: $59,061

Current Assessment: $71,700
Current Homestead: 74%
Current Property Class: 40 - Residential

Last Year's Assessment: $69,100
Last Year's Homestead: 74%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $448
Village Tax: $0
Township Tax: $1,200

Property Sale Information

Sale Date: 8/17/2000
Sale Amount: $54,293
Liber and Page: 553-16

Sale Date: 6/18/1999
Sale Amount: $47,000
Liber and Page: 553-15

Sale Date: 1/14/1997
Sale Amount: ($100)
Liber and Page: 460-1328

Legal Description

COM AT THE NW COR OF SEC 23; TH S 200 FT ALG W SEC LINE TO THE POB; TH S 1120 FT; TH E 660 FT; TH N 1120 FT; TH W 660 FT TO THE POB; BEING PT OF THE NW 1/4 OF THE NW 1/4 SEC 23 T30N R5W 17 A M/L

Parcel 05-13-023-004-15

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): CROFT LLC
Mailing Address: 121 E FRONT ST STE 200
TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: $5,653

Current Assessment: $24,050
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $24,050
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $43
Village Tax: $0
Township Tax: $187

Property Sale Information

Sale Date: 12/31/2004
Sale Amount: $0
Liber and Page: 728-2464

Legal Description

BEG AT THE NW COR OF THE NW 1/4 OF THE NW 1/4; TH E 1320 FT; TH S 1320 FT; TH W 660 FT; TH N 1120 FT; TH W 660 FT TO W SEC LINE; TH N 200 FT ALG SD LINE TO THE POB; BEING PT OF THE NW 1/4 OF THE NW 1/4 SEC 23 T30N R5W 23 A M/L

Parcel 05-13-023-004-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): CROFT LLC
Mailing Address: 121 E FRONT ST STE 200
TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: $7,417

Current Assessment: $13,750
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $12,650
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $56
Village Tax: $0
Township Tax: $246

Property Sale Information

Sale Date: 12/31/2004
Sale Amount: $0
Liber and Page: 0-0

Sale Date: 12/9/1999
Sale Amount: $15,000
Liber and Page: 535-714

Sale Date: 12/9/1997
Sale Amount: ($100)
Liber and Page: 460-1327

Legal Description

THE N 1/2 OF THE N 1/2 OF THE SW 1/4 OF THE NW 1/4 SEC 23 T30N R5W 10 A M/L

Parcel 05-13-024-002-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): TAYLOR ROBERT W FAMILY TRUST
Mailing Address: P O BOX 120401
ARLINGTON, TX 76012

Property Information

Current Taxable Value: $30,749

Current Assessment: $114,950
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $114,950
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $233
Village Tax: $0
Township Tax: $1,019

Property Sale Information

Sale Date: 2/3/2003
Sale Amount: $0
Liber and Page: 651-931

Legal Description

W 1/2 OF NE 1/4; ALSO NE 1/4 OF NE 1/4; EXC E 10 ACRES SEC 24 T30N R5W 110 A M/L

Parcel 05-13-024-006-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): VOELKER OREITHA M LIVING TRUST
Mailing Address: 105 BOUGHEY ST
TRAVERSE CITY, MI 49684

Property Information

Current Taxable Value: $10,631

Current Assessment: $37,700
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $42,650
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $81
Village Tax: $0
Township Tax: $352

Legal Description

NW 1/4 OF NW 1/4 EXC THE W 1/2 OF NW 1/4 OF NW 1/4 OF NW 1/4 SEC 24 T30N R5W 35 A M/L

Parcel 05-13-024-006-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): HUNLEY ROBERT & ANNETTE
Property Address: 3121 PATTERSON ROAD
ELMIRA, MI 49730
Mailing Address: 3121 PATTERSON RD
ELMIRA, MI 49730

Property Information

Current Taxable Value: $34,344

Current Assessment: $47,600
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $42,400
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $261
Village Tax: $0
Township Tax: $543

Property Sale Information

Sale Date: 9/24/2003
Sale Amount: $85,000
Liber and Page: 686-686

Sale Date: 9/24/2003
Sale Amount: $87,500
Liber and Page: 686-687

Sale Date: 9/19/2001
Sale Amount: $85,000
Liber and Page: 679-1303

Sale Date: 9/5/2001
Sale Amount: $0
Liber and Page: 591-445

Sale Date: 9/5/2001
Sale Amount: $0
Liber and Page: 591-446

Sale Date: 6/9/2000
Sale Amount: $10,900
Liber and Page: 548-156

Sale Date: 7/1/1999
Sale Amount: $0
Liber and Page: 521-892

Sale Date: 6/23/1998
Sale Amount: $5,700
Liber and Page: 498-1355

Legal Description

THE W 1/2 OF THE NW 1/4 OF THE NW 1/4 OF THE NW 1/4; EXC THE N 250 FT OF THE W 174.24 FT OF THE W 1/2 OF NW 1/4 OF NW 1/4 OF THE NW 1/4 SEC 24 T30N R5W 4 A M/L

Parcel 05-13-024-006-15

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): MILBOCKER TERRANCE AA MATHEY CARRIE A
Property Address: 11030 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: 11030 ALBA HWY
ELMIRA, MI 49730

Property Information

Current Taxable Value: $25,297

Current Assessment: $53,050
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $50,650
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $192
Village Tax: $0
Township Tax: $400

Legal Description

THE N 250 FT OF THE W 174.24 FT OF THE W 1/2 OF THE NW 1/4 OF NW 1/4 OF NW 1/4 SEC 24 T30N R5W

Parcel 05-13-024-007-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): AVERY JAMES W - WILHELM JOANNE WILD WINGS GAME FARM
Property Address: 11378 ALBA HIGHWAY
ELMIRA, MI 49730
Mailing Address: P O BOX 1232
GAYLORD, MI 49735

Property Information

Current Taxable Value: $55,402

Current Assessment: $117,500
Current Homestead: 100%
Current Property Class: 10 - Agricultural

Last Year's Assessment: $114,900
Last Year's Homestead: 100%
Last Year's Property Class: 10 - Agricultural

Property Tax Information

Taxable Year: 2005
Summer Tax: $420
Village Tax: $0
Township Tax: $876

Legal Description

E 1/2 OF NW 1/4 SEC 24 T30N R5W.

Parcel 05-13-024-008-00

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): BRITTON HARVEY & KIMBERLY
Mailing Address: 3455 PATTERSON RD
ELMIRA, MI 49730

Property Information

Current Taxable Value: $7,187

Current Assessment: $8,600
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $7,600
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $55
Village Tax: $0
Township Tax: $238

Property Sale Information

Sale Date: 10/31/2002
Sale Amount: $22,000
Liber and Page: 634-77

Legal Description

COM AT THE W 1/4 COR OF SEC 24, TH N 0 DEG E ALG THE W LINE OF SD SEC 1069.8 FT TO THE POB, TH CONT N ALG W LINE OF SD SEC 264.5 FT, TH S 88 DEG E 1225.46 FT, TH S 262.6 FT, TH N 88 DEG W 1224.92 FT TO THE W LINE AND THE POB, BEING PART OF THE SW 1/4 OF NW 1/4 PARCEL 1.....SEC 24 T30N R5W.....7.4 A M/L

Parcel 05-13-024-008-05

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): BRITTON HARVEY & KIMBERLY
Property Address: 3351 PATTERSON ROAD
ELMIRA, MI 49730
Mailing Address: 3455 PATTERSON RD
ELMIRA, MI 49730

Property Information

Current Taxable Value: $25,562

Current Assessment: $28,750
Current Homestead: 0%
Current Property Class: 40 - Residential

Last Year's Assessment: $22,450
Last Year's Homestead: 0%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $160
Village Tax: $0
Township Tax: $700

Property Sale Information

Sale Date: 10/31/2002
Sale Amount: $30,000
Liber and Page: 634-767

Legal Description

COM AT THE W 1/4 COR OF SEC 24, TH N 0 DEG E ALG THE W LINE OF SD SEC 713.2 FT TO THE POB, TH CONT N 0 DEG E ALG THE W LINE OF SD SEC 356.6 FT, TH S 88 DEG E 1224.92 FT, TH S 0 DEG W 356.6 FT, TH N 88 DEG W 1224.2 FT TO THE W LINE AND POB, BEING PART OF THE SW 1/4 OF NW 1/4 PARCEL 2.....SEC 24 T30N R5W 10.01 A M/L

Parcel 05-13-024-008-10

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): HUFFMAN TERRY L - WOOLLEY LISA
Property Address: 3393 PATTERSON ROAD
ELMIRA, MI 49730
Mailing Address: 4001 W SILVERSPRING BLVD
OCALA, FL 34482

Property Information

Current Taxable Value: $10,776

Current Assessment: $19,100
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $17,900
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $82
Village Tax: $0
Township Tax: $170

Property Sale Information

Sale Date: 2/23/2001
Sale Amount: $174
Liber and Page: 568-803

Sale Date: 1/29/2001
Sale Amount: $0
Liber and Page: 564-733

Legal Description

PARCEL 3 COM AT THE W 1/4 COR OF SEC 24, TH N 0 DEG E ALG W LINE OF SEC 356.6 FT TO THE POB, TH CONT N 0 DEG E 356.6 FT, TH S 88 DEG E 1224.2 FT, TH S 0 DEG W 356.6 FT, TH N 88 DEG W 1223.5 FT TO THE W LINE OF SEC AND THE POB, SEC 24 T30N R5W 10.01 A M/L

Parcel 05-13-024-008-20

Close This Window

Antrim County Parcel Information for 2006 Assessment Year

Jurisdiction: Star Twp
Owner Name(s): BRITTON HARVEY & KIMBERLY
Property Address: 3455 PATTERSON ROAD
ELMIRA, MI 49730
Mailing Address: 3455 PATTERSON RD
ELMIRA, MI 49730

Property Information

Current Taxable Value: $55,776

Current Assessment: $58,600
Current Homestead: 100%
Current Property Class: 40 - Residential

Last Year's Assessment: $54,700
Last Year's Homestead: 100%
Last Year's Property Class: 40 - Residential

Property Tax Information

Taxable Year: 2005
Summer Tax: $423
Village Tax: $0
Township Tax: $882

Property Sale Information

Sale Date: 9/18/1998
Sale Amount: $10,000
Liber and Page: 499-205

Legal Description

PARCEL 4 COM AT THE W 1/4 COR OF SD SEC 24, TH N 0 DEG E ALG THE W LINE OF SD SEC 24 356.6 FT, TH S 88 DEG E 1223.5 FT, TH S 0 DEG W 356.6 FT TO THE EW 1/4 LINE OF SD SEC, TH N 88 DEG W ALG SD EW 1/4 LINE 1222.79 FT TO THE W LINE OF SEC AND THE POB, BEING PART OF THE SW 1/4 OF NW 1/4 SEC 24 T30N R5W 10.01 A M/L

Petrotek Engineering Corporation 10288 West Chatfield Avenue, Suite 201 Littleton, Colorado 80129 USA (303) 290-9414 FAX (303) 290-9580

March 5, 2007

Mr. William Bates
US EPA, Region 5
UIC Section, (WU-16J)
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

VIA PRIORITY MAIL

RE: Beeland Group, LLC, UIC Permit Application Revision

Dear Mr. Bates:

Included with this letter is a copy of the MDEQ Part 625 Mineral Well Permit Application pertaining to the proposed Class I well at the Beeland Group, LLC, Alba, Michigan site.

Also enclosed are copies of revised EPA permit application pages requested in your most recent correspondence. Please feel free to contact me at 303-290-9414, ext. 15 or Dave Dowhan at 517-768-7517 if additional information is required.

Sincerely,

Petrotek Engineering Corporation
Ken Cooper

Enclosures: (4)

2.L CONSTRUCTION PROCEDURES

Discuss the construction procedures (according to §146.12 for Class I, §146.22 for Class II, and §146.32 for Class III) to be utilized. This should include details of the casing and cementing program, logging procedures, deviation checks, and the drilling, testing and coring programs, and proposed annulus fluid (Request and submission of justifying data must be made to use an alternative to a packer for Class I).

RESPONSE

The proposed Beeland Well No. 1 is to be a newly installed Class I well. Well No. 1 will be located in the Southeast 1/4 of Section 14, Township 30 North, Range 5 West, Antrim County, Michigan. Ground level is estimated to be approximately 1,335 feet above sea level (ASL) with Kelly Bushing (KB) that will be dependent on rig availability. The well will be drilled to a Total Depth (TD) of approximately 2,450 feet BGL into the top of the Detroit River Group and will be completed openhole in the Dundee formation.

Drilling, Casing and Testing Program

The conductor casing, 13-3/8-inch, 61 lb/ft, J-55 grade, ST&C, or equivalent will be driven to refusal in the Glacial Drift to a maximum depth of up to approximately 175 feet BGL.

After a rotary rig is brought to the location, a 12¼-inch hole will be drilled out of the surface casing to a depth of approximately 950 feet. The intermediate casing shoe will be targeted at a minimum of 100 feet below the base of the Glacial Drift. After the shallow openhole logging program is complete (see attached table), the hole will be conditioned and minimum 9 5/8-inch, 36 lb/ft, J-55, ST&C, or equivalent surface casing will be installed to a depth of approximately 950 feet. The cementing program will be determined based on field conditions, but will likely consist of a mixture of 301 sacks (based on 20% excess for the gauge openhole portion) of Michigan equivalent Class A standard cement with 3 percent CaCl2 and additives. Additional excess cement, if any, will be pumped based on field conditions. It is anticipated that a float shoe will be used plus a float collar one joint up from the bottom and that centralizers are to be placed a minimum of one every fourth joint.

After the intermediate casing string has been cemented, a cement bond log will be conducted to document cement circulation to surface. The cement will be drilled out of the intermediate string and an 8 1/2-inch hole will then drilled to approximately 2,150 feet BGL. The top of the Dundee injection formation will be penetrated in this stage of the drilling process. After the deep openhole logging program is complete (see attached table), the hole will be conditioned and minimum 7-inch, 26 lb/ft, J-55, ST&C, or equivalent long-string casing will be installed to a depth of approximately 2,150 feet. The cementing program for the long string will be determined based on field conditions, but will likely consist of a mixture of 289 sacks (based on 20% excess for the gauge openhole section) of Michigan equivalent Class A standard cement with 3 percent CaCl2 and additives. Additional excess cement, if any, will be pumped based on field conditions. It is anticipated that a float shoe will be used plus a float collar one joint up from the bottom and that centralizers are to be placed a minimum of one every fourth joint.

The final stage of drilling will be conducted using a 6-1/4-inch drill bit to drill out cement and complete the well as an openhole to a depth of approximately 2,450 feet. After drilling is complete, additional openhole logging will be conducted to obtain data regarding the Dundee injection interval. A cement bond log and a baseline casing inspection log will be conducted in the long-string casing, and a directional survey will be conducted to ascertain the bottomhole location and trajectory of the wellbore. A packer will be set at a depth of approximately 2,100 feet inside the 7-inch long string casing. Four and one-half inch injection tubing is proposed for the completion. As noted in Response 2.I., fluid will then be swabbed from the well to obtain a sample of injection interval fluids. A radioactive tracer survey and a temperature log will then be conducted to establish baseline conditions and initial external mechanical integrity. A pressure transient test will also be

conducted to derive estimates of formation pressure and properties (See Response 2.I). A proposed schematic for the Beeland Well is presented in Figure M-1.

TABLE L-1 LIST OF PROPOSED LOGS
BEELAND GROUP, LLC WELL NO. 1

Description	Depth Run
Dual Laterolog Gamma Ray, Formation Density, and Caliper Logs (openhole before intermediate casing)	100-950'
Cement Bond Log (intermediate casing)	surf-950'
Dual LateroLog, SP, Gamma Ray, Formation Density, Compensated Neutron, and Caliper Log (openhole before long string casing and in openhole completion)	950- TD(2,450')
If required, Fracture Finder ID Log (openhole before long-string casing)	1,950-2,150'
Cement Bond Log, Casing Inspection Log and Directional Survey (long-string casing)	surf-2,150'
Temperature Log	surf-TD (2,450')
Radioactive Tracer Log	long string casing
Pressure/Temperature Gradient and Pressure Transient Falloff test	2,150'

Nature of Annulus Fluid

In the proposed Beeland well, the annulus space between the injection tubing and the well protection casing will be sealed and filled with fresh water containing a corrosion inhibitor, an oxygen scavenger and a biocide. Annulus fluids will include Baker Petrolite CRW0037F or Unichem Technihib 366W corrosion inhibitors and bactericides, CRW 132 oxygen scavenger A-303 corrosion inhibitor, Knockout 50 oxygen scavenger, and Bacban 3 Biocides or suitable equivalents. No permit conditions regarding specific brands or fluid additives are requested at this time.

(○) CEMENT, VOLUMES, FLUIDS and HOLE SIZE

[ ] TUBULARS and COMPONENTS

(A) 12 1/4" Hole, Cemented to Surface with 301 sacks* Class A (MI equiv.)

(B) 8 1/2" Hole, Cemented to Surface with 289 sacks* Class A (MI equiv.)

(C) Annulus Fluid: Fresh water with Inhibitor and scavenger

(D) Completion: 6 1/4" Open Hole, total depth @ +/-2,450'

[1] Surface Casing: 13 3/8", 61#/ft., Driven to refusal as deep as 175'

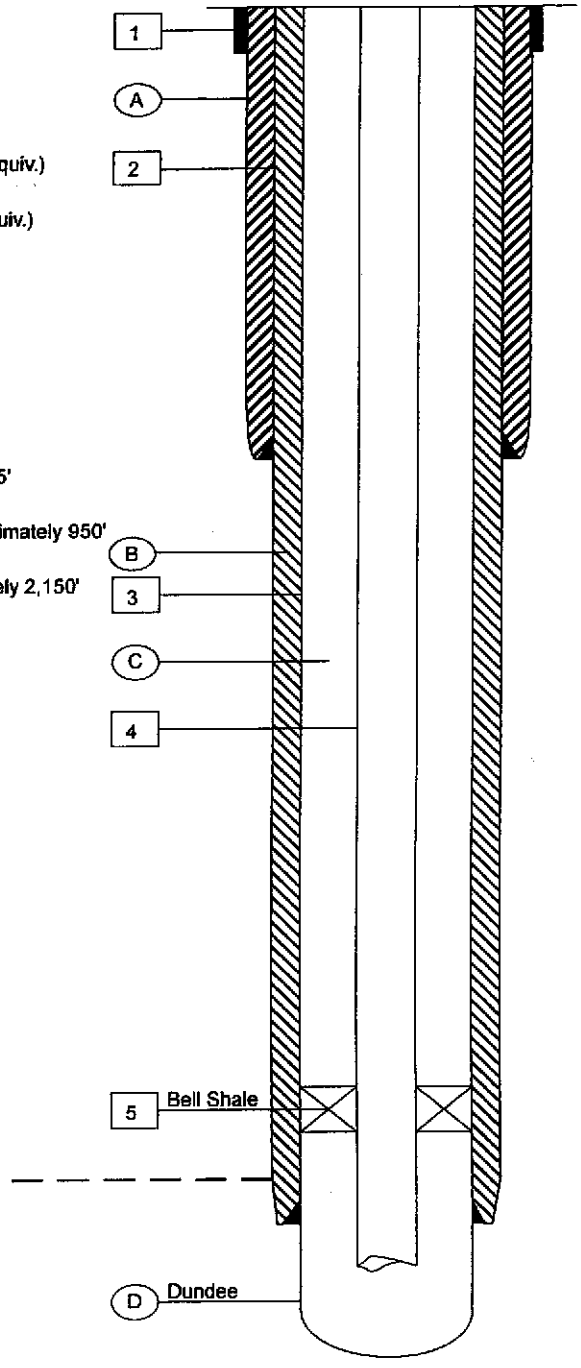
[2] Intermediate Casing: 9 5/8", 36 lb/ft., K-55 or J-55, Set @ approximately 950'

[3] Long String Casing: 7", 26 lb/ft., J-55 or K-55, Set @ approximately 2,150'

[4] Injection Tubing: 4 1/2", 11.6#/ft., J-55

[5] Packer: 7" x 4 1/2" Large Bore, Set @ approximately 2,100'

*Cement volumes based on 20% excess for gauge diameter openhole



Petrotek Engineering Corporation

Figure M-1

Beeland Group, LLC.
Alba, Michigan Facility

WELL SCHEMATIC
DISPOSAL WELL NO. 1

SCALE: NONE DATE: Rev. 2/07

(○) CEMENT, VOLUMES, FLUIDS and HOLE SIZE

[ ] TUBULARS and COMPONENTS

(A) 12 1/4" Hole, Cemented to Surface with 301 sacks*

(B) 8 1/2" Hole, Cemented to Surface with 289 sacks*

(C) 291 Sacks Cement, 2,100' to surface

(D) 7 Sacks Cement, 2,150' - 2,100'

(E) 48 Sacks Cement, 2,450' - 2,150'

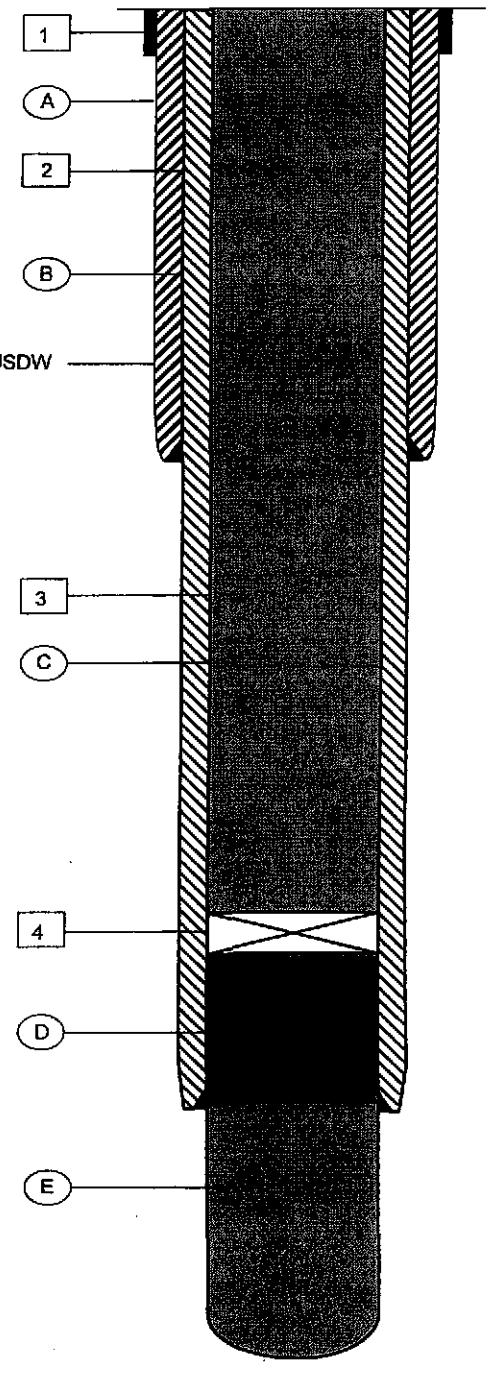
[1] Surface Casing: 13 3/8", Driven to refusal

[2] Intermediate Casing: 9 5/8", 36 lb/ft., K-55 or J-55, Set @ 950'

[3] Long String Casing: 7", 26 lb/ft., J-55 or K-55, Set @ 2,150'

[4] Mechanical Plug: Set @ 2,100' on top of cement retainer or original packer

*Annulus cement volumes based on 20% excess for gauge diameter openhole



Petrotek Engineering Corporation

Figure Q-1

Beeland Group, LLC.

Alba, Michigan Facility

WELL SCHEMATIC

DISPOSAL WELL NO. 1

SCALE: NONE DATE: Rev. 2/07