BUCKEYE TERMINALS, LLC

# CLASS III AREA PERMIT APPLICATION FOR PROPOSED CAVERN WELLS CW-1 THROUGH CW-4

## WOODHAVEN TERMINAL, WAYNE COUNTY, MICHIGAN

DECEMBER 15, 2017

# CLASS III AREA PERMIT APPLICATION FOR PROPOSED CAVERN WELLS CW-1 THROUGH CW-4

## WOODHAVEN TERMINAL, WAYNE COUNTY, MICHIGAN

BUCKEYE TERMINALS, LLC

PROJECT NO.: 192065A
DATE: DECEMBER 2017

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December 15, 2017

Stephen Jann, UIC Branch Chief
United States Environmental Protection Agency, Region 5
77 W. Jackson Blvd.
Chicago, IL 60604-359

Subject: Submission of Class I UIC Non-Hazardous Permit Application for Proposed Wells BDW-1 through BDW-5 and Class III Area Permit for Proposed Wells CW-1 through CW-4

Dear Sir:

On the behalf of Buckeye Terminals, LLC, please find the following permit applications for proposed Class 1 non-hazardous injection wells (BDW-1 through BDW-5) and Class III area permit application for proposed cavern wells (CW-1 through CW-4) to be installed at Buckeye Terminals, LLC, Woodhaven Terminal in Wayne County, Michigan. The following is included with this transmittal letter.

- (2) Prints of Class I Non-Hazardous Permit Application for Proposed BDW-1 Through BDW-5
- (2) Prints of Class III Area Permit Application for Proposed Caverns Wells CW-1 through CW-4
- (2) USB Drives Containing PDF Files of Abovementioned Permit Applications, Complete with Bookmarks and Hyperlinks

Kind regards,

Brandon Schulte

BMS/bms
Encl.
cc: Brian Ball, Buckeye Partners L.P.

WSP USA
Suite 200
16200 Park Row
Houston, TX 77084

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# SIGNATURES

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Mgr. Permitting & Well Integrity

# PRODUCTION TEAM

## CLIENT

| | |
|---|---|
| Senior Manager | Grant McHardy |
| Vice President | Brian Ball |

## WSP

| | |
|---|---|
| Senior Geologist | Graciela Moore, P.G. |
| Mgr. Permitting & Well Integrity | Brandon Schulte, P.E. |
| Drilling Engineer | Tim Jones |

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A WELL RECORDS (SEE ATTACHMENT C)

B DRILLING PROGRAM (SEE ATTACHMENT L)

C EPA PLUGGING AND ABANDONMENT PLAN - EPA FORM 7540-14 (SEE ATTACHMENT Q)

# ACRONYMS

| | |
|---|---|
| AOR | Area of Review |
| bbls | barrels |
| bgs | below ground surface |
| BOP | Blowout Preventer |
| CFR | Code of Federal Regulations |
| D&A | Dry and Abandoned |
| EIS | Emissions Inventory System |
| EPA | Environmental Protection Agency - Region 5 |
| FT | feet |
| GL | ground level |
| gpd | gallons per day |
| gpm | gallons per minute |
| GSTG | Liquified Petroleum Gas Storage - Active |
| LPG | liquefied petroleum gas |
| MASIP | maximum allowable injection pressure |
| md | millidarcy |
| MD | measured depth |
| MDEQ | Michigan Department of Environmental Quality |
| mg/L | milligram per liter |
| MIT | Mechanical Integrity Test |
| NPDES | National Pollutant Discharge Elimination System |
| psi | pound per square inch |
| RCRA | Resource Conservation and Recovery Act |
| SWDOP | Gas Storage - Plugging Approved |
| SWPPP | Stormwater Pollution Prevention Plan |
| TDS | Total Dissolved Solids |
| TSDF | Hazardous Waste Treatment, Storage, or Disposal Facilities |
| UIC | Underground Injection Control |
| USDW | Underground Source of Drinking Water |

# APPLICATION INTRODUCTION

Buckeye Terminals, LLC ("Buckeye") is seeking an Area Permit Application approval from the Environmental Protection Agency - Region 5 (EPA) Underground Injection Control (UIC) for Class III solution mining wells to be installed at Buckeye's Woodhaven Terminal in Wayne County, Michigan.

Buckeye currently operates a terminal at Woodhaven that uses surface tanks to store gasoline, diesel fuel, and ethanol. Approximately 990,000 barrels (bbls) of tank storage is present at the Woodhaven Terminal.

The four proposed wells in this Area Permit Application will be solution mined to create cavern space for future liquefied petroleum gas (LPG) storage. The underground solution mined salt caverns will be created by injecting fresh water into the well (completed in the B Evaporite Unit) and producing brine generated from the solution mining process. The brine will be disposed of via US EPA UIC Class I brine disposal wells (the proposed disposal wells were applied for with a separate permit application). Diesel will be injected into the outer well annulus to establish and maintain a diesel-brine interface as a buffer between the final cemented casing string (production casing shoe) and the solution mining process, and to also control the shape of the cavern as it is developed.

The proposed wells will operate under the UIC program 40 Code of Federal Regulations (CFR) 146.

Enclosed in this Area Permit Application for the Class III wells is EPA Form 7520-6 and the supporting attachments. Attachments are keyed to the letter designations indicated in the instructions for EPA Form 7520-6. To ease agency review, the application has been prepared to the format outlined in EPA Form 7520-6.

OMB No. 2040-0042 Approval Expires 11/30/2014

United States Environmental Protection Agency

# Underground Injection Control Permit Application

*(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, 40 CFR 144)*

| I. EPA ID Number | | T/A | C |
|---|---|---|---|
| U | | | |

*Read Attached Instructions Before Starting*

**For Official Use Only**

| Application approved mo day year | Date received mo day year | Permit Number | Well ID | FINDS Number |
|---|---|---|---|---|
| | | | | |

| II. Owner Name and Address | | | III. Operator Name and Address | | |
|---|---|---|---|---|---|
| Owner Name: Buckeye Terminals, LLC | | | Owner Name: Buckeye Terminals, LLC | | |
| Street Address: One Greenway Plaza | | Phone Number: (832) 214-6026 | Street Address: 20755 West Road | | Phone Number: |
| City: Houston | State: TX | ZIP CODE: 77046 | City: Woodhaven | State: MI | ZIP CODE: 48483 |

| IV. Commercial Facility | V. Ownership | VI. Legal Contact | VII. SIC Codes |
|---|---|---|---|
| [x] Yes<br>[ ] No | [x] Private<br>[ ] Federal<br>[ ] Other | [x] Owner<br>[ ] Operator | 4226 |

**VIII. Well Status** *(Mark "x")*

| [ ] A. Operating | Date Started mo day year | [ ] B. Modification/Conversion | [x] C. Proposed |
|---|---|---|---|
| | | | |

**IX. Type of Permit Requested** *(Mark "x" and specify if required)*

| [ ] A. Individual | [x] B. Area | Number of Existing Wells | Number of Proposed Wells | Name(s) of field(s) or project(s) |
|---|---|---|---|---|
| | | 0 | 1 | CW-1 |

**X. Class and Type of Well** *(see reverse)*

| A. Class(es) (enter code(s)) | B. Type(s) (enter code(s)) | C. If class is "other" or type is code 'x,' explain | D. Number of wells per type (if area permit) |
|---|---|---|---|
| III | G | | |

**XI. Location of Well(s) or Approximate Center of Field or Project**

| Latitude Deg | Min | Sec | Longitude Deg | Min | Sec | Township and Range Sec | Twp | Range | 1/4 Sec | Feet From | Line | Feet From | Line |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 35 | 12 | 57 | 46 | 22 | 04S | 10E | NW | | | | |

**XII. Indian Lands (Mark 'x')**

[ ] Yes
[x] No

**XIII. Attachments**

*(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)*

For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.

**XIV. 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)

| A. Name and Title *(Type or Print)* | B. Phone No. *(Area Code and No.)* |
|---|---|
| Carl A. Ostach, VP Domestic Field Operations | (610) 904-4262 |
| C. Signature: Carl A. Ostach | D. Date Signed: 12/15/17 |

EPA Form 7520-6 (Rev. 12-11)

OMB No. 2040-0042 Approval Expires 11/30/2014

EPA

United States Environmental Protection Agency

# Underground Injection Control Permit Application

*(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, 40 CFR 144)*

| I. EPA ID Number | | T/A | C |
|---|---|---|---|
| U | | | |

*Read Attached Instructions Before Starting*

**For Official Use Only**

| Application approved mo day year | Date received mo day year | Permit Number | Well ID | FINDS Number |
|---|---|---|---|---|
| | | | | |

| II. Owner Name and Address | | | III. Operator Name and Address | | |
|---|---|---|---|---|---|
| Owner Name: Buckeye Terminals, LLC | | | Owner Name: Buckeye Terminals, LLC | | |
| Street Address: One Greenway Plaza | | Phone Number: (832) 214-6026 | Street Address: 20755 West Road | | Phone Number: |
| City: Houston | State: TX | ZIP CODE: 77046 | City: Woodhaven | State: MI | ZIP CODE: 48483 |

| IV. Commercial Facility | V. Ownership | VI. Legal Contact | VII. SIC Codes |
|---|---|---|---|
| [x] Yes<br>[ ] No | [x] Private<br>[ ] Federal<br>[ ] Other | [x] Owner<br>[ ] Operator | 4226 |

**VIII. Well Status** *(Mark "x")*

| [ ] A. Operating | Date Started mo day year | [ ] B. Modification/Conversion | [x] C. Proposed |
|---|---|---|---|
| | | | |

**IX. Type of Permit Requested** *(Mark "x" and specify if required)*

| [ ] A. Individual | [x] B. Area | Number of Existing Wells | Number of Proposed Wells | Name(s) of field(s) or project(s) |
|---|---|---|---|---|
| | | 0 | 1 | CW-2 |

**X. Class and Type of Well** *(see reverse)*

| A. Class(es) (enter code(s)) | B. Type(s) (enter code(s)) | C. If class is "other" or type is code 'x,' explain | D. Number of wells per type (if area permit) |
|---|---|---|---|
| III | G | | |

**XI. Location of Well(s) or Approximate Center of Field or Project**

| Latitude Deg | Min | Sec | Longitude Deg | Min | Sec | Township and Range Sec | Twp | Range | 1/4 Sec | Feet From | Line | Feet From | Line |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 32 | 12 | 57 | 28 | 22 | 04S | 10E | NW | | | | |

**XII. Indian Lands (Mark 'x')**

[ ] Yes
[x] No

**XIII. Attachments**

*(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)*

For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.

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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)

| A. Name and Title *(Type or Print)* | B. Phone No. *(Area Code and No.)* |
|---|---|
| Carl A. Ostach, VP Domestic Field Operations | (610) 904-4262 |
| C. Signature: Carl A. Ostach | D. Date Signed: 12/15/17 |

EPA Form 7520-6 (Rev. 12-11)

OMB No. 2040-0042 Approval Expires 11/30/2014

EPA

United States Environmental Protection Agency

# Underground Injection Control Permit Application

*(Collected under the authority of the Safe Drinking Water Act. Sections 1421, 1422, 40 CFR 144)*

| I. EPA ID Number | | T/A | C |
|---|---|---|---|
| U | | | |

*Read Attached Instructions Before Starting*

**For Official Use Only**

| Application approved mo day year | Date received mo day year | Permit Number | Well ID | FINDS Number |
|---|---|---|---|---|
| | | | | |

| II. Owner Name and Address | | | III. Operator Name and Address | | |
|---|---|---|---|---|---|
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| Street Address: One Greenway Plaza | | Phone Number: (832) 214-6026 | Street Address: 20755 West Road | | Phone Number: |
| City: Houston | State: TX | ZIP CODE: 77046 | City: Woodhaven | State: MI | ZIP CODE: 48483 |

| IV. Commercial Facility | V. Ownership | VI. Legal Contact | VII. SIC Codes |
|---|---|---|---|
| [x] Yes<br>[ ] No | [x] Private<br>[ ] Federal<br>[ ] Other | [x] Owner<br>[ ] Operator | 4226 |

**VIII. Well Status** *(Mark "x")*

| [ ] A. Operating | Date Started mo day year | [ ] B. Modification/Conversion | [x] C. Proposed |
|---|---|---|---|
| | | | |

**IX. Type of Permit Requested** *(Mark "x" and specify if required)*

| [ ] A. Individual | [x] B. Area | Number of Existing Wells | Number of Proposed Wells | Name(s) of field(s) or project(s) |
|---|---|---|---|---|
| | | 0 | 1 | CW-3 |

**X. Class and Type of Well** *(see reverse)*

| A. Class(es) (enter code(s)) | B. Type(s) (enter code(s)) | C. If class is "other" or type is code 'x,' explain | D. Number of wells per type (if area permit) |
|---|---|---|---|
| III | G | | |

**XI. Location of Well(s) or Approximate Center of Field or Project** / **XII. Indian Lands (Mark 'x')**

| Latitude Deg | Latitude Min | Latitude Sec | Longitude Deg | Longitude Min | Longitude Sec | Township and Range Sec | Twp | Range | 1/4 Sec | Feet From | Line | Feet From | Line | Indian Lands |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 21 | 12 | 57 | 43 | 22 | 04S | 10E | NE | | | | | [ ] Yes [x] No |

**XIII. Attachments**

*(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)*

For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.

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| A. Name and Title *(Type or Print)* | B. Phone No. *(Area Code and No.)* |
|---|---|
| Carl A. Ostach, VP Domestic Field Operations | (610) 904-4262 |
| C. Signature: Carl A. Ostach | D. Date Signed: 12/15/17 |

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**I. EPA ID Number**

| | | T/A | C |
|---|---|---|---|
| U | | | |

*Read Attached Instructions Before Starting*

**For Official Use Only**

| Application approved mo day year | Date received mo day year | Permit Number | Well ID | FINDS Number |
|---|---|---|---|---|
| | | | | |

**II. Owner Name and Address**

Owner Name: Buckeye Terminals, LLC

Street Address: One Greenway Plaza | Phone Number: (832) 214-6026

City: Houston | State: TX | ZIP CODE: 77046

**III. Operator Name and Address**

Owner Name: Buckeye Terminals, LLC

Street Address: 20755 West Road | Phone Number:

City: Woodhaven | State: MI | ZIP CODE: 48483

**IV. Commercial Facility**

[x] Yes
[ ] No

**V. Ownership**

[x] Private
[ ] Federal
[ ] Other

**VI. Legal Contact**

[x] Owner
[ ] Operator

**VII. SIC Codes**

4226

**VIII. Well Status** *(Mark "x")*

[ ] A. Operating | Date Started mo day year:

[ ] B. Modification/Conversion

[x] C. Proposed

**IX. Type of Permit Requested** *(Mark "x" and specify if required)*

[ ] A. Individual [x] B. Area

| Number of Existing Wells | Number of Proposed Wells | Name(s) of field(s) or project(s) |
|---|---|---|
| 0 | 1 | CW-4 |

**X. Class and Type of Well** *(see reverse)*

| A. Class(es) (enter code(s)) | B. Type(s) (enter code(s)) | C. If class is "other" or type is code 'x,' explain | D. Number of wells per type (if area permit) |
|---|---|---|---|
| III | G | | |

**XI. Location of Well(s) or Approximate Center of Field or Project**

| Latitude Deg | Latitude Min | Latitude Sec | Longitude Deg | Longitude Min | Longitude Sec | Township and Range Sec | Twp | Range | 1/4 Sec | Feet From | Line | Feet From | Line |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2 | 2 | 4.1 | 12 | 57 | 43 | 22 | 04S | 10E | NE | | | | |

**XII. Indian Lands (Mark 'x')**

[ ] Yes
[x] No

**XIII. Attachments**

*(Complete the following questions on a separate sheet(s) and number accordingly; see instructions)*

For Classes I, II, III, (and other classes) complete and submit on a separate sheet(s) Attachments A--U (pp 2-6) as appropriate. Attach maps where required. List attachments by letter which are applicable and are included with your application.

**XIV. 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)

A. Name and Title *(Type or Print)*: Carl A. Ostach, VP Domestic Field Operations

B. Phone No. *(Area Code and No.)*: (610) 904-4262

C. Signature: Carl A. Ostach

D. Date Signed: 12/15/17

EPA Form 7520-6 (Rev. 12-11)

# A. AREA OF REVIEW

Buckeye Terminals, LLC's Woodhaven Terminal is located in south-central Wayne County, Michigan, approximately 15 miles southwest of the city of Detroit at 20755 West Road in Woodhaven, Michigan. Buckeye Terminals, LLC is seeking an Area Permit Application approval from the EPA UIC for Class III solution mining wells. There are four cavern wells planned for installation at this terminal (Figure A-1).

The Area of Review (AOR) for a Class III area permit is ¼ mile beyond the permitted area. However, as this location will be using Class I wells for discharge of the brine waste (permitted separately), the AOR has been extended to a fixed radius of 2 miles surrounding the injection wells. Well data available from public records within the AOR are tabulated in Table A-1 (non-freshwater) and Table A-2 (freshwater). Twenty-three (23) non-freshwater wells and eight freshwater wells were identified within the AOR. The non-freshwater wells include:

- Active liquefied petroleum gas storage – 8 wells;
- Gas storage (plugging approved) - 8 wells;
- Brine disposal - 1 well;
- Dry and abandoned - 4 wells; and
- Abandoned locations – 2 wells.

The above wells include active storage caverns at the site operated by Marathon Pipe Line LLC (five storage caverns, one disposal well, and three brine recovery wells). The storage caverns at the site formerly operated by Phillips Petroleum Co. (two caverns and one brine disposal well) and Mobil Oil Co. (four caverns and two brine disposal wells), but have since been plugged and abandoned.

Cross sections are provided on Figures F-4 and F-5 in Attachment F illustrating the subsurface of the area. As demonstrated in Attachment C, no corrective action is necessary for this site.

Surrounding wells, with the exception of shallow monitoring wells and borings, are shown on the map provided in Attachment B.

## List of Tables in Attachment A

Table A-1 Non-Freshwater (Oil and Gas) Wells in Area of Review

Table A-2 Freshwater Wells in 2-Mile Area of Review

## List of Figures in Attachment A

Figure A-1 Proposed Cavern Well and Disposal Well Locations

**TABLE A-1**
**NON-FRESHWATER (OIL AND GAS) WELLS IN AREA OF REVIEW**
**BUCKEYE TERMINAL, LLC**
**WOODHAVEN TERMINAL**
**WAYNE COUNTY, MICHIGAN**

| Map ID | API | Township-Range-Section | Footage | Lease Name | Well Num | Current Operator | Status and Type | Drill Date | Depth (feet) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2116324850 | 4S 10E 10 | 487 FNL 1065 FEL CONGRESS SECTION | PHILLIPS PETROLEUM CO | 1 | PHILLIPS PETRLM CO | D&A | 1963-08-14 | 1315 |
| 2 | 2116300135 | 4S 10E 10 | 735 FNL 1065 FEL CONGRESS SECTION | PHILLIPS PETROLEUM COMPANY | BD-2 | PHILLIPS PETRLM CO | AB-LOC | | |
| 3 | 2116324851 | 4S 10E 10 | 992 FNL 1065 FEL CONGRESS SECTION | PHILLIPS PETROLEUM CO | 2 | PHILLIPS PETRLM CO | D&A | 1963-09-03 | 1315 |
| 4 | 2116327160 | 4S 10E 22 | 525 FNL 143 FEL CONGRESS SECTION | MARATHON OIL LPG | 1 | MARATHON PIPELINE CO | GSTG | 1968-04-11 | 1156 |
| 5 | 2116323775 | 4S 10E 22 | 1470 FNL 120 FEL CONGRESS SECTION | SOCONY-MOBIL OIL | 3-A | MOBIL OIL CORP | SWDOP | 1961-12-14 | 1158 |
| 6 | 2116323776 | 4S 10E 22 | 1570 FNL 120 FEL CONGRESS SECTION | SOCONY-MOBIL OIL | 3-B | MOBIL OIL CORP | SWDOP | 1961-12-29 | 1150 |
| 7 | 2116323673 | 4S 10E 22 | 1500 FNL 660 FEL CONGRESS SECTION | FEE | 1 | MOBIL OIL CORP | SWDOP | 1961-10-17 | 1162 |
| 8 | 2116323774 | 4S 10E 22 | 1800 FNL 660 FEL CONGRESS SECTION | SOCONY-MOBIL | 2 | MOBIL OIL CORP | SWDOP | 1962-02-01 | 1148 |
| 9 | 2116300145 | 4S 10E 22 | 1918 FNL 356 FEL CONGRESS QTR | MOBIL OIL CORPORATION | BD2 | MOBIL OIL CORP | SWDOP | 1967-11-01 | 365 |
| 10 | 2116323777 | 4S 10E 22 | 1870 FNL 120 FEL CONGRESS SECTION | SOCONY-MOBIL | 4-A | MOBIL OIL CORP | SWDOP | 1962-01-09 | 1147 |
| 11 | 2116300133 | 4S 10E 22 | 1895 FNL 120 FEL CONGRESS SECTION | SOCONY-MOBIL OIL | BD-1 | MOBIL OIL CORP | SWDOP | 1962-01-18 | 330 |
| 12 | 2116323778 | 4S 10E 22 | 1970 FNL 12 FEL CONGRESS SECTION | SOCONY-MOBIL OIL | 4-B | MOBIL OIL CORP | SWDOP | 1962-01-24 | 1162 |
| 13 | 2116300146 | 4S 10E 22 | 561 FNL 342 FEL CONGRESS QTR | FEE | BD-1 | MARATHON PIPELINE CO | Brine Disposal | 12/12/1968 | 3745 |
| 14 | 2116327161 | 4S 10E 22 | 525 FNL 629 FEL CONGRESS QTR | MARATHON OIL LPG | 2 | MARATHON PIPELINE CO | GSTG | 1968-03-12 | 1154 |
| 15 | 2116328435 | 4S 10E 22 | 1580 FSL 204 FEL CONGRESS SECTION | MARATHON OIL CO | BR-1 | MARATHON PIPELINE CO | GSTG | 1971-07-08 | 1150 |
| 16 | 2116327162 | 4S 10E 22 | 781 FNL 341 FEL CONGRESS QTR | MARATHON OIL LPG | 4 | MARATHON PIPELINE CO | GSTG | 1968-02-14 | 1154 |
| 17 | 2116331007 | 4S 10E 22 | 1186 FNL 670 FEL CONGRESS QTR | MARATHON OIL COMPANY BR | BR-2 | MARATHON PIPELINE CO | AB-LOC | | |
| 18 | 2116327980 | 4S 10E 22 | 781 FNL 1314 FEL CONGRESS QTR | MARATHON OIL LPG | 6 | MARATHON PIPELINE CO | GSTG | 1970-05-27 | 1165 |
| 19 | 2116332882 | 4S 10E 22 | 1165 FNL 709 FEL CONGRESS QTR | MARATHON OIL CO | 2 | MARATHON PIPELINE CO | GSTG | 1979-07-11 | 1158 |
| 20 | 2116332883 | 4S 10E 22 | 1135 FNL 1158 FEL CONGRESS QTR | MARATHON OIL CO | BR-3 | MARATHON PIPELINE CO | GSTG | 1979-06-13 | 1130 |
| 21 | 2116327528 | 4S 10E 22 | 785 FNL 823 FEL CONGRESS QTR | FEE | 5 | MARATHON PIPELINE CO | GSTG | 1969-01-31 | 1155 |
| 22 | 2116357361 | 4S 10E 22 | 990 FSL 1070 FEL CONGRESS SECTION | WOODHAVEN WELL | 3 | MARATHON PIPELINE CO | D&A | 2005-12-01 | 1244 |
| 23 | 21163004199 | 4S 10E 35 | | W.E. ELLIS | 1 | W E ELLIS | D&A | 4/11/1927 | 3055 |

**Note:**
D&A = Dry and Abandoned
AB-LOC = Abandoned Location
GSTG - Liquified Petroleum Gas Storage - Active
SWDOP - Gas Storage - Plugging Approved

# TABLE A-2
# FRESHWATER WELLS WITHIN 2-MILE AREA OF REVIEW
# BUCKEYE TERMINAL, LLC
# WOODHAVEN TERMINAL
# WAYNE COUNTY, MICHIGAN

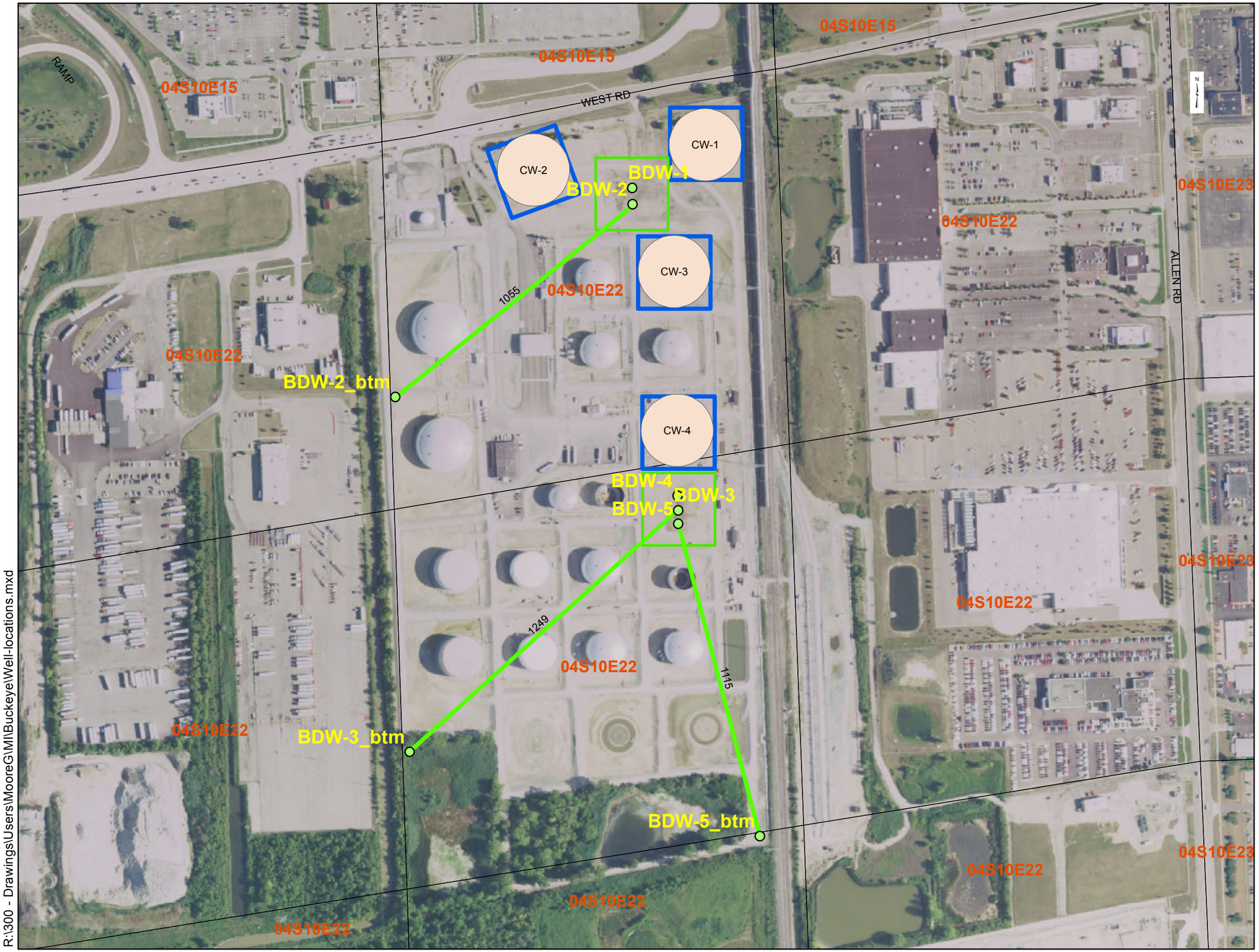
| WELLID | USE | OWNER NAME | COUNTY | DEPTH (feet) | DATE | SECTION | TOWNSHIP | RANGE | EASTING | NORTHING |
|---|---|---|---|---|---|---|---|---|---|---|
| 82000001604 | OTHER | MARATHON OIL* | Wayne | 1156 | 5/3/68 | 22 | 04S | 10E | -83.226748 | 42.13917558 |
| 82000001605 | OTHER | SOCONY MOBIL OIL CO. | Wayne | 1162 | 11/18/61 | 22 | 04S | 10E | 42.136549 | -83.2285466 |
| 82000001606 | OTHER | MOBIL OIL CO. | Wayne | 365 | 11/14/67 | 22 | 04S | 10E | -83.227492 | 42.13530271 |
| 82000001607 | OTHER | MARATHON OIL CO.* | Wayne | 1155 | 2/19/69 | 22 | 04S | 10E | -83.229152 | 42.13851764 |
| 82000001608 | OTHER | SOCONY MOBIL OIL CO. | Wayne | 1158 | 12/22/61 | 22 | 04S | 10E | 42.136654 | -83.2265824 |
| 82000001609 | OTHER | MARATHON OIL CO.* | Wayne | 1153 | 3/7/68 | 22 | 04S | 10E | -83.227232 | 42.13866968 |
| 82000001610 | OTHER | SOCONY MOBIL OIL CO. | Wayne | 1149 | 1/3/62 | 22 | 04S | 10E | 42.136247 | -83.2264726 |
| 82000001611 | OTHER | MARATHON OIL CO.* | Wayne | 1142 | 4/18/72 | 22 | 04S | 10E | -83.226853 | 42.13621126 |

**NOTES:**

Source: Michigan Department of Environmental Quality - Wellogic Systems

Datum: NAD27

* - Cavern Well




**Legend**

- Proposed Brine Disposal Well (BDW)
- Directional BDW Route
- Proposed BDW Pad
- Proposed Cavern Well
- Proposed Cavern Well Pad
- Michigan PLSS QQ Sections

0 250 500 1,000 Feet

R:\300 - Drawings\Users\MooreG\MI\Buckeye\Well-locations.mxd

**Figure A-1**
**Proposed Cavern Well and Disposal Well Locations**
**Buckeye Terminals, LLC**

v4 - Oct 6, 2017

# B. MAPS OF WELLS (AREA OF REVIEW)

## B.1 MAPS

Figure B-1 was prepared using a compilation of USGS 7 ½ minute series topographic quadrangle maps: Flat Rock NE, MI; Wyandotte, MI, ON; Flat Rock, MI; and Rockwood, MI. This figure shows the proposed injection well locations, the property boundary, the AOR for the proposed injection wells, surface features, and one listed Hazardous Waste Treatment, Storage, or Disposal Facilities (TSDF) (see Attachment B.3). There are no known faults within the AOR.

Figure B-2 illustrates the property boundary, the AOR boundary, freshwater and non-freshwater penetrations, and cross section line locations for regional cross sections provided in Attachment F.

## B.2 ADJACENT LANDOWNERS

Table B-1 is a list of property landowners that are within ¼ mile radius of the proposed injection well locations (Figure B-3).

## B.3 HAZARDOUS WASTE TREATMENT, STORAGE, OR DISPOSAL FACILITIES (TSDF)

A search of the TSDF in the vicinity of the Woodhaven Terminal was conducting using the EPA Enforcement and Compliance History Online Facility Search (2017). One TSDF is located within the AOR as shown on Figure B-1:

1 Solutia Inc. (RCRA ID: MID009708678)
5045 W. Jefferson Ave.
Trenton, MI
Current Compliance Status: Noncompliance
Designation: Conditionally Exempt Small Quantity Generator (CESQG)

## B.4 PROTOCOL FOR IDENTIFYING WELLS

### *B.4.1 NON-FRESHWATER RECORDS*

Records for oil and gas wells in the state of Michigan are maintained by the Mineral Wells Division of the Michigan Department of Environmental Quality (MDEQ), which is the primary regulatory agency that enforces compliance with oil and gas rules and regulations. Well permits, completions, and pluggings filed with this agency are maintained by county, township, range and section number.

Information on non-freshwater wells located in the AOR was reviewed. Well data available from public records within the AOR for non-freshwater wells are tabulated in Table A-1. Twenty-three (23) non-freshwater wells were identified within the AOR. The non-freshwater wells include:

— Active liquefied petroleum gas storage – 8 wells;

- Gas storage (plugging approved) - 8 wells;
- Brine disposal - 1 well;
- Dry and abandoned - 4 wells; and
- Abandoned locations – 2 wells.

The above wells include active storage caverns near the site formerly operated by Marathon Pipe Line LLC (five storage caverns, one disposal well, and three brine recovery wells). The storage caverns near the site operated by Phillips Petroleum Co. (two caverns and one brine disposal well) and Mobil Oil Co. (four caverns and two brine disposal wells) were previously operated, but have since been plugged and abandoned. The locations of these wells are indicated on Figure B-2.

Cross section are provided in Figures F-4 and F-5 in Attachment F. As demonstrated in Attachment C, no corrective action is necessary for this site.

### B.4.2 FRESHWATER RECORDS

Water well records available for the State of Michigan are maintained by the MDEQ – Water Bureau. The filing system used is referenced by section, township, and range. Well data available from public records for freshwater wells within the AOR are tabulated in Table A-2. Eight freshwater wells are listed and indicated on Figure B-2.

### B.4.3 PUBLIC WATER

The City of Woodhaven sources its drinking water from the Detroit River, within the Lake St. Clair, Clinton River, Detroit River, Rouge River, Ecorse River watersheds in the U.S. and parts of the Thames River, Little River, Turkey Creek and Sydenham watersheds in Canada. The river is located approximately 3.5 miles east of the facility.

## List of Tables in Attachment B

Table B-1 Adjacent Landowners List

## List of Figures in Attachment B

Figure B-1 Topographic Map of Area of Review

Figure B-2 Area of Review Map

Figure B-3 Property Owner Map

## TABLE B-1

## ADJACENT LANDOWNERS LIST
## BUCKEYE TERMINALS, LLC
## WOODHAVEN TERMINAL
## WAYNE COUNTY, MICHIGAN

1. BUCKEYE TERMINAL, LLC
   20089 WEST ROAD
   WOODHAVEN, MI 48183

2. FORD MOTOR CO- TAX DEPT.
   VAN HORN
   WOODHAVEN, MI 48183

3. WOLVERNINE PROPERTIES
   WEST ROAD
   WOODHAVEN, MI 48183

4. WORLD OF BEER
   20970 WEST ROAD
   WOODHAVEN, MI 48183

5. BAGGER DAVES BURGER
   20980 WEST ROAD
   WOODHAVEN, MI 48183

6. TST EXPEDITED SERVICES
   20985 WEST ROAD
   WOODHAVEN, MI 48183

7. WOODHAVEN VILLAGE SQUARE
   23420 ALLEN ROAD
   WOODHAVEN, MI 48183

8. MCINERNEY'S WOODHAVEN CHRYSLER
   23940 ALLEN ROAD
   WOODHAVEN, MI 48183

9. BUCKEYE PIPE LINE CO.
   24002 ALLEN ROAD
   WOODHAVEN, MI 48183

10. MARATHON ASHLAND PETROLEUM CO.
    24400 ALLEN ROAD
    WOODHAVEN, MI 48183

11. MEIJER INC.
    22600 ALLEN ROAD
    WOODHAVEN, MI 48183

12. CITY OF WOODHAVEN
    21869 WEST ROAD
    WOODHAVEN, MI 48183

13. FORD MOTOR CO. - TAX DEPT.
    24189 ALLEN ROAD
    WOODHAVEN, MI 48183

14. ALLEN WOOD PROPERTIES
    23979 ALLEN ROAD
    WOODHAVEN, MI 48183

15. MORETTI LAND CO.
    23933 ALLEN ROAD
    WOODHAVEN, MI 48183

16. MORETTI FOUNDATION
    23933 ALLEN ROAD
    WOODHAVEN, MI 48183

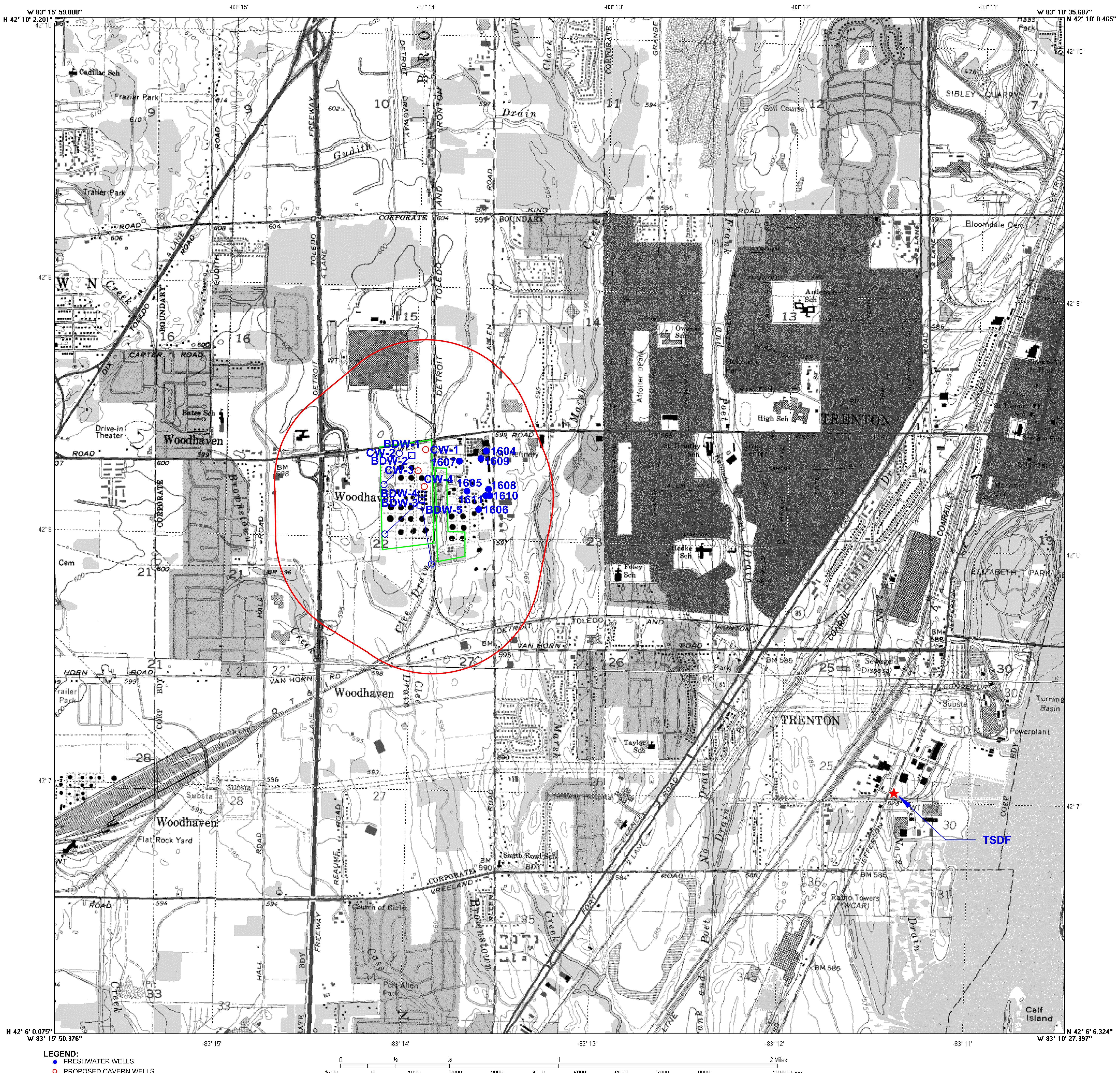
17. DBT PROPERTIES LLC
    23901 ALLEN ROAD
    WOODHAVEN, MI 48183

18. MARATHON ASHLAND PETROLEUM
    ALLEN ROAD
    WOODHAVEN, MI 48183

19. RODGERS HOLDINGS LLC
    23755 ALLEN RD
    WOODHAVEN, MI 48183

20. FORD MOTOR COMPANY-TAX DEPT
    ALLEN RD
    WOODHAVEN, MI 48183

21. FLYING J, IHOP AND SUBWAY
    21055 WEST ROAD
    WOODHAVEN, MI 48183




**LEGEND:**

- FRESHWATER WELLS
- PROPOSED CAVERN WELLS
- PROPOSED BRINE SOLUTION WELLS SURFACE HOLE LOCATIONS
- BOTTOMHOLE LOCATIONS
- 1/4-MILE COMBINED RADIUS AROUND WELLS
- Property Boundary

0 ¼ ½ 1 2 Miles

1000 0 1000 2000 3000 4000 5000 6000 7000 8000 10,000 Feet

1,000 Meters 500 0 ½ 1 2 Kilometers

**NOTE:** A search of the TSDF in the vicinity of the Buckeye Woodhaven Terminal was conducted using the EPA Enforcement and Compliance History Online Facility Search (2017). One TSDF is located within the AOR as shown on Figure B-xx:

1. Solutia Inc. (RCRA ID: MID009708678)
   5045 W. Jefferson Ave.
   Trenton, MI
   Current Compliance Status: Noncompliance

Designation: Conditionally Exempt Small Quantity Generator (CESQG)

Maps Compiled from USGS Quads:
Flat Rock NE, MI
Wyandotte, MI,ON
Flat Rock, MI
Rockwood, MI

ROAD CLASSIFICATION

Heavy-duty
Light-duty
Medium-duty
Unimproved dirt
Interstate Route
U. S. Route

UTM GRID AND 1980 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

MICHIGAN

QUADRANGLE LOCATION

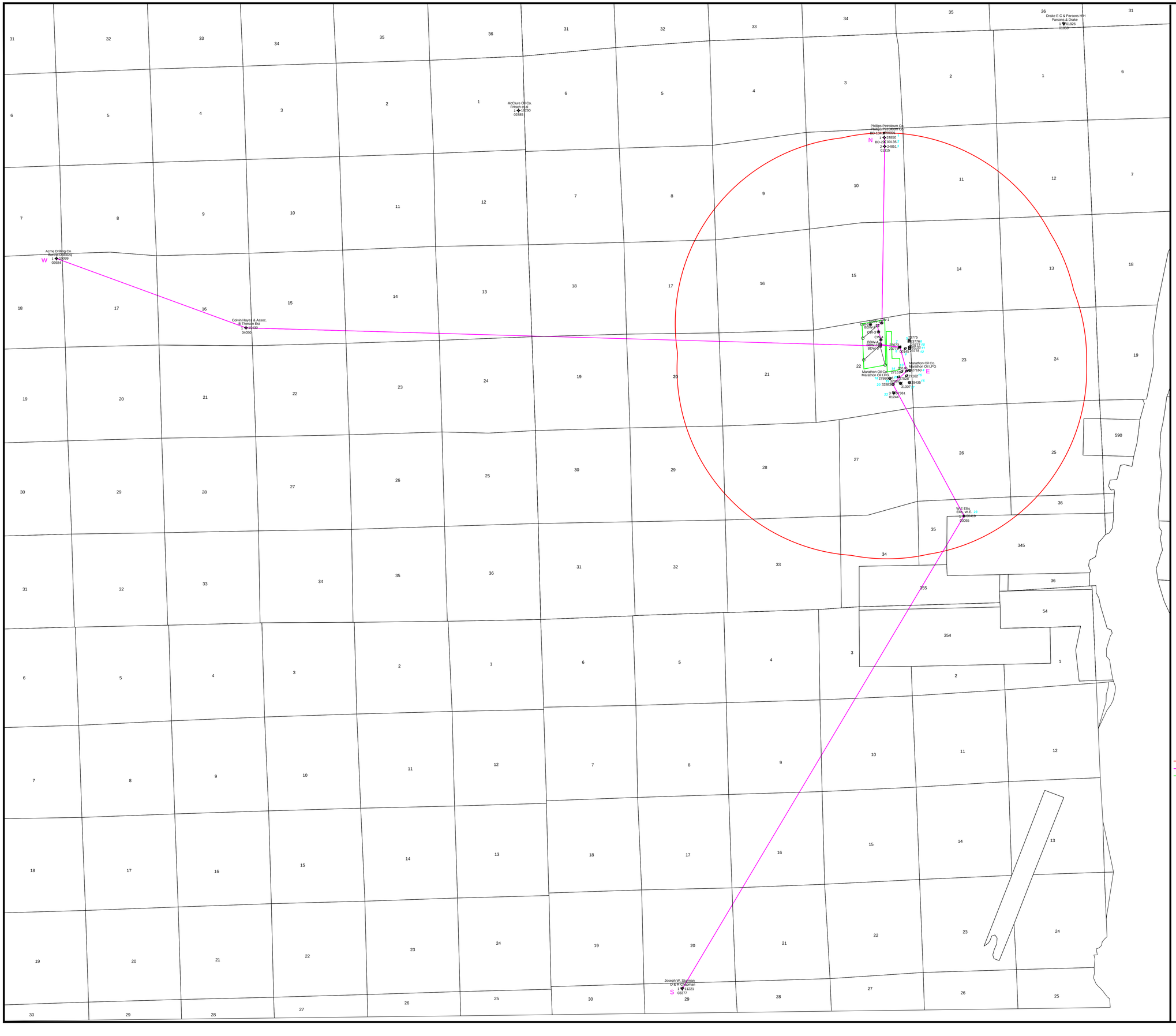
WSP USA Inc.
16200 Park Row Ste. 200
Houston, TX 77084
TEL: (281) 589-5900

**FIGURE B-1**

**BUCKEYE TERMINALS, LLC**
**WAYNE COUNTY, MICHIGAN**

TOPOGRAPHIC MAP OF AREA OF REVIEW

| | | |
|---|---|---|
| DATE: 11/14/17 | CHECKED BY: | JOB NO.: 192065A |
| DRAWN BY: WDD | APPROVED BY: | DWG NO.: |




## LEGEND

- DRY HOLE
- DRY HOLE - OIL
- DRY HOLE - OIL & GAS
- GAS STORAGE
- SALTWATER DISPOSAL - INJECTION
- ABANDONED LOCATION
- PROPOSED CAVERN WELLS
- PROPOSED BRINE SURFACE LOCATION
- BOTTOMHOLE LOCATION
- COMBINED 2-MILE AREA OF REVIEW
- LINES OF CROSS SECTION
- BUCKEYE PROPERTY BOUNDARY

Map ID Number (Refer to Table ????)
API Number
Well Number
Total Depth of Well

**SCALE (IN FEET)**

0 2000 4000

WSP USA Inc.
16200 Park Row Ste 200
Houston, Texas 77084
TEL: (281) 589-5900

FIGURE B-2

BUCKEYE LOGISTICS
WAYNE COUNTY, MICHIGAN

# AREA OF REVIEW MAP

| | | |
|---|---|---|
| DATE: 11/14/17 | CHECKED BY: | JOB NO: 19/3065A |
| DRAWN BY: WDD | APPROVED BY: | DWG NO: |

Source: http://wayne.maps.arcgis.com/apps/Viewer/index.html?appid=4e75960fbf28455c9acf115e97a3c7c0

Buckeye Property Boundary

Combined 1/4-Mile Area around the Buckeye Facilities.

**25** See Table B-1 Adjacent Landowers List

| | | |
|---|---|---|
| WSP USA Inc.<br>16200 Park Row Suite. 200<br>Houston, TX 77084<br>TEL: (281) 589-5900 | **BUCKEYE TERMINALS, LLC**<br>**WOODHAVEN TERMINAL**<br>**WAYNE COUNTY, MICHIGAN** | |
| **PROPERTY OWNERS MAP** | | Job No. 192065A–Rev 2 |

| | | | | | |
|---|---|---|---|---|---|
| Design: WDD | Drawn: WDD | Checked: GM | Date: 12/13/17 | Scale: NTS | Figure No. B–3 |

# C. CORRECTIVE ACTION PLAN AND WELL DATA

The AOR, as discussed in Attachment A, is set at a minimum fixed radius of 2-miles for non-hazardous Class 1 wells as they also fall within the facility boundary and will be used to dispose of the brine waste. Well data available from public records within the AOR are tabulated in Table A-1 (non-freshwater) and Table A-2 (freshwater). Twenty-three (23) non-freshwater wells and eight freshwater wells were identified within the AOR, all penetrating the Salina B Evaporite Unit (Table A-1). Surrounding wells, with the exception of shallow monitoring wells and borings, are shown on the map provided in Attachment B.

No wells appear to have been improperly completed or plugged and abandoned that might act to transmit fluids into the lowermost underground source of drinking water (USDW). In addition, hydraulic gradient of the USDW, and the potentiometric surface is not anticipated to be affected or altered as a result of solution mining activities. Well records are included in Appendix A. Therefore, no corrective action is necessary for this site.

# D. MAPS AND CROSS SECTIONS OF USDWS

Figure D-1 illustrates a stratigraphic column for Michigan (MDEQ, 2000). Figure D-2 illustrates regional cross sections across Wayne County showing the sedimentary rocks below the glacial overburden discussed further below.

## D.1 DOMESTIC WATER USE

The aquifer most commonly used for domestic water is generally found in the glacial drift zone (Figure D-2). In Wayne County, the glacial deposits range in thickness from 20 to 400 feet (Mozola, 1969). In the vicinity of the site, this zone is estimated to be 70 feet thick. The glacial drift zone in the Detroit area occurs under both water table and artesian conditions. It is composed of irregular beds of sand, silt, gravel, and clay (Wisler et al., 1952). Groundwater flow is generally in the east to southeast direction, toward the Michigan River (Gillespie and Dumouchelle, 1988). Based on the February 2005 Wellogic database, approximately 67 percent of the wells in Wayne County produce water from this zone (USGS, 2007). See additional information in Section B.4.3 concerning Public Water.

## D.2 LOWERMOST USDW

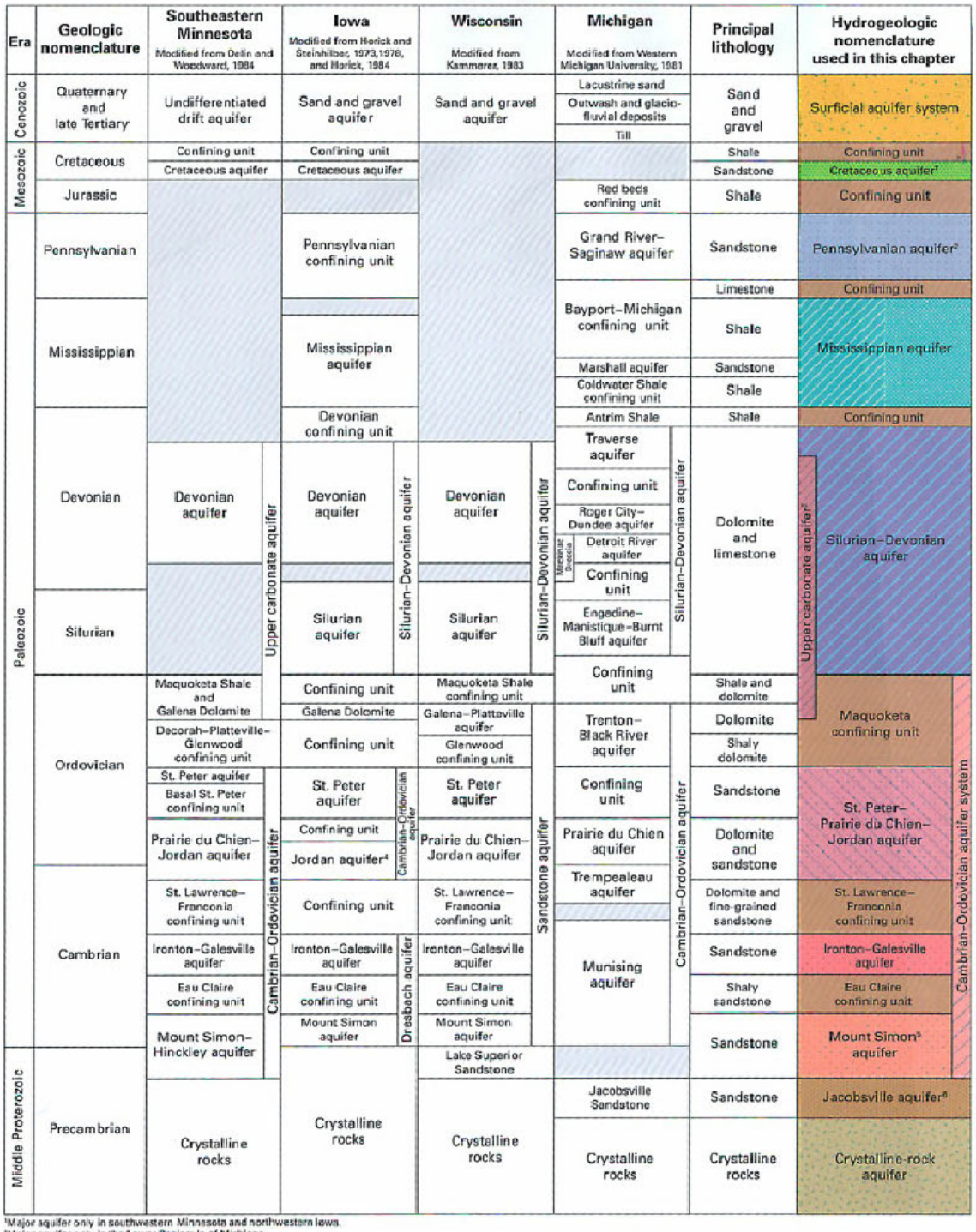
An Underground Source of Drinking Water (USDW) is defined as an aquifer or its portion which either supplies any public water system or contains a sufficient quantity of groundwater to supply a public water system. Potential USDWs are aquifers that can yield producible quantities of water that have a total dissolved solids (TDS) concentration less than 10,000 milligram per liter (mg/L). If an aquifer is not currently supplying drinking water for human consumption, it must contain fewer than 10,000 mg/L TDS and not be an exempted aquifer to be considered a USDW.

The base of the USDW within the AOR, based on logs of wells within the vicinity of the site, is estimated to be at 350 feet below ground surface (bgs) at the base of the Sylvania Sand. This is illustrated on Figure D-2 and on cross sections in Attachment F. Underlying the USDW is approximately 590 feet of limestone, dolomite, and salt formations protecting the USDW from the proposed interval to be used for storage (discussed further in Attachment F).

# List of Figures in Attachment D

Figure D-1 Stratigraphic Column of Michigan

Figure D-2 Regional Cross Sections of Sedimentary Formations in Wayne County




[1]Major aquifer only in southwestern Minnesota and northwestern Iowa.
[2]Major aquifer only in the Lower Peninsula of Michigan.
[3]Major aquifer only in southeastern Minnesota.
[4]Includes lower part of the Prairie du Chien Group and the Jordan Sandstone.
[5]Major aquifer includes the Hinckley Sandstone of Precambrian age in southeastern Minnesota.
[6]Major aquifer only in part of the Upper Peninsula of Michigan.

*Figure 8. The numerous aquifers and confining units that have been named in the four States of Segment 9 are grouped into the sequence of hydrogeologic units shown in the column on the right. The gray area represents missing rocks.*

WSP USA Inc.
16200 Park Row Ste. 200
Houston, TX 77084
TEL: (281) 589-5900

**BUCKEYE**
**WAYNE COUNTY, MICHIGAN**

**STRATIGRAPHIC COLUMN OF MICHIGAN**

Job No. 192065A

| Design: | Drawn: WDD | Checked: GM | Date: 05/24/2017 | Scale: | Figure No. D–1 |
|---|---|---|---|---|---|

WSP USA Inc.
16200 Park Row Suite 200
Houston, TX 77084
TEL: (281) 589-5900

**BUCKEYE**
**WAYNE COUNTY, MICHIGAN**

**REGIONAL CROSS SECTIONS OF SEDIMENTARY FORMATIONS IN WAYNE COUNTY**

Job No. 192065A

| Design: | Drawn: | Checked: | Date: | Scale: | Drawing No. |
|---|---|---|---|---|---|
| WDD | WDD | GM | 06/01/2017 | NTS | D–2 |

# E. DOES NOT APPLY TO CLASS III WELLS

# F. MAPS AND CROSS SECTIONS OF GEOLOGIC STRUCTURE OF AREA

## F.1 REGIONAL GEOLOGY

The site is located in the southeastern part of the Michigan Basin and the Algonquin Arch (Figure F-1). The Precambrian basement rock in this area is part of the Grenville Province. The basin was filled with sedimentary layers dipping and thickening inward toward the center of the basin. In addition to including most of the state of Michigan, the basin includes parts of Wisconsin, Illinois, Indiana, Ohio, and Ontario, Canada. A general regional cross section of the Michigan Basin from Lake Michigan to Lake Erie is provided in Figure F-2. Formations outcropping along the margins of the basin are the older rocks which are overlain by younger formations toward the center of the basin. The basin structure originated by slow tectonic movements within the crust.

Sedimentary rocks predominately deposited during the Paleozoic Era form the stratigraphy of the region. Figure F-3 illustrates the stratigraphy of Michigan. The general lithology consists of sandstone in basal Mt. Simon and Eau Claire Formations overlain by dolomite, limestone, and shale up to the Salina Group, which consists of dolomite, anhydrites and interbedded salts. Overlying the Salina Group are Devonian aged dolomites, sandstones, and limestones.

## F.2 LOCAL GEOLOGY

The local geologic information for the site was determined based on the construction of cross sections from West to East and North to South across the area (Figure F-4 and Figure F-5). Data from open hole logging was used to provide a generalized site geology.

The deepest formation observed in the area is the Precambrian granite of the basement rock of the Central Stable Region or Canadian Shield. Overlying the granite, as seen in the nearby Marathon Pipe Line LLC BD-1 (API 21163001468000) is the Granite Wash at 3,745 feet KB. The Granite Wash is composed of eroded granitic materials.

The Eau Claire Formation and Mt. Simon Sandstone unconformably overlie the Granite Wash. The Mt. Simon Sandstone is characterized as having sub-rounded to rounded quartz grains, grading from medium to very coarse grains. The sandstone is observed to thicken southward. The base of the unit contains a higher content of feldspar grains. Figure F-6 and Figure F-7 illustrate the thickness and structure of the Mt. Simon across Michigan. The Mt. Simon interfingers with the Eau Claire Formation which consists of a basal sandstone that is commonly included in the Mt. Simon. The upper section consists of thinly bedded dolomite and siltstone. Figure F-8 illustrates the structure of the Eau Claire (EPA, 1981). These combined sands are further discussed in Attachment F.4.

The Trenton/Black River Group overlies the Eau Claire. The limestone is estimated to be 1,090 feet thick at the site and is observed to be a sequence of dense, brown to gray, micritic limestone. The formation includes widespread cherty zones. The Trenton Group (Figure F-9) has been dolomitized in some areas.

The Utica Shale overlies the Trenton Group and is estimated to be 340 feet thick in this area (Figure F-10). The shale consists of a hard, dark gray to greenish-black, calcareous shale that is homogeneous. A distinctive contact exists between the Trenton and Utica Shale, unlike the gradational contact with the overlying Cincinnatian Series (EPA, 1981).

The Cincinnatian Series, overlying the Utica Shale, consists of a sequence of interbedded shales and carbonates that is estimated to be 350 feet thick in the vicinity of the site.

The Clinton Shale is considered part of the Middle Silurian age deposits (Niagaran Series) situated between the Cincinnatian and the Upper Niagaran Series. This deposit is composed of interbedded shale and dolomite. The Niagaran Series of the Middle Silurian overlies the Clinton Shale in this area (Figure F-11). This series includes basal dolomitic shale (Clinton Shale) and consists of mostly dolomites in the outcrop areas. The Niagaran is estimated to be 390 feet thick in this area.

The Salina Group of the upper Silurian overlies the Niagaran. The Salina Group is a thick sequence of anhydrite, salt and shale in the basin. The Salina is estimated to be 640 feet thick in the area and includes a sequence of evaporite units starting at the base of the foundation with the A-1 Carbonate (Figure F-12 through Figure F-15). Multiple Silurian-aged, salt-bearing deposits occur within the basin; however, only the B Evaporite (salt) unit of the Salina Group underlies the area of this study with suitable thickness for storage cavern development (Figure F-3).

The Bass Island Formation overlies the Salina Group and consists of fine-grained cherty dolomite. Figure F-16 illustrates the thickness of this formation across Michigan.

The Bois Blanc overlying the Bass Island Formation may be present at the site. The formation is cherty limestone with some dolomite. The Sylvania Sandstone overlies the Bois Blanc Formation and consists of well-rounded and sorted, fine to medium quartz grains. The combined lithofacies thickness of the Bois Blanc and Sylvania is illustrated on Figure F-17.

The Detroit River Formation, consisting of limestone with chert, anhydrite and gypsum, typically overlies the Sylvania Sandstone; however, it is not anticipated to be observed at the site. Instead, the Dundee Formation is expected to overlie the Sylvania Sandstone in this area. The Dundee Formation is an alternating sequence of shales and limestones, often combined with the Traverse Group. Figure F-18 and Figure F-19 illustrate the thickness of the lithofacies and the structure of the Dundee Formation.

The upper 70 feet at the site consists of the overlying glacial drift. The drift consists of clay and silt in this area (EPA, 1981).

## F.3 SOLUTION MINING

The cavern wells will be installed in the B Evaporite unit of the Salina Group (Figure F-15). The B Evaporaite is comprised of up to 450 feet of salt and an upper unit of up to 80 feet of shale, dolomite, and anhydrite. The unit is thickest in the basin and thins toward the north. The unit is considered an aquiclude, lacking permeability and porosity (EPA, 1981). As a result of the unit's geologic characteristics, it is considered ideal for storage.

## F.4 STRUCTURE AND SEISMIC ACTIVITY

Figure F-20 indicates the lack of seismic risk in the area. In addition, the cross sections provided as Figures F-4 and F-5 do not indicate faulting in the area. The U.S. Geological Survey Earthquake Data Base (National Earthquake Information Center) was used to locate any significant earthquake events occurring within 100 miles of the Woodhaven Terminal. Twelve (12) earthquake events were recorded within the 100 mile search radius (Figure F-21). The closest earthquake to occur near the site was approximately 8 miles away on the Canadian side of Lake Erie. The event was a magnitude 2.5 on March 2010 at a depth of 18 km (11.2 miles) (USGS, 2017).

The lack of seismic activity coupled with the lack of faulting within the vicinity of the site reinforces the choice of this site for a brine disposal wells.

# List of Figures in Attachment F


Figure F-1 Geologic Map of Michigan

Figure F-2 Generalized Regional Cross-Section of Michigan Basin

Figure F-3 Stratigraphic Nomenclature for Michigan

Figure F-4 West-East Cross-Section

Figure F-5 North-South Cross-Section

Figure F-6 Thickness of the Mt. Simon

Figure F-7 Structure Map of the Mt. Simon

Figure F-8 Structure Map of the Eau Claire

Figure F-9 Structure Map of the Ordovician Trenton Group

Figure F-10 Thickness of the Utica Shale

Figure F-11 Thickness-Facies of the Niagaran Group

Figure F-12 Thickness of the A-1 Carbonate – Salina Group

Figure F-13 Thickness of the A-2 Evaporite – Salina Group

Figure F-14 Thickness of the A-3 Carbonate – Salina Group

Figure F-15 Thickness of the B Evaporite – Salina Group

Figure F-16 Thickness of the Bass Island Group

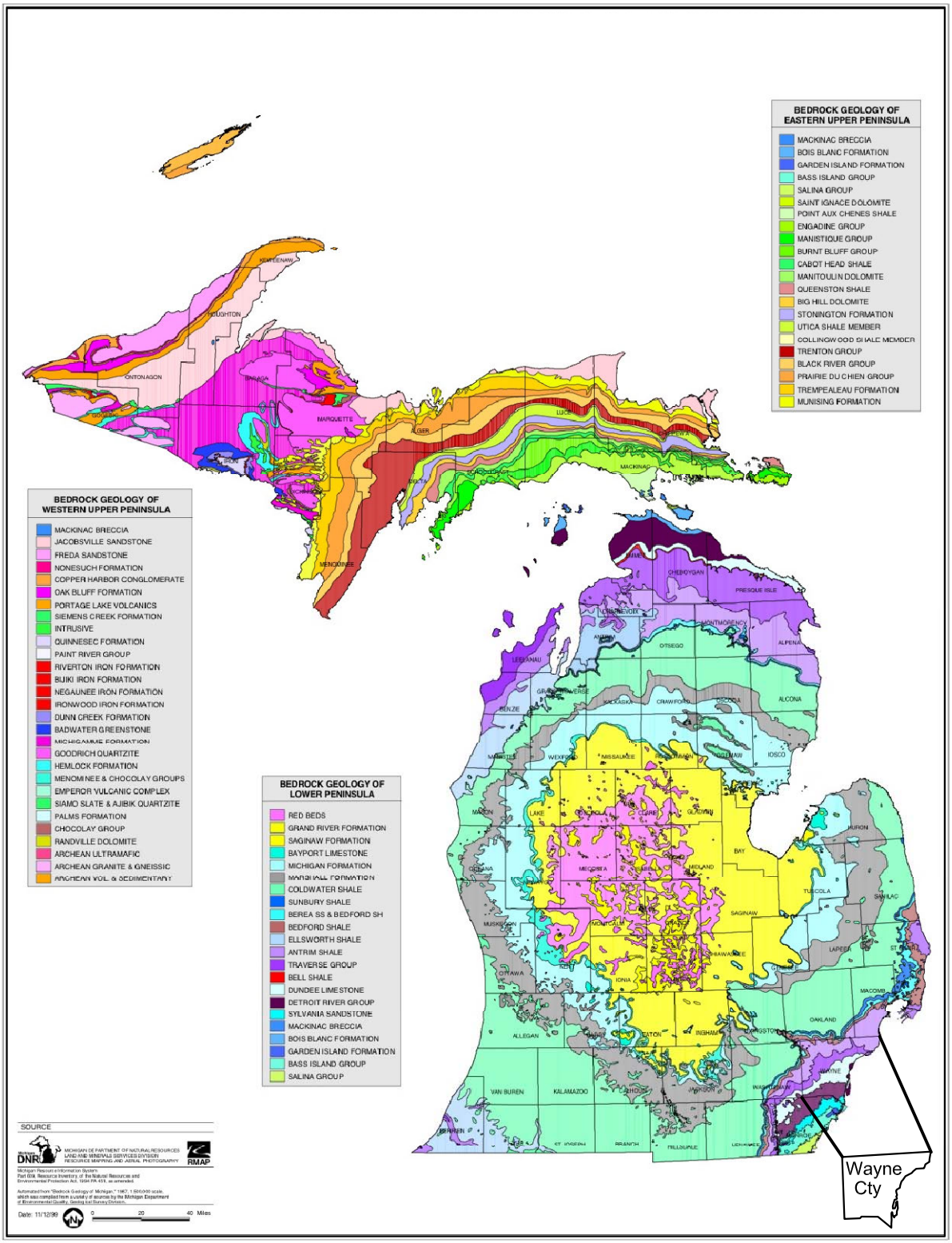
Figure F-17 Thickness Lithofacies of the Bios Blac/Sylvania

Figure F-18 Thickness Lithofacies of the Dundee Formation

Figure F-19 Structure Map of the Dundee Formation

Figure F-20 Seismic Risk Map

Figure F-21 Historical Earthquakes




Source: Michigan DNR, 1987

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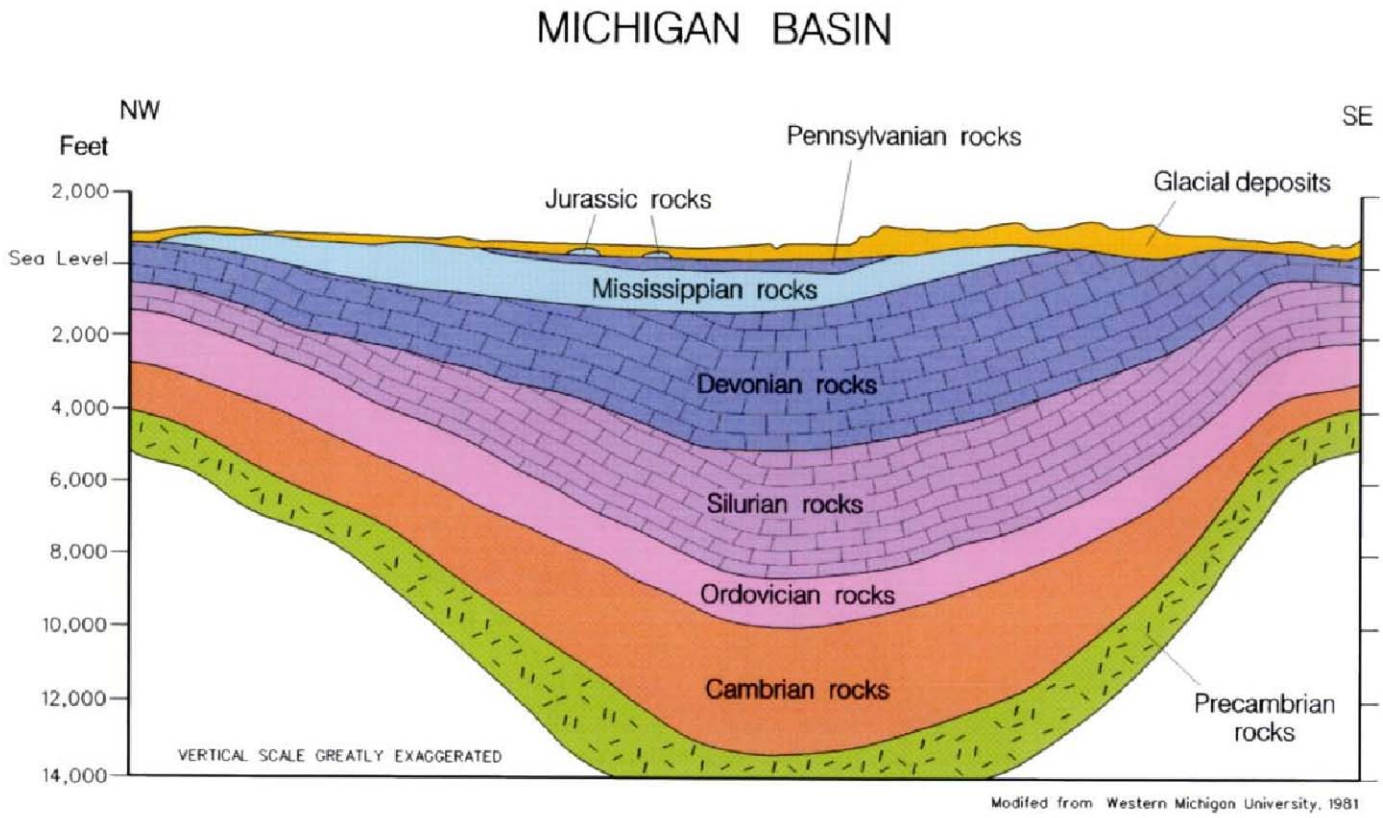
**GEOLOGIC MAP OF MICHIGAN**

| Job No. 192065A | | | | | |
|---|---|---|---|---|---|
| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F–1 |

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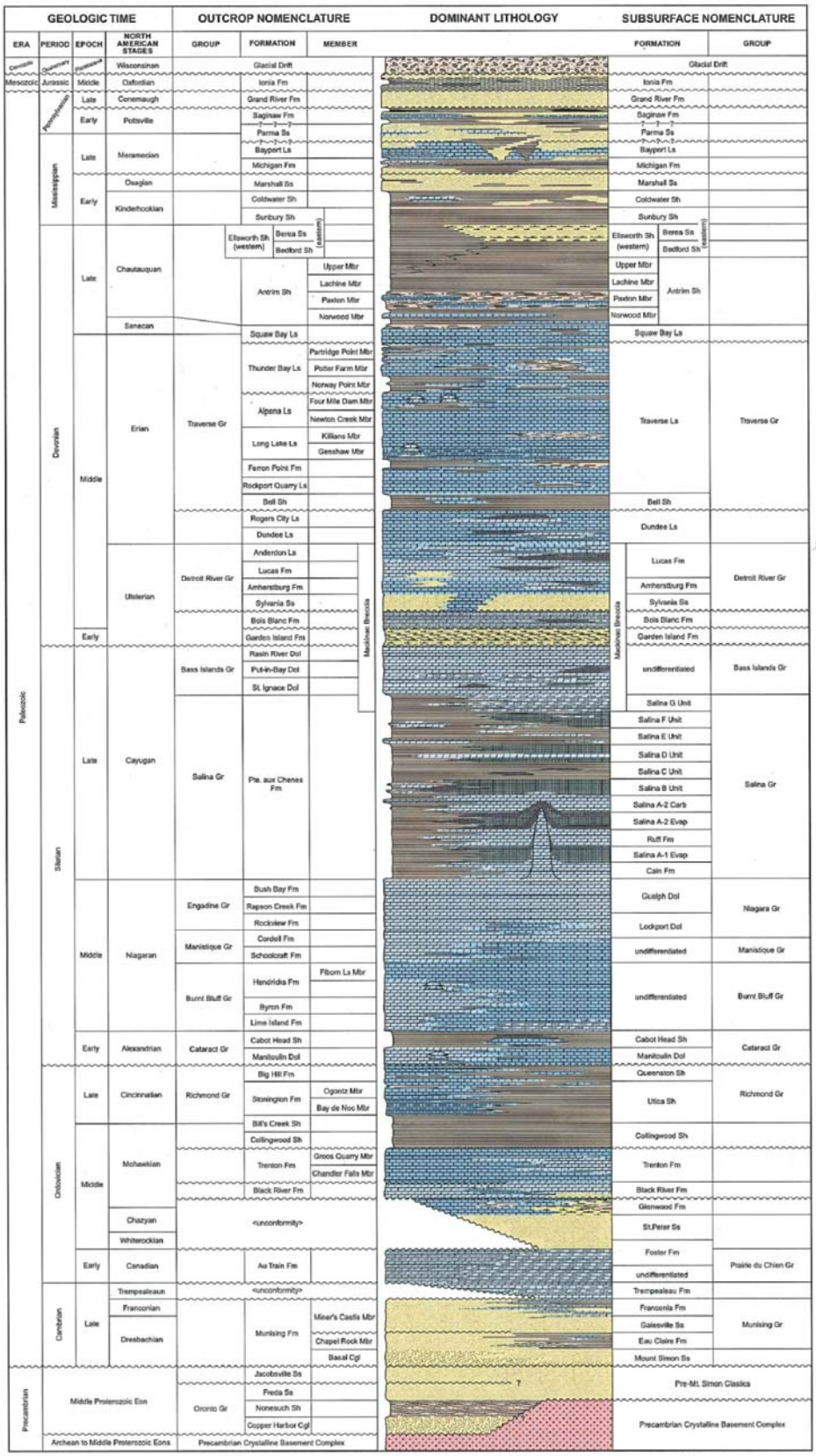
**GENERALIZED REGIONAL CROSS-SECTION OF MICHIGAN BASIN**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F-2 |
|---|---|---|---|---|---|




# 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. Aureal 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.

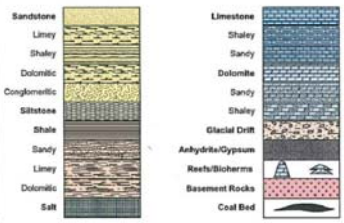
*Industry:* Mr. Donald J. Bailey, Consultant; Mr. Jimmy R. Myles, Scot Energy; Mr. Dan E. Pfeiffer, Pfeiffer Exploration Services.

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-Stray-Stray Sandstone, Triple Gyp |
| Coldwater Sh | Coldwater Red Rock, Speckled Dolomite, Wier Sand |
| Antrim Sh | Charlton Black Shale Member, Elbrim, 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 | Reed City Member/Dolomite/Anhydrite |
| Lucas Fm | Freer Sandstone, Horner Member, Iatzi Member, Massive Salt/Anhydrite, Sour Zone, Big Anhydrite, Richfield Zone/Member/Sandstone, Big Salt |
| Amherstburg Fm | Filer Sandstone, Matrium Member, Stark 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 Peek, 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, T-PDC, Oneota Dolomite, Brazos Shale |
| Trempealeau Fm | Lodi Formation |
| Galesville Ss | Dresbach Sandstone |
| Pre-Mt. Simon Clastics | Precambrian "Red Beds" |

## LEGEND




Source: Michigan DEQ, 2000

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**STRATIGRAPHIC NOMENCLATURE FOR MICHIGAN**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F-3 |
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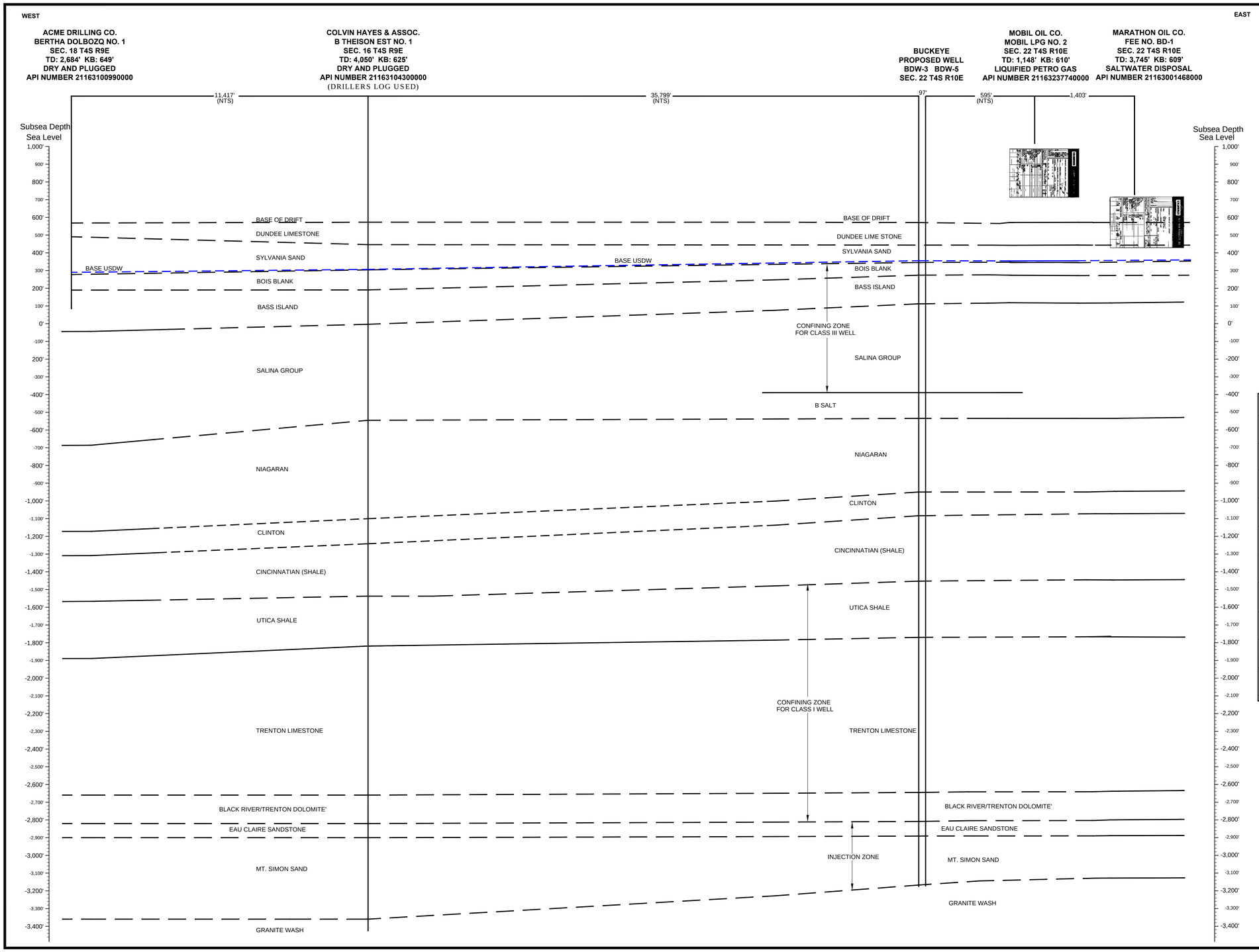


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**FIGURE F-4**

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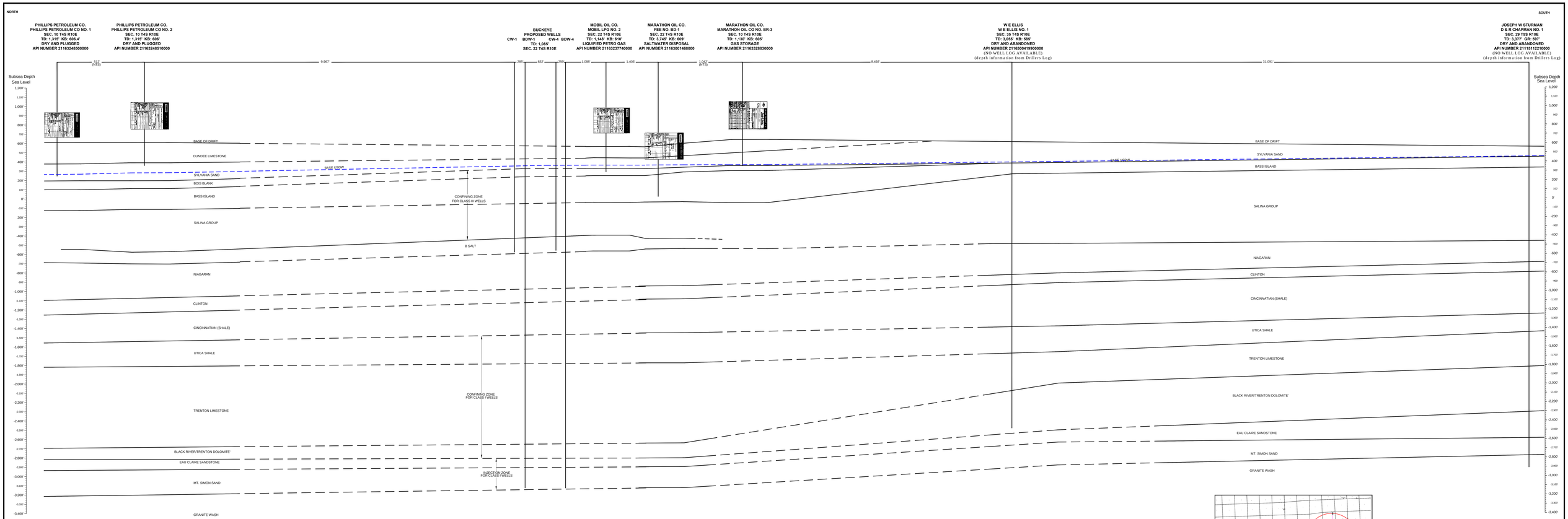
WEST - EAST
CROSS-SECTION

| | | |
|---|---|---|
| DATE: 11/14/17 | CHECKED BY: | JOB NO: 192065A |
| DRAWN BY: WDD | APPROVED BY: | DWG. NO: |


NORTH
SOUTH
PHILLIPS PETROLEUM CO.
PHILLIPS PETROLEUM CO NO. 1
SEC. 10 T4S R10E
TD: 1,319' KB: 606.4'
DRY AND PLUGGED
API NUMBER 21163248500000
PHILLIPS PETROLEUM CO.
PHILLIPS PETROLEUM CO NO. 2
SEC. 10 T4S R10E
TD: 1,315' KB: 606'
DRY AND PLUGGED
API NUMBER 21163248510000
BUCKEYE
PROPOSED WELLS
CW-1 BDW-1 CW-4 BDW-4
TD: 1,085'
SEC. 22 T4S R10E
MOBIL OIL CO.
MOBIL LPG NO. 2
SEC. 22 T4S R10E
TD: 1,148' KB: 610'
LIQUIFIED PETRO GAS
API NUMBER 21163237740000
MARATHON OIL CO.
FEE NO. BD-1
SEC. 22 T4S R10E
TD: 3,745' KB: 609'
SALTWATER DISPOSAL
API NUMBER 21163001468000
MARATHON OIL CO.
MARATHON OIL CO NO. BR-3
SEC. 10 T4S R10E
TD: 1,130' KB: 605'
GAS STORAGE
API NUMBER 21163328830000
W E ELLIS
W E ELLIS NO. 1
SEC. 35 T4S R10E
TD: 3,055' KB: 585'
DRY AND ABANDONED
API NUMBER 21163004419900000
(NO WELL LOG AVAILABLE)
(depth information from Drillers Log)
JOSEPH W STURMAN
D & R CHAPMAN NO. 1
SEC. 29 T5S R10E
TD: 3,377' GR: 597'
DRY AND ABANDONED
API NUMBER 21115112210000
(NO WELL LOG AVAILABLE)
(depth information from Drillers Log)
Subsea Depth
Sea Level
BASE OF DRIFT
DUNDEE LIMESTONE
BASE USDW
SYLVANIA SAND
BOIS BLANK
BASS ISLAND
SALINA GROUP
B SALT
NIAGARAN
CLINTON
CINCINNATIAN (SHALE)
UTICA SHALE
TRENTON LIMESTONE
BLACK RIVER/TRENTON DOLOMITE'
EAU CLAIRE SANDSTONE
MT. SIMON SAND
GRANITE WASH
CONFINING ZONE
FOR CLASS III WELLS
CONFINING ZONE
FOR CLASS I WELLS
INJECTION ZONE
FOR CLASS I WELLS
VERTICAL
SCALE
HORIZONTAL
SCALE
FIGURE F-5
BUCKEYE TERMINALS, LLC
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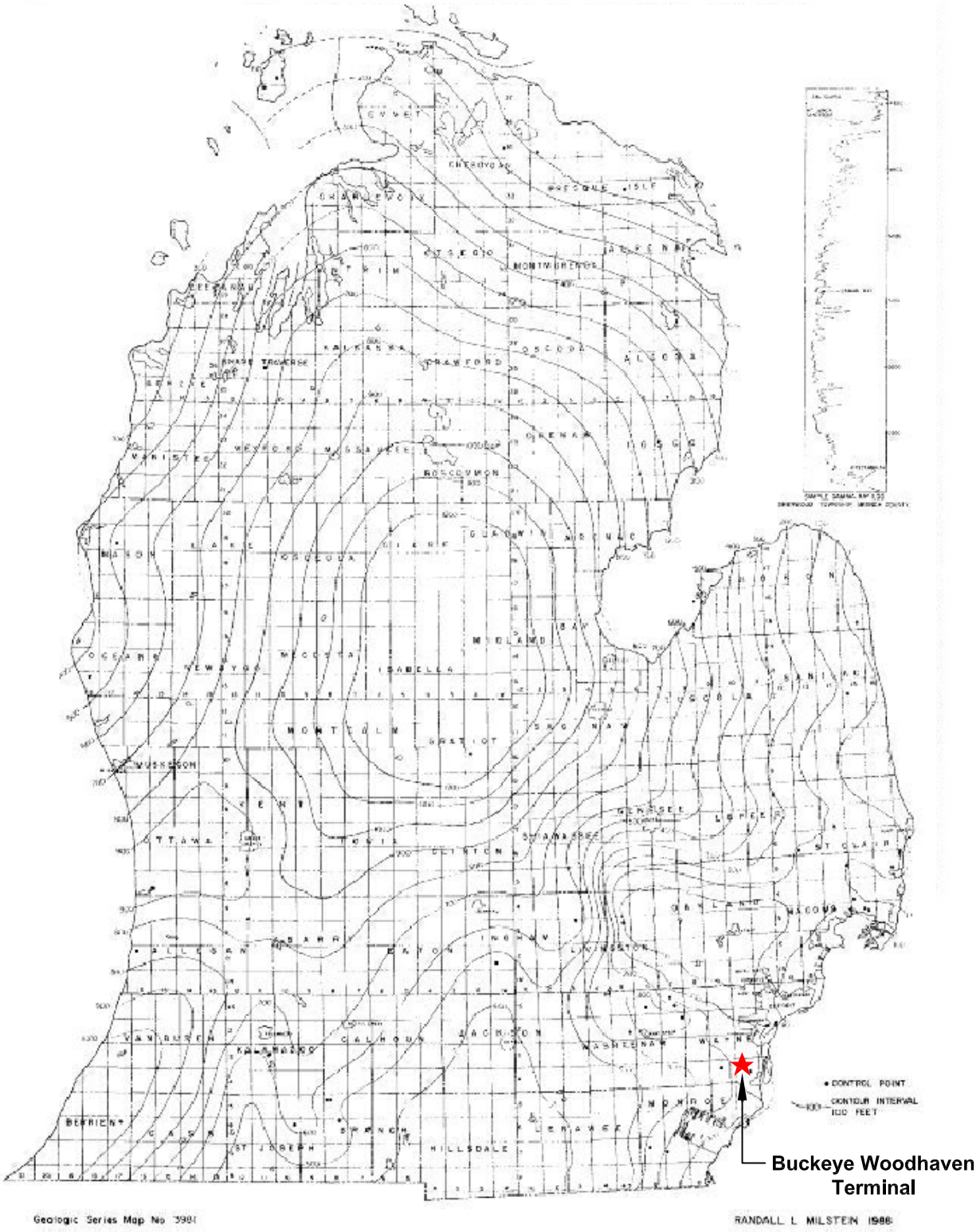
WAYNE COUNTY, MICHIGAN
NORTH - SOUTH
CROSS-SECTION
DATE 12/14/13
DRAWN BY BGC
CHECKED BY
APPROVED BY
JOB NO. 1320656
DWG NO.




Source: Milstein, 1988

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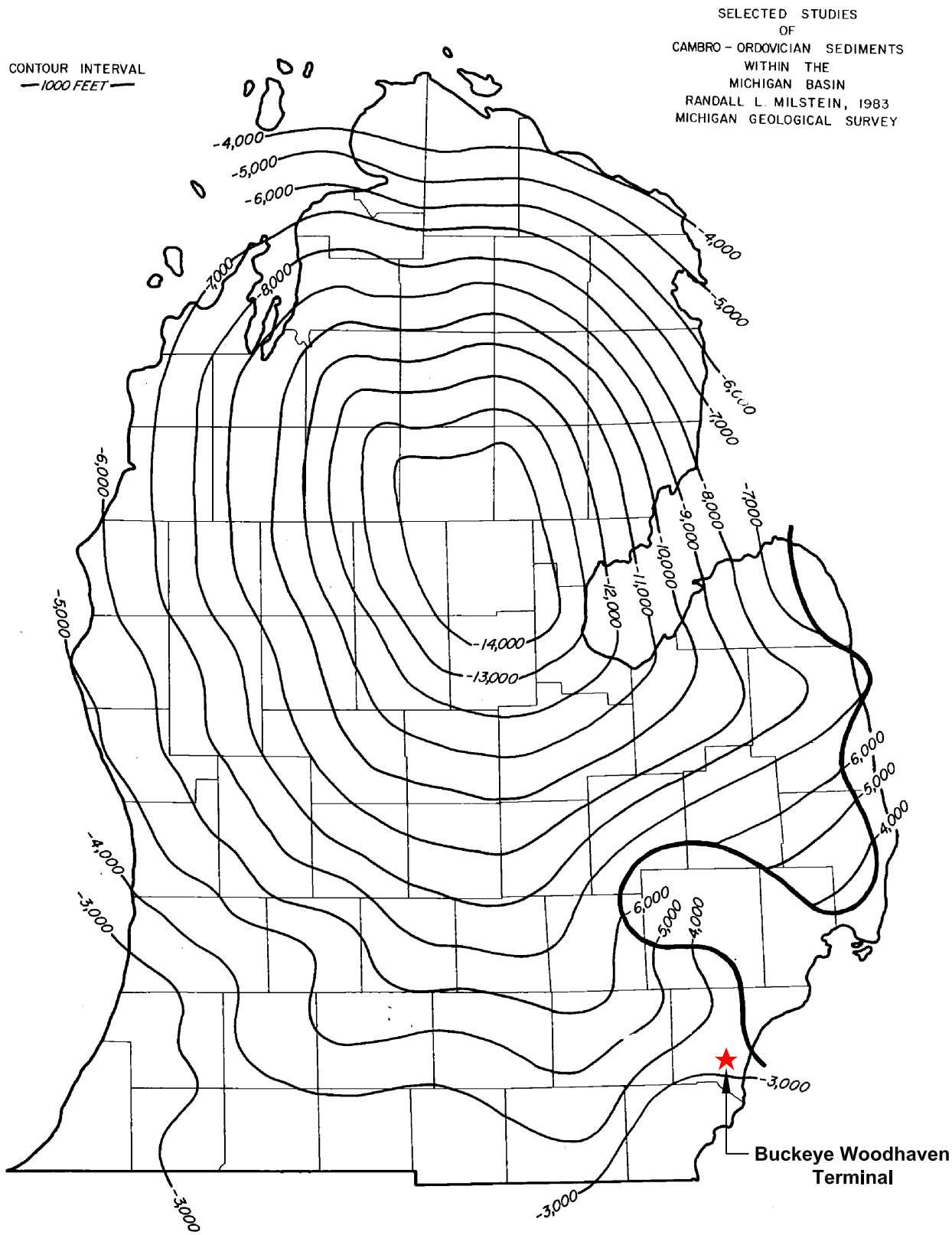
**THICKNESS OF THE MT. SIMON**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F–6 |
|---|---|---|---|---|---|




Source: Michigan Geological Survey, 1983

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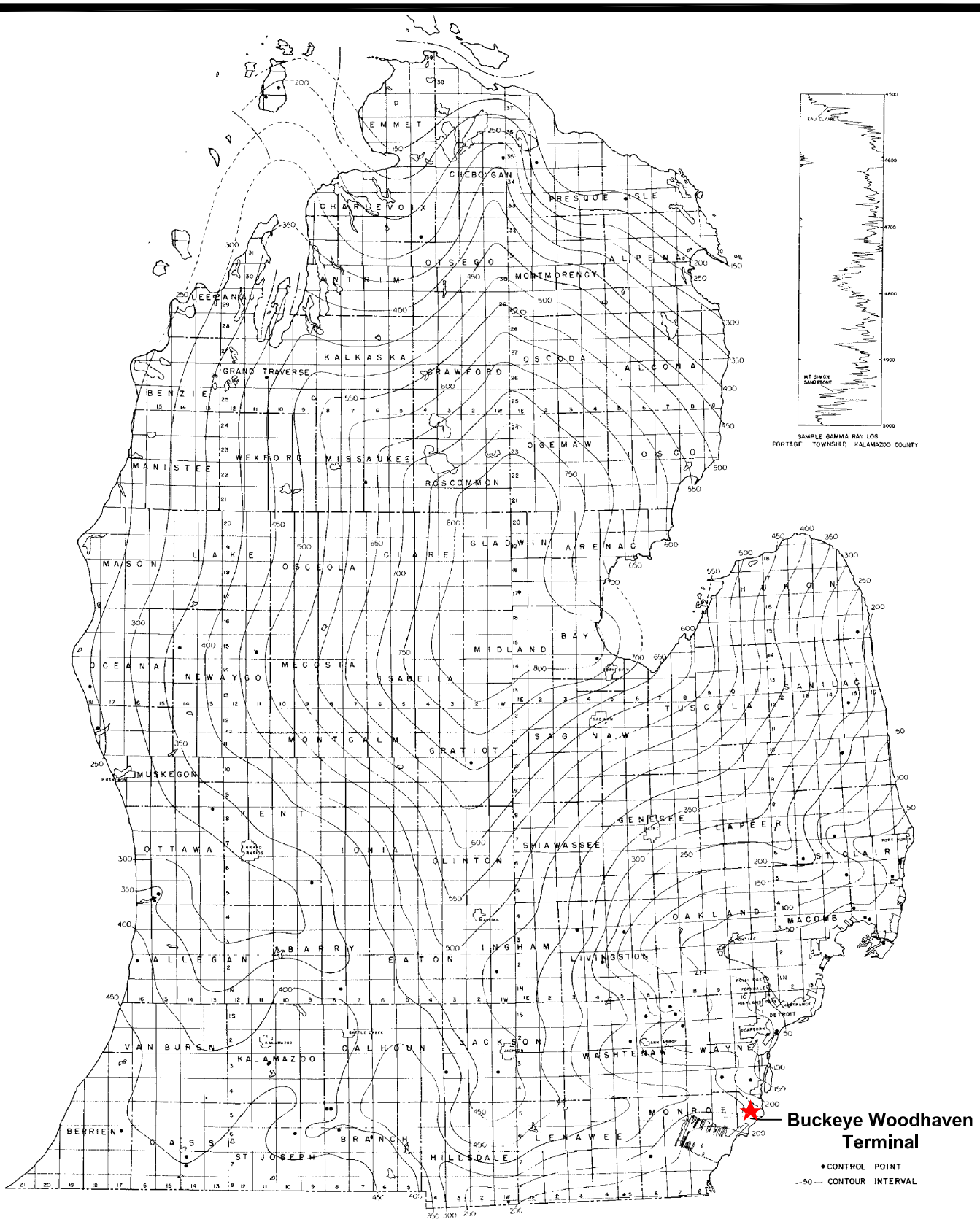
**STRUCTURE ON THE MT. SIMON**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F-7 |
|---|---|---|---|---|---|




Source: Milstein, 1988

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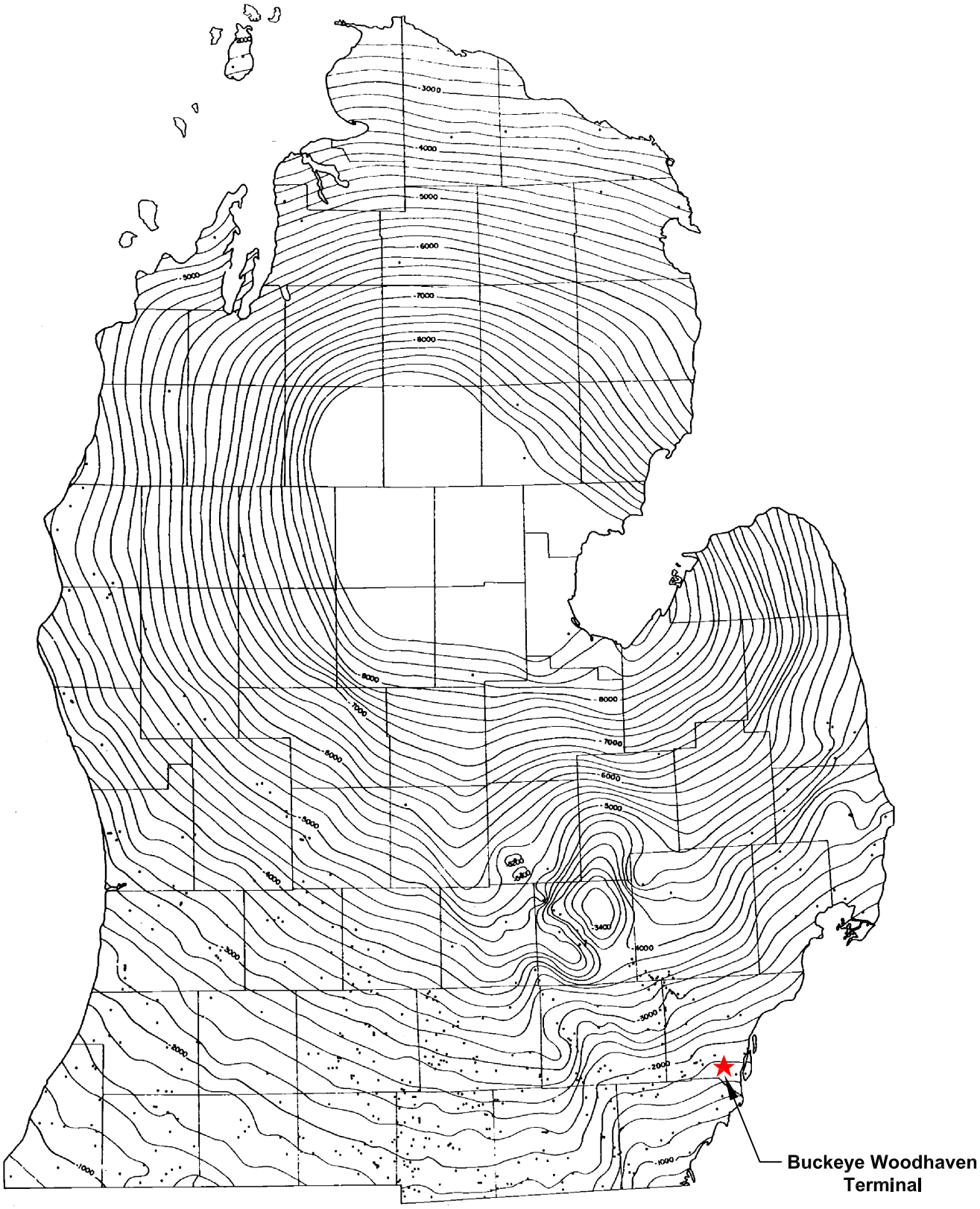
**STRUCTURE ON THE EAU CLAIRE**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F–8 |
|---|---|---|---|---|---|




Source: Michigan Basin Geological Society, 1969

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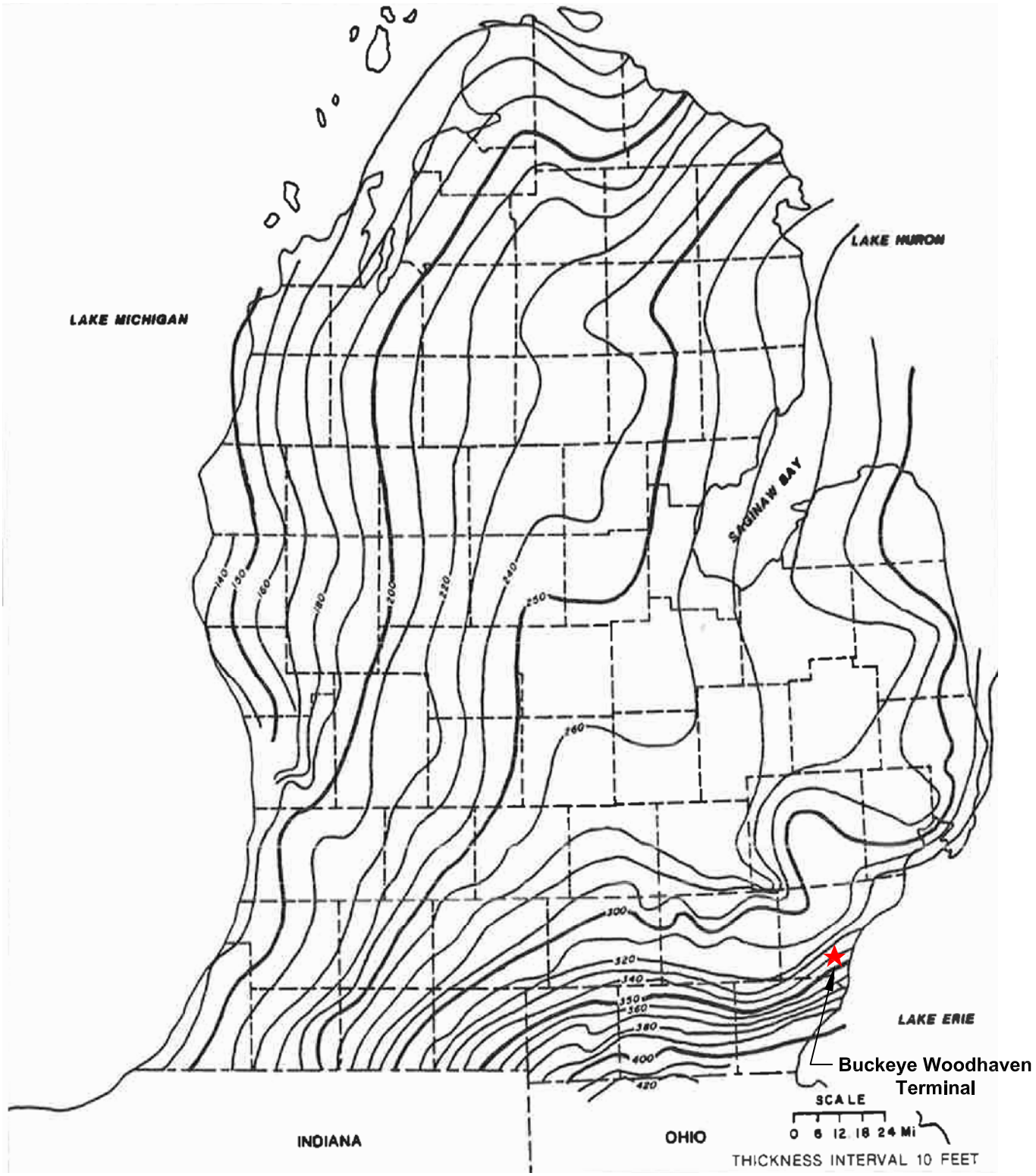
**STRUCTURE MAP OF THE ORDOVICIAN TRENTON GROUP**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F-9 |
|---|---|---|---|---|---|




Source: Michigan Basin Geological Society, 1969

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**THICKNESS OF UTICA SHALE**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F–10 |
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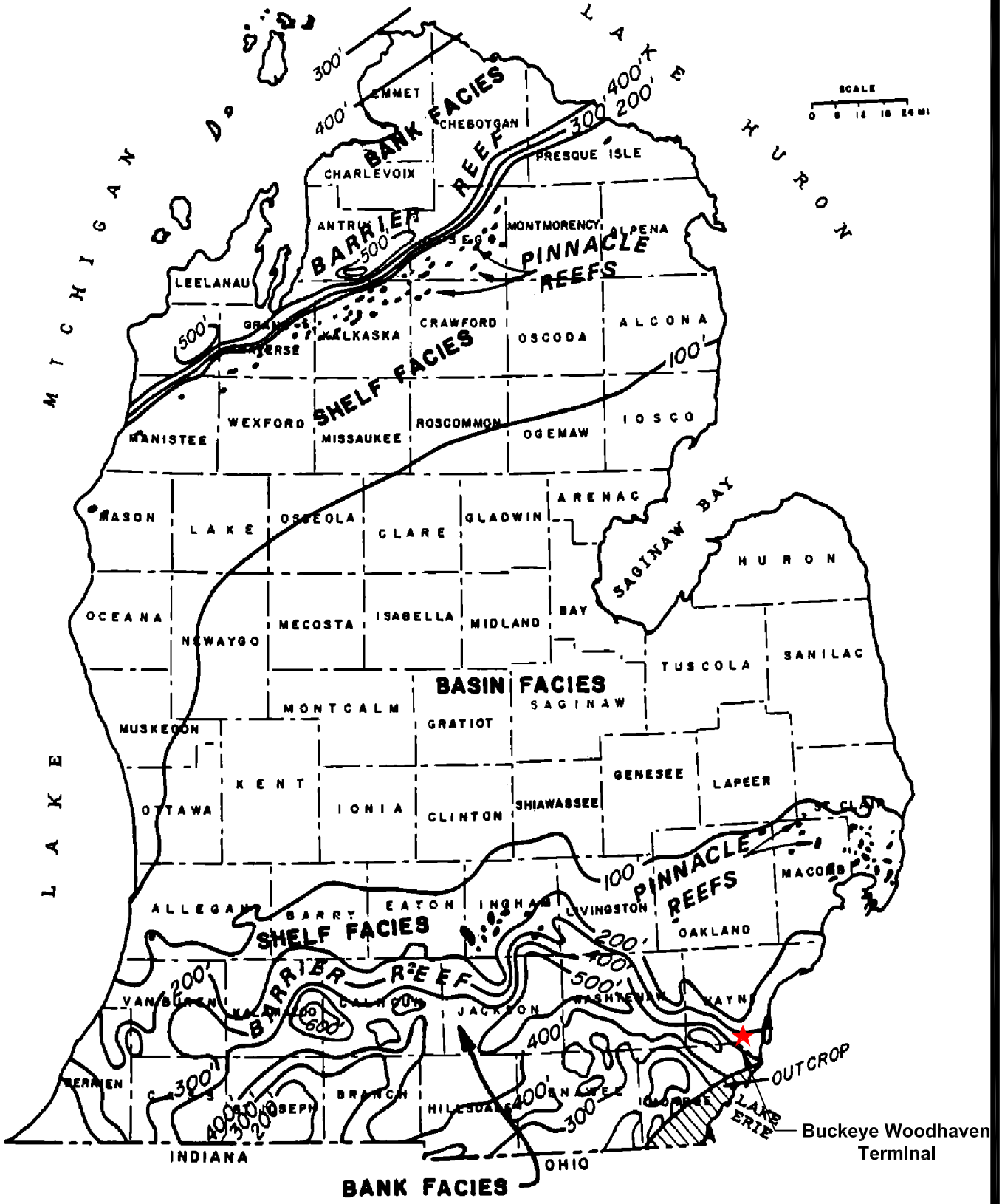


Source: Hydrogeology for Underground Injection Control in Michigan: Part I, 1981

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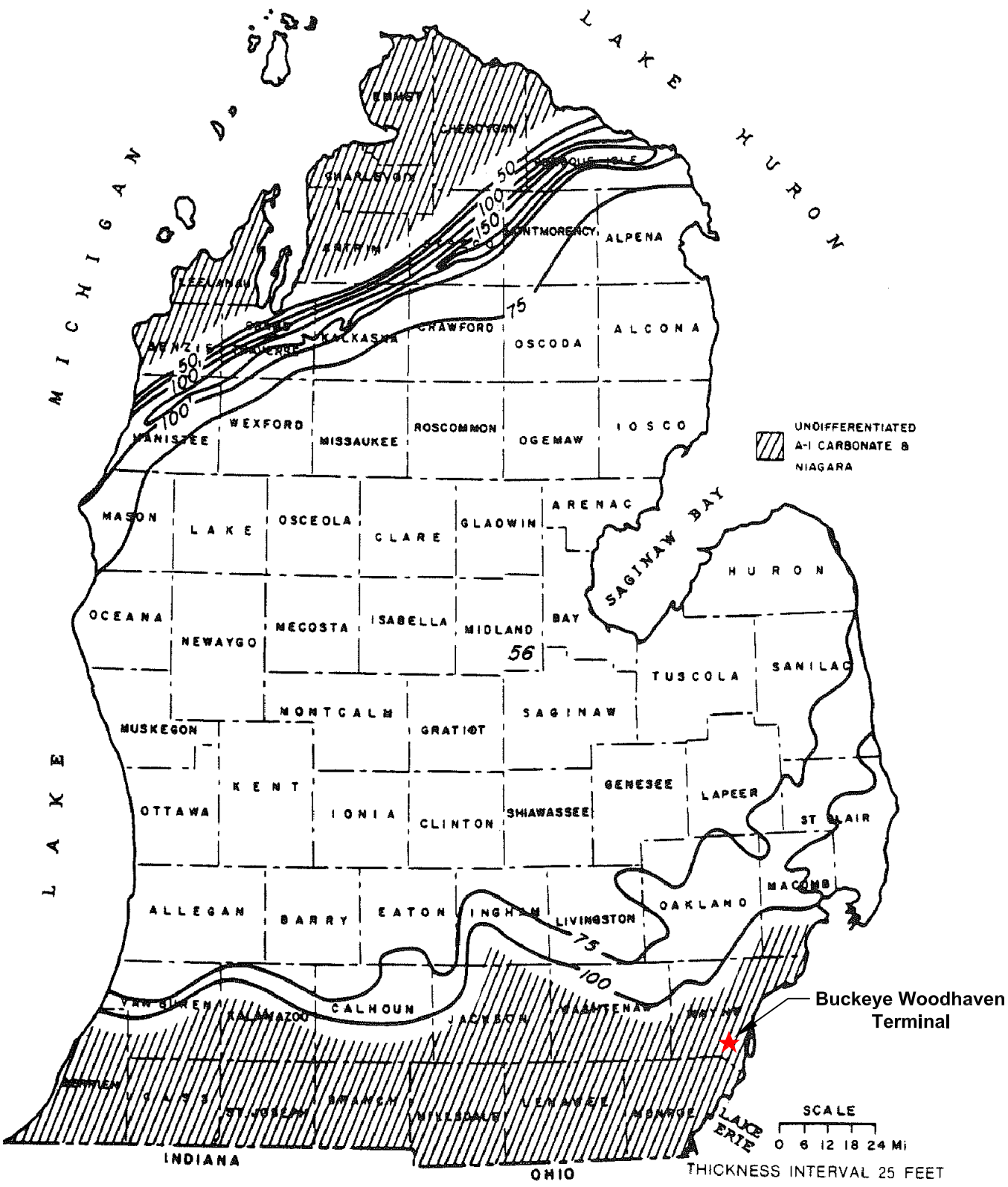
**THICKNESS-FACIES OF THE NIAGARAN GROUP**

| Job No. 192065A | | | | | |
|---|---|---|---|---|---|
| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F–11 |




Source: Hydrogeology for Underground Injection Control in Michigan: Part I, 1981

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**THICKNESS OF THE A-1 CARBONATE - SALINA GROUP**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 10/09/17 | Scale: NTS | Figure No. F-12 |
|---|---|---|---|---|---|

Source: Hydrogeology for Underground Injection Control in Michigan: Part I, 1981

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**THICKNESS OF THE A-2 EVAPORITE - SALINA GROUP**

Job No. 192065A

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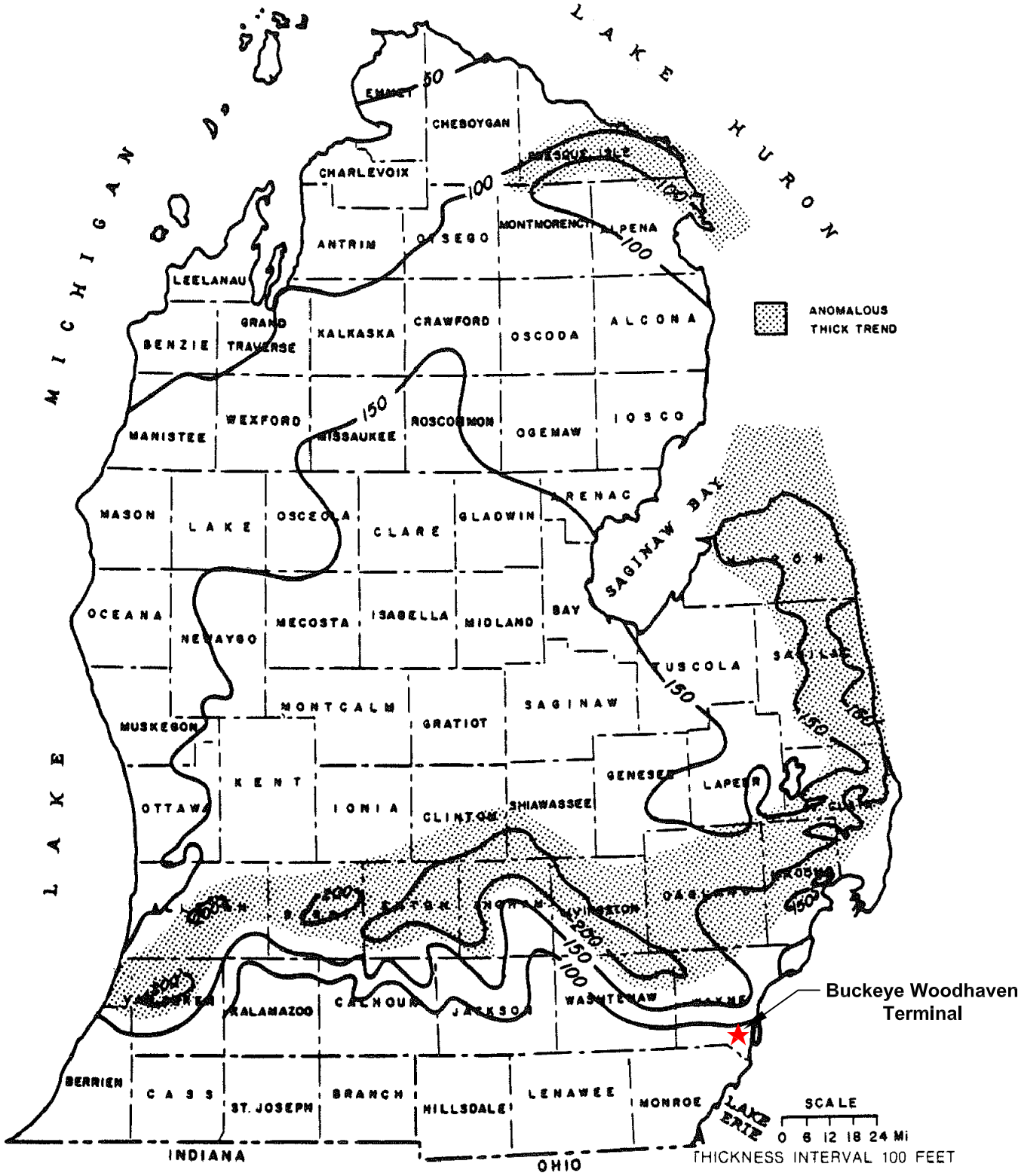


Source: Hydrogeology for Underground Injection Control in Michigan: Part I, 1981

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**THICKNESS OF THE A-3 CARBONATE - SALINA GROUP**

Job No. 192065A

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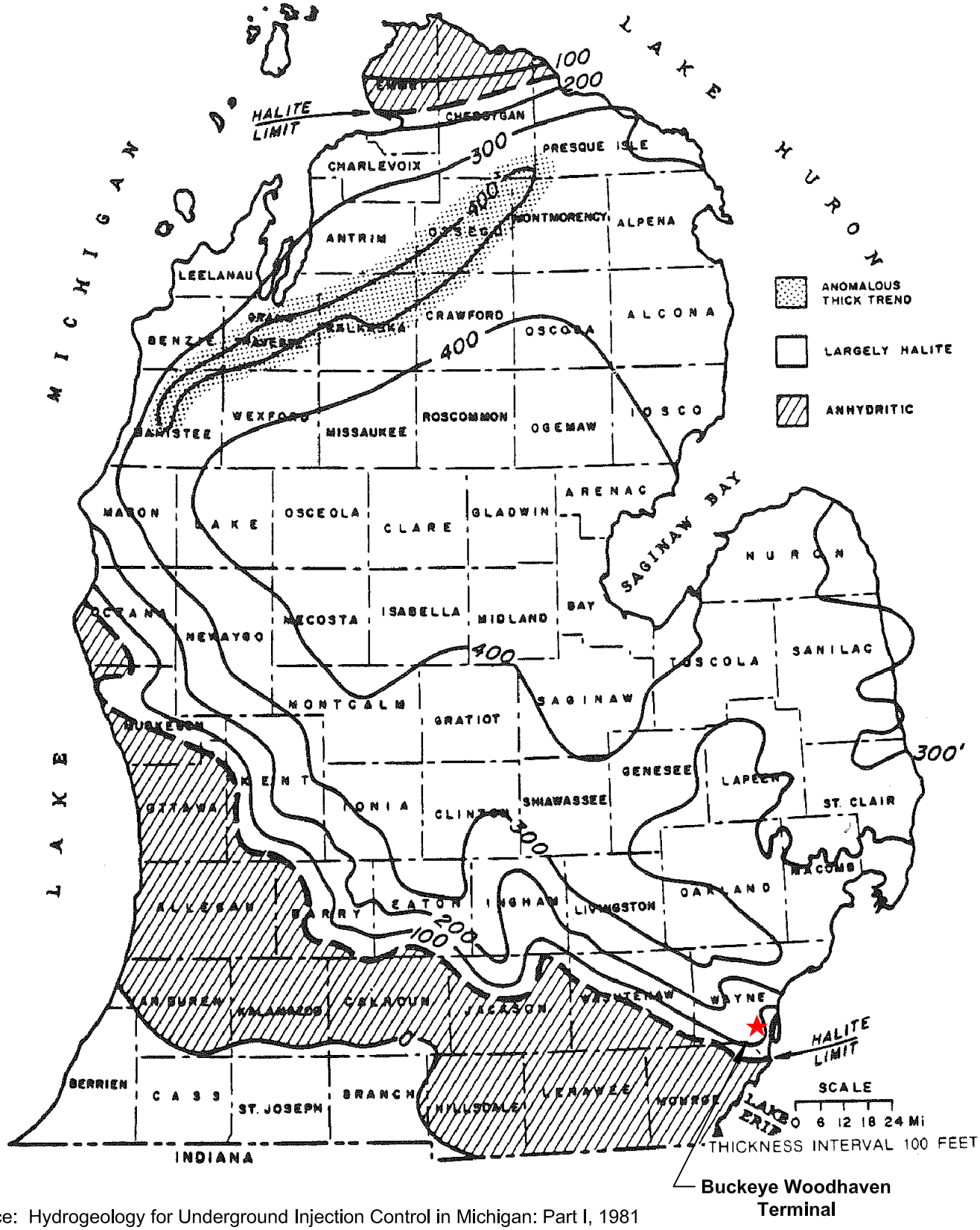


Source: Hydrogeology for Underground Injection Control in Michigan: Part I, 1981

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**THICKNESS OF THE B EVAPORITE - SALINA GROUP**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 08/21/17 | Scale: NTS | Figure No. F–15 |
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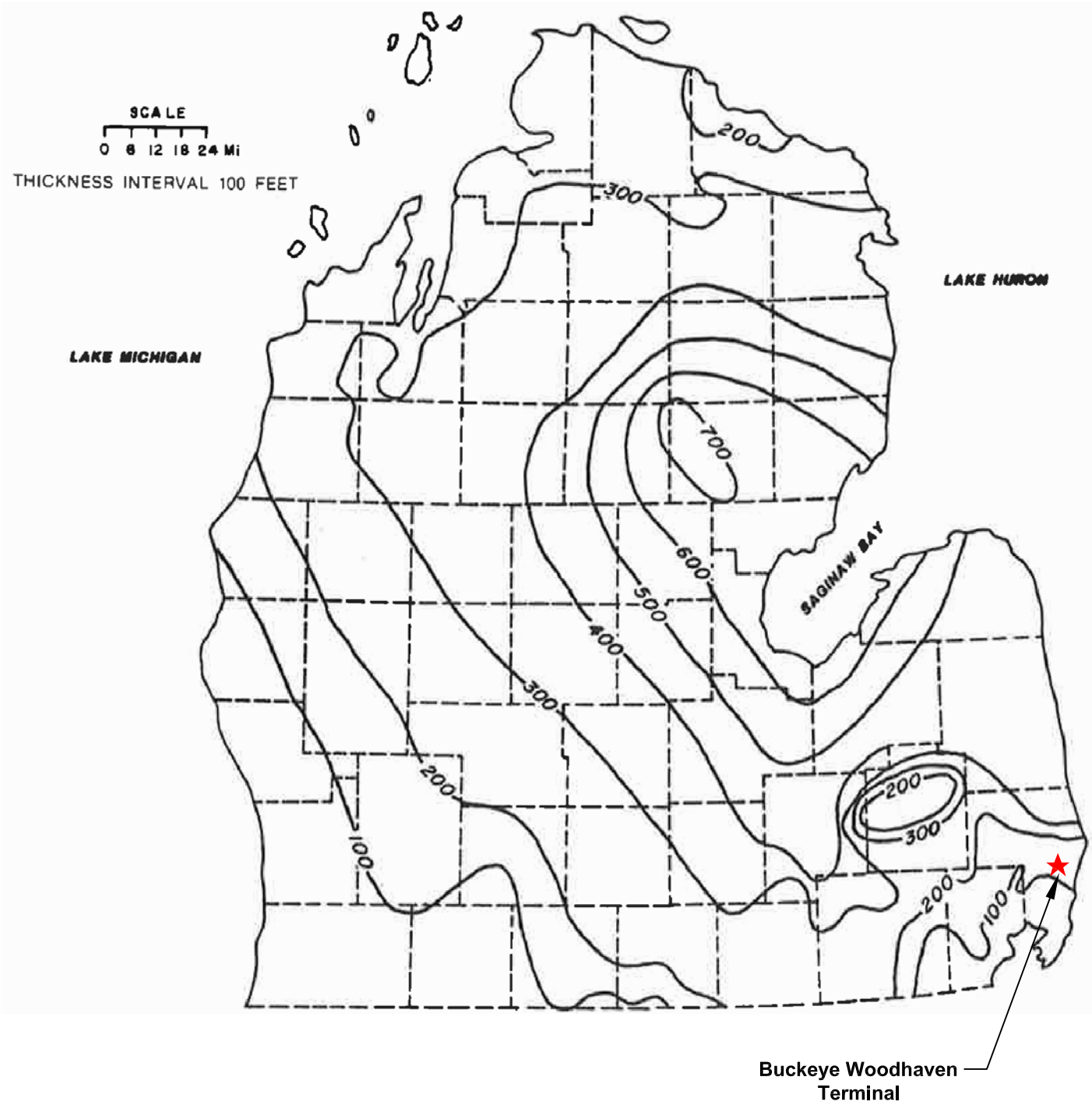


Source: Nurmi, 1972

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**THICKNESS OF THE BASS ISLAND FORMATION**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 10/09/17 | Scale: NTS | Figure No. F-16 |
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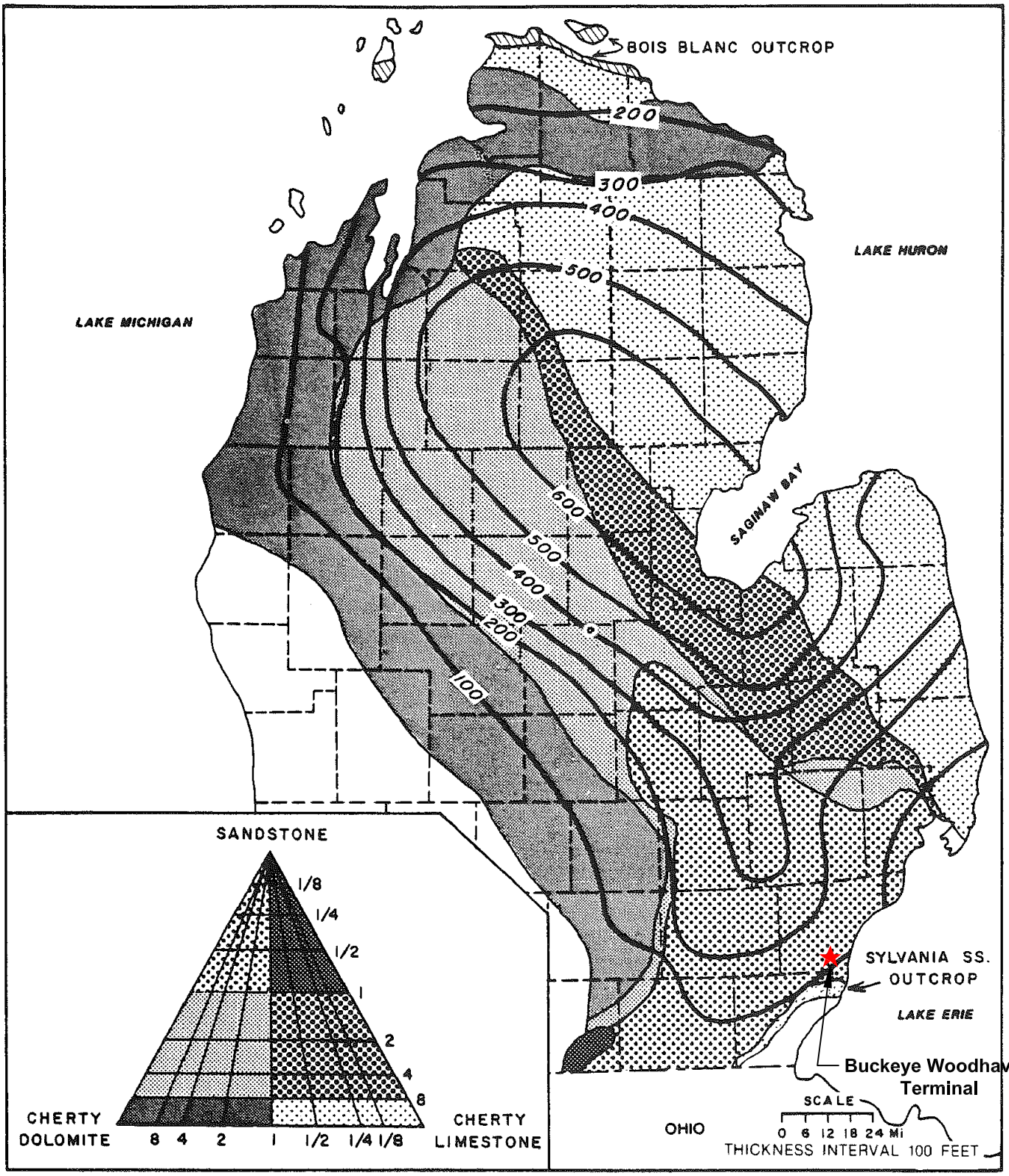


Source: Hydrogeology for Underground Injection Control in Michigan: Part I, 1981

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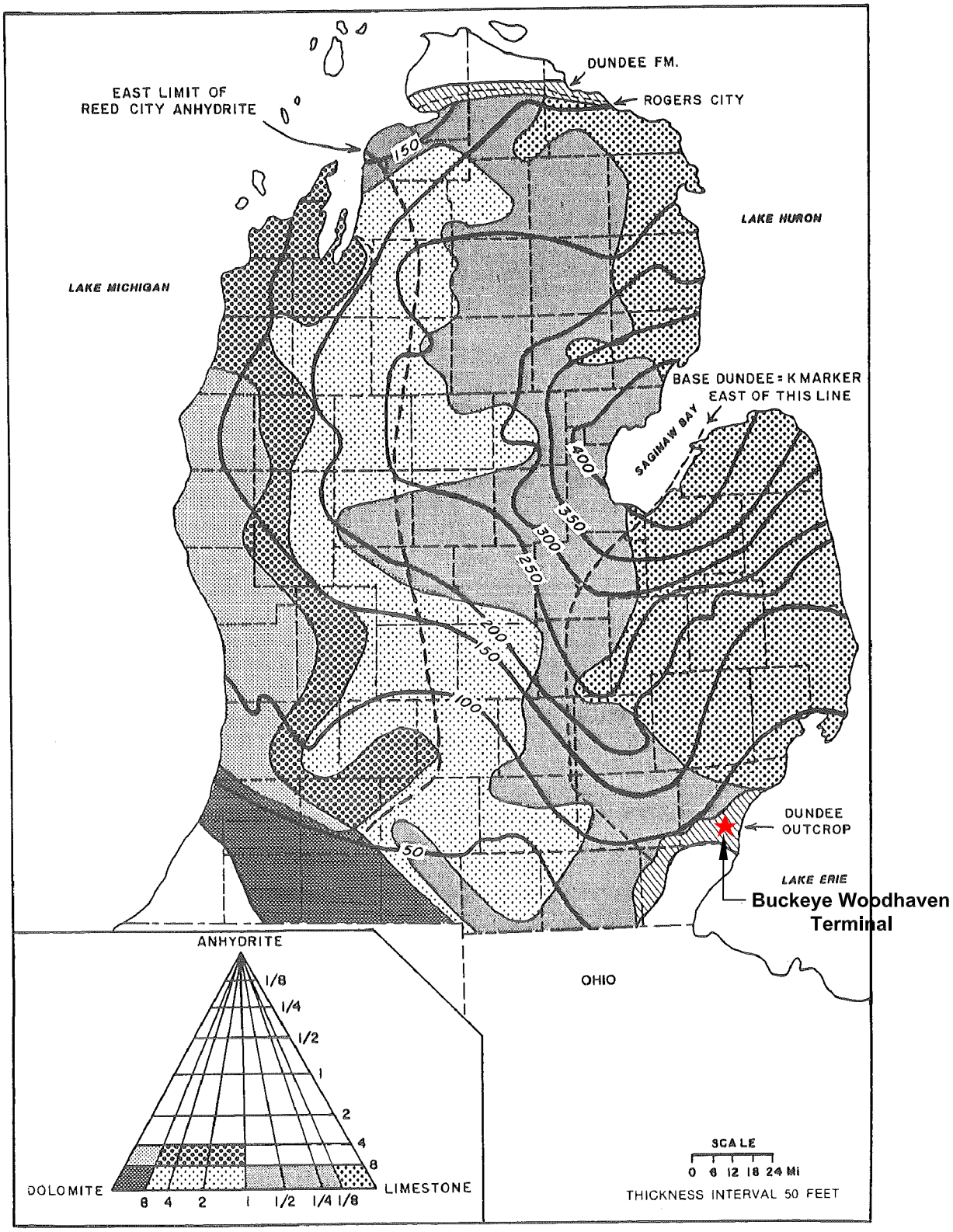
**WAYNE COUNTY, MICHIGAN**

**THICKNESS LITHOFACIES OF THE BOIS BLANC/SYLVANIA**

| Job No. 192065A | | | | | |
|---|---|---|---|---|---|
| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F–17 |




Source: Hydrogeology for Underground Injection Control in Michigan: Part I, 1981

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**BUCKEYE**
**WAYNE COUNTY, MICHIGAN**

**THICKNESS LITHOFACIES OF THE DUNDEE FORMATION**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F–18 |
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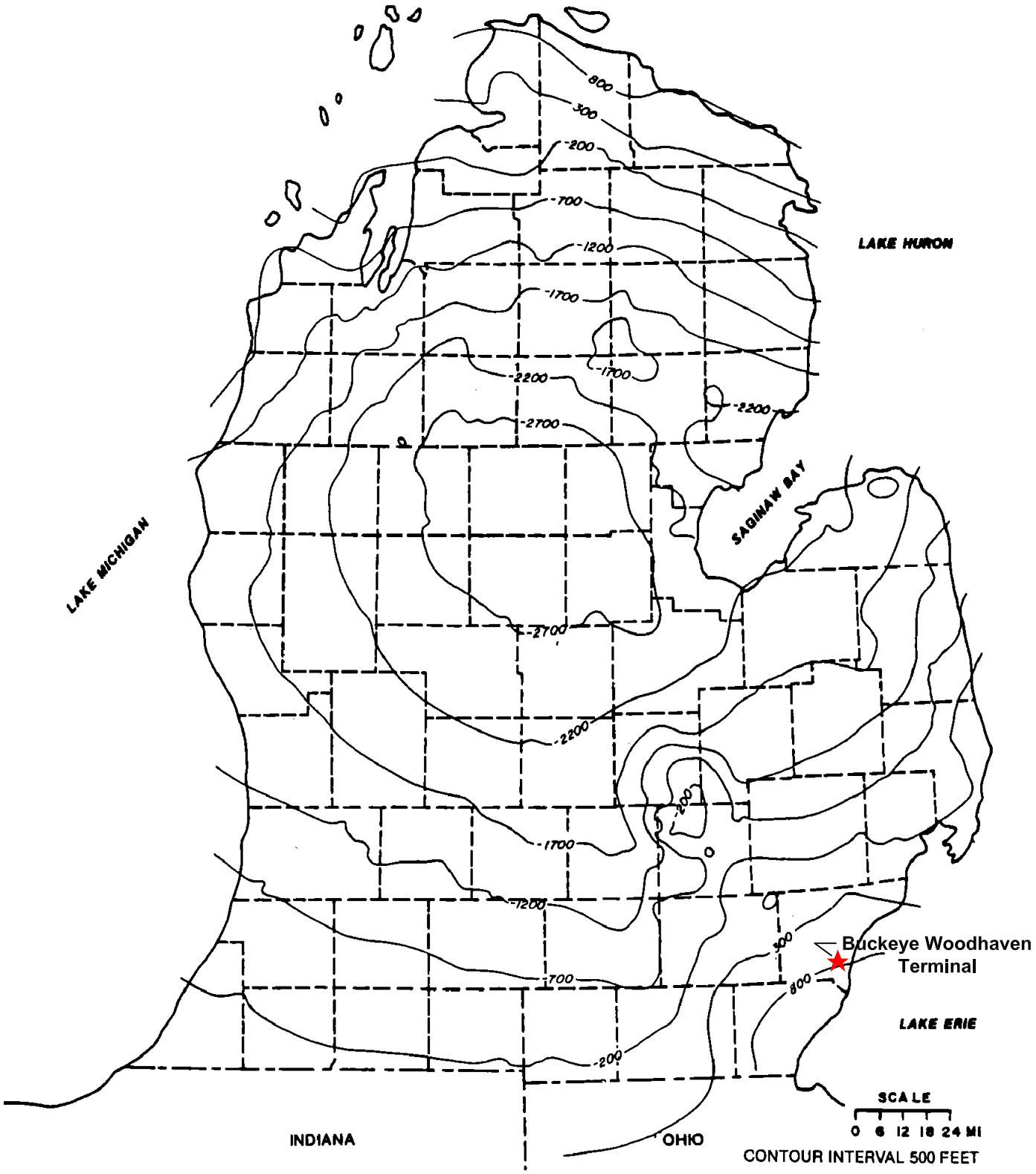


Source: Hydrogeology for Underground Injection Control in Michigan: Part I, 1981

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**STRUCTURE MAP OF THE DUNDEE FORMATION**

Job No. 192065A

| Design: CRB | Drawn: WDD | Checked: GM | Date: 05/25/2017 | Scale: NTS | Figure No. F-19 |
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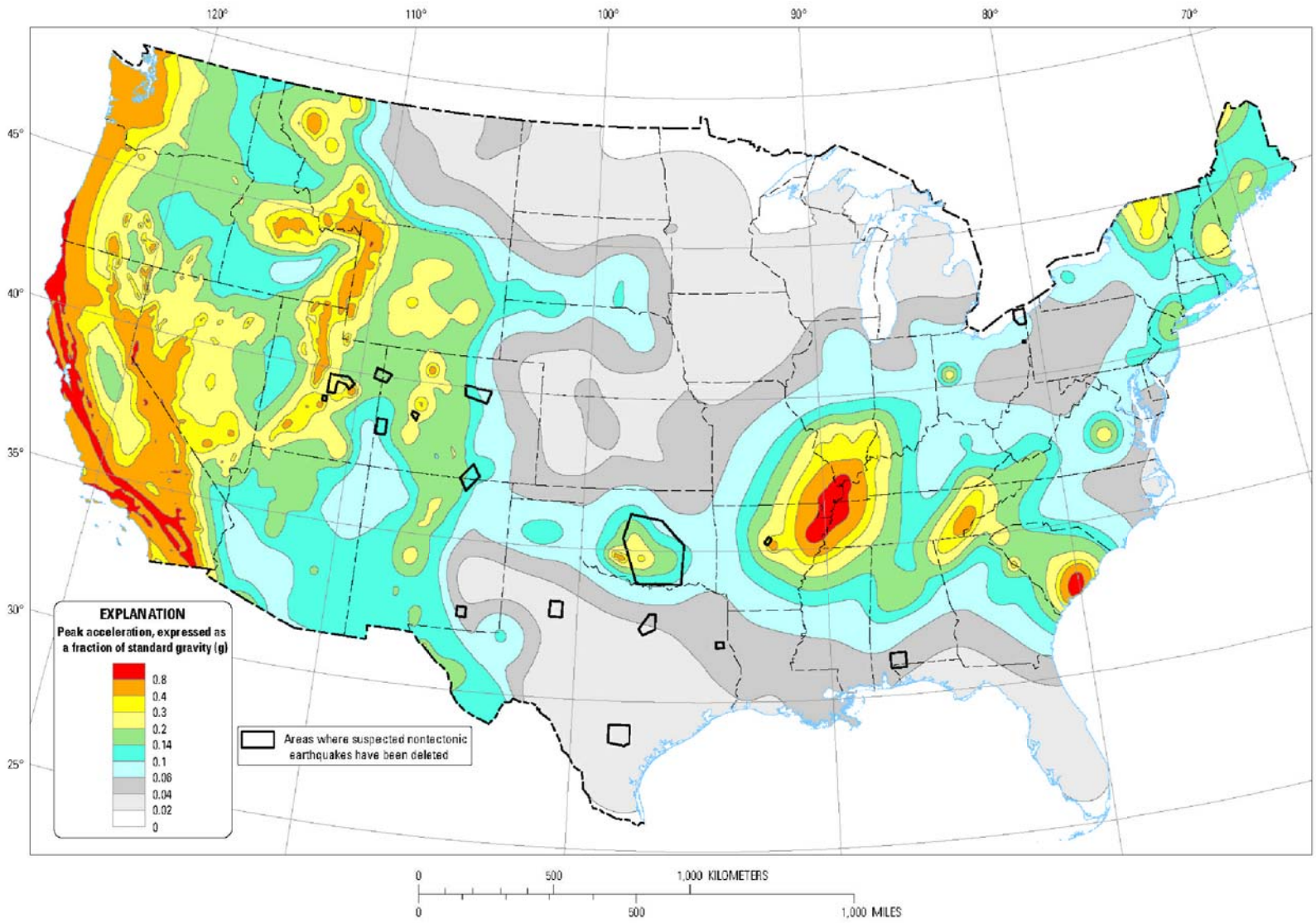


**Two-percent probability of exceedance in 50 years map of peak ground acceleration**

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**BUCKEYE**
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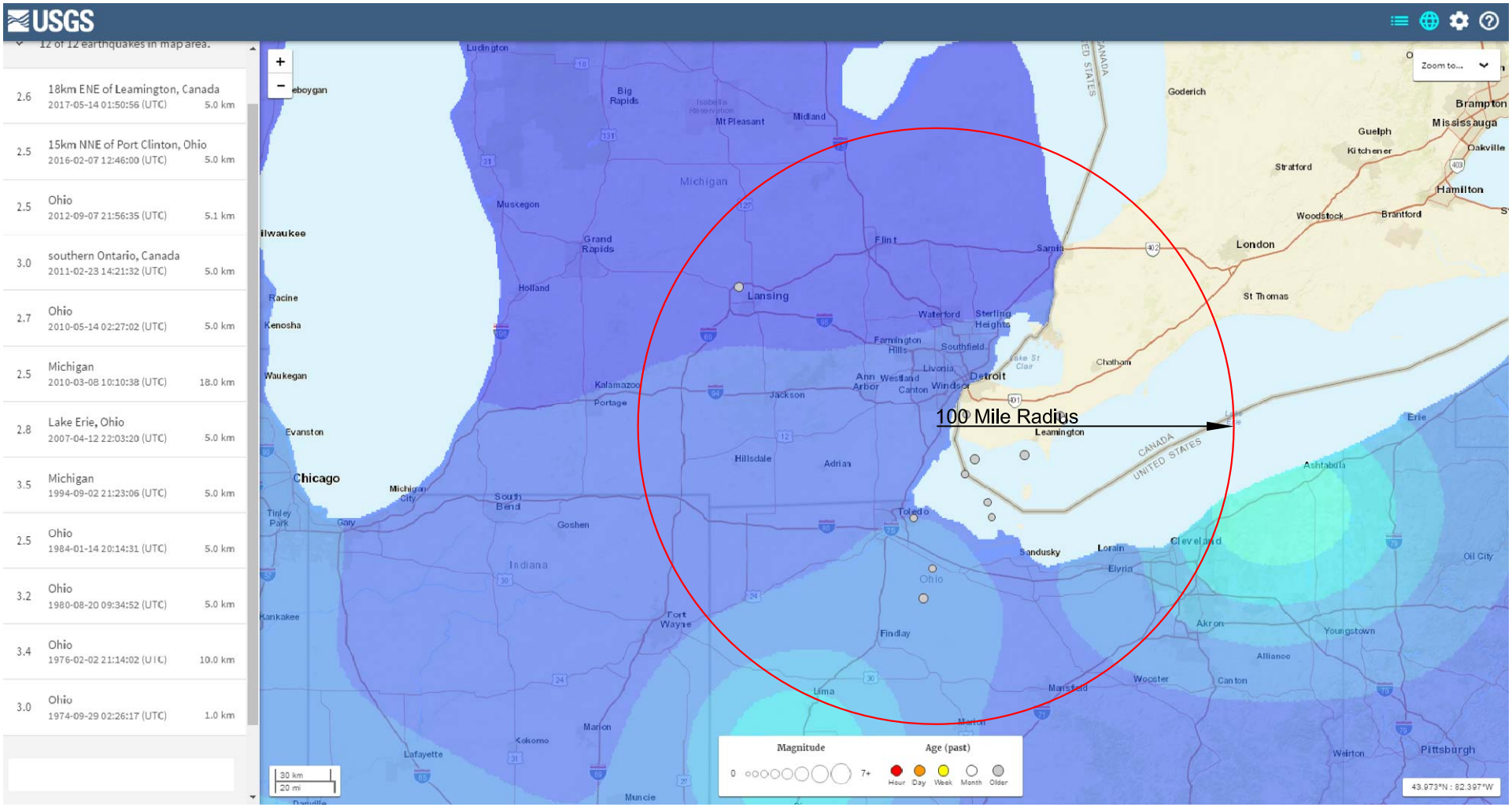
**SEISMIC RISK MAP**

Job No. 192065A

| Design: | Drawn: | Checked: | Date: | Scale: | Drawing No. |
|---|---|---|---|---|---|
| WDD | WDD | GM | 05/30/2017 | NTS | F–20 |




| Date and Time | Latitude | Longitude | Depth | Magnitude | Place | Type |
|---|---|---|---|---|---|---|
| 2017-05-14T01:50:56.250Z | 42.136 | -82.41 | 5 | 2.6 | 18km ENE of Leamington, Canada | earthquake |
| 2016-02-07T12:46:00.000Z | 41.6503 | -82.8969 | 5 | 2.5 | 15km NNE of Port Clinton, Ohio | earthquake |
| 2012-09-07T21:56:35.100Z | 41.864 | -83.076 | 5.1 | 2.5 | Ohio | earthquake |
| 2011-02-23T14:21:32.420Z | 42.157 | -82.43 | 5 | 3 | southern Ontario, Canada | earthquake |
| 2010-05-14T02:27:02.150Z | 41.39 | -83.3 | 5 | 2.7 | Ohio | earthquake |
| 2010-03-08T10:10:38.560Z | 42.163 | -83.07 | 18 | 2.5 | Michigan | earthquake |
| 2007-04-12T22:03:20.450Z | 41.722 | -82.924 | 5 | 2.8 | Lake Erie, Ohio | earthquake |
| 1994-09-02T21:23:06.520Z | 42.798 | -84.604 | 5 | 3.5 | Michigan | earthquake |
| 1984-01-14T20:14:31.290Z | 41.645 | -83.427 | 5 | 2.5 | Ohio | earthquake |
| 1980-08-20T09:34:52.300Z | 41.941 | -83.01 | 5 | 3.2 | Ohio | earthquake |
| 1976-02-02T21:14:02.000Z | 41.96 | -82.67 | 10 | 3.4 | Ohio | earthquake |
| 1974-09-29T02:26:17.100Z | 41.238 | -83.361 | 1 | 3 | Ohio | earthquake |

Note: Colors indicate US Hazard Risk, see Figure F-20 showing low risk

Source: USGS, 2017

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**BUCKEYE**
**WAYNE COUNTY, MICHIGAN**

## HISTORICAL EARTHQUAKES

Job No. 192065A

| Design: | WDD | Drawn: | WDD | Checked: | GM | Date: | 05/30/2017 | Scale: | NTS | Drawing No. | F–21 |
|---|---|---|---|---|---|---|---|---|---|---|---|

# G. DOES NOT APPLY TO CLASS III WELLS

# H. OPERATING DATA

## H.1 CAVERN WELLS

The four proposed wells and any future wells will be solution mined to create salt cavern space for future liquefied petroleum gas (LPG) storage. The underground solution mined salt caverns will be created by injecting fresh water into the well (completed in the B Evaporate Unit of the Salina Group) and producing brine generated from the solution mining process. The brine will be disposed of via US EPA UIC Class I brine disposal wells (applied for with a separate permit application). Diesel will be injected into the well's outer annulus, as is typical with this type of well application, to establish and maintain a diesel-brine interface as a buffer between the final cemented casing string (production casing shoe) and the solution mining process, and to also control the shape of the cavern as it is developed.

The open-hole interval across the B Evaporate Unit of the Salina Group is accessed by the well with three casing strings; the inner hanging string (5 ½" O.D.), the outer hanging string (8 5/8"), and the production casing (13 3/8"). The caverns will be developed with two modes of leaching; direct leaching and reverse leaching. During direct leaching, fresh water is injected into the inner hanging string and brine is returned from the outer hanging string at approximately equal rates. In reverse leaching, fresh water is injected into the outer hanging string and brine is returned from the inner hanging string. A diesel pad is maintained below the production casing in both scenarios. The two modes of leaching are used to control the cavern shape.

The following proposed fresh water injection operating data applies to each well:

Maximum Daily Rate – 1,800,000 gallons per day (gpd) (1250 gallons per minute [gpm]) per well

Average Daily Rate – 1,440,000 gpd (1000 gpm) per well

Outer Annulus (13 3/8" by 8 5/8") Fluid – Diesel

Injection Fluid – Fresh water produced from water wells or the Detroit River

Based on the following calculations, the requested maximum surface injection pressure (MASIP) for fresh water is as follows:

[(0.80 pound per square inch per foot [psi/ft] – (0.433 psi/ft x specific gravity)) x depth] – 14.7 pounds per square inch gauge (psig)

[(0.80 psi/ft – (0.433 psi/ft x 1.00)) x 1,015 ft] – 14.7 psi = 357 psig

Where: Specific Gravity = 1.00

Production Casing Setting Depth = 1,015 feet

Fracture Gradient > 0.80 psi/ft

Maximum Surface Injection Pressure (MASIP) = 357 psig

Average Surface Injection Pressure = 240 psig

## H.2 BRINE DISPOSAL

Brine waste water will be injected into 5 onsite injection wells permitted under a separate application. The proposed injectate will consist of brine from the solution mining of the Salina Formation to create storage caverns. The specific gravity of the brine is expected to range from 1.00 to 1.21. The injectate pH will be approximately 7.24 at 70 F

The estimated average injection rate is: 165 gpm for each well.

The estimated average injection volume is: 7,128,000 gallons per month (30 days)

The requested maximum injection rate is: 215 gpm

The requested maximum injection volume is: 9,288,000 gallons per month (30 days)

The estimated average injection rate is based on measured injection rates in nearby wells injecting into the Mt. Simon Formation.

## H.3 WASTE ANALYSIS

An estimation of wastewater concentrations based on typical brine waste is provided in Table H-1 The Waste Analysis Plan is provided in the Class I permit application.

# List of Tables in Attachment H

Table H-1 Estimated Wastestream Analysis for Proposed Monitored Parameters

**Table H-1 Estimated Wastestream Analysis for Proposed Monitored Parameters**

| PARAMETER | UNITS | READING |
|---|---|---|
| pH | | 7.24 |
| Resistivity | ohm-meter | 0.046 |
| Temperature | °F | 70 |
| **ANIONS** | | |
| Chlorides | mg/L | 193,000 |
| Sulfates | mg/L | 2,989 |
| Sulfides | mg/L | ND < 1 |
| Carbonates | mg/L | ND < 10 |
| Bicarbonates | mg/L | 150 |
| **CATIONS** | | |
| Sodium | mg/L | 112,500 |
| Calcium | mg/L | 1,940 |
| Magnesium | mg/L | 199 |
| Barium | mg/L | ND < 1 |
| Iron (total) | mg/L | ND < 1 |

# I. FORMATION TESTING PROGRAM

The formation testing program is further discussed in Attachment L (Appendix B).

## I.1 PROCEDURES TO VERIFY DEPTH OF THE LOWERMOST USDW, IF NEEDED

The base of the USDW within the AOR is estimated to be at 350 feet bgs at the base of the Sylvania Sand. The base of the USDW will be verified in the field by the onsite mudlogger.

At each proposed well, the surface hole will drilled to 470 feet (120 feet below the base of the USDW) to allow for geophysical logging to be conducted across the base of the USDW. The logging to be conducted is discussed further in Attachment L. The resistivity of the formation water will be calculated using the resistivity and porosity values recorded on the logs.

No open-hole testing is planned to sample the lowermost USDW during the installation of the cavern wells.

## I.2 COLLECTION AND ANALYSIS OF CORES

Coring of the well(s) is discussed further in Attachment L. Full-hole cores will be obtained in specific intervals during the drilling of future wells as needed.

Physical core analysis will include lithologic descriptions. Rock density, porosity, and air permeability will be determined on selected core samples. In addition, permeability to both waste and brine will be determined on selected plug samples taken from obtained core. Both horizontal and vertical permeability will be measured. Brine and waste permeability measurements will be run utilizing methods with a high range of accuracy ($10^3$ to $10^{-6}$ md).

Testing for mechanical rock properties will include determinations of Young's Modulus, Poisson's Ratio, tensile strength, and bulk compressibility. Selected samples from each core will be tested. Injectate compatibility testing will be conducted with fluids and matrix material derived from the injection zone.

# J. STIMULATION PROCEDURE

No stimulation will be required for the salt cavern wells.

# K. INJECTION PROCEDURE

## K.1 CAVERN LEACHING

The cavern leaching program is further discussed in Attachment L.

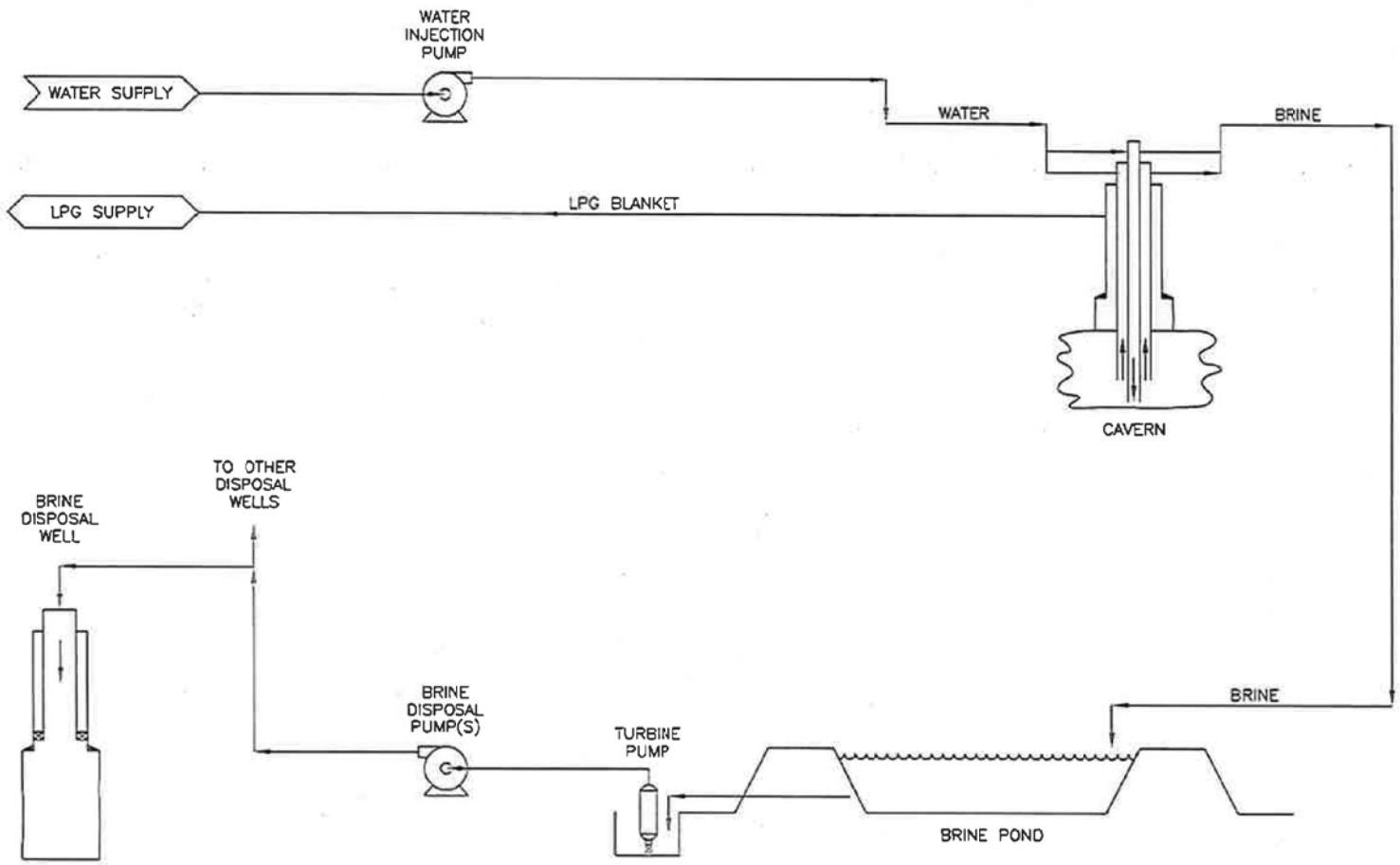
The cavern solution mining system will be composed of two smaller connected systems: 1) the water injection system; and 2) the brine disposal system. The brine disposal system incorporates solids separation, a booster pump to pressurize the brine, a fine particle filtration system, brine disposal pumps, a disposal well, and a well annulus monitoring system. This leaching system will not be a part of the facility until future cavern development starts.

## K.2 BRINE WASTE STREAM FLOW

Brine will be injected into the brine disposal wells with multiple, variable speed positive displacement injection pumps connected in parallel. A sample tap will be located on the injectate flow line before the injection pumps. Figure K-1 provides a simplified schematic diagram showing the flow of the injectate through storage, filtration and pumps to the injection well.

# List of Figures in Attachment K

Figure K-1 Schematic Diagram of Injectate Flow

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## SIMPLIFIED SCHEMATIC DIAGRAM OF INJECTATE FLOW

| | | | | | |
|---|---|---|---|---|---|
| Job No. 192065A | | | | | |
| Design: WDD | Drawn: WDD | Checked: GM | Date: 08/21/17 | Scale: NTS | Drawing No. K–1 |

# L. CONSTRUCTION PROCEDURES

These new Class III wells will be cased and cemented to prevent the migration of fluids into or between underground sources of drinking water. The casing and cement used in the construction of each newly drilled well are designed for the life expectancy of the well.

## L.1 CAVERN LEACHING

The cavern well construction configuration during leaching is provided in Attachment M (Figure M-1). The well is estimated to take approximately 240 leaching days and 289 total days (9½ months) to leach a single cavern at a rate of 500 gpm (Table L-1). This leaching duration assumes 49 days (6 to 7 weeks) for interventions (e.g., workovers to change hanging string depths and sonar surveys) and system downtime. During development, it is likely that a single cavern will be leached (e.g., after the first two caverns have been leached). In this case, it is possible to leach a single cavern at a maximum rate of 750 gpm (Table L-1).

## L.2 CAVERN WELL CONSTRUCTION PROCEDURES

The target storage interval is the B Evaporite Unit of the Salina Group (approximately 940 to 1,150 feet bgs). The initial design maximum cavern diameter is 250 feet. The Bois Blank, Bass Island, and Salina Group (units overlying B Evaporate Unit) constitute the confining zone for the solution mining well (approximately 350 to 940 feet bgs). The target combined cavern volume is approximately 1,000,000 bbls. Preliminary solution-mining simulations indicate a final cavern volume of about 315,000 bbls given a salt thickness of 140 feet. The planned roof for the storage cavern is 30 feet below the top of salt.

The construction procedures discussed in the drilling program Buckeye Woodhaven cavern wells is included as Appendix B. The proposed casing program during the leaching procedures is show in Figure L-1 and the proposed well construction schematic is included in Attachment M. The estimated timetable for drilling, logging, and formation testing is provided on Table L-2.

Injection wells to be used to dispose of the brine waste will be injecting into the Eau Claire Formation and the Mt. Simon Sandstone (approximately 3,470 to 3,730 feet bgs). The Utica shale, the Trenton Limestone, and the Trenton/Black River Dolomite constitute the confining zone (2,060 to 3,470 feet bgs). The construction of these wells is discussed in a separate permit application.

### *L.2.1 PROPOSED OPEN-HOLE AND CASED-HOLE LOGS*

The proposed logging program is detailed in Appendix B. Multiple logging runs in the open hole may be required to evaluate the potential intervals available for injection.

The well(s) will be tested to demonstrate mechanical integrity as required by the guidelines of Region 5.

All tests will be conducted according to the most current edition of EPA Region 5 guidelines for mechanical integrity testing.

### *L.2.2 PROPOSED MUD PROGRAM*

The proposed mud program is discussed in Appendix B.

# List of Tables in Attachment L

Table L-1 Leaching Program

Table L-2 Estimated Timetable for Field Operations (Drilling, Logging, and Testing)

**Table L-1 Leaching Program**

| MINING DAYS | OPEN VOLUME VARRELS | FLOW RATE (GPM) | BLANKET DEPTH (FT) | INJECTION DEPTH (FT) | PRODUCTION DEPTH (FT) | INSOLUBLE DEPTH (FT) |
|---|---|---|---|---|---|---|
| 500 GPM Fresh Water Injection Rate | | | | | | |
| 40 | 14,000 | 200 | 1,070 | 1,040 | 1,070 | 1,112 |
| 80 | 51,000 | 500 | 1,045 | 1,040 | 1,070 | 1,106 |
| 120 | 110,000 | 500 | 1,040 | 1,070 | 1,101 | 1,102 |
| 160 | 177,000 | 500 | 1,035 | 1,070 | 1,096 | 1,098 |
| 200 | 245,000 | 500 | 1,035 | 1,070 | 1,091 | 1,095 |
| 240 | 315,000 | 500 | 1,030 | 1,070 | 1,086 | 1,093 |
| 750 GPM Fresh Water Injection Rate | | | | | | |
| 35 | 12,000 | 200 | 1,070 | 1,040 | 1,070 | 1,113 |
| 70 | 50,000 | 750 | 1,045 | 1,040 | 1,070 | 1,107 |
| 106 | 114,000 | 750 | 1,040 | 1,070 | 1,101 | 1,102 |
| 142 | 189,000 | 750 | 1,035 | 1,070 | 1,096 | 1,098 |
| 178 | 269,000 | 750 | 1,035 | 1,070 | 1,091 | 1,095 |
| 210 | 336,000 | 750 | 1,030 | 1,070 | 1,086 | 1,093 |

**Notes:**

gpm – gallons per minute
FT – feet

## Table L-2 Estimated Timetable for Field Operations (Drilling, Logging, and Testing)

| | Week | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Days | 7 | 14 | 21 | 28 | 35 | 42 | 49 | 56 | 63 | 70 | 77 | 84 |
| | Task | | | | | | | | | | | | |
| 1 | Build Location, Drive Conductor and Rig Up | | | | | | | | | | | | |
| 2 | Drill, Log, Case and Cement Surface Casing to 420' (20" Casing 26" Hole) | | | | | | | | | | | | |
| 3 | Drill, Log Case and Cement Production Casing to 1,015'TVD / (13-3/8" Casing in 17-1/2" Hole) | | | | | | | | | | | | |
| 4 | Drill, Core Salt, Log, to total depth of 1180'TVD / Run 8-5/8" Hanging String | | | | | | | | | | | | |
| 5 | Run 5-1/2" Hanging String | | | | | | | | | | | | |
| 6 | Conduct MIT pressure test | | | | | | | | | | | | |

**NOTES:**
TVD - Total Vertical Depth
MD - Measured Depth
MIT - Mechanical Integrity Test

# M. CONSTRUCTION DETAILS

## M.1 PROPOSED CAVERN WELL CONSTRUCTION

A schematic of the proposed cavern well casing program to be applied to each of the wells, is included as Figure M-1. Installation and construction of the well(s) is described in Attachment L. The casing sizes were chosen to minimize frictional losses while leaching at a rate of 500 gpm and withdrawing product at 2,100 gpm (3,000 bph).

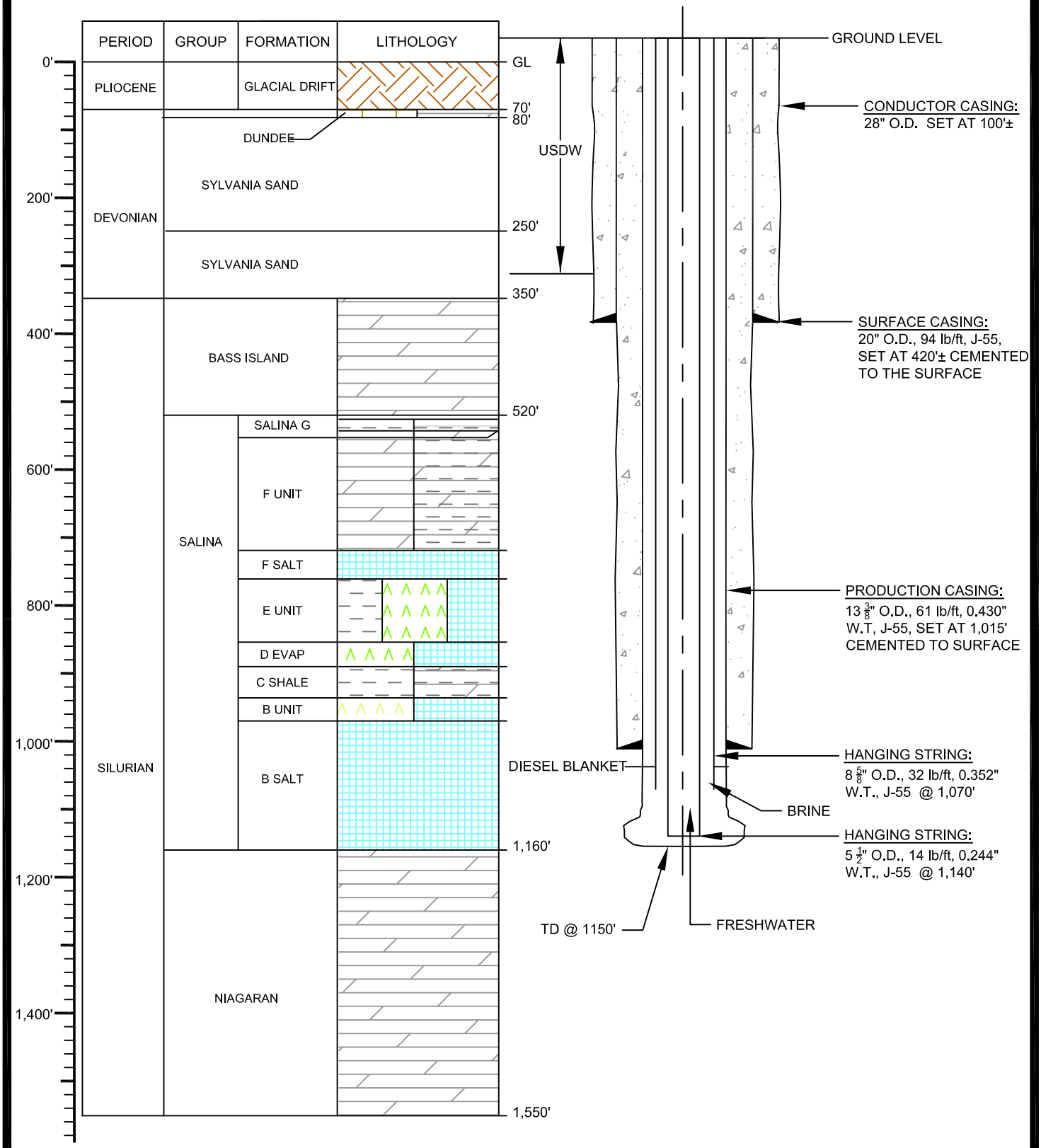
## M.2 CAVERN ARRANGEMENT

The conceptual cavern arrangement is based on an initial maximum diameter of 250 feet and cavern spacing of 450 feet which results in an initial cavern-to-cavern separation of 200 feet. Currently 4 cavern wells are proposed.

# List of Figures for Attachment M

Figure M-1 Proposed Casing Program and Stratigraphy – Leaching Operations

Figure M-2 Proposed Wellhead Schematic




Note: Top of formation depths are estimated based on surrounding geology information.

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**WAYNE COUNTY, MICHIGAN**

**PROPOSED CASING PROGRAM - LEACHING OPERATIONS**

Job No. 192065A

| Design: WDD | Drawn: WDD | Checked: GM | Date: 11/14/17 | Scale: 1"=100' | Drawing No. M-1 |
|---|---|---|---|---|---|

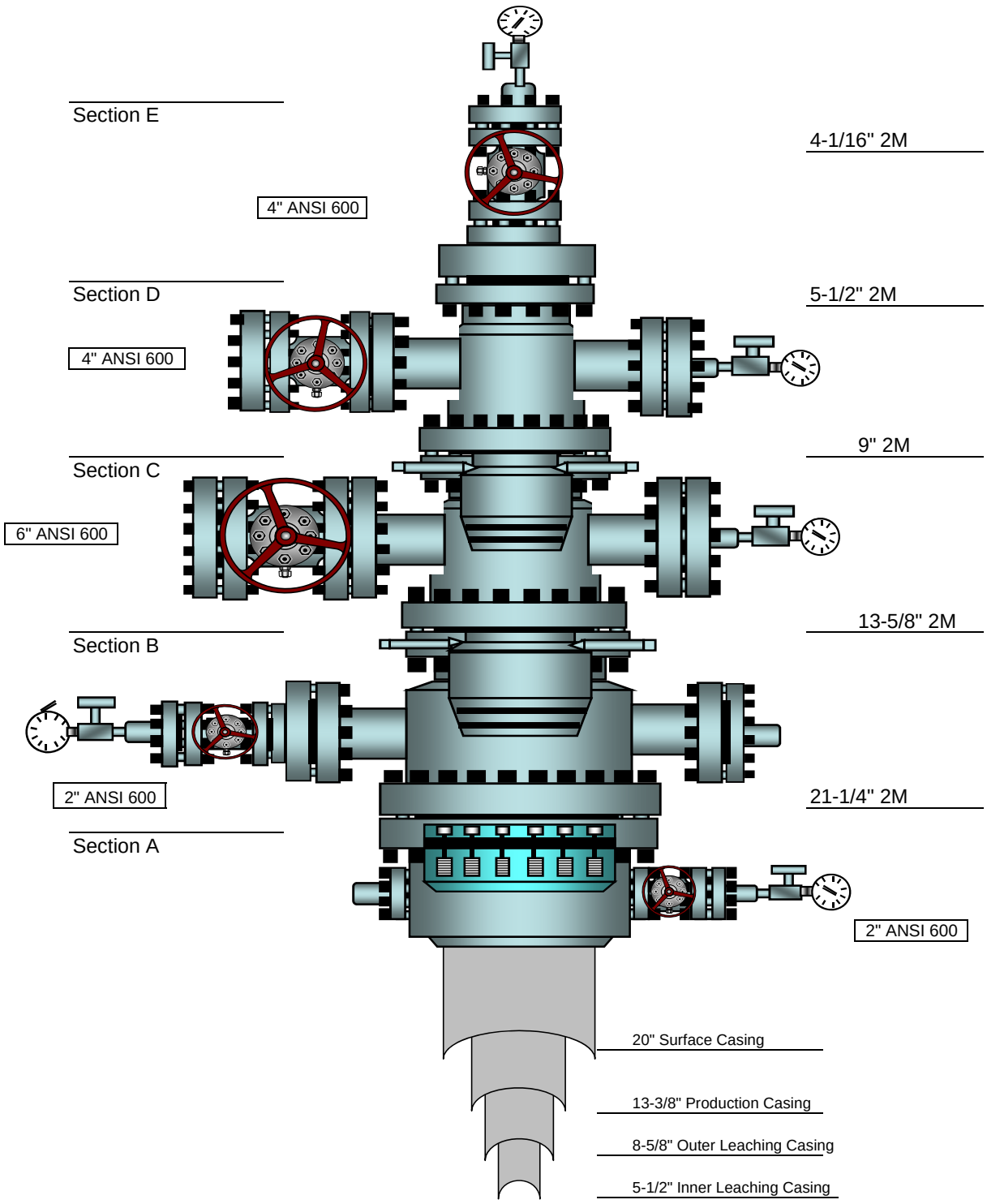



**FIGURE M-2**

**PROPOSED WELLHEAD SCHEMATIC, BUCKEYE WOODHAVEN**

| DRAWN: TJJ | CHECKED: JDB | DATE: 9/19/17 | SCALE: NONE | JOB NO. 192065A |
|---|---|---|---|---|

# N. CHANGES IN INJECTED FLUID

The B Evaporate Unit of the Salina Group is impermeable and has no native fluid. Therefore, there will be no changes in pressure or native fluid displacement. A void in the salt formation will be created through the solution mining process of injecting fresh water into one hanging string and producing brine through the other hanging string. The specific gravity of the brine produced will range from 1.0 to 1.21 and is a function of the several factors, including the rate of fresh water injection and the current size of the cavern. Insoluble materials in the salt formation will either settle at the bottom of the cavern or be filtered at surface.

# O. PLANS FOR WELL FAILURES

In the event a failure occurs to any one of the cavern wells, the well will be shut-in immediately to prevent migration of fluids into any USDW. See Attachment P, Well Monitoring Program, for description of method used to monitor for well failure. If it is determined that the well has lost mechanical integrity, the necessary measures will be taken to assess the cause(s) of lost mechanical integrity, and a work plan for restoring mechanical integrity will be developed and submitted to the EPA Region 5, for approval. Once regulatory approval has been obtained, the work plan will be implemented to restore mechanical integrity to the well. When mechanical integrity of the well can be demonstrated to EPA Region 5, regulatory approval to restore operation will be obtained prior to resuming storage. A final report documenting the well work performed and mechanical tests run will be prepared and submitted to EPA Region 5.

# P. MONITORING PROGRAM

## P.1 INSTURMENTATION AND CONTROLS

Essential processes and process equipment will be provided with monitoring and control instrumentation. Such instrumentation will enable operators to monitor and control flow rates for fresh water and brine, pressures, temperature, density and levels in the pond and process equipment.

Considering the close location of almost all process equipment, the instruments will be hard wired to the operator's PLC and Human Machine Interface (HMI) display control system in the leach plant control room. Initial discussions for this project revealed that one or two PLCs used for the leaching and product pumps will be able to integrate with Buckeye's current control system. Wireless instrumentation will be considered for remotely located process equipment.

An extensive gas and fire detection and alarm/shutdown systems will be designed and installed for the product-handling facilities, including product pumps; brine ponds; product storage well; and all areas determined as National Electrical Code Class 1, Division 2, Groups C and D hazardous locations during the area classification study. All gas and fire detection systems will be incorporated in the design and PLC/HMI programming for the product-handling facilities.

## P.2 WASTE ANALYSIS PLAN

The waste analysis plan is intended for the injection wells to be used for brine disposal and is provided as part of the Class I permit application.

# Q. PLUGGING AND ABANDONMENT PLAN

A completed EPA Plugging and Abandonment Plan (EPA Form 7540-14), including a detailed estimate of plugging and abandonment costs, has been included as Appendix C. This cost estimate may be used for each of the wells due to the expected similarity of design and construction. The form was completed by WSP, an independent firm.

The following general closure procedure will be used to permanently plug and abandon the cavern wells. This program is intended as a guideline for the work, since the actual conditions encountered during the work will dictate the appropriate action to be taken. Any significant deviation from the proposed program will require prior approval by WSP Project Manager and Buckeye. Figure Q-1 illustrates the proposed plugging and abandonment for the cavern well(s). The objectives of this program are:

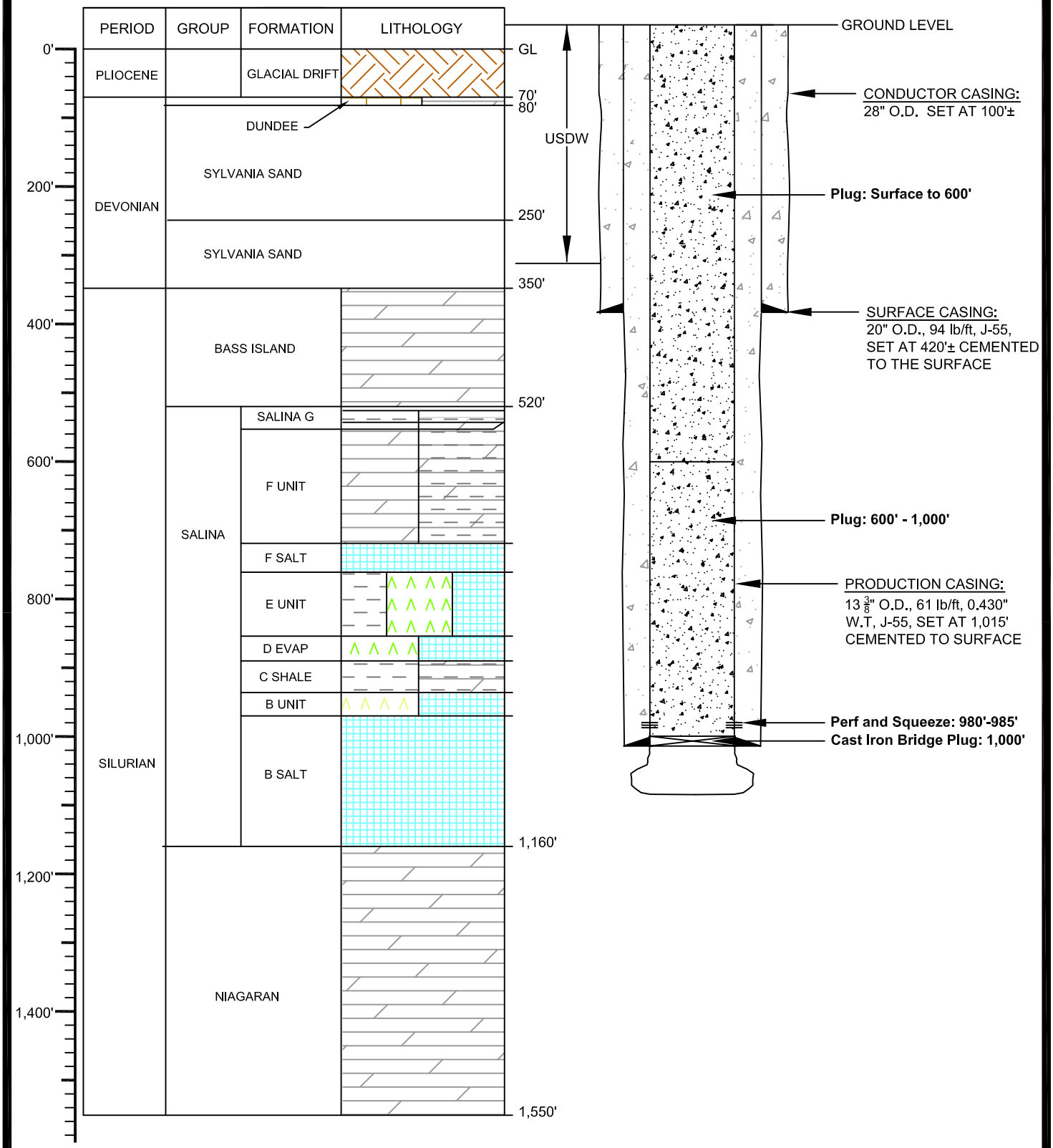
- Run a final sonar survey on the well
- Plug and abandon the well

The procedure for plugging and abandonment of the storage well is:

1. Bleed down well and flare off any residual product vapors.
2. WSP job supervisor and contractor personnel arrive at the facility and complete safety orientation.
3. Move in and rig up workover rig.
4. Nipple up and function test Blowout Preventer (BOP).
5. Rig up casing crew and remove the 8-5/8", 32 lb/ft, hanging string from the well.
6. Run 13-3/8" 61 lb/ft casing scraper from surface to 1015'.
7. Rig up wireline and pressure control equipment.
8. Make a gauge run.
9. Run sonar survey.
10. Set cast iron bridge plug at 1000'.
11. Perforate the 13-3/8" casing from 980-985' with 4 shots/ft at 90° phasing.
    Note: Watch for return of product that may have been trapped behind casing.
12. Rig down wireline and pressure control.
13. Run in hole with work string to 1000', tag bridge plug and pick up 1'.
14. Rig up cementing equipment.
15. Spot a balanced salt saturated cement plug from 1000-600'.
16. Apply 300 psi at the wellhead for 5 minutes to push cement into perforations. Release pressure.
17. Pick up work string to 600'.
18. Cement to surface using freshwater cement.
19. Pull out of hole.
20. Wait on cement overnight.
21. Check top of cement and top off to just below surface if necessary.
22. Rig down workover rig.
23. Excavate around the well and cut off the wellhead 2-3' below grade.
24. Weld cap on the well and mark with MDEQ permit number.
25. Backfill the excavation and restore location.
26. Document P&A using MDEQ Form EQP 7200-08 Record of Well Plugging.

# List of Figures for Attachment Q

Figure Q-1 Proposed Cavern Well Plugging and Abandonment Schematic




Note: Top of formation depths are estimated based on surrounding geology information.

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**WAYNE COUNTY, MICHIGAN**

**PROPOSED PLUG & ABANDON CAVERN WELL CONSTRUCTION AND STRATIGRAPHY**

Job No. 192065A

| Design: WDD | Drawn: WDD | Checked: GM | Date: 10/03/2017 | Scale: 1"=100' | Drawing No. Q-1 |
|---|---|---|---|---|---|

# R. NECESSARY RESOURCES

See attached documentation.

By consent of the FOIA requestor, private financial information specific to Buckeye Terminals LLC, contained on Pages 85-86, have been determined to be not relevant to the information request, and have been partially redacted.

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Regional Administrator
United States Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, IL 60605-3590

I am the chief financial officer of Buckeye Partners, L.P., One Greenway Plaza Ste 600, Houston, Texas 77046. This letter is in support of this firm's use of the financial test to demonstrate financial assurance, as specified in subpart F of 40 CFR part 144.

1. This firm is the owner or operator of the following injection wells for which financial assurance for plugging and abandonment is demonstrated through the financial test specified in subpart F of 40 CFR part 144. The current plugging and abandonment cost estimate covered by the test is shown for each injection well.

| Well Name | EPA Identification No. | Address | Plugging and Abandonment Cost Estimate |
|---|---|---|---|
| BDW-1 | Permit Pending | 20755 West Road, Woodhaven, MI, 48483 | $109,895 |
| BDW-2 | Permit Pending | 20755 West Road, Woodhaven, MI, 48483 | $112,645 |
| BDW-3 | Permit Pending | 20755 West Road, Woodhaven, MI, 48483 | $112,645 |
| BDW-4 | Permit Pending | 20755 West Road, Woodhaven, MI, 48483 | $109,895 |
| BDW-5 | Permit Pending | 20755 West Road, Woodhaven, MI, 48483 | $112,645 |
| CW-1 | Permit Pending | 20755 West Road, Woodhaven, MI, 48483 | $224,050 |
| CW-2 | Permit Pending | 20755 West Road, Woodhaven, MI, 48483 | $224,050 |
| CW-3 | Permit Pending | 20755 West Road, Woodhaven, MI, 48483 | $224,050 |
| CW-4 | Permit Pending | 20755 West Road, Woodhaven, MI, 48483 | $224,050 |
| | | **Total:** | $1,453,925 |

2. This firm guarantees, through the corporate guarantee specified in subpart F of 40 CFR part 144, the plugging and abandonment of the following injection wells owned or operated by subsidiaries of this firm. The current cost estimate for plugging and abandonment so guaranteed is shown for each injection well:

NOT APPLICABLE

3. In States where EPA is not administering the financial requirements of subpart F of 40 CFR part 144, this firm, as owner or operator or guarantor, is demonstrating financial assurance for the plugging and abandonment of the following injection wells through the use of a test equivalent or substantially equivalent to the financial test specified in subpart F of 40 CFR part 144. The current plugging and abandonment cost estimate covered by such a test is shown for each injection well:

NOT APPLICABLE

4. This firm is the owner or operator of the following injection wells for which financial assurance for plugging and abandonment is not demonstrated either to EPA or a State through the financial test or any other financial assurance mechanism specified in subpart F of 40 CFR part 144 or equivalent or substantially equivalent State mechanisms. The current plugging and abandonment cost estimate not covered by such financial assurance is shown for each injection well:

None.

This firm is required to file a Form 10K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this firm ends on December 2017. The figures for the following items marked with an asterisk are derived from this firm's independently audited, yearend financial statements for the latest completed fiscal year, ended 2016.

ALTERNATIVE I

| | | |
|---|---|---|
| 1. | (a) Current plugging and abandonment cost | [redacted] |
| | (b) Sum of the company's financial responsibilities under 40 CFR Parts 264 and 265, Subpart H, currently met using the financial test or corporate guarantee | |
| | (c) Total of lines a and b | |
| *2. | Total liabilities [if any portion of the plugging and abandonment cost is included in total liabilities, you may deduct the amount of that portion from this line and add that amount to lines 3 and 4] | |
| *3. | Tangible net worth | |
| *4. | Net worth | |
| *5. | Current assets | |
| *6. | Current liabilities | |
| *7. | Net working capital [line 5 minus line 6] | |
| *8. | The sum of net income plus depreciation, depletion and amortization | |
| *9. | Total assets in U.S. (required only if less than 90% of firm's assets are located in U.S.) | |

| | | Yes | No |
|---|---|---|---|
| 10. | Is line 3 at least $10 million? | [redacted] | |
| 11. | Is line 3 at least 6 times line 1(c)? | | |
| 12. | Is line 7 at least 6 times line 1(c)? | | |
| *13. | Are at least 90% of firm's assets located in the U.S.? If not, complete line 14 | | |
| 14. | Is line 9 at least 6 times line 1(c)? | | |

| | | | |
|---|---|---|---|
| 15. | Is line 2 divided by line 4 less than 2.0? | [redacted] | |
| 16. | Is line 8 divided by line 2 greater than 0.1? | | |
| 17. | Is line 5 divided by line 6 greater than 1.5? | | |

ALTERNATIVE II – NOT APPLICABLE – Using Alternative I for financials assurance testing

| | | |
|---|---|---|
| 1. | (a) Current plugging and abandonment cost | |
| | (b) Sum of the company's financial responsibilities under 40 CFR Parts 264 and 265, Subpart H, currently met using the financial test or corporate guarantee | |
| | (c) Total of lines a and b | |
| 2. | Current bond rating of most recent issuance of this firm and name of rating service | |
| 3. | Date of issuance of bond | |
| 4. | Date of maturity of bond | |
| *5. | Tangible net worth [if any portion of the plugging and abandonment cost estimate is included in ''total liabilities'' on your firm's financial statements, you may add the amount of that portion to this line] | |
| *6. | Total assets in U.S. (required only if less than 90% of firm's assets are located in U.S.) | |

| | | **Yes** | **No** |
|---|---|---|---|
| 7. | Is line 5 at least $10 million? | | |
| 8. | Is line 5 at least 6 times line 1(c)? | | |
| *9. | Are at least 90% of the firm's assets located in the U.S.? If not, complete line 10 | | |
| 10. | 10. Is line 6 at least 6 times line 1(c)? | | |

I hereby certify that the wording of this letter is identical to the wording specified in 40 CFR 144.70(f) as such regulations were constituted on the date shown immediately below.

BUCKEYE PARTNERS, L.P.
By Buckeye GP LLC, its sole general partner

Keith E. St.Clair
Executive Vice President & Chief Financial Officer

December 15, 2017

**Deloitte.**

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## INDEPENDENT ACCOUNTANTS' REPORT ON APPLYING AGREED-UPON PROCEDURES

The Board of Directors of Buckeye GP LLC and the
Partners of Buckeye Partners, L.P.

We have performed the procedures included in the Code of Federal Regulations (CFR) Title 40, Part 144 Section 63 (40 CFR 144.63) which were agreed to by the Environmental Protection Agency and Buckeye Partners, L.P., related to Buckeye Partners, L.P.'s compliance with the financial test option as of December 31, 2016, included in the accompanying letter dated December 15, 2017, from Keith E. St.Clair of Buckeye Partners, L.P. Buckeye Partners, L.P.'s management is responsible for its compliance with those requirements. The sufficiency of these procedures is solely the responsibility of those parties specified in this report. Consequently, we make no representations regarding the sufficiency of the procedures enumerated below either for the purpose for which this report has been requested or for any other purpose.

The procedures that we performed and related findings are as follows:

1. We compared the amounts included in items "Total Liabilities", "Current Assets", and "Current Liabilities" under the caption Alternative I in the letter referred to above with the corresponding amounts in the audited financial statements of Buckeye Partners, L.P. as of and for the year ended December 31, 2016, on which we have issued our report dated February 24, 2017, and noted that such amounts were in agreement, after rounding.

2. We recomputed from, or reconciled to, the financial statements referred to in procedure 1 the information included in items "Tangible Net Worth", "Net Worth", "Net Working Capital", "The Sum of Income Plus Depreciation, Depletion and Amortization", and "Total Assets in U.S." under the caption Alternative I in the letter referred to above and noted no differences, after rounding.

This agreed-upon procedures engagement was conducted in accordance with attestation standards established by the American Institute of Certified Public Accountants. We were not engaged to and did not conduct an examination or review, the objective of which would be the expression of an opinion or conclusion, respectively, on compliance with the financial test option in the accompanying letter dated December 15, 2017. Accordingly, we do not express such an opinion or conclusion. Had we performed additional procedures, other matters might have come to our attention that would have been reported to you.

This report is intended solely for the information and use of the board of directors and management of Buckeye Partners, L.P. and the Environmental Protection Agency and is not intended to be, and should not be, used by anyone other than the specified parties.

Deloitte + Touche LLP

December 15, 2017

**2016** ANNUAL REPORT

# BUCKEYE PARTNERS, L.P.

# EXPANDED GLOBAL PRESENCE

ABOUT US

**BUCKEYE PARTNERS, L.P.** (NYSE: BPL) is a publicly traded master limited partnership and owns and operates a diversified network of integrated assets providing midstream logistic solutions, primarily consisting of the transportation, storage, and marketing of liquid petroleum products.

## ORGANIZATIONAL OVERVIEW

### DOMESTIC PIPELINES & TERMINALS

- ~6,000 miles of pipeline with ~110 delivery locations
- Over 115 liquid petroleum product terminals
- ~56 million barrels of liquid petroleum product storage capacity
- Stable fee-based cash flows derived from throughput volumes, tariffs and terminalling and storage fees
- Primarily demand-pull system; limiting impact of supply disruptions
- Operates and/or maintains third-party pipelines and performs certain engineering and construction management services for its customers

### GLOBAL MARINE TERMINALS

- Seven liquid petroleum product terminals in: the Caribbean, including The Bahamas, St. Lucia and Puerto Rico; New York Harbor, including Perth Amboy, Port Reading and Raritan Bay; and South Texas
- ~62 million barrels of liquid petroleum product storage capacity
- Deep water capability to handle ULCCs and VLCCs in The Bahamas and St. Lucia
- Ship, barge, truck rack, rail and pipeline transportation in the New York Harbor
- Condensate splitters and connectivity through truck rack, pipeline, and marine handling capabilities in South Texas
- Revenue supported by take or pay contracts
- 50% equity interest in VTTI B.V., which owns and operates 14 terminals located in key global energy hubs, including Northwest Europe, the United Arab Emirates and Singapore

### MERCHANT SERVICES

- Markets liquid petroleum products in areas served by Domestic Pipelines & Terminals and Global Marine Terminals

Vessel dock at the Buckeye Perth Amboy facility in New Jersey

DEAR UNITHOLDERS:

**I AM PLEASED TO REPORT THAT 2016 WAS AN EXCEPTIONAL YEAR** for Buckeye and our unitholders. Our strong financial and operational performance for the year continues to prove the value of Buckeye's culture, growth strategy and diversified asset base. We successfully completed a number of capital investment projects across Buckeye as well as executing on a significant strategic investment in an international growth platform that I am confident will deliver strong results to our unitholders. In addition to improving our position as a global enterprise, we surpassed $1 billion of Adjusted EBITDA[1] for the first time in our illustrious 130-year history.

**Clark C. Smith**
*Chairman, President and Chief Executive Officer*

**Safely Through the Storm**

Buckeye is fully committed to the safety of our employees, contractors and the communities in which we operate. Our employees were able to demonstrate that commitment when Hurricane Matthew delivered a direct hit to our Buckeye Bahamas Hub facility on the Grand Bahama Island in October 2016. Buckeye's preparation before the storm and our response and recovery in the aftermath of the storm were nothing short of outstanding.

Prior to the storm landfall, our teams worked diligently to ensure that all of our operations were secure and that our facilities were fully prepared for its impact. Our teams relied on their extensive training and existing safety processes as they readied for landfall. Through past incidents, Buckeye has repeatedly

Rail unloading rack at the Buckeye Port Reading facility in New Jersey

demonstrated that this advanced preparation allows us to withstand incidents with minimal impact. Most importantly, we are happy and thankful to report that all of our employees and their families in Matthew's path survived the storm with no injuries.

**Financial and Operational Excellence**

2016 was an outstanding year for Buckeye as we grew Adjusted EBITDA[1] by almost 20 percent to a record $1.03 billion. This strong performance allowed us to continue to grow distributions to our unitholders as we declared distributions of $4.875 for the year, representing over four percent growth from the prior year. All three of our business segments contributed to this record performance. Our Domestic Pipelines & Terminals segment has grown consistently through the contribution from numerous capital projects that our commercial and operating teams have successfully delivered. Tariff increases, favorable tariff mix and growing terminal throughput and storage revenues also contributed to this growth. Global Marine Terminals benefited from strong storage demand driving higher utilization and storage rates as well as new capital projects that brought storage capacity back in service. In addition, we completed the build out and are now operating all assets at our South Texas hub. Merchant Services had a record year as it benefited from continued discipline in inventory management and favorable business conditions. This segment also contributed a record level of revenues to the Buckeye umbrella, fulfilling its mission to drive higher utilization of our pipeline and terminal assets.

**2016 WAS AN OUTSTANDING YEAR FOR BUCKEYE AS WE GREW ADJUSTED EBITDA BY ALMOST 20 PERCENT TO A RECORD $1.03 BILLION.**

**Business Strategy for Growth and Diversification**

Buckeye has continually emphasized our goal of diversifying our business across new products and services as well as new geographic locations. We have achieved great success in executing that strategy. We have invested over $8 billion since 2010 in strategic acquisitions and high return growth capital projects. We have significantly expanded our portfolio of domestic terminals. We also entered into the marine terminal business while meeting our objective of increasing our geographic scale by acquiring terminals in the Caribbean, Corpus Christi, and New York Harbor as well as our global expansion with the 50% investment in VTTI B.V.

We also diversified our product handling capabilities through the liquid petroleum gas ("LPG") storage and condensate splitter operations in South Texas and propane storage caverns in the Midwest. We created and significantly expanded our Chicago Complex, adding crude oil and diluent storage and handling along with propylene, ethanol and other service capabilities across the Complex. We were prudent in executing this strategy, minimizing investment risk where possible with long-term contracts. We managed our balance sheet and conservatively financed these investments with an appropriate mix of equity and debt.

The success of this diversification strategy has been demonstrated by the tremendous growth and stability we have achieved over this time. Our Adjusted EBITDA has increased by almost 170% since embarking on this strategy in 2010. At the same time, we have also improved our coverage and strengthened our balance sheet, maintaining our investment grade credit rating while continuing to grow distributions to our unitholders. Our strategy has allowed us to excel despite the many challenges in the energy markets over the past 18 to 24 months.

We continue to expect this strategy to drive growth for our unitholders. Importantly, we remain focused on targeting strategic midstream activities with the appropriate size and scale to be impactful to Buckeye and its investors. We prefer assets that offer platforms for future growth, driven by favorable macroeconomic and competitive factors. We look for growth opportunities that meet our objectives of safe and efficient operations, all within a culture emphasizing accountability and integrity. We focus on assets that offer fee-based cash flow backed by contracts with creditworthy counterparties as well as minimal commodity price exposure. Lastly, we look for accretive opportunities meeting our internal cost of capital hurdle rates that improve coverage and strengthen our balance sheet.

To put it simply, we want to be best in class in the eyes of our customers, the communities we serve, our regulators and our investors. These are the core principles that we believe differentiate Buckeye and continue to contribute to our success.

**Investing Globally**

We announced in 2016 a significant investment in one of the largest independent global marine terminal businesses in the world. In January 2017, we acquired a 50 percent interest in VTTI B.V., which boasts approximately 57 million barrels of petroleum product storage across 14 terminals located in 13 countries on five continents. The majority of this capacity is located in key global energy hubs, including the Amsterdam-Rotterdam-Antwerp hub in Northwest Europe, the Fujairah terminal in the United Arab Emirates in the Middle East and in Johor, Malaysia near the Port of Singapore. VTTI's terminals offer world-class storage and marine terminalling services primarily for refined products as well as crude oil and LPGs.

Importantly, we believe this transaction delivers on all of the key objectives of our growth strategy enumerated above. Our investment establishes for Buckeye an immediate worldwide geographically diverse presence. VTTI has been a very successful high growth business, growing through both acquisition in the very fragmented international terminal market as well as greenfield development. We expect this growth to continue and look forward to working with the outstanding management teams at both VTTI as well as Vitol, our new partner and one of the world's largest global traders of crude and petroleum products.

VTTI terminal located in Johor, Malaysia near the Port of Singapore

## Capitalizing on Opportunities

Buckeye made substantial progress on our Michigan Ohio pipeline and terminal expansion project during the year. We completed construction and began transportation of product on the first phase of this project, which provides incremental capacity for our customers to move refined products from advantaged Midwestern supply sources eastward to the Pittsburgh and other Western Pennsylvania markets. This project, which is supported by 10-year transportation agreements with major shippers, is expected to continue to ramp up in early 2017 with the full run-rate contribution being achieved in the second quarter.

We also announced the successful completion of an open season for the second phase of this project. The second phase is expected to further expand Buckeye's ability to move competitively priced refined products from Midwestern refineries to Pittsburgh as well as destinations in central Pennsylvania through the partial reversal of our Laurel Pipeline. We are proceeding with engineering activities and have initiated the regulatory approval and permitting process for this project, which we currently plan to complete in late 2018.

In addition, we benefited from a number of capital investment projects that were completed during the year. We constructed or refurbished significant additional storage capacity across our domestic and international terminals. We also increased our butane blending and vapor recovery capabilities and completed a number of additional improvements and debottlenecks across our system during the year that we expect to benefit us in 2017 and beyond.

## Opportunity Set Remains Vast

As we look forward to 2017, we continue to see numerous opportunities as well as business challenges to execute on our strategy. The pipeline of potential investments, both acquisitions and internal capital projects, is more robust now than it has ever been. Beyond our Michigan Ohio and VTTI opportunities, we are continuing to make progress on infrastructure upgrades expected to enhance our competitive positon among our New York Harbor terminals. We are assessing further opportunities to invest in our Chicago Complex to support the growing needs of major Midwestern refinery customers. In addition, we announced recently that we are exploring two pipeline opportunities to move crude oil and natural gas liquids from the prolific Permian basin. We have received positive feedback from potential shippers on these two greenfield pipeline construction projects, which would capitalize on our existing infrastructure and rights-of-way in and around Corpus Christi. I expect to continue to update our unitholders on the progress our commercial and development teams are making on these very important initiatives.

Finally, we continue to focus on maximizing the performance of our legacy businesses, as we believe our exceptional employees will continue to deliver safe and strong performance for our unitholders. We look forward to another outstanding year and I thank you for your investment and your confidence in our ability to continue to deliver outstanding results.

**Clark C. Smith**
*Chairman, President and Chief Executive Officer*

[1]See definition of Non-GAAP measures and reconciliations to Non-GAAP measures at the end of this report.

BUCKEYE PARTNERS, L.P.

# 2016
# FORM 10-K

By consent of the FOIA requestor, most of (Pages 96 to 224) the Form 10-K report containing private financial information specific to Buckeye Terminals LLC, has been determined to be not relevant to the FOIA request, and have been removed.

# S. AQUIFER EXEMPTIONS

This application does not request an aquifer exemption.

# T. EXISTING PERMITS

Buckeye Terminals, LLC holds the permits listed in Table T-1.

**Table T-1 Existing EPA Permits for Buckeye Terminals, LLC Woodhaven Terminal**

| MEDIUM | PERMIT TYPE | PERMIT ID | EXPIRATION DATE |
|---|---|---|---|
| Federal Permits | | | |
| Air | Emissions Inventory System (EIS) | EIS #7305611 | NA |
| Waste | RCRA - Notification of Waste Activity<br>Active Conditionally Exempt Small Quantity Generator (CESQG) | MIR000039974 | NA |
| State Permits | | | |
| Air | MDEQ Permit to Install No. 21-14A, Wayne County | State Registration Number B2158 | December 7, 2017 |
| Water | Michigan DEQ, EPA Region 5, CWA, National Pollutant Discharge Elimination System (NPDES) Certificate of Coverage under General Permit | MIG670085 | April 2018 |
| Water | Stormwater Pollution Prevention Plan (SWPPP) | MIS320020 | April 2018 |

# U. DESCRIPTION OF BUSINESS

Buckeye Terminals, LLC is an affiliate of Buckeye Partners, L.P., a publicly traded master limited partnership that owns and operates a diversified network of integrated assets providing midstream logistic solutions, primarily consisting of the transportation, storage, and marketing of liquid petroleum products. Buckeye Terminals, LLC is one of the largest independent terminalling and storage operators in the United States in terms of capacity available for service. Buckeye Terminals, LLC, through its affiliates, also uses its service expertise to operate and/or maintain third-party pipelines and perform certain engineering and construction services for its customers.

Buckeye Terminals, LLC's terminal network comprises more than 120 liquid petroleum products terminals with aggregate storage capacity of over 115 million barrels across its portfolio of pipelines, inland terminals and an integrated network of marine terminals located primarily in the East Coast and Gulf Coast regions of the United States and in the Caribbean.

Buckeye Terminals, LLC has 115 active terminals that provide bulk storage and throughput services with respect to liquid petroleum products and renewable fuels, including ethanol, and have an aggregate storage capacity of over 55 million barrels. In addition, three of the terminals provide crude oil services, including train loading/unloading, storage and throughput.

The Woodhaven Terminal located at 20755 West Road, Woodhaven, Michigan, currently uses surface tanks to store gasoline, diesel fuel, and ethanol. Approximately 990,000 bbls of tank storage is present at the Woodhaven Terminal.

Applicable SIC Code: 4226 Special Warehousing and Storage

# V. BIBLIOGRAPHY


- Environmental Protection Agency (EPA) Enforcement and Compliance History Online; Facility Search – Enforcement and Compliance Data. Retrieved May 19, 2017: https://echo.epa.gov/facilities/facility-search?mediaSelected=all
- EPA, 1981. Hydrogeology for Underground Injection Control in Michigan. EPA – Underground Protection Control Program.
- Gillespie and Dumouchelle, 1988. Ground-water Flow and Quality Near the Upper Great Lakes Connecting Channels, Michigan. U.S. Geological Survey (USGS). Water-Resources Investigations Report 88-4232. Retrieved December 2017. https://pubs.usgs.gov/wri/1988/4232/report.pdf
- Michigan Department of Environmental Quality (MDEQ), 2000. Stratigraphic Nomenclature for Michigan. Geologic Survey Division and Michigan Basin Geological Society. Retrieved May 22, 2017. http://www.michigan.gov/documents/deq/2000CHRT_301468_7.PDF
- Mozola, A.J., 1969. Geology for Land and Ground-Water Development in Wayne County, Michigan. State of Michigan Department of National Resources – Geological Survey. Report of Investigation 3.
- USGS, 2017. Earthquake Catalog. Earthquake Hazards Program. Retrieved May 22, 2017. https://earthquake.usgs.gov/earthquakes/search/
- USGS, 2007. Summary of Hydrogeologic Conditions by County for the State of Michigan. Open-File Report 2007-1236.

# APPENDIX

# A WELL RECORDS

(SEE ATTACHMENT C)

L. P. G. (33)
TD 1316 in Salina "B Salt" (42)
Facility Well

10-4S-10E
Brownstown Twp. (Wayne Co.)

Phillips Petroleum Company

Phillips Petroleum Company No. 1 Permit No. 24850

Drilling Contractor: North American Drilling Co. (Rotary)

Location: NW¼ NE¼ NE¼ Section 10, T. 4S, R. 10E
487' from North and 1065' from East line of quarter section

Elevation: 606 feet above sea level (rot. bush.)

Record by: William Mantek from core descriptions submitted by the company; some formation tops from Schlumberger Gamma Ray-Neutron Log (Schj)

Note: Well was cored continuously from surface to total depth

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| No record | 70 | 70 |
| DEVONIAN: | | |
| Detroit River: | | |
| No Record | 172 | 242 |
| Sylvania: | | |
| No record | 8 | 250 |
| Sand, medium to coarse, subrounded to round, clear to frosted, well sorted, fair to good porosity and permeability, friable | 3' | |
| Sand, medium to coarse, fair sorted, fair porosity and permeability with some very fine Sand; and, Dolomite as pore infill | 1' | |
| Sand, medium to coarse, fair to good sorted porosity and permeability, clear to white, frosted, fraible, very slightly dolomitic | 2' | |
| Sand, coarse to very coarse, good sorting porosity and permeability, frosted, friable | 1' | |
| Sand, medium to coarse, fair sorting porosity and permeability, slightly friable, subrounded to round | 4' | |
| Sand, fine to coarse, fair sorting porosity and permeability, some pore space infilling of Dolomite and very fine Sand, frosted and friable | 3' | |
| Sand, fine to medium, some crystalline, friable, fair porosity and permeability | 2' | |
| Sand, medium to coarse, fair sorting porosity and permeability, subrounded, frosted | 6' | |
| Sand, fine to coarse, poor sorting, very poor permeability, tight | 2' | |
| Sand, coarse, subrounded to round, well sorted, friable, good porosity and permeability | 3' | |
| Sand, fine to coarse, fair to good sorting porosity and permeability, friable | 3' | |
| Sand, medium to coarse with some very fine Sand and calcitic cement, poor porosity and permeability | 1' | |
| Sand, medium to coarse, subrounded to round, frosted, good sorting porosity and permeability, friable | 3' | |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| DEVONIAN: | | |
| Sylvania: (Continued) | | |
| Sand, medium; some Dolomite and silica cement, tight to very slightly porous | 1' | |
| Sand, medium to coarse, subrounded to round, frosted, good porosity and permeability, friable | 6' | |
| Sand, fine to coarse, some calcitic cement, fair porosity and permeability | 1' | |
| Sand, fine to medium, fair sorting porosity and permeability, slightly friable | 2' | |
| Sand, fine to medium, sub angular, calcitic, shaly, tight | 1' | |
| Sand, fine to medium to coarse, fair to good porosity and permeability, friable | 1' | |
| Sand, coarse, round, good sorting porosity and permeability, friable | 2' | |
| Sand, medium to coarse, round, good sorting porosity and permeability, friable | 2' | |
| Sand, medium to coarse, sub round to round, fair sorting permeability and porosity | 4' | |
| Sand, medium to coarse, round, good sorting porosity and permeability | 2' | |
| Sand, medium to coarse, good sorting porosity and permeability with few small Shale inclusions | 4' | |
| Sand, medium coarse, good sorting porosity and permeability | 4' | |
| Sand, fine to medium to coarse, poor sorting, fiar to light porosity and permeability, dolomitic cement, shaly | 4' | |
| Dolomite, finely crystalline, light gray, tight | 1' | |
| Sand, coarse grained, subrounded, dolomitic cement, shaly pyritic, tight | 1' | |
| Dolomite, finely crystalline, light gray with abundant floating fine to medium Sand grains, tight | 2' | |
| Sand, fine to medium, subrounded, shaly, very dolomitic, tight | 2' | |
| Dolomite, very sandy as 320-322 | 2' | |
| Sand, medium coarse, slightly dolomitic, slightly porous and permeability | 1' | |
| Sand, medium subrounded, slightly dolomitic, tight, very slightly porous | 1' | |
| Sand, fine to medium, dolomitic, slightly shaly, tight with large solution vugs with inner growth of Calcite and Gypsum crystals | 1' | |
| Sand, medium to coarse, subrounded to round, slightly friable, very slightly dolomitic, fair to good porosity and permeability | 2' | |
| Sand, medium to coarse, very slightly dolomitic, very slightly shaly, tight, very slightly porous | 3' | |
| Sand, medium to coarse, subrounded, fair sorting porosity and permeability | 4' | |
| Sand, medium to coarse, subrounded to round, clear to frosted good sorting porosity and permeability | 5' | |
| Sand, medium to coarse, slightly dolomitic, fair sorting, fair to good porosity and permeability | 1' | |
| Sand, medium to coarse, slightly dolomitic, tight, slightly porous | 3' | |
| Dolomite, finely crystalline, buff-gray, very sandy | 1' | |
| Chert, white, weathered, soft unconsolidated | 3' | |
| Dolomite, finely crystalline, buff-gray, very sandy with nodules of Chert, as above | 2' | 353 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| DEVONIAN: | | |
| Sylvania: (Continued) | | |
| Sand, coarse to very coarse, subangular to subrounded, clear grains with occasional frosted grains, occasional dark gray dolomitic Shale inclusions, good porosity and permeability (some grains are actual quartz crystals) | 4' | |
| Sand, fine to medium, subrounded, very dolomitic, tight | 1' | |
| Chert, white-gray; weathered, soft with floating sand grains, appears "re-worked" | 1' | |
| Dolomite, very finely crystalline, tan with fine to medium grained dolomitic shaly Sand and Chert, as above | 2' | |
| Dolomite, very finely crystalline, tan with some secondary Calcite | 1' | |
| Dolomite, very finely crystalline, gray, fossil fragments (probably brachs) with some "re-worked" sandy Chert | 1' | |
| Dolomite, very finely crystalline, gray, Sand, fine to medium and weathered Chert | 2' | |
| Dolomite, very finely crystalline, buff-gray, very sandy | 1' | |
| Sand, medium to coarse, shaly, pyritic, slightly dolomitic, fair porosity and permeability | 1' | |
| Sand, coarse, subrounded to round, porous and permeability, very slightly shaly | 1' | |
| Sand, medium to coarse grained, slightly dolomitic, fair to good porosity and permeability | 6' | |
| Sand, medium grained, dolomitic cement, tight, slightly porous | 3' | |
| Sand, medium to coarse, subrounded, slightly friable, fair porosity and permeability | 1' | |
| Sand, medium to coarse, dolomitic cement, tight | 1' | |
| Sand, medium to coarse, subrounded to round, fair to good porosity and permeability | 1' | |
| Sand, fine to medium grained, dolomitic, tight | 2' | |
| Sand, fine to medium, subrounded to round, shale laminations tight | 5' | |
| Sand, medium to coarse, shaly, tight | 3' | |
| Sand, medium to coarse, subrounded, glassy, slightly dolomitic, few Shale laminations, fair porosity and permeability | 1' | |
| Dolomite, finely crystalline, buff-gray, tight | 1' | |
| Sand, medium to coarse, dolomitic, shaly, pyritic, tight | 1' | |
| Sand, fine to medium, tight, to slightly porous | 3' | |
| Sand, coarse, subrounded, friable, good porosity and permeability | 2' | |
| Sand, medium to coarse, subrounded, tight to slightly porous and permeability | 1' | |
| Sand, fine to very coarse, poor sorted, tight, very slightly porous and permeability | 1' | |
| Sand, medium to coarse, dolomitic cement, tight, very slightly porous andpermeability | 3' | |
| Dolomite, very finely crystalline, tan with nodules of white, soft, re-worked Chert | 3' | |
| Same, with some coarse dolomitic Sand, tight | 1' | |
| Sand, fine to medium, slightly dolomitic, poor porosity and permeability | 1' | |
| Sand, coarse, sub angular (mostly quartz crystals) fair porosity and permeability | 1' | |
| Sand, medium to coarse (mostly clear quartz crystals) very slightly dolomitic, tight | 6' | 415 |
| | (173) | |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| DEVONIAN: (Continued) | | |
| Bois Blanc: | | |
| Chert, white, chalky, re-worked, with some Calcite filled fractures, some Dolomite, finely crystalline, gray (Bois Blanc @ 414 Schj) | 3' | |
| Same, with some medium grained Dolomitic Sand | 1' | |
| Chert, as above with finely crystalline Dolomite, sandy | 1' | |
| Chert, as above and Dolomite, finely crystalline, tan with occasional fossil molds | 7' | |
| Sand, medium to coarse grained, sub angular to subrounded, dolomitic cement, shaly, tight | 1' | |
| Chert, white, slightly weathered; and, Dolomite, very finely crystalline, tan-gray (looks like a breccia), with some carbonaceous pyritic Shale | 5' | |
| Dolomite, finely crystalline, tan-gray, slightly sandy | 1' | |
| Chert, white, weathered with Dolomite, as above (appears solutional) | 3' | |
| Dolomite, finely crystalline, slightly laminated, tan and gray | 1' | |
| Mostly Chert, as above and Dolomite, very finely crystalline, tan to gray, occasional black Shale laminations, stylolitic, brecciated appearance | 7' | |
| Shale, dark gray, sand, medium grained, Dolomite, finely crystalline, fossiliferous ("mess") | 2' | |
| Chert, gray, marly, dolomite, very finely crystalline, tan and secondary calcite (breccia) | 1' | |
| Chert and Dolomite, as above - appears more solutional than brecciated | 8' | |
| Same, with introduction of Chert, light gray, slightly spicular with concoidal fracture | 1' | |
| Chert, "re-worked" "crumbly" and Dolomite, light brown, very finely crystalline, both extremely fossiliferous | 5' | |
| As above, medium to coarse, sub angular, clear, dolomitic, occasional Shale laminations, with some Chert nodules | 4' | |
| Sand, medium to coarse, sub angular to subrounded, clear grained, fair porosity and permeability | 1' | |
| Predominantly Chert, off-white, weathered and unaltered Chert, gray with Dolomite, very finely crystalline to very fine, tan-gray, some secondary Calcite | 25' | |
| Dolomite, very finely crystalline, light brown, abundant tiny carbonaceous spicules, occasional green (glauconite?) specks, few iron oxide concretions, dark brown to black, minor Shale stylolites; and, Chert, gray, almost unaltered, pinpoing vugular porosity (Bass Island @ 497 Schj) | 7' | 501 |
| | (86) | |
| SILURIAN: | | |
| Bass Island: | | |
| Dolomite, very finely crystalline, slightly sucrosic, good vugular porosity, with Pyrite crystals in the vugs | 3' | |
| Dolomite, sub-lithographic to very finely crystalline, tan and buff, no porosity | 24' | |
| Dolomite, very light gray, tight with one Chert nodule at 534 | 8 | |
| Dolomite, tan, good oolitic development, good vugular porosity | 1' | |
| Dolomite, very finely crystalline, light gray, buff-tan, some pinpoint vugs | 8' | 545 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| SILURIAN: | | |
| Bass Island: (Continued) | | |
| Dolomite, very finely crystalline, tan to light brown, fossiliferous, some fossil molds forming vugs with zones of pinpoint vuggy porosity | 14' | |
| Dolomite, light brown, oolitic, good porosity and permeability | 2'6" | |
| Dolomite, very finely crystalline, gray with inclusions of dark gray, argillaceous material (slightly mottled effect) | 6'6" | |
| Dolomite, very finely crystalline, buff-tan, occasional shaly, slightly marly, few Gypsum crystals, scattered zones of vugular porosity | 10' | |
| Same | 5' | |
| Dolomite, sub-lithographic, tan with very fine pinpoint vugs | 2' | |
| As 568-583 | 4' | |
| Dolomite, very finely crystalline, light brown, gray | 2' | |
| Dolomite, tan, oolitic | 1' | |
| Dolomite, sub-lithographic, with blotchy, irregular, Shale partings with plains of Gypsum in a general vertical direction | 12' | |
| Dolomite, sub-lithographic to very finely crystalline, tan to gray, occasional Calcite veins with distorted pyritic Shale laminations | 8' | |
| Dolomite, very finely crystalline, medium gray, mottled, dark gray Shale inclusions (looks slightly brecciated) | 2' | |
| Dolomite, finely crystalline, light brown to gray, tight | 1' | |
| Dolomite, very finely crystalline, light gray with abundant beds of Gypsum, clear | 3' | |
| Dolomite, very finely crystalline, light gray, occasionally very slightly fossiliferous | 6' | |
| Dolomite, same, with vertical Gypsum veins | 3'6" | |
| Dolomite, very finely crystalline, light gray to tan | 4'6" | |
| Dolomite, very finely crystalline, tan, occasional vertical vein of Gypsum | 2'6" | |
| Gypsum, white, chalky, slightly brecciated with Dolomite as above | 1' | |
| Dolomite, very finely crystalline, gray | 0'6" | |
| Gypsum, as above | 1'6" | |
| Dolomite and Shale, mottled, gray, dark gray | 0'6" | |
| Gypsum, with some Dolomite, very finely crystalline | 1' | |
| Transitional Gypsum and Anhydrite, bluish white with some Dolomite, very finely crystalline, medium brownish gray | 1'6" | |
| Dolomite, lithographic to extremely finely crystalline, chocolate brown with minor Anhydrite veins | 6' | |
| Anhydrite, bluish-white | 1'6" | |
| Dolomite, extremely finely crystalline, chocolate brown, anhydritic in part | 3' | |
| Anhydrite, brownish gray to bluish white, dolomitic in part | 8' | |
| Interbedded Dolomite, extremely finely crystalline, medium gray to slightly brown; and, Anhydrite, as above | 7' | |
| Anhydrite, bluish white | 1' | |
| Interbedded Dolomite and Anhydrite | 4' | |
| Same, with abundant irregular dark gray Shale laminations | 3' | |
| Anhydrite, bluish white with some Dolomite, as above | 7' | |
| Dolomite, very finely crystalline, medium gray to tan, rare Anhydrite flecks | 10' | |
| Dolomite, tan, very finely crystalline | 4' | |
| Dolomite, brown and tan mottled, finely crystalline, argillaceous | 8' | 703 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| SILURIAN: | | |
| Bass Island: (Continued) | | |
| Dolomite, extremely finely crystalline, interbedded with Anhydrite, bluish white | 8' | |
| Anhydrite, bluish white with some Dolomite, as above | 8' | |
| Dolomite, extremely finely crystalline, medium gray tan | 1' | |
| Interbedded Dolomite and Anhydrite | 8' | 728 |
| | (227) | |
| Salina: | | |
| Same, extremely shaly (Salina @ 729 Schj) | 1'6" | |
| Anhydrite and Dolomite, as above | 4'6" | |
| Dolomite, sub-lithographic, dark gray, conchoidal, fracture, with occasional Anhydrite inclusions | 9' | |
| Same, with Anhydrite content nearing 30% | 25' | |
| Dolomite, as 734-743 | 8' | |
| Interbedded Anhydrite and Dolomite, shaly | 17' | |
| Anhydrite, blusih white | 3' | |
| Dolomite, sub-lithographic, dark gray, shaly | 2' | |
| Anhydrite, as above | 2' | |
| Same, shaly | 2' | |
| Anhydrite ("F" Unit @ 802 Schj) | 4' | |
| Dolomite, extremely finely crystalline, dark gray, probably argillaceous | 5' | |
| Anhydrite | 3' | |
| Dolomite, argillaceous as 806-811 | 6' | |
| Dolomite, medium brown gray, very finely crystalline, very anhydritic | 10' | |
| Dolomite, very finely crystalline, dark gray, argillaceous, some Shale laminations; some Anhydrite | 6' | |
| Anhydrite, with minor Dolomite stringers | 2' | |
| Dolomite, extremely fine to crystalline, medium brown, some Anhydrite | 4' | |
| Dolomite, argillaceous; and, Shale laminations | 1'6" | |
| Anhydrite, gray | 1' | |
| Dolomite, as above | 9'6" | |
| Anhydrite, with minor Dolomite laminations | 9' | |
| Dolomite, very finely crystalline, medium brown | 3' | |
| Dolomite, very finely crystalline, dark gray, argillaceous with dark gray Shale laminations, brittle to fissile and some Anhydrite - bluish white; Anhydrite, brown to gray ("E" Unit @ 874 Schj) | 5' | |
| Dolomite, very finely crystalline, medium brown with occasional black Shale laminations, very rare Anhydrite nodules, few thin vertical fractures, Anhydrite filled | 12'6" | |
| Inter laminated dolomitic Shale and minor Anhydrite | 6'6" | |
| Dolomite, very finely crystalline, brownish gray, conchoidal fractures, occasional Shale laminations | 5' | |
| Inter laminated Anhydrite and Dolomite | 4' | |
| Dolomite, very finely crystalline, medium brown, minor Anhydrite and Shale | 16' | |
| Dolomite, very finely crystalline, light brown, minor Shale laminations | 12' | |
| Dolomite, sub-lithographic, light gray to tan | 10' | |
| Same, with Shale laminations | 2' | |
| Same, as 962-964 with Anhydrite inclusions | 1' | |
| Dolomite, very finely crystalline, chocolate brown, with very thin Gypsum laminations, and some vuggy porosity | 1' | |
| Dolomite, laminated; Shale and minor Anhydrite | 11' | 977 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| SILURIAN: | | |
| Salina: (Continued) | | |
| Same, with one orange vertical Salt crystal at 977 | 3'6" | |
| Salt, clear to slightly dirty ("D" Salt @ 992 Schj) | 18' | |
| Dolomite, very finely crystalline, medium gray with minor thin Salt laminations, some Salt inclusions (probable Salt leached and collapsed zone) | 8'6" | |
| Salt, clear | 4' | |
| Dolomite, very finely crystalline, medium dark gray with some Anhydrite and vertical veins of orange Salt ("C" Unit @ 1026 Schj) | 21' | |
| Anhydrite, gray, brown | 0'6" | |
| Same, as 1011-1031 with some Shale partings | 10'6" | |
| Dolomite, very finely crystalline, dark gray, slightly shaly, with occasional inclusions and few vertical veins of orange Salt | 38' | |
| Same, with occasional very large Salt vugs | 2' | |
| Dolomite, extremely finely crystalline, slightly argillaceous, dark gray, very minor amount Salt filled vugs | 4' | |
| Dolomite, as above with minor Anhydrite | 6' | |
| Anhydrite, with minor Dolomite | 5' | |
| Dolomite, very finely crystalline, dark gray, argillaceous with some Shale laminations | 3' | |
| Same, with large vertical Salt veins | 1' | |
| Dolomite, as above with some Anhydrite ("B" Unit @ 1102 Schj) | 13' | |
| Same, with vugular porosity filled with orange Salt, collapsed zone? | 3' | |
| Dolomite and Anhydrite, as above | 6' | |
| Dolomite, very finely crystalline, dark gray, minor Shale inclusions | 9' | |
| Same, with some Salt vug filling | 2' | |
| Salt, smokey gray, impure | 2' | |
| Dolomite, very finely crystalline, dark gray | 1' | |
| Salt | 1' | |
| Dolomite, as above | 1'6" | |
| Salt | 3'6" | |
| Dolomite, shaly, with Salt inclusions | 1' | |
| Salt ("B" Salt @ 1147 Schj) | 2' | |
| Dolomite, very finely crystalline, medium brown, shaly with Salt inclusions | 0'8" | |
| Salt, medium gray to brown, impure | 12'3" | |
| Dolomite, shaly with Salt inclusions | 2' | |
| Salt, smokey, impure | 10' | |
| Dolomite, very finely crystalline, dark gray, shaly, with Salt inclusions | 2' | |
| Salt, impure | 2' | |
| Dolomite, as above, shaly | 0'6" | |
| Salt, smokey, impure | 8' | |
| Dolomite, as above, shaly, salt inclusions | 1' | |
| Salt, as above | 3'6" | |
| Dolomite, shaly with Salt inclusions | 1' | |
| Salt, dirty | 10' | |
| Dolomite, dark gray, very finely crystalline, argillaceous with abundant Salt inclusions | 6'6" | |
| Salt | 14'6" | |
| Dolomite, anhydritic, as above | 3'6" | |
| Salt, becoming clean at base | 7'6" | |
| Dolomite, very finely crystalline, very vuggy, salt filled | 8' | 1239 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| SILURIAN: | | |
| Salina: (Continued) | | |
| Salt, brownish gray, impure | 10' | |
| Salt, clean | 9' | |
| Dolomite, anhydritic, rare Salt inclusions | 2' | |
| Salt, impure | 2' | |
| Dolomite, as above, abundant Salt inclusions | 1' | |
| Salt, impure | 6' | |
| Dolomite and Anhydrite with highly distorted Salt laminations, probable zone of collapse | 2' | |
| Impure Salt with scattered very thin Dolomite beds up to 1½" thick | 10' | |
| Dolomite and Anhydrite, small amount of Salt, highly distorted bedding | 4' | |
| Salt | 1' | |
| As 1281-1285 | 2' | |
| Dolomite, interbedded with Salt and Anhydrite | 2' | |
| Dolomite, distorted laminations, Salt filled vugs | 2' | |
| Anhydrite and Dolomite, fairly massive | 3' | |
| Salt, white, clean, highly fractured | 4' | |
| Dolomite, very finely crystalline, brown, Anhydrite, brown and Salt, highly distroted laminations | 5' | |
| No record | 12' | |
| | (588+) | |
| TOTAL DEPTH | | 1316 Schj |
| TOTAL DEPTH | | 1315 Drlr. |

Casing Record:

| | | |
|---|---|---|
| 10 3/4" | 1142' | (1145 cement) |
| 16" | 70' | (160 cement) |
| 7" | 1152' | |
| 4 1/2" | 1290' | |

Drilling Commenced: 8-16-63
Drilling Completed: 8-25-63

3/64

24850

24850

WAYNE

PHILLIPS PETROLEUM COMPANY

# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, OR KEY WELL FOR SECONDARY RECOVERY

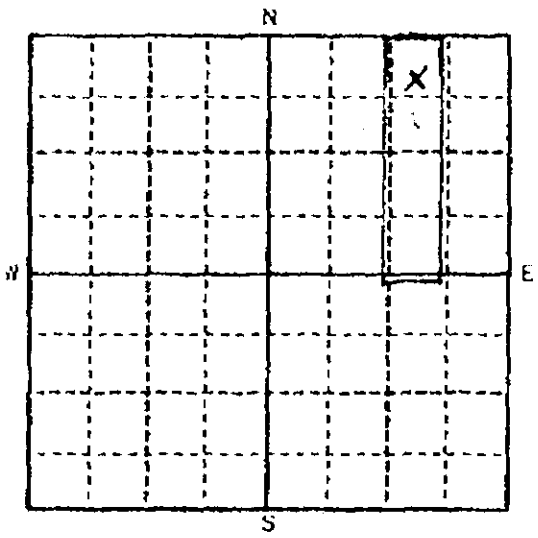
UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, AND ACT 326, P.A. 1937 AS AMENDED.

JUN 24 1963

MAIL TO:
SUPERVISOR OF WELLS
GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING 26, MICHIGAN

*See Reverse Side Before Filling Out This Application*

1. DATE: June 19, 1963




LOCATE WELL AND LEASE ACCURATELY ON THIS SECTION PLAT - 640 ACRES

2. APPLICATION IS MADE TO DRILL A WELL FOR: (GAS, OIL, BRINE DISPOSAL, SECONDARY RECOVERY, ETC.) Development of reservoir for LPG Storage

3. ENCLOSED HEREWITH FIND AMOUNT OF: $ $25.00

4. LESSEE (OWNER OF LEASE RIGHTS): Phillips Petroleum Company

5. ADDRESS: Bartlesville, Oklahoma

6. PHONE: FE-6 6600

7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Phillips Petroleum Company

8. WELL NO.: 1

9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER):

10. DRILLING CONTRACTOR: To be selected

11. ADDRESS:

12. PHONE:

13. See attachment NW ¼ OF NE ¼ OF NE ¼, SECTION 10 T 4 ~~N~~S., R 10 E.

14. ACRES IN LEASE: 42 acres

15. TOWNSHIP: Brownstown

16. COUNTY: Wayne

17. *Locate well in two directions from nearest lines of quarter section and property ownership lines:*

487 FT. FROM north (north-south) LINE OF QUARTER SECTION

1065 FT. FROM east (east-west) LINE OF QUARTER SECTION

454 FT. FROM north (north-south) PROPERTY LINE

376 FT. FROM east (east-west) PROPERTY LINE

18. NUMBER OF FEET FROM NEAREST PRODUCING WELL: Not applicable

19. KIND OF TOOLS TO BE USED *(Cable, rotary, combination)*: Rotary

20. WELL IS TO BE COMPLETED IN salt bed about 1130' to about 1300' below surface FORMATION

21. INTENDED DEPTH OF WELL: about 1300'

22. PROGRAM OF CASING, SEALING, AND COMPLETING WELL

16" casing - about 70 ft. - cemented to surface
10 3/4" casing - about 1135 ft. - cemented to surface

23. WELL LOCATION IS IN: *(Cleared Farm Land, Open Grass Land, Brush Land, Timbered Land.)* Unplanted cleared farm land

24. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? *Yes* ☐ *No* ☒

25. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? *Yes* ☐ *No* ☒

26. IF ANSWER TO NO. 24 ABOVE IS *YES*, DESCRIBE AND GIVE DISTANCE FROM LOCATION AND SPECIFY PRECAUTIONS TO BE TAKEN TO PROTECT FRESH WATER FROM WELL WASTES.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST OIL HAZARD REDUCTION FIELD OFFICE. *(See reverse side)*

27. ADDRESS CORRESPONDENCE AND PERMIT TO: Phillips Petroleum Company, Bartlesville, Oklahoma

28. PHONE: FE 6-6600

**LEAVE BLANK**

DATE ISSUED 7-11-63 GROUP NO.

PERMIT NO. 24850 ACCOUNT NO.

29. OWNER OF LEASE RIGHTS: Phillips Petroleum Company

30. AUTHORIZED REPRESENTATIVE: A. F. Dyer A. F. Dyer

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

JUN-24-63 5 8 8 8 8 5 4 V 5 2 5 0

DISTRIBUTION
1. WHITE - GEOL. SURVEY DIV. - LANSING.
2. CANARY - CASHIER.
3. BLUE - F.ADM.DIV. - FIELD.
4. GOLDENROD - GEOL. SUR. DIV. - FIELD.
5. PINK - F.A.DIV. - GR. RAPIDS.
6. GREEN - APPLICANT.

GS-1 Rev. 1/56

JUN 24 1963

DESCRIPTION OF PROPOSED
WYANDOTTE TERMINAL

The West 1/2 of the East 1/2 of the Northeast 1/4 of Section 10. Township 4 South. Range 10 East, and also the East five (5) acres of the West 1/2 of the Northeast 1/4 of Section 10.

Except that part described as: Beginning at a point in the North line of said section. Distance N. 89°-11' W. 1384.99' from the Northeast corner of Section 10 and proceeding. Thence South 1°-34' W. 2659.10' to the East and West quarter line of said section. Thence N. 86°-46' W. along said line 74.03'. Thence N. 1°-45' E. 2656.10' to the North line of Section 10. Thence S. 89°-11' E. along said North line. 65.13' to the point of beginning.

Easement - Township of Brownstown
Along the South 27' of the North 60' of the described property.

STATE OF MICHIGAN

# DEPARTMENT OF CONSERVATION

SUPERVISOR OF WELLS

№ 6548

## PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST CLOTH PERMIT AT WELL LOCATION)

Permit No. 24,850 Date Issued July 11, 1963

Permission is hereby granted to Phillips Petroleum Company
Owner

Bartlesville, Oklahoma
Address

Lease Name Phillips Petroleum Company Well Number 1

To drill a well for Development of reservoir for LPG Storage

in the NW¼ NW¼ NW¼ Section 10, T.4S., R.10E., Brownstown Township, Wayne County

and located 487' from North and 1065' from East line of quarter section

and located 454' from North and 376' from East property lines.

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By Robert E. Coker

## CAUTION

DRILLING OPERATIONS NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

WASTE IS PROHIBITED in the drilling, producing, and plugging of this well. This includes underground, surface, and market waste.

DAMAGE TO FRESH WATERS, both underground and surface, is prohibited in the drilling, producing, and plugging of this well.

UNNECESSARY DAMAGE TO LIFE AND PROPERTY is prohibited in the drilling, producing, and plugging of this well.

Department offices at: Lansing, Phone 373-1256
Mount Pleasant, Phone SPring 3-8691
Cadillac, Phone PRospect 5-3181
Plainwell, Phone MUrray 5-8051
Grand Rapids, Phone GLendale 8-3007
Escanaba, Phone STate 6-0333

PERMITS MAY BE TRANSFERRED ONLY WITH PERMISSION OF THE SUPERVISOR OF WELLS

July 11, 1963

Mr. A. F. Dyer, Technical Representative
Phillips Petroleum Company
Room 944
Adams Building
Bartlesville, Oklahoma

Dear Mr. Dyer:

We are enclosing herewith permits for the drilling of the two Sylvania Formation wells on your property in Section 10, T.4S., R.10E., Brownstown Township, Wayne County, Michigan.

The drilling, testing, and use of these wells for disposal of the salt water returns has been considered by the Water Resources Commission, the Water Section of the Geological Survey, and the Regulatory and Geological Section of the Geological Survey. They find no objection at this time for your proposed use of the Sylvania Formation.

We are also enclosing permits as follows:

#1 well for the development of a reservoir for LPG Storage; and

#2 well for the development of a reservoir for Pipeline Interface Storage.

These two wells are to be drilled into the salt formation at about 1300 feet and cavities developed for the storage of the products indicated.

It is our understanding that the salt water returns from the drilling and construction of cavities in the salt formation will be injected into the two Sylvania Formation wells and thus eliminate any contamination of surface or underground fresh waters.

The whole project has been reviewed and approved except for the proposed brine pond. We understand this pond would be used for the storage of salt water which would be used in the operation of the storage project.

Brine ponds in Michigan related to oil and gas operations are not encouraged and may not be used except with the approval of the staff of our

Oil Hazard Reduction Section. Clearance should be made with them for the use of such pond and for such construction as will meet with their approval. Copies of your correspondence and your proposed pond construction have been forwarded to Mr. H. A. Young, Supervisor, Oil Hazard Reduction, Department of Conservation, 310 Murray Building, Grand Rapids, Michigan, for his consideration. It is suggested that you or your company representative make prompt contact with Mr. Young on this matter.

Please advise if there are any questions regarding any of the requirements.

Very truly yours,

GEOLOGICAL SURVEY DIVISION
L. W. Price
Petroleum Geologist

LWP/jjk
Encl.
cc:- H. A. Young

PHILLIPS PETROLEUM COMPANY
BARTLESVILLE, OKLAHOMA

ENGINEERING DEPARTMENT

JUN 24 1963

June 21, 1963 Wyandotte Terminal

Dyer-642-63

Mr. L. W. Price
Petroleum Engineer
Geological Survey Division
Department of Conservation
Lansing 26, Michigan

Dear Mr. Price:

This is an application for approval of permits to drill two wells at a proposed petroleum products terminal in Trenton, Michigan, as discussed by telephone with W. H. Butterbaugh of my office on June 17 and 19, 1963. Both of these wells will be drilled into a salt bed lying from about 1130' to about 1300' below the surface for the development of storage caverns. One cavern will be for liquefied petroleum gas storage; the other one is for storage of pipeline interface material consisting of housebrand gasoline and liquefied petroleum gas.

The products handled through this terminal will be received from the Buckeye Pipe Line System. Buffers or mechanical means are not used to separate the different products in the pipeline as some other systems do. The order of the products being transferred is selected so that a product does not follow or lead another product of a similar density. This selection, combined with a high rate of transfer, keeps the amount of mixing at the interface between products at a minimum. However, since this interface would contaminate either product if stored with it, we switch the interface out at the receiving terminal and store it for further disposition. This interface material in trade jargon is generally called "slops".

The location of the wells is shown in the copies of Phillips Petroleum Company Drawing LD-643, Sheets M-7 and M-8 attached to the applications. A legal description of the terminal site is shown on Sheet M-7. Copies of Drawing LD-643, Sheet P-1 are also attached to the applications. This drawing shows the piping elevation for the drilling operation for each well. Three copies of each of the above drawings are attached to each application.

These applications are being filed under a surety bond previously filed with your office in the name of Phillips Petroleum Company.

This letter will also serve to certify that Phillips Petroleum Company will furnish a derrick floor or ground elevation above the sea level datum run by a competent engineer or surveyor within fourteen days after each well is spudded.

We have attached our check No. 757,008 in the amount of $25.00 for the LP-gas storage cavern well permit. Check No. 757,007 in the amount of $25.00 is attached for the pipeline interface (slop) storage well permit.

At the present time, we have not determined the method we propose to use to dispose of the brine produced in developing the caverns. Application for approval of the brine disposal method will be submitted as soon as it is developed.

In order that we might begin drilling the construction of these wells as soon as possible, we would appreciate having your approval of these permits at your earliest convenience. If you have any questions or wish to discuss this project, please call us collect at FE 6-6600, station 8437. In my absence please feel free to talk to Mr. J. W. Hale or W. H. Butterbaugh at station 8032.

With thanks and best regards, I am

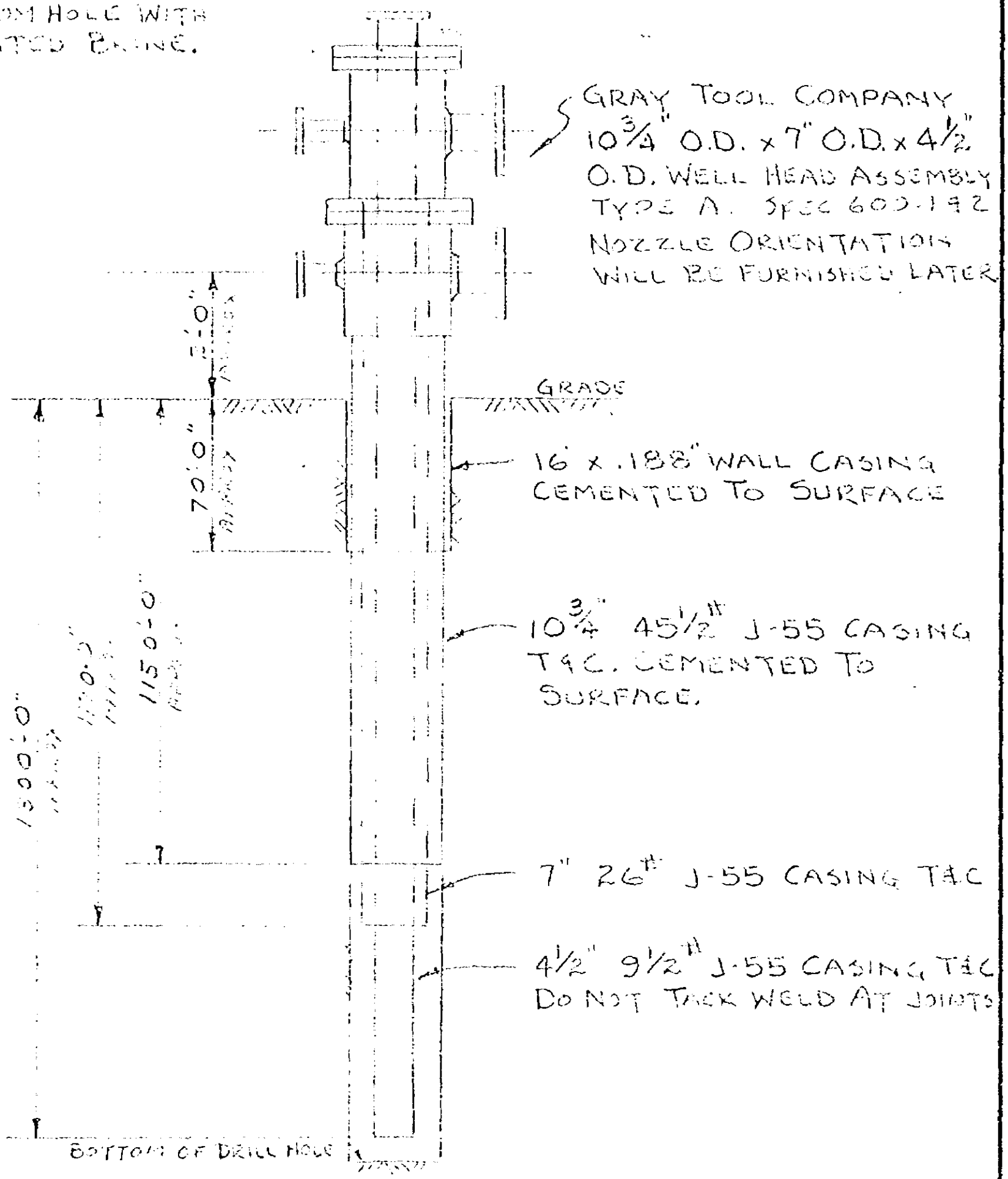
Very truly yours,

A. F. Dyer

dce

A. F. Dyer
Technical Representative

NOTE: AFTER COMPLETION OF WELL, FLUSH ALL DRILLING MUD FROM HOLE WITH SATURATED BRINE.



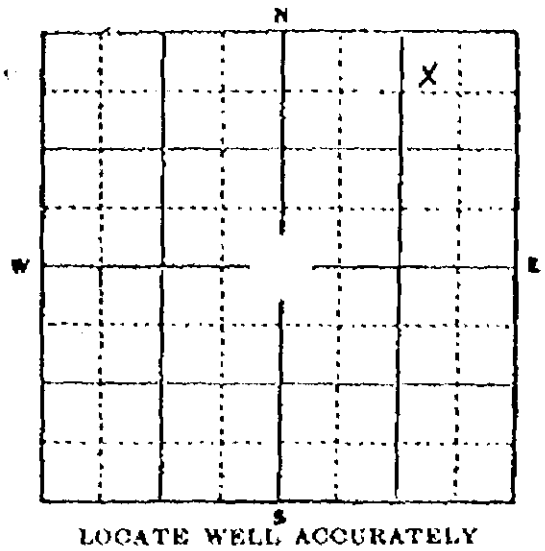

**PHILLIPS PETROLEUM COMPANY** BARTLESVILLE, OKLAHOMA

| REVISION | BY | DATE |
|---|---|---|
| [illegible] | [illegible] | [illegible] |

PIPING ELEVATION FOR DRILLING OPERATION

WYANDOTTE TERMINAL WAYNE CO., MICH.

| | | | |
|---|---|---|---|
| DRAWN [illegible] | [illegible] | AFE NO. NT 1033 | DWG. NO. LA 64[illegible] |
| CHECKED [illegible] | [illegible] | | |
| APPROVED [illegible] | | SCALE NONE | SHEET NO. [illegible] - 1 |




LOCATE WELL ACCURATELY

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

# 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. 24850

Owner or Operator: Phillips Petroleum Company

Address: Bartlesville, Oklahoma

Well No. 1 Farm: Fee

Township: Brownstown County: Wayne

Location: NW¼ NE¼ NE¼ Sec. 10 Twp. 45 Range 10E Elevation 598.4 ft.

Footage 487 ft. from North line and 1065 ft. from East line of quarter section

Type of well: LP-gas Storage Total depth 1315 Completed in Salina

Top of Salt Bed for Storage Well is 1134 ft.

Name of producing formation: Storage Well Top of formation 620 ft.

Date drilling begun: 8-14-63 Date drilling completed: Date well completed: 8-30-63

Drilling contractor: North American Drilling Co. Address: Mt. Pleasant, Michigan

**WATER ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OIL OR GAS ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**DEVIATION SURVEY**

| Run at | Degrees |
|---|---|
| | |
| | |
| | |
| 930 | 3/4° |
| 1174 | 3/4° |

**CASING AND CEMENTING**

| Size | Where Set | Cement | Amt. Pulled |
|---|---|---|---|
| 16" | 70 ft. | Yes | None |
| 10 3/4" | 1142 | Yes | None |
| 7" | 1152 | No | None |
| 4 1/2" | 1290 | No | None |
| | | | |

**STEEL LINES RUN**

| Run at | Corrected to | Run by |
|---|---|---|
| None | | |
| | | |
| | | |
| | | |
| | | |

**PERFORATIONS**

| Date | From | To | No. Holes |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**ACID OR SHOOTING RECORD**

| Date | From | To | Gals. Acid or Qts. Nitro |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Rotary tools from 0 feet to 1315 feet. Cable tools from None feet to feet.

Natural initial production first 24 hours None Bbls. After acid or shot None Bbls.

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

The above information is complete and correct. Signed A. E. Dyer

Date October 15, 1963 Title Technical Representative

CONS. 7010
REV. 9/61

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

(Submit in Duplicate)

Ref PPCO Storage Area Core Test
W/2 E/2 NE sec. 10-4S-10E
Wayne County, Michigan
Elev. 600 DF

Subject well was cored continuously from the surface to total depth of 1304'.

~~LITHOLOGY~~

(~~Samples were not cored from surface to 250'~~)

| | |
|---|---|
| 250-53 | Sand m-c, sub round to round, clear to frosted, well sorted, fair to good porosity and permeability, friable. |
| 253-54 | sand, m-c, fair sorted, fair p and p with some very fine sd, and dolomite as pore infill. |
| 254-56 | sand, m-c, fair to good sorted porosity and perm., clear to white, frosted, friable, very slightly dolomitic. |
| 256-57 | sand, coarse to vy coarse, good sorting porosity and perm., frstd, friable |
| 257-261 | Sand, m-c, fair sorting por and perm, sli. friable, sub round to round |
| 261-264 | sand, fine crs, fair sorting por and perm, some pore space infilling of dolomite and vy fn sd, frosted and friable. |
| 264-266 | sand, fine-med, some crs, friable, fair por. and perm. |
| 266-272 | sand, m-c, fair sorting por. and perm., sub round, frosted |
| 272-274 | sand, f-c, poor sorting, very poor perm, tight |
| 274-277 | sand, crs, sub round to round, well sorted, friable, good por. and perm. |
| 277-280 | sand, f-c; fair to good sorting por. and perm., friable |
| 280-281 | sand, m-c with some vy fn sd and calc. cement, poor por. and perm. |
| 281-284 | sand, m-c, sub round to round, frosted, good sorting por and perm, friabl |
| 284-285 | med. sd, some dolomite and silica cement tight to very slightly porous |
| 285-291 | sand, m-c, sub round to round, frosted, good por. and perm, friable |
| 291-292 | sand, f-c, some calc. cement, fair por and perm. |
| 292-294 | sand, f-m, fair sorting por and perm, sli. friable |
| 294-95 | sand, f-m, sub angular, calc, shaley, tight |
| 295-296 | sand, f-m-c, fair to good por. and perm, friable |
| 296-298 | sand, crs, rd, good sorting por. and perm, friable |
| 298-300 | sand, m-c, round, good sorting por. and perm, friable |
| 300-304 | sand, m-c, sub round to round, fair sorting perm. and por. |
| 304-06 | sand, med-c, rd, good sorting por. and perm. |
| 306-310 | sand, m-c, good sorting por and perm. with few small shale inclusions. |
| 310-314 | sand, m-c, good sorting por and perm |
| 314-318 | sand, f-m-c, poor sorting, fair to tight por. and perm., dolomitic cement, shaley |
| 318-319 | Dolomite, fnly xln, lt gray, tight |
| 319-320 | sand, crs grained, sub round, dolomitic cement, shaley, pyritic, tight |
| 320-322 | dolomite, fnly xln, lt. gray with abundant floating fn to med. sd. grains, tight. |
| 322-324 | sand, fn to med, sub round, shaley, very dolomitic, tight |
| 324-326 | dolomite, very sandy as 320-322. |
| 326-327 | sand, med crs, sli. dolomitic, sli. porous and perm. |
| 327-328 | sand, med sub round, sli. dolomitic, tight, very sli. porous |
| 328-329 | sand, fn-med, dolomitic, sli. shaley, tight with large solution vugs with inner growth of calcite and gypsum crystals. |
| 329-331 | sand, m-c, sub round to round, sli. friable, very sli. dolomitic, fair to good por. and perm. |
| 331-334 | sand, m-c, very sli. dolomitic, vy sli. shaley, tight, very sli. porous |
| 334-338 | sand, m-c, sub round, fair sorting por. and perm. |
| 338-343 | sand, m-c, sub round to round, clear to frosted, good sorting por. and perm. |
| 343-344 | sand, m-c, sli. dolomitic, fair sorting, fair to good por. and perm. |

| | |
|---|---|
| 344-347 | sand, m-c, sli. dolomitic, tight, sli. por. |
| 347-48 | dolomite, fnly xln, buff-gray, vy sdy |
| 348-51 | chert, white, weathered, soft unconsolidated. |
| 351-353 | dolomite, fnly xln, buff-gray, very sdy with nodules of chert as above |
| 353-357 | sand, crs to vy crs, sub angular to sub round, clear grains with occ. frosted grains; occ. dark gray dolomitic shale inclusions, good por. and perm. (some grains are actual quartz crystals). |
| 357-58 | sand, fn-med, sub round, very dolomitic, tight |
| 358-359 | chert, white-gray, weathered, soft with floating sand grains, appears "re-worked". |
| 359-361 | dolomite, vy fnly xln, tan with fn to med grained dolomitic shaley sd and chert as above |
| 361-362 | dolomite, vy fnly xln tan with some secondary calcite. |
| 362-363 | dolomite, very fnly xln, gray, fossil fragments (probably bracha) with some "re-worked" sdy chert. |
| 363-365 | dolomite, very fnly xln, gray, sd, f-m and weathered chert. |
| 365-66 | dolomite, very fnly xln, buff-gray, very sdy. |
| 366-367 | sand, m-crs shaley, pyritic, sli. dolomitic, fair por. and perm. |
| 367-368 | sand, crs, sub round to round, porous and perm, very sli. shaley |
| 368-374 | sand, med-crs grained, sli. dolomitic, fair to good por and perm. |
| 374-377 | sand, med gr, dolomitic cement, tight, sli. porous |
| 377-378 | sand, m-crs, sub round, sli. friable, fair por. and perm. |
| 378-379 | sand, m-c, dolomitic cement, tight |
| 379-380 | sand, m-c, sub round to round, fair to good por and perm. |
| 380-382 | sand, fn to med gr. dolomitic, tight |
| 382-387 | sand, fn-med, sub round to round, shale laminations, tight |
| 387-390 | sand, m-c, shaley, tight |
| 390-391 | sand, m-c, sub round, glassy, sli. dolomitic, few shale laminations, fair por and perm. |
| 391-92 | dolomite, fn. xln, buff-gray, tight |
| 392-93 | sand, m-c, dolomitic, shaley, pyritic, tight |
| 393-96 | sand, fn-med, tight to sli. porous |
| 396-98 | sand, crs, sub round, friable, good por. and perm. |
| 398-399 | sand, m-crs, sub round, tight to sli. porous and perm. |
| 399-400 | sand, f-very crs, poor sorted, tighty, vy. sli. porous and perm. |
| 400-403 | sand, med to crs, dolomitic cement, tight, vy sli. porous and perm. |
| 403-06 | dolomite, vy fn. xln tan with nodules of white, soft, re-worked chert. |
| 406-07 | same with some crs dolomitic sd, tight |
| 407-08 | sand, fn-med, sli. dolomitic, poor por and perm. |
| 408-09 | sand, crs, sub angular (mostly quartz crystals) fair por. and perm. |
| 409-15 | sand, med-crs, (mostly clear quartz crystals) very sli. dolomitic, tight |
| 415-418 | chert, white, chalky, re-worked, with some calcite filled fractures, some dolomite, fnly xln, gray |
| 418-419 | same with some med grained dol. sd. |
| 419-420 | chert as above with fnly xln dol, sdy |
| 420-427 | chert as above and dol fnly xln, tan with occ. fossil molds. |
| 427-428 | sand, med-crs grained, sub ang. to sub round, dol. cement, shaley, tight |
| 428-435 | chert, white sli. weathered and dol. vy fnly xln, tan-gray (looks like a breccia), with some carbonaceous pyritic shale. |
| 435-436 | dolomite, fn. xln, tan-gray, sli. sdy |
| 436-439 | chert, white, weathered with dolomite as above (appears solutional) |
| 439-440 | dolomite, fnly xln, sli. laminated, tan and gray |
| 440-447 | mostly chert as above and dolomite, very fnly xln, tan to gray, occ. black shale lams, stylolitic, brecciated appearance. |
| 447-449 | shale, dark gray, sand, med gr.,dol, fnly xln, fossiliferous ("mess") |
| 449-450 | chert, gray, marly, dolomite, vy fn xln tan and secondary calcite. (breccia) |
| 450-458 | chert and dolomite as above - appears more solutional than brecciated. |

| | |
|---|---|
| 458-459 | same with introduction of lt. gray chert, sli. spicular with concoidal fracture. |
| 459-464 | chert re-worked "crumbly" and dolomite lt. brn, very fnly. xln, both extremely fossiliferous |
| 464-468 | ss, med-crs, sub angular, clear, dolomitic, occ. shale lams, with some chert nodules. |
| 468-469 | sand, med-crs, sub angular to sub round, clear grained, fair por and perm. |
| 469-494 | predominantly chert off-white, weathered and unaltered chert, gray, with dolomite, vy fn. to fnly xln, tan-gray, some secondary calcite |
| 494-501 | dolomite, vy fnly xln, lt. brn, abundant tiny carbonaceous spicules, occ. green (glauconite?) specks, few iron oxide concretions, dk brn to black, minor shale stylolites and chert, gray, almost unaltered, pin-point vugular porosity. |
| 501-504 | dolomite, vy fnly xln, sli. sucrosic, good vugular por, with pyrite crystals in the vugs. |
| 504-528 | dolomite, sub lithographic to very fnly xln, tan and buff, no por. |
| 528-536 | dolomite, vy lt gray to buff, tight, with one chert nodule at 534. |
| 536-537 | dolomite, tan, good oolitic development, good vugular porosity |
| 537-545 | dolomite, vy fnly xln, lt. gray, buff-tan, some pp vugs. |
| 545-559 | dolomite, vy fnly xln, tan to lt brn, fossiliferous, some fossil molds forming vugs with zones of pp vuggy porosity. |
| 559-561½ | dolomite, lt. brn, oolitic, good por and perm. |
| 561½-68 | dolomite, vy fnly xln, gray with inclusions of dark gray argillaceous material, (sli. mottled effect). |
| 568-578 | dolomite, vy fnly xln, buff-tan, occ. shaley, sli. marly, few gypsum crystals, scattered zones of vugular por. |
| 578-583 | same |
| 583-585 | dolomite, sub lithographic, tan w/very fn. pp vugs. |
| 585-89 | As 568-83 |
| 589-591 | dolomite, vy. fnly xln, lt brn, gray |
| 591-592 | dolomite, tan, oolitic |
| 592-604 | dolomite, sub lithographic w/blotchy, irregular, shale partings w/plains of gypsum in a general vertical direction. |
| 604-612 | dolomite, sub lithographic to very fnly xln, tan to gray, occ. calcite veins w/distorted pyritic shale laminations. |
| 612-614 | dolomite, vy fnly xln, med gray, mottled, dk gray shale inclusions (looks slightly brecciated). |
| 614-615 | dolomite, fnly xln, lt. brn to gray, tight. |
| 615-618 | dolomite, vy fn. xln, lt. gray with abundant beds of gypsum, clear. |
| 618-624 | dolomite, vy fnly xln, lt. gray, occ. very sli. fossiliferous |
| 624-627½ | dolomite, same w/vertical gypsum veins |
| 627½-32 | dolomite, vy fnly xln, lt. gray to tan |
| 632-34½ | dolomite, vy fnly xln tan, occ. vertical vein of gypsum |
| 634½-35½ | gypsum, white chalky, sli. brecciated w/dolomite as above |
| 635½-36 | dolomite, vy fnly xln, gray |
| 636-37½ | gypsum as above |
| 637½-38 | mottled, gray dolomite and shale, dark gray |
| 638-39 | gypsum with some dolomite, vy fnly xln. |
| 639-640½ | transitional gypsum and bluish white anhydrite with some dolomite, vy fnly xln, med. brownish gray. |
| 640½-646½ | dolomite, lithographic to extremely fnly xln, chocolate brn with minor anhydrite veins. |
| 646½-648 | anhydrite - bluish-white. |
| 648-651 | dolomite, extremely fn. xln, chocolate brn, anhydritic in part. |
| 651-659 | anhydrite, brownish gray to bluish white, dolomitic in part. |
| 659-666 | interbedded dolomite, extremely fn. xln, med. gray to sli. brn, and anhydrite as above. |
| 666-667 | anhydrite, bluish white. |

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|---|---|
| 667-671 | interbedded dolomite and anhydrite |
| 671-674 | same with abundant irregular dark gray shale laminations |
| 674-681 | anhydrite, bluish white with some dolomite as above |
| 681-691 | dolomite, vy fnly xln, med. gray to tan, rare anhydrite flecks |
| 691-695 | very fnly xln. tan dolomite |
| 695-703 | dolomite, fnly xln, brn and tan mottled, argillaceous |
| 703-711 | dolomite, extremely fn. xln, interbedded with anhydrite, bluish white |
| 711-719 | anhydrite, bluish white with some dolomite as above |
| 719-720 | dolomite, extremely fn. xln, med gray, tan |
| 720-728 | interbedded dolomite and anhydrite |
| 728-729½ | same, extremely shaley |
| 729½-734 | anhydrite and dolomite as above |
| 734-743 | dolomite, sub lithographic, dark gray, concoidal fracture, with occ. anhydrite inclusions. |
| 743-768 | same with anhydrite content nearing 30%. |
| 768-776 | dolomite as 734-43. |
| 776-793 | interbedded anhydrite and dolomite, shaley |
| 793-796 | anhydrite, bluish-white |
| 796-798 | dolomite, sub lithographic, dark gray, shaley |
| 798-800 | anhydrite as above |
| 800-802 | same, shaley |
| 802-806 | anhydrite |
| 806-811 | dolomite, extremely fnly xln, dark gray, probably argillaceous. |
| 811-814 | anhydrite |
| 814-820 | argillaceous dolomite as 806-811. |
| 820-830 | dolomite, med. brn. gray, vy fnly xln, vy anhydritic |
| 830-836 | dolomite, vy fnly xln, dark gray, argillaceous, some shale lams, some anhydrite |
| 836-838 | anhydrite with minor dolomite stringers |
| 838-842 | dolomite, extremely fine to xln, med. brn, some anhydrite |
| 842-843½ | argillaceous dolomite, and shale laminations |
| 843½-844½ | anhydrite, gray |
| 844½-854 | dolomite as above |
| 854-863 | anhydrite, with minor dolomite lams. |
| 863-866 | dolomite, vy fnly xln, med. brn |
| 866-891 | dolomite, vy fnly xln, dark gray, argillaceous with dark gray shale laminations, brittle to fissle and some anhydrite - bluish, white. |
| 891-896 | anhydrite, brown to gray |
| 896-908½ | dolomite, very fnly xln, med brn with occ. black shale lams. very rare anhydrite nodules, few thin vertical fractures, anhydrite filled. |
| 908½-915 | inter laminated dolomite shale and minor anhydrite |
| 915-920 | dolomite, very fnly xln, brnsh gray, concoidal fractures, occ. shale lams. |
| 920-924 | inter laminated anhydrite and dolomite |
| 924-940 | dolomite, very fnly xln, med brn, minor anhydrite and shale |
| 940-952 | dolomite, very fnly xln, lt. brn, minor shale laminations |
| 952-962 | dolomite, sub lithographic, lt gray to tan |
| 962-964 | same with shale laminations |
| 964-965 | same as 62-64 with anhydrite inclusions |
| 965-966 | dolomite, vy fn xln, chocolate brn, with very thin gypsum laminations, and some vuggy porosity |
| 966-977 | laminated dolomite, shale and minor anhydrite |
| 977-980½ | same with one orange vertical salt crystal at 977 |
| 980½-998½ | salt, clear to slightly dirty |
| 998½-1007 | dolomite, very fnly xln, med. gray with minor thin salt laminations, some salt inclusions (probable salt leached and collapsed zone). |
| 1007-1011 | salt, clear. |
| 1011-1031 | dolomite, vy fnly xln, med dark gray with some anhydrite and vertical veins of orange salt. |

| | |
|---|---|
| 1031-1031½ | ank rite, gray, brn |
| 1031½-42 | same as 1011-1031 with some shale partings |
| 1042-1080 | dolomite, very fnly xln, dark gray, sli. shaley, with occ. inclusions and few vertical veins of orange salt. |
| 1080-1082 | same with occ. very large salt vugs |
| 1082-1086 | dolomite, extremely fn. xln, sli. argillaceous, dark gray, very minor amount salt filled vugs. |
| 1086-1092 | dolomite as above with minor anhydrite |
| 1092-97 | anhydrite with minor dolomite |
| 1097-1100 | dolomite, very fnly xln, dark gray, argillaceous with some shale laminations |
| 1100-1101 | same with large vertical salt veins |
| 1101-1114 | dolomite as above with some anhydrite |
| 1114-1117 | same with some vugular porosity filled with orange salt, collapsed zone? |
| 1117-1123 | dolomite and anhydrite as above |
| 1123-1132 | dolomite, vy fn. xln, dark gray, minor shale inclusions |
| 1132-1134 | same with some salt vug filling |
| 1134-1136 | salt, smokey gray, impure |
| 1136-1137 | dolomite, very fnly xln, dark gray |
| 1137-1138 | salt |
| 1138-1139½ | dolomite as above |
| 1139½-1143 | salt |
| 1143-1144 | shaley dolomite with salt inclusions |
| 1144-1146 | salt |
| 1146-1146¾ 1146-~~1152½~~ | dolomite very fnly xln, med brn, shaley with salt inclusions |
| 1146¾-1159 ~~1152½~~-1159 | salt med. gray to brn, impure |
| 1159-1161 | dolomite, shaley with salt inclusions |
| 1161-1171 | salt smokey, impure |
| 1171-1173 | dolomite, very fnly xln, dark gray, shaley, with salt inclusions |
| 1173-1175 | salt, impure |
| 1175-1175½ | dolomite as above, shaley |
| 1175½-83½ | salt, smokey, impure |
| 1183½-1184½ | dolomite as above, shaley, salt inclusions |
| 1184½-1188 | salt as above |
| 1188-1189 | dolomite, shaley with salt inclusions |
| 1189-1199 | dirty salt |
| 1199-1205½ | dolomite, dark gray, vy fnly xln, argillaceous with abundant salt inclusions |
| 1205½-1220 | salt |
| 1220-1223½ | anhydritic dolomite as above |
| 1223½-31 | salt, impure becoming clean at base |
| 1231-39 | dolomite, very fnly xln., very vuggy, salt filled |
| 1239-1249 | salt, brownish gray, impure |
| 1249-1258 | salt, clean |
| 1258-1260 | dolomite, anhydritic, rare salt inclusions |
| 1260-1262 | salt, impure |
| 1262-1263 | dolomite as above, abundant salt inclusions |
| 1263-1269 | salt, impure |
| 1269-1271 | dolomite and anhydrite w/highly distorted salt laminations, probable zone of collapse. |
| 1271-1281 | impure salt with scattered very thin dolomite beds up to 1½" thick |
| 1281-1285 | dolomite and anhydrite, small amount of salt, highly distorted bedding |
| 1285-1286 | salt |
| 1286-1288 | As 1281-1285 |
| 1288-1290 | dolomite interbedded with salt and anhydrite |
| 1290-1292 | dolomite, distorted laminations, salt filled vugs |
| 1292-1295 | anhydrite and dolomite, fairly massive |
| 1295-1299 | salt, white, clean, highly fractured |
| 1299-1304 | dolomite, very fnly xln, brn, anhydrite, brn and salt, highly distorted laminations. |

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

GEOLOGICAL SURVEY

# WELL PLUGGING RECORD

DEC 09 1985

(Submit in TRIPLICATE Within 30 Days After Plugging is Completed)

Regulatory Control Unit

PERMIT NUMBER: BD 134 24850

FIELD NAME: Wyandotte Terminal

COMPLETE NAME(S) AND ADDRESS OF WELL OWNER: Phillips Petroleum Company Bartlesville, OK 74004

COMPLETE LEASE OR FARM NAME(S): Phillips Petroleum Company

WELL NUMBER: SWD-1

WELL LOCATION: NW ¼ NE ¼ NE ¼ SEC. 10 T. 4S R. 10E

TOWNSHIP: Brownstown

COUNTY: Wayne

TYPE OF WELL (Oil, Gas, Dry Hole, etc.): Brine disposal

TOTAL DEPTH: 420' RKB

FORMATION: Sylvania Sandstone

DATE PLUGGING STARTED: 6-18-85

DATE PLUGGING COMPLETED: 6-18-85

DEPT. REPRESENTATIVE(S) WHO ISSUED PERMIT OR WITNESSED PLUGGING: Bruce J. Waldo

CASING RECORD

| SIZE CASING | DEPTH SET | AMOUNT RECOVERED | SHOT OR RIPPED |
|---|---|---|---|
| 10 3/4" | 70' RKB | none | none |
| 5 1/2" | 220' | none | none |
| | | | |
| | | | |
| | | | |
| | | | |

BRIDGES OR PLUGS

| TYPE (Brush, Stone, Cement, Mechanical, etc.) | DEPTH PLACED | SACKS OF CEMENT AND ADDITIVES |
|---|---|---|
| cement | 371' RKB | 100 sacks |
| cement | 30' | 22 sacks |
| | | |
| | | |
| | | |
| | | |

Were tools, tubing, casing, etc., lost or left in the hole before or during plugging? [x] YES [ ] NO — If yes, give details: 5 1/2" and 10 3/4" casings remain

Did a Service Company pump mud, spot cement, or set bridge plugs? [x] YES [ ] NO — If yes, give name and address: Halliburton Services P.O. Box 331, Albion, MI 49224

Was the well plugged by a Company or Contractor other than Owner or Operator? [x] YES [ ] NO — If yes, give name and address: Lease Management, Inc. P.O. Box 290, 503 Industrial Ave. Mt. Pleasant, MI 48858

Representatives of Owner, Operator, Company, or Contractor who witnessed plugging: Lease Mgt.: Rick Desmoines, Jeff Meyers, Richard Lloyd — Owner: W. R. Thiel

DESCRIBE IN DETAIL HOW WELL WAS PLUGGED: 2 7/8" workstring was run in and T.D. tagged at 404' RKB (RKB is 8' above grade). With workstring set at 371' 5 bbls. of freshwater were injected and circulation attained.

100 sacks of cement were injected (50:50 Class A/Pozmix A with 2% gel, 3% calcium chloride and 1/4 lb. of Flocele per sack) and clean cement circulated to surface.

Pulled out workstring and waited one hour. Clean cement (no water on top) was then tagged at 70'. After two additional hours, TOC still at 70'.

Workstring was set at 30' and additional 22 sacks were injected with clean cement circulated to surface.

(USE REVERSE SIDE IF NEEDED)

## CERTIFICATION

"I state that I am authorized by said Owner or Operator to make this report; and that this report was prepared under my supervision and direction, and that the facts stated herein are true, correct and complete to the best of my knowledge."

NAME AND TITLE (Typed or Printed): W. R. Thiel Engineer, Corporate Engineering/Design Div.

SIGNATURE: W. R. Thiel

DATE (Month, Day, Year): July 3, 1985

COMPANY NAME AND ADDRESS: Phillips Petroleum Company
1-E6 Engineering Design Center
Bartlesville, OK 74004

R 7213
Rev. 4/74

## OPERATORS USE

**Description of Detail (cont.) or Other Supplemental Data:**

Pulled tubing out of hole; TOC at 9'. After 7 hours, TOC at 10: After additional 38 hours, hard cement tagged at 11 1/2' RKB (3 1/2' below grade).

Cementing operations began and ended 6-18-85.

On 7-2-85, 10 3/4" and 5 1/2" casings were cut off 3' below grade and a steel plate welded over the ends.

## DEPARTMENT USE ONLY

**Supplemental Plugging Data and Site Conditions:**

| FINAL INSPECTIONS BY DEPARTMENT REPRESENTATIVES | | |
|---|---|---|
| SIGNATURE | DIVISION | DATE |
| Vicki Wilcox | Oil Survey | 10-5-85 |
| | | |

GEOLOGICAL SURVEY

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

# PERMIT TO PLUG AND ABANDON

DNR DISTRIBUTION
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Field Office — File copy
Others — On request

MAY 31 1985
Regulatory Control

PERMIT NUMBER: BD 134 24850

FIELD NAME: Wyandotte Terminal

NAME AND ADDRESS OF PERMITTEE: Phillips Petroleum Co., Bartlesville, OK 74004

LEASE NAME AND WELL NO.: Phillips Petroleum Co. SWD-1

| LOCATION (¼ ¼ ¼ or other) | SECTION | TOWNSHIP | COUNTY |
|---|---|---|---|
| NW NE NE | 10 T 4S R 10E | Brownstown | Wayne |

| TYPE OF WELL (Oil, Gas, Dry Hole, etc.) | DATE COMPLETED | DATE PLUGGING WILL START | PLUGGING PERMIT REQUESTED BY & DATE |
|---|---|---|---|
| Brine disposal | 8-12-63 | 6-17-85 | W.R. Thiel 5-21-85 |

LAST PRODUCTION: BOPD BWPD MCFGPD DATE

PLUGGING TO BE DONE BY: will notify

PERMIT MAILED TO
Mr. W. R. Thiel
Phillips Petroleum Co.
Bartlesville, OK 74004

COPIES MAILED TO
Mr. Charles Brown
6525 Browns Rd.
Clare, MI 48617

✓ Geological Survey Division
Box 30028
Lansing, MI 48909

## CASING AND CEMENTING RECORD

| HOLE DIA. | CASING DIA. & WT./FT. | DEPTHS SET | CEMENT QUANTITY, TYPE, ADDITIVES | CMT. TOP. | PERFORATIONS |
|---|---|---|---|---|---|
| | 10 3/4" | 70' RKB | 160 sx | Circ. | |
| | 5 1/2" | 220' | Unknown | Circ. | |
| 9"± | Underreamed to 420' | | | | |
| | | | | | |

## GEOLOGIC DATA; GAS AND OIL SHOWS; DRILLING AND COMPLETION DATA:

TOPS

| | |
|---|---|
| BOD | 64' |
| DR | 64' |
| SYLV | 230' |
| T.D. | 420' |

## PLUGGING REQUIREMENTS*

Plugging requirements outlined are to be executed in accordance with the provisions of Act 61, P.A. 1939, as amended, and rules and orders adopted thereunder.

Clean out well preferably to 420' but at least to 270'.

Circulate-displace cement with LCM from total depth to about 6' below grade (your request).

WOC at least 12 hours then tag cement top. Fill as needed.

Cut casings off at least 3 feet below grade and weld a steel plate over the ends.

Notify this office the day before commencing plugging operations 313-724-2015.

You may also need approval from the EPA in conjunction with the UIC Program.

*NOTE: BONDS CANNOT BE RELEASED UNTIL A PLUGGING IS COMPLETED, CELLAR RAT HOLE AND PITS FILLED, WELL SITE RESTORED AND RECORDS FILED. WATER WELLS MUST BE PLUGGED ACCORDING TO RULE 166 OF ACT 294 P.A. 1985, "GROUND WATER QUALITY CONTROL". It is further made a requirement of this permit that the applicant give notice to the public utilities in accordance with Act 53, P.A. 1974 C.L. 460.701 to 460.718 and comply with each of the requirements of the act.

| AUTHORIZED BY (signature) | OFFICE | DATE |
|---|---|---|
| Bruce J. Weldon | IMLAY CITY | 5-29-85 |

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

R-7220
Rev. 11/77

DEQ

MICHIGAN DEPT. OF ENVIRONMENTAL QUALITY - GEOLOGICAL SURVEY DIVISION

# CHECKLIST FOR WELL BOND TERMINATION AND PERMIT TRANSFER

| | |
|---|---|
| Permit number: 24850 | Well name and number: Phillips Petroleum Co 1 |
| Permittee: Phillips Petroleum Co. | Owner number: 3386 |
| Surface location: NW 1/4 NE 1/4 NE 1/4 Sec 10 T 4S R 10E | |
| Township name: Brownstone | County name: Wayne |
| Bond number: 5669391 | Amount: |
| Type: SB SU | Bank number: |

Check ONE:

- [x] Part 615, Supervisor of Wells as amended, Act 451 PA 1994
- [ ] Part 625, Mineral Wells as amended, Act 451 PA 1994

Check ONE of the following activities:

- [x] Well plugged and abandoned
- [ ] Permit transfer requested
- [ ] Permit terminated
- [ ] Bond replaced

## PROCESSING SUMMARY

**Plugged and Abandoned or Terminated**

1. Field: Complete section "Field A" below
2. PGP Unit: Complete "Drilling Records" section
3. PGP Unit: Complete "Production Records" section (plugged wells only)
4. Compliance Unit: Complete "Compliance" section
5. PB Unit: Complete "Bonding" section and terminate well bond if apparent final approval is achieved

MAY 14 1997

**Permit Transfer or Bonding Change**

1. Field: Perform site inspection, attach copy of inspection Form EQ 7235, and complete section "Field B" below
2. PGP Unit: Complete "Drilling Records" section
3. PGP Unit: Complete "Production Records" section
4. Compliance Unit: Complete "Compliance" section
5. PB Unit: Complete "Bonding" section and terminate well bond if compliance is achieved (transfer)

AUG 1997 RECEIVED DNR-DISTRICT 11

Division Staff - fill-in appropriate boxes - ~~R910, R319 etc.~~ refer to applicable Act 451 rules - Check √ if requirement has been met - Mark box N if the requirement does not apply - then forward this form on to the next Unit in sequence listed above.

## FIELD COMPLETE SECTION A OR B BELOW:

### A - for Plugged and Abandoned wells or Terminated Permits

- [N] ~~R912~~ Permit term elapsed before commencement of drilling
- [N] Well construction has not occurred
- [√] ~~R805, R806~~ Surface casing properly abandoned
- [√] ~~R807~~ Rat and mouse holes properly abandoned
- [√] ~~R809~~ Well cellars and pits have been filled
- [√] ~~R809~~ Contour has been restored and stabilized
- [√] ~~R809~~ Debris has been removed
- [√] ~~R809~~ Apparent fire/pollution hazard eliminated
- [√] ~~R910~~ Plugging Record received and reviewed
- [N] ~~R314~~ Rework Records are filed
- [N] ~~R328~~ $H_2S$ analysis has been filed
- [N] Landowner assumption of responsibility has been filed
- [N] Pit plot received
- [ ] Other well records have been filed
- [N] Water well log has been filed
- [N] Water well plugged or permitted

### B - for Bond Replaced or Permit Transfer Requested attach inspection form EQ 7235

- [ ] ~~R314~~ rework records are filed
- [ ] ~~R328~~ $H_2S$ analysis has been filed
- [ ] Well construction has not occurred
- [ ] Pit plot received
- [ ] Water well log has been filed
- [ ] Other required records have been filed

Comments/Exceptions:

GEOLOGICAL SURVEY

AUG 14 1997

Permits & Bonding Unit

OK to terminate the well bond [√] YES [ ] NO (If NO, specify reason in comments, continue bond termination procedure)

Recommend approval of permit transfer [ ] YES [ ] NO (If NO, specify reason in comments, continue bond termination procedure)

Signature & Date: Bruce J. Waldo 7-30-97

EQ 7238 Rev (2/96) COMPLETE BOTH SIDES OF THIS FORM

**DRILLING RECORDS**

- [N] R319 Drill cuttings have been delivered
- [ ] R321 Driller's log has been filed
- [ ] R322 Electric logs have been filed
- [ ] R323 Deepening records have been filed
- [ ] R316 Directional surveys have been filed
- [ ] R329 Other required records have been filed

Comments/Exceptions:

OK to terminate the well bond [✓] YES [ ] NO (If NO, specify reason in comments, continue bond termination procedure)

Recommend approval of Permit Transfer [ ] YES [ ] NO (If NO, specify reason in comments, continue bond termination procedure)

Signature and date Mike Bruiks 5/13/97

**PRODUCTION RECORDS** (skip this section if permit is terminated)

- [ ] R505 - R515 Well capacity tests have been filed
- [ ] R516 Reservoir data has been filed
- [ ] R517 Monthly production has been reported
- [ ] R504 Secondary recovery records have been filed
- [ ] Other required records have been filed.

Comments/Exceptions:

OK to terminate the well bond [✓] YES [ ] NO (If NO, specify reason in comments, continue bond termination procedure)

Recommend approval of permit transfer [ ] YES [ ] NO (If NO, specify reason in comments, continue bond termination procedure)

Signature and date Gunther Schmidt MAY 19 1997

**COMPLIANCE**

- [X] No compliance cases initiated for this well
- [ ] Consent order signed by acquiring owner
- [ ] All district or region level cases for this well are closed
- [ ] Compliance unit cases for this well are closed.

Comments/Exceptions:

OK to terminate the well bond [X] YES [ ] NO (If NO, specify reason in comments, continue bond termination procedure)

Recommend approval of permit transfer [ ] YES [ ] NO (If NO, specify reason in comments, continue bond termination procedure)

Signature and date Susan M. Schiffert 5/20/97

**BONDING**

- [ ] One year has elapsed since PLGC date (Section 625 only)
- [ ] Plugging Record (original) and permit to plug are on file
- [ ] Affidavit of compliance is on file (Section 625)
- [ ] Final well on blanket bond
- [ ] Replaced by Bond No. _____ Effective date _____
- [ ] Permit transferred Effective date _____

Recommend approval of Permit Transfer [ ] YES [ ] NO (If NO, specify reason in comments, continue bond termination procedure)

Liability for the subject well under the above specified bond has terminated as presently determined. Notice sent to surety and/or permittee.

Signature and date David R. Davis AUG 26 1997

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - GEOLOGICAL SURVEY DIVISION

# RECORD OF WELL PLUGGING OR REWORK

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

| Permit number | Well name and number |
|---|---|
| 24,850 | Phillips Petroleum Company No. 1 |

Name and address of permittee

Phillips Petroleum Company
10 D1 Phillips Building
Bartlesville, OK 74004
Attn: W. R. Thiel

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

Name and address of contractor/service company

WellTech Eastern, Inc. (well service unit)
Mt. Pleasant, MI
Cementrite, Inc. (cement)
Mt. Pleasant, MI

| Type of well | Field name |
|---|---|
| LPG Storage | Phillips Petroleum Company |

NW 1/4 NE 1/4 NE 1/4 Sec 10 T4S R10E

| Date plugging/rework started | Date plugging/rework completed |
|---|---|
| April 21, 1997 | April 25, 1997 |

DEQ employee issuing plugging permit or approving Change of Well Status: Tom Godbold, Shiawassee District Geologist

Date issued: April 9, 1997

## WELL PLUGGING (Hole conditions after plugging)

| CASING | | | | PLUGS | | | | |
|---|---|---|---|---|---|---|---|---|
| Casing size | Where set | Amount casing pulled | Depth casing cut/perfed; or windows milled | Depth Bottom | Depth Top | Type of bridge or plug | Cement plugs: cement type, sacks, and additives | Tagged Top? Y/N |
| 16" | 70' RKB | none | N/A | N/A | N/A | | | |
| 10 3/4" | 1142' | none | N/A | 1111' | 1110' | mechanical | | Y |
| | | | | 1110' | -4'gl | cement | 526 sx cl A | N/A |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |

☐ Check if NORM material was reinserted into wellbore. If so, describe materials fully in the Daily Chronology section on reverse.

## WELL REWORK

Rework was to:
- ☐ Convert current zone to:
  - ☐ Disposal
  - ☐ Production
  - ☐ Storage
  - ☐ Secondary recovery
  - ☐ Other
- ☐ Remediate well:
  - ☐ Perf and test existing zone
  - ☐ Repair casing/cement
  - ☐ Other
- ☐ Temporarily abandon
- ☐ Plugback (recomplete as)
  - ☐ New production zone
  - ☐ Disposal
  - ☐ Storage
  - ☐ Enhanced recovery
  - ☐ Other
- ☐ Redrill:
  - ☐ Horizontal drain hole
  - ☐ Collapsed casing
  - ☐ Underream open hole
  - ☐ Other

### Well casing record - BEFORE rework

| Casing | | Cement | | Perforations | | | Acid or fracture treatment record |
|---|---|---|---|---|---|---|---|
| Size | Depth | Sacks | Type | From | To | If plugged, HOW? | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

### Well casing record - AFTER rework (Indicate additions and changes only, complete test record on next page)

| Casing | | Cement | | Perforations | | | Acid or fracture treatment record |
|---|---|---|---|---|---|---|---|
| Size | Depth | Sacks | Type | From | To | If plugged, HOW? | |
| | | | | | | | |
| | | | | | | | |
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| | | | | | | | |

GEOLOGICAL SURVEY
MAY 13 1997
Permits & Bonding Unit

| BEFORE REWORK | | | | AFTER REWORK | | | |
|---|---|---|---|---|---|---|---|
| Total depth | Completed Fm | Well completed for | | Total depth | Completed Fm | Well completed for | |
| BOPD | MCFGPD | Inj Rate | Pressure | BOPD | MCFGPD | Inj Rate | Pressure |

| DAILY PRODUCTION TEST RECORD | | | | | | DAILY INJECTION TEST RECORD ☐ Injection well ☐ Brine disposal | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Date | Oil (bbls) | Water (bbls) | Gas (Mcf) | Pressure | | Date | Bbls water or Mcf gas | Pressure | | Specific gravity of water |
| | | | | Tubing | Casing | | | Beginning | Ending | |
| | | | | | | | | | | |
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DAILY CHRONOLOGY - Describe in detail the daily chronology of rework/plugging, include days shut down. Describe exceptions to issued plugging instructions.

| Date | Narrative - also include dates pits filled, surface was restored, etc.. Use additional pages as needed. |
|---|---|
| 4-21-97 | RU (rigged up) WellTech DDU (double drum unit) No. 458. Well static and brine full. NU (nippled up) BOP, RU casing crew. Pulled and laid down 29 jts. 7" casing (about 1223', all recovered). RD (rigged down) casing crew. ND (nippled down) BOP, NU spool and 6" gate valve. Secured well. RD WellTech and moved DDU to Well No. 2. |
| 4-22-97 | RU Western Atlas Wireline and ran 4 3/4" gage ring and CCL (casing collar locator) to current TD (total depth) of 1230' RKB (rotary kelly bushing elevation datum). (RKB is surface plus 8'.) Ran GR (gamma ray) and density (interface) "roof" logs from TD to surface (using a container of 40 mC iodine 131 as a gamma ray source for the density log). Identified cavern roof coincidental with bottom of 10 3/4" casing at 1142' (with no washouts evident above the bottom of the casing). Fluid level at 50'. Multiple GR logs were inconsistent in the cavity (cased hole appeared normal). It was apparent that the iodine gamma source was causing interference to the natural GR detector. This was proven while logging Well No. 2 by logging with and without the source (same day, same tools). Natural GR zeroed in the cavern while logging WITHOUT the source, but detected radiation while logging WITH the source.<br><br>Ran sonar survey of cavern. Measured about 217,000 bbls. total volume.<br><br>Ran in with Baker CIBP (cast iron bridge plug) and set via wireline at 1110' RKB. RD Western Atlas. |
| 4-23-97 | RU pump truck, topped off well with water, pressure tested to 500 psig for 15 minutes. Tested good. RD pump truck. |
| 4-24-97 | RU WellTech, metal pit and 2 7/8" tubing. Ran in tubing and tagged CIBP at 1110'. Raised tubing to 1105'. RU Cementrite and cemented 10 3/4" casing from 1110' to 126' with 456 sx Class A cement (15.6 ppg, 1.18 cuft/sk yield, mixed w/5.2 gals water/sk). Ran out of cement. Upon checking weight tickets, discovered Cementrite had loaded truck 96 sx short. Pulled 2 7/8" tubing out of hole and waited on cement bulk truck.<br><br>More cement arrived about 1 1/4 hours later. Ran in 2 7/8" tubing to 151' (cement still soft) and circulated out about 11.4 sx cement. Recemented from 151' to surface with 70 sx cement (same mix as before). Completed job with total of 526 sx cement. Displaced brine was circulated to steel pit; circulated fresh water flush and excess cement to 10'x10'x10' dirt pit, lined with 20 mil plastic. Pulled 2 7/8" tubing and laydown on trailer. RD Cementrite , shutdown for night. |
| 4-25-97 | Vacuumed out steel pit and free water off plastic lined dirt pit and sent to disposal. Loaded out rental equipment and RD WellTech. Dug out around wellhead and cut off casings 4' below grade. Welded 1/2" steel plate across casings and welded on a 4 1/2" pipe vertically extending 4' above grade. Both plate and 4 1/2" pipe marked "Phillips Petroleum Co. No. 1, Permit #24850". (Purpose of pipe marker is to plainly mark the site to prevent a building from being erected directly over the abandoned well in the future.) Cleaned up and leveled site. Job complete. |

NOTICE: Under Part 615 Supervisor of Wells or Part 625 Mineral Wells, Act 451 PA 1994, as amended, a well owner has continuing liability for the integrity of a plugged well.

CERTIFICATION "I state that I am authorized by said owner. 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 and title for owner (printed or typed) | Authorized signature | Date |
|---|---|---|
| W. R. Thiel, Principal Cavern Engineer | W. R. Thiel | 5/6/97 |

NOTE. Bonds cannot be terminated until plugging is completed, cellar, rat and mouse holes, and pits filled, site leveled and cleaned and records filed.

Mail completed original and three copies to the DEQ District Office within 30 days after completion of plugging or rework.

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - GEOLOGICAL SURVEY DIVISION

# APPLICATION TO:

☐ CHANGE WELL STATUS OR

☒ PLUG AND ABANDON WELL

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, 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 or Gas Well ☐ Part 625 Mineral Well

| | |
|---|---|
| Permit number: 24,850 | Type of well: LPG Storage |
| Name and address of permittee: PHILLIPS PETROLEUM COMPANY, 10 D1 Phillips Building, Bartlesville, OK 74004 Attn: W. R. Thiel | |
| Field/facility name: Phillips Petroleum Co./Wyandotte Terminal | |
| Change of well status requested to: ☐ Plug back ☐ Perforate ☐ Temporarily abandon ☐ Other ☐ Convert to | Well name and number: Phillips Petroleum Company No. 1 |
| Last production/injection and type of fluid (amt. per day & injection pressure): 12/19/86-propane inj./38,000 bpd/450 psig | Well location: NW 1/4 of NE 1/4 of 1/4 Section 10 T 4S R 10E |
| Brief description of project: Cavern developed in salt formation for the storage of propane. | Township: Brownstown; County: Wayne |
| | Date drilling completed: 8/30/63; Date last produced/utilized: Emptied 9/15/93 |
| Work to be done by: WellTech Eastern, Inc. (wsu); Cementrite, Inc. (cement) | Starting date: 5/12/97 (+-) |

CASING AND CEMENTING RECORD

| Hole dia | Casing dia & wt/ft | Depths set | Cement quantity, type, additives | Cement top | Perforations |
|---|---|---|---|---|---|
| ? | 16"x31-3/4# | 70' | 160 sx. type & additives unknown | surface | none |
| 13-3/4' | 10-3/4"x45-1/2# | 1142' | 1145 sx. type & additives unknown | surface | none |
| | 7"x26# | 1223' | none (hanging) | N/A | none |
| | | | | | |
| | | | | | |

Formation record (formation and depth, oil, gas and water shows, etc.): (formation tops)

| formation | depth | | | | |
|---|---|---|---|---|---|
| RKB | 0' | Sylvania Sandstone | 241' | Salina C Unit | 1027' |
| Surface (Glacial Drift) | 8' | Bois Blanc Dolo. | 400' | Salina B Unit (dolomite) | 1100' |
| Detroit River Dolomite | 64' | Bass Is. Dolo. | 507' | Salina B Salt | 1147' |
| | | Salina G Unit | 620' | Salina A2 Dolo. | 1295' |
| | | Salina F Unit | 640' | T.D. | 1315' |
| | | Salina E Unit | 890' | | |
| | | Salina D Salt | 990' | | |

Detail proposed procedures: Insure well is brine full and depressured before mobilization. Rigup WSU (well service unit) nipple down wellhead and nipple up shop tested BOP (Hydril). Pull and lay down 7" casing. Nipple down BOP and nipple up 6" valve. Rigdown WSU and rigup Western Atlas wireline. Run gamma ray/density (interface) log from 1160' to surface (to insure no cavity development behind 10 3/4" casing). Run sonar survey of cavity. Set a 10 3/4" CIBP (cast iron bridge plug) on wireline at about 1130'. Rig down Western Atlas. Pressure test 10 3/4" casing and CIBP with casing brine full to 500 psig surface pressure for 15 minutes. Rigup WSU. Install 7 1/16" x 2000# SR Stripper. Go in hole with 2 7/8" tubing and tag CIBP. Rigup Cementrite. Fill 10 3/4" casing from 1130' to the surface with 550 sx Class A cement (mixed 5.2 gals. water/sk, yielding 1.18 cuft/sk at 15.6 ppg) with a 20 bbl. fresh water preflush dyed red for a cement marker. Circulate displaced brine into a surface tank. When red preflush is observed, circulate excess cement into a 10' x 10' x 10' workover pit lined with a minimum 20 mil plastic liner. (Note that this pit will only be used to catch the tail of the fresh water flush and any excess cement. Free water will be vacuumed up and sent to disposal. Excess cement will be buried in the pit.) Come out of hole and laydown 2 7/8" tubing. Rigdown WSU. Digout and cut off wellhead 4' below ground level. Weld on a 1/2" thick plate with the following inscribed: "PPCo #1, Permit #24850". Install a 4 1/2" monument marker from 1/2" plate to 4' above ground level to prevent any future building from being erected over the borehole. Cleanup and level area.

DEQ additional requirements:

| | |
|---|---|
| Name/signature (authorized representative): W. R. Thiel<br>W. R. Thiel, Principal Cavern Engineer, Phillips Pet. Co. | Date: 3/27/97 |

FOR GEOLOGICAL SURVEY DIVISION USE ONLY

| Approved by DEQ: | Office: | Approval date: | Termination Date: |
|---|---|---|---|
| Tom Fordbold | Shiawassee | 4/9/97 | 4/9/98 |

EQP 7200-6 (Rev 2/96) Submit original and three (3) copies of this application to the District Office.

Note: Three copies of Record of Well Plugging or Rework (EQP 7200-8) are to be filed within 30 days of completion at the District Office.

Permit No: 135 Source: Geowebface DEQ

- **API Number:21163001358000**
- **Permit Number:135**
- **Lease Name:PHILLIPS PETROLEUM COMPANY**
- **Well #:BD-2**
- **Status:Terminated Permit**
- **Total Depth:Null**
- **Producing Formation:Null**
- **Latitude:42.16744**
- **Longitude:-83.2309**
- **Place:Brownstown**
- **County:Wayne**
- **TRS:04S10E10**
- **Map-click Lat:42.16744**
- **Map-click Lon:-83.23096**

**API NO. 21163001350000**

**NO DATA AVAILABLE**

L. P. G. (33)
TD 1296 in Salina "B" Salt (42)
Facility Well

10-4S-10E
Brownstown Twp. (Wayne Co.)

Phillips Petroleum Company

Phillips Petroleum Company No. 2 Permit No. 24851

Drilling Contractor: North American Drilling Co. (Rotary)

Location: SW¼ NE¼ NE¼ Section 10, T. 4S, R. 10E
992' from North and 1065' from East line of quarter section

Elevation: 605.8 feet above sea level (rot. bush.)

Record by: William Mantek from core descriptions submitted by the company; some formation tops from Schlumberger Gamma Ray-Neutron Log (Schj)

Note: Well was cored continuously from surface to total depth.

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| No Record | 70 | 70 |
| DEVONIAN: | | |
| Detroit River: | | |
| No record | 172 | 242 Schj |
| Sylvania: | | |
| No record | 8 | 250 |
| Sand, medium to coarse, subrounded to round, clear to frosted, well sorted, fair to good porosity and permeability, friable | 3' | |
| Sand, medium to coarse, fair sorted, fair porosity and permeability with some very fine Sand and Dolomite as pore infill | 1' | |
| Sand, medium to coarse, fair to good sorted porosity and permeability, clear to white, frosted, friable, very slightly dolomitic | 2' | |
| Sand, coarse to very coarse, good sorting porosity and permeability, frosted, friable | 1' | |
| Sand, medium to coarse, fair sorting porosity and permeability, slightly friable, subrounded to round | 4' | |
| Sand, fine to coarse, fair sorting porosity and permeability, some pore space infilling of Dolomite and very fine Sand, frosted and friable | 3' | |
| Sand, fine to medium, some crystals, friable, fair porosity and permeability | 2' | |
| Sand, medium to coarse, fair sorting porosity and permeability, subround, frosted | 6' | |
| Sand, fine to coarse, poor sorting, very poor permeability, tight | 2' | |
| Sand, coarse, subrounded to round, well sorted, friable, good porosity and permeability | 3' | |
| Sand, fine to coarse, fair to good sorting porosity and permeability, friable | 3' | |
| Sand, medium to coarse with some very fine Sand and calcitic cement, poor porosity and permeability | 1' | |
| Sand, medium to coarse, subrounded to round, frosted, good sorting porosity and permeability, friable | 3' | 284 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| DEVONIAN: | | |
| Sylvania: (Continued) | | |
| Sand, medium, some Dolomite and silica cement, tight to very slightly porous | 1' | |
| Sand, medium to coarse, subrounded to round, frosted, good porosity and permeability, friable | 6' | |
| Sand, fine to coarse, some calcitic cement, fair porosity and permeability | 1' | |
| Sand, fine to medium, fair sorting porosity and permeability, slightly friable | 2' | |
| Sand, fine to medium, sub-angular, calcitic, shaly, tight | 1' | |
| Sand, fine to medium to coarse, fair to good porosity and permeability, friable | 1' | |
| Sand, coarse, round, good sorting porosity and permeability, friable | 2' | |
| Sand, medium to coarse, round, good sorting porosity and permeability, friable | 2' | |
| Sand, medium to coarse, subrounded to round, fair sorting permeability and porosity | 4' | |
| Sand, medium to coarse, round, good sorting porosity and permeability | 2' | |
| Sand, medium to coarse, good sorting porosity and permeability with few small Shale inclusions | 4' | |
| Sand, medium to coarse, good sorting porosity and permeability | 4' | |
| Sand, fine to medium to coarse, poor sorting, fair to tight porosity and permeability, dolomitic cement, shaly | 4' | |
| Dolomite, finely crystalline, light gray, tight | 1' | |
| Sand, coarse grained, subrounded, dolomitic cement, shaly, pyritic, tight | 1' | |
| Dolomite, finely crystalline, light gray with abundant floating fine to medium Sand grains, tight | 2' | |
| Sand, fine to medium subrounded, shaly, very dolomitic, tight | 2' | |
| Dolomite, very sandy as 320-322 | 2' | |
| Sand, medium to coarse, slightly dolomitic, slightly porous and permeability | 1' | |
| Sand, medium subrounded, slightly dolomitic, tight, very slightly porous | 1' | |
| Sand, fine to medium, dolomitic, slightly shaly, tight with large solution vugs with inner growth of calcite and gypsum crystals | 1' | |
| Sand, medium to coarse, subrounded, slightly friable, very slightly dolomitic, fair to good porosity and permeability | 2' | |
| Sand, medium to coarse, very slightly dolomitic, very slightly shaly, tight, very slightly porous | 3' | |
| Sand, medium to coarse, subrounded, fair sorting porosity and permeability | 4' | |
| Sand, medium to coarse, subrounded to round, clear to frosted, good sorting porosity and permeability | 5' | |
| Sand, medium to coarse, slightly dolomitic, fair sorting, fair to good porosity and permeability | 1' | |
| Sand, medium to coarse, slightly dolomitic, tight, slightly porous | 3' | |
| Dolomite, finely crystalline, buff-gray, very sandy | 1' | |
| Chert, white, weathered, soft, unconsolidated | 3' | |
| Dolomite, finely crystalline, buff-gray, very sandy with nodules of Chert, as above | 2' | 353 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| DEVONIAN: | | |
| Sylvania: (Continued) | | |
| Sand, coarse to very coarse, sub-angular to subrounded, clear grains with occasional frosted grains, occasional dark gray dolomitic Shale inclusions, good porosity and permeability (some grains are actual quartz crystals) | 4' | |
| Sand, fine to medium, subrounded, very dolomitic, tight | 1' | |
| Chert, white, gray, weathered, soft with floating sand grains, appears "re-worked" | 1' | |
| Dolomite, very finely crystalline, tan with fine to medium grained Dolomitic shaly Sand and Chert as above | 2' | |
| Dolomite, very finely crystalline, tan, with some secondary calcite | 1' | |
| Dolomite, very finely crystalline, gray, fossil fragments (probably brachs) with some "re-worked" sandy Chert | 1' | |
| Dolomite, very finely crystalline, gray, Sand, fine to medium and weathered Chert | 2' | |
| Dolomite, very finely crystalline, buff-gray, very sandy | 1' | |
| Sand, medium to coarse, shaly, pyritic, slightly dolomitic, fair porosity and permeability | 1' | |
| Sand, coarse, subrounded to round, porous and permeability, very slightly shaly | 1' | |
| Sand, medium to coarse grained, slightly dolomitic, fair to good porosity and permeability | 6' | |
| Sand, medium grained, dolomitic cement, tight, slightly porous | 3' | |
| Sand, medium to coarse, subrounded, slightly friable, fair porosity and permeability | 1' | |
| Sand, medium to coarse, dolomitic cement, tight | 1' | |
| Sand, medium to coarse, subrounded to round, fair to good porosity and permeability | 1' | |
| Sand, fine to medium grained, dolomitic, tight | 2' | |
| Sand, fine to medium, subrounded to round, shale laminations, tight | 5' | |
| Sand, medium to coarse, shaly, tight | 3' | |
| Sand, medium to coarse, subrounded, glassy, slightly dolomitic, few Shale laminations, fair porosity and permeability | 1' | |
| Dolomite, finely crystalline, buff-gray, tight | 1' | |
| Sand, medium to coarse, dolomitic, shaly, pyritic, tight | 1' | |
| Sand, fine to medium, tight to slightly porous | 3' | |
| Sand, coarse, subrounded, friable, good porosity and permeability | 2' | |
| Sand, medium to coarse, subrounded, tight to slightly porous and permeability | 1' | |
| Sand, fine to very coarse, poor sorted, tight, very slightly porous and permeability | 1' | |
| Sand, medium to coarse, dolomitic cement, tight, very slightly porous and permeability | 3' | |
| Dolomite, very finely crystalline, tan, with nodules of white, soft, re-worked Chert | 3' | |
| Same, with some coarse dolomitic Sand, tight | 1' | |
| Sand, fine to medium, slightly dolomitic, poor porosity and permeability | 1' | |
| Sand, coarse, sub-angular (mostly quartz crystals) fair porosity and permeability | 1' | |
| Sand, medium to coarse, (mostly clear quartz crystals), very slightly dolomitic, tight | 6' | 415 |
| | (173) | |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| DEVONIAN: (Continued) | | |
| Bois Blanc: | | |
| Chert, white, chalky, re-worked, with some Calcite filled fractures, some Dolomite, finely crystalline, gray (Bois Blanc @ 408 Schj) | 3' | |
| Same, with some medium grained Dolomite, Sand | 1' | |
| Chert, as above, with finely crystalline Dolomite, sandy | 1' | |
| Chert, as above; and, Dolomite, finely crystalline, tan with occasional fossil molds | 7' | |
| Sand, medium coarse grained, sub-angular to round and sub-rounded, dolomitic cement, shaly, tight | 1' | |
| Chert, white, slightly weathered and Dolomite, very finely crystalline, tan-gray (looks like a breccia), with some carbonaceous pyritic shale | 5' | |
| Dolomite, finely crystalline, tan-gray, slightly sandy | 1' | |
| Chert, white, weathered with Dolomite, as above (appears solutional) | 3' | |
| Dolomite, finely crystalline, slightly laminated, tan and gray | 1' | |
| Mostly Chert, as above, and Dolomite, very finely crystalline, tan to gray, occasional black Shale lamanations, stylolitic, brecciated appearance | 7' | |
| Shale, dark gray, Sand, medium grained, Dolomite, finely crystalline, fossiliferous ("mess") | 2' | |
| Chert, gray, marly, Dolomite, very finely crystalline, tan and secondary Calcite (breccia) | 1' | |
| Chert and Dolomite, as above - appears more solutional than brecciated | 8' | |
| Same, with introduction of light gray Chert, slightly spicular with conchoidal fracture | 1' | |
| Chert, re-worked "crumbly" and Dolomite, light brown, very finely crystalline, both extremely fossiliferous | 5' | |
| Sandstone, medium to coarse, sub-angular, clear, dolomitic, occasional Shale lamanations, with some Chert nodules | 4' | |
| Sand, medium to coarse, sub-angular to subrounded, clear grained, fair porosity and permeability | 1' | |
| Predominantly Chert, off-white, weathered and unaltered Chert, gray, with Dolomite, very fine to finely crystalling, tan-gray, some secondary Calcite | 25' | |
| Dolomite, very finely crystalline, light brown, abundant tiny carbonaceous spicules, occasionally green (glauconite?) specks, few iron oxide concretions, dark brown to black, minor Shale stylolites and Chert, gray, almost unaltered, pinpoint vugular porosity (Bass Island @ 497 Schj) | 7' (86) | 501 |
| SILURIAN: | | |
| Bass Island: | | |
| Dolomite, very finely crystalline, slightly sucrosic, good vugular porosity with Pyrite crystals in the vugs | 3' | |
| Dolomite, sub-lithographic to very finely crystalline, tan and buff, no porosity | 24' | |
| Dolomite, very light gray to buff, tight, with one Chert nodule at 534 | 8' | |
| Dolomite, tan, good oolitic development, good vugular porosity | 1' | |
| Dolomite, very finely crystalline, light gray, buff-tan, some pinpoint vugs | 8' | 545 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| SILURIAN: | | |
| Bass Island: (Continued) | | |
| Dolomite, very finely crystalline, tan to light brown, fossiliferous, some fossil molds forming vugs with zones of pinpoint vuggy porosity | 14' | |
| Dolomite, light brown, oolitic, good porosity and permeability | 2'6" | |
| Dolomite, very finely crystalline, gray with inclusions of dark gray argillaceous material, (slightly mottled effect) | 6'6" | |
| Dolomite, very finely crystalline, buff-tan, occasional shaly, slightly marly, few Gypsum crystals, scattered zones of vugular porosity | 10' | |
| Same | 5' | |
| Dolomite, sub-lithographic, tan, with very fine pinpoint bugs | 2' | |
| As 568-583 | 4' | |
| Dolomite, very finely crystalline, light brown, gray | 2' | |
| Dolomite, tan, oolitic | 1' | |
| Dolomite, sub-lithographic with blotchy, irregular Shale partings with plains of Gypsum in a general vertical direction | 12' | |
| Dolomite, sub-lithographic to very finely crystalline, tan to gray, occasional Calcite veins with distorted pyritic Shale laminations | 8' | |
| Dolomite, very finely crystalline, medium gray, mottled, dark gray Shale inclusions (looks slightly brecciated) | 2' | |
| Dolomite, finely crystalline, light brown to gray, tight | 1' | |
| Dolomite, very finely crystalline, light gray with abundant beds of Gypsum, clear | 3' | |
| Dolomite, very finely crystalline, light gray, occasional very slight fossiliferous | 6' | |
| Dolomite, same, with vertical Gypsum veins | 3'6" | |
| Dolomite, very finely crystalline, light gray to tan | 4'6" | |
| Dolomite, very finely crystalline, tan, occasional vertical vein of Gypsum | 2'6" | |
| Gypsum, white chalky, slightly brecciated, with Dolomite as above | 1' | |
| Dolomite, very finely crystalline, gray | 0'6" | |
| Gypsum, as above | 1'6" | |
| Mottled, gray Dolomite and Shale, dark gray | 0'6" | |
| Gypsum, with some Dolomite, very finely crystalline | 1' | |
| Gypsum, transitional, and bluish white Anhydrite with some Dolomite, very finely crystalline, medium brownish gray | 1'6" | |
| Dolomite, lithographic to extremely finely crystalline, chocolate brown with minor Anhydrite veins | 6' | |
| Anhydrite, bluish white | 1'6" | |
| Dolomite, extremely finely crystalline, chocolate brown, anhydritic in part | 3' | |
| Anhydrite, brownish gray to bluish white, dolomitic in part | 8' | |
| Interbedded Dolomite, extremely finely crystalline, medium gray to slightly brown, and Anhydrite, as above | 7' | |
| Anhydrite, bluish white | 1' | |
| Interbedded Dolomite and Anhydrite | 4' | |
| Same, with abundant irregular Shale, dark gray, laminations | 3' | |
| Anhydrite, bluish white with some Dolomite, as above | 7' | |
| Dolomite, very finely crystalline, medium gray to tan, rare Anhydrite flecks | 10' | |
| Dolomite, tan, very finely crystalline | 4' | 695 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| SILURIAN: | | |
| Bass Island: (Continued) | | |
| Dolomite, brown and tan, finely crystalline, mottled, argillaceous | 8' | |
| Dolomite, extremely finely crystalline, interbedded with Anhydrite, bluish white | 8' | |
| Anhydrite, bluish white with some Dolomite, as above | 8' | |
| Dolomite, extremely finely crystalline, medium gray, tan | 1' | |
| Interbedded Dolomite and Anhydrite (Salina @ 721 Schj) | 8' | 728 |
| | (227) | |
| Salina: | | |
| Same, extremely shaly | 1'6" | |
| Anhydrite and Dolomite, as above | 4'6" | |
| Dolomite, sub-lithographic, dark gray, conchoidal fracture with occasional Anhydrite inclusions | 9' | |
| Same, with Anhydrite content nearing 30% | 25' | |
| Dolomite, as 734-743 | 8' | |
| Interbedded Anhydrite and Dolomite, shaly | 17' | |
| Anhydrite, bluish-white ("F" Unit @ 795 Schj) | 3' | |
| Dolomite, sub-lithographic, dark gray, shaly | 2' | |
| Anhydrite, as above | 2' | |
| Same, shaly | 2' | |
| Anhydrite | 4' | |
| Dolomite, extremely finely crystalline, dark gray, probably argillaceous | 5' | |
| Anhydrite | 3' | |
| Dolomite, argillaceous as 806-811 | 6' | |
| Dolomite, medium brown, gray, very finely crystalline, very anhydritic | 10' | |
| Dolomite, very finely crystalline, dark gray, argillaceous, some Shale lamanations, some Anhydrite | 6' | |
| Anhydrite, with minor Dolomite stringers | 2' | |
| Dolomite, extremely fine to crystalline, medium brown, some Anhydrite | 4' | |
| Dolomite, argillaceous; and, Shale laminations | 1'6" | |
| Anhydrite, gray | 1' | |
| Dolomite, as above | 9'6" | |
| Anhydrite, with minor Dolomite laminations | 9' | |
| Dolomite, very finely crystalline, medium brown ("E" Unit @ 866 Schj) | 3' | |
| Dolomite, very finely crystalline, dark gray, argillaceous with Shale, dark gray, laminations, brittle to fissile and some Anhydrite - bluish white | 25' | |
| Anhydrite, brown to gray | 5' | |
| Dolomite, very finely crystalline, medium brown, with occasional black Shale laminations, very rare Anhydrite nodules, few thin vertical fractures, Anhydrite filled | 12'6" | |
| Inter laminated Dolomite, Shale and minor Anhydrite | 6'6" | |
| Dolomite, very finely crystalline, brownish gray, conchoidal fractures, occasional Shale laminations | 5' | |
| Inter laminated Anhydrite and Dolomite | 4' | |
| Dolomite, very finely crystalline, medium brown, minor Anhydrite and Shale | 16' | |
| Dolomite, very finely crystalline, light brown, minor Shale lamanations | 12' | |
| Dolomite, sub-lithographic, light gray to tan | 10' | |
| Same, with Shale laminations | 2' | |
| Same, as 962-965 with Anhydrite inclusions | 1' | 965 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| SILURIAN: | | |
| Salina: (Continued) | | |
| Dolomite, very finely crystalline, chocolate brown, with very thin Gypsum laminations and some vuggy porosity | 1' | |
| Laminated Dolomite, Shale and minor Anhydrite | 11' | |
| Same, with one orange vertical Salt crystal at 977 | 3'6" | |
| Salt, clear to slightly dirty ("D" Salt @ 983 Schj) | 18' | |
| Dolomite, very finely crystalline, medium gray with minor thin Salt laminations, some Salt inclusions (probable Salt leached and collapsed zone) | 8'6" | |
| Salt, clear | 4' | |
| Dolomite, very finely crystalline, medium dark gray with some Anhydrite and vertical veins of orange Salt ("C" Unit @ 1016 Schj) | 21' | |
| Anhydrite, gray, brown | 1'6" | |
| Same, as 1011-1031 with some Shale partings | 10'6" | |
| Dolomite, very finely crystalline, dark gray, slightly shaly with occasional inclusions and few vertical veins of orange Salt | 38' | |
| Same, with occasionally very large Salt vugs | 2' | |
| Dolomite, extremely finely crystalline, slightly argillaceous, dark gray, very minor abount Salt filled vugs | 4' | |
| Dolomite, as above with minor Anhydrite | 6' | |
| Anhydrite, with minor Dolomite ("B" Unit @ 1093 Schj) | 5' | |
| Dolomite, very finely crystalline, dark gray, argillaceous with some Shale laminations | 3' | |
| Same, with large vertical Salt veins | 1' | |
| Dolomite, as above with some Anhydrite | 13' | |
| Same, with some vugular porosity filled with orange Salt collapsed zone? | 3' | |
| Dolomite and Anhydrite as above | 6' | |
| Dolomite, very finely crystalline, dark gray, minor Shale inclusions | 9' | |
| Same, with some Salt vug filling | 2' | |
| Salt, smokey gray, impure | 2' | |
| Dolomite, very finely crystalline, dark gray | 1' | |
| Salt ("B" Salt @ 1138 Schj) | 1' | |
| Dolomite, as above | 1'6" | |
| Salt | 3'6" | |
| Dolomite, shaly, with Salt inclusions | 1' | |
| Salt | 2' | |
| Dolomite, very finely crystalline, medium brown, shaly with Salt inclusions | 0'8" | |
| Salt, medium gray to brown, impure | 12'3" | |
| Dolomite, shaly with Salt inclusions | 2' | |
| Salt, smoky, impure | 10' | |
| Dolomite, very finely crystalline, dark gray, shaly with Salt inclusions | 2' | |
| Salt, impure | 2' | |
| Dolomite, as above, shaly | 0'6" | |
| Salt, smokey, impure | 8' | |
| Dolomite, as above, shaly, Salt inclusions | 1' | |
| Salt, as above | 3'6" | |
| Dolomite, shaly with Salt inclusions | 1' | |
| Salt, dirty | 10' | |
| Dolomite, dark gray, very finely crystalline, argillaceous with abundant Salt inclusions | 6'6" | |
| Salt | 14'6" | 1220 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| SILURIAN: | | |
| Salina: (Continued) | | |
| Dolomite, anhydritic, as above | 3'6" | |
| Salt, impure, becoming clean at base | 7'6" | |
| Dolomite, very finely crystalline, very vuggy, Salt filled | 8' | |
| Salt, brownish gray, impure | 10' | |
| Salt, clean | 9' | |
| Dolomite, anhydritic, rare Salt inclusions | 2' | |
| Salt, impure | 2' | |
| Dolomite, as above; abundant Salt inclusions | 1' | |
| Salt, impure | 6' | |
| Dolomite and Anhydrite with highly distorted Salt laminations, probable zone of collapse | 2' | |
| Salt, impure, with scattered very thin Dolomite beds up to 1½" thick | 10' | |
| Dolomite and Anhydrite, small amount of Salt, highly distorted bedding | 4' | |
| Salt | 1' | |
| As 1281-1285 | 2' | |
| Dolomite, interbedded with Salt and Anhydrite | 2' | |
| Dolomite, distorted laminations, Salt filled vugs | 3' | |
| Anhydrite and Dolomite, fairly massive | 4' | |
| Salt, white, clean, highly fractured | 1' | 1296 |
| | (568+) | |

TOTAL DEPTH 1296 Schj

TOTAL DEPTH 1315 Drlr.

Casing Record:

| | | |
|---|---|---|
| 16" | 70' | (160 cement) |
| 10 3/4" | 1142' | (850 cement) |
| 7" | 1152' | |
| 4 1/2" | 1290' | |

Drilling Commenced: 8-23-63
Drilling Completed: 9-5-63

3/64

L.P.G. (33)
TD 1156 in Salina (B salt) (42)
Facility Well

22-4S-10E
Brownstone Twp. (Wayne Co.)
(City of Woodhaven)

Marathon Oil Co.

Marathon Oil Co. No. LPG 1 Permit No. 27160

Drilling Contractor: North American Drilling Co. (Rotary 0-1156)

Location: N½ SE¼ Sec. 22, T4S, R10E
525' from north and 143' from east line of quarter section.

Elevation: 606.5' above sea level (rot. bush.)

Record by: H. Laaksonen from driller's log submitted by the company.
Logs run: Schlumberger Conpensated Formation Density Log (20-1154) (Sj)

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Clay | 35 | 35 |
| DEVONIAN: | | |
| Detroit River: | | |
| Limestone, gray | 151 | 186 Sj |
| Sylvania | | |
| Limestone, gray, sandy (SHS=0° deviation @200) | 33 | 229 |
| Sandstone, white | 31 | 260 |
| Limestone, gray, shaley | 27 | 287 |
| Limestone, gray, sandy (SHS=0° deviation @300) | 37 | 324 |
| Sandstone, | 27 | 351 Sj |
| | (165) | |
| Bois Blanc: | | |
| Limestone, gray; anhydrite, white | 20 | 371 |
| Limestone, brown (SHS=1° deviation @400) | 80 | 451 Sj |
| | (100) | |
| SILURIAN: | | |
| Bass Islands: | | |
| Limestone, brown, sandy (SHS= 1° deviation @500) | 56 | 507 |
| Limestone, gray (SHS=0° deviation @600) | 138 | 645 Sj |
| | (194) | |
| Salina: | | |
| Limestone, gray; anhydrite, white (F unit @717 Sj) (SHS=0° deviation @720; SHS=0° deviation @840) | 242 | 887 |
| Limestone and shale, gray; anhydrite, white (D unit @901 Sj; C unit @910 Sj) | 53 | 940 |
| Limestone and shale, gray (B unit @981 Sj; 947 DPM=949 SDP) | 68 | 1028 |
| Salt and dolomite (B salt @1028 Sj) | 128 | 1156 |
| | (511+) | |
| Total depth | | 1156 |

Casing record: 16" 154 (300 cem.); 11 3/4" 1029 (600 cem.)
Commenced: 4-11-68; Completed: 4-21-68; Well Completed 5-3-68

BEST COPY
AVAILABLE

21160

# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, GAS OR L.P.G. STORAGE OR FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61 P.A. OF 1939, AS AMENDED AND ACT 326, P.A. 1937 AS AMENDED.

SUPERVISOR OF WELLS
GEOLOGICAL SURVEY
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING, MICHIGAN 48926

*See Reverse Side Before Filling Out This Application*

See Marathon Oil Co. Drawing #34-17 (R)

1. APPLICATION TO DRILL A WELL FOR: LPG Storage
2. DATE: 12-19-67
3. FEE INCLOSED: 125.00
4. LESSEE (OWNER OF LEASE RIGHTS): Marathon Oil Company
5. PERMANENT ADDRESS: 1300 S. Fort Street, Detroit, Michigan, 48217
6. PHONE: 843-9100
7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Marathon Oil Company (Woodhaven)
8. WELL NO.: LPG #1
9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER): Same
10. DRILLING CONTRACTOR: North American Drilling Company
11. ADDRESS: 1300 N. Fancher St., Mt. Pleasant
12. PHONE: 773-3945
13. LOCATE WELL AND OUTLINE LEASE OR UNIT ON SECTION PLAT - 640 ACRES: NW NW SE ¼, SECTION 22, T 4 S, R 10 east
14. ACRES IN LEASE OR UNIT (SPECIFY): 11.534
15. TOWNSHIP: City of Woodhaven
16. COUNTY: Wayne
17. *Locate well in two directions from nearest lines of quarter section and property ownership or unit lines*: 525 FT. FROM North (north-south) LINE OF QUARTER SECTION; 143 FT. FROM east (east-west) LINE OF QUARTER SECTION; 25 FT. FROM North (north-south) (PROPERTY) LINE; 110 FT. FROM East (east-west) (PROPERTY) LINE
18. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary
19. WELL IS TO BE COMPLETED IN: Salina FORMATION
20. INTENDED DEPTH OF WELL: Approx. 1150'
21. PROGRAM OF CASING, SEALING, CEMENTING AND COMPLETING WELL

See attached write-up.

CASING IS NOT TO BE STRIPPED FROM THE HOLE AND NO CHANGE IS TO BE MADE IN THE PROGRAM OUTLINED ABOVE WITHOUT APPROVAL OF THE SUPERVISOR OF WELLS OR HIS AUTHORIZED REPRESENTATIVE

22. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒
23. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒
24. IF ANSWER TO No. 22 ABOVE IS Yes, DESCRIBE AND GIVE DISTANCE FROM LOCATION.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST FIELD OFFICE. *(See reverse side)*

25. ADDRESS CORRESPONDENCE AND PERMIT TO: Mr. T. J. Ruffing - 1300 S. Fort St., Detroit, Mich. 48217
26. PHONE: 843-9100

LEAVE BLANK
DATE ISSUED: 
PERMIT NO. 

27. OWNER OF LEASE RIGHTS: Marathon Oil Company
28. AUTHORIZED REPRESENTATIVE: [signature]

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

DISTRIBUTION
1. WHITE - LANSING
2. CANARY - CASHIER
3. BLUE - FIELD
4. GOLDENROD - FIELD
5. GREEN - APPLICANT

OIL DIVISION - BOX 30028 - LANSING, MICHIGAN 48909
GAS DIVISION - BOX 30028 - LANSING, MICHIGAN 48909

Form Cons. [illegible] A 100 Sets 1-66

STATE OF MICHIGAN

DEPARTMENT OF CONSERVATION

SUPERVISOR OF WELLS

No. 8936

# PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST WHITE COPY OF PERMIT AT WELL LOCATION)

Permit No. 27160 Date Issued January 22, 1966

Permission is hereby granted to Marathon Oil Company
Owner

1300 S. Fort Street, Detroit, Michigan 48217
Address

Lease Name Marathon Oil Company (Woodhaven) Well Number LPG #1

To drill a well for LPG Storage

in the E½ of SE¼ of Sec. 22, T.4S, R.10 E., City of Woodhaven, Wayne Co.

and located 525' from the north and 143' from the east line of quarter section

and located 75' from the north and 110' from the east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By Robert M. Acker

## SPECIAL REQUIREMENTS

### NOTICE

DRILLING PERMIT ISSUED on the basis of the drilling, casing and sealing program as outlined on the application for permit and subject to special requirements as set forth above. No change or alteration is to be made without the permission and approval of the Supervisor of Wells or his authorized representative.

DRILLING OPERATIONS ARE NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

### DEPARTMENT OFFICES

Lansing, Phone 517-373-1236
Mount Pleasant, Phone 517-773-8691
Cadillac, Phone 616-775-3181
Plainwell, Phone 616-685-8051
Imlay City, Phone 313-724-7015
Escanaba, Phone 906-786-0333

PERMITS MAY BE TRANSFERRED ONLY WITH THE PERMISSION OF THE SUPERVISOR OF WELLS

Recommended Drilling Program For Marathon's Proposed Storage Caverns
At Parhart Station, Brownstown Township, Wayne County, Michigan

1. Move in North American Drilling Company's rotary rig No. 10 or comparable equipment.

2. Rig up and drill a 20" hole to 170 feet or deeper as required to completely penetrate the drift.

3. Run 170 feet of 16" O.D., H-40, 55#/ft. S.T. & C., casing and cement with 150 sacks of accelerated portland cement. The Texas pattern shoe and the bottom two joints of casing should be spot welded.

4. Install surface casing flange and blowout preventer.

5. After 12 hours W.O.C., drill out with a 15" bit. Brine mud will be used.

6. At approximately 975 feet reduce hole size to 7-7/8" diameter.

7. At approximately 990 feet or ten feet above the "B" salt as selected by the engineer or geologist on the well, begin coring operations. Cut three cores to include all of the salt and five feet of the under lying limestone. The entire core should be described and boxed for storage. Samples for analysis should be selected as desired.

   Upon completing the last core, circulate long enough to condition the hole for logging.

8. At this time, Schlumberger Well Logging Company should run a Formation Density - Gamma Ray Log and a Neutron Log.

9. The reduced hole from 975 feet to a point three feet beneath the top of the salt should be enlarged to 15". Top of the salt will be selected from the core and log data.

10. After circulating long enough to condition the hole, approximately 1000 feet of 11-3/4" O.D., 47#/ft., J-55, S.T. & C., 8 Rd. thd., casing should be run. Casing equipment will consist of a Baker guide, shoe, a Baker float collar, and three Baker centralizers. The first four joints are to be spot welded.

    Prior to running casing, all thread protectors are to be removed. The casing threads are then to be brushed and cleaned with solvent. After cleaning, dry the threads with clean rags and inspect each thread visually. After inspecting threads, dope with lubricant as provided. The thread protectors should be similarly cleaned and dried and replaced on the casing and not removed until the casing is run.

11. Upon landing the casing, circulation should be established and continued until 175 bbls. (150% of casing capacity) or more has been circulated. Halliburton should then cement the string with 500 sacks of salt saturated cement with 1.5% excess crushed salt blended into the dry mix. If enough brine storage is available on the rig, the plug should be pumped down with brine. This will facilitate testing prior to drilling out.

12. Hang casing in casing slips in full tension. Release rig or shut rig down for seven days W.O.C. The remainder of the completion can be done with the rotary rig or a workover rig as economics dictate.

13. After seven days W.O.C. test casing to 750 psi for fifteen minutes.

14. Drill out plug and ream hole to total depth, using a 10-5/8" bit.

15. A Birdwell 3-D Bond Log should then be run over the entire cased interval.

16. A string of 8-5/8" casing should then be run and suspended approximately 30 feet above the base of the salt. The lower portion of this string could be plastic or thin wall line pipe if desired. The lighter pipe would facilitate recovery in the event of cave ins.

17. A string of 4-1/2" O.D. casing should then be run and suspended approximately 1 foot above the base of the salt.

18. After tree is installed, release rig.

19. Additional pressure tests as desired can be run prior to initiating the washing operation.

MARATHON OIL COMPANY

PRODUCING - UNITED STATES

MICHIGAN PRODUCING DIVISION

1300 SOUTH FORT STREET
DETROIT, MICHIGAN 48217
PHONE 313-843-8100

January 17, 1968

Michigan Department of Conservation
Geological Survey
Lansing, Michigan

Attention: Mr. R. M. Acker,
Petroleum Geologist

Dear Mr. Acker,

We are enclosing a copy of Marathon Oil Company Drawing #R34-17, showing the locations for our LPG storage wells in Woodhaven, Michigan. We have also enclosed copies of our initial well permit applications depicting the revised well locations and designations. As shown, we will be drilling wells LPG #1, #2, and #4.

In answer to your questions on our drilling procedure, we have provided a more detailed description of the drilling program. This should be sufficient to clarify any misunderstandings of the operation.

Please be advised that during the cavern development process, we intend to ship the brine solution to one of our customers via pipeline. Upon completion of the washing operation, we hope to have eliminated the requirement for displacement brine, thereby eliminating any brine storage.

If you have any further questions or require additional information, do not hesitate to contact the undersigned.

Very truly yours,

MARATHON OIL COMPANY

Sydney Blum
Manager of Engineering

per T. J. Ruffing
T. J. Ruffing,
Project Coordinator

RECEIVED
JAN 19 1968
GEOLOGICAL SURVEY

TJR:tk
enc.

January 3, 1968

Marathon Oil Company
Refining Division
1300 South Fort Street
Detroit, Michigan 48217

Attention: Mr. T. J. Ruffing
Project Coordinator

Dear Mr. Ruffing:

Re: L.P.G. Storage Wells #2, #3 and #4, City of Woodhaven, Wayne County.

With reference to your letter of December 26, 1967 and applications for drilling permits, there are a few matters which need clarification. They are as follows:

1) In paragraph four of your letter, are we to assume that the locations specified on your applications are not final or is reference made to the proposed #1, #5 and #6 locations? If the locations applied for are not final, there apparently is no reason why the drilling permits should be issued until a final determination is made and the data is correct.

2) On checking your casing, running and cementing program, I gather the 1000 feet of 11 3/4 inch casing is to be cemented with pipe hung in the hole and not at the point of a casing seat. If so, do you intend to use scratchers and centralizers to assure even distribution of the cement in the annulus? In addition to testing the casing under pressure, it is equally important to test the cement job under pressure. After drilling out the plug in the 11 3/4 inch casing, what is there left to ream with a 10 5/8 inch bit in a 15 inch hole?

3) What are your intentions and what arrangements have been made for disposal of the brine solution in the process of developing the caverns?

4) What are your intentions for storage of brine solution or fluid to be used for displacement of the L.P.G.?

On receipt of your advice and clarification of the points in question, the applications will be reviewed with the Supervisor of Wells and processed in accordance with his instructions.

Very truly yours,

GEOLOGICAL SURVEY DIVISION

R. M. Acker,
Petroleum Geologist

RMAcker

MARATHON OIL COMPANY

REFINING - UNITED STATES
MICHIGAN REFINING DIVISION

1300 SOUTH FORT STREET
DETROIT, MICHIGAN 48217
PHONE: 313-843-0100

December 26, 1967

Michigan Dept. of Conservation
Geological Survey
Lansing, Michigan 48926

Gentlemen:

Marathon Oil Company intends to install, in the near future, three wells for the storage of LPG products, in the city of Woodhaven, Michigan.

Attached is a copy of Marathon Oil Company Drawing R34-17, which is a topographical and boundary survey of our Woodhaven property site, showing the preliminary locations of the six storage wells.

We are enclosing permit applications for the installation of wells - LPG #2, LPG #3, and LPG #4. We have also enclosed Marathon Oil Company Check #3337 to cover the $25.00 fees for each of the three wells.

Please be advised that we are considering the expansion of our present design capacity, so that the locations of the wells, as shown, are preliminary. As soon as we have finalized our design criteria, we will immediately forward the actual well locations on to you.

If you have any questions, or require any further information, do not hesitate to contact the undersigned.

Very truly yours,

MARATHON OIL COMPANY

Sydney Blum
Manager of Engineering

per T. J. Ruffing
T. J. Ruffing
Project Coordinator

RECEIVED
JAN 2 1968
GEOLOGICAL SURVEY

TJR:tk

Attach.

12/19/67

MARATHON OIL COMPANY

CASING, SEALING AND CEMENTING PROGRAM

FOR

LPG STORAGE WELLS #2, 3, and 4

1. Drill 20" hole to approximately 170' and install 16" OD casing. Cement with an estimated 150 sacks of Portland cement.

2. Drill a 15" hole from 170' to approximately 975' depth. At 975' reduce hole size to 7-7/8" diameter.

3. At approximately 990' begin coring of the salt formation. Coring to include all of the salt formation and 5' of the underlying limestone.

4. Run a Schlumberger log from surface to T.D.

5. Ream 7-7/8" OD hole to 15" from 975' to T.D.

6. Run approximately 1000' of 11-3/4" OD casing and cement with about 500 sacks of cement.

7. After 7 days W.O.C., test casing to 750 psi for 15 minutes.

8. Drill out plug and ream hole to T.D. with 10-5/8" bit.

9. Run a Birdwell 3-D log over the entire cased interval.

10. Run and suspend a 8-5/8" casing to approximately 30' above the base of the salt.

11. Run and suspend a 4-½" OD casing to 1 ft. above the base of the salt.

12. After completion of the cavern solutioning process, remove the 4½" O.D. casing.

Form 7222

# WELL LOCATION REPORT

Permit No. 27160

Operator Marathon Oil Co.

Farm Name Woodhaven LPG #1

Notification 4/10/68 Jud Woodyshell to Audrey.

"Will start drilling at midnight 4/10/68".

Nature of Location open level field

Condition of Pits 30 x 8 x 6 ' steel mud pit.

Distance from Water none involved

Remarks 4/11/68 Drilling at 148' at 4:45 P.M.

Approved by D. R. Brackenbury Date 4/11/68

DIVISION - BOX 30020 - LINCOLN
DIVISION - BOX 30020 - LINCOLN

MARATHON OIL COMPANY

REFINING - UNITED STATES

MICHIGAN REFINING DIVISION

1300 SOUTH FORT STREET
DETROIT, MICHIGAN 48217
PHONE: 313 [illegible] 8100

June 4, 1968

Michigan Department of Conservation
Geological Survey
Lansing, Michigan 48926

Attention: Mr. Robert Acker,
Supervisor of Wells

Dear Mr. Acker;

Marathon Oil Company has completed drilling three LPG storage wells in the City of Woodhaven, Michigan, as shown on our Well Permits #27160, 27161, and 27162. We have completed our survey of the wells and the enclosed information should provide you with an accurate record of the referenced wells.

Our survey determined the following data:

LPG #1

523.99 ft. from North Line of Quarter Section
73.73 ft. from North property line
148.53 ft. from East Line of Quarter Section
115.53 ft. from East property line

Geodetic Elevation at top of 16" casing flange 596.47'

LPG #2

530.41 ft. from North line of Quarter Section
80.15 ft. from North property line
627.28 ft. from North line of Quarter Section
594.28 ft. from North property line

Geodetic Elevation at top of 16" casing flange 596.75'

continued.....

LTO #4

780.43 ft. from North line of Quarter Section
330.17 ft. from North property line
241.07 ft. from East line of Quarter Section
308.07 ft. from East property line

Geodetic Elevation at top of 16" casing flange 597.00'

The geodetic elevations can be correlated to the Schlumberger logs by adding 10.0 ft. since the Kelly Bushing was located 10.0 ft. above the 16" flange during the logging operation.

We have enclosed copies of the actual drilling and casing history along with copies of each of the logs which we ran. As a package, this information should provide you with accurate well records.

If you have need of any further information, please feel free to call me.

Very truly yours,

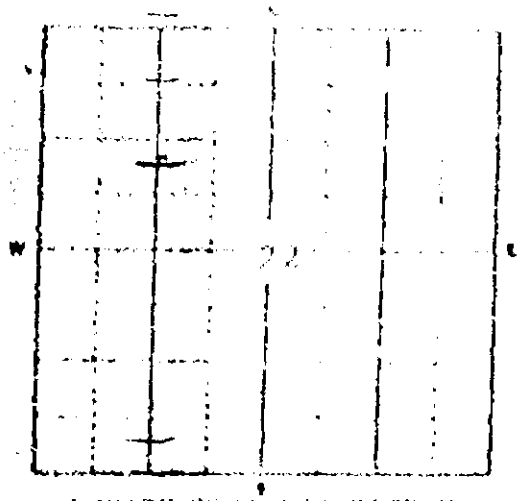
MARATHON OIL COMPANY

Sydney Blum
Manager of Engineering

per T. J. Ruffing
T. J. Ruffing
Project Coordinator

RECEIVED
JUN 5 1968
GEOLOGICAL SURVEY

TJR:tk
enc.




LOCATE WELL ACCURATELY

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

OCT 4 19

# 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. 27160 Deepening No.

Owner or Operator Marathon Oil Company

Address 1300 S. Fort St., Detroit, Mich. 48217

Well No. 1 Farm Marathon Oil Co. (Woodhaven) LPG

Township City of Woodhaven County Wayne

Location NE1/2 SW-1/4 Sec. 22 Twp. 4S Range 10E Elevation ~~XXXXXXXX~~ 596.47 top of 12 506.5 R.T.

Footage 525 ft. from North line and 142 ft. from East line of quarter section

Type of well LPG Storage (oil, gas, brine disposal, dry hole) Total depth 1156 Completed in Salt & Dol.

Name of producing formation Salt & Dolomite Top of formation 1031'

Date drilling begun 4/11/68 Date drilling completed 4/21/68 Date well completed 5/3/68 See reverse

Drilling contractor North American Drlg. Co. Address Mt. Pleasant

WATER ZONES

| NAME | FROM | TO |
|---|---|---|
| | | |

FIELD ACTIVITY REPORT

Drilling

| DATE | OPERATOR | LEASE OR WELL NAME & NO. | FIELD NAME OR TYPE WELL | TOWNSHIP | COUNTY |
|---|---|---|---|---|---|
| Apr. 12 to 68 | Marathon Oil Co. | Woodhaven LPG #1 | | 22-Woodhaven | Wayne |

PERMIT NO. 27160

Spudded 4/11/68. Drift to 35', Line at 35'. Drilling at 148' at 4:45 P.M.

INSPECTOR D. R. Brackenbury

CONS 7231

| | | | |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

ACID OR SHOOTING RECORD

| DATE | FROM | TO | GALS. ACID OR QTS. NITRO |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Rotary tools from 0 feet to 1156 feet. Cable tools from ..... feet to ..... feet.

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

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

NORTH AMERICAN DRILLING COMPANY

The above information is complete and correct. As taken from the daily drilling reports

Signed [signature]

Date 10/1/68

Title Leo W. Larimer, Sec.-Treas.

CONS. 210
Rev. 9/64

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

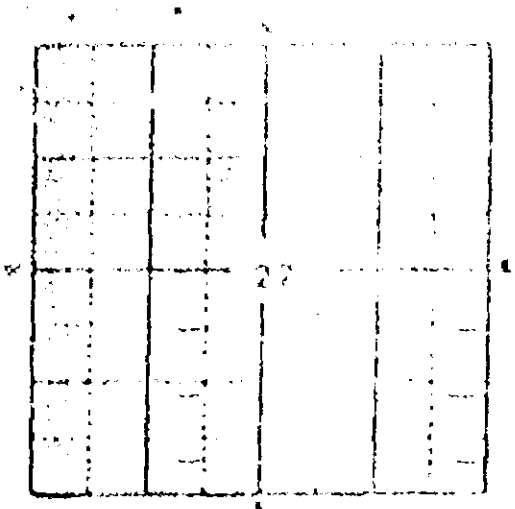
(Submit in Duplicate)

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

OCT 4 '68

# 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)




LOCATE WELL ACCURATELY

Permit No. 27160 Deepening No.

Owner or Operator Marathon Oil Company

Address 1300 S. Fort St., Detroit, Mich. 48217

Well No. 2 Farm Marathon Oil Co. (Woodhaven) LPG

Township City of Woodhaven County Wayne

Location N-1/2 SE-1/4 Sec. 22 Twp. 4S Range 10E Elevation ~~XXXXXXXX~~ 596.47 606.5 R.T.

Footage 525 ft. from North line and 143 ft. from East line of quarter section

Type of well LPG Storage (OIL, GAS, BRINE DISPOSAL, DRY HOLE) Total depth 1156 Completed in Salt & Dol.

Name of producing formation Salt & dolomite Top of formation 1031'

Date drilling begun 4/11/68 Date drilling completed 4/21/68 Date well completed 5/3/68 See reverse side

Drilling contractor North American Drlg. Co. Address Mt. Pleasant, Michigan

WATER ZONES

| Name | From | To | Amount |
|---|---|---|---|
| | | | |

OIL OR GAS ZONES

| Name | From | To | Amount |
|---|---|---|---|
| | | | |

DEVIATION SURVEY

| Run at | Degrees |
|---|---|
| 200 | 0 |
| 300 | 0 |
| 400 | 1 |
| 500 | 1 |
| 600 | 0 |
| 720 | 0 |
| 840 | 0 |

CASING AND CEMENTING

| Size | Where Set | Cement | Amt. Pulled |
|---|---|---|---|
| 16" | 154' | 300 cu ft. | None |
| & 2# | HOS by HOWCO | | |
| 11-3/4 | 1029 | 500 cu ft. | None |
| & 2# | chlorida by HOWCO | | |

STEEL LINES RUN

| Run at | Corrected to | Run by |
|---|---|---|
| 947 | 949 | Strapped DP |

PERFORATIONS

| Date | From | To | No. Holes |
|---|---|---|---|
| | | | |

ACID OR SHOOTING RECORD

| Date | From | To | Gals. Acid or Qts. Nitro |
|---|---|---|---|
| | | | |

Rotary tools from 0 feet to 1156 feet Cable tools from ..... feet to ..... feet.

Natural initial production first 24 hours ..... 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. As taken from the daily drilling reports

Date 10/1/68

NORTH AMERICAN DRILLING COMPANY

Signed [signature]

Title Leo W. Larimer, Sec.-Treas.

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE (Submit in Duplicate)

CONS. 2210
Rev. 9/64

SURVEY DIVISION - BOX 30028 - LANSING, MICHIGAN 48909

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

| FROM | TO | FORMATION (TYPE, COLOR, HARDNESS) | FROM | TO | FORMATION |
|---|---|---|---|---|---|
| 0 | 35 | (Drift) clay | | | |
| 35 | 160 | Gray lime | | | |
| 160 | 229 | Gray sandy lime | | | |
| 229 | 260 | White sand | | | |
| 260 | 287 | Gray shaley lime | | | |
| 287 | 324 | Gray sandy lime | | | |
| 324 | 344 | Sand | | | |
| 344 | 371 | Gray lime W/ white anhyd. | | | |
| 371 | 450 | Brown lime | | | |
| 450 | 507 | Brown sandy lime | | | |
| 507 | 618 | Gray lime | | | |
| 618 | 887 | Gray lime & white anhyd. | | | |
| 887 | 940 | Gray lime, shale & white anhyd. | | | |
| 940 | 1005 | Gray lime & shale | | | |
| 1005 | 1031 | Gray lime | | | |
| 1031 | 1156 | Salt & dolomite | | | |
| | 1156 | Total depth | | | |

5/3/68

11-3/4" csg head was installed
Drilled out cement to T.D.
circulated hole for 2 hours

(IF WELL WAS CORED, ATTACH CORE DESCRIPTION)

DRILL STEM TEST DATA

DATE May 1, 1968

# MARATHON OIL COMPANY

FIELD LRG Storage

## HISTORY OF OIL OR GAS WELL

WELL NO. 1 LEASE Earhart Station SEC. 22 TWP. 4 S R. 10 E

STATE Michigan COUNTY Wayne

ELEV.

MEASUREMENTS TAKEN FROM: Top of Oil Spring, Elev. ; Top of Rotary Table, Elev. ; Grd. or Mat, Elev.

HISTORY PREPARED BY P. H. DuVal, Jr.

TITLE Area Petroleum Engineer

It is of the greatest importance to have a complete history of the well. Use this form in reporting the history of all important operations of the well, together with the dates thereof, including size of hole, size and number of bits, complete description of casing, cementing, fishing or drilling difficulties, surveys, all tests, all completion operations and procedure, etc.

| DATE | |
|---|---|
| 4- 8-68 | Moving in rig. |
| 4- 9-68 | Rigging up. |
| 4-10-68 | Rigging up. Dug rathole. |
| 4-11-68 | Drilled from 0 to 160 KB with a 15" bit. Mixed mud. |
| 4-12-68 | Pulled 15" bit and put on 22" reamer. Reamed to 160 KB. Circulated hole clean and pulled drill pipe to run casing. Ran 5 joints (153.70') of 16" OD, 63#/ft., 8 Rd, ST&C, Armco Casing. A "Texas Pattern" shoe and 2 centralizers were run. The casing was cemented at 152.70 KB with 300 sacks of common cement with 2% HA-5, 1/4# of Flo-Seal/sk was added to the first 100 sacks. Two plugs were run and twenty feet of cement were left in the pipe. W.O.C. |
| 4-15-68 | Cut off casing and welded on casing head. Installed blow out preventer. Tested BOP and casing to 750 psig. No leaks. Drilled shoe off and drilled to 178 KB. Lime and Sand. |
| 4-16-68 | Drilled from 178 to 324 KB. Ran Inclinometer and found deviation to be ½°. Exact of depth of survey unknown. Sand and Lime. |
| 4-17-68 | Drilled from 324 to 507 KB. Sand, Lime, Anhydrite. Deviation ½°. |
| 4-18-68 | Drilled from 507 KB to 664 KB. Lime and Anhydrite. Deviation ½°. |
| 4-19-68 | Drilled from 664 to 841 KB. Lime and Anhydrite. Deviation ½°. |
| 4-20-68 | Drilled from 841 KB to 1005 KB. Lime, Shale and Anhydrite. Deviation ½°. Made trip for Bit No. 3 at 920 KB. |
| 4-21-68 | Drilled from 1005 KB to 1156 KB (Total Depth). Top of salt 1031 KB. Circulated hole clean and pulled out to run log. Rigged up Schlumberger and ran a Gamma Ray-Density Log. |
| 4-22-68 | Ran 7 joints of 11 3/4" casing and hung on slips. Waiting on delivery of additional casing from mill. |
| 4-24-68 | Waiting on casing. |
| 4-25-68 | [illegible] |

SURVEY DIVISION - BOX 30028 - LANSING
SURVEY DIVISION - BOX 30028 - LANSING
SURVEY DIVISION - BOX 30028 - LANSING

DATE May 7, 1968

# MARATHON OIL COMPANY
## HISTORY OF OIL OR GAS WELL

FIELD LPG Storage

WELL NO. 1 LEASE Eckhart Stellen SEC 22 TWP. 4 S R. 10 E

STATE Michigan COUNTY Wayne

ELEV.

MEASUREMENTS TAKEN FROM: Top of Csg. String Elev. / Top of Rotary Table Elev. / Gro. or Mat. Elev.

History Prepared By R. H. DuVal, Jr.

Title Area Petroleum Engineer

It is of the greatest importance to have a complete history of the well. Use this form in reporting the history of all important operations of the well, together with the dates thereof, including size of hole, size and number of bits, complete description of casing, cementing, fishing or drilling difficulties, tests, all completion operations and procedure, etc.

| DATE | |
|---|---|
| 4- 8-68 | Moving in rig. |
| 4- 9-68 | Rigging up. |
| 4-10-68 | Rigging up. Dug rathole. |
| 4-11-68 | Drilled from 0 to 160 KB with a 15" bit. Mixed mud. |
| 4-12-68 | Pulled 15" bit and put on 22" reamer. Reamed to 160 KB. Circulated hole clean and pulled drill pipe to run casing. Ran 5 joints (153.70') of 16" OD, 63#/ft., 8 Rd, ST&C, Armco Casing. A "Texas Pattern" shoe and 2 centralizers were run. The casing was cemented at 153.70 KB with 300 sacks of common cement with 2% HA-5, 1/4# of Flo-Seal/sk was added to the first 100 sacks. Two plugs were run and twenty feet of cement were left in the pipe. W.O.C. |
| 4-15-68 | Cut off casing and welded on casing head. Installed blow out preventer. Tested BOP and casing to 750 psig. No leaks. Drilled shoe off and drilled to 178 KB. Lime and Sand. |
| 4-16-68 | Drilled from 178 to 324 KB. Ran Inclinometer and found deviation to be ¼°. Exact of depth of survey unknown. Sand and Lime. |
| 4-17-68 | Drilled from 324 to 507 KB. Sand, Lime, Anhydrite. Deviation ¼°. |
| 4-18-68 | Drilled from 507 KB to 664 KB. Lime and Anhydrite. Deviation ¼°. |
| 4-19-68 | Drilled from 664 to 841 KB. Lime and Anhydrite. Deviation ¼°. |
| 4-20-68 | Drilled from 841 KB to 1005 KB. Lime, Shale and Anhydrite. Deviation ½°. Made trip for Bit No. 3 at 920 KB. |
| 4-21-68 | Drilled from 1005 KB to 1156 KB (Total Depth). Top of salt 1031 KB. Circulated hole clean and pulled out to run log. Rigged up Schlumberger and ran a Gamma Ray-Density Log. |
| 4-22-68 | Ran 7 joints of 11 3/4" casing and hung on slips. Waiting on delivery of additional casing from mill. |
| 4-24-68 | Waiting on casing. |
| 4-25-68 | Waiting on casing. |
| 4-26-68 | Completed running casing for a total of 34 joints (1041.92') of 11 3/4 OD, 47#/ft., 8 Rd, ST&C, Armco casing and set at 1029 KB. A Baker guide shoe and float collar were run. Rigged Halliburton and cemented with 600 sacks of salt saturated cement with 27% excess salt. 1/4#/sk of Flo-Seal was added to the first 200 sacks to reduce loss to Sylvania Sand. Good cement returns were obtained. Two plugs were run. W.O.C. |
| 5- 3-68 | Pressured casing to 750 psig for 15 min. No leaks. Removed BOP. Cut off casing and installed National Well head. Ran in with 10 5/8" bit and drilled off shoe. Cleaned hole out to total depth and circulated hole clean. Layed down drill pipe. Released rig. Well now ready to install wash strings. |

OIL SURVEY DIVISION - BOX 30028 - LANSING, MI 48909 *** DEC 05 1968

22-4S-10E
Brownstown Twp. (Wayne Co.)

TD 1158 in Salina

Facility
L. P. G. Storage

Socony-Mobil Oil Co., Inc.

Socony-Mobil L. P. G. No. 3-A

Permit No. 23775

Drilling Contractor: Union Rotary Corp. (Rotary)

Location: N½ SE¼ NE¼ Section 22, T. 4S., R. 10E.
1470' from North and 120' from East line of quarter section

Elevation: 610 feet above sea level (rot. bush.)

Record by: William Mantek from geologic log; some formation tops from Schlumberger Gamma Ray-Neutron (Schj.)

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Drift | 40 | 40 |
| DEVONIAN: | | |
| Detroit River: | | |
| Dolomite, buff to brown to gray, very finely to finely crystalline; some pinpoint and vuggy porosity | 128 | 168 Schj. |
| Sylvania: | | |
| Sand, quartzose, white, fine to medium, well rounded, dolomitic, friable to tight; some interbedded dolomite | 168 | 336 Schj. |
| Bois Blanc: | | |
| Dolomite, buff, brown, gray, finely to very finely crystalline, with abundant chert, white | 116 | 452 Schj. |
| SILURIAN: | | |
| Bass Island: | | |
| Dolomite, buff to brown to gray, finely to very finely to micro-crystalline; some pinpoint and vuggy porosity | 108 | 560 |
| Dolomite, buff to tan to gray, microcrystalline, interbedded with shale, dolomite and anhydrite, white to tan | 74 | 634 Schj. |
| | (182) | |
| Salina: | | |
| Shale, gray, interbedded with dolomite, buff to tan to gray, and anhydrite (C shale at 892 Schj.; B unit at 960 Schj.; B salt at 1005 Schj.) | 370 | 1004 |
| Salt, clear to orange, translucent, crystalline; inclusions, laminations and thin beds of dolomite, gray to brown, micro- to finely crystalline; occasional thin bed of anhydrite, gray to tan | 150 | 1154 |
| Dolomite, buff to tan, finely crystalline; some anhydrite, tan, translucent (A-2 dolomite at 1154 Schj.) | 4 | 1158 |
| | (524+) | |
| TOTAL DEPTH | | 1158 |

Note:
A core was taken in the Salina formation but no description or other formation was submitted by the company.

Socony-Mobil Oil Co., Inc.
Fee No. 3-A

Casing Record:
13 3/8" 138' (150 cement)
9 5/8" 1012' (450 cement)

Commenced: 12-14-61
Completed: 12-22-61
Initial Production: L. P. G. Storage well

BEST COPY
AVAILABLE

23775

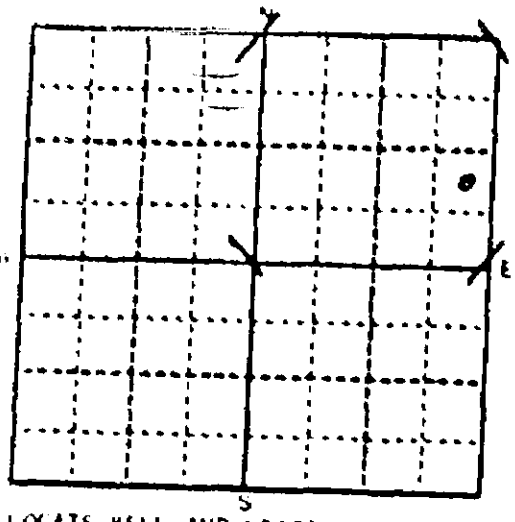
# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, OR KEY WELL FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, AND ACT 326, P.A. 1937 AS AMENDED.

MAIL TO:
SUPERVISOR OF WELLS
GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING 26, MICHIGAN

*See Reverse Side Before Filling Out This Application*

1. DATE: December 7, 1961




LOCATE WELL AND LEASE ACCURATELY ON THIS SECTION PLAT - 640 ACRES

2. APPLICATION IS MADE TO DRILL A WELL FOR: (GAS, OIL, BRINE DISPOSAL, SECONDARY RECOVERY, ETC.) L.P.G. Storage

3. ENCLOSED HEREWITH FIND AMOUNT OF $ 25.00

4. LESSEE (OWNER OF LEASE RIGHTS): Socony-Mobil Oil Company, Inc.

5. ADDRESS: West & Allen Road, Trenton, Michigan

6. PHONE: OR 6-3100

7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Socony-Mobil L.P.G.

8. WELL NO.: 3-A

9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER):

10. DRILLING CONTRACTOR: Union Rotary Corporation

11. ADDRESS: 1104 N. Mission Street, Mt. Pleasant, Michigan

12. PHONE: SP 3-4901

13. N½ ¼ OF SE ¼ OF NE ¼, SECTION 22 T 4 N.S., R 10 E.M.

14. ACRES IN LEASE: 160

15. TOWNSHIP: Brownstown

16. COUNTY: Wayne

17. *Locate well in two directions from nearest lines of quarter section and property ownership lines:*

1470 FT. FROM north (north-south) LINE OF QUARTER SECTION

1470 FT. FROM north (north-south) PROPERTY LINE

120 FT. FROM east (east-west) LINE OF QUARTER SECTION

120 FT. FROM east (east-west) PROPERTY LINE

18. NUMBER OF FEET FROM NEAREST PRODUCING WELL: Approx. 500' east of #1 well

19. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary

20. WELL IS TO BE COMPLETED IN Salina FORMATION

21. INTENDED DEPTH OF WELL: Approx. 1150'

22. PROGRAM OF CASING, SEALING, AND COMPLETING WELL

Set 13 3/8" at approximately 160' and cement to surface.
Set 9 5/8" casing at top of Salina Salt and cement to the surface.
Wash out salt cavity and complete as L.P.G. Storage Well.

23. WELL LOCATION IS IN: *(Cleared Farm Land, Open Grass Land, Brush Land, Timbered Land.)* Refinery Property

24. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒

25. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒

26. IF ANSWER TO NO. 24 ABOVE IS *YES*, DESCRIBE AND GIVE DISTANCE FROM LOCATION AND SPECIFY PRECAUTIONS TO BE TAKEN TO PROTECT FRESH WATER FROM WELL WASTES.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST OIL HAZARD REDUCTION FIELD OFFICE. *(See reverse side)*

27. ADDRESS CORRESPONDENCE AND PERMIT TO: Socony-Mobil Oil Company, Inc., West & Allen Rd., Trenton, Mich.

28. PHONE: OR 6-3100

**LEAVE BLANK**

DATE ISSUED 12/8/61 GROUP NO.

PERMIT NO. 23,775 ACCOUNT NO.

29. OWNER OF LEASE RIGHTS: SOCONY-MOBIL OIL COMPANY, INC.

30. AUTHORIZED REPRESENTATIVE: R. S. Baxter

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

Receipt No. 103335 - $25.00 - 12/7/61 jjk

DISTRIBUTION —
1. WHITE - GEOL. SURVEY DIV. - LANSING.
2. CANARY - CASHIER.
3. BLUE - F.ADM.DIV. - FIELD.
4. GOLDENROD - GEOL. SUR. DIV. - FIELD.
5. PINK - F.A.DIV. - GR. RAPIDS.
6. GREEN - APPLICANT.

GS-1 Rev. 8/56

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

Form OR-2 500 Sets 10 59

STATE OF MICHIGAN

# DEPARTMENT OF CONSERVATION

SUPERVISOR OF WELLS

№ 5434

## PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST CLOTH PERMIT AT WELL LOCATION)

Permit No. 23775 Date Issued December 8, 1961

Permission is hereby granted to Socony-Mobil Oil Company, Inc.
Owner

West 4 Allen Road, Trenton, Michigan
Address

Lease Name Socony-Mobil LPG Well Number 3-A

To drill a well for LPG Storage

in the N½ SE¼ NW¼ Section 22, T.4S., R.10E., Brownstown Twp., Wayne Co.

and located 1470' from north and 120' from east line of quarter section.,

and located 1470' from north and 120' from east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By Robert M. Acker

## CAUTION

DRILLING OPERATIONS NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

WASTE IS PROHIBITED in the drilling, producing, and plugging of this well. This includes underground, surface, and market waste.

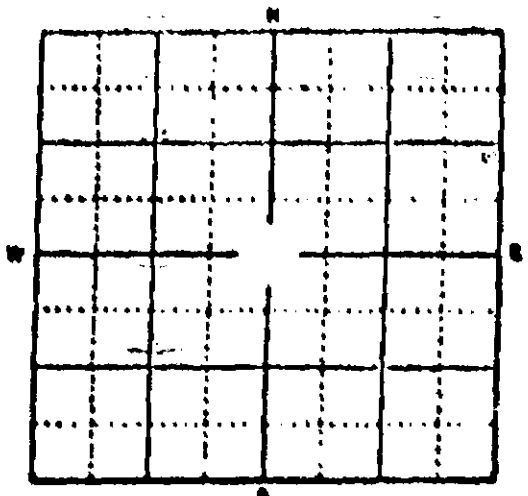
DAMAGE TO FRESH WATERS, both underground and surface, is prohibited in the drilling, producing, and plugging of this well.

UNNECESSARY DAMAGE TO LIFE AND PROPERTY is prohibited in the drilling, producing, and plugging of this well.

Department offices at: Lansing, Phone IVanhoe 5-8144, Ext. 2686
Mount Pleasant, Phone SP 3-8691
Cadillac, Phone PRospect 5-3181
Plainwell, Phone MUrray 5-8051
Grand Rapids, Phone GLendale 8-3007
Escanaba, Phone STate 6-0333

PERMITS MAY BE TRANSFERRED ONLY WITH PERMISSION OF THE SUPERVISOR OF WELLS

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909




LOCATE WELL ACCURATELY

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

# 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. 1929 AND ACT 326 P. A. 1937)

1/16/62

Permit No. 23,775

Owner or Operator: Mobil Oil Company

Address: Box 477, Trenton, Michigan

Well No. 3-A Farm: Mobil Fee L.P.G.

County: Wayne Township: Brownstown

Location: N½ of SE¼ of NE¼ Sec. 22 Twp. 4S Range: 10E Elevation: 630 R.B.

Footage: 1470 ft. from North line and 120 ft. from East line of quarter section

Type of well: L.P.G. Storage Total depth: 1158 Completed in: Salina

Name of ~~producing~~ storage formation: Salina "B" Zone Top of formation: 1004

Date drilling began: 12-14-61 Date drilling completed: 12-22-61

Drilling contractor: Union Rotary Corp. Address: Mt. Pleasant, Michigan

**WATER ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OIL OR GAS ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CASING AND CEMENTING**

| Size | Where Set | Cement | Amt. Pulled |
|---|---|---|---|
| 13 3/8 | 138 | 150 | None |
| 9 5/8 | 1012 | 450 | None |
| | | | |
| | | | |
| | | | |

**STEEL LINER RUN**

| Run at | Corrected to | Run by |
|---|---|---|
| None | | |
| | | |
| | | |
| | | |
| | | |

**PERFORATIONS**

| Date | From | To | No. Holes |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**ACID OR SHOOTING RECORD**

| Date | From | To | Gals. Acid or Qts. Shot |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Rotary tools from Surface feet to 1158 feet. Cable tools from ..... feet to ..... feet.

Natural initial production first 24 hours ..... 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 W. F. Wright

Date ..... Title .....

08-10 Rev. 4/55

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

# FORMATION RECORD

| FROM | TO | FORMATION | FROM | TO | FORMATION |
|---|---|---|---|---|---|
| 0 | 40 | Glacial drift | | | |
| 40 | ---- | Top of Detroit River | | | |
| 40 | 168 | Dolomite, buff-brown-gray, very fine to fine crystalline, some pinpoint and vuggy porosity. | | | |
| 168 | ---- | Top of Sylvania | | | |
| 168 | 236 | Sand, quartzose, white, fine to medium, well rounded, dolomite cement, friable to tite, some interbedded dol. | | | |
| 236 | ---- | Top of Bois Blanc - Bass Island undivided | | | |
| 236 | 560 | Dolomite, buff-brown-gray, fine to very fine to micro crystalline, much gray to white chert in upper part, some pinpoint and vuggy porosity in lower part. | | | |
| 560 | ---- | Top of Salina | | | |
| 560 | 1004 | Dolomite, buff-tan-gray, microcrystalline; interbedded with shale, gray dolomite and anhydrite white to tan. | | | |
| 1004 | ---- | Top of Salina "B" Zone | | | |
| 1004 | 1154 | Salt, clear to orange, translucent, crystalline; inclusions, laminations and thin beds of dolomite, gray-brown, micro to fine crystalline; occasional thin bed anhydrite gray-tan. | | | |
| 1154 | ---- | Top of Salina "A" Zone | | | |
| 1154 | 1158 T.D. | Dolomite, buff-tan, fine crystalline; some anhydrite, tan, translucent. | | | |

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

GEOLOGICAL SURVEY

IMLAY CITY HAS COPY

JUN 30 1986

Regulatory Control Unit

# WELL PLUGGING RECORD

(Submit in TRIPLICATE Within 30 Days After Plugging is Completed)

PERMIT NUMBER: 23775

FIELD NAME: Mobil LPG Storage

COMPLETE NAME(S) AND ADDRESS OF WELL OWNER: Mobil Oil Corp. Houston, TX 77251

COMPLETE LEASE OR FARM NAME(S): Mobil LPG

WELL NUMBER: 3A

WELL LOCATION: N ¼ SE ¼ NE ¼ SEC. 22 T. 4S R. 10E

TOWNSHIP: Brownstown

COUNTY: Wayne

TYPE OF WELL (Oil, Gas, Dry Hole, etc.): LPG Storage

TOTAL DEPTH: 1158

FORMATION: A2

DATE PLUGGING STARTED: 10-02-85

DATE PLUGGING COMPLETED: 10-21-85

DEPT. REPRESENTATIVE(S) WHO ISSUED PERMIT OR WITNESSED PLUGGING: Bruce Waldo

CASING RECORD

| SIZE CASING | DEPTH SET | AMOUNT RECOVERED | SHOT OR RIPPED |
|---|---|---|---|
| 13 3/8 | 138 | 0 | --- |
| 9 5/8 | 1012 | 0 | --- |
| | | | |
| | | | |
| | | | |
| | | | |

BRIDGES OR PLUGS

| TYPE (Brush, Stone, Cement, Mechanical, etc.) | DEPTH PLACED | SACKS OF CEMENT AND ADDITIVES |
|---|---|---|
| Bridge Plug | 980 | --- |
| Cement | 980-0 | 375 SXS A |
| | | |
| | | |
| | | |
| | | |

Were tools, tubing, casing, etc., lost or left in the hole before or during plugging? ☐ YES ☒ NO — If yes, give details:

Did a Service Company pump mud, spot cement, or set bridge plugs? ☒ YES ☐ NO — If yes, give name and address: Dowell Mousherville

Was the well plugged by a Company or Contractor other than Owner or Operator? ☒ YES ☐ NO — If yes, give name and address: Lease Management Mt. Pleasant,

Representatives of Owner, Operator, Company, or Contractor who witnessed plugging: Joe VanWagnen

DESCRIBE IN DETAIL HOW WELL WAS PLUGGED

1. Pull 6 5/8 casing ( tubing)
2. Set wireline bridge plug at 980
3. Run tubing to 980 cement with 375 SXS Class A from 980-0
4. Cut off 13 3/8 and 9 5/8 4 ft. Below grade weld on ½" steel plate

(USE REVERSE SIDE IF NEEDED)

## CERTIFICATION

"I state that I am authorized by said Owner or Operator to make this report; and that this report was prepared under my supervision and direction, and that the facts stated herein are true, correct and complete to the best of my knowledge."

NAME AND TITLE (Typed or Printed): Joe VanWagnen Engineer

SIGNATURE: [signature]

DATE (Month, Day, Year): 11-08-85

COMPANY NAME AND ADDRESS: Lease Management, Inc.
P.O. Box 290
Mt. Pleasant, MI 48858

R 7213
Rev. 4/74

The site is clean & level. 6-25-86

Vicki Wilson Geo. Survey 6-27-86

NOV

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

# PERMIT TO PLUG AND ABANDON

DNR DISTRIBUTION
Permittee — Orig. & 1 copy
Division Office — 2 copies
Field Office — File copy
Others — On request

PERMIT NUMBER: 23775

FIELD NAME: Mobil LPG Storage

NAME AND ADDRESS OF PERMITTEE: Mobil Oil Corp., Houston, TX 77251

LEASE NAME AND WELL NO.: Mobil LPG 3-A

| LOCATION (¼ ¼ ¼ or other) | SECTION | TOWNSHIP | COUNTY |
|---|---|---|---|
| N SE NE | 22 T 4S R 10E | Brownstown | Wayne |

| TYPE OF WELL (Oil, Gas, Dry Hole, etc.) | DATE COMPLETED | DATE PLUGGING WILL START | PLUGGING PERMIT REQUESTED BY & DATE |
|---|---|---|---|
| LPG Storage | 12-22-61 | will notify | Jack Harkins 3-27-85 |

LAST PRODUCTION: BOPD | BWPD | MCFGPD | DATE

PLUGGING TO BE DONE BY: Lease Management, Inc.

PERMIT MAILED TO: Mr. J.V. Johnson
Mobil Oil Corp.
Gas Liquids Dept.
P.O. Box 1774
Houston, TX 77251

COPIES MAILED TO:
Mr. Jack Harkins
Lease Management, Inc.
503 Industrial Ave.
Mt. Pleasant, MI 48858

Geological Survey Division
Box 30028
Lansing, MI 48909

**CASING AND CEMENTING RECORD**

| HOLE DIA. | CASING DIA. & WT./FT. | DEPTHS SET | CEMENT QUANTITY, TYPE, ADDITIVES | CMT. TOP. | PERFORATIONS |
|---|---|---|---|---|---|
| | 13 3/8" | 138 | 150 sx | | |
| | 9 5/8" | 1012 | 450 sx | | |
| | | | | | |
| | | | | | |

Elev. 610' KB

**GEOLOGIC DATA; GAS AND OIL SHOWS; DRILLING AND COMPLETION DATA:**

| | | | |
|---|---|---|---|
| BOD | 40 | Sal. GU | 560 |
| DR | 40 | BU | 1004 |
| SYLV | 168 | A-2C | 1154 |
| BB | 336 | T.D. | 1158 |

**PLUGGING REQUIREMENTS***

Plugging requirements outlined are to be executed in accordance with the provisions of Act 61, P.A. 1939, as amended, and rules and orders adopted thereunder.

Pull uncemented casing and/or tubing. Set a bridge plug in the center of the second casing joint off bottom.

Place up to five feet of sand on top of bridge plug if desired. Otherwise, fill casing with cement from top of bridge plug to the surface.

Cut casings off at least three feet below grade and cap with a welded steel plate.

Notify this office the day before commencing plugging operations 313-724-2015.

GEOLOGICAL SURVEY
MAY 03 1985
Regulatory Control Unit

*NOTE: BONDS CANNOT BE RELEASED UNTIL A PLUGGING IS COMPLETED, CELLAR RAT HOLE AND PITS FILLED, WELL SITE RESTORED AND RECORDS FILED. WATER WELLS MUST BE PLUGGED ACCORDING TO RULE 168 OF ACT 294 P.A. 1965, "GROUND WATER QUALITY CONTROL". It is further made a requirement of this permit that the applicant give notice to the public utilities in accordance with Act 53, P.A. 1974 C.L. 460.701 to 460.718 and comply with each of the requirements of the act.

| AUTHORIZED BY (signature) | OFFICE | DATE |
|---|---|---|
| Bruce J. Waldo | IMLAY CITY | 5-2-85 |

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

R-7229
Rev. 11/77

22-4S-10E
Brownstown Twp. (Wayne Co.)

TD 1150 in Salina

Facility
L.P.G. Storage

Socony-Mobil Oil Co., Inc.

Socony-Mobil L. P. G. No. 3-B

Permit No. 23776

Drilling Contractor: Union Rotary Corp. (Rotary)

Location: N½ SE¼ NE¼ Section 22, T. 4S., R. 10E.
1570' from North and 120' from East line of quarter section

Elevation: 610 feet above sea level (rot. bush.)

Record by: William Mantek from geologic log ; some formation tops from Schlumberger Gamma Ray-Neutron (Schj.)

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Drift | 46 | 46 Schj. |
| DEVONIAN: | | |
| Detroit River: | | |
| Dolomite, buff to brown to gray, very finely to finely crystalline; some pinpoint and vuggy porosity | 126 | 172 Schj. |
| Sylvania: | | |
| Sand, white, quartzose, fine to medium, well rounded, dolomitic, friable to tight; some interbedded dolomite | 170 | 342 Schj. |
| Bois Blanc: | | |
| Dolomite, buff to brown to gray, fine to very fine to microcrystalline, with much gray to white chert | 114 | 456 Schj. |
| SILURIAN: | | |
| Bass Island: | | |
| Dolomite, buff to brown to gray, finely to very finely to microcrystalline, with some pinpoint and vuggy porosity | 108 | 564 |
| Dolomite, buff to tan to gray, microcrystalline, interbedded with shale, dolomite and anhydrite | 72 (180) | 636 Schj. |
| Salina: | | |
| Shale, gray, interbedded with dolomite, buff to tan to gray, microcrystalline, and anhydrite, white to tan (C shale at 892 Schj.; B unit at 962 Schj.; B salt at 1006 Schj.) | 370 | 1006 |
| Salt, clear to orange, translucent, crystalline; inclusions, laminations, and thin beds of dolomite, gray to brown, microcrystalline to finely crystalline; occasional thin beds of anhydrite, gray to tan | 139 | 1145 |
| Dolomite, buff to tan, finely crystalline; some anhydrite, tan, translucent (A-2 dolomite at 1145 Schj.) | 4 (513+) | 1149 |
| | TOTAL DEPTH | 1149 |

Casing Record:
13 3/8" 142' (150 cement)
9 5/8" 1029' (450 cement)

Commenced: 12-29-61
Completed: 1-3-62
Initial Production: L. P. G. Storage

7-62

BEST COPY
AVAILABLE

23776

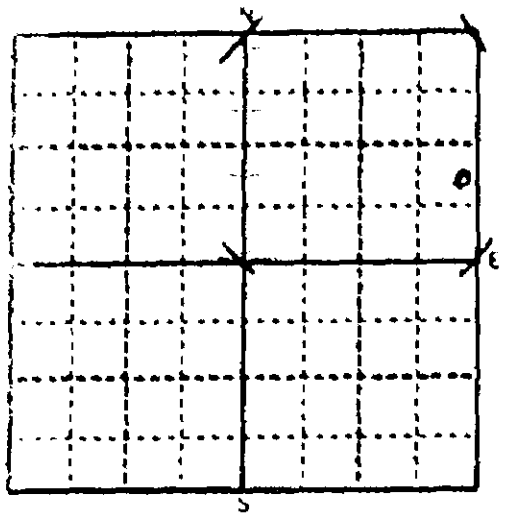
# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, OR KEY WELL FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, AND ACT 326, P.A. 1937 AS AMENDED.

MAIL TO:
SUPERVISOR OF WELLS
GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING 26, MICHIGAN

*See Reverse Side Before Filling Out This Application*

1. DATE: December 7, 1961



LOCATE WELL AND LEASE ACCURATELY ON THIS SECTION PLAT - 640 ACRES

2. APPLICATION IS MADE TO DRILL A WELL FOR: (GAS, OIL, BRINE DISPOSAL, SECONDARY RECOVERY, ETC.) L.P.G. Storage

3. ENCLOSED HEREWITH FIND AMOUNT OF: $25.00

4. LESSEE (OWNER OF LEASE RIGHTS): Socony-Mobil Oil Company, Inc.

5. ADDRESS: West & Allen Road, Trenton, Michigan

6. PHONE: OR 6-3100

7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Socony-Mobil L.P.G.

8. WELL NO.: 3-B

9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER):

10. DRILLING CONTRACTOR: Union Rotary Corp.

11. ADDRESS: 1104 N. Mission Street, Mt. Pleasant, Michigan

12. PHONE: SP 34001

13. N½ ¼ OF SE ¼ OF NE ¼ SECTION 22 T 4 N.S., R 10 E.S.

14. ACRES IN LEASE: 160

15. TOWNSHIP: Brownstown

16. COUNTY: Wayne

17. *Locate well in two directions from nearest lines of quarter section and property ownership lines:*

1570 FT. FROM north (north-south) LINE OF QUARTER SECTION

1570 FT. FROM north (north-south) PROPERTY LINE

120 FT. FROM east (east-west) LINE OF QUARTER SECTION

120 FT. FROM east (east-west) PROPERTY LINE

18. NUMBER OF FEET FROM NEAREST PRODUCING WELL: 100' south of #3-A

19. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary

20. WELL IS TO BE COMPLETED IN Salina FORMATION

21. INTENDED DEPTH OF WELL: Approx. 1150'

22. PROGRAM OF CASING, SEALING, AND COMPLETING WELL

Set 13 3/8" at approximately 160' and cement to surface.
Set 9 5/8" casing at top of Salina Salt and cement to the surface.
Wash out salt cavity and complete as L.P.G. Storage Well.

23. WELL LOCATION IS IN: (Cleared Farm Land, Open Grass Land, Brush Land, Timbered Land.) Refinery Property

24. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒

25. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒

26. IF ANSWER TO NO. 24 ABOVE IS YES, DESCRIBE AND GIVE DISTANCE FROM LOCATION AND SPECIFY PRECAUTIONS TO BE TAKEN TO PROTECT FRESH WATER FROM WELL WASTES.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST OIL HAZARD REDUCTION FIELD OFFICE. *(See reverse side)*

27. ADDRESS CORRESPONDENCE AND PERMIT TO: Socony-Mobil Oil Company, Inc., West & Allen Rd., Trenton, Mich.

28. PHONE: OR 6-3100

**LEAVE BLANK**

DATE ISSUED 12/8/61 GROUP NO.

PERMIT NO. 23,176 ACCOUNT NO.

29. OWNER OF LEASE RIGHTS: SOCONY-MOBIL OIL COMPANY, INC.

30. AUTHORIZED REPRESENTATIVE: C. H. Steiner

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

Receipt No. 108335 - $25.00 - 12/7/61 JJK

DISTRIBUTION
1. WHITE - GEOL. SURVEY DIV. - LANSING.
2. CANARY - CASHIER.
3. BLUE - P.ADM.DIV. - FIELD.
4. GOLDENROD - GEOL. SUR. DIV. - FIELD.
5. PINK - F.A.DIV. - GR. RAPIDS.
6. GREEN - APPLICANT.

GS-1 Rev. 1/56

Form GS-2 (50) Rev. 10-59

STATE OF MICHIGAN

# DEPARTMENT OF CONSERVATION

SUPERVISOR OF WELLS

№ 5435

## PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST CLOTH PERMIT AT WELL LOCATION)

Permit No. 23776 Date Issued December 8, 1961

Permission is hereby granted to Socony-Mobil Oil Company, Inc.
Owner

West & Allen Road, Trenton, Michigan
Address

Lease Name Socony-Mobil L.P.G. Well Number 3-8

To drill a well for L.P.G. Storage

in the NE SW NE Section 22, T.4S., R.10E., Brownstown Twp., Wayne Co.

and located 1570' from north and 120' from east line of quarter section.

and located 1570' from north and 120' from east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By Robert M. Acker

## CAUTION

DRILLING OPERATIONS NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

WASTE IS PROHIBITED in the drilling, producing, and plugging of this well. This includes underground, surface, and market waste.

DAMAGE TO FRESH WATERS, both underground and surface, is prohibited in the drilling, producing, and plugging of this well.

UNNECESSARY DAMAGE TO LIFE AND PROPERTY is prohibited in the drilling, producing, and plugging of this well.

Department offices at: Lansing, Phone IVanhoe 5-8144, Ext. 2686
Mount Pleasant, Phone SP 3-8691
Cadillac, Phone PRospect 5-3181
Plainwell, Phone MUrray 5-8051
Grand Rapids, Phone GLendale 8-3007
Escanaba, Phone STate 8-0333

PERMITS MAY BE TRANSFERRED ONLY WITH PERMISSION OF THE SUPERVISOR OF WELLS

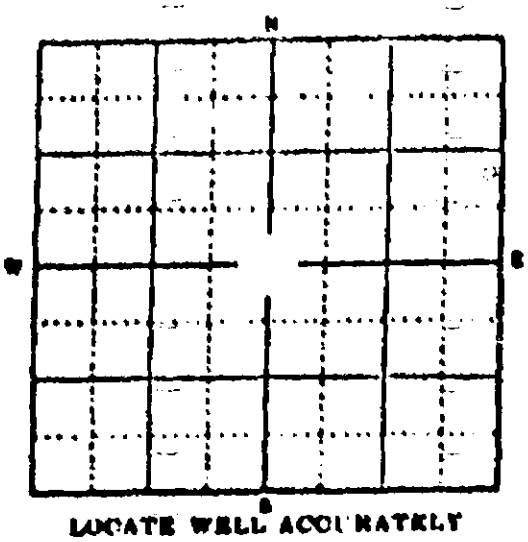
MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

# 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. 1929 AND ACT 326 P. A. 1937)

1/16/62




LOCATE WELL ACCURATELY

Permit No. 23,776

Owner or Operator Mobil Oil Company

Address Box 477, Trenton, Michigan

Well No. 33 Farm Mobil Fee 4-26

County Wayne Township Brownstown

Location N½ of SE¼ of NE¼ Sec. 22 Twp. 4S Range 10E Elevation 610 R.B.

Footage 1570 ft. from North line and 120 ft. from East line of quarter section

Type of well L.P.G. Storage Total depth 1149 Completed in Salina

Name of ~~producing~~ storage formation Salina "B" Zone Top of formation 1006

Date drilling began 12-29-61 Date drilling completed 1-3-62

Drilling contractor Union Rotary Corp. Address Mt. Pleasant, Michigan

**WATER ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OIL OR GAS ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CASING AND CEMENTING**

| Size | Where Set | Cement | Amt. Pulled |
|---|---|---|---|
| 13 3/8 | 142 | 150 | None |
| 9 5/8 | 1029 | 450 | None |
| | | | |
| | | | |
| | | | |

**STEEL LINES RUN**

| Run at | Corrected to | Run by |
|---|---|---|
| None | | |
| | | |
| | | |
| | | |
| | | |

**PERFORATIONS**

| Date | From | To | No. Holes |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**ACID OR SHOOTING RECORD**

| Date | From | To | Gals. Acid or Qts. Nitro |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Rotary tools from Surface feet to 1149 feet. Cable tools from ..... feet to ..... feet.

Natural initial production first 24 hours ..... 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 W. F. Wright

Date ..... Title .....

OS-10 Rev. 4/56

**GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE**

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

# FORMATION RECORD

| FROM | TO | FORMATION | FROM | TO | FORMATION |
|---|---|---|---|---|---|
| 0 | 40 est. | Glacial drift | | | |
| 40 est. | ---- | Top of Detroit River | | | |
| 40 est. | 176 | Dolomite, buff-brown-gray, very fine to fine crystalline, some pinpoint and vuggy porosity. | | | |
| 176 | ---- | Top of Sylvania | | | |
| 176 | 342 | Sand, quartzose, white, fine to medium, well rounded, dolomite cement, friable to tight, some interbedded dol. | | | |
| 342 | ---- | Top of Bois Blanc - Bass Island undivided | | | |
| 342 | 564 | Dolomite, buff-brown-gray, fine to very fine to micro crystalline, much gray to white chert in upper part, some pinpoint and vuggy porosity in lower part. | | | |
| 564 | ---- | Top of Salina | | | |
| 564 | 1006 | Dolomite, buff-tan-gray, microcrystalline; interbedded with shale, gray dolomite and anhydrite white to tan. | | | |
| 1006 | ---- | Top of Salina "M" Zone | | | |
| 1006 | 1145 | Salt, clear to orange, translucent, crystalline; inclusions, laminations and thin beds of dolomite, gray-brown, micro to fine crystalline; occasional thin bed anhydrite gray-tan. | | | |
| 1145 | ---- | Top of Salina "A" Zone | | | |
| 1145 | 1149 T.D. | Dolomite, buff-tan, fine crystalline; some anhydrite, tan, translucent. | | | |

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

GEOLOGICAL SURVEY

IMLAY CITY HAS COPY

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

JUN 30 1986

# WELL PLUGGING RECORD

(Submit in TRIPLICATE Within 30 Days After Plugging is Completed)

Regulatory Control Unit

| | |
|---|---|
| PERMIT NUMBER | 23776 |
| FIELD NAME | Mobil LPG Storage |

COMPLETE NAME(S) AND ADDRESS OF WELL OWNER: Mobil Oil Corp, Houston, TX 77251

COMPLETE LEASE OR FARM NAME(S): Mobil LPG

WELL NUMBER: 3B

WELL LOCATION: N ¼ SE ¼ NE ¼ SEC. 22 T. 4S R. 10E

TOWNSHIP: Brownstown

COUNTY: Wayne

TYPE OF WELL (Oil, Gas, Dry Hole, etc.): LPG Storage

TOTAL DEPTH: 1149

FORMATION: A2

DATE PLUGGING STARTED: 10-02-85

DATE PLUGGING COMPLETED: 10-21-85

DEPT. REPRESENTATIVE(S) WHO ISSUED PERMIT OR WITNESSED PLUGGING: Bruce Waldo

CASING RECORD

| SIZE CASING | DEPTH SET | AMOUNT RECOVERED | SHOT OR RIPPED |
|---|---|---|---|
| 13 3/8 | 142 | 0 | --- |
| 9 5/8 | 1029 | 0 | --- |
| | | | |
| | | | |
| | | | |
| | | | |

BRIDGES OR PLUGS

| TYPE (Brush, Stone, Cement, Mechanical, etc.) | DEPTH PLACED | SACKS OF CEMENT AND ADDITIVES |
|---|---|---|
| Bridge Plug | 1000 | |
| Cement | 1000-0 | 375 SXS A |
| | | |
| | | |
| | | |
| | | |

Were tools, tubing, casing, etc., lost or left in the hole before or during plugging? ☐ YES ☒ NO — If yes, give details:

Did a Service Company pump mud, spot cement, or set bridge plugs? ☒ YES ☐ NO — If yes, give name and address: Dowell Mousherville

Was the well plugged by a Company or Contractor other than Owner or Operator? ☒ YES ☐ NO — If yes, give name and address: Lease Management Mt. Pleasant,

Representatives of Owner, Operator, Company, or Contractor who witnessed plugging: Joe VanWagnen

DESCRIBE IN DETAIL HOW WELL WAS PLUGGED

1. Pull 6 5/8 casing (tubing)
2. Set wireline bridge plug at 1000'
3. Run tubing to 1000' cement with 375 SXS Class A from 1000-0
4. Cut off 13 3/8 and 9 5/8 4 ft. below grade weld on ½" steel plate

(USE REVERSE SIDE IF NEEDED)

## CERTIFICATION

"I state that I am authorized by said Owner or Operator to make this report; and that this report was prepared under my supervision and direction, and that the facts stated herein are true, correct and complete to the best of my knowledge."

NAME AND TITLE (Typed or Printed): Joe VanWagnen Engineer

SIGNATURE: JVanWagnen

DATE (Month, Day, Year): 11-08-85

COMPANY NAME AND ADDRESS: Lease Management, Inc.
P.O. Box 290
Mt. Pleasant, MI 48858

R 7213
Rev. 4/74

The site is Clean & level. 6-25-86

Vicki Wilson Geo. Survey 6-27-86

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

# PERMIT TO PLUG AND ABANDON

ORIGINAL DISTRIBUTION
Permittee — Orig. & 1 copy
Division Office — 2 copies
Field Office — File copy
Others — On request

PERMIT NUMBER: 23776
FIELD NAME: Mobil LPG Storage

NAME AND ADDRESS OF PERMITTEE: Mobil Oil Corp., Houston, TX 77251

LEASE NAME AND WELL NO.: Mobil LPG 3-B

| LOCATION (¼ ¼ ¼ or other) | SECTION | TOWNSHIP | COUNTY |
|---|---|---|---|
| N SE NE | 22 T 4S R 10E | Brownstown | Wayne |

| TYPE OF WELL (Oil, Gas, Dry Hole, etc.) | DATE COMPLETED | DATE PLUGGING WILL START | PLUGGING PERMIT REQUESTED BY & DATE |
|---|---|---|---|
| LPG Storage | 1-3-62 | will notify | Jack Harkins 3-27-85 |

| LAST PRODUCTION BOPD | BWPD | MCFGPD | DATE | PLUGGING TO BE DONE BY |
|---|---|---|---|---|
| | | | | Lease Management, Inc. |

PERMIT MAILED TO: Mr. J.V. Johnson
Mobil Oil Corp.
Gas Liquids Dept.
P.O. Box 1774
Houston, TX 77251

COPIES MAILED TO:
Mr. Jack Harkins
Lease Management, Inc.
503 Industrial Ave.
Mt. Pleasant, MI 48858

Geological Survey Division
Box 30028
Lansing, MI 48909

## CASING AND CEMENTING RECORD

| HOLE DIA. | CASING DIA. & WT./FT. | DEPTHS SET | CEMENT QUANTITY, TYPE, ADDITIVES | CMT. TOP. | PERFORATIONS |
|---|---|---|---|---|---|
| | 13 3/8" | 142 | 150 sx | | |
| | 9 5/8" | 1029 | 450 sx | | |
| | | | | | |
| | | | | | |

Elev. 610' KB

## GEOLOGIC DATA; GAS AND OIL SHOWS; DRILLING AND COMPLETION DATA:

| | | | |
|---|---|---|---|
| BOD | 40 | SAL. GU | 564 |
| DR | 40 | BU | 1006 |
| SYLV | 176 | A-2C | 1145 |
| BB | 342 | T.D. | 1149 |

## PLUGGING REQUIREMENTS*

Plugging requirements outlined are to be executed in accordance with the provisions of Act 61, P.A. 1939, as amended, and rules and orders adopted thereunder.

Pull uncemented casing and/or tubing. Set a bridge plug in the center of the second casing joint off bottom.

Place up to five feet of sand on top of bridge plug if desired. Otherwise, fill casing with cement from top of bridge plug to the surface.

Cut casings off at least three feet below grade and cap with a welded steel plate.

Notify this office the day before commencing plugging operations 313-724-2015.

GEOLOGICAL SURVEY
MAY 0 3 1985

*NOTE: BONDS CANNOT BE RELEASED UNTIL A PLUGGING IS COMPLETED, CELLAR RAT HOLE AND PITS FILLED, WELL SITE RESTORED AND RECORDS FILED. WATER WELLS MUST BE PLUGGED ACCORDING TO RULE 188 OF ACT 294 P.A. 1965, "GROUND WATER QUALITY CONTROL". It is further made a requirement of this permit that the applicant give notice to the public utilities in accordance with Act 53, P.A. 1974 C.L. 460.701 to 460.718 and comply with each of the requirements of the act.

| AUTHORIZED BY (signature) | OFFICE | DATE |
|---|---|---|
| Bruce J. Waldo | IMLAY CITY | 5-2-85 |

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

R-7229
Rev. 11/77

22-4S-10E
Brownstown Twp. (Wayne Co.)

TD 1162 in Salina Facility
L.P.G. Storage

Socony-Mobil Oil Co., Inc.

Fee No. 1

Permit No. 23673

Drilling Contractor: Ferguson & Ferguson (Cable)

Location: N½ SE¼ NE¼ Section 22, T. 4S., R. 10E.
1500' from North and 660' from East line of quarter section

Elevation: 600 feet above sea level (rig fl.)

Record by: William Mantek from geologic log

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Drift | 30 | 30 |
| DEVONIAN: | | |
| Detroit River: | | |
| Dolomite, buff to brown to gray, very finely to finely crystalline; some pinpoint and vuggy porosity (Pre. Report-Water at 90') | 125 | 155 |
| Sylvania: | | |
| Sand, quartzose, white, fine to medium, well rounded, dolomitic, friable to tight; some dolomite, interbedded | 170 | 325 |
| DEVONIAN-SILURIAN: | | |
| Bois Blanc-Bass Island-Salina: | | |
| Dolomite, buff to brown to gray, fine to very finely to micro-crystalline; much gray to white chert in upper part; some pinpoint and vuggy porosity in lower part (512 CTM = 502 SOM) | 225 | 550 |
| Dolomite, buff to tan to gray, microcrystalline, interbedded with shale, gray, dolomite, and anhydrite, white to tan | 448 | 998 |
| Salt, clear to orange, translucent, crystalline; inclusions, laminations and thin beds of dolomite, gray to brown, micro- to finely crystalline; occasional thin bed of anhydrite, gray to tan (B salt at 998) | 152 | 1150 |
| Dolomite, buff to tan, finely crystalline; some anhydrite, tan, translucent (A-2 dolomite at 1150) | 12 | 1162 |
| | (837+) | |
| TOTAL DEPTH | | 1162 |

Casing Record:
10 3/4" 34'
8 5/8" 565' (30 cement)
7" 1020' (150 cement)

Commenced: 10-27-61
Completed: 11-18-61
Initial Production: L. P. G. Storage

7-62

BEST COPY
AVAILABLE

23678

# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, OR KEY WELL FOR SECONDARY RECOVERY

AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, AND ACT 326, P.A. 1937 AS AMENDED.

SUPERVISOR OF WELLS
GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING 26, MICHIGAN

*See Reverse Side Before Filling Out This Application*

1. DATE: October 23, 1961

2. APPLICATION IS MADE TO DRILL A WELL FOR: (GAS, OIL, BRINE DISPOSAL, SECONDARY RECOVERY, ETC.): L.P.G. Well

3. ENCLOSED HERE FIND AMOUNT OF: $25.00

4. LESSEE (OWNER OF LEASE RIGHTS): Socony-Mobil Oil Company, Inc.

5. ADDRESS: West and Allen Road, Trenton, Michigan

6. PHONE: ORleans 6-3100

7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Fee

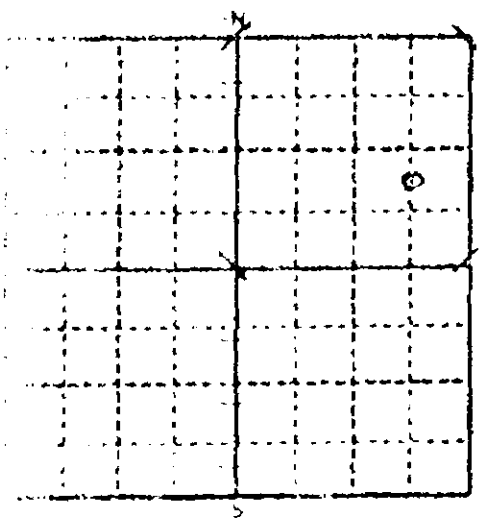
8. WELL NO.: 1

9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER):

10. DRILLING CONTRACTOR: Ferguson & Ferguson

11. ADDRESS: P. O. Box 288, Roscommon, Michigan

12. PHONE:



ATE WELL AND LEASE ACCURATELY ON SECTION PLAT - 640 ACRES

13. N½ ~~XXXX~~ SE ¼ OF NE ¼, SECTION 22 T 4 N.S., R 10 E.

ACRES IN LEASE: 160

15. TOWNSHIP: Brownstown

16. COUNTY: Wayne

*LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND PROPERTY OWNERSHIP LINES.*

1900 FT. FROM north (north-south) LINE OF QUARTER SECTION

660 FT. FROM east (east-west) LINE OF QUARTER SECTION

1500 FT. FROM north (north-south) PROPERTY LINE

660 FT. FROM east (east-west) PROPERTY LINE

NUMBER OF FEET FROM NEAREST PRODUCING WELL: Wildcat

19. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Cable Tools

PROPOSED TO BE COMPLETED IN: Salina FORMATION

21. INTENDED DEPTH OF WELL: 1500'

22. PROGRAM OF CASING, SEALING, AND COMPLETING WELL

" drive pipe to be set through the Drift.
" casing to be set through the Sylvania.
" casing to be set just above the salt section of the Salina Formation.

To test the Salina Formation for salt section suitable for developing a cavity for storage of liquid petroleum gas. If salt is present and suitable for storage 8" will be pulled and 7" casing cemented to the surface.

23. THIS LOCATION IS IN: (Cleared Farm Land, Grass Land, Brush Land, Timbered Land.) Cleared land on refinery property

24. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒

25. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒

26. ANSWER TO NO. 24 ABOVE IS YES, DESCRIBE AND STATE DISTANCE FROM LOCATION AND SPECIFY PRECAUTIONS TO BE TAKEN TO PROTECT FRESH WATER AND WELL WASTES.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST OIL HAZARD REDUCTION FIELD OFFICE. *(See reverse side)*

27. ADDRESS CORRESPONDENCE PERTINENT TO: Socony-Mobil Oil Company, West & Allen Road, Trenton, Michigan

28. PHONE: OR 6-3100

**LEAVE BLANK**

FEES: $25.00 GROUP NO.
ACCOUNT NO.

29. OWNER OF LEASE RIGHTS: SOCONY-MOBIL OIL COMPANY, INC.

30. AUTHORIZED REPRESENTATIVE: Edward A. Wilcox

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

DISTRIBUTION
1. WHITE - GEOL. SURVEY DIV. - LANSING.
2. CANARY - CASHIER.
3. BLUE - F.ADM.DIV. - FIELD.
4. GOLDENROD - GEOL. SUR. DIV. - FIELD.
5. PINK - F.A.DIV. - GR. RAPIDS.
6. GREEN - APPLICANT.

[illegible] DIVISION [illegible]

STATE OF MICHIGAN

DEPARTMENT OF CONSERVATION

SUPERVISOR OF WELLS

No 5327

# PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST CLOTH PERMIT AT WELL LOCATION)

Permit No. 23,673 Date Issued October 23, 1961

Permission is hereby granted to Socony-Mobil Oil Company, Inc.
Owner

West & Allen Road, Trenton, Michigan
Address

Lease Name Fee Well Number 1

To drill a well for L.P.G.

in the NE¼ SE¼ NE¼ Section 22, T.4S., R.11E., Brown Township, Wayne County

and located 1500' from north and 660' from east line of quarter section

and located 1500' from north and 660' from east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By Robert M. Acker

## CAUTION

DRILLING OPERATIONS NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

WASTE IS PROHIBITED in the drilling, producing, and plugging of this well. This includes underground, surface, and market waste.

DAMAGE TO FRESH WATERS, both underground and surface, is prohibited in the drilling, producing, and plugging of this well.

UNNECESSARY DAMAGE TO LIFE AND PROPERTY is prohibited in the drilling, producing, and plugging of this well.

Department offices at: Lansing, Phone IVanhoe 5-8144, Ext. 2686
Mount Pleasant, Phone SP 3-8691
Cadillac, Phone PRospect 5-3181
Plainwell, Phone MUrray 5-8051
Grand Rapids, Phone GLendale 8-3007
Escanaba, Phone STate 6-0333

PERMITS MAY BE TRANSFERRED ONLY WITH PERMISSION OF THE SUPERVISOR OF WELLS

MICHIGAN DEPARTMENT OF CONSERVATION

INTEROFFICE COMMUNICATION

December 13, 1961

DEC 1 1961

TO: R. M. Acker, Geologist, Geological Survey Division

FROM: H. A. Young, Supervisor, Oil Hazard Reduction

SUBJECT: Socony-Mobil Oil Company
Permits 23774, 23775, 23776, 23777, 23778, all on refinery property in Trenton.

Mr. Chuck Grenier of Socony-Mobil Oil Company telephoned this morning to advise they were commencing drilling operations on these wells.

They will presently use only small settling tanks from which the brine will be sewered to fresh water in accordance with Water Resources Commission's previous approval.

Later, a large lined pit will be constructed to store brine. I am to meet with Grenier, his Superintendent Dick Baxter, and others from Socony prior to the construction of this pit to see that their plans are in order.

I appreciate the fact you built the foundation for this one. These things are so much easier to deal with when you can get on them right in the beginning.

H. A. Young

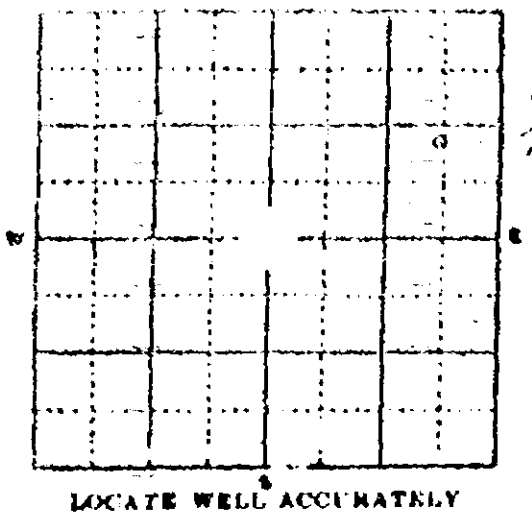
HAY:RJO

cc - Max Crego

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

# 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 318 P. A. 1937)




LOCATE WELL ACCURATELY

Permit No. 23,673

Owner or Operator Socony Mobil Oil Company

Address Box 477, Trenton, Michigan

Well No. 1 Farm Mobil Fee

County Wayne Township Brownstown

Location N½ of SE¼ of NE¼ Sec. 22 Twp. 4S Range 10E Elevation 600 df

Footage 1500 ft. from North line and 660 ft. from East line of quarter section

Type of well LPG Storage Total depth 1162 Completed in Salina

Name of ~~producing~~ storage formation Salina "B" Zone Top of formation 998

Date drilling began 10-27-61 Date drilling completed 11-18-61

Drilling contractor Ferguson & Ferguson Address Mt. Pleasant, Michigan

**WATER ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OIL OR GAS ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CASING AND CEMENTING**

| Size | Where Set | Cement | Amt. Pulled |
|---|---|---|---|
| 10 3/4 | 34 | - | None |
| 8 5/8 | 565 | 30 | None |
| 7 | 1020 | 150 | None |
| | | | |
| | | | |

**STEEL LINES RUN**

| Run at | Corrected to | Run by |
|---|---|---|
| None | | |
| | | |
| | | |
| | | |
| | | |

**PERFORATIONS**

| Date | From | To | No. Holes |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**ACID OR SHOOTING RECORD**

| Date | From | To | Gals. Acid or Qts. Nitro |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Rotary tools from ..... feet to ..... feet. Cable tools from SURFACE feet to 1162 feet.

Natural initial production first 24 hours ..... 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 W. F. Wright

Date ..... Title .....

OG. 10 REV. 4/55

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

[illegible] LANSING, MICH. [illegible] GEOLOGICAL SURVEY DIVISION

# FORMATION RECORD

| FROM | TO | FORMATION | FROM | TO | FORMATION |
|---|---|---|---|---|---|
| 0 | 30 | Glacial drift | | | |
| 30 | ---- | Top of Detroit River | | | |
| 30 | 155 | Dolomite, buff-brown-gray, very fine to fine crystalline, some pinpoint and vuggy porosity. | | | |
| 155 | ---- | Top of Sylvania | | | |
| 155 | 325 | Sand, quartzose, white, fine to medium, well rounded, dolomite cement, friable to tite, some interbedded dol. | | | |
| 325 | ---- | Top of Bois Blanc - Bass Island undivided | | | |
| 325 | 550 | Dolomite, buff-brown-gray, fine to very fine to micro crystalline, much gray to white chert in upper part, some pinpoint and vuggy porosity in lower part. | | | |
| 550 | ---- | Top of Salina | | | |
| 550 | 998 | Dolomite, buff-tan-gray, microcrystalline; interbedded with shale, gray dolomite and anhydrite white to tan. | | | |
| 998 | ---- | Top of Salina "B" Zone | | | |
| 998 | 1150 | Salt, clear to orange, translucent, crystalline; inclusions, laminations and thin beds of dolomite, gray-brown, micro to fine crystalline; occasional thin bed anhydrite gray-tan. | | | |
| 1150 | ---- | Top of Salina "A" Zone | | | |
| 1150 | 1162 T.D. | Dolomite, buff-tan, fine crystalline; some anhydrite, tan, translucent. | | | |

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

GEOLOGICAL SURVEY

IMLAY CITY HAS COPY

# WELL PLUGGING RECORD

JUN 30 1986

(Submit in TRIPLICATE Within 30 Days After Plugging is Completed)

Regulatory Control Unit

PERMIT NUMBER: 23673

FIELD NAME: Mobil LPG Storage

COMPLETE NAME(S) AND ADDRESS OF WELL OWNER: Mobil Oil Corp. Houston, TX 77251

COMPLETE LEASE OR FARM NAME(S): Mobil LPG

WELL NUMBER: 1

WELL LOCATION: N ¼ SE ¼ NE ¼ SEC. 22 T. 4S R. 10E

TOWNSHIP: Brownstown

COUNTY: Wayne

TYPE OF WELL (Oil, Gas, Dry Hole, etc.): LPG Storage

TOTAL DEPTH: 1162

FORMATION: A2

DATE PLUGGING STARTED: 10-02-85

DATE PLUGGING COMPLETED: 10-21-85

DEPT. REPRESENTATIVE(S) WHO ISSUED PERMIT OR WITNESSED PLUGGING: Bruce Waldo

CASING RECORD

| SIZE CASING | DEPTH SET | AMOUNT RECOVERED | SHOT OR RIPPED |
|---|---|---|---|
| 10 3/4 | 34 | 0 | --- |
| 8 5/8 | 565 | 0 | --- |
| 7" | 1020 | 0 | --- |
| | | | |
| | | | |
| | | | |

BRIDGES OR PLUGS

| TYPE (Brush, Stone, Cement, Mechanical, etc.) | DEPTH PLACED | SACKS OF CEMENT AND ADDITIVES |
|---|---|---|
| Bridge Plug | 975 | --- |
| Cement | 975-0 | 220 A |
| | | |
| | | |
| | | |
| | | |

Were tools, tubing, casing, etc., lost or left in the hole before or during plugging? ☐ YES ☒ NO — If yes, give details:

Did a Service Company pump mud, spot cement, or set bridge plugs? ☒ YES ☐ NO — If yes, give name and address: Dowell Mousberville

Was the well plugged by a Company or Contractor other than Owner or Operator? ☒ YES ☐ NO — If yes, give name and address: Lease Management Mt. Pleasant

Representatives of Owner, Operator, Company, or Contractor who witnessed plugging: Joe VanWagnen

DESCRIBE IN DETAIL HOW WELL WAS PLUGGED

1. Pull 5½" casing (tubing)
2. Set wireline bridge plug at 975
3. Run tubing to 975 cement with 220 SXS Class A from 975-0
4. Cut off 10 3/4, 8 5/8, 7" 4 ft. below grade weld on ½" steel plate

(USE REVERSE SIDE IF NEEDED)

## CERTIFICATION

"I state that I am authorized by said Owner or Operator to make this report; and that this report was prepared under my supervision and direction, and that the facts stated herein are true, correct and complete to the best of my knowledge."

NAME AND TITLE (Typed or Printed): Joe VanWagnen

SIGNATURE: Joe VanWagnen

DATE (Month, Day, Year): 11-08-85

COMPANY NAME AND ADDRESS: Lease Management, Inc.
P.O. Box 290
Mt. Pleasant, MI 48858

R 7213
Rev. 4/74

The site is Clean & level. 6-25-86

Vicki Wilson Geo. Survey 6-27-86

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

# PERMIT TO PLUG AND ABANDON

ONR DISTRIBUTION
Permittee — Orig. & 1 copy
Division Office — 2 copies
Field Office — File copy
Others — On request

PERMIT NUMBER: 23673
FIELD NAME: Mobil LPG Storage

NAME AND ADDRESS OF PERMITTEE: Mobil Oil Corp. Houston, TX 77251

LEASE NAME AND WELL NO.: Mobil LPG 1

| LOCATION (¼ ¼ ¼ or other) | SECTION | TOWNSHIP | COUNTY |
|---|---|---|---|
| N SE NE | 22 T 4S R 10E | Brownstown | Wayne |

| TYPE OF WELL (Oil, Gas, Dry Hole, etc.) | DATE COMPLETED | DATE PLUGGING WILL START | PLUGGING PERMIT REQUESTED BY & DATE |
|---|---|---|---|
| LPG Storage | 11-18-61 | will notify | Jack Harkins 3-27-85 |

| LAST PRODUCTION | | | | PLUGGING TO BE DONE BY |
|---|---|---|---|---|
| BOPD | BWPD | MCFGPD | DATE | Lease Management, Inc. |

PERMIT MAILED TO: Mr. J.V. Johnson
Mobil Oil Corp.
Gas Liquids Dept.
P.O. Box 1774
Houston, TX 77251

COPIES MAILED TO:
Mr. Jack Harkins
Lease Management, Inc.
503 Industrial Ave.
Mt. Pleasant, MI 48858

Geological Survey Division
Box 30028
Lansing, MI 48909

**CASING AND CEMENTING RECORD**

| HOLE DIA. | CASING DIA. & WT./FT. | DEPTHS SET | CEMENT QUANTITY, TYPE, ADDITIVES | CMT. TOP | PERFORATIONS |
|---|---|---|---|---|---|
| | 10 3/4" | 34 | | | |
| | 8 5/8" | 565 | 30 sx | | |
| | 7" | 1020 | 150 sx | | |
| | | | | | |

Elev. 600' RF

**GEOLOGIC DATA; GAS AND OIL SHOWS; DRILLING AND COMPLETION DATA:**

| | | | |
|---|---|---|---|
| BOD | 30 | Sal. GU | 550 |
| DR | 30 | BU | 998 |
| SYLV | 155 | A-2C | 1150 |
| BB | 325 | T.D. | 1162 |

**PLUGGING REQUIREMENTS***

Plugging requirements outlined are to be executed in accordance with the provisions of Act 61, P.A. 1939, as amended, and rules and orders adopted thereunder.

Pull uncemented casing and/or tubing. Set a bridge plug in the center of the second casing joint off bottom.

Place up to five feet of sand on top of bridge plug if desired. Otherwise, fill casing with cement from top of bridge plug to the surface.

Grout 10 3/4"-8 5/8" annulus with cement. Cut casings off at least three feet below grade and cap with a welded steel plate.

Notify this office the day before commencing plugging operations 313-724-2015.

GEOLOGICAL SURVEY
MAY 03 1985
Regulatory Control Unit

*NOTE: BONDS CANNOT BE RELEASED UNTIL A PLUGGING IS COMPLETED, CELLAR RAT HOLE AND PITS FILLED, WELL SITE RESTORED AND RECORDS FILED. WATER WELLS MUST BE PLUGGED ACCORDING TO RULE 168 OF ACT 294 P.A. 1965, "GROUND WATER QUALITY CONTROL". It is further made a requirement of this permit that the applicant give notice to the public utilities in accordance with Act 53, P.A. 1974 C.L. 460.701 to 460.718 and comply with each of the requirements of the act.

| AUTHORIZED BY (signature) | OFFICE | DATE |
|---|---|---|
| Bruce J. Waldon | IMLAY CITY | 5-1-85 |

NOTE: WELL PLUGGING RECORD form R-7213 to be filed in TRIPLICATE within 30 days after completion.

R-7229
Rev. 11/77

22-4S-10E
Brownstown Twp. (Wayne Co.)

L.P.G. (33)
TD 1148 in Salina -"B" Salt (42)
Facility

Socony-Mobil Oil Company, Inc.

Socony-Mobil LPG No. 2

Permit No. 23774

Drilling Contractor: Union Rotary Corp. (Rotary)

Location: N½ SE¼ NE¼ Section 22, T. 4S, R. 10E
1800' from North and 660' from East line of quarter section

Elevation: 610 feet above sea level (rot. bush.)

Record by: William Mantek from Schlumberger Gamma Ray-Neutron Log - no lithology log available

| | |
|---|---|
| PLEISTOCENE: | |
| Drift: | @ 40 |
| DEVONIAN: | |
| Detroit River: | @ 40 |
| Sylvania Sandstone: | @ 157 |
| Bois Blanc: | @ 341 |
| SILURIAN: | |
| Bass Island: | @ 451 |
| Salina: | @ 638 |
| "F" Unit | @ 700 |
| "C" Unit | @ 887 |
| "B" Unit | @ 952 |
| "B" Salt | @1001 |
| TOTAL DEPTH | @1148 Schj |
| TOTAL DEPTH | @1147 Drlr. |

Casing Record:
13 3/8" 129' (90 cement)
9 5/8" 1006' (390 cement)

Drilling Commenced: 2-1-62
Drilling Completed: 2-7-62
Initial Production: Before treatment: LPG storage well

3/65

BEST COPY
AVAILABLE

23774

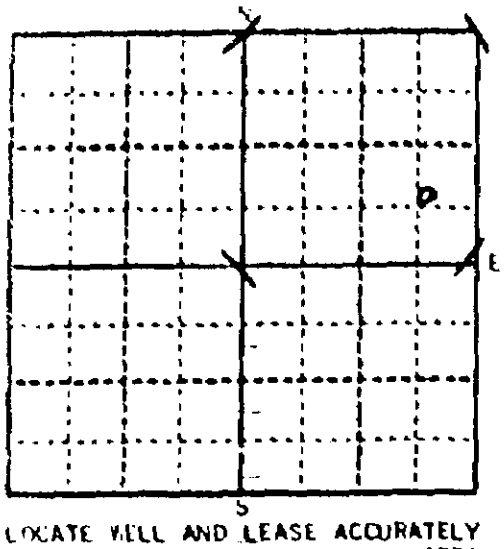
# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, OR KEY WELL FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, AND ACT 326, P.A. 1937 AS AMENDED.

MAIL TO:
SUPERVISOR OF WELLS
GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING 26, MICHIGAN

*See Reverse Side Before Filling Out This Application*

1. DATE: December 7, 1961



LOCATE WELL AND LEASE ACCURATELY ON THIS SECTION PLAT - 640 ACRES

2. APPLICATION IS MADE TO DRILL A WELL FOR: (GAS, OIL, BRINE DISPOSAL, SECONDARY RECOVERY, ETC.) L.P.G. Storage

3. ENCLOSED HEREWITH FIND AMOUNT OF: $ 25.00

4. LESSEE (OWNER OF LEASE RIGHTS): Socony-Mobil Oil Company, Inc.

5. ADDRESS: West & Allen Road, Trenton, Michigan

6. PHONE: OR 6-3100

7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Socony-Mobil L.P.G.

8. WELL NO.: 2

9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER):

10. DRILLING CONTRACTOR: Union Rotary Corp.

11. ADDRESS: 1104 N. Mission Street, Mt. Pleasant, Michigan

12. PHONE: SP 34901

13. W½ X¼ of SE ¼ of NE ¼, SECTION 22 T4 XXS., R10 E.4.

14. ACRES IN LEASE: 160

15. TOWNSHIP: Brownstown

16. COUNTY: Wayne

17. *Locate well in two directions from nearest lines of quarter section and property ownership lines:*

1800 FT. FROM north (north-south) LINE OF QUARTER SECTION — 660 FT. FROM east (east-west) LINE OF QUARTER SECTION

1800 FT. FROM north (north-south) PROPERTY LINE — 600 FT. FROM east (east-west) PROPERTY LINE

18. NUMBER OF FEET FROM NEAREST PRODUCING WELL: 300' south of #1 well

19. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary

20. WELL IS TO BE COMPLETED IN: Saline FORMATION

21. INTENDED DEPTH OF WELL: Approx. 1150'

22. PROGRAM OF CASING, SEALING, AND COMPLETING WELL

Set 13 3/8" at approximately 160' and cement to surface.
Set 9 5/8" casing at top of Salina Salt and cement to the surface.
Wash out salt cavity and complete as L.P.G. Storage Well.

23. WELL LOCATION IS IN: *(Cleared Farm Land, Open Grass Land, Brush Land, Timbered Land.)* Refinery Property

24. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒

25. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒

26. IF ANSWER TO NO. 24 ABOVE IS YES, DESCRIBE AND GIVE DISTANCE FROM LOCATION AND SPECIFY PRECAUTIONS TO BE TAKEN TO PROTECT FRESH WATER FROM WELL WASTES.

**APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST OIL HAZARD REDUCTION FIELD OFFICE.** *(See reverse side)*

27. ADDRESS CORRESPONDENCE AND PERMIT TO: Socony-Mobil Oil Company, Inc., West & Allen Road, Trenton, Mich.

28. PHONE: OR 63100

**LEAVE BLANK**

DATE ISSUED 12/8/61 GROUP NO.

PERMIT NO. 23174 ACCOUNT NO.

29. OWNER OF LEASE RIGHTS: SOCONY-MOBIL OIL COMPANY, INC.

30. AUTHORIZED REPRESENTATIVE: G. S. Baxter

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

Receipt No. 108335 - $25.00 - 12/7/61 JJK

DISTRIBUTION
1. WHITE - GEOL. SURVEY DIV. - LANSING.
2. CANARY - CASHIER.
3. BLUE - F.ADM.DIV. - FIELD.
4. GOLDENROD-GEOL.SUR.DIV.-FIELD.
5. PINK - F.A.DIV. - GR.RAPIDS.
6. GREEN - APPLICANT.

GS-1 Rev. 1/56

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

Form GN-2 500 Rev 10-56

STATE OF MICHIGAN

# DEPARTMENT OF CONSERVATION

SUPERVISOR OF WELLS

№ 5433

## PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST CLOTH PERMIT AT WELL LOCATION)

Permit No. 23774 Date Issued December 8, 1961

Permission is hereby granted to Socony-Mobil Oil Company, Inc.
Owner

West & Allen Road, Trenton, Michigan
Address

Lease Name Socony-Mobil L.P.G. Well Number 2

To drill a well for LPG Storage

in the NE SE NE Section 22, T.4S., R.10E., Brownstown Twp., Wayne Co.

and located 1800' from north and 660' from east line of quarter section.

and located 1800' from north and 600' from east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By Robert M. Acker

## CAUTION

DRILLING OPERATIONS NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

WASTE IS PROHIBITED in the drilling, producing, and plugging of this well. This includes underground, surface, and market waste.

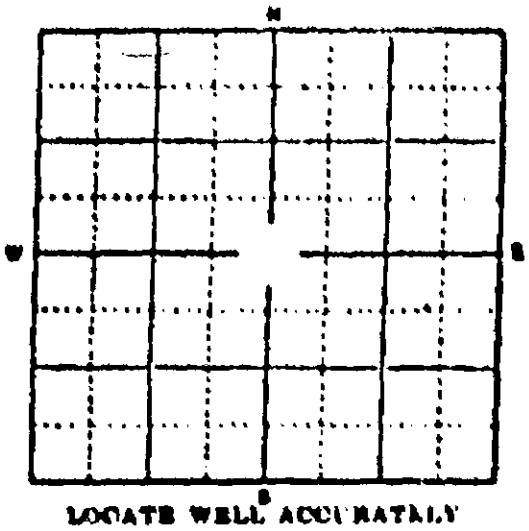
DAMAGE TO FRESH WATERS, both underground and surface, is prohibited in the drilling, producing, and plugging of this well.

UNNECESSARY DAMAGE TO LIFE AND PROPERTY is prohibited in the drilling, producing, and plugging of this well.

Department offices at: Lansing, Phone IVanhoe 5-8144, Ext. 2686
Mount Pleasant, Phone SP 3-8691
Cadillac, Phone PRospect 5-3181
Plainwell, Phone MUrray 5-8051
Grand Rapids, Phone GLendale 8-3007
Escanaba, Phone STate 6-0333

PERMITS MAY BE TRANSFERRED ONLY WITH PERMISSION OF THE SUPERVISOR OF WELLS

GEO GEO GEO GEO GEO GEO GEO GEO MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909 ***




LOCATE WELL ACCURATELY

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

# 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. 23,774

Owner or Operator: Mobil Oil Co.

Address: Box 477, Trenton, Mich.

Well No. 2 Farm: Mobil Res.

County: Wayne Township: Brownstown

Location: N½ of SE¼ of NE¼ Sec. 22 Twp. 4S Range 10 Elevation: 610 RR

Footage: 1800 ft. from North line and 600 ft. from East line of quarter section

Type of well: LPG Storage Total depth: 1148 Completed in: Salina

Name of ~~producing~~ storage formation: Salina "B" Zone Top of formation: 1000

Date drilling began: 2-1-62 Date drilling completed: 2-2-62

Drilling contractor: Union Rotary Corp. Address: Mt. Pleasant, Mich.

**WATER ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OIL OR GAS ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CASING AND CEMENTING**

| Size | Where Set | Cement | Amt. Pulled |
|---|---|---|---|
| 13-3/8" | 129 | 90 with | gilsonite |
| 9-5/8" | 1006 | 380 with | gilsonite |
| | | | |
| | | | |
| | | | |

**STEEL LINES RUN**

| Run at | Corrected to | Run by |
|---|---|---|
| None | | |
| | | |
| | | |
| | | |
| | | |

**PERFORATIONS**

| Date | From | To | No. Holes |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**ACID OR SHOOTING RECORD**

| Date | From | To | Gals. Acid or Qts. Shot |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Rotary tools from Surface feet to 1148 feet. Cable tools from ..... feet to ..... feet.

Natural initial production first 24 hours ..... 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: C. H. Grenier Jr.

Date: 4-3-62

Title: Project Engineer

GS-10 Rev. 4/55

**GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE**

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

# FORMATION RECORD

| FROM | TO | FORMATION | FROM | TO | FORMATION |
|---|---|---|---|---|---|
| | | As shown on Schlumberger Log | | | |

IMLAY CITY HAS COPY

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

GEOLOGICAL SURVEY

# WELL PLUGGING RECORD

JUN 30 1986

(Submit in TRIPLICATE Within 30 Days After Plugging is Completed)

Regulatory Control Unit

PERMIT NUMBER: 23774

FIELD NAME: Mobil LPG Storage

COMPLETE NAME(S) AND ADDRESS OF WELL OWNER: Mobil Oil Corp. Houston, TX 77251

COMPLETE LEASE OR FARM NAME(S): Mobil LPG

WELL NUMBER: 2

WELL LOCATION: N ¼ SE ¼ NE ¼ SEC. 22 T. 4S R. 10E

TOWNSHIP: Brownstown

COUNTY: Wayne

TYPE OF WELL (Oil, Gas, Dry Hole, etc.): LPG Storage

TOTAL DEPTH: 1148

FORMATION: A2

DATE PLUGGING STARTED: 10-2-85

DATE PLUGGING COMPLETED: 10-21-85

DEPT. REPRESENTATIVE(S) WHO ISSUED PERMIT OR WITNESSED PLUGGING: Bruce Waldo

CASING RECORD

| SIZE CASING | DEPTH SET | AMOUNT RECOVERED | SHOT OR RIPPED |
|---|---|---|---|
| 13 3/8 | 129 | 0 | --- |
| 9 5/8 | 1006 | 0 | --- |
| | | | |
| | | | |
| | | | |
| | | | |

BRIDGES OR PLUGS

| TYPE (Brush, Stone, Cement, Mechanical, etc.) | DEPTH PLACED | SACKS OF CEMENT AND ADDITIVES |
|---|---|---|
| Bridge Plug | 975 | ---- |
| Cement | 975-0 | 375 SXS A |
| | | |
| | | |
| | | |
| | | |

Were tools, tubing, casing, etc., lost or left in the hole before or during plugging? ☐ YES ☒ NO — If yes, give details:

Did a Service Company pump mud, spot cement, or set bridge plugs? ☒ YES ☐ NO — If yes, give name and address: Dowell Mousherville

Was the well plugged by a Company or Contractor other than Owner or Operator? ☒ YES ☐ NO — If yes, give name and address: Lease Management Mt. Pleasant

Representatives of Owner, Operator, Company, or Contractor who witnessed plugging: Joe Van Wagnen

DESCRIBE IN DETAIL HOW WELL WAS PLUGGED

1. Pull 6 5/8 casing (tubing)
2. Set wireline Bridge plug at 975
3. Run tubing to 975 cement with 375 SXS Class A from 975-0
4. Cut off 13 3/8, 9 5/8, 4 ft. below grade weld on ½" steel plate

(USE REVERSE SIDE IF NEEDED)

## CERTIFICATION

"I state that I am authorized by said Owner or Operator to make this report; and that this report was prepared under my supervision and direction, and that the facts stated herein are true, correct and complete to the best of my knowledge."

NAME AND TITLE (Typed or Printed): Joe VanWagnen Engineer

SIGNATURE: J Van Wagnen

DATE (Month, Day, Year): 11-08-85

COMPANY NAME AND ADDRESS: Lease Management, Inc.
P.O. Box 290
Mt. Pleasant, MI 48858

R 7213
Rev. 4/74

The site is clean & level. 6-25-86

Vicki Wilson Geo. Survey 6-27-86

DNR DISTRIBUTION
Permittee — Orig. & 1 copy
Division Office — 2 copies
Field Office — File copy
Others — On request

STATE OF MICHIGAN
**DEPARTMENT OF NATURAL RESOURCES**
GEOLOGICAL SURVEY DIVISION

# PERMIT TO PLUG AND ABANDON

PERMIT NUMBER: 23774
FIELD NAME: Mobil LPG Storage

NAME AND ADDRESS OF PERMITTEE: Mobil Oil Corp., Houston, TX 77251

LEASE NAME AND WELL NO.: Mobil LPG 2

| LOCATION (¼ ¼ ¼ or other) | SECTION | TOWNSHIP | COUNTY |
|---|---|---|---|
| N SE NE | 22 T 4S R 10E | Brownstown | Wayne |

| TYPE OF WELL (Oil, Gas, Dry Hole, etc.) | DATE COMPLETED | DATE PLUGGING WILL START | PLUGGING PERMIT REQUESTED BY & DATE |
|---|---|---|---|
| LPG Storage | 2-2-62 | will notify | Jack Harkins 3-27-85 |

| LAST PRODUCTION BOPD | BWPD | MCFGPD | DATE | PLUGGING TO BE DONE BY |
|---|---|---|---|---|
| | | | | Lease Management, Inc. |

PERMIT MAILED TO: Mr. J.V. Johnson
Mobil Oil Corp.
Gas Liquids Dept.
P.O. Box 1774
Houston, TX 77251

COPIES MAILED TO:
Mr. Jack Harkins
Lease Management, Inc.
503 Industrial Ave.
Mt. Pleasant, MI 48858

Geological Survey Division
Box 30028
Lansing, MI 48909

**CASING AND CEMENTING RECORD**

| HOLE DIA. | CASING DIA. & WT./FT. | DEPTHS SET | CEMENT QUANTITY, TYPE, ADDITIVES | CMT. TOP. | PERFORATIONS |
|---|---|---|---|---|---|
| | 13 3/8" | 129 | 90 sx | | |
| | 9 5/8" | 1006 | 390 sx | | |
| | | | | | |
| | | | | | |

Elev. 610' KB

**GEOLOGIC DATA; GAS AND OIL SHOWS; DRILLING AND COMPLETION DATA:**

Lacking on record

BU 1000
T.D. 1148

**PLUGGING REQUIREMENTS***

Plugging requirements outlined are to be executed in accordance with the provisions of Act 61, P.A. 1939, as amended, and rules and orders adopted thereunder.

Pull uncemented casing and/or tubing. Set a bridge plug in the center of the second casing joint off bottom.

Place up to five feet of sand on top of bridge plug if desired. Otherwise, fill casing with cement from top of bridge plug to the surface.

Cut casings off at least three feet below grade and cap with a welded steel plate.

Notify this office the day before commencing plugging operations 313-724-2015.

GEOLOGICAL SURVEY
MAY 0 3 1985
Regulatory Control Unit

*NOTE: BONDS CANNOT BE RELEASED UNTIL A PLUGGING IS COMPLETED, CELLAR RAT HOLE AND PITS FILLED, WELL SITE RESTORED AND RECORDS FILED. WATER WELLS MUST BE PLUGGED ACCORDING TO RULE 166 OF ACT 294 P.A. 1965, "GROUND WATER QUALITY CONTROL". It is further made a requirement of this permit that the applicant give notice to the public utilities in accordance with Act 53, P.A. 1974 C.L. 460.701 to 460.718 and comply with each of the requirements of the act.

| AUTHORIZED BY (signature) | OFFICE | DATE |
|---|---|---|
| Bruce J. Walker | IMLAY CITY | 5-2-85 |

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

R-7229
Rev. 11/77

Permit No.145 Well Details (Source: Geowebface DEQ)

- **API No. 21163001458000**
- **Permit Number:145**
- **Lease Name: MOBIL OIL CORPORATION**
- **Well #:BD2**
- **Status: Plugging Approved**
- **Total Depth:365**
- **Producing Formation: Null**
- **Latitude:42.1353**
- **Longitude:-83.2273**
- **Place: Woodhaven**
- **County: Wayne**
- **TRS:04S10E22**
- **Map-click Lat:42.13530**
- **Map-click Lon:-83.22732**

**API NO. 21163001458000**

**NO DATA AVAILABLE**

22-4S-10E
Brownstown Twp. (Wayne Co.)

L.P.G. (33)
TD 1147 in Salina-A-2 Dolomite
(44)
Facility well

Socony-Mobil Oil Company, Inc.

Socony-Mobil LPG No. 4-A

Permit No. 23777

Drilling Contractor: Union Rotary Corp. (Rotary)

Location: N½ SE¼ NE¼ Section 22, T. 4S, R. 10E
1870' from North and 120' from East line of quarter section

Elevation: 610 feet above sea level (rot. bush.)

Record by: William Mantek from partial sample log submitted by the company

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| No Record - probably includes some Detroit River | 135 | 135 |
| DEVONIAN: | | |
| Detroit River: | | |
| Dolomite, brown, buff, tan, white, with black Shale streaks, finely crystalline, dense to medium crystalline, granular and silty; vuggy porosity | 40 | 175 |
| Sylvania: | | |
| Sandstone, white, rounded and frosted, fine to medium grained, dolomitic | 105 | 280 |
| Sandstone, very fine grained, dense and Dolomite, light gray, very finely crystalline, sandy | 20 | 300 |
| Sandstone, very fine grained, silty, slightly argillaceous with dolomite cement | 20 | 320 |
| Sandstone, buff, tan, fine grained, dolomitic; trace Dolomite silty | 15 (160) | 335 |
| Bois Blanc: | | |
| Chert, white to cloudy, translucent, dolomitic, calcareous | 65 | 400 |
| Dolomite, buff, finely crystalline to dense; Chert, as above | 55 (120) | 455 |
| SILURIAN: | | |
| Bass Island (?): | | |
| Dolomite, buff, finely crystalline to dense | 45 | 500 |
| Dolomite, tan to buff, very finely crystalline and dark gray, finely crystalline, argillaceous | 20 | 520 |
| Dolomite, tan to buff, very finely crystalline to dense; trace pinpoint porosity | 20 | 540 |
| Dolomite, as above, and streaks of Dolomite, light gray, finely crystalline, granular | 20 | 560 |
| Gypsum, white, crystalline and Dolomite, as above, and Dolomite, gray, finely crystalline, argillaceous | 20 | 580 |
| Dolomite, buff, finely crystalline to dense; trace Gypsum | 40 | 620 |
| Dolomite, buff, as above and gray, shaly | 22 (187) | 642 |
| Salina: (?) | | |
| Shale, dark gray green, dolomitic, gypsiferous | 168 | 810 |
| Dolomite, buff to gray, clean to argillaceous, finely crystalline; dense; Anhydrite, clear to buff; Shale, gray, dolomitic | 50 | 860 |
| Dolomite, as above; some limy Dolomite; Shale, gray, dolomitic; Anhydrite, buff to orange and clear | 35 | 895 |

Socony-Mobil Oil Company, Inc.
Socony-Mobil LPG No. 4-A

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| SILURIAN: | | |
| Salina (?) (Continued) | | |
| Shale, as above, with trace Gypsum, lithographic; Dolomite, gray, finely crystalline, dense, argillaceous ("C" Unit @ 895; "B" Unit @ 960) | 100 | 995 |
| Dolomite, buff, finely crystalline to dense, anhydritic | 12 | 1007 |
| Salt, some Dolomite, medium grained, argillaceous, finely crystalline, anhydritic; and Gypsum, tan and clear ("B" Salt @ 1007) | 53 | 1060 |
| Salt; some Shale, green, gray, dolomitic | 82 | 1142 |
| Dolomite, tan to medium brown, dense, conchoidal, fracture (A-2 Dolomite @ 1147) | 5 | 1147 |
| | (505+) | |
| TOTAL DEPTH | | 1147 |

Casing Record:
13 3/8" 161' (150 cement)
9 5/8" 1025' (350 cement)

Drilling Commenced: 1-9-62
Drilling Completed: 1-15-62
Initial Production: LPG Storage well

3/65

BEST COPY
AVAILABLE

23777

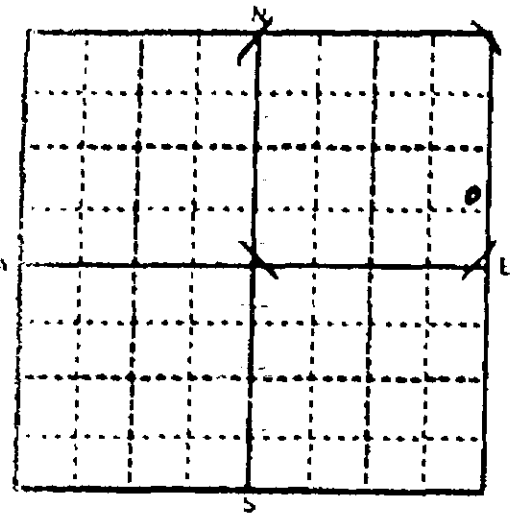
# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, OR KEY WELL FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, AND ACT 326, P.A. 1937 AS AMENDED.

MAIL TO:
SUPERVISOR OF WELLS
GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING 26, MICHIGAN

*See Reverse Side Before Filling Out This Application*

1. DATE: December 7, 1961




LOCATE WELL AND LEASE ACCURATELY ON THIS SECTION PLAT - 640 ACRES

2. APPLICATION IS MADE TO DRILL A WELL FOR: (GAS, OIL, BRINE DISPOSAL, SECONDARY RECOVERY, ETC.) L.P.G. Storage

3. ENCLOSED HEREWITH FIND AMOUNT OF: $25.00

4. LESSEE (OWNER OF LEASE RIGHTS): Socony-Mobil Oil Company, Inc.

5. ADDRESS: West & Allen Road, Trenton, Michigan

6. PHONE: OR 6-3100

7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Socony-Mobil L.P.G.

8. WELL NO.: #4-A

9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER): —

10. DRILLING CONTRACTOR: Union Rotary Corp.

11. ADDRESS: 1104 N. Mission Street, Mt. Pleasant, Michigan

12. PHONE: SP 34901

13. N½ ¼ OF SE ¼ OF NE ¼, SECTION 22 T 4 N.S., R 10 E.S.

14. ACRES IN LEASE: 160

15. TOWNSHIP: Brownstown

16. COUNTY: Wayne

17. *Locate well in two directions from nearest lines of quarter section and property ownership lines:*

1870 FT. FROM north (north-south) LINE OF QUARTER SECTION — 120 FT. FROM east (east-west) LINE OF QUARTER SECTION

1870 FT. FROM north (north-south) PROPERTY LINE — 120 FT. FROM east (east-west) PROPERTY LINE

18. NUMBER OF FEET FROM NEAREST PRODUCING WELL: 300' south of #3-B

19. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary

20. WELL IS TO BE COMPLETED IN: Salina FORMATION

21. INTENDED DEPTH OF WELL: Approx. 1150'

22. PROGRAM OF CASING, SEALING, AND COMPLETING WELL:
Set 13 3/8" at approximately 160' and cement to surface.
Set 9 5/8" casing at top of Salina Salt and cement to the surface.
Wash out salt cavity and complete as L.P.G. Storage Well.

23. WELL LOCATION IS IN: (*Cleared Farm Land, Open Grass Land, Brush Land, Timbered Land.*) Refinery Property

24. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒

25. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒

26. IF ANSWER TO NO. 24 ABOVE IS *YES*, DESCRIBE AND GIVE DISTANCE FROM LOCATION AND SPECIFY PRECAUTIONS TO BE TAKEN TO PROTECT FRESH WATER FROM WELL WASTES.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST OIL HAZARD REDUCTION FIELD OFFICE. *(See reverse side)*

27. ADDRESS CORRESPONDENCE AND PERMIT TO: Socony-Mobil Oil Company, Inc., West & Allen Road, Trenton, Mich.

28. PHONE: OR 6-3100

**LEAVE BLANK**

DATE ISSUED 12/8/61 GROUP NO. ____
PERMIT NO. 23,111 ACCOUNT NO. ____

29. OWNER OF LEASE RIGHTS: SOCONY-MOBIL OIL COMPANY, INC.

30. AUTHORIZED REPRESENTATIVE: C. H. Grenier

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

Receipt No. 108335 - $25.00 - 12/7/61 JJK

DISTRIBUTION
1. WHITE - GEOL. SURVEY DIV. - LANSING.
2. CANARY - CASHIER.
3. BLUE - F. ADM. DIV. - FIELD.
4. GOLDENROD - GEOL. SUR. DIV. - FIELD.
5. PINK - F. A. DIV. - GR. RAPIDS.
6. GREEN - APPLICANT.

GS-1 Rev. 1/56

Form GS-2 500 Sets 10-59

STATE OF MICHIGAN

# DEPARTMENT OF CONSERVATION

SUPERVISOR OF WELLS

№ 5436

## PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST CLOTH PERMIT AT WELL LOCATION)

Permit No. 23777 Date Issued December 8, 1961

Permission is hereby granted to Socony-Mobil Oil Company, Inc.
Owner

West & Allen Road, Trenton, Michigan
Address

Lease Name Socony-Mobil L.P.G. Well Number 4-A

To drill a well for L.P.G. Storage

in the NW SE NE Section 22, T.4S., R.10E., Brownstown Twp., Wayne Co.

and located 1870' from north and 120' from east line of quarter section.

and located 1870' from north and 120' from east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By Robert M. Ucker

## CAUTION

DRILLING OPERATIONS NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

WASTE IS PROHIBITED in the drilling, producing, and plugging of this well. This includes underground, surface, and market waste.

DAMAGE TO FRESH WATERS, both underground and surface, is prohibited in the drilling, producing, and plugging of this well.

UNNECESSARY DAMAGE TO LIFE AND PROPERTY is prohibited in the drilling, producing, and plugging of this well.

Department offices at: Lansing, Phone IVanhoe 5-8144, Ext. 2686
Mount Pleasant, Phone SP 3-8691
Cadillac, Phone PRospect 5-3181
Plainwell, Phone MUrray 5-8051
Grand Rapids, Phone GLendale 8-3007
Escanaba, Phone STate 6-0333

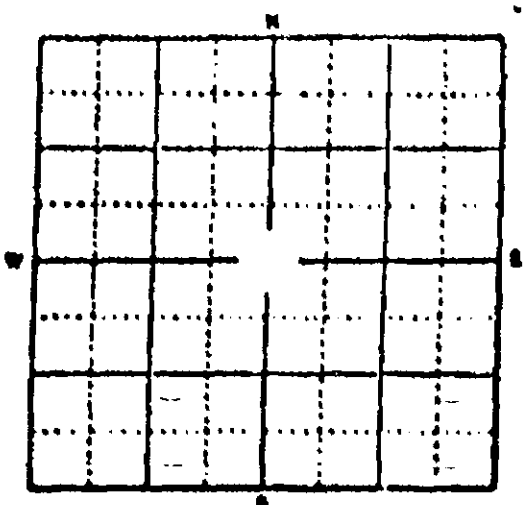
PERMITS MAY BE TRANSFERRED ONLY WITH PERMISSION OF THE SUPERVISOR OF WELLS

MI DNR - GEOLOGICAL SURVEY - BOX 30028 LANSING MI 48909

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

# 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. 1939)




LOCATE WELL ACCURATELY

Permit No. 23,777

Owner or Operator: Mobil Oil Co.

Address: Box 477, Trenton, Mich.

Well No. 4A Farm: Mobil Fee

County: Wayne Township: Brownstown

Location: N½ of SE¼ of NE¼ Sec. 22 Twp. 4S Range 10E Elevation 610 RB

Footage 1870' ft. from north line and 120 ft. from east line of quarter section

Type of well: LPG Storage Total depth: 1147 Completed in: Salina

Name of ~~producing~~ storage formation: Salina "B" Zone Top of formation: 1007

Date drilling began: 1-9-62 Date drilling completed: 1-13-62

Drilling contractor: Union Rotary Corp. Address: Mt. Pleasant, Mich.

**WATER ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OIL OR GAS ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CASING AND CEMENTING**

| Size | Where Set | Cement | Amt. Pulled |
|---|---|---|---|
| 13-3/8" | 161 | 150 | None |
| 9-5/8" | 1025 | 350 | None |
| | | | |
| | | | |
| | | | |

**STEEL LINES RUN**

| Run at | Corrected to | Run by |
|---|---|---|
| None | | |
| | | |
| | | |
| | | |
| | | |

**PERFORATIONS**

| Date | From | To | No. Holes |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**ACID OR SHOOTING RECORD**

| Date | From | To | Gals. Acid or Qts. Nitro |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Rotary tools from Surface feet to 1147 feet. Cable tools from ..... feet to ..... feet.

Natural initial production first 24 hours ..... 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: C. H. Gremer Jr.

Date: 4-3-62

Title: Project Engineer

OG-10 Rev. 4/55

**GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE**

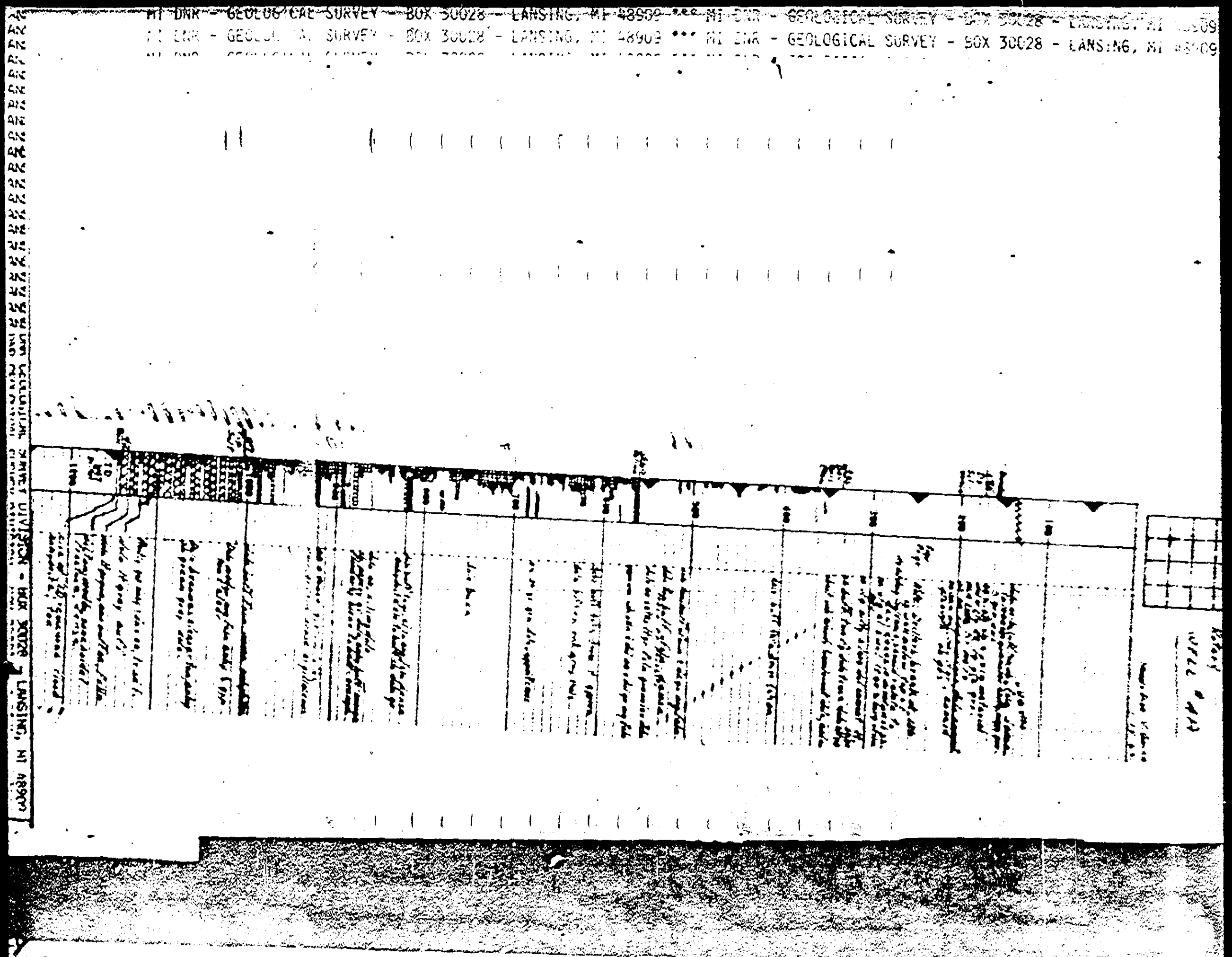
OG OG OG OG OG OG OG OG MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

# FORMATION RECORD

| FROM | TO | FORMATION | FROM | TO | FORMATION |
|---|---|---|---|---|---|

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909 ***

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909 *** MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909 *** MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909 *** MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909



MICHIGAN DEPARTMENT OF NATURAL RESOURCES - MICHIGAN DEPARTMENT OF NATURAL RESOURCES - MICHIGAN DEPARTMENT OF NATURAL RESOURCES

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

GEOLOGICAL SURVEY

IMLAY CITY HAS COPY

# WELL PLUGGING RECORD

JUN 30 1986

(Submit in TRIPLICATE Within 30 Days After Plugging is Completed)

Regulatory Control Unit

PERMIT NUMBER: 23777

FIELD NAME: Mobil LPG Storage

COMPLETE NAME(S) AND ADDRESS OF WELL OWNER: Mobil Oil Corp. Houston, TX 77251

COMPLETE LEASE OR FARM NAME(S): Mobil LPG

WELL NUMBER: 4A

WELL LOCATION: N ¼ SE ¼ NE ¼ SEC. 22 T. 4S R. 10E

TOWNSHIP: Brownstown

COUNTY: Wayne

TYPE OF WELL (Oil, Gas, Dry Hole, etc.): LPG Storage

TOTAL DEPTH: 1147

FORMATION: A2

DATE PLUGGING STARTED: 10-2-85

DATE PLUGGING COMPLETED: 10-21-85

DEPT. REPRESENTATIVE(S) WHO ISSUED PERMIT OR WITNESSED PLUGGING: Bruce Waldo

CASING RECORD

| SIZE CASING | DEPTH SET | AMOUNT RECOVERED | SHOT OR RIPPED |
|---|---|---|---|
| 13 3/8 | 161 | 0 | --- |
| 9 5/8 | 1025 | 0 | --- |
| | | | |
| | | | |
| | | | |
| | | | |

BRIDGES OR PLUGS

| TYPE (Brush, Stone, Cement, Mechanical, etc.) | DEPTH PLACED | SACKS OF CEMENT AND ADDITIVES |
|---|---|---|
| Bridge Plug | 980 | ---- |
| Cement | 980-0 | 375 SXS A |
| | | |
| | | |
| | | |
| | | |

Were tools, tubing, casing, etc., lost or left in the hole before or during plugging? ☐ YES ☒ NO — If yes, give details:

Did a Service Company pump mud, spot cement, or set bridge plugs? ☒ YES ☐ NO — If yes, give name and address: Dowell Mousherville

Was the well plugged by a Company or Contractor other than Owner or Operator? ☒ YES ☐ NO — If yes, give name and address: Lease Management MT. Pleasant.

Representatives of Owner, Operator, Company, or Contractor who witnessed plugging: Joe Van Wagnen

DESCRIBE IN DETAIL HOW WELL WAS PLUGGED

1. Pull 6 5/8 casing (tubing)
2. Set wireline bridge plug at 980 ft.
3. Run tubing to 980 spot. 375 SXS Class A cement from 980-0
4. Cut off 13 3/8, 9 5/8 4ft. below grade weld on ½" steel plate

(USE REVERSE SIDE IF NEEDED)

CERTIFICATION

"I state that I am authorized by said Owner or Operator to make this report; and that this report was prepared under my supervision and direction, and that the facts stated herein are true, correct and complete to the best of my knowledge."

NAME AND TITLE (Typed or Printed): Joe Van Wagnen Engineer

SIGNATURE: JVan Wagnen

DATE (Month, Day, Year): 11-8-85

COMPANY NAME AND ADDRESS: Lease Management, Inc.
P.O. Box 290
Mt. Pleasant, MI 48858

R 7213
Rev. 4/74

The site is Clean & level. 6-25-86

Vicki Wilson Geo. Survey 6-27-86

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

# PERMIT TO PLUG AND ABANDON

DNR DISTRIBUTION
Permittee — Orig. & 1 copy
Division Office — 2 copies
Field Office — File copy
Others — On request

PERMIT NUMBER: 23777

FIELD NAME: Mobil LPG Storage

NAME AND ADDRESS OF PERMITTEE: Mobil Oil Corp., Houston, TX 77251

LEASE NAME AND WELL NO.: Mobil LPG 4-A

| LOCATION (¼ ¼ ¼ or other) | SECTION | TOWNSHIP | COUNTY |
|---|---|---|---|
| N SE NE | 22 T4S R 10E | Brownstown | Wayne |

| TYPE OF WELL (Oil, Gas, Dry Hole, etc.) | DATE COMPLETED | DATE PLUGGING WILL START | PLUGGING PERMIT REQUESTED BY & DATE |
|---|---|---|---|
| LPG Storage | 1-15-62 | will notify | Jack Harkins 3-27-85 |

LAST PRODUCTION: BOPD | BWPD | MCFGPD | DATE

PLUGGING TO BE DONE BY: Lease Management, Inc.

PERMIT MAILED TO: Mr. J.V. Johnson, Mobil Oil Corp., Gas Liquids Dept., P.O. Box 1774, Houston, TX 77251

COPIES MAILED TO: Mr. Jack Harkins, Lease Management, Inc., 503 Industrial Ave., Mt. Pleasant, MI 48858; Geological Survey Division, Box 30028, Lansing, MI 48909

**CASING AND CEMENTING RECORD**

| HOLE DIA. | CASING DIA. & WT/FT. | DEPTHS SET | CEMENT QUANTITY, TYPE, ADDITIVES | CMT. TOP. | PERFORATIONS |
|---|---|---|---|---|---|
| | 13 3/8" | 161 | 150 sx | | |
| | 9 5/8" | 1025 | 350 sx | | |
| | | | | | |
| | | | | | |

Elev. 610' KB

**GEOLOGIC DATA; GAS AND OIL SHOWS; DRILLING AND COMPLETION DATA:**

| | | | |
|---|---|---|---|
| BOD | 40 | SAL. GU | 560 |
| DR | 40 | BU | 1007 |
| SYLV | 175 | A-2C | 1142 |
| BB | 335 | T.D. | 1147 |

**PLUGGING REQUIREMENTS***

Plugging requirements outlined are to be executed in accordance with the provisions of Act 61, P.A. 1939, as amended, and rules and orders adopted thereunder.

Pull uncemented casing and/or tubing. Set a bridge plug in the center of the second casing joint off bottom.

Place up to five feet of sand on top of bridge plug if desired. Otherwise, fill casing with cement from top of bridge plug to the surface.

Cut casings off at least three feet below grade and cap with a welded steel plate.

Notify this office the day before commencing plugging operations 313-724-2015.

GEOLOGICAL SURVEY
MAY 03 1985
Regulatory Control Unit

*NOTE: BONDS CANNOT BE RELEASED UNTIL A PLUGGING IS COMPLETED, CELLAR RAT HOLE AND PITS FILLED, WELL SITE RESTORED AND RECORDS FILED. WATER WELLS MUST BE PLUGGED ACCORDING TO RULE 166 OF ACT 294 P.A. 1965, "GROUND WATER QUALITY CONTROL". It is further made a requirement of this permit that the applicant give notice to the public utilities in accordance with Act 53, P.A. 1974 C.L. 460.701 to 460.718 and comply with each of the requirements of the act.

| AUTHORIZED BY (Signature) | OFFICE | DATE |
|---|---|---|
| Brian J. Waldon | IMLAY CITY | 5-2-85 |

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

R-7229
Rev. 11/77

Permit No 133 Well Data (Source: Geowebface DEQ)

- **API Number: 21163001338000**
- **Permit Number:133**
- **Lease Name: SCONY-MOBILE**
- **Well #:BD 1**
- **Status: Plugging Approved**
- **Total Depth:330**
- **Producing Formation: Null**
- **Latitude:42.13548**
- **Longitude:-83.22644**
- **Place: Woodhaven**
- **County: Wayne**
- **TRS:04S10E22**
- **Map-click Lat:42.13548**
- **Map-click Lon:-83.22646**

**API NO. 21163001338000**

**NO DATA AVAILABLE**

22-4S-10E
Brownstown Twp. (Wayne Co.)

L.P.G. (33)
TD 1162 in Salina-"B" Salt (42)
Facility

Socony-Mobil Oil Company, Inc.

Socony-Mobil LPG No. 4-B

Permit No. 23778

Drilling Contractor: Union Rotary Corp. (Rotary)

Location: N½ SE¼ NE¼ Section 22, T. 4S, R. 10E
1970' from North and 120' from East line of quarter section

Elevation: 610 feet above sea level (rot. bush.)

Record by: William Mantek from Schlumberger Gamma Ray-Neutron Log - no lithology log available

| | | |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | @ | 43 |
| DEVONIAN: | | |
| Detroit River: | @ | 43 |
| Sylvania Sandstone | @ | 165 |
| Bois Blanc: | @ | 340 |
| SILURIAN: | | |
| Bass Island: | @ | 453 |
| Salina: | @ | 637 |
| "F" Unit | @ | 704 |
| "C" Unit | @ | 902 |
| "B" Unit | @ | 958 |
| "B" Salt | @ | 1014 |
| TOTAL DEPTH | @ | 1162 Schj |
| TOTAL DEPTH | @ | 1160 Drlr. |

Casing Record:
13 3/8" 123' (90 cement)
9 5/8" 1017' (380 cement)

Drilling Commenced: 1-24-62
Drilling Completed: 1-28-62
Initial Production: LPG storage well

3/65

BEST COPY
AVAILABLE

23778

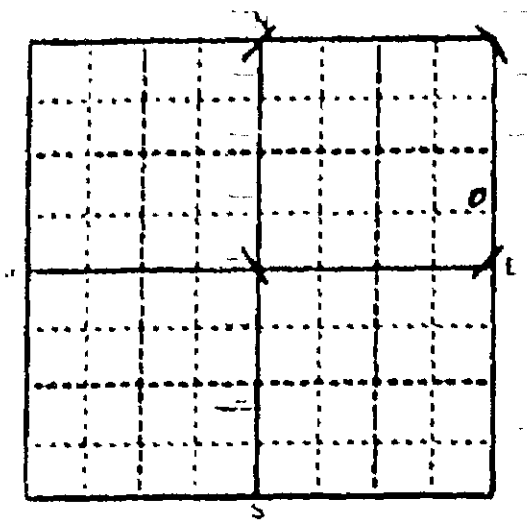
# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, OR KEY WELL FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, AND ACT 326, P.A. 1937 AS AMENDED.

MAIL TO:
SUPERVISOR OF WELLS
GEOLOGICAL SURVEY DIVISION
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING 26, MICHIGAN

*See Reverse Side Before Filling Out This Application*

1. DATE: December 7, 1961



LOCATE WELL AND LEASE ACCURATELY ON THIS SECTION PLAT - 640 ACRES

2. APPLICATION IS MADE TO DRILL A WELL FOR (GAS, OIL, BRINE DISPOSAL, SECONDARY RECOVERY, ETC.): L.P.G. Storage

3. ENCLOSED HEREWITH FIND AMOUNT OF: $ 25.00

4. LESSEE (OWNER OF LEASE RIGHTS): Socony-Mobil Oil Company, Inc.

5. ADDRESS: West & Allen Road, Trenton, Michigan

6. PHONE: OR 6-3100

7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Socony-Mobil L.P.G.

8. WELL NO.: 4-B

9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER):

10. DRILLING CONTRACTOR: Union Rotary Corporation

11. ADDRESS: 1104 N. Mission Street, Mt. Pleasant, Michigan

12. PHONE: SP 34901

13. N½ ¼ of SE ¼ of NE ¼, SECTION 22 T 4 S., R 10 E.

14. ACRES IN LEASE: 160

15. TOWNSHIP: Brownstown

16. COUNTY: Wayne

17. *Locate well in two directions from nearest lines of quarter section and property ownership lines:*

1970 FT. FROM north (north-south) LINE OF QUARTER SECTION

1970 FT. FROM north (north-south) PROPERTY LINE

120 FT. FROM east (east-west) LINE OF QUARTER SECTION

120 FT. FROM east (east-west) PROPERTY LINE

18. NUMBER OF FEET FROM NEAREST PRODUCING WELL: 100' south of #4-A

19. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary

20. WELL IS TO BE COMPLETED IN: Salina FORMATION

21. INTENDED DEPTH OF WELL: Approx. 1150'

22. PROGRAM OF CASING, SEALING, AND COMPLETING WELL

Set 13 3/8" at approximately 160' and cement to surface.
Set 9 5/8" casing at top of Salina Salt and cement to the surface.
Wash out salt cavity and complete as L.P.G. Storage Well.

23. WELL LOCATION IS IN: (*Cleared Farm Land, Open Grass Land, Brush Land, Timbered Land.*) Refinery Property

24. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒

25. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒

26. IF ANSWER TO NO. 24 ABOVE IS *YES*, DESCRIBE AND GIVE DISTANCE FROM LOCATION AND SPECIFY PRECAUTIONS TO BE TAKEN TO PROTECT FRESH WATER FROM WELL WASTES.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST OIL HAZARD REDUCTION FIELD OFFICE. (See reverse side)

27. ADDRESS CORRESPONDENCE AND PERMIT TO: Socony-Mobil Oil Company, Inc., West & Allen Road, Trenton, Mich.

28. PHONE: OR 6-3100

**LEAVE BLANK**

DATE ISSUED 12/8/61 GROUP NO.

PERMIT NO. 23,770 ACCOUNT NO.

29. OWNER OF LEASE RIGHTS: SOCONY-MOBIL OIL COMPANY, INC.

30. AUTHORIZED REPRESENTATIVE: T. S. Baxter

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

DISTRIBUTION
1. WHITE - GEOL. SURVEY DIV. - LANSING.
2. CANARY - CASHIER.
3. BLUE - F. ADM. DIV. - FIELD.
4. GOLDENROD - GEOL. SUR. DIV. - FIELD.
5. PINK - F. A. DIV. - GR. RAPIDS.
6. GREEN - APPLICANT.

GS-1 Rev. 1/56

Form GR-2 500 Rev 10-59

STATE OF MICHIGAN

# DEPARTMENT OF CONSERVATION

SUPERVISOR OF WELLS

№ 5437

## PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST CLOTH PERMIT AT WELL LOCATION)

Permit No. 27778 Date Issued [illegible] 8, 1961

Permission is hereby granted to Socony-Mobil Oil Company, Inc.
Owner

West 5 Allen Road, Trenton, Michigan
Address

Lease Name Socony-Mobil LaPalle Well Number 4-B

To drill a well for LaPalle Storage

in the N½ SE¼ NE¼ Section 22, T.4S., R.13E., Brownstown Twp., Wayne Co.

and located 1970' from north and 120' from east line of quarter section.

and located 1970' from north and 120' from east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By Robert M. Acker

## CAUTION

DRILLING OPERATIONS NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

WASTE IS PROHIBITED in the drilling, producing, and plugging of this well. This includes underground, surface, and market waste.

DAMAGE TO FRESH WATERS, both underground and surface, is prohibited in the drilling, producing, and plugging of this well.

UNNECESSARY DAMAGE TO LIFE AND PROPERTY is prohibited in the drilling, producing, and plugging of this well.

Department offices at: Lansing, Phone IVanhoe 5-8144, Ext. 2686
Mount Pleasant, Phone SP 3-8691
Cadillac, Phone PRospect 5-3181
Plainwell, Phone MUrray 5-8051
Grand Rapids, Phone GLendale 8-3007
Escanaba, Phone STate 6-0333

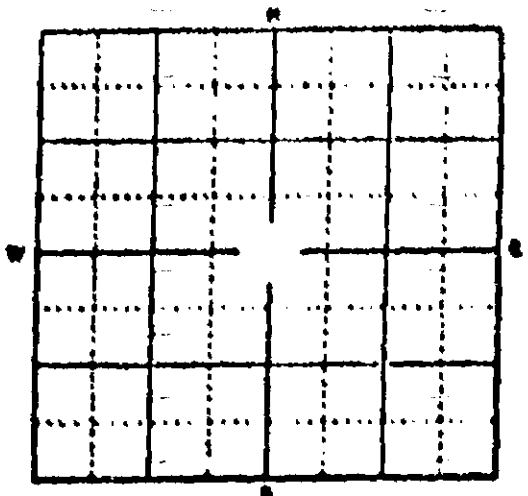
PERMITS MAY BE TRANSFERRED ONLY WITH PERMISSION OF THE SUPERVISOR OF WELLS

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

# 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 380 P. A. 1937)




LOCATE WELL ACCURATELY

Permit No. 23778

Owner or Operator Mobil Oil Co.

Address Box 477, Trenton, Mich.

Well No. 48 Farm Mobil Fee

County Wayne Township Brownstown

Location NW. of SE. of NE. Sec. 22 Twp. 4S Range 10E Elevation 610.88

Footage 1970 ft. from North line and 130 ft. from East line of quarter section

Type of well LPG Storage Total depth 1162 Completed in Salina

Name of ~~producing~~ storage formation Salina "B" Zone Top of formation 1008

Date drilling began 1-24-62 Date drilling completed 1-28-62

Drilling contractor Union Rotary Corp. Address Mt. Pleasant, Mich.

**WATER ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**OIL OR GAS ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**CASING AND CEMENTING**

| Size | Where Set | Cement | Amt. Pulled |
|---|---|---|---|
| 13-3/8" | 123 | 90 with | gilsonite |
| 9-5/8" | 1017 | 380 " | " |
| | | | |
| | | | |
| | | | |

**STEEL LINES RUN**

| Run at | Corrected to | Run by |
|---|---|---|
| None | | |
| | | |
| | | |
| | | |
| | | |

**PERFORATIONS**

| Date | From | To | No. Holes |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**ACID OR SHOOTING RECORD**

| Date | From | To | Gals. Acid or Qts. Nitro |
|---|---|---|---|
| None | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Rotary tools from Surface feet to 1162 feet. Cable tools from ..... feet to ..... feet.

Natural initial production first 24 hours - 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 C. H. Gremer Jr.

Date 4-3-62

Title Project Engineer

OS-10 Rev. 4/58

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

# FORMATION RECORD

| FROM | TO | FORMATION | FROM | TO | FORMATION |
|---|---|---|---|---|---|
| | | As shown on Schlumberger Log. | | | |

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

GEOLOGICAL SURVEY

# WELL PLUGGING RECORD

JUN 30 1986

(Submit in TRIPLICATE Within 30 Days After Plugging is Completed)

Regulatory Control Unit

PERMIT NUMBER: 23778

FIELD NAME: Mobil LPG Storage

COMPLETE NAME(S) AND ADDRESS OF WELL OWNER: Mobil Oil Corp. Houston, TX 77251

COMPLETE LEASE OR FARM NAME(S): Mobil LPG

WELL NUMBER: 4B

WELL LOCATION: N ¼ SE ¼ NE ¼ SEC. 22 T. 4S R. 10E

TOWNSHIP: Brownstown

COUNTY: Wayne

TYPE OF WELL (Oil, Gas, Dry Hole, etc.): LPG Storage

TOTAL DEPTH: 1162

FORMATION: A2

DATE PLUGGING STARTED: 10-02-85

DATE PLUGGING COMPLETED: 10-21-85

DEPT. REPRESENTATIVE(S) WHO ISSUED PERMIT OR WITNESSED PLUGGING: Bruce Waldo

CASING RECORD

| SIZE CASING | DEPTH SET | AMOUNT RECOVERED | SHOT OR RIPPED |
|---|---|---|---|
| 13 3/8 | 123 | 0 | --- |
| 9 5/8 | 1017 | 0 | --- |
| | | | |
| | | | |
| | | | |
| | | | |

BRIDGES OR PLUGS

| TYPE (Brush, Stone, Cement, Mechanical, etc.) | DEPTH PLACED | SACKS OF CEMENT AND ADDITIVES |
|---|---|---|
| Bridge Plug | 980 | --- |
| Cement | 980-0 | 375 SXS A |
| | | |
| | | |
| | | |
| | | |

Were tools, tubing, casing, etc., lost or left in the hole before or during plugging? ☐ YES ☒ NO — If yes, give details:

Did a Service Company pump mud, spot cement, or set bridge plugs? ☒ YES ☐ NO — If yes, give name and address: Dowell Mt. Pleasant

Was the well plugged by a Company or Contractor other than Owner or Operator? ☒ YES ☐ NO — If yes, give name and address: Lease Management Mt. Pleasant

Representatives of Owner, Operator, Company, or Contractor who witnessed plugging: Joe VanWagnen

DESCRIBE IN DETAIL HOW WELL WAS PLUGGED

1. Pull 6 5/8 casing (tubing)
2. Set wireline bridge plug at 980
3. Run tubing to 980 cement with 375 SXS A from 980-0
4. Cut off 13 3/8 and 9 5/8 4 ft. below grade weld on ½" steel plate

(USE REVERSE SIDE IF NEEDED)

## CERTIFICATION

"I state that I am authorized by said Owner or Operator to make this report; and that this report was prepared under my supervision and direction, and that the facts stated herein are true, correct and complete to the best of my knowledge."

NAME AND TITLE (Typed or Printed): Joe VanWagnen Engineer

SIGNATURE: J. VanWagnen

DATE (Month, Day, Year): 11-08-85

COMPANY NAME AND ADDRESS: Lease Management, Inc.
P.O. Box 290
Mt. Pleasant, MI 48858

R 7213
Rev. 4/74

The site is Clean & level. 6-25-86

Vicki Wilson Geo. Survey 6-30-86

NOV

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

# PERMIT TO PLUG AND ABANDON

DNR DISTRIBUTION
Permittee — Orig. & 1 copy
Division Office — 2 copies
Field Office — File copy
Others — On request

PERMIT NUMBER: 23778

FIELD NAME: Mobil LPG Storage

NAME AND ADDRESS OF PERMITTEE: Mobil Oil Corp., Houston, TX 77251

LEASE NAME AND WELL NO.: Mobil LPG 4-B

| LOCATION (¼ ¼ ¼ or other) | SECTION | TOWNSHIP | COUNTY |
|---|---|---|---|
| N SE NE | 22 T 4S R 10E | Brownstown | Wayne |

| TYPE OF WELL (Oil, Gas, Dry Hole, etc.) | DATE COMPLETED | DATE PLUGGING WILL START | PLUGGING PERMIT REQUESTED BY & DATE |
|---|---|---|---|
| LPG Storage | 1-28-62 | will notify | Jack Harkins 3-27-85 |

LAST PRODUCTION

| BOPD | BWPD | MCFGPD | DATE |
|---|---|---|---|
| | | | |

PLUGGING TO BE DONE BY: Lease Management, Inc.

PERMIT MAILED TO: Mr. J.V. Johnson
Mobil Oil Corp.
Gas Liquids Dept.
P.O. Box 1774
Houston, TX 77251

COPIES MAILED TO:
Mr. Jack Harkins
Lease Management, Inc.
503 Industrial Ave.
Mt. Pleasant, MI 48858

Geological Survey Division
Box 30028
Lansing, MI 48909

## CASING AND CEMENTING RECORD

| HOLE DIA. | CASING DIA. & WT./FT. | DEPTHS SET | CEMENT QUANTITY, TYPE, ADDITIVES | CMT. TOP. | PERFORATIONS |
|---|---|---|---|---|---|
| | 13 3/8" | 123 | 90 sx | | |
| | 9 5/8" | 1017 | 380 sx | | |
| | | | | | |
| | | | | | |

Elev. 610' KB

## GEOLOGIC DATA; GAS AND OIL SHOWS; DRILLING AND COMPLETION DATA:

Lacking on record

BU 1008
T.D. 1162

## PLUGGING REQUIREMENTS*

Plugging requirements outlined are to be executed in accordance with the provisions of Act 61, P.A. 1939, as amended, and rules and orders adopted thereunder.

Pull uncemented casing and/or tubing. Set a bridge plug in the center of the second casing joint off bottom.

Place up to five feet of sand on top of bridge plug if desired. Otherwise, fill casing with cement from top of bridge plug to the surface.

Cut casings off at least three feet below grade and cap with a welded steel plate.

Notify this office the day before commencing plugging operations 313-724-2015.

GEOLOGICAL SURVEY
MAY 03 1985
Regulatory Control Unit

*NOTE: BONDS CANNOT BE RELEASED UNTIL A PLUGGING IS COMPLETED, CELLAR RAT HOLE AND PITS FILLED, WELL SITE RESTORED AND RECORDS FILED. WATER WELLS MUST BE PLUGGED ACCORDING TO RULE 186 OF ACT 294 P.A. 1965, "GROUND WATER QUALITY CONTROL". It is further made a requirement of this permit that the applicant give notice to the public utilities in accordance with Act 53, P.A. 1974 C.L. 460.701 to 460.718 and comply with each of the requirements of the act.

| AUTHORIZED BY (signature) | OFFICE | DATE |
|---|---|---|
| Bruce J. Waldo | IMLAY CITY | 5-2-85 |

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

R-7229
Rev. 11/77

Permit No 146 Source: Geowebface DEQ

- **API Number:21163001468000**
- **Permit Number:146**
- **Lease Name:MARATHON OIL CO. (WOODHAVEN)**
- **Well #:BD1**
- **Status:Active**
- **Total Depth:3752**
- **Producing Formation:Null**
- **Latitude:42.131838**
- **Longitude:-83.227123**
- **Place:Woodhaven**
- **County:Wayne**
- **TRS:04S10E22**
- **Map-click Lat:42.13187**
- **Map-click Lon:-83.22718**

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



REPLY TO THE ATTENTION OF:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY (USEPA)
UNDERGROUND INJECTION CONTROL MINOR PERMIT MODIFICATION: CLASS II

Permit Number: MI-163-2D-0001

Facility Name: Brine Disposal Well #1 (BD146)

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

**Marathon Pipe Line LLC., of Findlay, Ohio**

is hereby authorized to operate an injection well located in Michigan, Wayne County, T4S, R10E, Section 22, SE 1/4 Section, for injection into the Eau Claire and Mt. Simon Formations at depths between 3252 feet and 3704 feet, upon the express condition that the permittee meet the restrictions set forth herein.

The purpose of the injection is for the disposal of salt water from gas storage operations owned or operated by Marathon Pipe Line LLC in the immediate area.

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

This permit is a minor modification of an existing permit which was signed on December 8, 1988. This permit shall become effective on NOV 4 2005 and shall remain in full force and effect during the operating life of the well, unless this permit is otherwise revoked, terminated, modified or reissued pursuant to 40 CFR 144.39, 144.40 or 144.41. This permit shall also remain in effect upon delegation of primary enforcement responsibility to the State of Michigan, unless that State chooses to adopt this permit as a State permit. This permit will be reviewed at least every five (5) years from the effective date specified above.

Signed and dated: November 4, 2005

Charles J. Elly
for
Jo Lynn Traub
Director, Water Division

This permit contains 13 pages and attachments A through C.

# PART I

## GENERAL PERMIT COMPLIANCE

### A. EFFECT OF PERMIT

The permittee is allowed to engage in underground injection in accordance with the conditions of this permit. The underground injection activity, otherwise authorized by this permit or rule, shall not allow the movement of fluid containing any contaminant into Underground Sources of Drinking Water (USDW), if the presence of that contaminant may cause a violation of any Primary Drinking Water Regulation pursuant to Title 40 CFR Part 142 or may otherwise adversely affect the health of persons. Any underground injection activity not specifically authorized in this permit or otherwise authorized by permit or rule is prohibited. Issuance of this permit does not convey property rights of any sort or any exclusive privilege; nor does it authorize any injury to persons or property, any invasion of other private rights, or any infringement of State or local law or regulations. Compliance with the terms of this permit does not constitute a defense to any action brought under Section 1431 of the Safe Drinking Water Act (SDWA), or any other law governing protection of public health or the environment, for any imminent and substantial endangerment to human health or the environment.

### B. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated for cause as specified in Title 40 CFR §144.39, §144.40, and §144.41. The filing of a request for a permit modification, revocation and reissuance, termination, or the notification of planned changes or anticipated noncompliance on the part of the permittee does not stay the applicability or enforceability of any permit condition.

### C. SEVERABILITY

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

### D. CONFIDENTIALITY

In accordance with Title 40 CFR Part 2 and §144.5, any information submitted to USEPA pursuant to this permit may be claimed as confidential by the submitter. Any such claim must be asserted at the time of submission by stamping the words "confidential business information" on each page containing such information. If no claim is made at the time of submission, USEPA may make the information available to the public without further notice.

If a claim is asserted, the validity of the claim will be assessed in accordance with the procedures in Title 40 CFR Part 2 (Public Information). Claims of confidentiality for the following information will be denied:

1) The name and address of the permittee; and,

2) Information which deals with the existence, absence or level of contaminants in drinking water.

E. DUTIES AND REQUIREMENTS

1. Duty to Comply - The permittee shall comply with all conditions of this permit, except to the extent and for the duration such noncompliance is authorized by an emergency permit. Any permit noncompliance constitutes a violation of the SDWA and is grounds for enforcement action, permit termination, revocation and reissuance or modification.

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

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

4. Duty to Mitigate - The permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit.

5. Proper Operation and Maintenance - The permittee shall at all times properly operate and maintain all facilities. Proper operation and maintenance includes effective performance and adequate funding, including appropriate quality assurance procedures.

6. Duty to Provide Information - The permittee shall furnish to the Director, within thirty (30) days, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. The permittee shall also furnish to the Director, upon request, copies of records required by this permit to be retained.

7. Inspection and Entry - The permittee shall allow the Director, or an authorized representative, upon the presentation of credentials and other documents as may be required by law to:

   (a) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records are kept under the conditions of this permit;

   (b) Have access to and copy, at reasonable times, any records that must be retained under the conditions of this permit;

   (c) Inspect, at reasonable times, any facilities, equipment (including monitoring equipment), practices, or operations, regulated or required under this permit; and,

   (d) Sample or monitor the injected fluids, at reasonable times, for the purposes of assuring permit compliance, or as otherwise authorized by the SDWA, at any location.

8. Records

   (a) The permittee shall retain records of all monitoring information, including all calibration and maintenance records and copies of all reports required by this permit, for a period of at least three (3) years from the date of the sample, measurement or report. The permittee shall also maintain records of all data required to complete this permit application and any supplemental information submitted under Title 40 CFR §144.27, §144.28 and §144.31. These periods may be extended by the Director at any time by written notice to the permittee.

   (b) The permittee shall retain records concerning the nature and composition of all injected fluids until three (3) years after the completion of plugging and abandonment in accordance with the plugging and abandonment plan, contained in Part III(B) of this permit. At the conclusion of the retention period, if the Director so requests, the permittee shall deliver the records to the Director.

   (c) Records of monitoring information shall include:

      (i) The date, exact place, and the time of sampling or measurements;

      (ii) The individual(s) who performed the sampling or measurements;

      (iii) A precise description of both sampling methodology and the handling of samples;

      (iv) The date(s) analyses were performed;

      (v) The individual(s) who performed the analyses;

(vi) The analytical techniques or methods used; and,

(vii) The results of such analyses.

9. Notification Requirements

(a) Planned Changes - The permittee shall notify the Director at least thirty (30) days prior to any planned physical alterations or additions to the permitted facility, or changes in the injection fluids. An analysis of new injection fluids shall be submitted to the Director in accordance with Parts II(B)(2) and II(B)(3) of this permit.

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

(c) Transfer of Permits - This permit is not transferrable to any person except after notice is sent to the Director and the requirements of Title 40 CFR §144.38 have been met. The Director may require modification or revocation of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under the SDWA.

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

(e) Twenty-Four (24) Hour Reporting

(i) The permittee shall report to the Director any noncompliance which may endanger health or the environment. This information shall be provided orally within twenty-four (24) hours from the time the permittee becomes aware of the circumstances, and shall include the following information:

(a) Any monitoring or other information which indicates that any contaminant may cause an endangerment to an underground source of drinking water; or,

(b) Any noncompliance with a permit condition or malfunction of the injection system which may cause fluid migration into or between underground sources of drinking water.

(ii) A written submission shall also be provided as soon as possible but no later than five (5) days from the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance.

(f) Other Noncompliance - The permittee shall report all other instances of noncompliance. The reports shall contain the information listed in Part I(E)(9)(e)(ii) of this permit.

(g) Other Information - If or when the permittee becomes aware that he/she failed to submit any relevant facts in the permit application, or submitted incorrect information in a permit application or in any report to the Director, the permittee shall promptly submit such facts or corrected information.

(h) Report on Permit Review - Within thirty (30) days of receipt, the permittee shall report to the Director that he/she has read and is personally familiar with all terms and conditions of this permit.

10. Commencing Injection - The permittee shall not recommence injection until any remedial procedures described in Parts I(E)(16) and III(C) of this permit are complete, and;

(a) The permittee has submitted a report on the remedial work to the Director; and,

(b) The Director has inspected or otherwise reviewed the remedial work and notified the permittee in writing that he/she is in compliance with the conditions of this permit; or,

(c) The permittee has not received, with thirteen (13) days of the date of the Director's receipt of the report required above, notice from the Director of his/her intent to inspect or otherwise review the new injection well, in which case prior inspection or review is waived and the permittee may commence injection.

11. Signatory Requirements - All reports or other information requested by the Director shall be signed and certified according to Title 40 CFR §144.32.

12. Notice of Plugging and Abandonment - The permittee shall notify the Director at least forty-five (45) days before conversion or abandonment of the well.

13. Plugging and Abandonment - The permittee shall plug and abandon the well as provided in the plugging and abandonment plan contained in Part III(B) of this permit. After a cessation of operation of two (2) years, the owner or operator shall plug and abandon the well in accordance with the plan provided in Part III(B) of this permit unless the operator fulfills the other requirements under Title 40 CFR §144.52(a)(6). The permittee shall notify the Director of plugging and abandonment in accordance with the reporting procedures in Part II(B)(3)(d) of this permit.

14. Financial Responsibility - The permittee shall maintain financial responsibility and resources to plug and abandon the underground injection well in accordance with Title 40 CFR §144.52(a)(7) as provided in Attachment R of the administrative record corresponding to this permit action which is hereby incorporated by reference as if it appeared fully set forth herein. The permittee shall not substitute an alternative demonstration of financial responsibility from that which the Director has approved, unless the permittee has previously submitted evidence of that alternative demonstration to the Director and the Director has notified the permittee in writing that the alternative demonstration of financial responsibility is acceptable. The financial responsibility mechanism shall be updated periodically, upon request of the Director.

15. Insolvency

    (a) In the event of the bankruptcy of the trustee or issuing institution of the financial mechanism, or a suspension or revocation of the authority of the trustee institution to act as trustee or the institution issuing the financial mechanism to issue such an instrument, the permittee must submit an alternative demonstration of financial responsibility acceptable to the Director within sixty (60) days after such event.

    (b) An owner or operator must also notify the Director by certified mail of the commencement of voluntary or involuntary proceedings under Title 11 (Bankruptcy), U. S. Code, naming the owner or operator as debtor, within ten (10) business days after the commencement of the proceeding. A guarantor of a corporate guarantee

must make such a notification if the permittee is named as debtor, as required under the terms of the guarantee.

16. Remedial Action

(a) The permittee shall shut in the injection well whenever he/she or USEPA determines that operation thereof may be causing upward fluid migration through the wellbore of any improperly plugged or unplugged well in the area of review and shall take such steps as he/she can to properly plug the offending well(s). Any operation of the well which may cause upward fluid migration from an improperly plugged or unplugged well will be considered a violation of this permit. If the permittee or USEPA determines that the casing of the permitted well is leaking, the permittee will immediately shut in the well until such time as appropriate repairs can be effected and a mechanical integrity demonstration provided to the Director.

(b) The permittee shall not recommence injection until any and all remedial action has been taken in accordance with the plan contained in Part III(C) of this permit and the requirements in Part I(E)(10) of this permit have been met.

17. Mechanical Integrity

(a) The permittee must establish and shall maintain mechanical integrity of this well, in accordance with Title 40 CFR §146.8.

(b) A demonstration of mechanical integrity, in accordance with Title 40 CFR §146.8, shall be performed at least every five (5) years from the date of the last approved demonstration. The permittee shall notify the Director of his/her intent to demonstrate mechanical integrity at least thirty (30) days prior to such demonstration.

(c) The permittee shall demonstrate the mechanical integrity of the well by pressure testing whenever: (i) the tubing is removed from the well or replaced; (ii) the packer is reset; or, (iii) a loss of mechanical integrity occurs during operation.

(d) The Director may, by written notice, require the permittee to demonstrate mechanical integrity at any time.

(e) The permittee shall cause all gauges used in mechanical integrity demonstrations to be calibrated prior to the demonstration. For continuous annulus monitoring, gauges shall be calibrated on an annual basis.

(f) The permittee shall cease injection if a loss of mechanical integrity during a test, or a loss of mechanical integrity, as defined by Title 40 CFR §146.8, becomes evident during operation. Operations shall not be resumed until the Director gives approval to recommence injection.

(g) The permittee shall notify the Director of the loss of mechanical integrity, in accordance with the reporting procedures in Parts II(B)(3)(d) and I(E)(9)(e) of this permit.

18. Restriction on Injected Substances - The permittee shall be restricted to the injection of oil field brines or those fluids used in the enhancement of oil and gas production, and further, no fluids other than those from sources noted in the administrative record and approved by the Director shall be injected.

# PART II

## WELL SPECIFIC CONDITIONS FOR UIC PERMITS

A. CONSTRUCTION REQUIREMENTS

1. Siting - Notwithstanding any other provision of this permit, the injection well shall inject only into a formation which is separated from any USDW by a confining zone that is free of known open faults or fractures within the area of the review.

2. Casing and Cementing - Injection wells shall be cased and cemented to prevent the movement of fluids into or between USDWs. Specifics on the casing and cement to be used in the construction of the well shall be as contained in Attachments L and M of the administrative record corresponding to this permit action which are hereby incorporated by reference as if they appeared fully set forth herein.

3. Tubing and Packer Specifications - Injection shall only take place through tubing with a packer set in the long string casing at a depth no higher than immediately above the injection zone. Tubing and packer specifications shall be as represented in engineering drawings contained in Attachments L and M of the administrative record corresponding to this permit action which are hereby incorporated by reference as if they appeared fully set forth herein. Any proposed changes shall be submitted by the applicant for the approval of the Director before installation.

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

B. OPERATING, MONITORING AND REPORTING REQUIREMENTS

1. Operating Requirements

(a) Injection Pressure Limitation

(i) Beginning on the effective date of this permit, the permittee is authorized to operate the injection well, subject to the limitations and monitoring requirements set forth herein. The injection pressure and injected fluid shall be limited and monitored as specified in Part III(A) of this permit.

(ii) Injection at a pressure which initiates fractures in the confining zone or causes the movement of injection or formation fluids into or between USDWs is prohibited.

(iii) Injection between the outermost casing protecting USDWs and the well bore is prohibited.

(iv) The annulus between the tubing and the long string casing shall be filled with a liquid designed to inhibit corrosion. The annulus liquid will be monitored in accordance with Parts II(B)(2)(d) and II(B)(3)(b) of this permit. Any specific annulus requirements are contained in Part III(A) of this permit.

2. Monitoring Requirements

(a) Samples and measurements, taken for the purpose of monitoring, shall be representative of the monitored activity. Grab samples shall be used to obtain a representative sample of the fluid to be analyzed. Part III(A) of this permit describes the sampling location and required parameters for injection fluid analysis. The permittee shall identify the types of tests and methods used to generate the monitoring data. The monitoring program shall conform to the one described in Part III(A) of this permit.

(b) Analytical Methods - Monitoring of the nature of injected fluids shall comply with applicable analytical methods cited and described in Table I of Title 40 CFR §136.3 or in Appendix III of Title 40 CFR Part 261 or by other methods that have been approved by the Director.

(c) Injection Fluid Analysis - The nature of the injection fluids shall be monitored as specified in Part III(A) of this permit. An initial analysis of the injection fluid is contained in Attachment H of the administrative record corresponding to this permit action which is hereby incorporated by reference as if it appeared fully set forth herein.

(d) Injection Pressure, Annulus Pressure, Annulus Liquid Loss, Flow Rate and Cumulative Volume - Injection pressure, annulus pressure, flow rate and cumulative volume shall be recorded at least weekly. Annulus liquid loss shall be recorded at least quarterly. This loss shall be reported as the volume of liquid added to the annulus to keep it filled in accordance with Part II(B)(1)(iv). All gauges used in monitoring shall be calibrated in accordance with Part I(E)(17)(e) of this permit.

3. Reporting Requirements - Copies of the monitoring results and all other reports shall be submitted to the Director at the following address:

U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604
Attn: UIC Section, Enforcement Team (5WD-TUB-9)

(a) Monthly Reports - Monitoring results obtained during each week shall be recorded on a form which has been signed and certified according to Title 40 CFR §144.32. Forms shall be submitted at the end of each month and shall be postmarked no later than the 10th day of the month following the sampling period. The first report shall be sent no later than the 10th day of the month following the month in which injection commences. This report shall include the weekly measurements of injection pressure, annulus pressure, flow rate and cumulative volume as required in Part III(A) of this permit.

(b) Quarterly Reports - Monitoring results obtained each quarter shall include the measurement of annulus liquid loss as required in Part III(A) of this permit. Reports shall be submitted at the end of each quarter and shall be postmarked no later than the 10th day of the first month of the following quarter.

(c) Annual Reports - Monitoring results obtained each year shall include the measurements of injected fluid characteristics as required in Part III(A) of this permit. Reports shall be submitted at the end of each year and shall be postmarked no later than the 10th day of the first month of the following year.

(d) Reports on Well Tests, Workovers, and Plugging and Abandonment - The applicant shall provide the Director with the following reports and test results within sixty (60) days of completion of the activity:

(i) Mechanical integrity tests;

(ii) Logging or other test data;

(iii) Well workovers (Using EPA Form 7520-12); and,

(iv) Plugging and abandonment.

# PART III

## SPECIAL CONDITIONS

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

A. OPERATING, MONITORING AND REPORTING REQUIREMENTS (ATTACHED)

B. PLUGGING AND ABANDONMENT PLAN (ATTACHED)

C. REMEDIAL ACTION PLAN (ATTACHED)

D. ADDITIONAL REQUIREMENTS (ATTACHED)

## OPERATING, MONITORING AND REPORTING REQUIREMENTS

| Characteristic | LIMITATION | MINIMUM MONITORING REG. Freq. | Type | MINIMUM REPORTING REQUIREMENTS |
|---|---|---|---|---|
| *Injection Pressure | 869 psig (MAXIMUM) | weekly | | monthly |
| Annulus Pressure | | weekly | | monthly |
| Flow Rate | | weekly | | monthly |
| Cumulative Volume | | weekly | | monthly |
| Annulus Liquid Loss | | weekly | | quarterly |
| **Chemical Composition of Injected Fluid | | annually | grab | annually |

SAMPLING LOCATION:

*The limitation on wellhead pressure serves to prevent confining-formation fracturing. This limitation was calculated using the following formula: [{0.8 - (0.433 psi/ft)(specific gravity)} x depth] - 14.7 psi. The maximum wellhead pressure is dependent upon depth and specific gravity of the injected fluid. The Eau Claire Formation at 3252 feet was used as the depth and a specific gravity of 1.22 was used for the injected fluid.

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

Form Approved OMB No. 2040-0042

EPA

United States Environmental Protection Agency
Washington, DC 20460

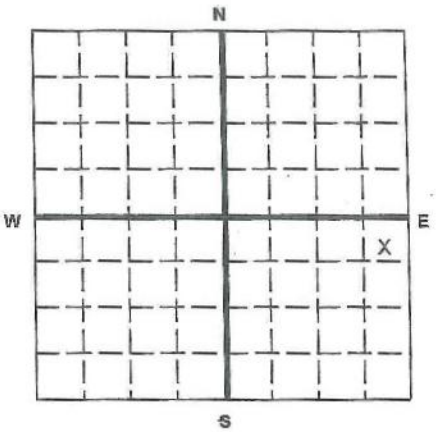
# PLUGGING AND ABANDONMENT PLAN

MI-163-2D-0001
Page B-1 of 2

**Name and Address of Facility**
Marathon Pipe Line LLC - Woodhaven Station
24400 Allen Road
Woodhaven, MI 48183

**Name and Address of Owner/Operator**
Marathon Pipe Line LLC
539 South Main Street
Findlay, OH 45840

**Locate Well and Outline Unit on Section Plat - 640 Acres**




| State | County | Permit Number |
|---|---|---|
| MI | Wayne | MI-163-2D-001 |

**Surface Location Description**
___ 1/4 of NE 1/4 of NE 1/4 of SE 1/4 of Section 22 Township 4S Range 10E

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

Surface Location 591 ft. frm (N/S) N Line of quarter section
and 342 ft. from (E/W) E Line of quarter section.

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

Number of Wells 1

Lease Name

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

Well Number

**CASING AND TUBING RECORD AFTER PLUGGING**

| SIZE | WT (LB/FT) | TO BE PUT IN WELL (FT) | TO BE LEFT IN WELL (FT) | HOLE SIZE |
|---|---|---|---|---|
| 16" | 65 | 83 | 83 | 22" |
| 10-3/4" | 40.5 | 422 | 422 | 13-3/4" |
| 5-1/2" | 14 | 3745 | 3745 | 7-7/8" |
| | | | | |

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

| CEMENTING TO PLUG AND ABANDON DATA: | PLUG #1 | PLUG #2 | PLUG #3 | PLUG #4 | PLUG #5 | PLUG #6 | PLUG #7 |
|---|---|---|---|---|---|---|---|
| Size of Hole or Pipe in which Plug Will Be Placed (inche | 5-1/2" | 5-1/2" | | | | | |
| Depth to Bottom of Tubing or Drill Pipe (ft | 3300 | 380 | | | | | |
| Sacks of Cement To Be Used (each plug) | 100 | 194 | | | | | |
| Slurry Volume To Be Pumped (cu. ft.) | 118 | 228.92 | | | | | |
| Calculated Top of Plug (ft.) | 2439 | Surface | | | | | |
| Measured Top of Plug (if tagged ft.) | N/A | N/A | | | | | |
| Slurry Wt. (Lb./Gal.) | 15.6 | 15.6 | | | | | |
| Type Cement or Other Material (Class III) | Class A | Class A | | | | | |

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

| From | To | From | To |
|---|---|---|---|
| 3334 | 3700 | | |
| | | | |
| | | | |
| | | | |

**Estimated Cost to Plug Wells**
$36,492.00

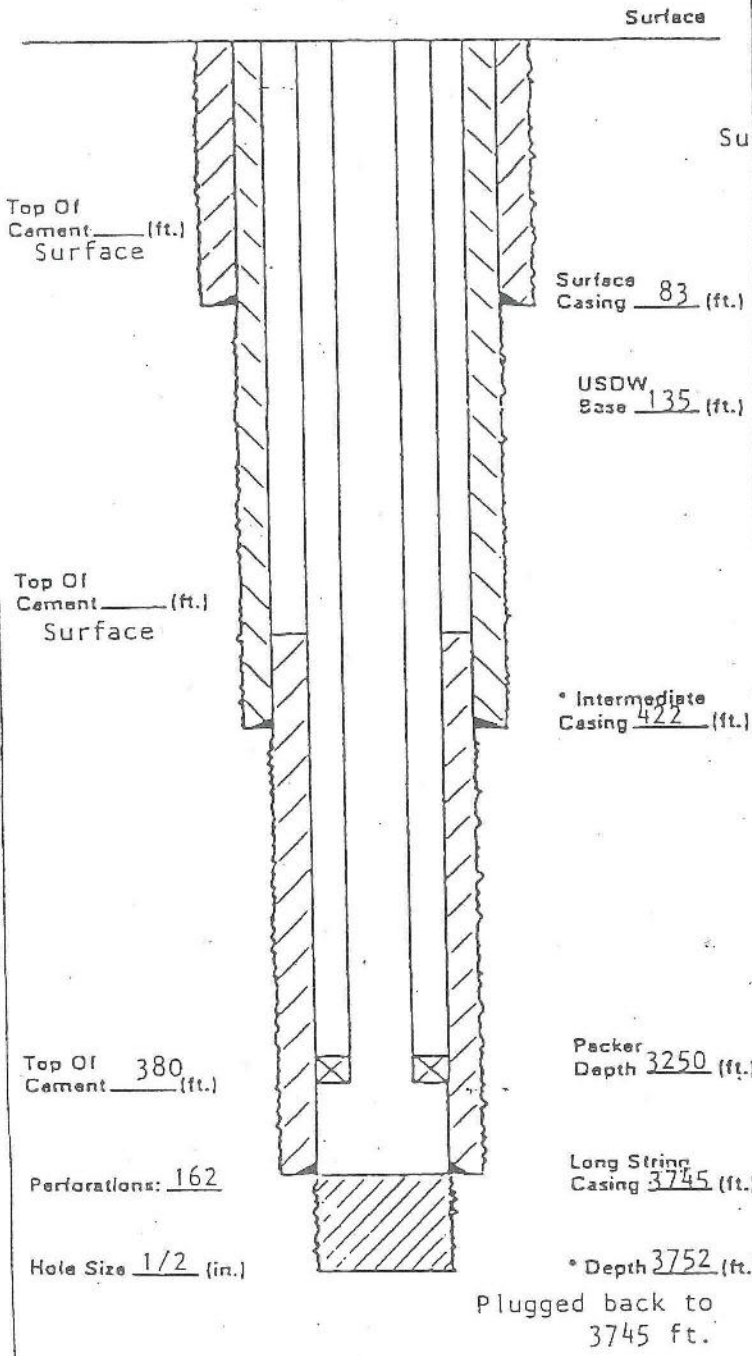
## Certification

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 |
|---|---|---|
| Mr. Donald P. Bozell, President<br>Marathon Pipe Line, LLC | DPBozell | 10/20/05 |

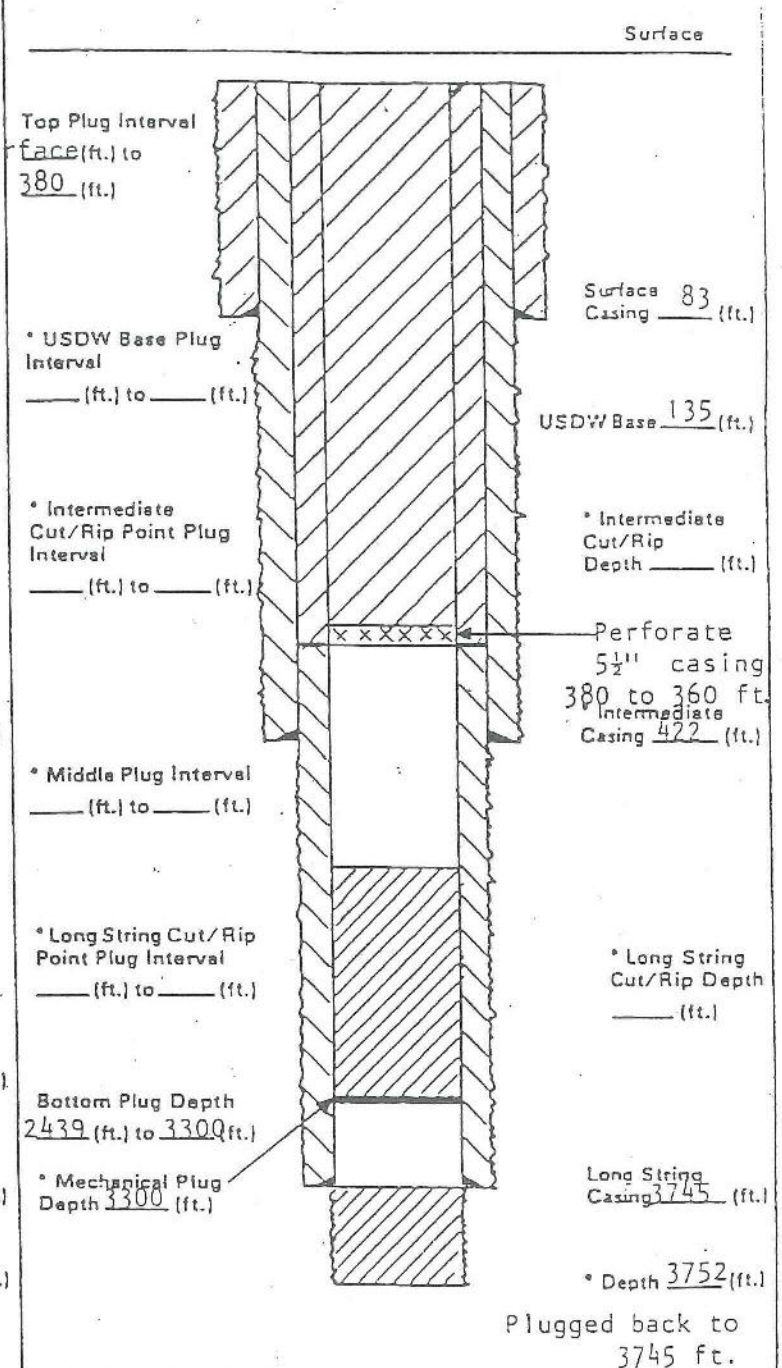
EPA Form 7520-14

ORIGINAL WELL CONSTRUCTION DURING OPERATION




** Add Any Additional Information
* May Not Apply

PLUGGING AND ABANDONMENT CONSTRUCTION



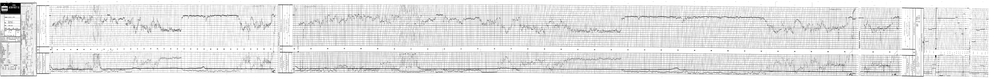

** Add Any Additional Information
* May Not Apply

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

| Specify Open Hole/Perforations/Varied Casing | From | To | Formation Name |
|---|---|---|---|
| 162 perforations | 3334 | 3700 | Eau Claire - Mt. Simon |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

## REMEDIAL ACTION PLAN

No remedial action is required at this time.



# Birdwell

Gamma - Perforating

FILING NO.

BD146

| | |
|---|---|
| COMPANY | Marathon O.C. Co |
| WELL | Brine Disposal #1 |
| FIELD | Ecorse Plant |
| COUNTY | Wayne |
| STATE | Mich |
| LOCATION | N/2 SE/4 |
| SEC | 22 |
| TWP | 4S |
| RGE | 11E |
| OTHER SERVICES | |
| PERMANENT DATUM | Ground Level |
| ELEV | 596 |
| LOG MEASURED FROM | K.B. |
| DRILLING MEASURED FROM | K.B. |
| ELEVATIONS: KB | 605 |
| GL | 596 |
| DATE | 1-2-69 |
| RUN NO. | One |
| TYPE LOG | Gamma CCL |
| DEPTH-DRILLER | 3710 |
| DEPTH-LOGGER | 3708 |
| BOTTOM LOGGED INTERVAL | 3708 |
| TOP LOGGED INTERVAL | 1400 |
| TYPE FLUID IN HOLE | Water |
| LEVEL | |
| OPR. RIG TIME | |
| TRUCK NO. | |
| LOCATION | Jackson |
| RECORDED BY | |
| WITNESSED BY | |

| RUN NO. | BORE HOLE RECORD BIT | FROM | TO | CASING RECORD WGT. | FROM | TO |
|---|---|---|---|---|---|---|
| | 13 3/8 | | | | Surf | 83 |
| | 7 7/8 | | | | Surf | 3475 |

FIELD PRINT

## EQUIPMENT DATA

| CORRELATION GAMMA-RAY | | CCL |
|---|---|---|
| RUN NO. | One | One |
| TOOL MODEL NO. | | |
| DIAM. | 3 7/8 | 3 7/8 |
| SPEED FT./MIN. | 40 | |
| T. C. SEC. | 1 | |

REMARKS: NA Means not available.

| WELL DATA | | | |
|---|---|---|---|
| PERFORATIONS TYPE | FROM | TO | |
| Selecta Jet (4½") | 3620 | 3700 | 1 hole/2' |

| BRIDGE PLUG | | |
|---|---|---|
| TYPE | C.I. ☐ | MAG. ☐ |
| SIZE NO. | DEPTH SET | |
| TYPE | C.I. ☐ | MAG. ☐ |
| SIZE NO. | DEPTH SET | |

L.P.G. (33)
TD 1154 in Salina (42)
Facility Well

22-4S-10E
Brownstone Twp. (Wayne Co.)
(City of Woodhaven)

Marathon Oil Co.

Marathon Oil Co. (Woodhaven) No. LPG 2 Permit No. 27161

Drilling Contractor: North American Drilling Co. (Rotary 0-1154)

Location: N½ SE¼ Sec. 22, T4S, R10E
525' from north and 629' from east line of quarter section.

Elevation: 606.8' above sea level (rot. bush.)

Record by: H. Laaksonen from driller's log submitted by the company.
Logs run: Schlumberger Compensated Formation Density Gamma Ray Log (Sj) (30-1153)

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Clay | 40 | 40 |
| DEVONIAN: | | |
| Detroit River: | | |
| Limestone, gray | 149 | 189 Sj |
| Sylvania: | | |
| Limestone, gray | 36 | 225 |
| Sandstone, gray; chert (SHS=0° deviation @280) | 120 | 345 Sj |
| | (156) | |
| Bois Blanc: | | |
| Limestone, brown | 112 | 457 Sj |
| SILURIAN: | | |
| Bass Islands: | | |
| Limestone, brown (SHS=0° deviation @500; SHS=0° deviation @600) | 148 | 605 |
| Limestone, brown with anhydrite | 45 | 650 Sj |
| | (193) | |
| Salina: | | |
| Limestone, brown with anhydrite (F unit @719 Sj) | 142 | 792 |
| Limestone, brown | 22 | 814 |
| Anhydrite | 43 | 857 |
| Limestone, brown with anhydrite (D unit @895 Sj; C unit @913 Sj; B unit @981 Sj) | 128 | 985 |
| Limestone, brown | 46 | 1032 |
| Salt with limestone, shells (B salt @1032 Sj) | 122 | 1154 |
| | (504+) | |
| Total depth | | 1154 |

Commenced: 3-12-68
Completed: 3-23-68
Well Competed: 4-3-68
LPG Storage

Casing record:
16" 173 (300 cem.)
11 3/4" 1031 (550 cem.)

plk 2-27-70

BEST COPY
AVAILABLE

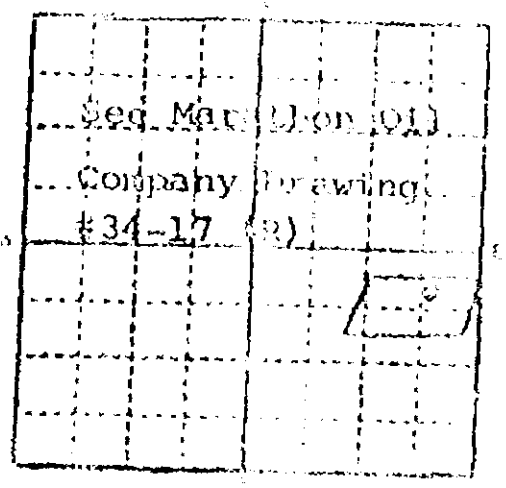
27161

# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, GAS OR L.P.G. STORAGE OR FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, ACT 326, P.A. 1937 AS AMENDED.

MAIL TO:
SUPERVISOR OF WELLS
GEOLOGICAL SURVEY
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING, MICHIGAN 48926

*See Reverse Side Before Filling Out This Application*




LOCATE WELL AND OUTLINE LEASE OR UNIT ON SECTION PLAT - 640 ACRES

1. APPLICATION TO DRILL A WELL FOR: LPG Storage
2. DATE: 12-19-67
3. FEE ENCLOSED: $ 25.00
4. LESSEE (OWNER OF LEASE RIGHTS): Marathon Oil Company
5. PRESENT ADDRESS: 1300 So. Fort Street, Detroit, Michigan, 48217
6. PHONE: 843-9100
7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Marathon Oil Company (Woodhaven)
8. WELL NO.: LPG #2
9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER): None
10. DRILLING CONTRACTOR: North American Drilling Company
11. ADDRESS: 1300 N. Fancher St., Mt. Pleasant
12. PHONE: 773-394[illegible]
13. ~~NE~~ N½ ~~NE~~ SE ¼ SECTION 22 T 4 S R 10 East
14. ACRES IN LEASE OR UNIT (SPECIFY): 11.534
15. TOWNSHIP: City of Woodhaven
16. COUNTY: Wayne

—Locate well in two directions from nearest lines of quarter section and property ownership or unit lines

616.525 FT. FROM North (north-south) LINE OF QUARTER SECTION
206.75 FT. FROM North (north-south) (PROPERTY) ~~(UNIT)~~ LINE

~~1313~~ 629 FT. FROM east (east-west) LINE OF QUARTER SECTION
~~201~~ 596 FT. FROM east (east-west) (PROPERTY) ~~(UNIT)~~ LINE

17. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary
18. WELL IS TO BE COMPLETED IN ~~FORM~~ Salina FORMATION
20. INTENDED DEPTH OF WELL: Approx. 1150'

21. PROGRAM OF CASING, SEALING, CEMENTING AND COMPLETING WELL

See attached write-up.

—CASING IS NOT TO BE STRIPPED FROM THE HOLE AND NO CHANGE IS TO BE MADE IN THE PROGRAM OUTLINED ABOVE WITHOUT APPROVAL OF THE SUPERVISOR OF WELLS OR HIS AUTHORIZED REPRESENTATIVE

22. ARE THERE ANY LAKES, STREAMS, DRAINAGE DITCHES, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒
IF ANSWER TO No. 22 ABOVE IS Yes, DESCRIBE AND GIVE DISTANCE FROM LOCATION.

23. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST FIELD OFFICE. *(See reverse side)*

ADDRESS CORRESPONDENCE AND PERMIT TO Mr. T. J. Ruffing - 1300 S. Fort, Detroit, Michigan 48217
26. PHONE: 843-9100

LEAVE BLANK
DATE ISSUED [illegible]
PERMIT NO. [illegible]

27. OWNER OF LEASE RIGHTS: Marathon Oil Company
28. AUTHORIZED REPRESENTATIVE: [signature]

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE
JAN-4-68 931778 T — — V $ 25.00

DISTRIBUTION
1. WHITE - LANSING
2. CANARY - CASHIER
3. BLUE - FIELD
4. GOLDENROD - PER[illegible]
5. GREEN - APPLICA[illegible]

CONTINUED ON REVERSE SIDE

(Select [illegible])

Form Cons. 1002-A 1000 Sets 1-68

STATE OF MICHIGAN

# DEPARTMENT OF CONSERVATION

No. 8937

SUPERVISOR OF WELLS

## PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST WHITE COPY OF PERMIT AT WELL LOCATION)

Permit No. 27161 Date Issued January 22, 1968

Permission is hereby granted to Marathon Oil Company
Owner

1300 S. Fort St., Detroit, Michigan 48217
Address

Lease Name Marathon Oil Company (Woodhaven) Well Number LPG #2

To drill a well for LPG Storage

in the N½ of SE¼ of Sec. 22, T.4S., R.10E., City of Woodhaven, Wayne Co.

and located 525' from the north and 629' from the east line of quarter section

and located 75' from the north and 396' from the east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By Robert M. Acker

## SPECIAL REQUIREMENTS

### NOTICE

DRILLING PERMIT ISSUED on the basis of the drilling, casing and sealing program as outlined on the application for permit and subject to special requirements as set forth above. No change or alteration is to be made without the permission and approval of the Supervisor of Wells or his authorized representative.

DRILLING OPERATIONS ARE NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

### DEPARTMENT OFFICES

Lansing, Phone 517-373-1256
Mount Pleasant, Phone 517-773-8691
Cadillac, Phone 616-775-3181
Plainwell, Phone 616-685-8051
Imlay City, Phone 313-724-7015
Escanaba, Phone 906-786-0333

PERMITS MAY BE TRANSFERRED ONLY WITH THE PERMISSION OF THE SUPERVISOR OF WELLS

COMPLETE FORMATION RECORD ON REVERSE SIDE

(Submit in Duplicate)

Recommended Drilling Program For Marathon's Proposed Storage Caverns
At Earhart Station, Brownstown Township, Wayne County, Michigan

1. Move in North American Drilling Company's rotary rig No. 10 or comparable equipment.

2. Rig up and drill a 20" hole to 170 feet or deeper as required to completely penetrate the drift.

3. Run 170 feet of 16" O.D., H-40, 55#/ft. S.T. & C., casing and cement with 150 sacks of accelerated portland cement. The Texas pattern shoe and the bottom two joints of casing should be spot welded.

4. Install surface casing flange and blowout preventer.

5. After 12 hours W.O.C., drill out with a 15" bit. Brine mud will be used.

6. At approximately 975 feet reduce hole size to 7-7/8" diameter.

7. At approximately 990 feet or ten feet above the "B" salt as selected by the engineer or geologist on the well, begin coring operations. Cut three cores to include all of the salt and five feet of the under lying limestone. The entire core should be described and boxed for storage. Samples for analysis should be selected as desired.

   Upon completing the last core, circulate long enough to condition the hole for logging.

8. At this time, Schlumberger Well Logging Company should run a Formation Density - Gamma Ray Log and a Neutron Log.

9. The reduced hole from 975 feet to a point three feet beneath the top of the salt should be enlarged to 15". Top of the salt will be selected from the core and log data.

10. After circulating long enough to condition the hole, approximately 1000 feet of 11-3/4" O.D., 47#/ft., J-55, B.T. & C., 8 Rd. thd., casing should be run. Casing equipment will consist of a Baker guide, shoe, a Baker float collar, and three Baker centralizers. The first four joints are to be spot welded.

    Prior to running casing, all thread protectors are to be removed. The casing threads are then to be brushed and cleaned with solvent. After cleaning, dry the threads with clean rags and inspect each thread visually. After inspecting threads, dope with lubricant as provided. The thread protectors should be similarly cleaned and dried and replaced on the casing and not removed until the casing is run.



GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE (Submit in Duplicate)
Rev. 9/64

11. Upon landing the casing, circulation should be established and continued until 175 bbls. (150% of casing capacity) or more has been circulated. Halliburton should then cement the string with 500 sacks of salt saturated cement with 1.5% excess crushed salt blended into the dry mix. If enough brine storage is available on the rig, the plug should be pumped down with brine. This will facilitate testing prior to drilling out.

12. Hang casing in casing slips in full tension. Release rig or shut rig down for seven days W.O.C. The remainder of the completion can be done with the rotary rig or a workover rig as economics dictate.

13. After seven days W.O.C. test casing to 750 psi for fifteen minutes.

14. Drill out plug and ream hole to total depth, using a 10-5/8" bit.

15. A Birdwell 3-D Bond Log should then be run over the entire cased interval.

16. A string of 8-5/8" casing should then be run and suspended approximately 30 feet above the base of the salt. The lower portion of this string could be plastic or thin wall line pipe if desired. The lighter pipe would facilitate recovery in the event of cave ins.

17. A string of 4-1/2" O.D. casing should then be run and suspended approximately 1 foot above the base of the salt.

18. After tree is installed, release rig.

19. Additional pressure tests as desired can be run prior to initiating the washing operation.

# WELL LOCATION REPORT

Permit No. 27161

Operator Marathon Oil Co.

Farm Name Woodhaven LPG #2

Notification 3/12/68 Phone call to McClure's Lansing office and via radio to Mr. Bromley at Mt. Pleasant. "Spudded last night at midnight".

Nature of Location open level field.

Condition of Pits 30' x 50' x 6'

Distance from Water None involved

Remarks 3/18/68. Drilling at 479'. Permits are posted at the fence in the front of the yard.

Approved by D. R. Brackenbury Date 3/18/68

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE (Submit in Duplicate)

CONS. 1203
Rev. 9/64

Cons. 7225

# WELL LOCATION REPORT

Permit No. 27161

Operator Marathon Oil Co.

Farm Name Marathon Oil Co. (Woodbourne) LPG #2

Notification 3/12/68 Closed McClure Engineering who radioed Mt. Pleasant.
Spudded at midnight. Drilling at 45' on morning of 12th.

Nature of Location open level field

Condition of Pits 50 x 8 x 6 + steel mud pit.

Distance from Water None involved

Remarks 3/11/68 Rig set up. No one around at 2 P.M. Fence locked.
Road muddy.
3/18/68 Drilling at 422'.

Approved by D. R. Brackenbury Date March 18, 1968

Cons. 7210
Rev. 9/54

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

(Submit in Duplicate)

OCT 4

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

# 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 128 P. A. 1937)

LOCATE WELL ACCURATELY

Permit No. 27161 Deepening No.

Owner or Operator Marathon Oil Company

Address 1300 S. Fort Ecay, Detroit, Mich. 48217

Well No. 2 Farm Marathon Oil Co. (Woodhaven) LPG

Township City of Woodhaven County Wayne

Location N-1/2 SE-1/4 Sec. 22 Twp. 4S Range 10E Elevation 606.8 RT

Footage 525 ft. from North line and 629 ft. from East line of quarter section

Type of well LPG Storage (OIL, GAS, BRINE DISPOSAL, DRY HOLE) Total depth 1154' Completed in Salt & Dolomite

Name of producing formation Salt & Dolomite Top of formation

Date drilling begun 3/12/68 Date drilling completed 3/23/68 Date well completed 4/3/68

Drilling contractor North American Drlg. Co. Address Mt. Pleasant, Michigan

WATER ZONES

| Name | From | To | Amount |
|---|---|---|---|
| | | | |

OIL OR GAS ZONES

| Name | From | To | Amount |
|---|---|---|---|
| | | | |

DEVIATION SURVEY

| Run at | Degrees |
|---|---|
| 280 | 0 |
| 500 | 0 |
| 600 | 0 |

CASING AND CEMENTING

| Size | Where Set | Cement | Amt. Pulled |
|---|---|---|---|
| 16" By Howco | 173 | 300 | None |
| 11-3/4" By Howco | 1031 | 550 | |

STEEL LINES RUN

| Run at | Corrected to | Run to |
|---|---|---|
| | | |

PERFORATIONS

| Date | From | To | No. Holes |
|---|---|---|---|
| | | | |

ACID OR SHOOTING RECORD

| Date | From | To | Gals. Acid or Qts. Nitro |
|---|---|---|---|
| | | | |

Rotary tools from 0 feet to 1154 feet. Cable tools from - feet to - feet.

Natural initial production first 24 hours - Bbls. After acid or shot - Bbls.

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

As taken from daily drilling report

The above information is complete and correct.

NORTH AMERICAN DRILLING COMPANY

Signed [signature]

Date 10/3/68

Title Lee W. Lorimer, Sec.-Treas.

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE (Submit in Duplicate)

Form 7210
Rev. 9/63

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

| TO | FORMATION (TYPE, COLOR, HARDNESS) |
|---|---|
| 40 | Drift (clay) |
| 225 | Gray lime |
| 364 | Gray sand & chert |
| 605 | Brown lime |
| 792 | Brown lime & anhydrite |
| 814 | Brown lime |
| 857 | Anhydrite |
| 985 | Brown lime & anhydrite |
| 1031 | Brown lime |
| 1154 | Salt & lime shells |
| 1154 | TD |
| | 3/25/68 |
| | Ran and cemented 11-3/4" csg. |
| | 4/2/68 |
| | Installed 11-3/4" csg. head & prepared to drill out cement |
| | 4/3/68 |
| | Drilled out cement & cir. hole 2 hrs. |

| FROM | TO | FORMATION |
|---|---|---|

(IF WELL WAS CORED, ATTACH CORE DESCRIPTION)

DRILL STEM TEST DATA

DIVISION - BOX 30028 - LANSING, KS 48909

DATE 4-15-68 WARRATCHEN OIL COMPANY FIELD Big Stone

# HISTORY OF OIL OR GAS WELL

WELL No. 2 LEASE Earhardt Station SEC. 22 TWP. 4 S R. 10E

STATE Michigan COUNTY Wayne

Elev.

Measurements Taken From: Top of Rotary Table Elev. ; Grd. or Mat Elev.

History Prepared By: P. H. DuVal, Jr.

Title: Area Petroleum Engineer

It is of the greatest importance to have a complete history of the well. Use this form in reporting the history of all important operations of the well, together with the dates thereof, including size of hole, size and number of bits, complete description of casing, cementing, fishing or drilling difficulties, surveys, all tests, all completion operations and procedure, etc.

| DATE | |
|---|---|
| 3-9-68 | Rigging up. Drilled rathole. |
| 3-12-68 | 0 to 97 KB. Drilling 15" hole. Base of drift at 40 KB. |
| 3-13-68 | 97 to 186 KB. Drilling line. Pulled out and put on a 22" reamer and reamed to 110 KB. |
| 3-14-68 | Continued reaming to 174 KB. Mixed mud and circulated 2 hours. Pulled drill pipe and ran 6 joints (181 ft.) of new 16" OD., 65#/ft., 8 Rd, ST&C, casing. Set at 173ft. w/300 sx. of common cement with 2% HA-5. The first 100 sx. contained 1/4# of Flo-Seal per sack. A top and bottom plug were run. Twenty feet of cement was left in casing below top plug. |
| | The casing was equipped with a "Texas Pattern" shoe and three Baker Model "M" Centralizers. Cement r turned to surface. |
| 3-15-68 | Cut off casing and welded on National Bradenhead. In talled blow out preventer. W.O.C. |
| 3-16-68 | Checked BOP to 750 psig for 15 minutes. OK. Went in hole with a 15" bit and drilled out. Drilled from 1.3 to 225 KB. |
| 3-17-68 | Drilled 225 to 364 KB. Ran Inclinometer at 280 KB. Zero degrees deviation. Sand and Chert. |
| 3-18-68 | Drilled from 364 to 524 KB. Ran Inclinometer at 400 KB and 500 KB. Deviation ½° and zero degree respectively. |
| 3-19-68 | Drilled from 524 to 695 KB. Ran Inclinometer at 600 KB. Zero degrees deviation. Made trip at 660 KB for bit No. 3. Lime and Anhydrite. |
| 3-20-68 | Drilled 695 to 857 KB. Lime and Anhydrite. |
| 3-21-68 | Drilled 857 to 985 KB. Lime and Anhydrite. |
| 3-22-68 | Drilled 985 to 1142 KB. Lime and Anhydrite to 1031 KB., Salt and Anhydrite to 1142 KB. |
| 3-23-68 | Drilled 1142 to 1154 KB. (Total depth). Strapped pipe out of hole and rigged up to log. Ran Schlumberger [illegible] Change BOP rams to 11 3/4" in preparation to run casing. |
| 3-24-68 | Washed and cleaned threads on 11 3/4" casing. Made up Baker Float collar and guide shoe on first joint. |
| 3-25-68 | Ran 34 joints (1039.44') of Armco 11 3/4" O.D., 47#/ft., 8 Rd, ST&C, casing set at 1031 KB. Casing was equipped with Baker float collar and guide shoe and 3 Baker Model "M" Centralizers. Rigged Halliburton and cemented with 550 sacks of salt saturated cement w/1% excess salt. 1/4#/sk of Flo-Seal was added to the first 150 sx of cement to minimize loss to Sylvania Sand. The return water at the end of the job was cement colored but good cement slurry did not come clear back to the surface. Top and bottom cement plugs were run. W.O.C. |
| 4-2-68 | Pressured up 11 3/4" casing to 800 psi for 15 minutes. OK. Removed BOP. Cut off casing. Installed well head. Rigged to drill out. |
| 4-3-68 | A 10 5/8" bit was used to drill out shoe and clean out hole to total depth. Hole was circulated clean with brine. Pulled drill pipe and began tearing down rig. Well is now ready to install wash strings. |

DATE _____ 19__

# MARATHON OIL COMPANY
# HISTORY OF OIL OR GAS WELL

FIELD LPG Storage

WELL NO. 2 LEASE Earlandale Station

~~BLOCK~~ SEC. 22 TWP. 4 S R. 10E

STATE Michigan ~~PARISH~~ COUNTY Wayne

MEASUREMENTS TAKEN FROM: Top of Oil Spool ____ Elev. ____ / Top of Rotary Table ____ Elev. ____ / Gro. or Mat. ____ Elev. ____

HISTORY PREPARED BY P. H. DuVal, Jr.

TITLE Area Petroleum Engineer

It is of the greatest importance to have a complete history of the well. Use this form in reporting the history of all important operations of the well, together with the dates thereof, including size of hole, size and number of bits, complete description of casing, cementing, fishing or drilling difficulties, surveys, all tests, all completion operations and procedure, etc.

| DATE | |
|---|---|
| 4- 4-68 | Tearing down rig. |
| 4- 5-68 | Tearing down rig. |

FIELD ACTIVITY REPORT

DATE Mar. 11 19 68 — FIELD NAME OR TYPE WELL Drilling

| PERMIT NO. | OPERATOR | LEASE OR WELL NAME & NO. | TOWNSHIP | COUNTY |
|---|---|---|---|---|
| 27161 | Marathon Oil Co. | LPG #2 | 22-Woodhaven | Wayne |

Rotary rig set up. No one around at 2 P.M. Fence locked. Road muddy.
Note: Called McClure Oil Company, Engineering Section on morning of 3/12/68. They radioed Mt. Pleasant. Mr. Bromley said that they spudded at midnight and were drilling at 45' on the morning of the 12th.

enb

FIELD ACTIVITY REPORT

DATE Mar. 18 19 68 — FIELD NAME OR TYPE WELL Drilling

| PERMIT NO. | OPERATOR | LEASE OR WELL NAME & NO. | TOWNSHIP | COUNTY |
|---|---|---|---|---|
| 27161 | Marathon Oil Co. | Woodhaven LPG #2 | 22-Woodhaven | Wayne |

Spudded 3/12/68. Drift to 40'. Det. River Lime 40', Sylvania Sand 225', Bois Blanc chert and lime 340'. 16" casing set at 173' and cemented with 300 sacks. B.O.P. tested to 750 P.S.I. 1° deviation at 140', 0° at 280', and ½° at 400. Drilling at 479' now.

nbu

FIELD ACTIVITY REPORT

DATE March 26 19 68 — FIELD NAME OR TYPE WELL Drilling

| PERMIT NO. | OPERATOR | LEASE OR WELL NAME & NO. | TOWNSHIP | COUNTY |
|---|---|---|---|---|
| 27161 | Marathon Oil Co. | Woodhaven LPG #2 | 22 Woodhaven | Wayne |

11 3/4" set at 1031.' Saturday night (3-23-68). Will drill out cement next Saturday (3-30-68). Shut down. No one around.

enb

FIELD ACTIVITY REPORT

DATE Apr. 12 19 68 — FIELD NAME OR TYPE WELL Drilling

| PERMIT NO. | OPERATOR | LEASE OR WELL NAME & NO. | TOWNSHIP | COUNTY |
|---|---|---|---|---|
| 27161 | Marathon Oil Co. | Woodhaven LPG #2 | 22-Woodhaven | Wayne |

Lime and salt 1031. Rotary TD 1154. 11 3/4" casing set at 1031 and cemented with 550 sacks. Completed 3/23/68. Flange top to Kelly Bushing is 10.30 ft. Moved to #1 location.

CONS 7231 — INSPECTOR D. R. Brackenbury

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

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

As taken from daily drilling report.

The above information is complete and correct.

NORTH AMERICAN DRILLING COMPANY

Signed [signature]

Date 10/1/68

Title Lee W. Larimer, Sec.-Treas.

CONS. 2210
Rev. 6/64

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

(Submit in Duplicate)

Facility (33)
TD 1150 in A2 Carbonate (44)
Facility - LPG & Brine Storage

22-4S-10E
City of Woodhaven Twp. (Wayne Co.)

Marathon Oil Company

Marathon Oil Co. No. BR#1 Permit No. 28435

Drilling Contractor: North American Drilling Co. (Rotary 0-1150)

Location: Approx. Center N½ SE¼ Section 22, T.4S, R.10E
1580.75 feet from North and 204 feet from East of Center Line of Allen Rd.

Elevation: 609 Rot. Bush. (use for datums); 596 Ground

Mechanical Logs Run: Schlumberger Gamma Ray - Neutron 700-1148, Compensated Formation Density Log 1032-1148

| Drilling Commenced | Drilling Completed | Well Completed |
|---|---|---|
| 7-8-71 | 7-19-71 | 9-3-71 |

| Casing Record | Corrections | Straight Hole Surveys |
|---|---|---|
| 16" 64' Cem. to Surf. | None | 1/2° @ 1038 |
| 11 5/8" 1029' Cem. to Surf. | | |
| 4 1/2" 1097' | | |
| 4 1/2" 1134' | | |

| Cores | Shows, Porosity, etc. | Initial Production |
|---|---|---|
| None | None | Facility Well |

| Perforations | Treatment | Drill Stem Test |
|---|---|---|
| None | None | None |

Stratigraphic intervals and formation tops as determined by Geological Survey from Gamma Ray - Neutron log and records submitted by the Operator. Record by: Bob Dunn, Geologist.

| | | | |
|---|---|---|---|
| PLEISTOCENE: | | Bass Island | 470 |
| Drift to | 90 | Salina | 586 |
| DEVONIAN: | | C Shale | 929 Sj. |
| Detroit River | 90 | B Unit | 999 Sj. |
| Sylvania | 180 | B Salt | 1057 Sj. |
| Bois Blanc | 295 | A2 Carbonate | 1142 Sj. |
| SILURIAN: | | | |

Pre-Reported Oil Scout Tops and/or Geological Survey Field Report Tops.

| | | | |
|---|---|---|---|
| Drift | 90 | Salina | 586 |
| Detroit River | 90 | C Shale | 913 |
| Sylvania | 180 | B Evaporite | 980 |
| Bois Blanc | 295 | A2 Carbonate | 1125 |
| Bass Island | 470 | | |

The following records are reproductions of those submitted by Dennis C. Moriarty, Project Co-ordinator for Marathon Oil Co.

mts.
4/18/72

DEPARTMENT OF NATURAL RESOURCES

Page 3 - 4

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)

SUBMIT IN DUPLICATE

| NAME OF OWNER OR OPERATOR | ADDRESS OF OWNER OR OPERATOR |
|---|---|
| Marathon Oil Company | 1300 S. Fort St. Detroit, Michigan 48217 |
| NAME OF DRILLING CONTRACTOR | ADDRESS OF DRILLING CONTRACTOR |
| North American Drilling Company | Mt. Pleasant, Michigan |

| FARM NAME | WELL NO. | PERMIT NO. | D.P. NO. |
|---|---|---|---|
| Woodhaven Caverns | BR#1 | 539 28435 | |

| LOCATION | SECTION | TWP. | RANGE |
|---|---|---|---|
| 24400 Allen Road | 22 | 4 South | 10 East |

| TOWNSHIP | COUNTY |
|---|---|
| City of Woodhaven | Wayne |

FOOTAGE: See Drawing D34-198 (0) Ft. from Line and Ft. from Line of quarter section

| DATE DRILLING BEGUN | DATE DRILLING COMPLETED | DATE WELL COMPLETED | TYPE OF WELL |
|---|---|---|---|
| 7-8-71 | 7-19-71 | 9-3-71 | LPG & Brine Storage |

| FORMATION COMPLETED IN | TOTAL DEPTH | ELEVATION | KB | RB | RT | RF | GRD |
|---|---|---|---|---|---|---|---|
| Saline | 1149 KB | | -6.8 | 609 | | 0 | 596 |

| ROTARY TOOLS | CABLE TOOLS |
|---|---|
| From 3 Feet to 1149 Feet | From Feet to Feet |

CASING AND CEMENTING

| SIZE | WHERE SET | CEMENT | AMOUNT PULLED |
|---|---|---|---|
| 16" | 64 KB | Surface | |
| 11-5/8 | 1029 KB | Circ. | |
| 4-1/2 | 1097 KB | None | |
| 4-1/2 | 1134 KB | None | |

PERFORATIONS

| DATE | NO. HOLES | FROM | TO |
|---|---|---|---|
| | | | |

DEPTH CORRECTION

| DEPTH | CORRECTED TO |
|---|---|
| | |

OIL OR GAS ZONES

| FORMATION | FROM | TO | AMOUNT |
|---|---|---|---|
| | | | |

WATER ZONES

| FORMATION | FROM | TO | AMOUNT |
|---|---|---|---|
| | | | |

DEVIATION SURVEY

| RUN AT | DEGREES |
|---|---|
| 1038 | 1/2° |

SAND FRAC OR ACID TREATMENT

| DATE | FROM | TO | QUANTITY |
|---|---|---|---|
| | | | |

MECHANICAL LOGS RUN

| BRAND | (X) | TYPE LOG | INTERVAL LOGGED |
|---|---|---|---|
| Schlumberger | X | Gamma Ray-Neutron | 1032.5-1149 KB |
| Shelwell | | | |
| Birdwell | | | |
| Burgener | | | |
| Other | | | |

PRODUCTION DATA

| WELL COMPLETED FOR: | BOPD | BWPD | MCF GAS | PRESSURES: | CASING - PSI | TUBING - PSI |
|---|---|---|---|---|---|---|
| | | | | | 300 | 300 |

The above information is complete and correct

9/3/71

Signed Dennis C. Moriarty

Dennis C. Moriarty
Project Coordinator

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)



Permit No. 28435

ELEVATION USED: GOM

GEOLOGIST NAME: David L. Pleasley

TOPS TAKEN FROM: [X] DRILLERS LOG [ ] SAMPLE LOG [ ] ELECTRIC LOG

| FROM | TO | FORMATION (TYPE, COLOR, HARDNESS) |
|---|---|---|
| 0 | 90 | Glacial Drift<br>Devonian |
| 90 | 135 | Detroit River<br>Dolomite, grey-brown microxln; v,f.x., scattered white gyp. and anhydrite |
| 135 | 180 | Dolomite, brown v.f.x.; microxln |
| 180 | 295 | Sylvania<br>Sandstone, white, very fine to fine grained, rounded grains, non-coherent to variable cemented. Dolomite at top and bottom |
| 295 | 305 | Bois Blanc<br>Dolomite light grey, lithographic to microxln, abundant chert light grey, partly weathered (Tripoli) |
| 305 | 345 | Sandstone white, very fine, non-coherent, variable chert and Trip. as above |
| 345 | 470 | Dolomite, tan-grey microxln, abundant chert |
| 470 | 586 | Silurian<br>~~Bass Island~~<br>Dolomite light grey, microxln, earth streaks of shale grey - dark grey |
| 586 | 720 | Salina "G"<br>Dolomite, brown-grey, Microxln, orange to shaly, variable amounts of white anhydrite |
| 720 | 913 | "FED"<br>Dolomite grey-brown, arg. and shale grey |
| 913 | 980 | "C"<br>Dolomite grey-brown, arg. and shale grey |
| 980 | 1061 | "B" Dolo.<br>Dolomite brown-grey microxln, lithographic, part arg., very anhydriti in part |
| 1061 | 1125 | "B" Salt<br>Salt, white to pink and orange, streaks of dolomite and shale throughout |
| 1125 | 1149 | Sal. "A"<br>Dolomite, brown-grey, part orange, variable anhydritic, interbedded anhydrite, white-grey |

IF WELL WAS CORED, ATTACH CORE DESCRIPTION

DRILL STEM TEST DATA

Marathon Oil Co. #BR-1 Wayne 28,435

MARATHON OIL COMPANY

3-4-8

# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, GAS OR L.P.G. STORAGE OR FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, AND ACT 326, P.A. 1937 AS AMENDED.

MAIL TO:
SUPERVISOR OF WELLS
GEOLOGICAL SURVEY
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING, MICHIGAN 48926

CONS. 7207 REV. 11/64

*See Reverse Side Before Filling Out This Application*

N
SEE DRAWING
(D)34 - 198 (O)
W E
S

LOCATE WELL AND OUTLINE LEASE OR UNIT ON SECTION PLAT -- 640 ACRES

1. APPLICATION TO DRILL A WELL, FOR: LPG & Brine Facility
2. DATE: 4-8-71
3. FEE ENCLOSED: $ 25.00
4. LESSEE (OWNER OF LEASE RIGHTS): Marathon Oil Company
5. PERMANENT ADDRESS: 1300 S. Fort St., Detroit, Michigan 48217
6. PHONE: VI 3-9100
7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Marathon Oil Company WOODHAVEN
8. WELL NO.: BR #1
9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER): Same
10. DRILLING CONTRACTOR: North American Drilling
11. ADDRESS: Mt. Pleasant
12. PHONE: 773-3945
13. ~~NE~~ N½ ~~NW~~ SE ¼, SECTION 22 T 4 S R 10 EAST
14. ACRES IN LEASE OR UNIT (SPECIFY): 43.601
15. TOWNSHIP: City of Woodhaven
16. COUNTY: Wayne
17. *Locate well in two directions from nearest lines of quarter section and property ownership or unit lines*
1580.75 ~~1273.99~~ FT. FROM North (north-south) LINE OF QUARTER SECTION
790 ~~774.99~~ FT. FROM North (north-south) (PROPERTY) ~~XXXX~~ LINE
204 ~~611.53~~ FT. FROM East (east-west) C/L of Allen Road LINE OF QUARTER SECTION
~~160~~ 161 FT. FROM East (east-west) (PROPERTY) ~~XXXX~~ LINE
18. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary
19. WELL IS TO BE COMPLETED IN Salt Saline FORMATION
20. INTENDED DEPTH OF WELL: Approx. 1150 Ft.
21. PROGRAM OF CASING, SEALING, CEMENTING AND COMPLETING WELL

See Attached Write Up.

CASING IS NOT TO BE STRIPPED FROM THE HOLE AND NO CHANGE IS TO BE MADE IN THE PROGRAM OUTLINED ABOVE WITHOUT APPROVAL OF THE SUPERVISOR OF WELLS OR HIS AUTHORIZED REPRESENTATIVE

22. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒
23. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒
24. IF ANSWER TO No. 22 ABOVE IS *Yes*, DESCRIBE AND GIVE DISTANCE FROM LOCATION.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST FIELD OFFICE. *(See reverse side)*

25. ADDRESS CORRESPONDENCE AND PERMIT TO: Mr. D. C. Moriarty, 1300 S. Fort St., Detroit, Mich. 48217
26. PHONE: 843-9100

LEAVE BLANK
DATE ISSUED: 5-21-71
PERMIT NO.: 38,435

27. OWNER OF LEASE RIGHTS: Marathon Oil Company
28. AUTHORIZED REPRESENTATIVE: Sydney Blum

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

DISTRIBUTION
1. WHITE - LANSING
2. CANARY - CASHIER
3. BLUE - FIELD
4. GOLDENROD - FIELD
5. GREEN - APPLICANT

## INSTRUCTIONS

(1) Prepare five copies of application and mail all copies to Michigan Department of Conservation, Geological Survey, Lansing, Michigan 48926. Green copy will be returned to applicant on issuance of permit.

(2) Applicant is required to submit three copies of a survey record on form 7208 or equivalent and furnish supplemental information and maps if hazardous conditions exist or the property is irregular in form.

(3) Applicant is required to submit certification that provision has been made with a competent surveyor or engineer to run and furnish the well elevation. Data is to be filed with the Supervisor of Wells within fourteen (14) days after the well is spudded.

(4) Suitable surety bond must be on file with the Supervisor of Wells before a drilling permit can be issued.

(5) The required permit fee must accompany the application. Send check, money order, or bank draft. Fee schedule is as follows:

$25.00 for Oil, Gas, Gas Storage, or L.P.G. Storage.
$ 1.00 for Geological Test, Brine Disposal, or Secondary Recovery.

(6) Application and survey must be filed in the Lansing office at least five (5) days before applicant intends to start drilling.

## NOTICE

THE SUPERVISOR OF WELLS IS PROHIBITED BY LAW FROM ISSUING A PERMIT TO ANY OWNER WHO HAS NOT COMPLIED WITH OR IS IN VIOLATION OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, ACT 326, PUBLIC ACTS 1937, AS AMENDED, OR ANY OF THE RULES, REGULATIONS, REQUIREMENTS, OR ORDERS ISSUED BY THE SUPERVISOR OF WELLS, OR THE MICHIGAN DEPARTMENT OF CONSERVATION.

## FIELD OFFICES

The office listed below supervising the activity in the area in which this well is to be drilled must be notified when drilling is to commence.

Lansing

Stevens T. Mason Bldg.
Telephone 373-1256

Mt. Pleasant

204 Court Street
Telephone 773-9965

Imlay City

P.O. Box 218
Telephone 724-7015

Plainwell

P.O. Box 355
Telephone 685-8051

Cadillac

P.O. Box 629
Telephone 775-9728

R-7209-A 1000 Sets 12-69

STATE OF MICHIGAN

**DEPARTMENT OF NATURAL RESOURCES** Nº 539

SUPERVISOR OF WELLS

# PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST WHITE COPY OF PERMIT AT WELL LOCATION)

Permit No. 28,435 Date Issued May 21, 1971

Permission is hereby granted to Marathon Oil Company
Owner
1300 S. Fort St., Detroit, Michigan 48217
Address

Lease Name Marathon Oil Company Well Number BR 1

To drill a well for LPG & Brine Facility

in the N½ SE¼ Section 22, T.4S., R.10E., City of Woodhaven, Wayne County

and located 1580.75 from north and 204' from east C/L of Allen Road

and located 790' from north and 161' from east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Natural Resources.

SUPERVISOR OF WELLS

By V. T. Sargent

## CASING AND SEALING REQUIREMENTS

### NOTICE

DRILLING PERMIT ISSUED on the basis of the drilling, casing and sealing program as outlined on the application for permit and subject to requirements as set forth above. No change or alteration is to be made without the permission and approval of the Supervisor of Wells or his authorized representative.

DRILLING OPERATIONS ARE NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

### DEPARTMENT OFFICES

Lansing, Phone 517-373-1256
Mount Pleasant, Phone 517-773-9965
Cadillac, Phone 616-775-9728
Plainwell, Phone 616-685-8051
Imlay City, Phone 313-724-2015
Escanaba, Phone 906-786-0333

PERMITS MAY BE TRANSFERRED ONLY WITH THE PERMISSION OF THE SUPERVISOR OF WELLS

1

68-70—3138

RECOMMENDED DRILLING PROGRAM FOR MARATHON'S CAVERN BR#1 AT WOODHAVEN
(FORMALLY CALLED EARHART STATION, BROWNSTONE TOWNSHIP,
WAYNE COUNTY, MICHIGAN)

1. Move in North American Drilling Company's rotary rig or comparable equipment.

2. Rig up and drill a 20" hole to 60' or deeper, from ground level, as required to completely penetrate the drift. Ream hole to 22".

3. Run 60' of 16" O.D., H-40, 55 lbs. per foot S.T.C., casing and cement with 60 sacks of accelerated portland cement. Texas pattern shoe should be spot welded to the bottom of casing.

4. After 12 hours minimum W.O.C., drill out with 15" pit, brine mud will be used.

5. Install surface blow-out preventer. Test preventer.

6. Go to total depth 1150 K.B. with 15" drill.

7. At this time Schlumberger Well Logging Company, will run a formation Density-Gamm a Ray Log and a Neutron Log.

8. After circulating long enough to condition the hole, approximately 1,000' of 11-3/4" O.D., 47 lbs. per foot, J-55, S.T. and C., eight round thread, casing should be run. Casing equipment will consist of a Baker guide, shoe, a Baker float collar, and three Baker centralizers. Prior to running casing, all thread protectors are to be removed. The casing threads are then to be brushed and cleaned with solvent. After cleaning, dry the threads with a clean rag and inspect each thread visually. After inspecting threads, dope with lubricant as provided. The thread protector should be similarly cleaned and dried and replaced on the casing and not removed until the casing is run.

9. Upon landing the casing, mud circulation should be established and continued until 175 bbl. (150% of casing capacity) or a more has been circulated. Halliburton should then cement the string with 500 sacks of cement. Use fresh water or brine to pump the plug down. This will facilitate testing prior to drilling out, put ¼# per sack flo-seal for the first 150 sacks of cement.

10. Release rig or shut rig down for approximately four days W.O.C. The remainder of the completion can be done when the rotary rig or a work-over rig as economics dictate.

11. After four days W.O.C. weld casing flange to 11 3/4 casing and test casing to 750 PSI for 15 minutes.

12. Drill out plug and ream hole to total depth, using a 10-5/8" bit.

13. Two strings of 4½ casing should then be run, one 10 ft. below the salt and one 30 ft. above the bottom of salt.

14. After tree is installed, release rig.

15. Additional pressure tests as desired can be run prior to initiating the washing operation.

DCM/lt

Cons. 7225

FILE
(V. F. S.)

# WELL LOCATION REPORT

Permit No. 28435

Operator Marathon Oil Co.

Farm Name Marathon Oil Co. BR #1

Notification verbal from D. Moriarity

Nature of Location open lot on Marathon Oil Co. facility

Condition of Pits 2) 5x5x30 2) 5x30x30

Distance from Water none

Remarks location falls inside fenced Marathon property in the City of Woodhaven (Earhart Station)

Approved by R Lehtola Date 8 July, 1971

MARATHON OIL COMPANY
1300 S. Fort
Detroit, MI 48217

January 7, 1972

Mr. Garland Ells
Geological Survey
State of Michigan
Department of Natural Resources
Lansing, Michigan 48926

Dear Gar:

Enclosed are the electric logs you requested on BR#1. Also, enclosed are the correlations I made with the data I received from you when I was up in Lansing with C. H. Grenier several months ago. You might be interested in seeing them.

If there is anything else you require, please contact me.

Sincerely,

David L. Florkey

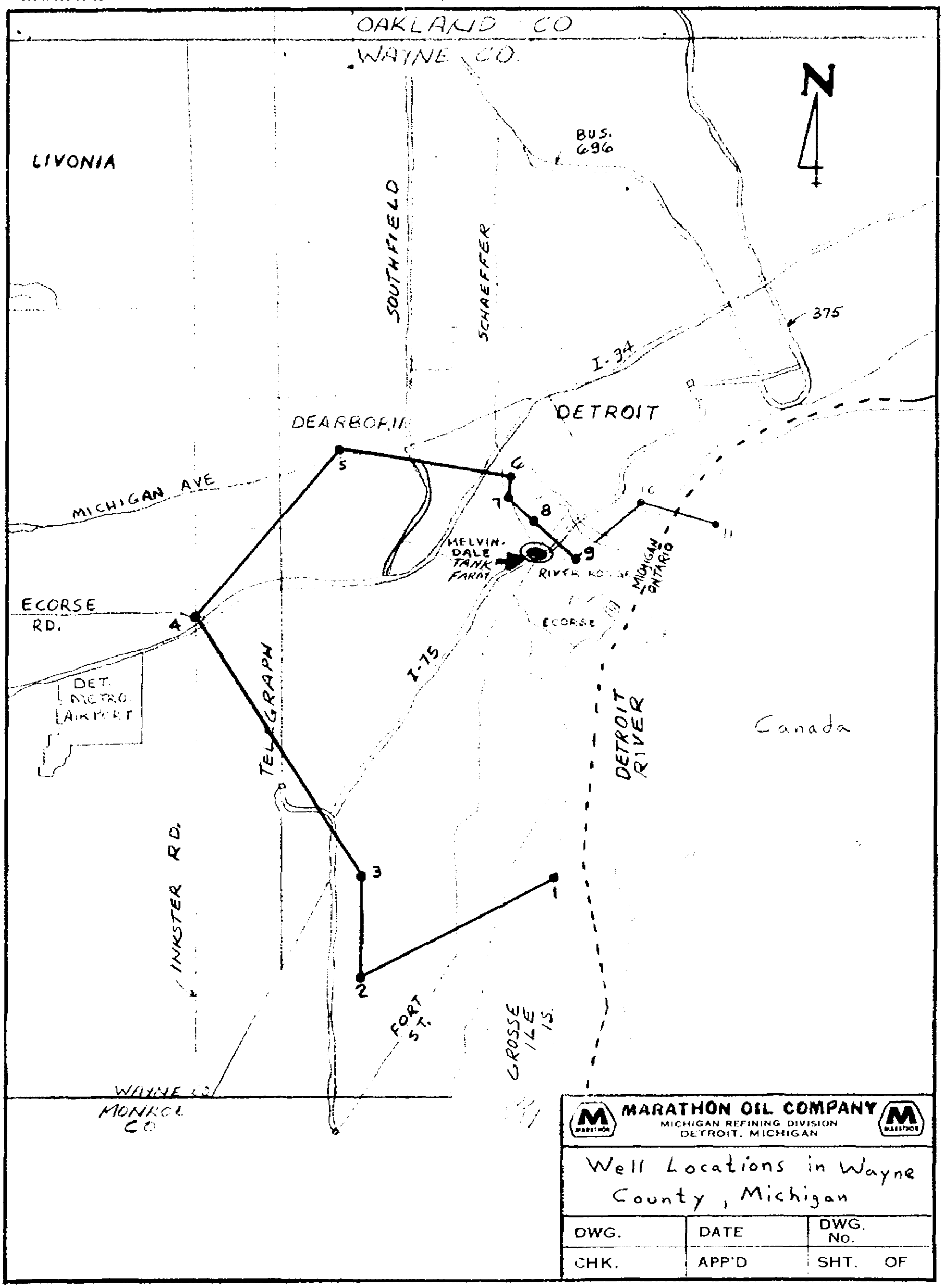
David L. Florkey

Attachments

DLF/jd

RECEIVED
JAN 10 1972
GEOLOGICAL SURVEY

K&E 163 11-62




**MARATHON OIL COMPANY**
MICHIGAN REFINING DIVISION
DETROIT, MICHIGAN

Well Locations in Wayne County, Michigan

| DWG. | DATE | DWG. No. |
|---|---|---|
| CHK. | APP'D | SHT. OF |

K&E 10-5135 5-64

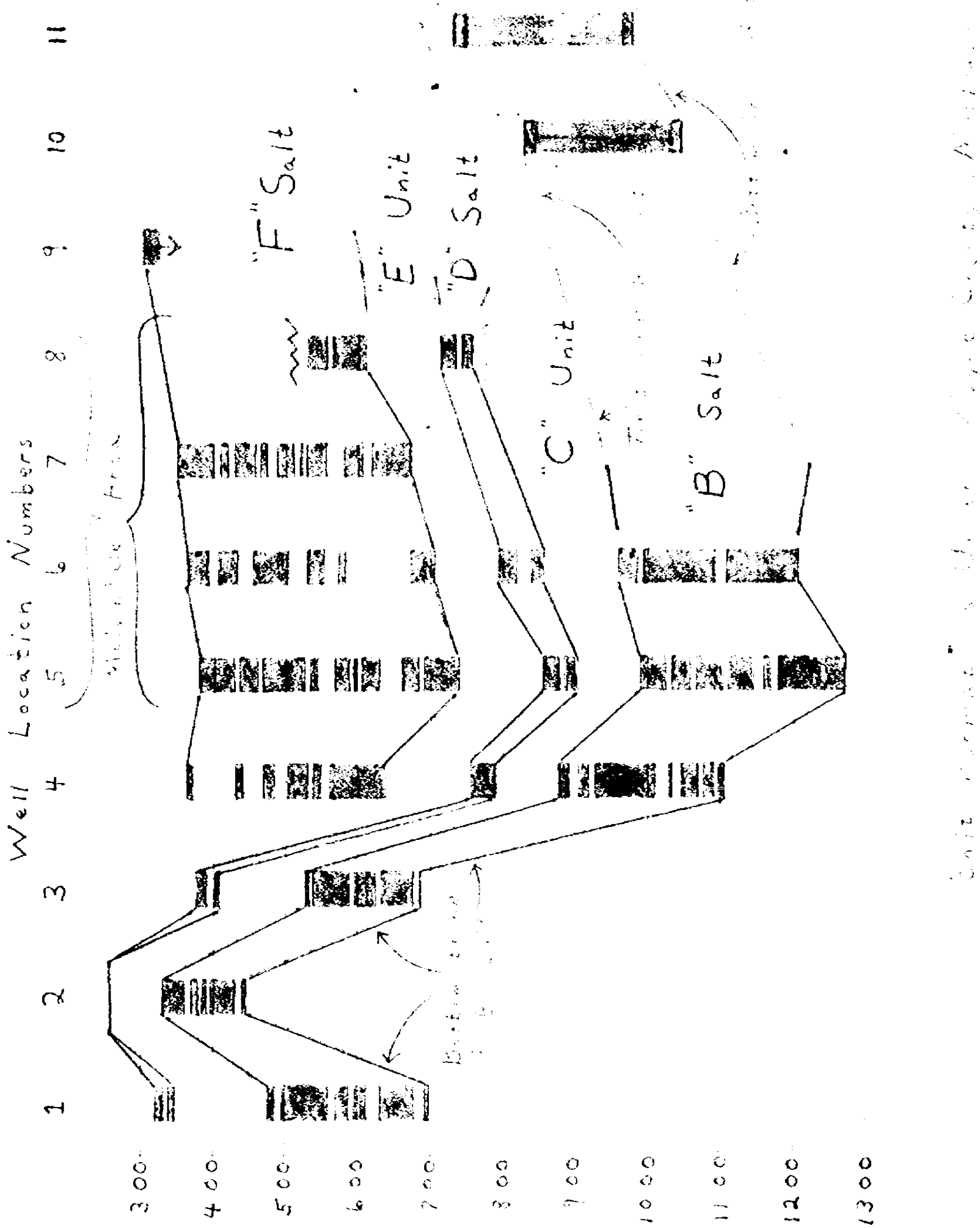
**MARATHON OIL COMPANY**
MICHIGAN REFINING DIVISION
DETROIT, MICHIGAN

BY DLF DATE
CHKD. BY DATE
COORDINATOR
APPROVED BY

SUBJECT Salt Formations [illegible]

SHEET NO. OF
JOB NO.

Figure 2



## WELL LOCATIONS FROM FIGURE 1

1. Wyandotte Chemical Co., Corehole No. 2, Grosse Ile, 9.25
   Elevation 610.5 ft., October, 1960.

2. Marathon Oil Co., LPG No. 4
   Woodhaven, T4S-R10E-522.
   Elevation 605 ft., June, 1968.

3. Phillips Petroleum Co., Well No. 2,
   Brownstown Twp., S10-T4S-R10E
   Elevation 605.8 ft., September, 1963.

4. Sun Oil Co., Well No. 4, Sun Inkster Junction,
   Taylor, S7-T3S-R10E
   Elevation 633 ft., March, 1957

5. H. R. Ford Wildcat,
   Dearborn, S22-T2S-R10E
   Elevation 612 ft., 1915

6. Panhandle Eastern Pipeline Co., Wildcat,
   Dearborn, S19-T2S-R11E
   Elevation 588 ft., August, 1964

7. Marathon Oil Co., Ford LPG #3
   Dearborn, S29-T2S-R11E
   Elevation 586 ft., March, 1960

8. International Salt Co., Detroit Mine,
   1,000 ft. N55$^{o}$W from No. 2 shaft

9. Unknown Company - well drilled in 1878. Only data of interest available is top of "F" Salt.

10. Allied Chemical Company. Total information not readily available, but will be soon. Location of "B" Salt noted through verbal conversations.

11. Canadian Brine Co., Windsor Mine.
    Location of "B" Salt noted through verbal conversation.
    More information will be available at a future date.

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

# 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)

SEP 21 1971
SUBMIT IN DUPLICATE

1-26-72
130

| NAME OF OWNER OR OPERATOR | ADDRESS OF OWNER OR OPERATOR |
|---|---|
| Marathon Oil Company | 1300 S. Fort St. Detroit, Michigan 48217 |
| NAME OF DRILLING CONTRACTOR | ADDRESS OF DRILLING CONTRACTOR |
| North American Drilling Company | Mt. Pleasant, Michigan |

| FARM NAME | WELL NO. | PERMIT NO. | D.P. NO. |
|---|---|---|---|
| Woodhaven Caverns | BR#1 | ~~539~~ 28,435 | |

| LOCATION | SECTION | TWP. | RANGE |
|---|---|---|---|
| 24400 Allen Road | 22 | 4 South | 10 East |

| TOWNSHIP | COUNTY |
|---|---|
| City of Woodhaven | Wayne |

FOOTAGE: See Drawing D34-198 (0) Ft. from Line and Ft. from Line of quarter section

| DATE DRILLING BEGUN | DATE DRILLING COMPLETED | DATE WELL COMPLETED | TYPE OF WELL |
|---|---|---|---|
| 7-8-71 | 7-19-71 | 9-3-71 | LPG & Brine Storage |

| FORMATION COMPLETED IN | TOTAL DEPTH | ELEVATION | KB | RB | RT | RF | GRD |
|---|---|---|---|---|---|---|---|
| Saline | 1149 KB | | -6.8 | 609 | | 0 | 596 |

ROTARY TOOLS: From 3 Feet to 1149 Feet

CABLE TOOLS: From Feet to Feet

## CASING AND CEMENTING

| SIZE | WHERE SET | CEMENT | AMOUNT PULLED |
|---|---|---|---|
| 16" | 64 KB | Surface | |
| 11-5/8 | 1029 KB | Circ. | |
| 4-1/2 | 1097 KB | None | |
| 4-1/2 | 1134 KB | None | |

## PERFORATIONS

| DATE | NO. HOLES | FROM | TO |
|---|---|---|---|
| | | | |

## DEPTH CORRECTION

| DEPTH | CORRECTED TO |
|---|---|
| | |

## OIL OR GAS ZONES

| FORMATION | FROM | TO | AMOUNT |
|---|---|---|---|
| | | | |

## WATER ZONES

| FORMATION | FROM | TO | AMOUNT |
|---|---|---|---|
| | | | |

## DEVIATION SURVEY

| RUN AT | DEGREES |
|---|---|
| 1038 | 1/2° |

## SAND FRAC OR ACID TREATMENT

| DATE | FROM | TO | QUANTITY |
|---|---|---|---|
| | | | |

## MECHANICAL LOGS RUN

| BRAND | (X) | TYPE LOG | INTERVAL LOGGED |
|---|---|---|---|
| Schlumberger | X | Gamma Ray-Neutron | 1032.5-1149 KB |
| Shelwell | | | |
| Birdwell | | | |
| Burgener | | | |
| Other | | | |

## PRODUCTION DATA

| WELL COMPLETED FOR: | BOPD | BWPD | MCF GAS | PRESSURES: | CASING - PSI | TUBING - PSI |
|---|---|---|---|---|---|---|
| | | | | | 300 | 300 |

The above information is complete and correct

Signed Dennis C. Moriarty
Dennis C. Moriarty
Project Coordinator

Date 9/3/71

Title

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

R 7210
REV 1/70

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

| ELEVATION USED: | GEOLOGIST NAME: | TOPS TAKEN FROM: |
|---|---|---|
| 609 | David L. Florkey | [X] DRILLERS LOG [ ] SAMPLE LOG [ ] ELECTRIC LOG |

| FROM | TO | FORMATION (TYPE, COLOR, HARDNESS) |
|---|---|---|
| 0 | 90 | Glacial Drift |
| | | Devonian |
| 90 | 135 | Detroit River<br>Dolomite, grey-brown microxln, v,f.x., scattered white gyp. and anhydrite |
| 135 | 180 | Dolomite, brown v.f.x., microxln |
| 180 | 295 | Sylvania<br>Sandstone, white, very fine to fine grained, rounded grains, non-coherent to variable cemented. Dolomite at top and bottom |
| 295 | 305 | Bois Blanc<br>Dolomite light grey, lithographic to microxln, abundant chert light grey, partly weathered (Tripoli) |
| 305 | 345 | Sandstone white, very fine, non-coherent, variable chert and Trip. as above |
| 345 | 470 | Dolomite, tan-grey microxln, abundant chert |
| 470 | 586 | Silurian<br>~~Bass Island~~<br>Dolomite light grey, microxln, earth streaks of shale grey - dark grey |
| 586 | 720 | Salina "G"<br>Dolomite, brown-grey, Microxln, orange to shaly, variable amounts of white anhydrite |
| 720 | 913 | "FED"<br>Dolomite grey-brown, arg. and shale grey |
| 913 | 980 | "C"<br>Dolomite grey-brown, arg. and shale grey |
| 980 | 1061 | "B" Dolo.<br>Dolomite brown-grey microxln, lithographic, part arg., very anhydritic in part |
| 1061 | 1125 | "B" Salt<br>Salt, white to pink and orange, streaks of dolomite and shale throughout |
| 1125 | 1149 | Sal. "A"<br>Dolomite, brown-grey, part orange, variable anhydritic, interbedded anhydrite, white-grey |

IF WELL WAS CORED, ATTACH CORE DESCRIPTION

DRILL STEM TEST DATA

# FIELD ACTIVITY REPORT

R 7231 7/70

| DATE | | INSPECTOR | TYPE WELL | |
|---|---|---|---|---|
| 9/27/71 | | R. Lehtola | Miscellaneous | |
| PERMIT NO. | OPERATOR | LEASE OR WELL NAME & NO. | TOWNSHIP | COUNTY |
| | | | | |

Went to Melvindale to get ground elevation for Marathon BR #1 located in Woodhaven.
Also picked up 4 applications from Chuck Grenier for storage wells.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

**APPLICATION TO:**

☒ **CHANGE WELL STATUS OR**

☐ **PLUG AND ABANDON WELL**

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, 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 or Gas Well ☐ Part 625 Mineral Well

Change of well status requested to:

☐ Plug back ☐ Perforate ☐ Temporarily abandon

☐ Convert to _____ ☒ Other Upgrade well

Last production/injection rate and type of fluid

Butane/Brine. Rate unknow, have not used well in 20+ years

Brief description of project

Cut off 15' of production casing at bottom of well
Change out brine string and reduce depth to 1045'
Conduct MIT

| | |
|---|---|
| Permit number: 28,435 | Type of well: LPG & Brine Storage |
| API number: | |
| Name and address of permittee: Marathon Pipe Line LLC, 539 South Main Street, Findlay, OH 45840 | |
| Well name and number: Marathon Pipe Line LLC - Woodhaven BR #1 (Cavern #7) | |
| Well location: N1/2 1/4 of SE 1/4 of 1/4 Section 22 T 4S R 10E | |
| Township: Brownstown | County: Wayne County |
| Date drilling completed: 1-1971 | Date last produced/utilized: Unknown - Early 1980. |
| Work to be done by: PB Energy Services - 11757 Katy Freeway, Suite 600, Houston TX 77079 | Starting date: 5/25/07 |

**CASING AND CEMENTING RECORD**

| Hole dia | Casing dia & wt/ft | Depths set | Cement quantity, type, additives | Cement top | Perforations |
|---|---|---|---|---|---|
| 16 in | 11 5/8 in | 160 ft | Class A (w.CaCL2). Estimated quantity 130 bags | TOC | Unkown |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Formation record (formation and depth of top, oil, gas and water shows, etc.):

| formation | depth | Silurian | 586 |
|---|---|---|---|
| Glacial Drift | 0 - 90 | Salina "G" | 720 |
| Detroit River | 135 | FED | 913 |
| Dolmite | 180 | "C" | 980 |
| Sylvania | 295 | "B" Dolomite | 1061 |
| Bois Blanc | 305 | "B" Salt | 1125 |
| Sandstone | 345 | Sal. "A" | 1149 |
| Dolomite | 470 | | |

Detail proposed procedures:

Marathon Pipe Line (MPL) is upgrading existing well BR-1 (Cavern #7) to active status. In order to do so, MPL is planning to cut of 15' of production casing at the bottom of the well casing to allow for more accurate sonar casing surveys in the future. In addition, MPL is hanging a new brine string to a depth of 1045 feet or approximately 105 feet higher than the original to better facilitate product removal and cavern operations.

MPL will also be conducting a MIT on the cavern once said upgrades have been completed.

Name/signature (authorized representative): Thomas A. Ross THOMAS A. ROSS

Date: 5-25-07

FOR OFFICE OF GEOLOGICAL SURVEY USE ONLY

DEQ additional requirements:

Please notify this office, 517-335-6253, prior to commencement of MIT test.

RECEIVED JUN 07 2007

☐ Yes ☐ No ☒ Not applicable Production tests to commence within 10 days of completion and to be filed

☐ Yes ☒ No Service company records are to be filed

| Approved by DEQ: | Office: | Approval date: | Termination Date: |
|---|---|---|---|
| [signature] | Lansing Dist. | 6/15/07 | 6/15/2008 |

Submit original and three (3) copies of this application to the District Office within 60 days ofchange of well status.
Note: Three copies of Record of Well Plugging or Change of Well status (EQP 7200-8) and any requested service company records are to be filed within 60 days of completion at the District Office

Environmental, Safety and Regulatory Compliance

**Marathon Pipe Line LLC**

539 South Main Street
Findlay, OH 45840
Telephone: (419) 421-3295

May 25, 2007

Walt Danyluk
District Supervisor
Michigan DEQ – Office of Geological Survey
Lansing District Office
525 West Allegan Street
PO Box 30242
Lansing, MI 48909-7742

Re: Application to Change Well Status
Well Permit No. 27162 &
Well Permit No. 28,435

Dear Mr. Danyluk:

Per our conversation of 5-25-06, please find enclosed the Michigan DEQ Form 7200-6, Application to Change Well Status for the Marathon Pipe Line LLC (MPL) Woodhaven Wells referenced above. Note that the MPL Well References are LPG Cavern #4 and LPG/Brine Cavern #7 respectively.

Please note that we are changing the well status enough to warrant submittal of Form 7200-6 for both wells. In both wells MPL will be removing a 15 ft section of production casing from the bottom elevation of the cavern production casing. This removal is to facilitate a more accurate sonar reading as the casing extends into the cavern itself, thus interfering with the sonar readings for the area hidden above the well casing.

In addition, MPL will be hanging two new brine strings that will be set at approximately 100 ft higher in elevation off the cavern floor than the original stringer depth.

MPL will be conducting a MIT on both caverns upon completion of the re-work and prior to bringing back into storage service. Please let me know if you wish to observe the MIT on either or both caverns.

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JUN 07 2007
GEOLOGICAL SURVEY

Please feel free to contact me at 419-421-3295 with questions or concerns.

Regards,

Thomas A. Ross

Thomas A. Ross
HES Professional
Marathon Pipe Line LLC

/tar

Enclosures

Cc: Cavern update file
B Lewandowski – Project Lead

RECEIVED

JUN 07 2007

LOUISIANA DO
GEOLOGICAL SURVEY

L.P.G. (33)
TD 1153 in Salina-B Unit(42
Facility Well

22-4S-10E
Brown Stone Twp. (Wayne Co.)
(City of Woodhaven)

Marathon Oil Co.

Marathon Oil Co. (City of Woodhaven) No. LPG #4 Permit No. 27162

Drilling Contractor: NADCO (rotary 0-1153)

Location: N½ SE¼ Sec. 22, T. 4S, R. 10E
781 feet from north and 341 feet from east line of quarter section

Elevation: 605 feet above sea level (kelly bush.)

Record by: H. Laaksonen from driller's log submitted by the company. Logs run: Schlumberger Compensated Formation Density Log (20-1153); Sidewall Neutron Porosity Log (20-1153); Directional Log (0-1153) Logs (Sj)

| | Thickness (Feet) | Depth (Feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Clay | 33 | 33 |
| DEVONIAN: | | |
| Detroit River: | | |
| Limestone, gray (SHS = ½° deviation @ 100) | 163 | 196 Sj |
| Sylvania: | | |
| Limestone, gray with anhydrite (?)(SHS =3/4° deviation @ 200) | 74 | 270 |
| Sandstone, gray (SHS = ½° deviation @ 300) | 89 | 359 Sj |
| | (153) | |
| Bois Blanc: | | |
| Limestone, gray & chert (SHS = ¼° deviation @ 400) | 101 | 460 Sj |
| SILURIAN: | | |
| Bass Islands: | | |
| Limestone, brown; sandstone, gray | 8 | 468 |
| Limestone, brown (SHS = ¼° deviation @ 500) | 69 | 537 |
| Limestone, brown with anhydrite (SHS = ¼° deviation @ 600) | 114 | 651 |
| | (191) | |
| Salina: | | |
| Limestone, brown with anhydrite (SHS = ¼° deviation @ 700) (SHS = ½° deviation @ 800)(F Unit @ 723 Sj) | 204 | 855 |
| Limestone, brown (SHS = ½° deviation @ 900)(C Unit @ 915 Sj) (Pre Report - 949 DPM = 949 SDP) | 95 | 950 |
| Limestone, brown with anhydrite (B Unit @ 989 Sj) | 40 | 990 |
| Cored (#1 - 990-1050; #2 - 1050-1109; #3 - 1109-1153) (SHS = 3/4° deviation @ 1000)(SHS = 1¼° deviation @ 1100) (SHS = 1¼° deviation @ 1153)(B Salt @ 1140 Sj) | 163 | 1153 |
| | (502+) | |
| TOTAL DEPTH | | 1153 |

Marathon Oil Co.
Marathon Oil Co. No. LPG #4

Casing record:
16" 156 (225 cem.)
11-3/4" 1040 (550 cem.)

Commenced: 2-14-68
Completed: 2-26-68
Well Completed: 3-7-68

LPG Storage

3-17-70
kcb

BEST COPY
AVAILABLE

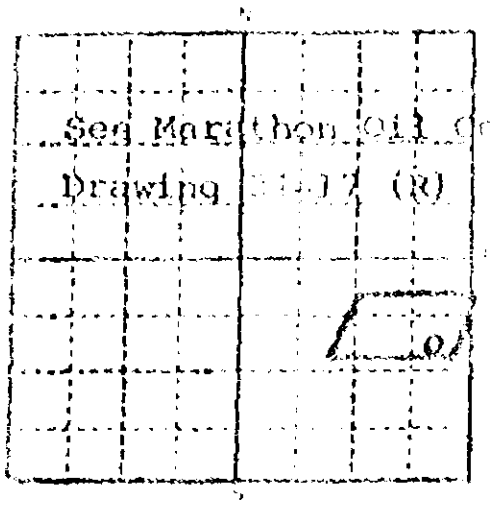
21162

APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, GAS OR L.P.G. STORAGE OR FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, OR ACT 326, P.A. 1937 AS AMENDED.

MAIL TO:
SUPERVISOR OF WELLS
GEOLOGICAL SURVEY
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING, MICHIGAN 48926

*See Reverse Side Before Filling Out This Application*




LOCATE WELL AND OUTLINE LEASE OR UNIT ON SECTION PLAT - 640 ACRES

1. APPLICATION TO DRILL A WELL FOR: LPG Storage
2. DATE: 12-19-67
3. FEE ENCLOSED: $ 25.00
4. LESSEE (OWNER OF LEASE RIGHTS): Marathon Oil Company
5. PERMANENT ADDRESS: 1300 S. Fort Street, Detroit, Michigan, 48217
6. PHONE: 843-9100
7. LESSOR (FEE NAME OF OWNER OF MINERAL RIGHTS): Marathon Oil Company (Woodhaven)
8. WELL NO.: LPG #4
9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER): Same
10. DRILLING CONTRACTOR: North American Drilling Company
11. ADDRESS: 1300 N. Fancher St., Mt. Pleasant
12. PHONE: 773-3945
13. ~~NW~~ N½ ~~NE~~ SE ¼ SECTION 22 T 4 S R 10 East
14. ACRES IN LEASE OR UNIT (SPECIFY): 11.534
15. TOWNSHIP: City of Woodhaven
16. COUNTY: Wayne

*Locate well in two directions from nearest lines of quarter section and property ownership or unit lines*

~~NORTH~~ 781 FT. FROM North (north-south) LINE OF QUARTER SECTION
~~NORTH~~ 31 FT. FROM North (north-south) (PROPERTY) (~~UNIT~~) LINE
~~WEST~~ 341 FT. FROM East (east-west) LINE OF QUARTER SECTION
~~WEST~~ 308 FT. FROM East (east-west) (PROPERTY) (~~UNIT~~) LINE

18. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary
19. WELL IS TO BE COMPLETED IN ~~SAND~~ Salina FORMATION
20. INTENDED DEPTH OF WELL: Approx. 1150'

21. PROGRAM OF CASING, SEALING, CEMENTING AND COMPLETING WELL

See attached write-up.

CASING IS NOT TO BE STRIPPED FROM THE HOLE AND NO CHANGE IS TO BE MADE IN THE PROGRAM OUTLINED ABOVE WITHOUT APPROVAL OF THE SUPERVISOR OF WELLS OR HIS AUTHORIZED REPRESENTATIVE

22. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒
23. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒
24. IF ANSWER TO NO. 22 ABOVE IS YES, DESCRIBE AND GIVE DISTANCE FROM LOCATION.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST FIELD OFFICE. *(See reverse side)*

25. ADDRESS CORRESPONDENCE AND PERMIT TO: Mr. T. J. Ruffing - 1300 S. Fort St., Detroit, Mich. 48217
26. PHONE: 843-9100

LEAVE BLANK
DATE ISSUED: 1-22-68
PERMIT NO.: 2216-2

27. OWNER OF LEASE RIGHTS: Marathon Oil Company
29. AUTHORIZED REPRESENTATIVE: [signature]

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

DISTRIBUTION
1. WHITE - LANSING
2. CANARY - CASHIER
3. BLUE - FIELD
4. GOLDENROD - FILE
5. GREEN - APPLICANT

Form Cons. 7-66 A 1000 Bdr. 7-66

STATE OF MICHIGAN

# DEPARTMENT OF CONSERVATION

No. 8938

SUPERVISOR OF WELLS

## PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST WHITE COPY OF PERMIT AT WELL LOCATION)

Permit No. 27162 Date Issued January 22, 1968

Permission is hereby granted to Marathon Oil Company
Owner

1300 S. Fort Street, Detroit, Michigan 48217
Address

Lease Name Marathon Oil Company (Woodhaven) Well Number LPG #4

To drill a well for LPG Storage

in the N½ of SE¼ of Sec. 22, T.4S., R.10E., City of Woodhaven, Wayne Co.

and located 781' from the north and 341' from the east line of quarter section

and located 331' from the north and 308' from the east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By Robert M. Acker

### SPECIAL REQUIREMENTS

### NOTICE

DRILLING PERMIT ISSUED on the basis of the drilling, casing and sealing program as outlined on the application for permit and subject to special requirements as set forth above. No change or alteration is to be made without the permission and approval of the Supervisor of Wells or his authorized representative.

DRILLING OPERATIONS ARE NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

### DEPARTMENT OFFICES

Lansing, Phone 517-373-1256
Mount Pleasant, Phone 517-773-8691
Cadillac, Phone 616-775-3181

Plainwell, Phone 616-685-8051
Imlay City, Phone 313-724-7015
Escanaba, Phone 906-786-0333

PERMITS MAY BE TRANSFERRED ONLY WITH THE PERMISSION OF THE SUPERVISOR OF WELLS

Recommended Drilling Program For Farnsher's Proposed Storage Caverns
At Forbart Station, Brownstone Township, Wayne County, Michigan

1. Move in North American Drilling Company's rotary rig No. 10 or comparable equipment.

2. Rig up and drill a 20" hole to 170 feet or deeper as required to completely penetrate the drift.

3. Run 170 feet of 16" O.D., H-40, 55#/ft. S.T. & C., casing and cement with 150 sacks of accelerated portland cement. The Texas pattern shoe and the bottom two joints of casing should be spot welded.

4. Install surface casing flange and blowout preventer.

5. After 12 hours W.O.C., drill out with a 15" bit. Brine mud will be used.

6. At approximately 975 feet reduce hole size to 7-7/8" diameter.

7. At approximately 990 feet or ten feet above the "B" salt as selected by the engineer or geologist on the well, begin coring operations. Cut three cores to include all of the salt and five feet of the under lying limestone. The entire core should be described and boxed for storage. Samples for analysis should be selected as desired.

   Upon completing the last core, circulate long enough to condition the hole for logging.

8. At this time, Schlumberger Well Logging Company should run a Formation Density - Gamma Ray Log and a Neutron Log.

9. The reduced hole from 975 feet to a point three feet beneath the top of the salt should be enlarged to 15". Top of the salt will be selected from the core and log data.

10. After circulating long enough to condition the hole, approximately 1000 feet of 11-3/4" O.D., 47#/ft., J-55, S.T. & C., 8 Rd. thd., casing should be run. Casing equipment will consist of a Baker guide, shoe, a Baker float collar, and three Baker centralizers. The first four joints are to be spot welded.

    Prior to running casing, all thread protectors are to be removed. The casing threads are then to be brushed and cleaned with solvent. After cleaning, dry the threads with clean rags and inspect each thread visually. After inspecting threads, dope with lubricant as provided. The thread protectors should be similarly cleaned and dried and replaced on the casing and not removed until the casing is run.

11. Upon landing the casing, circulation should be established and continued until 175 bbls. (150% of casing capacity) or more has been circulated. Halliburton should then cement the string with 500 sacks of salt saturated cement with 1.5% excess crushed salt blended into the dry mix. If enough brine storage is available on the rig, the plug should be pumped down with brine. This will facilitate testing prior to drilling out.

12. Hang casing in casing slips in full tension. Release rig or shut rig down for seven days W.O.C. The remainder of the completion can be done with the rotary rig or a workover rig as economics dictate.

13. After seven days W.O.C. test casing to 750 psi for fifteen minutes.

14. Drill out plug and ream hole to total depth, using a 10-5/8" bit.

15. A Birdwell 3-D Bond Log should then be run over the entire cased interval.

16. A string of 8-5/8" casing should then be run and suspended approximately 30 feet above the base of the salt. The lower portion of this string could be plastic or thin wall line pipe if desired. The lighter pipe would facilitate recovery in the event of caving.

17. A string of 4-1/2" O.D. casing should then be run and suspended approximately 1 foot above the base of the salt.

18. After tree is installed, release rig.

19. Additional pressure tests as desired can be run prior to initiating the washing operation.

ns. 7775

# WELL LOCATION REPORT

Permit No. 27162

Operator Marathon Oil Company

Farm Name Marathon Oil Company (Woodhaven) LPG #4

Notification 2/14/68 Office Invite to R.M. Acker. "Started drilling 7 A.M. this morning.

Nature of Location Open field

Condition of Pits 20 x 40 x 7 and 15 x 45 x 7

Distance from Water None involved.

Remarks 2/14/68 Drilling at 63'. No permit on location. Left blue copy. Crew didn't know which well they were on.

Approved by D. R. Brackenbury Date February 14, 1968

s. 7725

# WELL LOCATION REPORT

Permit No. 27162

Operator Marathon Oil Co.

Farm Name Marathon Oil Co. (Woodhouse) LPE #4

Notification 2/16/68 None. Times at the location the day they spudded.

Nature of Location open level field

Condition of Pits 50 x 8 x 6 and steel mud pit.

Distance from Water none involved

Remarks 2/16/68 Drilling at 65'. No permit on location. Drillers didn't know which well this was. Left them my blue copy of permit.

Approved by D. R. Brackenbury Date February 14, 1968

Cons. 7210

FIELD ACTIVITY REPORT

DATE Feb. 14 19 68 — FIELD NAME OR TYPE WELL Drilling

| PERMIT NO. | OPERATOR | LEASE OR WELL NAME & NO. | TOWNSHIP | COUNTY |
|---|---|---|---|---|
| 27162 | Marathon Oil Co. | Woodhaven LPG #4 | 2-Woodhaven | Wayne |

Nadco's Rig 7 spudded 2/14/68. Drift to 33', Det. River Lime 33', drilling in lime at 63' now. No permit on location. They didn't know which well it was. I left them my blue copy of the application.

FIELD ACTIVITY REPORT

DATE Feb. 27 19 68 — FIELD NAME OR TYPE WELL Drilling

| PERMIT NO. | OPERATOR | LEASE OR WELL NAME & NO. | TOWNSHIP | COUNTY |
|---|---|---|---|---|
| 27162 | Marathon Oil Co. | Woodhaven LPG #4 | 22-Woodhaven | Wayne |

Det. River lime and anhydrite 203, Sylvania sand 270-370, Bois Blanc lime and chert 370, Salina lime and anhydrite 537-855, Br. Lime 855, Lime and anhydrite 965, Salt 1040. 16" set at 156' and cemented with 225 sacks which did not circulate. B.O.P. tested to 600# on the 16' casing. All okay. 949.07 DF = 949.93 Strap. Cored 990-1153'. Logged hole at 1153'. Running 11 3/4" casing now. Will swing it at about 1040 and cement it there. Halliburton on hand to cement.

INSPECTOR D. R. Brackenbury

FIELD ACTIVITY REPORT

DATE Mar. 18 19 68 — FIELD NAME OR TYPE WELL Drilling

| PERMIT NO. | OPERATOR | LEASE OR WELL NAME & NO. | TOWNSHIP | COUNTY |
|---|---|---|---|---|
| 27162 | Marathon Oil Co. | Woodhaven LPG #4 | 22-Woodhaven | Wayne |

11 3/4" set at 1040 and cemented with 550 sacks of cement. TD 1153 on 2/25/68. Cement drilled out to 1153. 11 3/4" B.O.P. pressured up to 800 P.S.I. Okay. New plan is to run 2 strings of 4½" casing instead of the 8 5/8" and 4½". Waiting on spudder to run 4½".

FIELD ACTIVITY REPORT

DATE March 25 19 68 — FIELD NAME OR TYPE WELL Drilling

| PERMIT NO. | OPERATOR | LEASE OR WELL NAME & NO. | TOWNSHIP | COUNTY |
|---|---|---|---|---|
| 27162 | Marathon Oil Co. | Woodhaven LPG #4 | 22 Woodhaven | Wayne |

Called Tom Ruffing at Marathon's office. He said that their mean elevation grade is 595.2 but they will have flange elevation on all 3 wells in about a month. Ruffing's phone at the refinery is 313-843-9100 extension 314.

DORS 7231

INSPECTOR Donald Brackenbury

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

NORTH AMERICAN DRILLING COMPANY

The above information is complete and correct.

Signed ..... Leo W. Larimer

Date 10/1/68 ..... Jno. W. Larimer, Sec.-Treas.

DNR 7210

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

(Submit in Duplicate)

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

OCT 4 19

# 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)

LOCATE WELL ACCURATELY

Permit No. 27162 Deepening No.

Owner or Operator Marathon Oil Company

Address 1300 S. Fort St., Detroit, Michigan 48217

Well No. 4 Farm Marathon Oil Co. (Woodhaven) Corp.

Township City of Woodhaven County Wayne

Location N-1/2 SE-1/4 Sec. 22 Twp. 4S Range 10E Elevation 607.0 BT

Footage 781 ft. from North line and 341 ft. from East line of quarter section

Type of well LPG Storage (OIL, GAS, BRINE DISPOSAL, DRY HOLE) Total depth 1153 Completed in Salt & Dolomite

Name of producing formation Salt & Dolomite Top of formation

Date drilling begun 2/14/68 Date drilling completed 2/26/68 Date well completed 3/7/68

Drilling contractor North American Drlg. Co. Address Mt. Pleasant, Michigan

## WATER ZONES

| Name | From | To | Amount |
|---|---|---|---|
| | | | |

## OIL OR GAS ZONES

| Name | From | To | Amount |
|---|---|---|---|
| | | | |

## DEVIATION SURVEY

| Run at | Degrees |
|---|---|
| 125 | 1 |
| 270 | 1 |
| 420 | 1 |
| 500 | 0 |
| 600 | 0 |
| 700 | 0 |
| 820 | 0 |
| 949 | 0 |

## CASING AND CEMENTING

| Size | Depth Set | Cement | Amt. Pulled |
|---|---|---|---|
| 16" | 156' | 225 sks | None |
| | By Howco | | |
| 11-3/4" | 1040 | 550 " | None |
| | Set W/ Salt | By Howco | |

## STEEL LINES RUN

| Run at | Connected to | Run by |
|---|---|---|
| | | |

## PERFORATIONS

| Date | From | To | No. Holes |
|---|---|---|---|
| | | | |

## ACID OR SHOOTING RECORD

| Date | From | To | Gals. Acid or Qts. Nitro |
|---|---|---|---|
| | | | |

Rotary tools from 0 feet to 1153 feet. Cable tools from — feet to — feet.

Natural initial production first 24 hours — Bbls. After acid or shot — Bbls.

taken from the daily drilling repo

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

The above information is complete and correct

Date 10/1/68

NORTH AMERICAN DRILLING COMPANY

Signed Lee W. Larimer

Lee W. Larimer, Sec.-Treas.

Form 7210

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

(Submit in Duplicate)

DIVISION - BOX 30028 - LANSING, MICHIGAN 48909

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

| FROM | TO | FORMATIONS (TYPE, COLOR, HARDNESS) |
|---|---|---|
| ) | | |
| 0 | 33 | Drift (clay) |
| 33 | 203 | Gray lime |
| 203 | 270 | Gray lime & anhydrite |
| 270 | 370 | Gray sand |
| 370 | 406 | Gray lime & chert |
| 406 | 468 | Brown lime & gray sand |
| 468 | 537 | Brown lime |
| 537 | 855 | Brown lime & anhydrite |
| 855 | 950 | Brown lime |
| 950 | 990 | Brown lime & anydrite |
| 990 | 1050 | Core #1 |
| 1050 | 1109 | Core #2 |
| 1109 | 1153 | Core #3 |
| | 1153' | TD |

2/26 & 2/27/68
Reamed core hole to 15" & ran & cemented 11-3/4" csg.

3/6/68
Installed 11-3/4" csg. head & prepared to drill out cement.

3/7/68
Drilled out cement & cir. hole 2 hrs.

| FROM | TO | FORMATION |
|---|---|---|

(IF WELL WAS CORED, ATTACH CORE DESCRIPTION)

DRILL STEM TEST DATA

DATE

# MAGNOLIA PETROLEUM CO. COMPANY
# HISTORY OF OIL OR GAS WELL

FIELD LPG

WELL NO. 4 LPG LEASE Earbert Station SEC. 22 TWP. 4 S R. 10 E

STATE Michigan COUNTY Wayne

Elev.

Measurements Taken From: Top of Oil Bushing Elev. ; Top of Rotary Table Elev. ; Gr. or Map Elev.

History Prepared by P. H. DuVal, Jr.

Title Area Petroleum Engineer

It is of the greatest importance to have a complete history of the well. Use this form in reporting the history of all important operations of the well, together with the dates thereof, including size of hole, size and number of bits, complete description of casing, cementing, fishing or drilling difficulties, surveys, oil tests, all completion operations and procedure, etc.

| DATE | |
|---|---|
| 2-11-68 | Digging pits. Repairing rig pump. |
| 2-12-68 | Raised Derrick & rigged up. |
| 2-13-68 | Dug rat hole. Welder working on rig. |
| 2-14-68 | Spudded Well with 20" bit. Drilled from surface to 113 ft. From surface to 33 KB is drift. Found limestone at 33 KB. |
| 2-15-68 | Drilled 113 KB to 160 KB. Ran inclinometer at 125 KB. Dev. 1°. At 160 KB, circulated for 30 minutes, pulled drill pipe to run 16" surface casing. Casing would not go below the drift. Two joints of casing pulled and stood in derrick. Rigged 22" reamer to open hole. |
| 2-16-68 | Reamed hole to 75 KB w/ a 22" reamer. Circulated 30 minutes and came out to run surface casing. Ran 5 joints (154.95') of 16" H-40, 55 #/ft, 8 rd, ST&C, condition I casing. A Baker Texas pattern guide shoe was run. Baker "H" centralizers were placed on the first, second, and third joints.<br><br>The casing was cemented with 255 sacks of regular cement. Cement did not return to the surface. Plug down at 8:30pm. Twenty feet of cement was left in the casing. Plug location was check with Halliburton's Wire line. |
| 2-17-68 | W.O.C. Dug cellar and installed casing flange. Installed blowout preventer and tested casing and preventers to 600 psig. Began drilling out plug at 9:45pm. with a 15" bit. Drilled to 160 KB. |
| 2-18-68 | Drilled 160 to 260 KB. Lime and Anhydrite. Ran Inclinometer and found deviation of 1° at 200ft. |
| 2-19-68 | Drilled 260 to 406 KB. Sand, Lime and Chert. |
| 2-20-68 | Drilled 406 to 537 KB. Ran Inclinometer at 420 KB and 500 KB and recorded 3/4° and 3/4° respectively. Drilling Lime and Sand. |
| 2-21-68 | Drilled 537 KB to 663 KB. Ran Inclinometer at 600 ft. Measured 1/2° deviation Lime and Anhydrite. |
| 2-22-68 | Drilled 663 to 780 KB. Ran Inclinometer. 3/4° deviation at 700 KB. Lime and Anhydrite. |
| 2-23-68 | Drilled 780 to 935 KB. Ran Inclinometer 3/4° deviation at 820 KB. |
| 2-24-68 | Drilled 935 to 950 KB. At 950 KB, reduced hole size to 7 7/8" in preparation to core. Inclinometer at 940 KB indicated 3/4° deviation. Circulated one hour to mix 125 SX additional salt to get brine thoroughly saturated. Strapped pipe out of hole. Picked up Christiansen Core Barrel and went in to cut core # 1. Cored 990 KB to 1014 KB. |
| 2-25-68 | Continued coring 1014 KB to 1050 KB and pulled core No. 1 Cut 60' rec. 60'.<br>Cored 1050 KB to 1109 KB and pulled core No. 2 Cut 50' rec. 59'.<br>Cored 1109 KB to 1154 KB and pulled core No. 3 Cut 45' rec. 45'.<br>All three cores were described and boxed. Laid down core barrel. Boxed cores were taken to refinery for storage. |
| 2-26-68 | A Gamma Ray - Sidewall neutron log, a formation density log and an open hole directional survey were run by Schlumberger. A 15" bit was run to ream out the rat hole left by the core barrel. Reamed to total depth of 1153 KB. Pulled pipe out of hole and closed blind rams. |

DATE 3-8-68

# MARATHON OIL COMPANY
## HISTORY OF OIL OR GAS WELL

FIELD IPG Storage

WELL NO. 4 IPG LEASE Cobart Stolier

STATE Michigan COUNTY Macomb

SEC. 22 TWP. 6 S R. 10 E

MEASUREMENTS TAKEN FROM

Floor or Stump ELEV.
Top of Rotary Table ELEV.
Top of Casing ELEV.

HISTORY PREPARED BY P. H. DuVal, Jr.

TITLE Area Petroleum Engineer

It is of the utmost importance to have a complete history of the well. Use this form in reporting the history of all important operations on the well, including the dates thereof, including size of hole, size and number of bits, complete description of casing, cementing, fishing or other operations, unusual oil tests, oil completion operations and procedure, etc.

| DATE | |
|---|---|
| 2-27-68 | Ran 34 joints (1050.40 ft) of J. & L., 11 3/4", 47#/ft., J-55, Casing and set at 1049 KB. Cemented with 550 sacks of salt saturated cement, W/1% excess crushed salt. 1/4#/sk of flow seal was added to the first 150 sacks of cement to plug off the Sylvania Sand. Cement circulated to the surface. Casing was equipped w/a Baker Guide Shoe, Float collar and 3 centralizers. |
| 2-27-68 thru 3-5-68 | 7 Days WOC |
| 3-6-68 | Pressured up on 11 3/4" casing to 800 psig for 30 minutes. No leaks. Removed blowout preventer, cut off casing and installed well head. Rigged up to drill out. |
| 3-7-68 | A 10 3/8" bit was used to drill out shoe and clean hole out to total depth. Hole was circulated clean with brine. Pulled drill pipe and began tearing down rig for move to next well. This well is now ready for installing the wash string. |
| 3-8-68 | Finished tearing down rig. |

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

DEQ

**APPLICATION TO:**

☒ **CHANGE WELL STATUS OR**

☐ **PLUG AND ABANDON WELL**

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, 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 or Gas Well ☐ Part 625 Mineral Well

| | |
|---|---|
| Permit number: 27162 | Type of well: LPG Storage |
| API number: | |
| Name and address of permittee: Marathon Pipe Line LLC, 539 South Main Street, Findlay, OH 45840 | |
| Change of well status requested to: ☐ Plug back ☐ Perforate ☐ Temporarily abandon ☐ Convert to _____ ☒ Other Upgrade well | Well name and number: Marathon Pipe Line LLC (Woodhaven) LPG #4 |
| Last production/injection rate and type of fluid: Butane. Rate unknown, have not used well in 20+ years | Well location: N1/2 1/4 of SE 1/4 of 1/4 Section 22 T 4S R 10E |
| Brief description of project: Cut off 15' of production casing at bottom of well. Chanoe out brine strino and reduce depth to 1057'. Conduct MIT | Township: Brownstown / County: Wayne County |
| | Date drilling completed: 1-1968 / Date last produced/utilized: Unknown - Early 1980. |
| Work to be done by: PB Energy Services - 11757 Katy Freeway, Suite 600, Houston TX 77079 | Starting date: 5/25/07 |

**CASING AND CEMENTING RECORD**

| Hole dia | Casing dia & wt/ft | Depths set | Cement quantity, type, additives | Cement top | Perforations |
|---|---|---|---|---|---|
| 16 in | 11 5/8 in | 160 ft | Class A (w.CaCL2). Estimated quantity 130 bags | TOC | Unkown |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Formation record (formation and depth of top, oil, gas and water shows, etc.):

| formation | depth | Silurian | 586 |
|---|---|---|---|
| Glacial Drift | 0 - 90 | Salina "G" | 720 |
| Detroit River | 135 | FED | 913 |
| Dolmite | 180 | "C" | 980 |
| Sylvania | 295 | "B" Dolomite | 1061 |
| Bois Blanc | 305 | "B" Salt | 1125 |
| Sandstone | 345 | Sal. "A" | 1149 |
| Dolomite | 470 | | |

Detail proposed procedures:

Marathon Pipe Line (MPL) is upgrading existing well LPG #4 to active status. In order to do so, MPL is planning to cut of 15' of production casing at the bottom of the well casing to allow for more accurate sonar casing surveys in the future. In addition, MPL is hanging a new brine string to a depth of 1057 feet or approximately 105 feet higher than the original to better facilitate product removal and cavern operations.

MPL will also be conducting a MIT on the cavern once said upgrades have been completed.

Name/signature (authorized representative): Thomas A. Ross — THOMAS A. ROSS

Date: 5-25-07

FOR OFFICE OF GEOLOGICAL SURVEY USE ONLY

DEQ additional requirements: Please notify this office, 517-335-6253, prior to commencement of MIT test

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☐ Yes ☐ No ☒ Not applicable Production tests to commence within 10 days of completion and to be filed

☐ Yes ☒ No Service company records are to be filed

| Approved by DEQ: | Office: | Approval date: | Termination Date: |
|---|---|---|---|
| Mike Dangelmeyer | LANSING DIST. | 6/15/2007 | 6/15/2008 |

Submit original and three (3) copies of this application to the District Office within 60 days ofchange of well status

Note: Three copies of Record of Well Plugging or Change of Well status (EQP 7200-8) and any requested service company records are to be filed within 60 days of completion at the District Office

Environmental, Safety and Regulatory Compliance

**Marathon Pipe Line LLC**

539 South Main Street
Findlay, OH 45840
Telephone: (419) 421-3295

May 25, 2007

Walt Danyluk
District Supervisor
Michigan DEQ – Office of Geological Survey
Lansing District Office
525 West Allegan Street
PO Box 30242
Lansing, MI 48909-7742

Re: Application to Change Well Status
Well Permit No. 27162 &
Well Permit No. 28,435

Dear Mr. Danyluk:

Per our conversation of 5-25-06, please find enclosed the Michigan DEQ Form 7200-6, Application to Change Well Status for the Marathon Pipe Line LLC (MPL) Woodhaven Wells referenced above. Note that the MPL Well References are LPG Cavern #4 and LPG/Brine Cavern #7 respectively.

Please note that we are changing the well status enough to warrant submittal of Form 7200-6 for both wells. In both wells MPL will be removing a 15 ft section of production casing from the bottom elevation of the cavern production casing. This removal is to facilitate a more accurate sonar reading as the casing extends into the cavern itself, thus interfering with the sonar readings for the area hidden above the well casing.

In addition, MPL will be hanging two new brine strings that will be set at approximately 100 ft higher in elevation off the cavern floor than the original stringer depth.

MPL will be conducting a MIT on both caverns upon completion of the re-work and prior to bringing back into storage service. Please let me know if you wish to observe the MIT on either or both caverns.

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JUN 07 2007
GEOLOGICAL SURVEY

Please feel free to contact me at 419-421-3295 with questions or concerns.

Regards,

Thomas A. Ross

Thomas A. Ross
HES Professional
Marathon Pipe Line LLC

/tar

Enclosures

Cc: Cavern update file
B. Lewandowski – Project Lead

RECEIVED

JUN 07 2007

GEOLOGICAL SURVEY

310007

MARATHON OIL COMPANY

APR 6

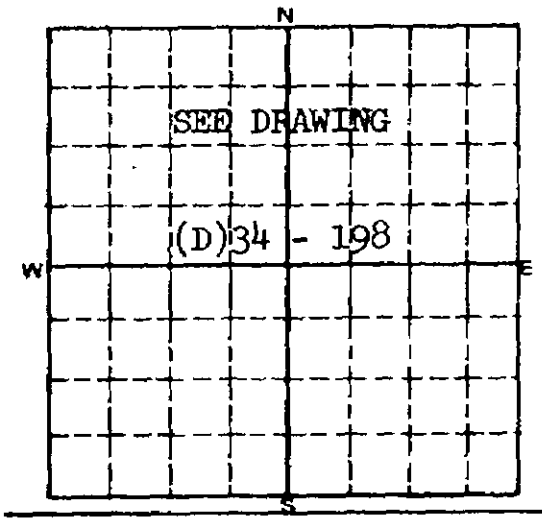
# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, GAS OR L.P.G. STORAGE OR FOR SECONDARY RECOVERY

Under Authority of Act 61, P.A. of 1939, As Amended.

MAIL TO:
OIL AND GAS SECTION
GEOLOGICAL SURVEY DIVISION
STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
LANSING, MICHIGAN 48926

*See Reverse Side Before Filling Out This Application*

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT-640 MILES




FOR DIRECTIONALLY DRILLED HOLE SEE INSTRUCTIONS ON REVERSE SIDE.

1. APPLICATION TO DRILL A WELL FOR: L.P.G., Brine or other hydrocarbon Storage
2. DATE: 4-19-76
3. FEE ENCLOSED: $ 100
4. LESEE (OWNER OF LEASE RIGHTS): Marathon Oil Company
5. PERMANENT ADDRESS: 1300 S. Fort St., Detroit, Michigan 48217
6. PHONE: VI 3-9100
7. LESSOR (FULL NAME OF OWNER OF MINERAL RIGHTS): Marathon Oil Company
8. WELL NO.: BR #2
9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER): Same
10. ADDRESS: Same
11. PHONE:
12. DRILLING CONTRACTOR: North American Drilling
13. ADDRESS: Mt. Pleasant
14. PHONE: 773-3945
15. SURFACE LOCATION: ~~NW~~ N½ ~~NW~~ SE ¼, SECTION 22 T 4 S R 10 EAST
16. TOWNSHIP: City of Woodhaven
17. COUNTY: Wayne

18. LOCATE WELL IN TWO DIRECTIONS FROM NEAREST LINES OF QUARTER SECTION AND UNIT LINES. (SURFACE LOCATION)

1185.53 FT. FROM North (north-south) LINE OF QUARTER SECTION
737.88 FT. FROM North (north-south) UNIT LINE
670.01 FT. FROM East (east-west) LINE OF QUARTER SECTION
625.06 FT. FROM East (east-west) UNIT LINE

19. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary
20. FORMATION IN WHICH WELL IS TO BE COMPLETED: Salt Saline
21. INTENDED DEPTH OF WELL: Approx. 1150 Ft.

22. PROGRAM OF CASING, SEALING, CEMENTING AND COMPLETING WELL (SEE REVERSE SIDE)

See Attached Write Up.

**CASING IS NOT TO BE STRIPPED FROM THE HOLE AND NO CHANGE IS TO BE MADE IN THE PROGRAM OUTLINED ABOVE WITHOUT APPROVAL OF THE SUPERVISOR OF WELLS OR HIS AUTHORIZED REPRESENTATIVE**

**APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND RULES PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS, BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST FIELD OFFICE.** *(See reverse side)*

23. SEND CORRESPONDENCE AND PERMIT TO: Mr. C. H. Grenier, 1300 S. Fort St., Detroit, Michigan 48217
24. PHONE: 313-843-9100
25. ADDRESS

| LEAVE BLANK | |
|---|---|
| DATE ISSUED | PERMIT NO. |
| 5-25-76 | 31,007 |

26. OWNER OF LEASE RIGHTS (PRINT): Marathon Oil Company
27. OWNER OR REPRESENTATIVE (Signature): C H Grenier

FOR CASHIER'S USE ONLY. DO NOT WRITE IN THIS SPACE

DISTRIBUTION
1. WHITE.LANSING
2. CANARY.CASHIER
3. BLUE.FIELD
4. GOLDENROD FIELD
5. GREEN.APPLICANT

R 7207
Rev. 7/73

## INSTRUCTIONS FOR PREPARING APPLICATION FOR PERMIT

1. Use form R-7202. (Five copies in set. Green will be returned when permit is issued.)
2. WELL LOCATION SURVEY. Use form R-7208. Submit four copies. (Surveyors plat may be substituted for form R-7208.) Submit supplemental information and maps if lakes, streams, swamps, buildings, roads, powerlines, etc., are within one quarter mile of location.
3. ENVIRONMENTAL IMPACT STATEMENT. Use form R-7616 or equivalent. Submit four copies. (See instructions and guidelines furnished with forms.)
4. WELL ELEVATION. Furnish with well location survey or submit certification that elevation will be run and submitted within fifteen days after drilling commences.
5. SURETY BOND. Proper bond coverage must be submitted with application or must have been filed previously. (See General Rules for details.)
6. PERMIT FEE. Must accompany application for permit. (See statute for applicable fee.) (Make check payable to STATE OF MICHIGAN.)

### IF THIS APPLICATION IS FOR A HOLE TO BE DIRECTIONALLY DRILLED, SUBMIT THE FOLLOWING SUPPLEMENTAL INFORMATION:

(Four copies required.)

1. Give geographical description of intended bottom hole location.
2. Give correct footage measurements of intended bottom hole location from the NEAREST quarter section lines and from NEAREST unit lines.
3. Give RADIUS of intended bottom hole target area.
4. SUBMIT DRILLING OR ENGINEERING PROGRAM COVERING THE DRILLING OF THIS HOLE: Include the following information: Different hole sizes and depths to be drilled. Casing sizes, weights, grades and casing points. Amount and type of cement to be used. Type and amount of additives if used. Specify deviation kick-off points, degrees of deviation intended, actual intended depth of well bore, and proposed True Vertical Depth of bottom hole. Show laterial distance between surface location and bottom hole location of well bore. Indicate type, weights and viscosities of drilling fluids to be used prior to penetrating known oil and gas producing zones. Give name and address of Engineering Company who will direct the deviation of the well bore. List blowout prevention control equipment to be used; give size, type, pressure ratings, and order of assembly in stack. Indicate intended well logging program, auxillary equipment to be used, if any, and general information and remarks not covered by the above.

### NOTICE

THE SUPERVISOR OF WELLS IS PROHIBITED BY LAW FROM ISSUING A DRILLING PERMIT TO ANY OWNER OR OPERATOR WHO IS IN VIOLATION OF ANY OF THE PROVISIONS OF ACT 61, P.A. 1939, AS AMENDED, OR ANY OF THE RULES OR ORDERS PROMULGATED THEREUNDER

### FIELD OFFICES

| Lansing | Mt. Pleasant | Imlay City |
|---|---|---|
| Stevens T. Mason Bldg.,<br>Phone (A/C 517) 373-1256 | 204 Court Street<br>Phone (A/C 517) 773-9965 | P.O. Box 218<br>Phone (A/C 313) 724-2015 |
| **Plainwell** | **Cadillac** | **Gaylord** |
| P.O. Box 355<br>Phone (A/C 616) 685-6851 | P.O. Box 629<br>Phone (A/C 616) 775-9728 | P.O. Box 576<br>Phone (A/C 517) 732-5803 |

The Field Office for the area in which the well is to be drilled must be notified when drilling operations are to commence. (See list of Field Offices above.)

STATE OF MICHIGAN

# DEPARTMENT OF NATURAL RESOURCES

SUPERVISOR OF WELLS

## PERMIT TO DRILL

(POST WHITE COPY OF PERMIT AT WELL LOCATION)

№ 3158

Permit No. 31,007 Date Issued May 25, 1976

Permission is hereby granted to Marathon Oil Company
Owner
1300 S. Fort Street, Detroit, Michigan 48217
Address

Lease Name Marathon Oil Company Well Number BR#2

Location N½ SE¼ Section 22, T.4S., R.10E., City of Woodhaven, Wayne County

Footages 1185.53' from north and 670.01' from east line of quarter section
737.88' from north and 625.06' from east unit line

Type of Well LPG, Brine or ~~other hydrocarbon~~ storage, Kind of Tools Rotary Objective Formation Salt Saline Intended Depth 1150' Appx.

This permit is issued subject to the provisions of Act 61, P.A. 1939, as amended, and rules, requirements, or orders issued by the Supervisor of Wells and Department of Natural Resources.

SUPERVISOR OF WELLS

By V. T. Sargent

## CASING AND SEALING REQUIREMENTS

Set 60' of 16" H-40, 55# conductor pipe, circulate cement to the surface.
Set 1000' of 11 3/4" O.D., 47#/ft., J-55 with 600 sacks of cement.
Run 8 5/8" casing to top of salt (approx. 1020')
Run string of 4½" casing to bottom of salt (approx. 1150').

### NOTICE

IT IS FURTHER MADE A REQUIREMENT OF THIS PERMIT that the applicant give notice to the Public Utilities in accordance with Act 53, P.A. 1974 C.L. 460.701 to 460.718 and comply with each of the requirements of the act.

DRILLING PERMIT ISSUED on the basis of the drilling, casing and sealing program as outlined on the application for permit and subject to requirements as set forth above. No change or alteration is to be made without the permission and approval of the Supervisor of Wells or his authorized representative.

DRILLING OPERATIONS ARE NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site. The nearest field office of the Department of Natural Resources must be notified prior to the commencement of drilling, deepening, reworking, and plugging.

### DEPARTMENT OFFICES

Lansing, Phone 517-373-1256
Mt. Pleasant, Phone 517-773-9965
Cadillac, Phone 616-775-9728
Roscommon, Phone 517-275-5151
Grayling, Phone 517-348-6371
Plainwell, Phone 616-685-6851
Imlay City, Phone 313-724-2015
Gaylord, Phone 517-732-1522
Region III, Lansing, Phone 517-373-1235

R 7209-A 9/75

Sam

Sid Blun of Marathon Oil
Detroit
313-843-9100 ext: 375

Regards to a permit for drilling a cavern in Woodhaven

STATE OF MICHIGAN

NATURAL RESOURCES COMMISSION

CARL T. JOHNSON
E. M. LAITALA
DEAN PRIDGEON
HILARY F. SNELL
HARRY H. WHITELEY
JOAN L. WOLFE
CHARLES G. YOUNGLOVE

WILLIAM G. MILLIKEN, Governor

# DEPARTMENT OF NATURAL RESOURCES

STEVENS T. MASON BUILDING, BOX 30028, LANSING, MICHIGAN 48909
HOWARD A. TANNER, Director

January 18, 1977

Marathon Oil Company
1300 S. Fort Street
Detroit, Michigan 48217

Attention: Mr. C. H. Grenier

WOODHAVEN

Re: Marathon Oil Company, Marathon Oil Co. BR #2,
N½ SE¼ Section 22, T.4S., R.10E., City of
Woodhaven, Wayne County.
Permit Number 31007

Gentlemen:

As set forth in Rule 112 of the General Rules Governing Oil and Gas Well Operations in the State of Michigan, this is to advise that Permit 31007 issued on May 25, 1976 has terminated and has been cancelled effective November 26, 1976.

Should you, at a later date, decide to drill this location, it is required that you submit a new application and permit fee and obtain a new drilling permit.

Very truly yours,

R. M. Acker

R. M. Acker, Chief
Oil and Gas Section

GEOLOGY DIVISION

RMA/jjk
cc:- Sargent
Ells
Alguire
Kuehner
Manners

MICHIGAN
THE GREAT LAKE STATE

R1026 10/76

APR 23 1976

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION

# SURVEY RECORD OF WELL LOCATION

*(Submit in Triplicate with Application for Permit to Drill a Well for Oil, Gas, Geological Test, Brine Disposal, or Key Well for Secondary Recovery)*

LESSEE (OWNER OF LEASE RIGHTS): MARATHON OIL COMPANY

LESSOR (OWNER OF MINERAL RIGHTS): MARATHON OIL COMPANY

WELL NO.: BR #2

LOCATION: N½ OF S.E. ¼ SECTION 22 T. 4 S R. 10 EAST

TOWNSHIP: BROWNSTOWN

COUNTY: WAYNE

_____ Quarter Section (160 acres more or less)

N

(Scale of Plat – 1 inch equals 660 feet)

1. Locate well site and show acreage in lease.

2. Locate well in two directions from nearest quarter section lines and from property or unit lines.

   1185.5 ft. from NORTH (north-south) line of Quarter Section

   670 ft. from EAST (east-west) line of Quarter Section

   737.9 ft. from NORTH (north-south) PROPERTY (property-unit) line.

   625 ft. from EAST (east-west) PROPERTY (property-unit) line.

3. Describe wellsite marker. Tell how it can be reached or show access route on plat.
   SEE DRAWING D34-198

4. Describe land and cover type. (farmland, grassland, brush, timber, etc.)
   GRASSLAND

5. On plat locate, identify, and show distances to all roads, power lines, residences, farm buildings, and other structures within 300 feet of the stake. NOT APPLICABLE

6. On plat locate, identify, and show distances to all lakes, streams, swamps, drainage-ways, etc. within 300 feet of the stake. NOT APPLICABLE

7. If well site is on state-owned lands, show lakes and principal streams within one-quarter (¼) mile of stake. (Attach supplemental plat if necessary) NOT APPLICABLE

8. On the **ENVIRONMENTAL IMPACT STATEMENT** applicant shall describe the structures and surface features shown on this plat, and shall outline his program for minimizing hazardous situations that relates to them. These are in addition to whatever impact the well site might have on other values.

| NAME OF INDIVIDUAL WHO SURVEYED WELL SITE | DATE | TITLE |
|---|---|---|
| K. O. Heath | April 19, 1976 | Drafting Supervisor |

ADDRESS: 1300 S. Fort St., Detroit, MI 48217

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

| SIGNATURE (LESSEE OR AUTHORIZED REPRESENTATIVE) | ADDRESS (IF DIFFERENT THAN LESSEE) | DATE (MONTH, DAY, YEAR) |
|---|---|---|
| C. H. Grenier | | |

R 7208 REV. 12/72

APR 23 1976

RECOMMENDED DRILLING PROGRAM FOR MARATHON'S CAVERN BR #2 AT WOODHAVEN

1. Move in North American Drilling Company's rotary rig or comparable equipment.

2. Rig up and drill a 20" hole to 60' or deeper, from ground level, as required to completely penetrate the drift. Ream hole to 22".

3. Run 60' of 16" O.D., H-40, 55 lbs. per foot S.T.C., casing and cement with 60 sacks of accelerated portland cement. Texas pattern shoe should be spot welded to the bottom of casing.

4. After 12 hours minimum W.O.C., drill out with 15" bit.

5. Install surface blow-out preventer. Test preventer.

6. Go to total depth 1150 K.B. with 15" drill.

7. At this time Schlumberger Well Logging Company, will run a formation Density-Gamm a Ray Log and a Neutron Log.

8. After circulating long enough to condition the hole, approximately 1,000' of 11-3/4" O.D., 47 lbs. per foot, J-55, S.T. and C., eight round thread, casing should be run. Casing equipment will consist of a Baker guide, shoe, a Baker float collar, and five Baker centralizers. Prior to running casing, all thread protectors are to be removed. The casing threads are then to be brushed and cleaned with solvent. After cleaning, dry the threads with a clean rag and inspect each thread visually. After inspecting threads, dope with lubricant as provided. The thread protector should be similarly cleaned and dried and replaced on the casing and not removed until the casing is run.

9. Upon landing the casing, mud circulation should be established and continued until 175 bbl. (150% of casing capacity) or a more has been circulated. Halliburton should then cement the string with 600 sacks of cement. Use fresh water or brine to pump the plug down. This will facilitate testing prior to drilling out, put $\frac{1}{4}$# per sack flo-seal for the first 150 sacks of cement.

10. Release rig or shut rig down for approximately $2\frac{1}{2}$ days W.O.C. The remainder of the completion can be done with the rotary rig or a work-over rig as economics dictate.

Cavern BR #2 at Woodhaven (Cont'd)

11. After 2½ days W.O.C. weld casing flange to 11 3/4 casing and test casing to 750 PSI for 15 minutes.

12. Drill out plug and ream hole to total depth, using a 10-5/8" bit.

13. Run 8 5/8" casing to top of salt (approximately 1020').

14. Run string of 4½ casing to bottom of salt (approximately 1150').

15. After tree is installed, release rig.

16. Additional pressure tests as desired can be run prior to initiating the washing operation.

OIL AND GAS OPERATIONS
STATE OF MICHIGAN
ENVIRONMENTAL IMPACT ASSESSMENT

(Note: Type or print. It is not intended that the items below be answered in the space provided. The applicant should use as many pages or attachments as may be needed to fully assess the environmental impact of the proposed well.)

Well Identification

Name of Applicant: Marathon Oil Company
Address: 1300 S. Fort St., Detroit, Michigan 48217
Well Name and Number: Brine Recovery #2, BR #2
Location: City of Melvindale

I. Description of Project:
Drill and develop underground storage cavern in the Salina Formation for storage of brine, LPG and other hydrocarbon liquids.

II. Environmental Impact Assessment:
See Attachment II

III. Possible Alternatives to the Proposed Well Location:
As described in Attachment II, there are no adverse environmental effects, therefore, there is no need for an alternative.

IV. Any Irreversible and Irretrievable Commitment of Resources:
The surrounding environment will not be affected by the operation.

V. Summary:

No detrimental environmental effects exist.

Applicant's Representative

C H Grenier 4/20/76
Signature Date

Rev. 1/75

ATTACHMENT II

Environmental Assessment

The drilling and developement of the storage cavern will have no effect on wild life or future population patterns as it is located in a zoned industrial area. The 100' x 50' area required for drilling will be leveled and graded. No additional access roads will be needed for this project.

There will be no effect on urban population or development. The well site is in a fenced location soley owned by Marathon Oil and is not accessible to the public. Continuous surveillance of this property is maintained by Marathon on a 24-hour 7-day a week basis. There will be no effect on life systems.

We know of no adverse consequences to the environment.

Michigan Refining Division

Marathon Oil Company

1300 South Fort Street
Detroit Michigan 48217
Telephone 313/843 9100

April 20, 1976

APR 23 1976

Mr. V. F. Sargent
Supervisor
Oil and Gas Section
State of Michigan
Department of Natural Resources
Lansing, Michigan 48926

Dear Mr. Sargent:

Enclosed is application for Permit to drill and develop an underground storage cavern for brine and hydrocarbon storage in the City of Woodhaven, Wayne County.

Also enclosed are:

1. Recommended Drilling Program
2. Well Location Drawing D34-198
3. Environmental Impact Statement
4. Survey Record of Well Location

Yours very truly,

C H Grenier

C. H. Grenier
Senior Refining Engineer

Enclosures

CHG/lmz

CC: MANNERS
ALGUIRE
REGION III (McGregor)
ACKER
ELLS

(THIS IS SUPPLEMENTAL DATA REQUESTED FROM MARATHON OIL CO.)

Michigan Refining Division

Marathon Oil Company

1300 South Fort Street
Detroit Michigan 48217
Telephone 313/843 9100

MAY 19 1976

May 17, 1976

CAVERN

Department of Natural Resources
Geological Survey
State of Michigan
Lansing, Michigan 48926

Attention: V. F. Sargent

Subject: Supplemental Data For Our Brine Recovery Cavern #2

Gentlemen:

In response to your memo of 5/14/76, we intend to develop a brine recovery cavern to a capacity of 500,000 Bbls. to a maximum of 1,000,000 Bbls.

Because of the relatively thin layer of salt, the cavern shape is generally formed as a cylinder in the 100' thick salt section.

Our source of wash water is the API Effluent of the Mobil Oil Co. located at West and Allen Roads. This water has been treated and would normally be discharged to the river.

Any excess brine not needed for the operation of the existing (5) caverns (which currently store LPG) is disposed of in a disposal well which has capabilities of injecting into the [redacted], the Theresa Eau Clair (3200'), and the Mt. Simon (3600').

No Knowledge

Upon completion of the cavern development, a "Reda" type pump will be installed inside 8-5/8" casing which will be drilled (as is the case in our other caverns) to the bottom of the rubble pile.

Two or three thousand barrels of propane will be stored in the cavern to keep a one or two pound pressure on the cavern when it is emptied.

Please be advised that our plans to commence immediate drilling have not been shelved, and await only final approval from our home office in Findlay, Ohio.

If we can be of any further assistance to expedite the securing of this permit, please let us know.

Yours truly,

C H Grenier

C. H. Grenier
Senior Refining Engineer

CHG/lmz

TO:

C. H. Grenier
Marathon Oil Co.
Detroit, Mi.
Woodhaven Storage

FROM:

V F Sargent, DNR
Geological Survey
Lansing

SUBJECT:

Need of supplemental data MARATHON CAVERN - Woodhaven -

OUR JOB NO.

DATE OF MEMO

5/14/76

## MESSAGE

I talked to Ollie in regards to the permit tag (whether to mail it to you or send it to him) and was informed that plans to commence immediate drilling have been shelved. Now that we have some slack time before you will need the permit, would you supplement your Impact Assessment Statement by covering the cavern washing and solution brine disposal phase of the operation. Data such as intended cavern size and capacity and shape; source of wash water; disposition of solution brine returning from the cavern wash and how you intend to equip the well bore and cavern to make it operational subsequent to the wash job will be helpful and hopefully satisfy some of the questions which have tossed my way since your application came in. I intended to give Ollie the permit and get the above information from you later but now that we have time, I'll hold up the permit so our file will be complete when it's issued.

SENDER — DO NOT WRITE BELOW THIS LINE

SIGNED Sargent

## REPLY

SIGNED

DATE

FOLLOW-UP

SENDER — Retain part 2 for your follow-up, send parts 1 and 3 to addressee
RECIPIENT — Retain part 1 and return part 3

Sam:

This application is for a Cavern in the Woodhaven area. Note No.1 of application. If seems they intend to make a "multi-use" of this one.

DO YOU SEE ANY REASON WHY I CAN'T GO AHEAD AND ISSUE THIS PERMIT?

Your comments/ input, please.

Sarge

Ollie 160-1-773-3945

Permit should be issued subject to revision or revocation upon adoption of proposed regulations of the Environmental Protection Agency - State Underground Injection Control Program (40 CFR Part 146)

---

Also, the E.I.A. doesn't discuss pertinent operational things like how they will dispose of waste brine during washing operations, etc. Will it be stored in a pit? BDW? Seems way short on details. Sam.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

4/28/76

TO: Roger M. Rasmussen, Manager, Region III

FROM: V. F. Sargent, Geologist & Head, Regulatory Control Unit, Geological Survey Division

SUBJECT: MARATHON OIL CO., Marathon Oil Co. BR#2, SE, Sec.22, T4S, R10E., City of Woodhaven - Wayne Co.

(Cavern for LPG or Brine or other Hydrocarbon products. Seemingly undecided at this time. May be used for any one or for each as time goes by.)

Enclosed herewith are copies of the application, well record survey, Environmental Impact Statement, and assorted supporting data covering the subject well location.

Please have a field review made of this location and forward your recommendations relative to the issuance of the drilling permit through the usual channels.

Sargent

VFS/
Encl.
cc:- Manners

NOTE: NADCo. has a deal in the fire to dispose of a number of rigs. The rig they intend to cut this hole with is included in the deal and this will be the last hole it drills for NADCo. They have a deadline of May 15th. for getting started or otherwise they will not be able to complete the hole before the date set for thetransfer of the rig to the purchaser. For this reason if there is any reason why this application can't be processed at the earliest possible date, contact Ollie Irvin of NADCO or call me and I'll get in touch with him.

Sargent

R-7239 Rev. 1/75

State of Michigan
Department of Natural Resources
Geological Survey Division

# FIELD REVIEW OF PROPOSED WELL SITE

Date of Inspection: 5-4-76

1. Name of Applicant: Marathon Oil Company
2. Well Name & Number: Marathon Oil Company BR #2
3. Legal Description: N½ SE¼ Sec. 22, T4S R10E, City of Woodhaven, Wayne Co.
4. Surface Owner: _____ *(If other than mineral owner)*
5. Topography: Flat
6. Cover Type/Density: Grass
7. Land Utilization: Industrial
8. Is there any type of surface water nearer than one-quarter (¼) mile? Yes, clee drain *(Specify direction and distance)* is 1000 ft. to the west.

9. Is the Environmental Impact Assessment accurate and acceptable? Yes

10. Have necessary soil erosion and sedimentation control measures been adequately considered? Yes

11. Are there any special drill site construction requirements and restrictions? No *(Specify)* We do not anticipate any sour gas zones.

THE APPLICANT HAS RECEIVED NOTICE OF THE SPECIFICATIONS STATED UNDER ITEM 11 ABOVE AND HAS AGREED TO IMPLEMENT THEM. ACCORDINGLY I RECOMMEND ISSUANCE OF A PERMIT TO DRILL.

GEOLOGICAL SURVEY: Imlay City *(location)* BY: Bruce J. Waldo *(signature)* 5-4-76 *(date)*

REGIONAL MANAGER: Region III *(location)* BY: John Mac Gregor *(signature)* 5-11-76 *(date)*

DIRECTOR: BY: C. D. Hamm *(signature)* 5-12-76 *(date)*

There is a map too large for microfilming included with these original documents at the Record Center

L.P.G. (33)
TD 1168 in Salina (44)
"A-2 Carbonate"
Facility Well

22-4S-10E
City of Woodhaven (Wayne Co.)

Marathon Oil Company

(Woodhaven) LPG No. 6 Permit No. 27980

Drilling Contractor: North American DrillingCompany (Rotary 0-1168)

Location: N½ SE¼ Section 22, T4S, R10E
781 feet from North and 1314 feet from East line of quarter section.

Elevation: 604.5 (estimated) feet above sea level (rot. bush.)

Record by: M. Balombin from driller's log. Logs run: Schlumberger Compensated Formation Density Log 1032'-1167' & Schlumberger Gamma Ray-Neutron Log 50'-1167' (Sj)

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| "Drift" | 90 | 90 |
| DEVONIAN: | | |
| Detroit River-Sylvania: | | |
| Dolomite, gray-brown, microcrystalline, scattered white gypsum, & anhydrite | 45 | 135 |
| Dolomite, brown, very finely crystalline | 45 | 180 |
| Sandstone, white, very fine to finely rounded grains, non-coherent to variable cemented; dolomite @ top & bottom (Sylvania @ 180?) | 115 (175) | 295 |
| DEVONIAN-SILURIAN: | | |
| Bois Blanc-Bass Islands: | | |
| Dolomite, light gray, lithographic to microcrystalline; abundant chert, light gray, partly weathered (tripoli) | 10 | 305 |
| Sandstone, white, very fine & non-coherent, friable chert & tripoli as above | 40 | 345 |
| Dolomite, tan-gray & microcrystalline, abundant chert | 125 | 470 |
| Dolomite, light gray, microcrystalline, earthy; streaks of shale, gray-dark gray (Bass Island @ 470?) | 118 (293) | 588 Sj |
| SILURIAN: | | |
| Salina: | | |
| Dolomite, brown-gray, microcrystalline, argillaceous to shaly, variable amounts of white anhydrite | 72 | 660 |
| Dolomite, gray-brown, argillaceous & shaly, gray (C Unit @ 981 Sj)(E Unit @ 796 Sj) | 329 | 989 |
| Dolomite, brown-gray, microcrystalline, lithographic, part argillaceous, very anhydritic in part ( B Unit @ 989 Sj) | 53 | 1042 |
| Salt, white to pink & orange; streaks of dolomite and shale thruout (B Salt @ 1042 Sj)(SHS = 1/2° deviation @ 1047) | 108 | 1150 |

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| Salina Cont: | | |
| Dolomite, brown- gray, part argillaceous interbedded anhydrite, white-gray (A-2 Carbonate @ 1150 Sj) | 18 (580+) | 1168 |

Total Depth = 1168

Casing Record:
16" 40
11 5/8" 1024
4 1/2" 1100 & 1141.13

Commenced: 5/27/70
Completed: 6/10/70
Well Completed: 8/31/70

Initial Production: Facility Well LPG Storage

tmo
1/20/71

BEST COPY
AVAILABLE

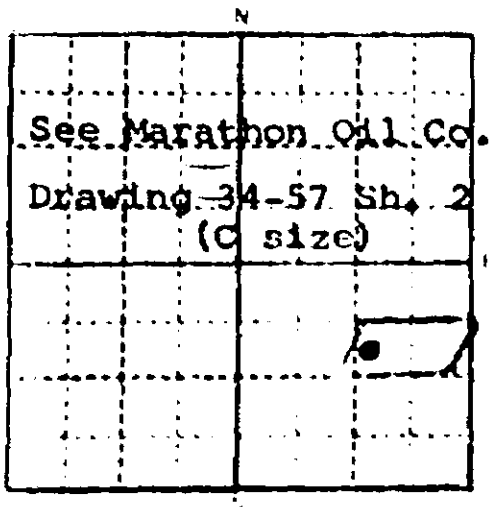
27980

# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, GAS OR L.P.G. STORAGE OR FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, AND ACT 326, P.A. 1937, AS AMENDED.

MAIL TO:
SUPERVISOR OF WELLS
GEOLOGICAL SURVEY
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING, MICHIGAN 48926

*See Reverse Side Before Filling Out This Application*




LOCATE WELL AND OUTLINE LEASE OR UNIT ON SECTION PLAT - 640 ACRES

1. APPLICATION TO DRILL A WELL FOR: L.P.G. Storage
2. DATE: 2-25-70
3. FEE ENCLOSED: $ 25.00
4. LESSEE (OWNER OF LEASE RIGHTS): Marathon Oil Company
5. PERMANENT ADDRESS: 1300 S. Fort St. Detroit, Michigan
6. PHONE: VI 3-9100
7. LESSOR (FEE NAME OF OWNER OF MINERAL RIGHTS): Marathon Oil Company (Woodhaven)
8. WELL NO.: LPG #6
9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER): Same
10. DRILLING CONTRACTOR: North American Drilling
11. ADDRESS: Mt. Pleasant, Michigan
12. PHONE: 773-3945
13. N½ ~~XXX~~ SE ¼ X ¼ SECTION 22 T 4 South R 10 East
14. ACRES IN LEASE OR UNIT (SPECIFY): 11.534
15. TOWNSHIP: City of Woodhaven
16. COUNTY: Wayne
17. Locate well in two directions from nearest lines of quarter section and property ownership or unit lines

781 FT. FROM North (north-south) LINE OF QUARTER SECTION
1314 FT. FROM East (east-west) LINE OF QUARTER SECTION
331 FT. FROM North (north-south) (PROPERTY) (UNIT) LINE
1281 FT. FROM East (east-west) (PROPERTY) (UNIT) LINE

18. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary
19. WELL IS TO BE COMPLETED IN: Salt - Saline FORMATION
20. INTENDED DEPTH OF WELL: Approx. 1150 ft.
21. PROGRAM OF CASING, SEALING, CEMENTING AND COMPLETING WELL

See attached write-up.

CASING IS NOT TO BE STRIPPED FROM THE HOLE AND NO CHANGE IS TO BE MADE IN THE PROGRAM OUTLINED ABOVE WITHOUT APPROVAL OF THE SUPERVISOR OF WELLS OR HIS AUTHORIZED REPRESENTATIVE

22. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒
23. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒
24. IF ANSWER TO No. 22 ABOVE IS Yes, DESCRIBE AND GIVE DISTANCE FROM LOCATION.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST FIELD OFFICE. (See reverse side)

25. ADDRESS CORRESPONDENCE AND PERMIT TO: Mr. D. C. Moriarty - 1300 S. Fort St. Detroit, Mich. 48217
26. PHONE: 843-9100

LEAVE BLANK
DATE ISSUED: 4-16-70
PERMIT NO.: 27980

27. OWNER OF LEASE RIGHTS: Marathon Oil Company
28. AUTHORIZED REPRESENTATIVE: C. H. Grenier

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

DISTRIBUTION
1. WHITE - LANSING
2. CANARY - CASHIER
3. BLUE - FIELD
4. GOLDENROD - FIELD
5. GREEN - APPLICANT

R-7209-A 1000 Sets 12-69

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

N° 77

SUPERVISOR OF WELLS

# PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST WHITE COPY OF PERMIT AT WELL LOCATION)

Permit No. 27980 Date Issued April 16, 1970

Permission is hereby granted to Marathon Oil Company
Owner
1300 S. Fort St., Detroit, Michigan
Address

Lease Name Marathon Oil Company (Woodhaven) Well Number LPG #6

To drill a well for LPG Storage

in the N½ SE¼ Sec. 22, T4S, R10E, City of Woodhaven, Wayne Co.

and located 781' from the north and 1314' from the east line of quarter section

and located 331' from the north and 1281' from the east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Natural Resources.

SUPERVISOR OF WELLS

By Robert M. Reiss

## CASING AND SEALING REQUIREMENTS

### NOTICE

DRILLING PERMIT ISSUED on the basis of the drilling, casing and sealing program as outlined on the application for permit and subject to requirements as set forth above. No change or alteration is to be made without the permission and approval of the Supervisor of Wells or his authorized representative.

DRILLING OPERATIONS ARE NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

### DEPARTMENT OFFICES

Lansing, Phone 517-373-1256
Mount Pleasant, Phone 517-773-9965
Cadillac, Phone 616-775-9728
Plainwell, Phone 616-685-8051
Imlay City, Phone 313-724-2015
Escanaba, Phone 906-786-0333

PERMITS MAY BE TRANSFERRED ONLY WITH THE PERMISSION OF THE SUPERVISOR OF WELLS

- LANSING, MI 48909 *** MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

RECOMMENDED DRILLING PROGRAM FOR MERCHANT'S GAS STORAGE CAVERN AT WOODHAVEN
(FORMERLY CALLED HARBERT STATION, BROWNSTOWN TOWNSHIP,
WAYNE COUNTY, MICHIGAN)

1. Move in North American Drilling Company's rotary rig or comparable equipment.

2. Rig up and drill a 20" hole to 40' or deeper, from ground level, as required to completely penetrate the drift. Ream hole to 22".

3. Run 40' of 16" O.D., H-40, 55 lbs. per foot S.T.C., casing and cement with 40 sacks of accelerated portland cement. Texas pattern shoe should be spot welded to the bottom of casing.

4. After 12 hours minimum W.O.C., drill out with 15" pit, brine mud will be used.

5. Install surface casing flange and blow-out preventer. Test preventer.

6. Go to total depth 1150 K.B. with 15" drill.

7. At this time Schlumberger Well Logging Company, will run a formation Density-Gamma Ray Log and a Neutron Log.

8. After circulating long enough to condition the hole, approximately 1,000' of 11-3/4" O.D., 47 lbs. per foot., J-55, S.T. and C., eight round thread, casing should be run. Casing equipment will consist of a Baker guide, shoe, a Baker float collar, and three Baker centralizers. The first four joints are to be spot welded. Prior to running casings, all thread protectors are to be removed. The casing threads are then to be brushed and cleaned with solvent. After cleaning, dry the threads with a clean rag and inspect each thread visually. After inspecting threads, dope with lubricant as provided. The thread protector should be similarly cleaned and dried and replaced on the casing and not removed until the casing is run.

9. Upon landing the casing, mud circulation should be established and continued until 175 bbl. (150% of casing capacity) or a more has been circulated. Halliburton should then cement the string with 500 sacks of cement. Use fresh water or brine to pump the plug down. This will facilitate testing prior to drilling out, put 1/4# per sack flo-seal for the first 150 sacks of cement.

10. Hang casing in casing slips in full tension. Release rig or shut rig down for approximately seven days W.O.C. The remainder of the completion can be done when the rotary rig or a workover rig as economics dictate.

LANSING, MI 48909
- LANSING, MI 48909 ••• MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

11. After seven days W.O.C. test casing to 750 PSI for 15 minutes.

12. Drill out plug and wash hole to total depth, using a 10-5/8" bit.

13. A string of 8-5/8" casing should then be run and suspended into the salt.

14. A string of 4-1/2" O.D. casing should then be run and suspended approximately 1' above the bottom of the salt.

15. After tree is installed, release rig.

16. Additional pressure tests as desired can be run prior to initiating the washing operation.

DCM/mc

- LANSING, MI 48909 ••• MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

# MARATHON OIL COMPANY

REFINING · UNITED STATES

MICHIGAN REFINING DIVISION

1300 SOUTH FORT STREET
DETROIT, MICHIGAN 48217
PHONE 313·843·8100

April 9, 1970

Supervisor of Wells
Geological Survey
Michigan Department of Conservation
Lansing, Michigan 48926

Attention: Mr. R. M. Acker

Gentlemen:

Please find attached our permit application and $25.00 fee to drill a L.P.G. storage well at the Marathon Oil Company's Woodhaven storage terminal. For your additional information we are also enclosing our proposed drilling program and piping prints for this installation. We plan to start drilling operations by June 1, 1970.

If you have any questions on this matter please contact us @ your earliest convenience.

Very truly yours,

MARATHON OIL COMPANY

Sydney Blum
Manager of Engineering

per C. H. Grenier
C. H. Grenier
Senior Refining Engineer

CHG:mc

Cons. 7225

# WELL LOCATION REPORT

Permit No. 27980

Operator Marathon Oil Company

Farm Name Marathon Oil Company (Woodhaven)

Notification Call from Mr. Moriarty 5/21/70 - Drilling well #6.

Nature of Location L.P.G. Storage Facility

Condition of Pits

Distance from Water

Remarks

Approved by Robert Dunn Date May 25, 1970

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

# 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. 1939)

E.L. filed ✓ F.L.B. M.B. 11-19-70

SUBMIT IN DUPLICATE

| | |
|---|---|
| NAME OF OWNER OR OPERATOR: Marathon Oil Company | ADDRESS OF OWNER OR OPERATOR: 1300 South Fort St. - Detroit, Mich. 17 |
| NAME OF DRILLING CONTRACTOR: North American Drilling Company | ADDRESS OF DRILLING CONTRACTOR: Mt. Pleasant, Michigan |
| FARM NAME: L. P. G. 1 | PERMIT NO.: 27980 / D.P. NO.: |
| LOCATION: 24400 Allen Rd. N ½ SE | SECTION: 22 / TWP.: 4 South / RANGE: 10 East |
| TOWNSHIP: City of Woodhaven | COUNTY: Wayne |
| 781 Ft. from North Line of | 1314 Ft. from East Line of quarter section |
| DATE DRILLING BEGUN: 5-27-70 / DATE DRILLING COMPLETED: 6-10-70 | DATE WELL COMPLETED: 8-31-70 / TYPE OF WELL: LPG Storage |
| FORMATION COMPLETED IN: Saline / TOTAL DEPTH: 1165 | ELEVATION: KB 8.5, RB, RT, RF 0, GRD 3 |
| ROTARY TOOLS: From 3 Feet to 1165 Feet | CABLE TOOLS: From - Feet to - Feet |

## CASING AND CEMENTING

| SIZE | WHERE SET | CEMENT | AMOUNT PULLED |
|---|---|---|---|
| 16" | 40 | Circ | |
| 11-5/8 | 1024 | Circ | |
| 4½ | 1141.13 | None | |
| 4½ | 1100 | None | |

## PERFORATIONS

| DATE | NO. HOLES | FROM | TO |
|---|---|---|---|
| | | | |

## DEPTH CORRECTION

| DEPTH | CORRECTED TO |
|---|---|
| | |

## OIL OR GAS ZONES

| FORMATION | FROM | TO | AMOUNT |
|---|---|---|---|
| | | | |

## WATER ZONES

| FORMATION | FROM | TO | AMOUNT |
|---|---|---|---|
| | | | |

## DEVIATION SURVEY

| RUN AT | DEGREES |
|---|---|
| 1047 | 1/2°- |

## SAND FRAC OR ACID TREATMENT

| DATE | FROM | TO | QUANTITY |
|---|---|---|---|
| | | | |

## MECHANICAL LOGS RUN

| BRAND | | TYPE LOG | INTERVAL LOGGED |
|---|---|---|---|
| Schlumberger | X | Gamma Ray-Neutron | 1030-1065 |
| Shelwell | | | |
| Birdwell | | | |
| Burgener | | | |
| Other | | | |

## PRODUCTION DATA

| WELL COMPLETED FOR | BOPD | BWPD | MCF GAS | PRESSURES. | CASING - PSI | TUBING - PSI |
|---|---|---|---|---|---|---|
| | | | | | 300 | 300 |

The above information is complete and correct

Signed [illegible]

Date 9-2-70

Title Const. Engineer

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE

A 7210
REV 1 '70

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

ELEVATION USED: 609

GEOLOGIST NAME: David L. Florkey

DATA FROM: X DRILLERS LOG ☐ SAMPLE LOG ☐ ELECTRIC LOG

| FROM | TO | FORMATION (TYPE, COLOR, HARDNESS) |
|---|---|---|
| 0 | 90 | Glacial Drift |
| | | Devonian |
| 90 | 135 | Detroit River<br>Dolomite, grey-brown microxln., v.f.x., scattered white gyp. and anhydrite. |
| 135 | 180 | Dolomite, brown v.f.x., microxln. |
| 180 | 295 | Sylvania<br>Sandstone, white, very fine to fine grained, rounded grain, non-coherent to variable cemented. Dolomite at top and bottom |
| 295 | 305 | Bois Blanc<br>Dolomite light grey, lithographic to microxln, abundant chert light grey, partly weathered (Tripoli). |
| 305 | 345 | Sandstone white, very fine, non-coherent, friable chert and Trip as above. |
| 345 | 470 | Dolomite, tan-grey microxln., abundant chert. |
| 470 | 586 | Silurian<br>Bass Island<br>Dolomite light grey microxln, earthy. Streaks of shale grey-dark grey. |
| 586 | 720 | Salina "G"<br>Dolomite, brown-grey Microxln., arg. toshaly, variable amounts of white anhydite. |
| 720 | 913 | "FED"<br>Dolomite grey-brown, arg. and shale grey. |
| 913 | 980 | "C"<br>Dolomite grey-brown, arg. and shale grey. |
| 980 | 1032 | "B" Dolo.<br>Dolomite brown-grey microxln., lithographic part arg., very anhydritic in part. |
| 1032 | 1139 | "B" Salt<br>Salt, white to pink and orange, streaks of dolomite and shale throughout |
| 1139 | 1165 | Sals "A"<br>Dolomite, brown-grey, part arg., variably anhydritic in' 'rbedded anhydrite, white-grey |

IF WELL WAS CORED, ATTACH CORE DESCRIPTION

DRILL STEM TEST DATA

22-04S-10E
BROWNSTOWN TWP. (WAYNE CO.)

MARATHON OIL COMPANY

MARATHON OIL CO #BR-2

Facility
LPG STORAGE
TD 1154 FT. IN SALINA B SALT

PERMIT NO. 32882

| SURFACE LOCATION: | QT | QT | QT | SEC | T | R | FT FROM QT SEC LINES |
|---|---|---|---|---|---|---|---|
| | S2 | NE | SE | 22 | 04S | 10E | 1165 N 709 E |

THIS WELL RECORD ASSEMBLY IS A COMPILATION OF WELL DATA FILED BY OR ON BEHALF OF THE OPERATOR, AS REQUIRED BY ACT 61, P.A. 1939, AS AMENDED; FORMATION TOPS AND STRATIGRAPHIC INTERVALS DETERMINED OR CONFIRMED WHERE POSSIBLE BY GEOLOGICAL SURVEY DIVISION PERSONNEL FROM MECHANICAL LOGS AND PRELIMINARY INFORMATION COLLECTED WHILE DRILLING WAS IN PROGRESS. RECORDS COMPILED BY BOB RESZKA, GEOLOGIST.

ELEVATIONS: 605 KELLY BUSHING (DATUM), 595 GROUND

FORMATION TOPS AND STRATIGRAPHIC INTERVALS DETERMINED OR CONFIRMED BY GEOLOGICAL SURVEY PERSONNEL FROM BIRDWELL COMPENSATED NEUTRON/GAMMA RAY LOGS AND RECORDS FILED BY OPERATOR.

| | MD | | MD |
|---|---|---|---|
| PLEISTOCENE: | | Salina G Unit | 607 |
| Drift to | 138 | F Evaporites | 626 |
| DEVONIAN: | | E Unit | 826 |
| Amherstburg | 138 | D Evaporite | 919 |
| Sylvania | 221 | C Unit | 937 |
| Bois Blanc | 307 | B Unit | 1006 |
| SILURIAN: | | B Evaporite | 1059 |
| Bass Islands Group | 423 | | |

THE FOLLOWING DOCUMENTS ARE REPRODUCTIONS OF OFFICIAL RECORDS SUBMITTED BY:
R. H. CHURCH, ON BEHALF OF MARATHON OIL COMPANY,

12/07/84

IMLAY CITY [illegible]

DEPARTMENT OF NATURAL RESOURCES

# LOG OF OIL, GAS, DISPOSAL OR STORAGE WELL (ACT 61)

Submit in **DUPLICATE** Within 30 Days after Well Completion

PERMIT NUMBER: 32882

DEEPENING PERMIT NUMBER:

| NAME(S) & ADDRESS OF OWNER(S) SHOWN ON PERMIT | NAME & ADDRESS OF DRILLING CONTRACTOR(S) |
|---|---|
| Marathon Oil Company<br>1300 S. Fort Street<br>Detroit, MI 48217 | L&G Drilling<br>3959 East River Road<br>Mt. Pleasant, MI 48858 |

LEASE NAME(S) & WELL NUMBER SHOWN ON PERMIT: Marathon Oil Company BR#2

DIRECTIONALLY DRILLED: YES ☐ NO ☒

| SURFACE LOCATION | SECTION | TOWNSHIP | RANGE | TOWNSHIP NAME |
|---|---|---|---|---|
| C S NE SE | 22 | 4S | R 10E | Brownstown |

FOOTAGES (North/South): 1165 Ft. from North Line and (East/West): 709 Ft. from East Line of quarter section — COUNTY NAME: Wayne

| SUBSURFACE LOCATION | SECTION | TOWNSHIP | RANGE | TOWNSHIP NAME |
|---|---|---|---|---|
| | | | | Brownstown |

FOOTAGES (North/South): 1165 Ft. from North Line and (East/West): 709 Ft. from East Line of quarter section — COUNTY NAME: Wayne

| DATE | | | | ELEVATIONS | |
|---|---|---|---|---|---|
| DRILLING BEGUN: 7/11/79 | TOTAL DEPTH OF WELL: Driller ____ Log 1154 | TYPE WELL: LPG STORAGE | | | |
| DRILLING COMPLETED: 7/26/79 | FORMATION AT T.D.: Salina B-Salt | FT. DRLD. – ROTARY TOOLS: From W.H. To 1154 | | K.B.: 605 | R.F.: |
| WELL COMPLETED: 7/27/79 | PRODUCING FORMATION(S): – | FT. DRLD. – CABLE TOOLS: From – To – | | R.T.: | Grd.: 595 |

## CASING, CASING LINERS AND CEMENTING

| SIZE | WHERE SET | CEMENT | Ft. Pulled |
|---|---|---|---|
| 16" | 144.42 ft. | Circ. | |
| 11-3/4" | 1017.69 ft. | Circ. | |
| 9-5/8" | 1068.29 ft. | None | |
| 4½" | 1136.0 ft. | None | |
| | | | |

## PERFORATIONS

| DATE | NUMBER HOLES | INTERVAL PERFORATED | OPEN YES | OPEN NO |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## 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 Line | Gas Log. | Fill Up |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

## 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 |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## MECHANICAL LOGS, LIST EACH TYPE RUN

| Brand | (X) | LOG TYPES | LOGGED INTERVALS |
|---|---|---|---|
| Schlumberger | | | |
| Birdwell | X | Density & | 0-1154' |
| | | Neutron | |
| Other: Birdwell | X | 3D Velocity | 0-1158' |

## DEPTH CORRECTION / DEVIATION SURVEY / PLUGGED BACK

| DEPTH | CORRECT'N | 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. | B.H.P. AND DEPTH |
|---|---|---|---|---|---|---|
| | | | | | | |

I AM RESPONSIBLE FOR THIS REPORT. WITHIN MY KNOWLEDGE ALL FACTS ARE TRUE AND COMPLETE.

| DATE | TITLE | SIGNATURE |
|---|---|---|
| 6/23/80 | Manager, Engineering Department | [signature] |

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

R - 7210
Rev. 12/75

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

| ELEVATION USED: | GEOLOGIST NAME: | TOPS TAKEN FROM: |
|---|---|---|
| 605 K.B. | H. M. Kuchta | [X] 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) |
|---|---|---|
| 0 | 100 | Top Bedrock |
| | | **DEVONIAN** |
| 100 | 218 | Detroit River. |
| | | Dolomite, scattered gyp. anhydrite. |
| 218 | 330 | Sylvania |
| | | Sandstone. |
| 330 | 520 | Bois Blanc |
| | | Interbedded dolomite and sandstone. |
| | | **SILURIAN** |
| 520 | 600 | Bass Island |
| | | Dolomite with Shale streaks. |
| 600 | 740 | Salina "G" |
| | | Dolomite; shale, some white anhydrite. |
| 740 | 936 | "Fed" |
| | | Dolomite; anhydrite. |
| 936 | 1004 | "C" Dolomite |
| | | Dolomite and shale. |
| 1004 | 1032 | "B" Dolomite |

| FROM | TO | FORMATION (TYPE, COLOR, HARDNESS) |
|---|---|---|
| 1004 | 1032 | "B" Dolomite |
| | | Dolomite; anhydritic in parts. |
| 1032 | 1062 | |

JUN 25 1980

IF WELL WAS CORED, ATTACH CORE DESCRIPTION

DRILL STEM TEST DATA

Marathon Oil Co. #BR-2 Wavne 32.882

32882

FEB 9 1979

7207
Rev. 12/77

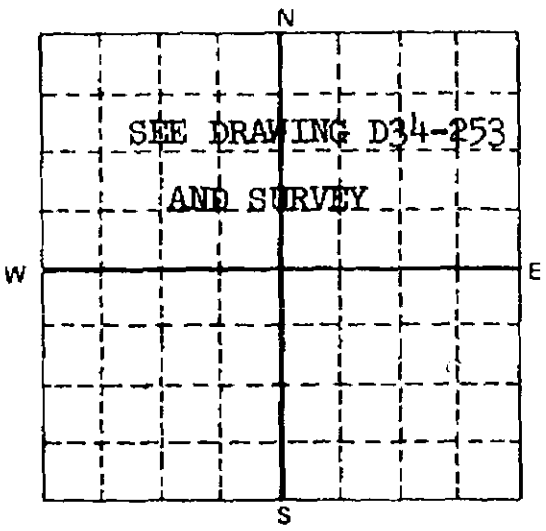
# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, BRINE DISPOSAL, HYDROCARBON STORAGE OR FOR SECONDARY RECOVERY

Under Authority of Act 61, P.A. of 1939, As Amended.

MAIL TO:
STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION
Box 30028, Lansing, Michigan 48909

See Reverse Side Before Filling Out This Application

LOCATE WELL AND OUTLINE UNIT ON SECTION PLAT – 640 ACRES




FOR DIRECTIONALLY DRILLED HOLE SEE INSTRUCTIONS ON REVERSE SIDE.

1. Application to drill a well for BRINE, LPG, OR HYDROCARBON STORAGE
2. Date: JANUARY 29, 1979
3. Fee enclosed: $ 100.00
4. Applicant's name(s) as it is on the surety bond(s): MARATHON OIL COMPANY
5. Permanent address: 1300 S. FORT ST., DETROIT, MICHIGAN 48217
6. Phone: (313)843-9100
7. Lease name (owner of mineral rights): MARATHON OIL COMPANY (WOODHAVEN, MICHIGAN)
8. Well No.: BR#2
9. Surface owner: SAME
10. Address: SAME
11. Phone:
12. Drilling contractor: NOT CONTRACTED AS OF THIS DATE
13. Address:
14. Phone:
15. Surface location: ¼ of ¼ of ¼ Section 22 T 4 S R 10 EAST
16. Township: CITY OF WOODHAVEN
17. County: WAYNE

18. Locate well in two directions from nearest lines of quarter section and unit lines. (Surface location)

1165.0' Ft. From NORTH (north-south) Line of quarter section
716.0' Ft. From NORTH (north-south) Unit line
709.0' Ft. From EAST (east-west) Line of quarter section
685.0' Ft. From EAST (east-west) Unit line

19. Kind of tools to be used (Cable, rotary, combination): ROTARY
20. Formation in which well is to be completed: SALT SALINE
21. Intended depth of well: 1,150 FEET

22. Program of casing, sealing, cementing and completing well (SEE REVERSE SIDE)

SEE ATTACHED WRITE-UP.

**CASING IS NOT TO BE STRIPPED FROM THE HOLE AND NO CHANGE IS TO BE MADE IN THE PROGRAM OUTLINED ABOVE WITHOUT APPROVAL OF THE SUPERVISOR OF WELLS OR HIS AUTHORIZED REPRESENTATIVE**

**APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND RULES PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. *BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST FIELD OFFICE. (See reverse side)***

23. Send correspondence and permit to: MR. AL KRESSLEIN
24. Phone: (313) 843-9100
25. Address: 1300 S. FORT STREET, DETROIT, MICHIGAN 48217

LEAVE BLANK

| Date Issued | Permit No. |
|---|---|
| 3-8-79 | 32,882 |

26. Name of applicant's agent (Print): SYDNEY BLUM
27. Signature of agent: Sydney Blum

FOR CASHIER'S USE ONLY. DO NOT WRITE IN THIS SPACE

FEB-8-79 M 6889 100.00

For Geological Survey Use Only
1. White - Lansing
2. Canary - Cashier
3. Blue - Field
4. Goldenrod - Field
5. Green - Applicant

## INSTRUCTIONS FOR PREPARING APPLICATION FOR PERMIT

1. Use form R-7207. (Five copies in set. Green will be returned when permit is issued.)
2. WELL LOCATION SURVEY. Use form R-7208. Submit five copies. (Surveyors plat may be substituted for form R-7208.) Submit supplemental information and maps if lakes, streams, swamps, buildings, roads, powerlines, etc., are within one quarter mile of location.
3. ENVIRONMENTAL IMPACT ASSESSMENT. Use form R-7616 or equivalent. Submit five copies. (See instructions and guidelines furnished with forms.)
4. WELL ELEVATION. Furnish with well location survey or submit certification that elevation will be run and submitted within fourteen days after drilling commences.
5. SURETY BOND. Proper bond coverage must be submitted with application or must have been filed previously. (See General Rules for details.)
6. PERMIT FEE. Must accompany application for permit. (See statute for applicable fee.) (Make check payable to STATE OF MICHIGAN.)
7. PROGRAM OF CASING, SEALING, CEMENTING AND COMPLETING WELL (SECTION 22). Include the different hole sizes and depths to be drilled; casing sizes, weights, grades and lengths; amount and type of cement and additives if used. Indicate the type, weight and viscosities of drilling fluids to be used. List blowout control equipment to be used; give size, type, pressure ratings and order of assembly. Indicate intended well logging and completion program, auxiliary equipment to be used (i.e. sour gas), if any, and general information and remarks not covered by the above.

### IF THIS APPLICATION IS FOR A HOLE TO BE DIRECTIONALLY DRILLED, SUBMIT THE FOLLOWING SUPPLEMENTAL INFORMATION:

(Five copies required.)

1. Give geographical description of intended bottom hole location.
2. Give correct footage measurements of intended bottom hole location from the NEAREST quarter section lines and from NEAREST unit lines.
3. Give RADIUS of intended bottom hole target area.
4. DIRECTIONAL DRILLING AND ENGINEERING PROGRAM. Include deviation kick-off points, degree of deviation intended, proposed depth and True Vertical Depth of the bottom hole. Specify the lateral distance and direction from the surface location to the proposed bottom hole location. Give name and address of the engineering company who will direct the deviation of the well bore and any general information and remarks not covered.

**NOTICE: When drilling commences, the proper area field office MUST be notified!**

### FIELD OFFICES

| Grayling | East Lansing | Mt. Pleasant | Imlay City |
|---|---|---|---|
| P.O. Box 507, 49738<br>Phone (A/C 517)<br>348-6371 | 8562 East Stoll Rd., 48823<br>Phone (A/C 517)<br>339-8638 | 204 Court St., 48858<br>Phone (A/C 517)<br>773-9965 | P.O. Box 218, 48444<br>Phone (A/C 313)<br>724-2015 |

| Plainwell | Cadillac | Gaylord |
|---|---|---|
| P.O. Box 355, 49080<br>Phone (A/C 616) 685-6851 | P.O. Box 629, 49601<br>Phone (A/C 616) 775-9728 | P.O. Box 576, 49735<br>Phone (A/C 517) ~~732-1922~~<br>732-3541 |

THE SUPERVISOR OF WELLS IS PROHIBITED BY LAW FROM ISSUING A DRILLING PERMIT TO ANY OWNER OR OPERATOR WHO IS IN VIOLATION OF ANY OF THE PROVISIONS OF ACT 61, P.A. 1939, AS AMENDED, OR ANY OF THE RULES OR ORDERS PROMULGATED THEREUNDER.

STATE OF MICHIGAN

# DEPARTMENT OF NATURAL RESOURCES

№ 5080

SUPERVISOR OF WELLS

## PERMIT TO DRILL

For Auditing Only

(POST WHITE COPY OF PERMIT AT WELL LOCATION)

Permit No. 32,882 Issue Date March 8, 1979 Termination Date March 8, 1980

Permission is hereby granted to Marathon Oil Company
Owner

1300 S. Fort St., Detroit, MI 48217
Address

Lease Name Marathon Oil Company Well Number #BR-2

Location C S½ NE¼ SE¼ Section 22, T.4S., R.10E., Brownstown Township, Wayne County

Footages 1165.0' from north and 709' from east line of quarter section

716.0' from north and 685' from east unit line

Type of Well Brine, LPG, Hydro-carbon Storage Kind of Tools Rotary Objective Formation Salt Saline Intended Depth 1150'

This permit is issued subject to the provisions of Act 61, P.A. 1939, as amended, and rules, requirements, or orders issued by the Supervisor of Wells and Department of Natural Resources.

SUPERVISOR OF WELLS

By [signature]

## CASING AND SEALING REQUIREMENTS

Run 150' of 16" O.D., H-40, 55 lbs. per foot. Then cement with with 150' of accelerated portland cement. Run 1022' of 11 3/4" O.D., 47 lbs. per foot J-55. Cement the string with 600 sacks of cement. Core to depth of 1150'.
Run 9 5/8" casing in Cavern BR#2 to 38' below top of salt (approximately 1080').
Run string of 4½" casing to within 1 foot of bottom of salt (approximately 1123').

### NOTICE

IT IS FURTHER MADE A REQUIREMENT OF THIS PERMIT that the applicant give notice to the Public Utilities in accordance with Act 53, P.A. 1974 C.L. 460.701 to 460.718 and comply with each of the requirements of the act.

DRILLING PERMIT ISSUED on the basis of the drilling, casing and sealing program as outlined on the application for permit and subject to requirements as set forth above. No change or alteration is to be made without the permission and approval of the Supervisor of Wells or his authorized representative.

DRILLING OPERATIONS ARE NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site. The nearest field office of the Department of Natural Resources must be notified prior to the commencement of drilling, deepening, reworking, and plugging.

### DEPARTMENT FIELD OFFICES

Region II, Roscommon ..... Phone 517-275-5151
Cadillac ..... Phone 616-775-9728
Gaylord ..... Phone 517-732-3541
Mt. Pleasant ..... Phone 517-773-9965

Region III, Lansing ..... 517-322-1300
E. Lansing ..... 517-339-8638
Imlay City ..... 313-724-2015
Plainwell ..... 616-685-6851
Grand Rapids ..... 616-456-5071

R 7209-A 1/79

RECOMMENDED DRILLING PROGRAM FOR
MARATHON'S CAVERNS BR#2 AND BR#3 AT WOODHAVEN

1. Move in rotary rig.

2. Rig up and drill a 20" diameter hole to 150' depth from ground level, as required to completely penetrate the drift. Ream hole to 22" diameter.

3. Run 150' of 16" O.D., H-40, 55 lbs. per foot standard thread and coupled casing. Then cement with 150' of accelerated portland cement. Texas pattern shoe should be spot welded to the bottom of casing.

4. Wait on the concrete (W.O.C.) for 12 hours and then drill out with 15" bit.

5. Install 15" bit and surface blow-out preventer. Test preventer.

6. Go to total depth 1025' K.B. with 15" drill.

7. At this time a well logging company will run a formation Density Gamma-Gamma Ray Log and a Neutron Log.

8. After circulating long enough to condition the hole, approximately Run 1022' of 11-3/4" O.D., 47 lbs. per foot, J-55, standard thread and coupled, eight round thread, casing should be run. Casing equipment will consists of a Baker guide, shoe, a Baker float collar, and five Baker centralizers. Prior to running the casing, all thread protectors are to be removed and the casing threads are to be brushed and cleaned with solvent. After cleaning, dry the threads with a clean rag and visually inspect each thread. After inspecting threads, dope with lubricant as provided. The thread protector should be similiarly cleaned, dried and replaced on the casing and not removed until the casing is run.

9. Upon landing the casing, mud circulation should be established and continued until 175 barrels (150% of casing capacity) or more has been circulated. Halliburton should then cement the string with 600 sacks of cement. Put $\frac{1}{4}$# per sack flo-seal for the first 150 sacks of cement. Use fresh water or brine to pump the plug down.

10. Shut rig down for approximately $2\frac{1}{2}$ days W.O.C.

11. After this $2\frac{1}{2}$ days W.O.C., weld casing flange to 11-3/4" casing and test casing to 750 psi for 15 minutes.

12. Run a density Gamma-Gamma Ray and Neutron Log.

13. Core to depth of 1150'.

14. Ream hole to total depth of 1150', using a 10-3/4" bit.

15. Run ~~8-5/8" casing in Cavern BR#3 and~~ 9-5/8" casing in Cavern BR#2 to 38' below top of salt (approximately 1080').

16. Run string of $4\frac{1}{2}$" casing to within 1 foot of bottom of salt (approximately 1123').

17. After tree is installed, release rig.

State of Michigan
Department of Natural Resources
Geological Survey Division

MAR 6 - 1979

FIELD REVIEW OF PROPOSED WELL SITE

1. Date of Inspection: 2-22-79
2. Name of Applicant: Marathon Oil Co.
3. Well Name & Number: Marathon Oil Co. BR #2
4. Legal Description: CS½ , NE¼, SE¼, Sec. 22, T4S, R10E, Brownstown Twp., Wayne Co.
5. Surface Owner: ---
6. Topography: Very minor relief 590-595 ft. 1/4 mile radius
7. Cover Type/Density: grass
8. Land Utilization: industrial
9. State the type of and the direction and distance to surface waters within one-quarter (¼) mile. None
10. Were soil erosion and sedimentation control measures adequately considered? If not, specify additional requirements. Soil erosion and sedimentation will be very minor if any at all due to the very minor relief.
11. Is it reasonable to expect to encounter $H_2S$ while drilling this well? No
Are drilling practices proposed adequate for $H_2S$ safety? If not, specify additional requirements. Yes, In addition to the annular preventer, there will be either a master gate or a blind ram preventer.
12. Is the Environmental Impact Assessment accurate and acceptable? Yes . Specify any other site construction requirements and/or restrictions. Comments, if any.
Drlg. pits must be filled in as soon as possible after operations cease. Drill cuttings and mud other than what is used for analysis must remain on site and be buried. Brine and other fluids must be disposed of in an authorized brine disposal well or taken to another site or pursuant to Sup. of Wells letter enclosed.

APPLICANT'S REPRESENTATIVE WAS NOTIFIED OF ALL REQUIREMENTS AND/OR RESTRICTIONS AND AGREES TO THEM. THEREFORE I RECOMMEND ISSUANCE OF A PERMIT TO DRILL FOR THE WELL SITE.

GEOLOGICAL SURVEY DIVISION: Imlay City BY: John T. Mazeus 3-1-79
(signature) (date)

REGIONAL DIRECTOR: Region III BY: Bruce M. Auslie 3-6-79
(signature) (date)

JRD

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES
GEOLOGY DIVISION

# SURVEY RECORD OF WELL LOCATION

*(Submit in quadruplicate with Application for Permit to Drill a Well for Oil or Gas, Brine Disposal, Secondary Recovery, or Gas or L.P.G. Storage)*

LESSEE (OWNER OF LEASE RIGHTS)
MARATHON OIL COMPANY (WOODHAVEN, MICHIGAN)

LESSOR (OWNER OF MINERAL RIGHTS)
MARATHON OIL COMPANY (WOODHAVEN, MICHIGAN)

WELL NO.
BR#2

LOCATION
¼ OF ¼ OF ¼ SECTION 22 T. 4 S R. 10 EAST

TOWNSHIP
CITY OF WOODHAVEN

COUNTY
WAYNE

PLAT BELOW REPRESENTS ONE FULL SECTION
(1 Mile Square)

N

SEE MARATHON OIL COMPANY DRAWING D34-253 AND SURVEY (ATTACHED)

1165'

709'

(Scale of Plat — 1 inch equals 1320 ft.)

1. Outline drilling unit and spot well location on plat at left. Where drilling unit crosses section lines, divide the plat into an east half and a west half **OR** a north half and a south half (which ever applies). Outline the unit and locate the well in two directions from **NEAREST** quarter section and unit lines.

2. Location of well in two directions from **NEAREST** quarter section and unit lines is:

   1165 ft. from NORTH (north-south) line of Quarter Section

   709 ft. from EAST (east-west) line of Quarter Section

   716 ft. from NORTH (north-south) line of unit

   685 ft. from EAST (east-west) line of unit

3. Describe wellsite marker. Show or describe access route if it is not readily accessible.

   FIELD STAKED - ACCESS BY PROPOSED ROAD

4. ON SEPARATE PLAT OR PLOT PLAN:

   A. Locate, identify, and show distances to all roads, power lines, residences, farm buildings, and other structures within 300 feet of the stake;

   B. Locate, identify, and show distances to all lakes, streams, swamps, drainage-ways or any other surface water features within 1320 feet of the stake.

5. In an ENVIRONMENTAL IMPACT ASSESSMENT describe all structures and surface features shown detailing plans for hazards prevention and erosion control (See instructions and guidelines for preparation of an environmental impact assessment).

NAME OF INDIVIDUAL WHO SURVEYED WELL SITE: BOYD W. ARTHURS
DATE: 1/25/79
TITLE: REGISTERED LAND SURVEYOR #11358

ADDRESS: 2521 WEST JEFFERSON P.O. 266 TRENTON, MICHIGAN 48183

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

SIGNATURE (LESSEE OR AUTHORIZED REPRESENTATIVE): [signature]
ADDRESS (IF DIFFERENT THAN LESSEE): 1300 S. Fort, Detroit, MI 48217
DATE (MONTH, DAY, YEAR): 2/5/79

R 7208 REV. 7/76

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

February 12, 1979

TO: Roger M. Rasmussen, Regional Director, Region III

FROM: James R. Duszynski, Region III Field Coordinator, Geological Survey Division

SUBJECT: Marathon Oil Company, Marathon Oil Company #BR-2, C S½ NE¼ SE¼ Section 22, T.4S., R.10E., (City of Woodhaven) Brownstown Twp., Wayne Co.

Enclosed are copies of the application, well survey record, EIA, and supporting data for the subject well location.

Please have the required field review made of the well site and forward your recommendations to this office.

JRD:jjk

Encl.

JRD

cc: J. Manners

IV. Any Irreversible and Irretrievable Commitment of Resources:

The surrounding environment will not be effected by the additional caverns. Below ground level (~1,050 feet), approximately 20-40,000 barrels per year of salt will be removed and replaced with brine.

V. Summary:

No deterimental environmental effects exist.

Applicant's Representative

Sydney Bleier 2-5-79

Signature Date

ENVIRONMENTAL IMPACT STATEMENT

Well Identification

| | |
|---|---|
| Name of Applicant: | Marathon Oil Company |
| Address: | 1300 S. Fort St., Detroit, MI 48217 |
| Well Name and Number: | Brine Recovery #2 (BR #2)<br>Brine Recovery #3 (BR #3) |
| Location: | City of Woodhaven |

I. Description of Project:

Drill and develop two brine recovery caverns in the salina formation for the supply of saturated brine to the existing caverns. The two caverns will be washed in series to insure proper brine saturation. Saturated brine is necessary for controlling the growth of the existing caverns. The new caverns will be used for storage of LPG, brine, and other hydrocarbon liquids.

II. Environmental Impact Assessment:

The new caverns will be developed on the same premises of the existing caverns. There will be no effect on wild life or future population patterns as it is located in the zoned industrial area. The property (~22 acres) is completely owned by Marathon, fenced in, and its sole purpose is for hydrocarbon storage and truck liftings. The property is not open to the public and is under a 24 hour-7 day week continuous surveillance. There are no future plans for any other type of usage on the above ground area. The land is bordered by Mobil Oil (Lube Oil Plant) to the north, the railroad/Detroit Edison easements to the west and south. Allen Road borders the property to the east.

The new caverns will have all of the same safety devices as the existing caverns. Excess brine will be disposed of in our existing brine disposal well as shown on the attached drawings. All piping and roadway additions will be branched off of the existing caverns, so nothing unusual or out of normal will exist in the area. We know of no adverse consequence to the environment.

III. Possible Alternative to the Proposed Well Location:

Use of an above ground brine pond (1,000,000 barrel capacity) is believed environmentally less desirable than the proposed brine wells.

As described in Part II, there are no adverse environmental effects, there is no need for an alternative.

The wells, as indicated on the permit application, will be completed in the Salt Saline formation at an intended depth of 1150 feet.

It is our intention that, upon approval of the permit application, we will commence drilling operations around the 1st of April, 1979.

If we can be of any further assistance to expedite the securing of this permit, please let us know.

Yours truly,

R. H. Church, P.E.
Manager, Engineering Department

A. G. Kresslein
Senior Refining Engineer

RHC/AGK/lmz

Enclosure

Michigan Refining Division

Marathon Oil Company

1300 South Fort Street
Detroit, Michigan 48217
Telephone 313/843-9100

January 29, 1979

Department of Natural Resources
Geological Survey
State of Michigan
Lansing, Michigan 48926

Attention: Messrs. Acker and Duszynsky

Subject: Marathon Oil Company Brine Recovery Caverns #2 and #3

Gentlemen:

Enclosed are applications for Permit to drill and develop (2) two underground storage caverns for brine and hydrocarbon storage in the City of Woodhaven, Wayne County.

It should be noted here, that in 1976 a permit was granted for one of these wells (Permit #31,007). This well was not drilled at that time, and because of new thinking, the location of that well has been somewhat altered. Therefore, the application is being resubmitted with the minor location change.

Also enclosed are:

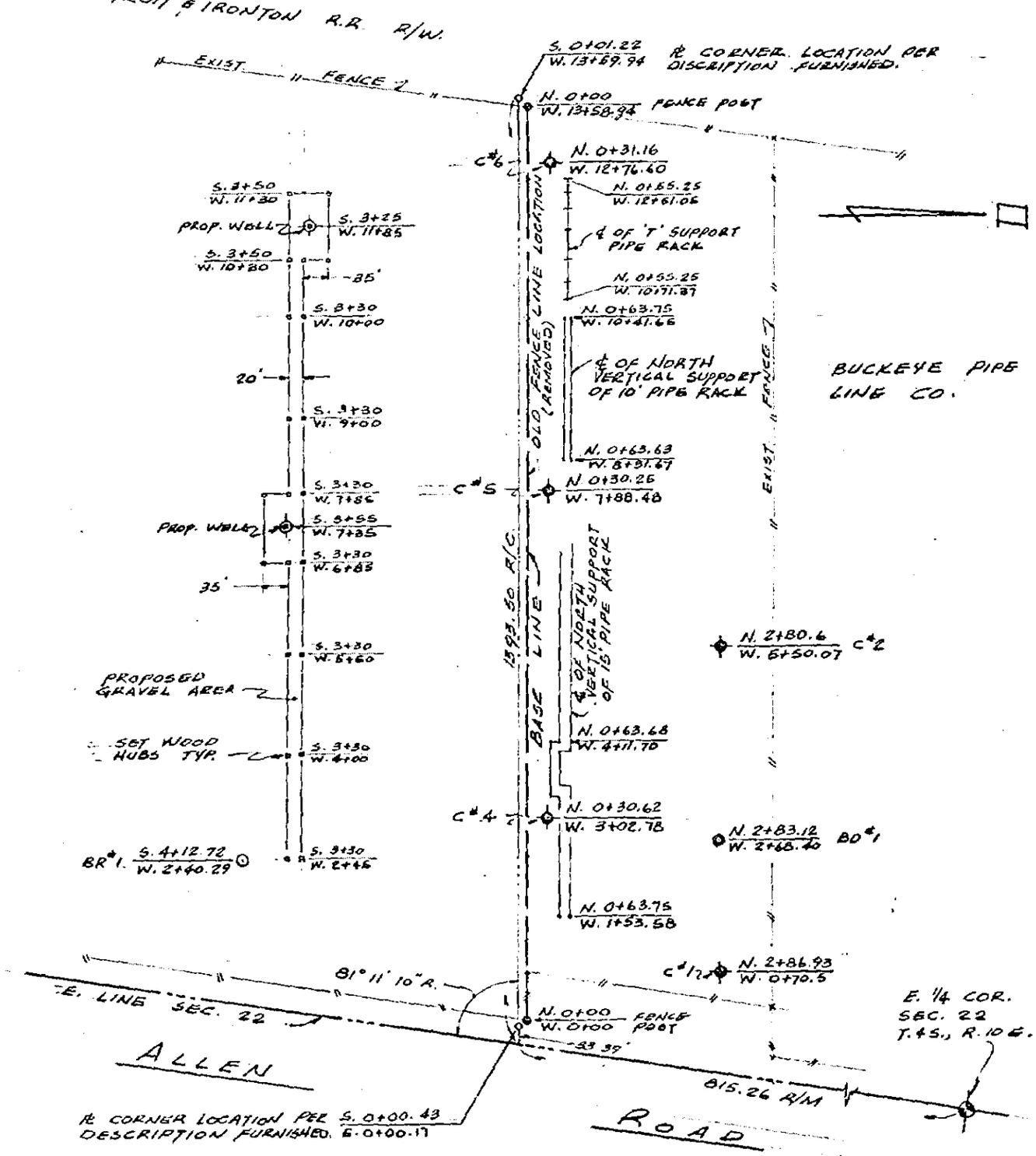
1. Recommended Drilling Program.
2. Well Location Drawing D34-198.
3. Environmental Impact Statement.
4. Certified land survey of the property involved.

Any excess brine not needed for the operation of the existing caverns (which currently store LPG) is disposed of in a disposal well which has capabilities of injecting into the Mt. Simon level (3600').

Marathon Oil Company's source of wash water is the API Effluent of the Mobil Oil Company, located at West and Allen Roads. This water has been treated and would normally be discharged to the river.

# REPORT OF SURVEY
## FOR
# MARATHON OIL COMPANY

BEING PART OF THE S.E. 1/4 OF SECTION 22, T.4S., R.10E., CITY OF WOODHAVEN, WAYNE COUNTY, MICHIGAN.




NOTE:
COORDINATES SYSTEM BASED ON DWG. NO. D-34-253 SUPPLIED BY MARATHON OIL CO.

JOB NO. 8-79

DATE 1-25-79

Boyd W. Arthurs

LEGEND
R. Recorded
M. Measured
C. Computed

Scale: one inch 200 feet

Boyd W. Arthurs
Registered Land Surveyor No. 11358
2521 West Jefferson, P.O. 266
Trenton, Michigan 48183

JUL 1 0 1980

IMLAY CITY HAS COPY

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

# LOG OF OIL, GAS, DISPOSAL OR STORAGE WELL (ACT 61)

Submit in **DUPLICATE** Within 30 Days after Well Completion

PERMIT NUMBER: 32882

DEEPENING PERMIT NUMBER:

NAME(S) & ADDRESS OF OWNER(S) SHOWN ON PERMIT
Marathon Oil Company
1300 S. Fort Street
Detroit, MI 48217

NAME & ADDRESS OF DRILLING CONTRACTOR(S)
L&G Drilling
3959 East River Road
Mt. Pleasant, MI 48858

LEASE NAME(S) & WELL NUMBER SHOWN ON PERMIT: Marathon Oil Company BR#2

DIRECTIONALLY DRILLED: YES ☐ NO ☒

| SURFACE LOCATION | SECTION | TOWNSHIP | RANGE | TOWNSHIP NAME |
|---|---|---|---|---|
| C S NE SE | 22 | 4S | R 10E | Brownstown |

FOOTAGES (North/South) 1165 Ft. from North Line and 709 (East/West) Ft. from East Line of quarter section — COUNTY NAME: Wayne

| SUBSURFACE LOCATION | SECTION | TOWNSHIP | RANGE | TOWNSHIP NAME |
|---|---|---|---|---|
| | | | | Brownstown |

FOOTAGES (North/South) 1165 Ft. from North Line and 709 (East/West) Ft. from East Line of quarter section — COUNTY NAME: Wayne

| DATE | DRILLING BEGUN | TOTAL DEPTH OF WELL | TYPE WELL | ELEVATIONS | |
|---|---|---|---|---|---|
| | 7/11/79 | Driller ____ Log 1154 | LPG STORAGE | | |
| DRILLING COMPLETED | 7/26/79 | FORMATION AT T.D.: Salina B-Salt | FT. DRLD. – ROTARY TOOLS From W.H. To 1154 | K.B. 605 | R.F. |
| WELL COMPLETED | 7/27/79 | PRODUCING FORMATION(S): – | FT. DRLD. – CABLE TOOLS From – To – | R.T. | Grd. 595 |

CASING, CASING LINERS AND CEMENTING

| SIZE | WHERE SET | CEMENT | Ft. Pulled |
|---|---|---|---|
| 16" | 144.42 ft. | Circ. | |
| 11-3/4" | 1017.69 ft. | Circ. | |
| 9-5/8" | 1068.29 ft. | None | |
| 4½" | 1136.0 ft. | None | |
| | | | |

PERFORATIONS

| DATE | NUMBER HOLES | INTERVAL PERFORATED | OPEN YES | OPEN NO |
|---|---|---|---|---|
| | | | | |

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 Line | Gas Log. | Fill Up |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

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 |
|---|---|---|---|---|
| | | | | |

MECHANICAL LOGS, LIST EACH TYPE RUN

| Brand | (X) | LOG TYPES | LOGGED INTERVALS |
|---|---|---|---|
| Schlumberger | | | |
| Birdwell | X | Density & | 0-1154' |
| | | Neutron | |
| Birdwell | X | 3D Velocity | 0-1158' |

DEPTH CORRECTION / DEVIATION SURVEY / PLUGGED BACK

| DEPTH | CORRECT'N | 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. | B.H.P. AND DEPTH |
|---|---|---|---|---|---|---|
| | | | | | | |

I AM RESPONSIBLE FOR THIS REPORT. WITHIN MY KNOWLEDGE ALL FACTS ARE TRUE AND COMPLETE.

| DATE | TITLE | SIGNATURE |
|---|---|---|
| 6/23/80 | Manager, Engineering Department | [signature] |

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

R - 7210
Rev. 12/75

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

| ELEVATION USED: | GEOLOGIST NAME: | TOPS TAKEN FROM: |
|---|---|---|
| 605 K.B. | H. M. Kuchta | [X] 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) |
|---|---|---|
| 0 | 100 | Top Bedrock |
| | | DEVONIAN |
| 100 | 218 | Detroit River |
| | | Dolomite, scattered gyp. anhydrite. |
| 218 | 330 | Sylvania |
| | | Sandstone. |
| 330 | 520 | Bois Blanc |
| | | Interbedded dolomite and sandstone. |
| | | SILURIAN |
| 520 | 600 | Bass Island |
| | | Dolomite with Shale streaks. |
| 600 | 740 | Salina "G" |
| | | Dolomite; shale, some white anhydrite. |
| 740 | 936 | "Fed" |
| | | Dolomite; anhydrite. |
| 936 | 1004 | "C" Dolomite |
| | | Dolomite and shale. |
| 1004 | 1032 | "B" Dolomite |
| 1004 | 1032 | "B" Dolomite |
| 1032 | 1062 | Dolomite; anhydritic in parts. |

IF WELL WAS CORED, ATTACH CORE DESCRIPTION

DRILL STEM TEST DATA

JUN 25 1980

There is a Map too large for microfilming included with these original documents, at the record center.

22-04S-10E
BROWNSTOWN TWP. (WAYNE CO.)

MARATHON OIL COMPANY

MARATHON OIL CO #BR-3

GAS STORAGE FIELD WELL
LPG STORAGE
TD 1173 FT. IN SALINA B

PERMIT NO. 32883

| SURFACE LOCATION: | QT | QT | QT | SEC | T | R | FT FROM QT SEC LINES |
|---|---|---|---|---|---|---|---|
| | SW | NE | SE | 22 | 04S | 10E | 1135 N 1158 E |

THIS WELL RECORD ASSEMBLY IS A COMPILATION OF WELL DATA FILED BY OR ON BEHALF OF THE OPERATOR, AS REQUIRED BY ACT 61, P.A. 1939, AS AMENDED; FORMATION TOPS AND STRATIGRAPHIC INTERVALS DETERMINED OR CONFIRMED WHERE POSSIBLE BY GEOLOGICAL SURVEY DIVISION PERSONNEL FROM MECHANICAL LOGS AND PRELIMINARY INFORMATION COLLECTED WHILE DRILLING WAS IN PROGRESS. RECORDS COMPILED BY BOB RESZKA, GEOLOGIST.

ELEVATIONS: 605 KELLY BUSHING (DATUM), 595 GROUND

FORMATION TOPS AND STRATIGRAPHIC INTERVALS DETERMINED OR CONFIRMED BY GEOLOGICAL SURVEY PERSONNEL FROM BIRDWELL DENSITY, NEUTRON (CNL,FDC,GAMMA) LOGS AND RECORDS FILED BY OPERATOR.

| | MD | | MD |
|---|---|---|---|
| PLEISTOCENE: | | Bass Islands Group | 405 |
| Drift to | 133 | Salina G Unit | 598 |
| DEVONIAN: | | F Evaporites | 615 |
| Amherstburg | 133 | E Unit | 815 |
| Sylvania | 205 | D Evaporite | 906 |
| Bois Blanc | 291 | C Unit | 924 |
| SILURIAN: | | B Unit | 990 |

THE FOLLOWING DOCUMENTS ARE REPRODUCTIONS OF OFFICIAL RECORDS SUBMITTED BY: R. H. CHURCH, ON BEHALF OF MARATHON OIL COMPANY.

12/07/84

IMLAY CITY HAS COPY

STATE OF MICHIGAN
DEPARTMENT OF NATURAL RESOURCES

# LOG OF OIL, GAS, DISPOSAL OR STORAGE WELL (ACT 61)

Submit in **DUPLICATE** Within 30 Days after Well Completion

PERMIT NUMBER: 32883

DEEPENING PERMIT NUMBER:

| NAME(S) & ADDRESS OF OWNER(S) SHOWN ON PERMIT | NAME & ADDRESS OF DRILLING CONTRACTOR(S) |
|---|---|
| Marathon Oil Company<br>1300 South Fort St.<br>Detroit, MI 48217 | L&G Drilling<br>3959 East River Road<br>Mt. Pleasant, MI 48858 |

LEASE NAME(S) & WELL NUMBER SHOWN ON PERMIT: Marathon Oil Company BR#3

DIRECTIONALLY DRILLED: YES ☐ NO ☒

| SURFACE LOCATION | SECTION | TOWNSHIP | RANGE | TOWNSHIP NAME |
|---|---|---|---|---|
| SW NE SE | 22 | 4S | R 10E | Brownstown |

FOOTAGES (North/South): 1135 Ft. from North Line and (East/West): 1158 Ft. from East Line of quarter section — COUNTY NAME: Wayne

| SUBSURFACE LOCATION | SECTION | TOWNSHIP | RANGE | TOWNSHIP NAME |
|---|---|---|---|---|
| | | | | Brownstown |

FOOTAGES (North/South): 1135 Ft. from North Line and (East/West): 1158 Ft. from East Line of quarter section — COUNTY NAME: Wayne

| DATE | | | | ELEVATIONS | |
|---|---|---|---|---|---|
| DRILLING BEGUN: 6/13/79 | TOTAL DEPTH OF WELL: Driller ____ Log 1169 ft. | TYPE WELL: LPG Storage | | | |
| DRILLING COMPLETED: 7/6/79 | FORMATION AT T.D.: Salina B-Salt | FT. DRLD. – ROTARY TOOLS: From W.H. To 1173 | | K.B. 605 | R.F. |
| WELL COMPLETED: 7/8/79 | PRODUCING FORMATION(S): – | FT. DRLD. – CABLE TOOLS: From – To – | | R.T. | Grd. 595 |

CASING, CASING LINERS AND CEMENTING

| SIZE | WHERE SET | CEMENT | Ft. Pulled |
|---|---|---|---|
| 16" | 145.88 ft. | Circ. | |
| 11-3/4" | 1017.13 ft. | Circ. | |
| 8-5/8" | 1065 ft. | None | |
| 4½" | 1141.72 ft. | None | |
| | | | |

PERFORATIONS

| DATE | NUMBER HOLES | INTERVAL PERFORATED | OPEN YES | OPEN NO |
|---|---|---|---|---|
| | | | | |

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 Line | Gas Log. | Fill Up |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |

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 |
|---|---|---|---|---|
| | | | | |

MECHANICAL LOGS, LIST EACH TYPE RUN — DEPTH CORRECTION — DEVIATION SURVEY — PLUGGED BACK

| Brand | (X) | LOG TYPES | LOGGED INTERVALS | DEPTH | CORRECT'N | RUN AT | DEGREES | YES | NO | DEPTH |
|---|---|---|---|---|---|---|---|---|---|---|
| Schlumberger | | | | | | | | | | |
| Birdwell | X | Density & | 20'-1015' | | | | | | | |
| | | Neutron | | | | | | | | |
| OTHER Birdwell | X | 3D Velocity | 20'-1015' | | | | | | | |

PRODUCTION TEST DATA

| OIL – Bbls/day | GRAVITY – °API | COND. Bbls/day | GAS – MCF/day | WATER – Bbls/day | $H_2S$ – Grains/100 cu. ft. | B.H.P. AND DEPTH |
|---|---|---|---|---|---|---|
| | | | | | | |

I AM RESPONSIBLE FOR THIS REPORT. WITHIN MY KNOWLEDGE ALL FACTS ARE TRUE AND COMPLETE.

| DATE | TITLE | SIGNATURE |
|---|---|---|
| 6/23/80 | Manager, Engineering Department | [signature] |

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

R-7210
Rev. 12/75

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

| ELEVATION USED: | GEOLOGIST NAME: | TOPS TAKEN FROM: |
|---|---|---|
| 605 K B | H. M. Kuchta | [X] 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) |
|---|---|---|
| 0 | 100 | Top Bedrock |
| | | DEVONIAN |
| 100 | 204 | Detroit River. |
| | | Dolomite, scattered gyp. and anhydrite. |
| 204 | 292 | Sylvania |
| | | Sandstone |
| 292 | 502 | Bois Blanc |
| | | Interbedded dolomite and sandstone. |
| | | SILURION |
| 502 | 592 | Bass Island |
| | | Dolomite with Shale Streaks. |
| 592 | 732 | Salina "G" |
| | | Dolomite, Shaly, some white anhydrite. |
| 732 | 926 | "Fed" |
| | | Dolomite; anhydritic. |
| 926 | 992 | "C" Dolomite |
| | | Dolomite with shale. |
| 992 | 1047 | "B" Dolomite |
| | | Dolomite, Anhydritic in parts. |

IF WELL WAS CORED, ATTACH CORE DESCRIPTION

DRILL STEM TEST DATA

JUN 25 1980

E. P. G. (33)
TD 1155 in Salina-A-2
Carbonate (44)
Facility Well

22-4S-10E
City of Woodhaven Twp. (Wayne Co.)

Marathon Oil Company

Marathon Oil Company (Woodhaven) LPG No. 5 Permit No. 27528

Drilling Contractor: North American Drilling Company (Rotary 0-1155)

Location: N½ SE¼ Section 22, T. 4S, R. 10E
785.2 feet from North and 823.39 feet from East line of quarter section.

Elevation: 606 feet above sea level (Kelly bush.)

Record by: H. Laaksonen from poor driller's log. Logs run: Schlumberger Compensated Formation Density Log 100'-1150' (Sj)

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Clay | 40 | 40 |
| DEVONIAN: | | |
| Detroit River: | | |
| Limestone, gray (SHS = 0° deviation @ 156) | 160 | 200 S |
| Sylvania: | | |
| Limestone, gray,sandy | 89 | 289 S |
| Bois Blanc: | | |
| Limestone, gray | 155 | 444 |
| Limestone & Chert | 58 | 502 |
| Limestone (SHS = 0° deviation @500) | 91 | 593 S |
| SILURIAN: | | |
| Salina: | | |
| Limestone | 47 | 640 |
| Limestone & Anhydrite | 86 | 726 |
| Limestone | 70 | 796 |
| Limestone and Anhydrite (C Unit @ 917 Sj)(B Unit @ 988 Sj) (SHS = 0° deviation @ 862) | 233 | 1029 |
| Anhydrite | 14 | 1043 |
| Salt (B Salt @ 1043 Sj) | 107 | 1150 |
| Limestone (A-2Carbonate @ 1150 Sj) | 5 | 1155 |
| | (562+) | |
| | Total Depth = 1155 | |

Casing Record:
16" 148 (300 Cement)
11 3/4" 1039 (600 Cement) Commenced: 1/31/69
Completed: 2/11/69
Well Completed: 2/19/69

Initial Production: LPG Storage
tmo
1/6/71

BEST COPY
AVAILABLE

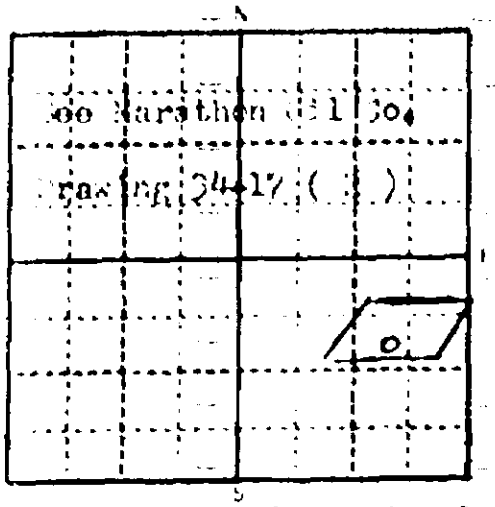
27528

# APPLICATION FOR PERMIT TO DRILL A WELL FOR OIL, GAS, GEOLOGICAL TEST, BRINE DISPOSAL, GAS OR L.P.G. STORAGE OR FOR SECONDARY RECOVERY

UNDER AUTHORITY OF ACT 61, P.A. OF 1939, AS AMENDED, AND ACT 326, P.A. 1937 AS AMENDED.

MAIL TO: SUPERVISOR OF WELLS
GEOLOGICAL SURVEY
MICHIGAN DEPARTMENT OF CONSERVATION
LANSING, MICHIGAN 48926

*See Reverse Side Before Filling Out This Application*




LOCATE WELL AND OUTLINE LEASE OR UNIT ON SECTION PLAT - 640 ACRES

1. APPLICATION TO DRILL A WELL FOR: LPG Storage
2. DATE: 1-14-69
3. FEE ENCLOSED: $ 25.00
4. LESSEE (OWNER OF LEASE RIGHTS): Marathon Oil Company
5. PERMANENT ADDRESS: 1300 So. Fort Street, Detroit, Michigan, 48217
6. PHONE: 843-9100
7. LESSOR (IF LEASE NAME OF OWNER OF MINERAL RIGHTS): Marathon Oil Company ( Woodhaven )
8. WELL NO.: LPG #5
9. SURFACE OWNER (IF OTHER THAN MINERAL OWNER): Same
10. DRILLING CONTRACTOR: North American Drilling Company
11. ADDRESS: 1300 W. Fancher
12. PHONE: 773-3945
13. XXX N½ XXX SE ¼ SECTION 22 T 4 S R 10 East
14. ACRES IN LEASE OR UNIT (SPECIFY): 11.534 acres
15. TOWNSHIP: City of Woodhaven
16. COUNTY: Wayne
17. *Locate well in two directions from nearest lines of quarter section and property ownership or unit lines*

785.26 FT. FROM North (north-south) LINE OF QUARTER SECTION
823.39 FT. FROM East (east-west) LINE OF QUARTER SECTION
335.00 FT. FROM North (north-south) (PROPERTY) (XXXX) LINE
790.00 FT. FROM East (east-west) (PROPERTY) (XXXX) LINE

18. KIND OF TOOLS TO BE USED (Cable, rotary, combination): Rotary
19. WELL IS TO BE COMPLETED IN: Salina FORMATION
20. INTENDED DEPTH OF WELL: 1150'
21. PROGRAM OF CASING, SEALING, CEMENTING AND COMPLETING WELL

Duplication of Wells LPG #1, #2, and #4.

See attached write-up.

CASING IS NOT TO BE STRIPPED FROM THE HOLE AND NO CHANGE IS TO BE MADE IN THE PROGRAM OUTLINED ABOVE WITHOUT APPROVAL OF THE SUPERVISOR OF WELLS OR HIS AUTHORIZED REPRESENTATIVE

22. ARE THERE ANY LAKES, STREAMS, DRAINAGE WAYS, SWAMPS, OR MARSHES NEARER THAN 300 FEET FROM WELL LOCATION? Yes ☐ No ☒
23. ARE THERE ANY BUILDINGS OR OTHER STRUCTURES WITHIN 75 FEET OF THE PROPOSED LOCATION? Yes ☐ No ☒
24. IF ANSWER TO No. 22 ABOVE IS Yes, DESCRIBE AND GIVE DISTANCE FROM LOCATION.

APPLICANT AGREES TO COMPLY WITH THE PROVISIONS OF ACT 61, PUBLIC ACTS OF 1939, AS AMENDED, AND ACT 326, PUBLIC ACTS OF 1937, AS AMENDED, AND RULES AND REGULATIONS PERTAINING TO THE LOCATING, DRILLING, CASING, SEALING, COMPLETING, PRODUCING, AND PLUGGING OF WELLS. BEFORE COMMENCING DRILLING OPERATIONS, CONTACT THE NEAREST FIELD OFFICE. *(See reverse side)*

25. ADDRESS CORRESPONDENCE AND PERMIT TO: Mr. T. Ruffing - 1300 S. Fort St., Detroit, Michigan
26. PHONE: 843-9100

LEAVE BLANK
DATE ISSUED
PERMIT NO.

27. OWNER OF LEASE RIGHTS: Marathon Oil Company
28. AUTHORIZED REPRESENTATIVE: Thomas Fritz, Div. Mgr.

FOR CASHIER'S USE ONLY - DO NOT WRITE IN THIS SPACE

DISTRIBUTION
1. WHITE - LANSING
2. CANARY - CASHIER
3. BLUE - FIELD
4. GOLDENROD - FIELD
5. GREEN - APPLICANT

Form Cons. 7209-A 1000 Sets 7-68

STATE OF MICHIGAN

DEPARTMENT OF CONSERVATION

SUPERVISOR OF WELLS

No 9317

# PERMIT TO DRILL A WELL FOR OIL OR GAS

(POST WHITE COPY OF PERMIT AT WELL LOCATION)

Permit No. 27328 Date Issued January 21, 1969

Permission is hereby granted to Marathon Oil Company
Owner

1300 South Fort Street, Detroit, Michigan 48217
Address

Lease Name Marathon Oil Company (Woodhaven) Well Number LPG #5

To drill a well for LPG Storage

in the N½ SE¼ Section 22, T.4S., R.10E., City of Woodhaven, Wayne Co.

and located 785.26' from north and 823.39' from east line of quarter section

and located 335.00' from north and 790.00' from east property line

This permit is issued subject to the provisions and requirements of Act 61, P. A. 1939 and Act No. 326, P. A. 1937, as amended, and rules, regulations, requirements, or orders issued by the Supervisor of Wells and Department of Conservation.

GERALD E. EDDY, SUPERVISOR OF WELLS

By. Robert M. Baker

## SPECIAL REQUIREMENTS

### NOTICE

DRILLING PERMIT ISSUED on the basis of the drilling, casing and sealing program as outlined on the application for permit and subject to special requirements as set forth above. No change or alteration is to be made without the permission and approval of the Supervisor of Wells or his authorized representative.

DRILLING OPERATIONS ARE NOT TO BE COMMENCED until all the well location requirements have been completed and the permit has been posted in a conspicuous place at the well site.

### DEPARTMENT OFFICES

Lansing, Phone 517-373-1256
Mount Pleasant, Phone 517-773-9965
Cadillac, Phone 616-775-9728
Plainwell, Phone 616-685-8051
Imlay City, Phone 313-724-7018
Escanaba, Phone 906-786-0333

PERMITS MAY BE TRANSFERRED ONLY WITH THE PERMISSION OF THE SUPERVISOR OF WELLS

- LANSING, MI 48909 ••• MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

1-14-69

Recommended Drilling Program for Marathon's Proposed Storage Caverns at Woodhaven, Brownstone Township, Wayne County, Michigan

1. Move in North American Drilling Company's rotary rig No. 10 or comparable equipment.

2. Rig up and drill a 20" hole to 80 feet or deeper as required to completely penetrate the drift.

3. Run 80 feet of 16" O.D., H-40 55#/ft. S.T. & C., casing and cement with 150 sacks of accelerated portland cement. The Texas pattern show and the bottom two joints of casing should be spot welded.

4. Install surface casing flange and blowout preventer.

5. After 12 hours W.O.C., drill out with a 15" bit. Brine mud will be used. Drill to approximately 1150' or to the bottom of the salt formation.

6. Upon completion of the drilling, circulate long enough to condition the hole for logging.

7. At this time, Schlumberger Well Logging Company should run a Formation Denisty - Gamma Ray Log and a Neutron Log.

8. After circulating long enough to condition the hole, approximately 1050 feet of 11-3/4" O.D., 47#/ft., J-55, S.T. & C., 8 Rd. Thd., casing should be run. Casing equipment will consist of a Baker guide, shoe, a Baker float collar, and three Baker centralizers. The first four joints are to be spot welded.

   Prior to running casing, all thread protectors are to be removed. The casing threads are then to be brushed and cleaned with solvent. After cleaning, dry the threads with clean rags and inspect each thread visually. After inspecting threads, dope with lubricant as provided. The thread protectors should be similarly cleaned and dried and replaced on the casing and not removed until the casing is run.

9. Upon landing the casing, circulation should be established and continued until 175 bbls. (150% of casing capacity) or more has been circulated. Halliburton should then cement the string with 500 sacks of salt saturated cement with 1.5% excess crushed salt blended into the dry mix. If enough brine storage is available on the rig, the plug should be pumped down with brine. This will facilitate testing prior to drilling out.

- LANSING, MI 48909 *** MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
- LANSING, MI 48909 *** MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

10. Hang casing in casing slips in full tension. Release rig or shut rig down for seven days W.O.C. The remainder of the completion can be done with the rotary rig or a workover rig as economics dictate.

11. After seven days W.O.C. test casing to 750 psi for fifteen minutes.

12. Drill out plug and ream hole to total depth, using a 10-5/8" bit.

13. Two strings of 4-1/2" O.D. casing should then be run and suspended approximately 1 foot above the base of the salt.

14. After tree is installed, release rig.

MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909 ***

# MARATHON OIL COMPANY

REFINING - UNITED STATES

MICHIGAN REFINING DIVISION

1300 SOUTH FORT STREET
DETROIT, MICHIGAN 48217
PHONE 313-843-9100

January 16, 1969

Michigan Department of Conservation
Geological Survey Division
Lansing, Michigan 48926

Attention: Mr. Robert Acker
Petroleum Geologist

Dear Mr. Acker:

In accordance with our conversation of January 15th, enclosed please find an LPG Storage Well permit application, a Marathon Oil Company check for the amount of $25.00 to cover the permit fee, and a scheduled drilling and casing procedure for the new well. As mentioned, the new well will be a duplicate of the three wells drilled last year for this same purpose.

At this same time, I would like to submit the actual well location for the recently completed Brine Disposal Well (BD#I). The result of our survey shows the following:

532.72 feet from North 1/4 line
82.46 feet from North property line
302.72 feet from East 1/4 line
269.33 feet from East property line
597.11 feet - Geodetic Elevation of 10-3/4" Casing Flange.

I hope this data is satisfactory. If you should have any questions, please feel free to contact me.

Very truly yours,

MARATHON OIL COMPANY

Sydney Blum
Manager of Engineering

per T. J. Ruffing
T. J. Ruffing
Associate Refining Engineer

TJR:tk
enc.

*** MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909 ***
- LANSING, MI 48909 *** MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

Cons. 7225

# WELL LOCATION REPORT

Permit No. 27528

Operator Marathon Oil Company

Farm Name Woodhaven LPG #5

Notification 1/31/69. Jud Howdyshell to Diana Trierweiler.
"Should start drilling about noon today".

Nature of Location Open field with oil storage tanks and piping near-by.

Condition of Pits Big enough

Distance from Water None involved

Remarks 2/3/69 Running 16" casing. Halliburton on hand to cement.

Approved by D. R. Brackenbury Date February 3, 1969

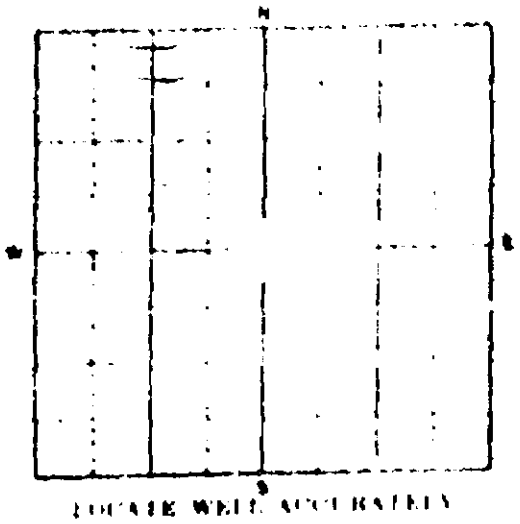

- LANSING, MI 48909 ••• MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

APR 13 1970

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

# 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 346 P. A. 1937)




LOCATE WELL ACCURATELY

Permit No. 27528 Deepening No. .....

Owner or Operator Marathon Oil Company

Address 1300 South Fort St., Detroit, Michigan

Well No. 5 Farm Marathon Oil Co. (Woodhaven) LPG

Township City of Woodhaven County Wayne

Location N/2 SE/4 Sec. 22 Twp. 4S Range 10E Elevation 594.68R

Footage 785.26 ft. from North line and 823.39 ft. from East line of quarter section

Type of well LPG Storage (OIL, GAS, BRINE DISPOSAL, DRY HOLE) Total depth 1155 Completed in Salt & Lime

Name of producing formation ..... Top of formation Salt 1039'

Date drilling begun 1/31/69 Date drilling completed 2/11/69 Date well completed Drld out cement, plgs & 2/19/69 cir. hole clean.

Drilling contractor NORTH AMERICAN DRILL. CO. Address Mt. Pleasant, Michigan 48858

**WATER ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| | | | |

**OIL OR GAS ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| | | | |

**DEVIATION SURVEY**

| Run at | Degrees |
|---|---|
| 156 | 0 |
| 500 | 0 |
| 862 | 0 |

**CASING AND CEMENTING**

| Size | Where Set | Cement | Amt. Pulled |
|---|---|---|---|
| 16" | 148 | 300 + 2% HA5 | |
| 11-3/4" | 1039 | 600 | |

**STEEL LINES RUN**

| Run at | Corrected to | Run by |
|---|---|---|
| | | |

**PERFORATIONS**

| Date | From | To | No. Holes |
|---|---|---|---|
| | | | |

**ACID OR SHOOTING RECORD**

| Date | From | To | Gals. Acid or Qts. Nitro |
|---|---|---|---|
| | | | |

Rotary tools from 0 feet to 1155 feet Cable tools from ..... feet to ..... feet.

Natural initial production first 24 hours ..... 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. As taken from daily drilling reports.

Date April 6, 1970

Signed NORTH AMERICAN DRILLING COMPANY

Title Lee W. Larimer, Sec. & Treas.

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE (Submit in Duplicate)

Cons. 1210
Rev. 9/64

LANSING, MI 48909
LANSING, MI 48909 ••• MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

| FROM | TO | FORMATION (TYPE, COLOR, HARDNESS) | FROM | TO | FORMATION |
|---|---|---|---|---|---|
| 0 | 40 | Clay (Drift) | | | |
| 40 | 242 | Grey Lime | | | |
| 242 | 378 | Grey Sandy Lime | | | |
| 378 | 444 | Grey Lime | | | |
| 444 | 502 | Lime & Chert | | | |
| 502 | 640 | Lime | | | |
| 640 | 726 | Lime & Anhyd | | | |
| 726 | 796 | Lime | | | |
| 796 | 1029 | Lime & Anhyd | | | |
| 1029 | 1039 | Anhyd | | | |
| 1039 | 1149 | Salt | | | |
| 1149 | 1155 | Lime | | | |
| | 1155 | TD | | | |

(IF WELL WAS CORED, ATTACH CORE DESCRIPTION)

DRILL STEM TEST DATA

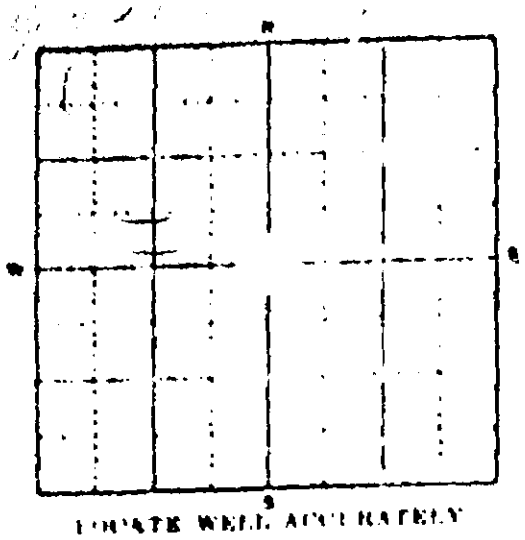
*** MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909 ***

APR 6 8 1970

STATE OF MICHIGAN
DEPARTMENT OF CONSERVATION

# 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. 27528 Deepening No. .....

Owner or Operator Marathon Oil Company

Address 1300 South Fort St., Detroit, Michigan

Well No. 5 Farm Marathon Oil Co. (Woodhaven) LPG

Township City of Woodhaven County Wayne

Location N/2 SE/4 Sec. 22 Twp. 4S Range 10E Elevation ?

Footage 785.26 ft. from North line and 823.39 ft. from East line of quarter section

Type of well (OIL, GAS, BRINE DISPOSAL, DRY HOLE) LPG Storage Total depth 1155 Completed in Salt & Lime

Name of producing formation ..... Top of formation Salt 1039'

Date drilling begun 1/31/69 Date drilling completed 2/11/69 Date well completed Drld out cement, plgs & 2/19/69 clr. hole clean.

Drilling contractor NORTH AMERICAN DRILL. CO. Address Mt. Pleasant, Michigan 48858

**WATER ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| | | | |

**OIL OR GAS ZONES**

| Name | From | To | Amount |
|---|---|---|---|
| | | | |

**DEVIATION SURVEY**

| Run at | Degrees |
|---|---|
| 156 | 0 |
| 500 | 0 |
| 862 | 0 |

**CASING AND CEMENTING**

| Size | Where set | Cement | Amt. pulled |
|---|---|---|---|
| 16" | 148 | 300 + 2% | 105 |
| 11-3/4" | 1039 | 600 | |

**STEEL LINES RUN**

| Run at | Corrected to | Run by |
|---|---|---|
| | | |

**PERFORATIONS**

| Date | From | To | No. holes |
|---|---|---|---|
| | | | |

**ACID OR SHOOTING RECORD**

| Date | From | To | Gals. acid or qts. nitro |
|---|---|---|---|
| | | | |

Rotary tools from 0 feet to 1155 feet. Cable tools from ..... feet to ..... feet.

Natural initial production first 24 hours ..... 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. As taken from daily drilling reports.

Date April 6, 1970

Signed NORTH AMERICAN DRILLING COMPANY

Title [illegible]

LANSING, MI 48909 *** MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

# FORMATION RECORD

(ATTACH ADDITIONAL SHEETS IF NECESSARY)

| FROM | TO | FORMATION (TYPE, COLOR, HARDNESS) | FROM | TO | FORMATION |
|---|---|---|---|---|---|
| 0 | 40 | Clay (Drift) | | | |
| 40 | 242 | Grey Lime | | | |
| 242 | 370 | Grey Sandy Lime | | | |
| 370 | 444 | Grey Lime | | | |
| 444 | 562 | Lime & Chert | | | |
| 562 | 640 | Lime | | | |
| 640 | 725 | Lime & Anhyd | | | |
| 725 | 726 | Lime | | | |
| 726 | 1029 | Lime & Anhyd | | | |
| 1029 | 1030 | Anhyd | | | |
| 1030 | 1149 | Salt | | | |
| 1149 | 1155 | Lime | | | |
| | 1155 | TD | | | |

(IF WELL WAS CORED, ATTACH CORE DESCRIPTION)

DRILL STEM TEST DATA


LANSING, MI 48909 ••• MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

Issued: 1/21/69 Permit No. 27528

Co. MARATHON OIL COMPANY

Farm MARATHON OIL CO. (WOODHAVEN) LPG #5 No.

Twp. CITY OF WOODHAVEN Co. WAYNE

Loc. N½ SE¼ Sec 22 T. 4S R. 10E

785.26 from N and 823.39 from E line of ¼ Sec.

335.00 from N and 790.00 from E property line

Contractor NORTH AMERICAN DRILLING COMPANY

Comm. 1-31-69 Comp.

CASING RECORD

| | Length | Pulled |
|---|---|---|
| 16" | 148' | |
| 10" | | |
| 8¾" | | |
| 6¾" | | |
| 5¾" | | |

MUDDING AND CEMENTING RECORD

| Date | Size | No. Sacks | Company |
|---|---|---|---|
| | 10" | | |
| | 8¾" | | |
| | 6¾" | | |
| | 5¾" | | |

GEOLOGICAL FORMATION RECORD

Elevation

Drift to 40'

T. D.

P. B.

I. P. (N)

I. P. (A)

Plug Comp.

FIELD ACTIVITY REPORT

BRACKENBURY

DATE Feb. 3 19 69 FIELD NAME OR TYPE WELL Drilling

| PERMIT NO. | OPERATOR | LEASE OR WELL NAME & NO. | TOWNSHIP | COUNTY |
|---|---|---|---|---|
| 27528 | Marathon Oil Co. | Woodhaven LPG #5 | 22-Woodhaven | Wayne |

Spud 1/31/69. Drift to 40', Det. River lime 40'. 16" casing now being set at 148'. Halliburton to cement with 300 sacks of regular cement with 2% HA-5. 3/4# of Flocele per sack in 1st 100 sacks of cement.

INSPECTOR

CONS 7231


- LANSING, MI 48909 ••• MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

(Salina - 1150')
Duplication of Wells LPG #1, #2, and #4.
See attached write-up.
2-3-87, [illegible]
[illegible]
[illegible]

GS-14

- LANSING, MI 48909 ••• MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909
- LANSING, MI 48909 ••• MI DNR - GEOLOGICAL SURVEY - BOX 30028 - LANSING, MI 48909

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY REVISED

# RECORD OF WELL DRILLING OR DEEPENING

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

Permit number/Deepening number: 57361

(Submit 3 copies within 60 days of drilling completion.)

API number: 21-163-57361-00-00

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

Well name and number: Woodhaven Well #3

Name and address of permittee:
Marathon Pipeline LLC
539 South Main Street
Findlay, OH 45840

Surface location: NW 1/4 of SE 1/4 of SE 1/4 Section 22 T4S R10E

Township: Brownstown

County: Wayne

Footages North/South: 990 ft. from South line and

East/West: 1070 ft. from East line of sec.

Name and address of drilling contractor:
Bigard & Hugoard
5580 Venture Way
Mt. Pleasant

Directionally drilled (check one): ☐ Yes ☒ No

Previous permit numbers:

Subsurface location (if directionally drilled): 1/4 of 1/4 of 1/4 Section T R

Township: County:

Footages North/South: ft. from line and

East/West: ft. from line of sec.

Date drilling began: 12/1/05

Date drilling completed: 12/16/05

Total depth of well: Driller 1244 Log 1244

Formation at total depth: Saline "B"

Elevations: K.B. 11 ft. R.F. ft. R.T. ft. Grd 600 ft

Feet drilled - cable tools: from to

Feet drilled - rotary tools: from 0 to 1244

**Casing, Casing Liners and Cementing, Operating Strings**

| Size | Where set | Cement | T.O.C. | Ft. pulled |
|---|---|---|---|---|
| 16 | 162 | 125 | Surf | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Water Fill Up (F.U.) or Lost Circulation (L.C.) (X)**

| Formation | F.U. | L.C. | Depth | Amount |
|---|---|---|---|---|
| N/A | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Gross Pay Intervals**

| Formation | Oil or Gas | From | To |
|---|---|---|---|
| N/A | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**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 |
|---|---|---|---|---|---|---|---|---|
| N/A | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Depth Correction**

| Depth | Correction |
|---|---|
| N/A | |
| | |
| | |
| | |

**Deviation Survey**

| Run at | Degrees |
|---|---|
| | |
| | |
| | |
| | |

**Plugged Back**

| Yes | No | Depth |
|---|---|---|
| X | | 100 ft |
| | | |
| | | |
| | | |

**Geophysical / Mechanical Logs** (list each type run)

| Brand | Log types | Logged intervals |
|---|---|---|
| Baker Atlas | GRN/FDL | 50-1210 ft |
| Baker Atlas | Multipole Array Acoustic Imaging Log | 740-1233 ft |
| Baker Atlas | Dipole Sonic Circumferential Borehole Log | 100-1210 ft |
| | | |

Notice: Report complete sample and formation record, coring record, and drill stem test information on reverse side.

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

| Date | Name and title (print) | Signature |
|---|---|---|
| 3/28/07 | Thomas A. Ross ES&R Professional | Thomas A. Ross |

Submit to: OFFICE OF GEOLOGICAL SURVEY,
MICHIGAN DEPT OF ENVIRONMENTAL QUALITY
PO BOX 30256, LANSING, MI 48909-7756

EQP 7200-5 (rev. 8/2004)

APR 02 2007

REVISED

# FORMATION RECORD

Attach additional sheets if necessary

| API number | Permit number/Deepening number |
|---|---|
| 21-163-57361-00-00 | 57361 |

| Elevation used | Geologist name | Tops taken from |
|---|---|---|
| | | ☐ Driller's log ☐ Sample log ☐ Electric log |

Note: if well directionally drilled, add true vertical depth formation tops where appropriate

| From | To | Formation (type, color, hardness) |
|---|---|---|
| N/A | | |

| From | To | Formation (type, color, hardness) |
|---|---|---|
| | | |

If well was cored, attach core description

DRILL STEM TEST DATA

N/A

LIST ATTACHMENTS

OFFICE OF GEOLOGICAL SURVEY USE ONLY

Reviewed by

Date of review

APR 02 2007

57361

# DESCRIPTION OF ROCK CORE RECOVERED FROM WOODHAVEN WELL #3 WOODHAVEN, MICHIGAN

Topical Report RSI-1880

*prepared for*

PB Energy Storage Services, Inc.
11757 Katy Freeway, Suite 600
Houston, Texas 77079

March 2007

RESPEC
CONSULTING & SERVICES

APR 02 2007

57361

# DESCRIPTION OF ROCK CORE RECOVERED FROM WOODHAVEN WELL #3 WOODHAVEN, MICHIGAN

Topical Report RSI-1880

*by*

Paul E. Nelson

RESPEC
P.O. Box 725
Rapid City, South Dakota 57709

*prepared for*

PB Energy Storage Services, Inc.
11757 Katy Freeway, Suite 600
Houston, Texas 77079

March 2007

APR 02 2007

57361

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APR 02 2007

57361

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APR 02 2007

5736|

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APR 02 2007

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(Continued)


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| B-30 | Core Run 3: 1,110 to 1,115 Feet | B-16 |
| B-31 | Core Run 3: 1,115 to 1,120 Feet | B-17 |
| B-32 | Core Run 3: 1,120 to 1,124 Feet | B-17 |
| B-33 | Core Run 4: 1,124 to 1,125 Feet | B-18 |
| B-34 | Core Run 4: 1,125 to 1,130 Feet | B-18 |
| B-35 | Core Run 4: 1,130 to 1,135 Feet | B-19 |
| B-36 | Core Run 4: 1,135 to 1,140 Feet | B-19 |
| B-37 | Core Run 4: 1,140 to 1,145 Feet | B-20 |
| B-38 | Core Run 4: 1,145 to 1,150 Feet | B-20 |
| B-39 | Core Run 4: 1,150 to 1,155 Feet | B-21 |
| B-40 | Core Run 4: 1,155 to 1,160 Feet | B-21 |
| B-41 | Core Run 4: 1,160 to 1,165 Feet | B-22 |
| B-42 | Core Run 4: 1,165 to 1,170 Feet | B-22 |
| B-43 | Core Run 4: 1,170 to 1,175 Feet | B-23 |
| B-44 | Core Run 4: 1,175 to 1,180 Feet | B-23 |
| B-45 | Core Run 4: 1,180 to 1,184.5 Feet | B-24 |




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# 1.0 BACKGROUND

Marathon Ashland Petroleum LLC (Marathon) engaged by PB Energy Storage Services, Inc. (PB ESS) to undertake a geomechanical study of the caverns at their underground storage facility in Woodhaven, Michigan. In support of the study, Marathon drilled a well at the facility for the purpose of recovering rock core for laboratory testing, performing geophysical logging of the stratigraphy, and carrying out in situ stress measurements.

RESPEC was engaged by PB ESS to examine, log, and photograph the core recovered from Woodhaven Well #3. In addition, RESPEC prepared the core for shipment and secured transportation for the core samples to the RESPEC laboratory in Rapid City, South Dakota. Field activities were carried out under the supervision of Mr. Paul Nelson of RESPEC with the assistance of Mr. Louis Venegas of PB ESS.

Marathon's Woodhaven facility is located in the city of Woodhaven, Michigan, approximately 16 miles southwest of downtown Detroit. The site is situated on the eastern edge of the Michigan sedimentary basin. The storage caverns at the Woodhaven facility are located in the Silurian-age Salina Group. The Salina Group contains several salt sequences separated by intervals of shale and dolomite. The caverns at the Woodhaven facility are located in the B Unit of the Salina Group. The B Unit in the Michigan Basin is a sequence of relatively thin salt beds separated by beds of shale and dolomite (e.g., Johnson and Gonzales [1978]).

Coring began on December 12, 2005, and was completed on December 14, 2005. The cored interval in Woodhaven Well #3 started in the nonsalt units overlying the B Unit of the Salina Group. This was done to collect core samples of the nonsalt units that form the roof of the existing storage caverns. The well was subsequently drilled through the B Unit salt and terminated in the nonsalt units below. The cored interval extended from 975 to 1,184 feet. All depths are measured relative to the Rotary Kelley Bushing (RKB) elevation, 12 feet above ground level. This report describes the coring activities for Woodhaven Well #3 and includes the field description of the core lithology.

Field activities are described in Chapter 2.0, and Chapter 3.0 summarizes the lithology of the core recorded in the field. Cited references are listed in Chapter 4.0. Appendix A is the lithologic description of the core as recorded in the field. Appendix B contains a photographic log of the core.



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# 2.0 FIELD OPERATIONS

All activities completed at the field site are in accordance with the following RESPEC procedures or as modified to meet specific conditions encountered:

- Test Procedure TP-01, RSI *Standard Procedure for Sample Acquisition, Storage, and Shipping, Rev. 3.*
- Test Procedure TP-09, *RSI Standard Procedure for Logging and Preserving Rock Core at a Field* Site, *Rev. 1.*

## 2.1 GENERAL OPERATIONS DESCRIPTION

The coring assembly was nominally 60 feet in length and the core was nominally 4 inches in diameter. The core was removed from the core barrel on the rig floor. The core was recovered in pieces short enough to be easily handled. Each core piece was hand-carried off the rig floor, "reassembled," and measured on the trailer used to carry the coring tools. After washing, the core was laid out in a heated van located near the drill rig where the core was logged, photographed, and packaged for shipment.

The individual pieces of core were reassembled as well as possible so that a valid measurement of the actual length of the core could be obtained. The core was marked at 1-foot intervals, beginning with the top of each core run. Two colored parallel lines (red on the right and yellow on the left when viewed from the bottom of the core) were also scribed on the core to maintain orientation of the pieces. A lithologic description of the core was recorded and photographs were taken. Upon completion of these tasks, the core was enclosed in plastic wrap, carefully wrapped in "bubble-wrap" material, and placed in 6-inch- by 5-foot-long polyvinyl chloride (PVC) tubes. End caps were fastened to the PVC tubes to secure the core during transportation. After the completion of field activities, the core tubes were transported to the Yellow Freight dispatch center in Detroit, Michigan, for shipment to the RESPEC offices in Rapid City, South Dakota.

## 2.2 CORING ACTIVITIES

Coring activities began in the early morning of December 12, 2005, when the core point (the top of the first core run) was reached at a depth of 975 feet RKB (963 feet below ground level). The final core run, Run 4, was recovered on December 14, 2005, and terminated at a depth of 1,184 feet RKB. Drilling ceased at a total depth of 1,244.8 feet RKB.



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# 3.0 LITHOLOGIC DESCRIPTION

The cored section of Woodhaven Well #3 is within the Silurian-age Salina Group. The cored interval includes all or part of the C, B, and A-2 Units of the Salina Group (in order of increasing depth).

The top of the first core run, Run 1, is at a depth of 975 feet and ends at a depth of 1,004 feet (all depths are relative to RKB). Run 1 covered a 29-foot interval of the C Unit of the Salina Group and is composed predominately of a gray dolomite with varying amounts of light gray to white anhydrite. The top of Run 2 is located at a depth of 1,004 feet and ends at a depth of 1,063.2 feet. Run 2, cored the base of the C Unit and top of the B Unit, encountered a similar lithology as Run 1—dolomite with varying amounts of anhydrite. The transition between the Salina B and C Units occurs at a depth of 1,018 feet and is marked by a shift in the gamma ray trace, indicating a lower clay content in the Salina B Unit. The top of Run 3 is at a depth of 1,063.2 feet and terminated at a depth of 1,124 feet. The top of Run 3 encountered dolomite with anhydrite. The top of salt was encountered by Run 3 at a depth of 1,079.6 feet (1,067.6 feet below ground level). The salt encountered by Run 3 varied from clean to very dirty, giving the salt a color variation of clear to black. The salt is interbedded or mixed with dolomite. The top of Run 4 is located at a depth of 1,124 feet and terminates at a depth of 1,184 feet. Run 4 encountered salt mixed and interbedded with dolomite. Run 4 exited the salt sequence at a depth of 1,142.7 feet, indicating a total salt thickness of 63.1 feet. Run 4 indicated interbedded dolomite and anhydrite immediately underlying the salt.

Figure 3-1 shows a stratigraphic column developed from the core log of Woodhaven Well #3, and Table 3-1 summarizes the field description of the core. Appendix A contains field notes for each core run, and Appendix B contains photographs taken of the core.



APR 02 2007

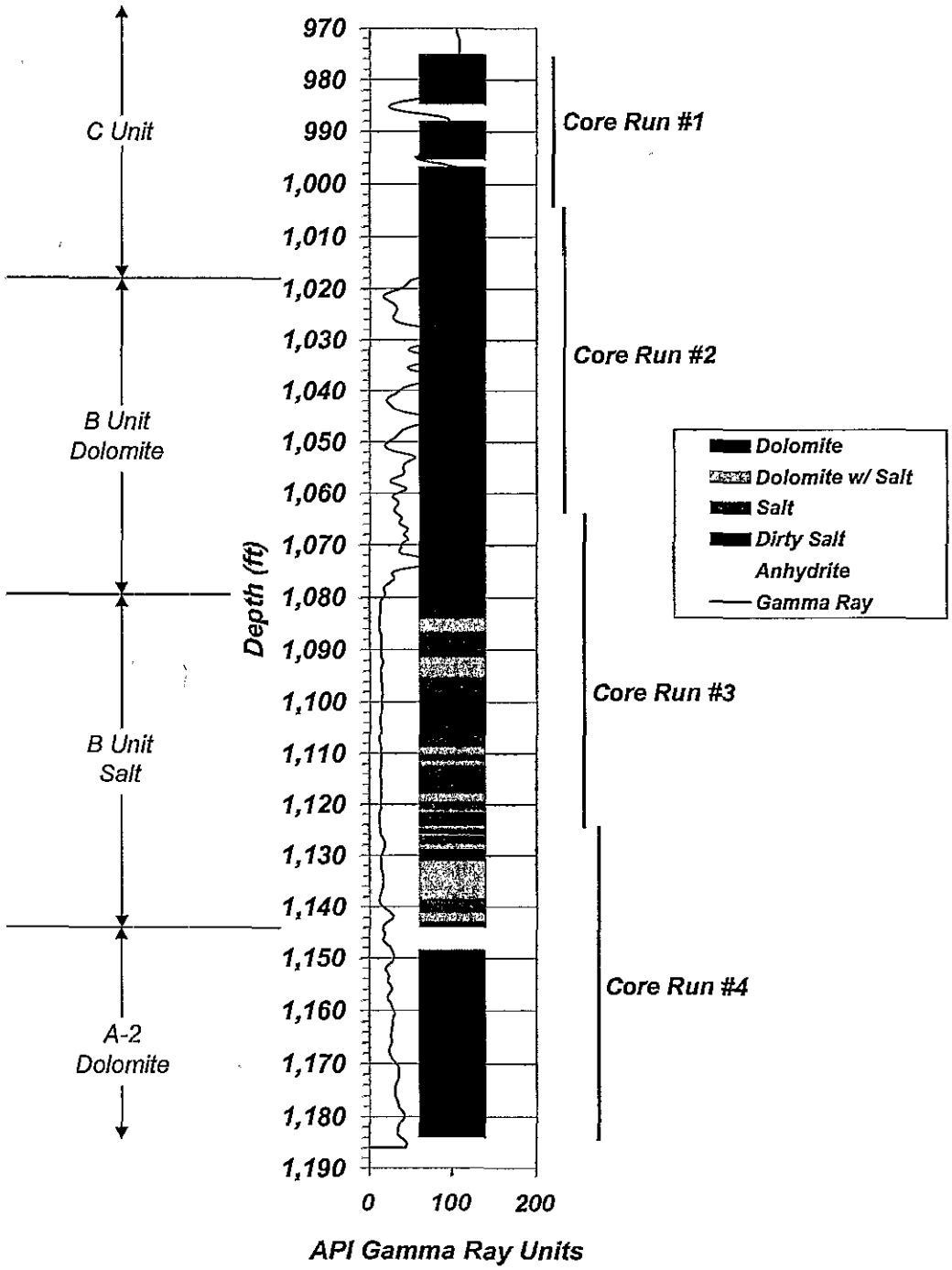


**Figure 3-1.** Stratigraphic Section of Woodhaven Well #3.



APR 02 2007

**Table 3-1. Field Description of Woodhaven Well #3 Core (Page 1 of 2)**

| Depth Interval | Lithology | Description |
|---|---|---|
| 975.0–984.9 | Dolomite | Dolomite, light gray, massive, with white to light-gray masses of anhydrite. Anhydrite content typically less than 10 percent with some intervals approaching 50 percent. Anhydrite typically occurs as masses, with some thin beds and irregular bands less than ¼ inch in thickness. Very few fractures (subvertical filled fracture at 983.3). |
| 984.9–988.0 | Anhydrite | Anhydrite, white to light-gray, massive, competent, with light-gray dolomite, generally less than 5 percent. Subvertical fracture at 986.8). |
| 988.0–995.4 | Dolomite | Dolomite, light-gray, massive, with bands of white to light-gray anhydrite. |
| 995.4–996.7 | Anhydrite | Anhydrite, white to light-gray, massive, competent, with light-gray dolomite. |
| 996.7–1,079.6 | Dolomite | Dolomite, light-gray, massive, with white to light gray masses of anhydrite. Anhydrite typically occurs as masses with some bands. Beds of predominately anhydrite from 1,018 to 1,029; 1,039 to 1,045; 1,047 to 1,053; 1,067 to 1,069; and 1,078 to 1,079.6. Fracture at 1,046.1. |
| 1,079.6–1,080.2 | Salt | Salt, black, very dirty. |
| 1,080.2–1,081.1 | Dolomite | Dolomite, light-gray, massive. |
| 1,081.1–1,084.2 | Salt | Salt, black to dark-gray contains anhydrite inclusions. Top 1 foot very dirty. |
| 1,084.2–1,086.7 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,086.7–1,091.6 | Salt | Salt, dark-gray to black to light-gray. Contains anhydrite inclusions. |
| 1,091.6–1,095.2 | Dolomite With Salt | Dolomite, light-gray with salt-filled voids 1,093.0 to 1,096.6 (breccia). |
| 1,095.2–1,099.4 | Salt | Salt, light-gray to black to clear, with dolomite beds at 1,096.6 to 1,108.8. |
| 1,099.4–1,104.7 | Dirty Salt | Salt, dark-gray to black, very dirty |
| 1,104.7–1,108.9 | Salt | Salt, clear to dark-gray |
| 1,108.9–1,110.2 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |



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**Table 3-1. Field Description of Woodhaven Well #3 Core (Page 2 of 2)**

| Depth Interval | Lithology | Description |
|---|---|---|
| 1,110.2–1,111.5 | Salt | Salt, dark-gray to black, dirty. |
| 1,111.5–1,112.4 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,112.4–1,118.0 | Salt | Salt, dark-gray to black to clear. Very dirty at top becoming cleaner down section. Dolomite masses at 1,115.4, 1,115.7, 1,116.0, 1,116.4, 1,116.8, 1,117.1, and 1,117.8. |
| 1,118.0–1,119.5 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,119.5–1,123.7 | Salt | Salt, light-gray to black to clear. 1-inch anhydrite seam at 1,120.2. 1-inch to 3-inch anhydrite seam at 1,121.2. Thin (<¼ inch) anhydrite seam at 1,121.5. Broken anhydrite seam at 1,121.9. Thin (1/16 inch) anhydrite seams at 1,122.3, 1,122.7, and 1,123.0. |
| 1,123.7–1,124.1 | Dolomite | Dolomite, light-gray, with salt-filled vuggy porosity. |
| 1,124.1–1,124.3 | Salt | Salt, clear with dolomite masses |
| 1,124.3–1,124.9 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,124.9–1,128.0 | Salt | Salt, clear to smoky. Broken dolomite bands at 1,125.1 to 1,125.3, 1,125.55 to 1,126.65, 1,126.2, 1,126.7 to 1,126.8, and 1,127.5 to 1,127.7. |
| 1,128.0–1,128.7 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. Structure appears to dip about 10° near top of section about 30° at 1,135.4. |
| 1,128.7–1,131.2 | Dolomite | Dolomite, light-gray. |
| 1,131.2–1,138.5 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,138.5–1,141.3 | Salt | Salt, clear to smoky with dolomite masses distributed throughout. |
| 1,141.3–1,142.7 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,142.7–1,144.0 | Dolomite | Dolomite, light-brown, bedded, with darker bands. |
| 1,144.0–1,148.4 | Anhydrite | Anhydrite, white, with darker bands, wavy to mottled, appears cross-bedded. |
| 1,148.4–1,184.0 | Dolomite | Dolomite, brown to light-gray, with dark bands, bedded in part. |



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57361

# 4.0 REFERENCES

**Johnson, K. S. and S. Gonzales, 1978.** *Salt Deposits in the United States and Regional Geologic Characteristics Important for Storage of Radioactive Waste,* prepared by Earth Resource Associates, Inc., Athens, GA, for The Office of Waste Isolation, Union Carbide Corporation, U.S. Department of Energy, Washington, DC.



APR 02 2007

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – OFFICE OF GEOLOGICAL SURVEY

# RECORD OF WELL COMPLETION

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.

(Submit 3 copies within 60 days of well completion.)

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

| Permit number/deepening permit no. | API number |
|---|---|
| 57361 | NA |

Type of well (after completion): Test

Well name & number: Woodhaven Well#3

Name and address of permittee
MARATHON PIPE LINE LLC: TOM ROSS
539 SOUTH MAIN STREET
FINDLAY, OH 45840

| Directionally drilled (check one) | Previous permit numbers | Total depth of well |
|---|---|---|
| ☐ Yes ☒ No | | M.D. 1244 T.V.D. 1244 |

| Surface location | Subsurface location (if directionally drilled) |
|---|---|
| NW ¼ of SE ¼ of SE ¼ Section 22 T 4S R 10E | NW ¼ of SE ¼ of SE ¼ Section 22 T 4S R 10E |
| Township: City of Woodhaven; County: Wayne | Township: City of Woodhaven; County: Wayne |
| Footages: North/South 990 Ft. from S line and East/West 1070 Ft. from E line of Sec. | Footages: North/South 990 Ft. from S line and East/West 1070 Ft. from E line of Sec. |

| Part 615 - oil/gas wells | | | Part 625 - mineral wells | | |
|---|---|---|---|---|---|
| Date well completed | Producing formation(s) | Injection formation(s) | Date of first injection | Disposal formation(s) | Solution formation(s) |
| 12/16/2005 | NA | NA | | | |

## COMPLETION INTERVALS(S)

| Date | Number holes | Perforation or open hole interval | Open Yes | Open No |
|---|---|---|---|---|
| | | NA | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## STIMULATION BY ACID OR FRACTURING

| Date | Interval treated | Materials and amount used |
|---|---|---|
| | NA | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## PRODUCTION TEST DATA

| Oil Bbls/day | Gravity °API | Condensate Bbls/day | Gas MCF/day | Water Bbls/day | $H_2S$ Grains/100 $ft^3$. | B.H.P. and depth |
|---|---|---|---|---|---|---|
| 0 | NA | 0 | 0 | 0 | 0 | |

CERTIFICATION "I state that I am authorized by said owner. 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 and title (print or type) | Signature | Date |
|---|---|---|
| Thomas Ross ESER Professional | Thomas A. Ross | 3-28-07 |

**Submit to:** OFFICE OF GEOLOGICAL SURVEY
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
PO BOX 30256
LANSING MI 48909-7756

APR 02 2007

EQP 7130 (rev. 8/2004)

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

# RECORD OF WELL DRILLING OR DEEPENING

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

Permit number/Deepening number: 57361

(Submit 3 copies within 60 days of drilling completion.)

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

API number:

Well name and number: Woodhaven Well #3

Name and address of permittee:
Marathon Pipeline LLC
539 South Main Street
Findlay, OH 45840

Surface location: NW 1/4 of SE 1/4 of SE 1/4 Section 22 T4S R10E

Township: Brownstown

County: Wayne

Footages: 990 ft. from South line and 1070 ft. from East line of sec.

Name and address of drilling contractor:
Bigard & Huggard
5580 Venture Way
Mt. Pleasant

Directionally drilled (check one): ☐ Yes ☒ No

Previous permit numbers:

Subsurface location (if directionally drilled): 1/4 of 1/4 of 1/4 Section T R

Township: County:

Footages: ft. from line and ft. from line of sec.

Date drilling began: 12/1/05

Date drilling completed: 12/16/05

Total depth of well: Driller 1244 Log 14

Formation at total depth: Saline "B"

Elevations: K.B. ft. R.F. ft. R.T. ft. Grd ft

Feet drilled - cable tools: from to

Feet drilled - rotary tools: from to

**Casing, Casing Liners and Cementing, Operating Strings**

| Size | Where set | Cement | T.O.C. | Ft. pulled |
|---|---|---|---|---|
| 16 | 162 | 125 | Surf | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Water Fill Up (F.U.) or Lost Circulation (L.C.) (X)**

| Formation | F.U. | L.C. | Depth | Amount |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**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 Line | Gas Log | Fill Up |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Depth Correction**

| Depth | Correction |
|---|---|
| | |
| | |
| | |
| | |

**Deviation Survey**

| Run at | Degrees |
|---|---|
| | |
| | |
| | |
| | |

**Plugged Back**

| Yes | No | Depth |
|---|---|---|
| X | | 100 ft |
| | | |
| | | |
| | | |

**Geophysical / Mechanical Logs** (list each type run)

| Brand | Log types | Logged intervals |
|---|---|---|
| Baker Atlas | GRN/FDL | 1 ft |
| Baker Atlas | Multipole Array Acoustic Imaging Log | 5 ft |
| Baker Atlas | Dipole Sonic Circumferential Borehole Log | 5 ft |
| | | |

RECEIVED AUG 15 2006 DEQ LANSING GEO. SURVEY

Notice: Report complete sample and formation record, coring record, and drill stem test information on reverse side.

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

| Date | Name and title (print) | Signature |
|---|---|---|
| 7/31/06 | Thomas A. Ross ES&R Professional | Thomas A. Ross |

Submit to: OFFICE OF GEOLOGICAL SURVEY, MICHIGAN DEPT OF ENVIRONMENTAL QUALITY PO BOX 30256, LANSING, MI 48909-7756

EQP 7200-5 (rev. 8/2004)

AUG 30 2006

# FORMATION RECORD

Attach additional sheets if necessary

| API number | Permit number/Deepening number |
|---|---|
| | |

| Elevation used | Geologist name | Tops taken from |
|---|---|---|
| | | ☐ Driller's log ☐ Sample log ☐ Electric log |

| From | To | Formation (type, color, hardness) |
|---|---|---|
| Note: if well directionally drilled, add true vertical depth formation tops where appropriate | | |
| | | |

| From | To | Formation (type, color, hardness) |
|---|---|---|
| | | |

If well was cored, attach core description

DRILL STEM TEST DATA

LIST ATTACHMENTS

RECEIVED

AUG 15 2006

DEQ LANSING DO
GEOLOGICAL SURVEY

OFFICE OF GEOLOGICAL SURVEY USE ONLY

Reviewed by

Date of review

AUG 30 2006

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

**3.** Fed. Employer ID. No. or Soc. Security No.
31-1551440

**4.** Conformance bond ☐ Blanket ☒ Single well

**5.** ☒ Attached ☐ On file

**6.** Bond number

**7.** Bond amount $10,000

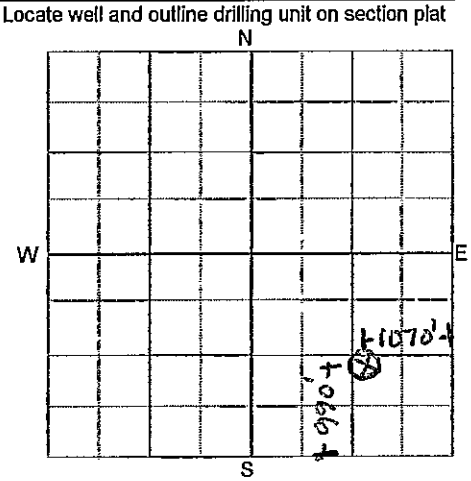
**8.** Applicant (name of permittee as bonded)
Marathon Pipe Line LLC

**9.** Address
539 S. Main Street
Findlay, Ohio 45840
Attention: Tom A. Ross

Phone
(419) 421-3295

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

Locate well and outline drilling unit on section plat




**10.** Lease or well name (be as brief as possible)
Woodhaven Well #3

Well number
#3

**11.** Surface owner
Marathon Pipe Line LLC

**12.** Surface location
NW 1/4 of SE 1/4 of SE 1/4 of Sec 22 T 4 S R 10 E
Township Brownstone City of Woodhaven County Wayne

**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
990 feet from nearest (N/S) S section line AND 1070 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
~~910~~ feet from nearest (N/S) ~~S~~ ~~drilling unit line~~ SECTION LINE AND ~~990~~ feet from nearest (E/W) ~~E~~ ~~drilling unit line~~ SECTION 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 Detroit River Depth 128

**20.** Intended total depth
MD 1,200 TVD 1,200

**21.** Formation at total depth
A2 Carbonate

**22.** Producing/injection formation(s)
BSalt

**23.** Objective pool, field, or project
Woodhaven Well #3

**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. |
| 0-150 | Detroit River | 20" | 16" | 55 #H-40 N | 150 | 265 | Surf | 12 | 8.8 | 60 |
| 1,022 | B Salt | 14 3/4 | 11 3/4 | 47 #J-55 | 1,022 | 600 | Surf | 12 | FW | FW |
| | | | 8 5/8 | | 1,080 | | | | | |
| | | | 4 1/2 | | 1,123 | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

**25.** DETAIL CEMENTING PROGRAM. IDENTIFY ALL CEMENT CLASSES, ADDITIVES, AND VOLUMES (IN CU. FT.) FOR EACH CASING STRING
Surface 16" cemented with 265 sacks Class A with 10 sacks CaCl2 312.7 cf
Intermediate 11 3/4" cemented with 600 sacks Class A with 10 sacks CaCl2 708 cf
Production/Injection

**26.** Send correspondence and permit to
Name Tom A. Ross E-mail taross@marathonpetroleum.com
Address 539 S. Main Street, Findlay, Ohio 45840 Phone (419) 421 3295

**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)
Donald P. Bozell, President

Phone
419 422 2121

**28.** Signature

Date 11/4/05

DEQ Cashier use only.

Office of Geological Survey Use Only

| Permit number | API number | Date issued | Owner number |
|---|---|---|---|
| 57361 | 21-1103-57361-00 | 11/30/05 | 6308 |

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

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.

A050817

**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

**3.** Fed. Employer ID. No. or Soc. Security No. 31-1551440

**4.** Conformance bond ☐ Blanket ☒ Single well

**5.** ☒ Attached ☐ On file

**6.** Bond number

**7.** Bond amount $10,000

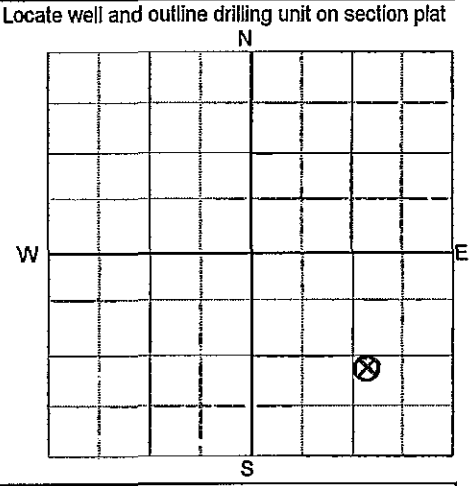
**8.** Applicant (name of permittee as bonded) Marathon Pipe Line LLC

**9.** Address
539 S. Main Street
Findlay, Ohio 45840
Attention: Tom A. Ross

Phone (419) 421-3295

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

Locate well and outline drilling unit on section plat




**10.** Lease or well name (be as brief as possible) Woodhaven Well #3

Well number #3

**11.** Surface owner Marathon Pipe Line LLC

**12.** Surface location NW 1/4 of SE 1/4 of SE 1/4 of Sec 22 T 4 S R 10 E Township City of Woodhaven County Wayne

**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 990 feet from nearest (N/S) S section line AND 1070 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 990 feet from nearest (N/S) S drilling unit line AND 1070 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 Limestone Depth 128

**20.** Intended total depth MD 1,200 TVD 1,200

**21.** Formation at total depth BSalt

**22.** Producing/injection formation(s)

**23.** Objective pool, field, or project Woodhaven Well #3

**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. |
| 0-150 | Travers | 20" | 16" | 55 #H-40 N | | 150 | 265 | Surf | 12 | 8.8 | 60 |
| 1,022 | B Salt | | 11 3/4 | 47 #J-55 | | 1,200 | 600 | | | | |
| | | | 8 5/8 | | | 1,080 | | | | | |
| | | | 4 1/2 | | | 1,123 | | | | | |
| | | | | | | | | | | | |
| | | | | | | | | | | | |

Revised

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

Surface 16" cemented with 265 sacks Class A with 10 sacks CaCl2 312.7 cf

Intermediate 11 3/4" cemented with 600 sacks Class A with 10 sacks CaCl2 312.7 cf

Production/Injection

**26.** Send correspondence and permit to

Name Tom A. Ross E-mail taross@marathonpetroleum.com

Address 539 S. Main Street, Findlay, Ohio 45840 Phone (419) 421 3295

**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) Donald P. Bozell, President Phone 419 422 2121

**28.** Signature D P Bozell Date 10/25/05

DEQ Cashier use only.

GEOR 515645-12-1 11/02/C
71351 88510 9096

AY 2006 $300

Office of Geological Survey Use Only

| Permit number | API number | Date issued | Owner number |
|---|---|---|---|
| — | — | — | 6308 |

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

DEQ

State of Michigan
Department of Environmental Quality
Geological and Land Management Division
P.O. Box 30256
Lansing, MI 48909-7756

| PERMIT NO. | ISSUE DATE | EXPIRATION DATE |
|---|---|---|
| 57361 | 11/30/2005 | 11/30/2007 |

WELL NAME AND NUMBER
WOODHAVEN WELL #3

| FORMATION AT TOTAL DEPTH | COMPLETION FORMATION |
|---|---|
| SALINA B SALT | SALINA B SALT |
| PERMITTED TOTAL DEPTH (MEASURED) | PERMITTED TOTAL DEPTH (TVD) |
| 1200 ft. | 1200 ft. |
| TYPE OF PERMIT | API NUMBER |
| Liquified Petroleum Gas Storage | 21-163-57361-00-00 |

## PERMIT TO

☑ DRILL AND OPERATE ☐ DEEPEN AND OPERATE

GRANTED UNDER THE PROVISIONS OF
Part 615 Supervisor of Wells, Act 451, PA 1994, as amended

Violation of and/or non-compliance with the provisions of this act or its rules, instructions or orders of the supervisor, or these permit conditions may result in penalties. This permit includes as requirements all the operations and methods proposed by the applicant in the application to drill, unless rejected or altered by the DEQ. This permit is also subject to the general and specific conditions identified on this page and/or attached to it. Initiation of any work under this permit confirms the permittee's acceptance and agreement to comply with its terms and conditions.

ISSUED TO:
MARATHON PIPELINE LLC
539 S MAIN ST
FINDLAY, OH 45840

LOCATION AND FOOTAGES: SHL: NW SE SE, SEC 22, 4S 10E, BROWNSTOWN TWP, WAYNE CO.
990 FT. FROM S AND 1070 FT. FROM E SECTION LINE.

### CASING AND SEALING REQUIREMENTS

| HOLE DEPTH | HOLE DIA. | CASING O.D. | WT./FT. | GRADE | CONDITION | DEPTH (M.D.) | SACKS CMT | CEMENT TOP | MUD WT. |
|---|---|---|---|---|---|---|---|---|---|
| 150' | 20" | 16" | 55 | H-40 | NEW | 150' | 265 | SURFACE | 8.8 |
| 1022' | 14 3/4" | 11 3/4" | 47 | J-55 | NEW | 1022' | 600 | SURFACE | FW |
| | | 8 5/8" | | | | 1080' | | | |
| | | 4 1/2" | | | | 1123' | | | |

### SPECIFIC PERMIT CONDITIONS

1. Cavern development shall not extend beyond property line.
2. No earthen reserve pit is planned. Steel tanks are to be used to contain drilling fluids and cuttings.
3. Pursuant to RULE 407(7)(b), drilling fluids generated or utilized while drilling below the base of the Detroit River Anhydrite SHALL NOT be placed in the lined pit. Cuttings and the solid fraction of drilling muds generated or utilized while drilling below the base of the Detroit River Anhydrite may be placed in the lined reserve pit if they DO NOT contain free liquids as determined by the US EPA, paint filter test, method 9095, September 1986 edition. Drilling muds and cuttings which contain weighting or lost circulation materials, and which cannot reasonably be treated to eliminate free liquids may be placed in the reserve pit if approved by the authorized representative of the supervisor.
4. Salt cuttings are to be dissolved and removed from the mud system for proper disposal.
5. Drilling mud and cuttings shall be hauled to a DEQ approved Class II landfill, or a remote pit site approved by the District Geologist.

### GENERAL PERMIT CONDITIONS

1. The permittee is required to give notice to public utilities in accordance with Act 53, PA 1974, M.C.L. 460.701-460.718.
2. This permit does not convey property rights in either real estate or material, neither does it authorize any injury to any public or personal property.
3. This permit does not preclude the necessity of obtaining other local, state, or federal permits which may apply to the drilling or operation of this well.
4. All trash and garbage shall be removed from the drill site at the completion of drilling, no garbage may be buried on site.
5. This permit allows a well containing hydrogen sulfide to be drilled and tested subject to the Hydrogen Sulfide Management Provisions of the Rules promulgated under Part 615, 1994 PA 451, as amended. Contact the Air Quality Division prior to producing a sour well to determine if an Air Quality Installation or Operation Permit is required.

OFFICE TO BE NOTIFIED PRIOR TO PREPARING LOCATION AND PRIOR TO MOVING IN DRILLING EQUIPMENT
Southeast Michigan Office (586) 753-3700

PERMIT ISSUED FOR THE SUPERVISOR OF WELLS BY
James R. Dunzynski

EQ 7200 (Rev 12/02)

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – OFFICE OF GEOLOGICAL SURVEY

# TRANSMITTAL AND FIELD REVIEW FOR PROPOSED WELL SITE

☒ Part 615 Supervisor of Wells, Act 451 PA 1994, as amended
☐ Part 625 Mineral Wells, Act 451 PA 1994, as amended

| 1a. Application number | 1b. Owner number | 1c. Revision | 1d. Coordinator | 1e. Date sent |
|---|---|---|---|---|
| A050817 | | ☒ Yes ☐ No | jr duszynski | 10/28/5 |

2. Applicant MARATHON PIPE LINE, LLC — 1f. District Lansing/Warren

3a. Well name and number WOODHAVEN WELL #3 — 3b. Previous permit numbers

4a. Surface location: NW 1/4 SE 1/4 SE 1/4 Sec. 22 T 4S R 10E — Township: Brownstown — County: WAYNE

4b. Footages: 990 feet from South line of Section 1070 feet from East line of Section

5a. Surface Ownership ☒ Private ☐ State ☐ Federal — 5b. Mineral ownership ☒ Private ☐ State ☐ Federal

6a. ☐ Within Gas Storage Field
Rule 413 applies
Storage field name

6b. ☐ Contains $H_2S$ Part 11 rules apply

6c. Well site area local zoning
☐ Res, date _____ see R407(3), 505,506
☒ Other: Industrial

7. Endangered species, state leases, or additional information State Threatened Animal in area
8. Two Act 307 sites - 82000170 & 82001487 in area.
9. Missing data in Casing program, survey, & EIA.

## FIELD REVIEW AND RECOMMENDATIONS

7. Field review by: name and date
BRUCE WALDO 11-15-05
Walt Danyluk

8a. Land use
LPG STORAGE OPERATIONS

8b. Cover type/density
GRASSES

9. Topography - (slope, % grade)
LEVEL

10a. Area involved
Drill pad 100'X200' Acres .45

10b. Area involved
Access road EXISTING Acres

11. Soil type and drainage, field tiles, etc.
URBAN LAND. SURFACE DRAINAGE TO SW. NO FIELD TILES.

12 Are soil erosion and sedimentation control measures for well site, access, flowline, and surface facilities adequate? ☒ Yes ☐ No

13. Buildings, public roads, pipelines and power lines, private water wells within 600 feet and public water wells within 800 or 2,000'.
2 POWER LINES, 2 PIPELINES, 2 BRINE PONDS FOR PRODUCT DISPLACEMENT.
Are all features shown on attached plat? ☒ Yes ☐ No

14. Type, direction and distance to surface waters, waterways, wet lands, flood plains, natural rivers within 1320 feet, and Great Lakes shorelines within1500 feet.
CLEE DRAIN (N-S) WITH ASSOCIATED FLOODPLAIN AND WETLANDS IS 900' W.
Are all features shown on attached plat? ☒ Yes ☐ No

15. Nearby scenic, historical, recreational, environmentally sensitive, or critical dune areas, and threatened and endangered species within 1320 feet.
NONE KNOWN ACCORDING TO KIM BORLAND OF MI NATURAL FEATURES INVENTORY.
Are all features shown on attached plat? ☐ Yes ☐ No

16. Is casing and sealing adequate?

| | | |
|---|---|---|
| Conductor | ☐ Yes | ☐ No |
| Surface | ☒ Yes | ☐ No |
| Intermediate | ☐ Yes | ☐ No |
| Production | ☒ Yes | ☐ No |

Expected depth to base of fresh water 128' formation DR

17. Is Intermediate Casing Exception recommended? ☐ Yes ☐ No ☒ NA

18. B.O.P. Program adequate? ☒ Yes ☐ No
If certified tests required, give details.

19. $H_2S$, Part 11 rules apply? ☐ Yes ☒ No
☐ Contingency plan reviewed and approved
☐ Deficiencies in contingency plan, specify
☐ Class IV, plan not required

Well location complies with Rule 1106(1), (2), Isolation Distances ☐Yes ☐No
Surface facility complies with Rule 506, Residential Areas ☐Yes ☐No ☐ Don't know, surface facility not identified.

20. Source of freshwater:
☒ Municipal source ☐ Temporary well
☐ Permanent well ☐ Other, specify

21. Drilling pit requirements
a. On-site in-ground pit allowed?
☒ Yes ☐ No

*If no, specify disposition of mud and cuttings.*
BUT COMPANY PLANS USE OF STEEL MUD TANKS. EVERGREEN LANDFILL (OH).

b. Specific requirements?
☐ Yes ☐ No

*If yes, specify requirements, such as location of pit on drill pad.*

c. Remote pit will be used
☐ Yes ☒ No

*If yes, identify location of remote pit.*
Are all surface owner approvals and surveys filed? ☐ Yes ☐ No

d. Rule 407(3) applies
Zoned residential prior to 1/8/93?
☐ Yes ☒ No

*If yes, is in-ground pit exception requested by applicant AND recommended by GLMD* ☐ Yes ☐ No

e. Rule 407(7)(b) (iv) applies
Paint filter test required?
☐ Yes ☒ No

*If yes, what is contingency for disposal of muds if they fail paint filter test?*

f. Salt cuttings to be (give details)
☐ Removed for disposal
☒ Dissolved & removed
☐ None

Specify landfill
Specify disposal well or waste hauler INTERDYNE

g. Area Geologist notification prior to:
☐ Yes ☐ No Pit encapsulation
☐ Yes ☐ No Pit excavation
☐ Yes ☐ No Pit liner installation

N/A

22. Is EIA for surface facilities included in application or described elsewhere?
☐ Yes ☐ No, R504 (4) applies
☐ No, less than 300' from well head

*If no and greater than 300' from wellhead, does feasible location for surface facilities exist?* ☐ Yes ☐ No
EXISTING FACILITY

23. DEQ and/or DNR comments

24. Items continued and/or not covered above (attach additional sheets if needed)

25. Revision included (describe if applicable)

26. Representative of permittee contacted regarding additional requirements? ☒ Yes ☐ No

| Name | Date | Phone |
|---|---|---|
| TOM ROSS | VARIOUS | 419-421-3295 |

27. Area geologist: recommend a permit: ☒ Yes ☐ No (provide reasons) ☐ Needs corrections or additional information ☐ Memo attached

| BRUCE WALDO | SENIOR GEOLOGIST | 11-15-05 |
|---|---|---|
| Signature | Title | Date |

28. District Geologist: Recommend a permit: ☒ Yes ☐ No (provide reasons) ☐ Needs corrections or additional information ☐ Memo attached

| Walter Danyluk | District Supervisor | 11/17/2005 |
|---|---|---|
| Signature | Title | Date |

**From:** "Ross, Thomas A." <taross@marathonpetroleum.com>
**To:** <duszynsj@michigan.gov>
**Date:** 11/29/05 2:11PM
**Subject:** Woodhaven Cavern #3 project.

Mr. Duszynski:

Thank you for taking time to discuss the Woodhaven Cavern #3 project that Marathon Pipe Line LLC (MPL) has submitted for approval. Per our discussion, please note the following information. The overall project plan is to develop a new cavern in the existing salt formation located in the strata beneath the facility. MPL has no intention of mining the proposed cavern past any property boundaries of the Woodhaven station. MPL is very cognizant of both the boundary issue as well as the proximity of the cavern to the current and existing caverns already located within the station boundaries and will be taking every precaution to ensure that neither boundary is breached.

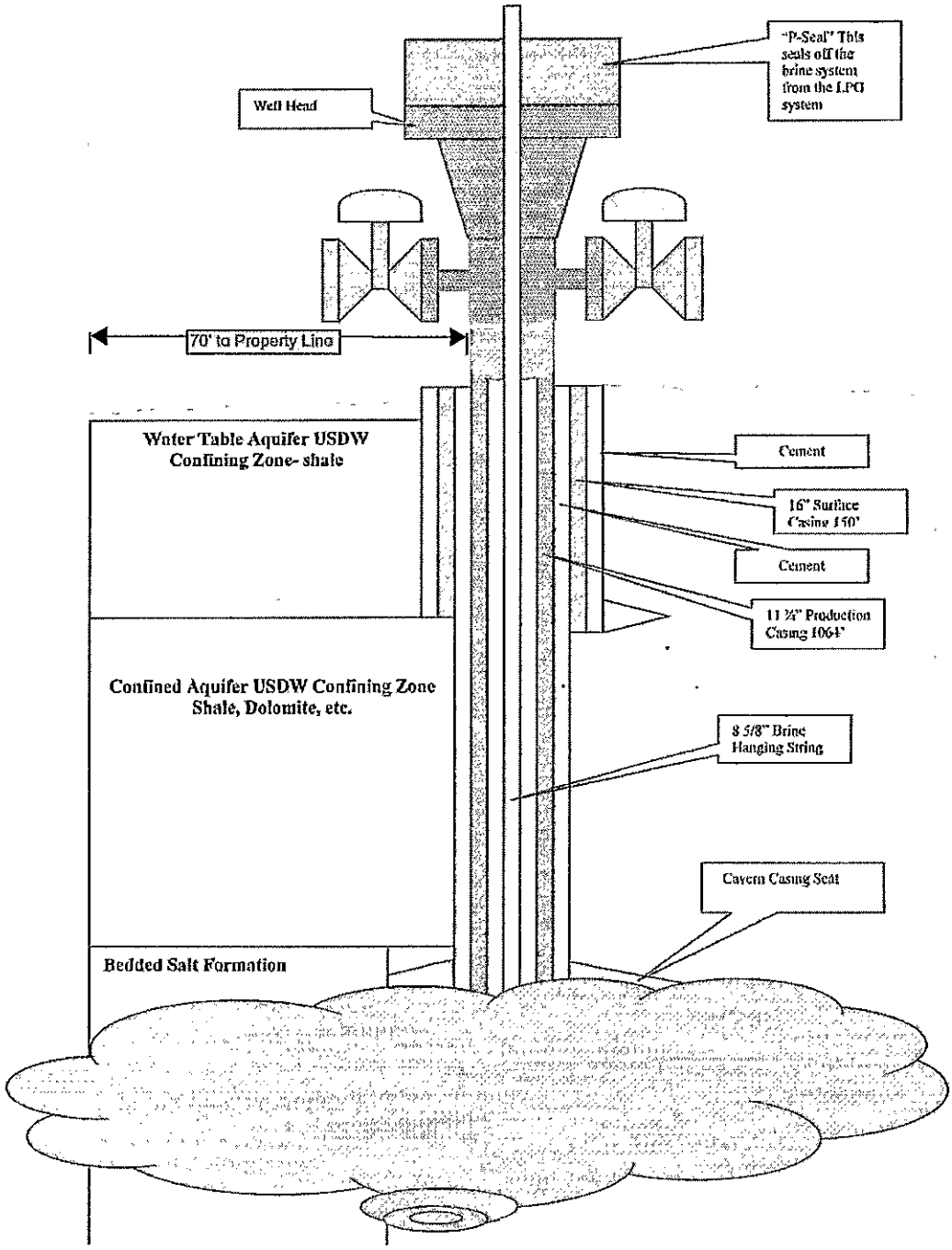
I have attached an elementary illustration of the well head proximity to the property line. It should be noted that the illustration drawing does not show the extent of the cavern excavation at this time. As indicated in our discussion, we are unable to quantify this value until we actually initiate the excavation process.

Thanks again for taking time to discuss this project and please feel free to contact me for further discussion.

Thomas A. Ross
ES&R Professional
Marathon Pipe Line LLC
taross@marathonoil.com

419-421-3295 Phone
419-431-3917 Fax
419-351-0524 Cell

<<Cavern drawing.ZIP>>


"P-Seal" This seals off the brine system from the LPG system
Well Head
70' to Property Line
Water Table Aquifer USDW Confining Zone- shale
Cement
16" Surface Casing 150'
Cement
11 ¾" Production Casing 1064'
Confined Aquifer USDW Confining Zone Shale, Dolomite, etc.
8 5/8" Brine Hanging String
Cavern Casing Seat
Bedded Salt Formation

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: Marathon Pipe Line LLC

Well name and number: Woodhaven Well #3

1a. Surface location

NW 1/4 of SE 1/4 of SE 1/4 of section 22 T 4 S R 10 E — Township: ~~City of Woodhaven~~ Brownstown — County: Wayne

1b. If this is a directional well, bottom hole location will be — Township — County

1/4 of 1/4 of 1/4 of section T R

**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**

990 ft. from nearest (N/S) South section line

1,070 ft. from nearest (E/W) East section line

and

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

1,620 ft. from nearest (E/W) 1/4 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)**

910 ft. from nearest (N/S) South section line ~~drilling unit line~~

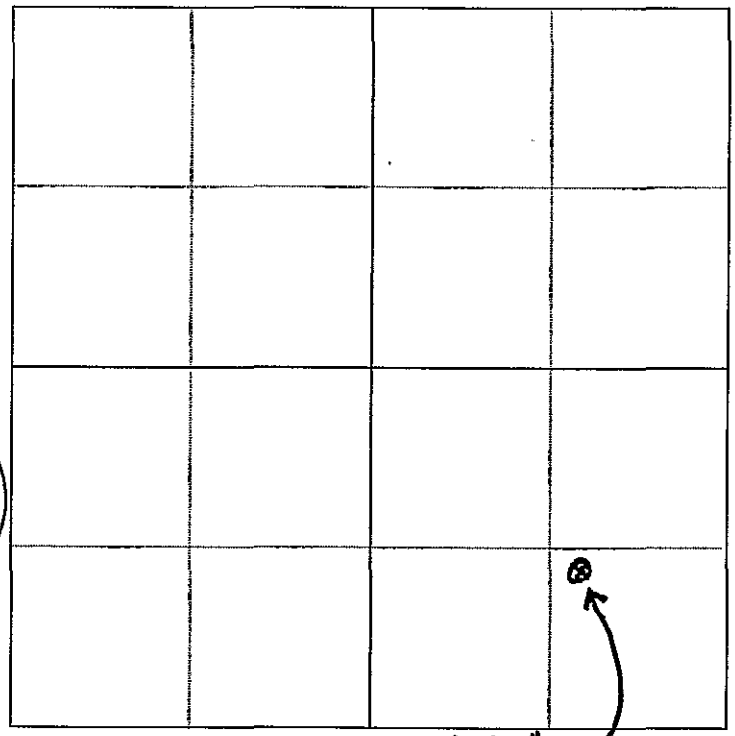
990 ft. from nearest (E/W) East section line ~~drilling unit line~~

incorrect

5. Show access to stake on plat and describe if it is not readily accessible. Access to the well (existing perimeter access road) is within the existing Woodhaven ~~Storage Field~~ Facility.

PLAT BELOW REPRESENTS ONE FULL SECTION (1 MILE SQUARE)

N ↑



Woodhaven Well #3

6. Zoning ☐ Residential, effective date ____

Initial date of residential zoning ____

☒ Other Industrial

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 | Company | Date of survey |
|---|---|---|
| Catherine DeDecker, PS | Spalding DeDecker | 9/7/05 |
| Address: 2505 West Jefferson, Trenton, MI 48183 | | Phone: 734 671-4344 |

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

Signature of licensed surveyor (affix seal): Catherine M DeDecker — Date: 11-2-05

STATE OF MICHIGAN CATHERINE M. DEDECKER PROFESSIONAL SURVEYOR LICENSED PROFESSIONAL SURVEYOR No. 45498

EQP 7200-2 (rev. 18/2004) ENCLOSE WITH APPLICATION TO DRILL OR DEEPEN

AIR & WATER
COMPLIANCE
GROUP, LLC

**Transmittal Memorandum**

Date: November 7, 2005

To: Mr. Rex Tefertiller
Michigan Department of Environmental Quality
Office of Geological Survey - Permits & Bonding Unit
Constitution Hall, South Tower, 1st Floor,
525 West Allegan Street,
Lansing, MI 48933

RECEIVED
NOV 08 2005
OFFICE OF GEOLOGICAL SURVEY
PERMITS & BONDING UNIT

From: Jacob Koebbe

Subject: Marathon Pipe Line Company LLC
Woodhaven # 3 Well
***REVISED*** Application for Permit to Drill
City of Woodhaven, Wayne County, Michigan
JN: 05010

Enclosed:
1.) Revised Application for Permit to Drill, Form 7200-1,
2.) Revised Survey Record of Well Location, Form 7200-2,
3.) Revised Environmental Impact Assessment, Form 7200-19,

Remarks: Please include the attached forms into the Marathon Woodhaven #3 Well Application. The revised Application for Permit to Drill, Form 7200-1 addressed formation and casing issues, the revised Survey Record of Well Location, Form 7200-2, indicates the proposed cavern will not exceed Marathons property boundary and the revised Environmental Impact Assessment, Form 7200-19 included the No In-ground Pit and landfill information. Please inform Tom Ross if there is anything else required from your office regarding this project.

***Copies of these forms are being sent to the MDEQ Southeast Regional Office attention to Bruce Waldo via FedEx Priority.***

Via: FedEx Priority

Copies to:
Laura McKee
Kirk Greenlee
Tom Ross
Project File
Bob Everett
Steve Binion
Donna Henry

104 Fletcher Drive • Brooklyn, Michigan 49230
(517)592-2226 • Fax (517)592-2227 • www.awcgllc.com

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – OFFICE OF GEOLOGICAL SURVEY

# ENVIRONMENTAL IMPACT ASSESSMENT

Required for issuance of well permit pursuant to Part 615, 1994 PA 451, as amended. Falsification of this information may result in fines and/or imprisonment. Check all boxes and fill in all blanks which apply to this drilling application. Attach additional pages as necessary.

## A. DESCRIPTION OF PROJECT

**1. Applicant's name** Marathon Pipe Line LLC
**Well name and number** Woodhaven Well #3
**Intended use of well** Storage

**2. Mineral ownership,** check each category of mineral owners in drilling unit or Antrim Uniform Spacing Plan
☐ Private ☐ State ☐ Federal ☐ Other, identify

**3. Applicable spacing order and drilling unit size**
☐ S.O. 14-9-94 N. Mich. Antrim, 80 acres
☐ S.O. 1-73 Niagaran, 80 acres
☐ R 324.301 General rule, 40 acres
☐ Field Spacing or Unitization Order (identify below)
X Storage
☐ S.O. 3-3-95 S. Mich. Antrim, 40 acres
☐ S.O. 2-81 Oakland Co. Niagaran, 40 acres
☐ S.O. 1-86 P.D.C., 640 acres
☐ Antrim USP (identify name, number of acres, and number of drilled and permitted wells)
☐ Administrative exception requested per R324.303 (2). See instructions for applying for an administrative spacing exception
☐ Exception to spacing requested, petition for hearing filed
☒ Non-producing well, no drilling unit

**4. Applicant's right to drill and produce**
☒ Yes ☐ No Are all mineral interests in the drilling unit under lease and controlled by the applicant/permittee?
If no, ☐ petition filed for compulsory pooling **OR** ☐ certified efforts to obtain leases are attached (if allowed by spacing order)
☐ Not applicable, no drilling unit.
☒ Yes ☐ No Has applicant obtained all contractual rights needed to locate the well where it is proposed?
If no, ☐ what additional approvals are needed? _____

**5. Special considerations**
☐ Replacement well for permit no. _____ or ☐ Existing well pad
☐ Yes ☒ No Is well expected to encounter $H_2S$?
☒ Yes ☐ No Is well located in a city, township, or village with a population greater than 70,000?
☐ Other (describe) _____

## B. IMPACTS AS A RESULT OF DRILLING

**1. Access route dimensions**
2460 feet x 15 feet / 43,560 = 0.84 acres.
Provide a detailed description of topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use for the access route while drilling. Identify route on attached plat. The access route is an existing, man-made perimeter road, generally flat. There will be no new disturbance required for access to the drill site.

**2. Well site dimensions**
100 feet x 200 feet / 43,560 = 0.45 acres.
Provide a detailed description of topography, drainage, soil types(s), direction and percentage of slopes, land cover and present land use for the well site. Identify well site on attached plat The drill site is located at an existing storage facility in a generally flat area of mowed grass, located between an existing perimeter access road and existing brine pond dikes.

**3. Is well site located in residentially zoned area?** ☐ Yes ☒ No If yes, R324.407(3) and R324.505 apply.

**4. Are drain tiles present?** ☐ Yes ☒ No If yes, identify where they exist on attached plat or project map. How will they be handled if they are encountered? .

**5. Identify the distance and direction to all of the following, also identify on attached plat**
a. All buildings, fresh water wells, public roads, power lines and other man-made features within 600' of the well site.
There are no buildings, fresh water wells, or public roads within 600 feet of the propoed well site. There are two power lines, two pipelines, and brine ponds located within 600 feet. There will be no impacts to any of the above listed items. See attached Map Part 5a.

b. All Type I and Type IIa public water supply wells within 2000' of the well site and all Type IIb and Type III public water wells within 800' of the well site There are no Type I or Type IIa public water supply wells within 2,000 feet of the proposed site and no Type IIb or Type III public water supply wells within 800 feet of the proposed site.
(Type I is a community water supply with year-round service ≥ 15 living units or ≥ 25 residents. Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year. Average daily water production: IIA ≥ 20,000 GPD IIB <20,000 GPD Type III is a public water supply which is neither type I or II.)

(Part B-5 continued)
c. Surface waters, floodplains, wetlands, natural rivers, critical dune areas, threatened or endangered species within 1320' and Great Lake shorelines within 1500' of the well site There are no natural rivers, critical dune areas, or threatened and endangered species within 1,320 feet of the proposed well site. There is a Wayne County Drain (Clee Drain), associated floodplain, and wetlands located within 1,320 feet of the propsed site. See attached Map Part 5c.

d. Describe the actions to be taken to mitigate impacts to any of the items identified in Part B-5 a-c above. The applicant will utilize guidelines provided in its existing Erosion and Sedimentation Control Plan and Best Management Practices to avoid/minimize impacts.

**6. Identify the source of fresh water used to drill this well**

☐ "Permanent" water well, to be retained after final completion OR used for drinking water (shall be drilled and installed pursuant to Part 127 of 1979 PA 368, as amended)
☐ "Temporary" water well, will be plugged upon final completion and not used for drinking water (consult R 324.403 (2) for minimum construction requirements)
☒ Fresh water will be hauled from existing water well or municipal source (identify) City of Detroit
☐ No fresh water will be used in drilling this well

**7. Pit location and handling and disposal of drill cuttings, muds and fluids**

Anticipated depth to groundwater 20 ft Method determined by State of Michigan well log data
☐ On site in-ground pit, anticipated dimensions: L _____ W _____ D _____
☐ Remote in-ground pit, anticipated dimensions: L _____ W _____ D _____
Attach approval of landowner and attach survey of remote pit location
☒ Well drilled below base of Detroit River Anhydrite. Describe how mud and cuttings pursuant to R324.407(7)(iv) will be handled.
Pit fluids below DRA disposed by Interdyne licensed liquid waste hauler **OR**
Pit fluids below DRA disposed at the _____ disposal well.
If drill cuttings & mud don't pass paint filter test, they will be disposed at _____ landfill.
☐ No salt cuttings **OR**
☒ Salt cuttings dissolved and disposed by Interdyne licensed liquid waste hauler **OR**
☐ Salt cuttings hauled to _____ landfill
☐ Temporary pit, cuttings and muds disposed at (identify) _____
☒ No in-ground pit, cuttings and muds disposed at (identify) Evergreen Landfill, 2625 E. Broadway, Northwood, OH 43619 (419) 666-5136
☐ Pit will be solidified.

## C. IMPACTS AS A RESULT OF PRODUCTION

**1. Kind of well** ☐ exploratory ☐ development ☒ Other (describe) Storage
☐ Antrim project **(submit separate project EIA, form EQP 7200-21, for access roads, flow lines, and surface facilities)**
where is project EIA found? _____ and complete C-2, omit C-3 and C-4

**2. Location of surface facilities (Prior to construction, the District Geologist, pursuant to R324.1002, must also approve all surface facility secondary containment plans.)**

☒ Greater than 300' from wellhead. Identify facility location on attached plat and complete C-3 and C-4.
☐ Less than 300' from wellhead. Identify facility location on attached plat, complete C-3, omit C-4
☐ Surface facility exists or was previously approved for construction and is known as _____ complete C-3, omit C-4.
☐ Surface facility location was not determined for this **exploratory** well (omit C-3 and C-4). Submit a separate request for **Surface Facility Location Approval (form 7200-22)**, which includes a Facility Plan, Environmental Impact Assessment, and Soil Erosion and Sedimentation Control Plan, to District Geologist prior to construction pursuant to R324.504.

**3. Flow Line Environmental Impact Assessment**

☐ Identify flow line location and course from well to the surface facility on attached plat.
Flow line route dimensions _____ feet x _____ feet / 43,560 = _____ acres.
Describe the topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use along the flow line route No flow lines proposed.

**4. Surface Facility Environmental Impact Assessment**

a. Dimensions of surface facility 100 feet x 200 feet / 43,560 = 0.45 acres.
b. Describe the topography, drainage, soil type(s), direction and percentage of slopes, land cover, and present land use
1. Along access route to surface facility The access route is an existing, man-made perimeter road, generally flat. There will be no new disturbance required for access to the drill site.

Part C-4, continued

2. At surface facility site The drill site is located at an existing storage facility in a generally flat area of mowed grass, located between an existing perimeter access road and existing brine pond dikes.

c. Are surface facilities likely to receive oil or gas with $H_2S$ concentration greater than 300 ppm? ☐ Yes ☒ No, if yes, R324.1106(2) applies.

d. Will surface facilities be located in residentially zoned area? ☐ Yes ☒ No, If yes, R324.506 may apply

e. Identify the distance and direction to all of the following, and identify on attached plat

1. Distance and direction to all buildings, fresh water wells, public roads, power lines and other man-made features within 600' of surface facility There are no buildings, fresh water wells, or public roads within 600 feet of the proposed well site. There are two power lines, two pipelines and brine ponds located within 600 feet. There will be no impacts to any of the above listed items.See attached Map Part 5a.

_____2. Distance and direction to any surface waters, floodplains, wetlands, natural rivers, critical dune areas, and threatened or endangered species within 1320' and Great Lakes shorelines within 1500' of the surface facility site There are no natural rivers, critical dune areas, or threatened and endangered species within 1,320 feet of the propoed well site. There is a Wayne County Drain (Clee Drain) within approximately 900 feet, associated floodplain, and wetlands located within approximately 90 feet of the proposed site. See attached Map Part 5c.

3. Describe the actions to be taken to mitigate impacts to any of the items identified in Part C-4e 1 and 2 above. The applicant will utilize guidelines provided in its existing Erosion and Sedimentation Control Plan and Best Management Practices to avoid/minimize impacts.

4. Distance and direction to all Type I and Type IIa public water supply wells within 2000' of the surface facility site and all Type IIb and Type III wells within 800' of the surface facility There are no Type I and Type IIa public water supply wells within 2,000 feet of the proposed site and no Type IIb and Type III public water supply wells within 800 feet of the proposed site.

Type I is a community water supply with year-round service ≥ 15 living units or > 25 residents. Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year. Average daily water production: IIA ≥ 20,000 GPD IIB <20,000 GPD Type III is a public water supply which is neither type I or II.

**5. Method of brine disposal**

☐ Dedicated flow line to disposal well_____, permit number _____

☒ Transported by tanker. ☐ Other _____

**6. Method of transporting hydrocarbons past the point of sale**

☐ Oil sold through transmission line ☐ Gas sold through transmission line

☐ Oil transported by tanker for sale ☐ Gas flared on site (production restrictions may apply)

☒ Other Storage

## D. MITIGATION OF IMPACTS FROM DRILLING AND/OR PRODUCTION

Describe additional measures to be taken to protect environmental and/or land use values All proposed impacts will be located within an existing storage cavern facility; the entire construction area was previously disturbed during past construction activities. Marathon will utilize the Best Management Practices outlined in its attached E&S Control Plan (Woodhaven Well #3 Erosion & Sedimentation Control Plan) to avoid/minimize impacts. The use of quiet mufflers will be used to reduce rig noise.

## E. ADDITIONAL PERMITS

Identify additional permits to be sought See Table 1

## F. SOIL EROSION AND SEDIMENTATION PLAN

Submit a soil erosion and sedimentation plan (form 7200-18) which addresses each well site, surface facility, and flow line route identified in this application. (Refer to requirements under Part 91, 1994 PA 451)

## G. ALTERNATE WELL AND SURFACE FACILITY LOCATIONS

Were alternate surface locations considered for this well or surface facility?

☒ No, alternate sites did not seem necessary or more desirable

☐ Yes, the following locations were considered

Why were they rejected in favor of the proposed location?

## H. 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."

| Donald P. Bozell, President | D P Bozell | 11/4/05 |
|---|---|---|
| Name and title (printed or typed) | Authorized Signature | Date |

Enclose with *Application For Permit To Drill*

AIR & WATER
COMPLIANCE
GROUP, LLC

**Transmittal Memorandum**

Date: November 7, 2005

To: Mr. Bruce Waldo
Michigan Department of Environmental Quality
Southeast Regional Office
27700 Donald Quart,
Warren, MI 48092-2793

From: Jacob Koebbe

Subject: Marathon Pipe Line Company LLC
Woodhaven # 3 Well
***REVISED*** Application for Permit to Drill
City of Woodhaven, Wayne County, Michigan
JN: 05010

Enclosed:
1.) Revised Application for Permit to Drill, Form 7200-1,
2.) Revised Survey Record of Well Location, Form 7200-2,
3.) Revised Environmental Impact Assessment, Form 7200-19,

Remarks: Please include the attached forms into the Marathon Woodhaven #3 Well Application. The revised Application for Permit to Drill, Form 7200-1 addressed formation and casing issues, the revised Survey Record of Well Location, Form 7200-2, indicates the proposed cavem will not exceed Marathons property boundary and the revised Environmental Impact Assessment, Form 7200-19 included the No In-ground Pit and landfill information. Please inform Tom Ross if there is anything else required from your office regarding this project.

***Copies of these forms are being sent to the MDEQ Lansing Office attention to Rex Tefertiller via FedEx Priority.***

Via: FedEx Priority

Copies to:

| | |
|---|---|
| Laura McKee | Bob Everett |
| Kirk Greenlee | Steve Binion |
| Tom Ross | Donna Henry |
| Project File | |

104 Fletcher Drive • Brooklyn, Michigan 49230
(517)592-2226 • Fax (517)592-2227 • www.awcgllc.com

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: Marathon Pipe Line LLC

Well name and number: Woodhaven Well #3

1a. Surface location

NW 1/4 of SE 1/4 of SE 1/4 of section 22 T 4 S R 10 E — Township: City of Woodhaven — County: Wayne

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**

990 ft. from nearest (N/S) South section line

1,070 ft. from nearest (E/W) East section line

and

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

1,620 ft. from nearest (E/W) 1/4 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)

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

1070 ft. from nearest (E/W) East drilling unit line

5. Show access to stake on plat and describe if it is not readily accessible. Access to the well (existing perimeter access road) is within the existing Woodhaven Storage Field Facility.

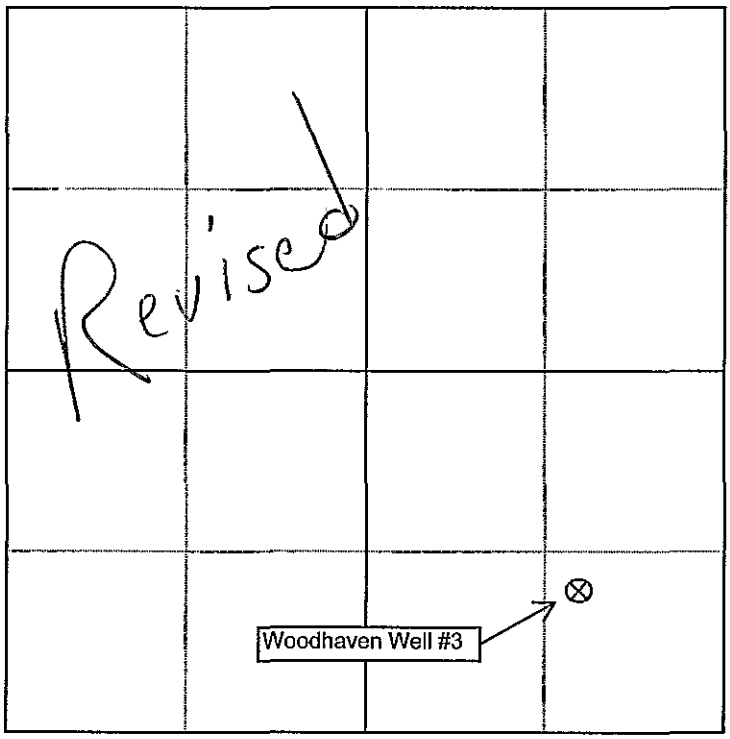
6. Zoning ☐ Residential, effective date ____

Initial date of residential zoning ____

☒ Other Industrial

PLAT BELOW REPRESENTS ONE FULL SECTION (1 MILE SQUARE)

N ↑




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 | Company | Date of survey |
|---|---|---|
| Catherine DeDecker, PS | Spalding DeDecker | 9/7/05 |

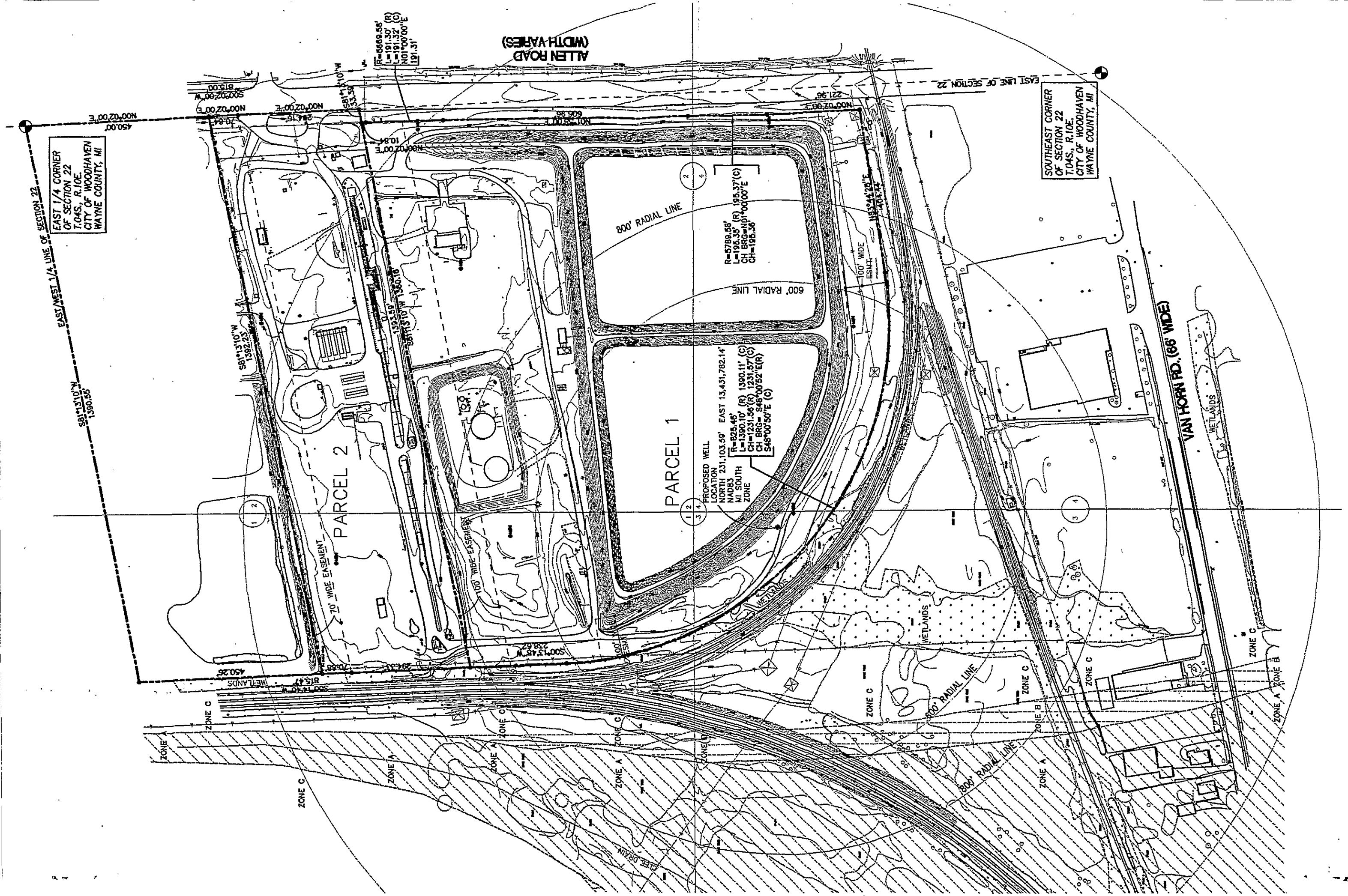
| Address | Phone |
|---|---|
| 2505 West Jefferson, Trenton, MI 48183 | 734 671-4344 |

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

Signature of licensed surveyor (affix seal) — Date 9-27-05

STATE OF MICHIGAN CATHERINE M. DeDECKER PROFESSIONAL SURVEYOR No. 46496 LICENSED PROFESSIONAL SURVEYOR

EQP 7200-2 (rev. 18/2004) ENCLOSE WITH APPLICATION TO DRILL OR DEEPEN


EAST 1/4 CORNER OF SECTION 22 T.04S., R.10E. CITY OF WOODHAVEN WAYNE COUNTY, MI
SOUTHEAST CORNER OF SECTION 22 T.04S., R.10E. CITY OF WOODHAVEN WAYNE COUNTY, MI
EAST/WEST 1/4 LINE OF SECTION 22
EAST LINE OF SECTION 22
ALLEN ROAD (WIDTH VARIES)
VAN HORN RD. (66' WIDE)
PARCEL 1
PARCEL 2
PROPOSED WELL LOCATION NORTH 231,103.59' EAST 13,431,782.14' NAD83 MI SOUTH ZONE
R=825.45' L=1390.10' (R) 1390.11' (C) CH=1231.56'(R) 1231.57'(C) CH BRG= S46°00'52"E(R) S46°00'50"E (C)
R=5789.58' L=195.35' (R) 195.37'(C) CH BRG=N01°00'00"E CH=195.35'
R=5669.58' L=191.30' (R) L=191.32' (C) N01°00'00"E 191.31'
800' RADIAL LINE
600' RADIAL LINE
100' WIDE ESMT.
70' WIDE EASEMENT
100' WIDE EASEMENT
WETLANDS
ZONE A
ZONE B
ZONE C

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

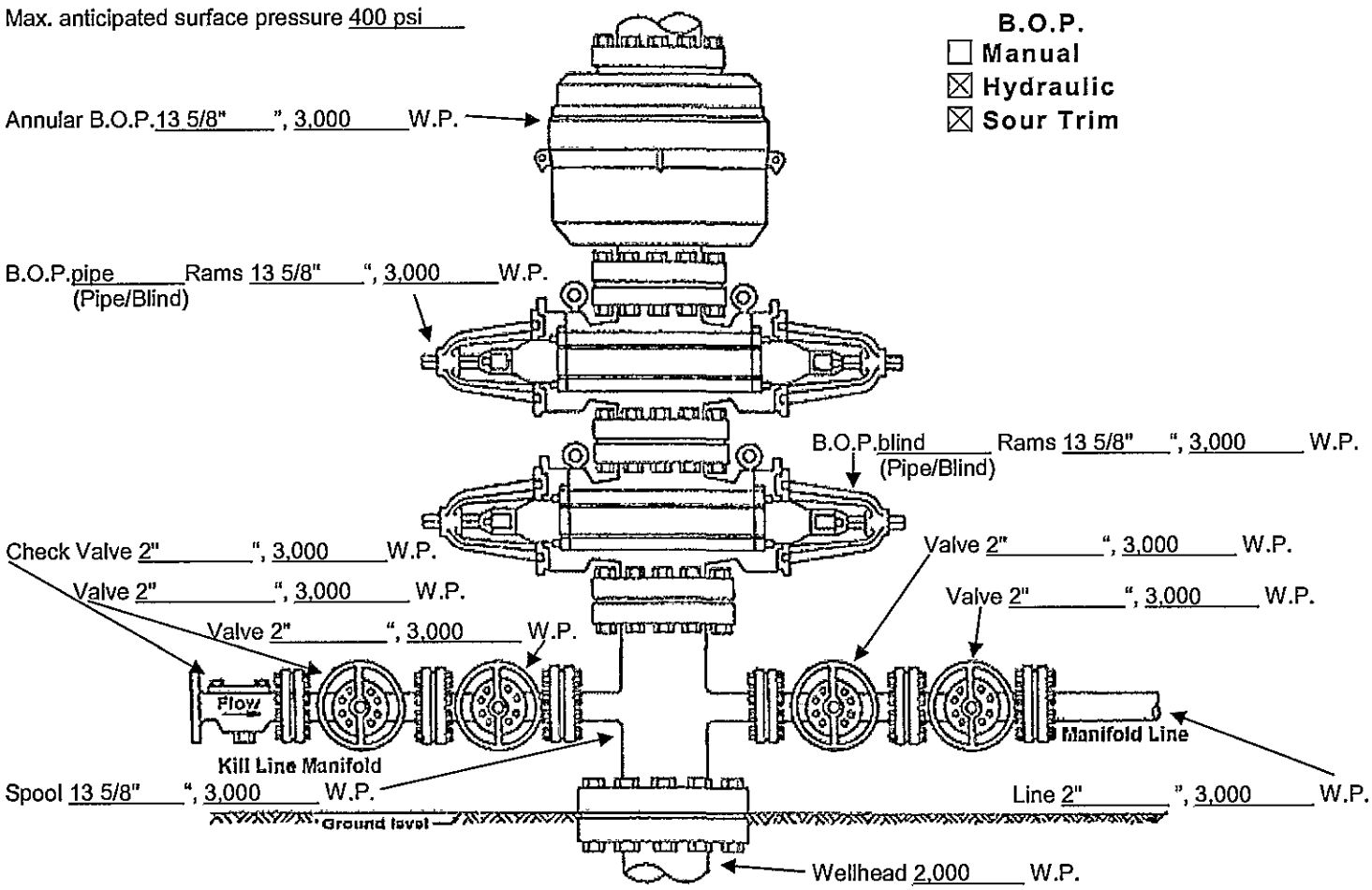
This information is required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, Act 451 PA 1994, as amended, in order to obtain a permit.

Applicant
Marathon Pipe Line LLC

Well name and number
Woodhaven Well #3

Max. anticipated surface pressure 400 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.

Install a 1000# pressure gauge on the Manifold Line piping between the well head and the first valve off the wellhead. Close all wellhead manifold valves and the 13 5/8" blind B.O.P. Ram. Open the 13 5/8" Annular B.O.P and the pipe B.O.P Ram. Connect the rig pressure pump to the Kill Line Manifold piping. Open Kill Line Manifold piping valves. Using the rig pressure pump, pressure wellhead piping and the 13 5/8" blind B.O.P. Ram. to 500-psig. Hold the test pressure for 20 mins. If any wellhead components fail to hold the test pressure, make repairs as needed and re-test. Bleed down test pressure to mud tub using the Manifold Line piping. Close Manifold Line piping valves after pressure reaches zero. Open the 13 5/8" blind B.O.P Ram and insert a section of drill pipe into the wellhead manifold. Close the 13 5/8" Annular B.O.P. Using the rig pressure pump, pressure the wellhead piping and the 13 5/8" Annular B.O.P. to 500-psig. Hold the test pressure for 20 mins. If any wellhead components fail to hold the test pressure, make repairs as needed and re-test. Bleed down test pressure to the mud tub using the Manifold Line piping. Close Manifold Line piping valves after pressure reaches zero. Open the 13 5/8" Annular B.O.P. Close the pipe B.O.P Ram. Using the rig pressure pump, pressure the wellhead piping and the pipe B.O.P. Ram to 500-psig. Hold the test pressure for 20 mins. If any wellhead components fail to hold the test pressure, make repairs as needed and re-test. Bleed down the test pressure to the mud tub using the Manifold Line piping.

There will be no exceptions to R324.406.

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
Marathon Pipe Line LLC
539 S. Main St.
Findlay, OH 45840
Attention: Tom A. Ross
Phone: (419) 421-3295 Fax: (419) 421-3601

2. Well or project name:
Woodhaven Well #3

3. Well or project location:
Section(s) 22 T4 E R10S

4. Name and address of County or local Enforcement Agent (CEA)
Wayne County Department of Environment
Land Resources Management Division
3600 Commerce Court, Bldg. E
Wayne, MI 48184
Phone: (734) 326-3936 Fax: ( )

5. Township
City of Woodhaven

6. County
Wayne

7. Date earth changes expected to start
Nov. 1, 2005

8. Date of expected completion
Dec. 1, 2005

9. Name and address of person responsible for earth change:
Marathon Pipe Line LLC
24400 Allen Road
Woodhaven, MI 48183
Attention: Kirk Greenlee
Phone: (734) 529-9939 Fax: ( )

10. Name and address of person responsible for maintenance:
Marathon Pipe Line LLC
24400 Allen Road
Woodhaven, MI 48183
Attention: Kirk Greenlee
Phone: (734) 529-9939 Fax: ( )

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 10/13/05

## EARTH CHANGE ACTIVITIES

12. Project description: (Project activities may be permitted sequentially.)
a. Number of well sites Existing , acres
b. Number of surface facility sites , acres
c. New access roads No feet, acres
d. Flow line(s) trenched in off well site* feet, acres
e. Flow line(s) plowed in off well site* feet, acres
*Contact CEA for fee schedule

13. Describe sites for which permits are being sought under Part 301 (Inland Lakes & Streams) No Permit Required
Describe sites for which permits are being sought under Part 303 (Wetlands) No Permit Required
List file numbers if known

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 MDOT Seed Mix
☒ Describe other proposed methods of restoration Regrade to preconstruction contours. Seed, fertilize and mulch exposed areas.

16. Application prepared by (name) Signature Date
Donald P. Bozell, President 10/12/05

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

EQP 7200-18 (rev. 8/2004) ENCLOSE WITH APPLICATION FOR PERMIT TO DRILL

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – OFFICE OF GEOLOGICAL SURVEY

# ENVIRONMENTAL IMPACT ASSESSMENT

Required for issuance of well permit pursuant to Part 615, 1994 PA 451, as amended. Falsification of this information may result in fines and/or imprisonment. Check all boxes and fill in all blanks which apply to this drilling application. Attach additional pages as necessary.

## A. DESCRIPTION OF PROJECT

| 1. Applicant's name | Well name and number | Intended use of well |
|---|---|---|
| Marathon Pipe Line LLC | Woodhaven Well #3 | Storage |

**2. Mineral ownership,** check each category of mineral owners in drilling unit or Antrim Uniform Spacing Plan

☐ Private ☐ State ☐ Federal ☐ Other, identify

**3. Applicable spacing order and drilling unit size**

☐ S.O. 14-9-94 N. Mich. Antrim, 80 acres
☐ S.O. 1-73 Niagaran, 80 acres
☐ R 324.301 General rule, 40 acres
☐ Field Spacing or Unitization Order (identify below)
☐ S.O. 3-3-95 S. Mich. Antrim, 40 acres
☐ S.O. 2-81 Oakland Co. Niagaran, 40 acres
☐ S.O. 1-86 P.D.C., 640 acres

X Storage

☐ Antrim USP (identify name, number of acres, and number of drilled and permitted wells)

☐ Administrative exception requested per R324.303 (2). See instructions for applying for an administrative spacing exception
☐ Exception to spacing requested, petition for hearing filed
☒ Non-producing well, no drilling unit

**4. Applicant's right to drill and produce**

☒ Yes ☐ No Are all mineral interests in the drilling unit under lease and controlled by the applicant/permittee?
If no, ☐ petition filed for compulsory pooling **OR** ☐ certified efforts to obtain leases are attached (if allowed by spacing order)
☐ Not applicable, no drilling unit.
☒ Yes ☐ No Has applicant obtained all contractual rights needed to locate the well where it is proposed?
If no, ☐ what additional approvals are needed? _____

**5. Special considerations**

☐ Replacement well for permit no. _____ or ☐ Existing well pad
☐ Yes ☒ No Is well expected to encounter $H_2S$?
☒ Yes ☐ No Is well located in a city, township, or village with a population greater than 70,000?
☐ Other (describe) _____

## B. IMPACTS AS A RESULT OF DRILLING

**1. Access route dimensions**

2460 feet x 15 feet / 43,560 = 0.84 acres.

Provide a detailed description of topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use for the access route while drilling. Identify route on attached plat. The access route is an existing, man-made perimeter road, generally flat. There will be no new disturbance required for access to the drill site.

**2. Well site dimensions**

100 feet x 200 feet / 43,560 = 0.45 acres.

Provide a detailed description of topography, drainage, soil types(s), direction and percentage of slopes, land cover and present land use for the well site. Identify well site on attached plat The drill site is located at an existing storage facility in a generally flat area of mowed grass, located between an existing perimeter access road and existing brine pond dikes.

**3. Is well site located in residentially zoned area?** ☐ Yes ☒ No If yes, R324.407(3) and R324.505 apply.

**4. Are drain tiles present?** ☐ Yes ☒ No If yes, identify where they exist on attached plat or project map. How will they be handled if they are encountered? .

**5. Identify the distance and direction to all of the following, also identify on attached plat**

a. All buildings, fresh water wells, public roads, power lines and other man-made features within 600' of the well site.
There are no buildings, fresh water wells, or public roads within 600 feet of the propoed well site. There are two power lines, two pipelines, and brine ponds located within 600 feet. There will be no impacts to any of the above listed items. See attached Map Part 5a.

b. All Type I and Type IIa public water supply wells within 2000' of the well site and all Type IIb and Type III public water wells within 800' of the well site There are no Type I or Type IIa public water supply wells within 2,000 feet of the proposed site and no Type IIb or Type III public water supply wells within 800 feet of the proposed site.
(Type I is a community water supply with year-round service ≥ 15 living units or ≥ 25 residents. Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year. Average daily water production: IIA ≥ 20,000 GPD IIB <20,000 GPD Type III is a public water supply which is neither type I or II.)

(Part B-5 continued)
c. Surface waters, floodplains, wetlands, natural rivers, critical dune areas, threatened or endangered species within 1320' and Great Lake shorelines within 1500' of the well site There are no natural rivers, critical dune areas, or threatened and endangered species within 1,320 feet of the proposed well site. There is a Wayne County Drain (Clee Drain), associated floodplain, and wetlands located within 1,320 feet of the propsed site. See attached Map Part 5c.

d. Describe the actions to be taken to mitigate impacts to any of the items identified in Part B-5 a-c above. The applicant will utilize guidelines provided in its existing Erosion and Sedimentation Control Plan and Best Management Practices to avoid/minimize impacts.

**6. Identify the source of fresh water used to drill this well**

☐ "Permanent" water well, to be retained after final completion OR used for drinking water (shall be drilled and installed pursuant to Part 127 of 1979 PA 368, as amended)
☐ "Temporary" water well, will be plugged upon final completion and not used for drinking water (consult R 324.403 (2) for minimum construction requirements)
☒ Fresh water will be hauled from existing water well or municipal source (identify) City of Detroit
☐ No fresh water will be used in drilling this well

**7. Pit location and handling and disposal of drill cuttings, muds and fluids**

Anticipated depth to groundwater 20 ft Method determined by State of Michigan well log data
☐ On site in-ground pit, anticipated dimensions: L ____ W ____ D ____
☐ Remote in-ground pit, anticipated dimensions: L ____ W ____ D ____
Attach approval of landowner and attach survey of remote pit location
☒ Well drilled below base of Detroit River Anhydrite. Describe how mud and cuttings pursuant to R324.407(7)(iv) will be handled.
Pit fluids below DRA disposed by Interdyne licensed liquid waste hauler **OR**
Pit fluids below DRA disposed at the ____ disposal well.
If drill cuttings & mud don't pass paint filter test, they will be disposed at ____ landfill.
☐ No salt cuttings **OR**
☒ Salt cuttings dissolved and disposed by Interdyne licensed liquid waste hauler **OR**
☐ Salt cuttings hauled to ____ landfill
☐ Temporary pit, cuttings and muds disposed at (identify) ____
☐ No in-ground pit, cuttings and muds disposed at (identify) ____
☐ Pit will be solidified.

## C. IMPACTS AS A RESULT OF PRODUCTION

**1. Kind of well** ☐ exploratory ☐ development ☒ Other (describe) Storage
☐ Antrim project **(submit separate project EIA, form EQP 7200-21, for access roads, flow lines, and surface facilities)**
where is project EIA found? ____ and complete C-2, omit C-3 and C-4

**2. Location of surface facilities (Prior to construction, the District Geologist, pursuant to R324.1002, must also approve all surface facility secondary containment plans.)**

☒ Greater than 300' from wellhead. Identify facility location on attached plat and complete C-3 and C-4.
☐ Less than 300' from wellhead. Identify facility location on attached plat, complete C-3, omit C-4
☐ Surface facility exists or was previously approved for construction and is known as ____ complete C-3, omit C-4.
☐ Surface facility location was not determined for this **exploratory** well (omit C-3 and C-4). Submit a separate request for **Surface Facility Location Approval (form 7200-22)**, which includes a Facility Plan, Environmental Impact Assessment, and Soil Erosion and Sedimentation Control Plan, to District Geologist prior to construction pursuant to R324.504.

**3. Flow Line Environmental Impact Assessment**

☐ Identify flow line location and course from well to the surface facility on attached plat.
Flow line route dimensions ____ feet x ____ feet / 43,560 = ____ acres.
Describe the topography, drainage, soil type(s), direction and percentage of slopes, land cover and present land use along the flow line route No flow lines proposed.

**4. Surface Facility Environmental Impact Assessment**

a. Dimensions of surface facility 100 feet x 200 feet / 43,560 = 0.45 acres.
b. Describe the topography, drainage, soil type(s), direction and percentage of slopes, land cover, and present land use
1. Along access route to surface facility The access route is an existing, man-made perimeter road, generally flat. There will be no new disturbance required for access to the drill site.

Part C-4, continued

2. At surface facility site The drill site is located at an existing storage facility in a generally flat area of mowed grass, located between an existing perimeter access road and existing brine pond dikes.

c. Are surface facilities likely to receive oil or gas with $H_2S$ concentration greater than 300 ppm? ☐ Yes ☒ No, if yes, R324.1106(2) applies.

d. Will surface facilities be located in residentially zoned area? ☐ Yes ☒ No, If yes, R324.506 may apply

e. Identify the distance and direction to all of the following, and identify on attached plat

1. Distance and direction to all buildings, fresh water wells, public roads, power lines and other man-made features within 600' of surface facility There are no buildings, fresh water wells, or public roads within 600 feet of the proposed well site. There are two power lines, two pipelines and brine ponds located within 600 feet. There will be no impacts to any of the above listed items.See attached Map Part 5a.

_____2. Distance and direction to any surface waters, floodplains, wetlands, natural rivers, critical dune areas, and threatened or endangered species within 1320' and Great Lakes shorelines within 1500' of the surface facility site There are no natural rivers, critical dune areas, or threatened and endangered species within 1,320 feet of the propoed well site. There is a Wayne County Drain (Clee Drain) within approximately 900 feet, associated floodplain, and wetlands located within approximately 90 feet of the proposed site. See attached Map Part 5c.

3. Describe the actions to be taken to mitigate impacts to any of the items identified in Part C-4e 1 and 2 above. The applicant will utilize guidelines provided in its existing Erosion and Sedimentation Control Plan and Best Management Practices to avoid/minimize impacts.

4. Distance and direction to all Type I and Type IIa public water supply wells within 2000' of the surface facility site and all Type IIb and Type III wells within 800' of the surface facility There are no Type I and Type IIa public water supply wells within 2,000 feet of the proposed site and no Type IIb and Type III public water supply wells within 800 feet of the proposed site.

Type I is a community water supply with year-round service ≥ 15 living units or ≥ 25 residents. Type II is a non-community water supply with ≥ 15 service connections or ≥ 25 individuals for not less than 60 days per year. Average daily water production: IIA ≥ 20,000 GPD IIB <20,000 GPD Type III is a public water supply which is neither type I or II.

**5. Method of brine disposal**

☐ Dedicated flow line to disposal well_____, permit number _____

☒ Transported by tanker. ☐ Other _____

**6. Method of transporting hydrocarbons past the point of sale**

☐ Oil sold through transmission line ☐ Gas sold through transmission line

☐ Oil transported by tanker for sale ☐ Gas flared on site (production restrictions may apply)

☒ Other Storage

## D. MITIGATION OF IMPACTS FROM DRILLING AND/OR PRODUCTION

Describe additional measures to be taken to protect environmental and/or land use values All proposed impacts will be located within an existing storage cavern facility; the entire construction area was previously disturbed during past construction activities. Marathon will utilize the Best Management Practices outlined in its attached E&S Control Plan (Woodhaven Well #3 Erosion & Sedimentation Control Plan) to avoid/minimize impacts. The use of quiet mufflers will be used to reduce rig noise.

## E. ADDITIONAL PERMITS

Identify additional permits to be sought See Table 1

## F. SOIL EROSION AND SEDIMENTATION PLAN

Submit a soil erosion and sedimentation plan (form 7200-18) which addresses each well site, surface facility, and flow line route identified in this application. (Refer to requirements under Part 91, 1994 PA 451)

## G. ALTERNATE WELL AND SURFACE FACILITY LOCATIONS

Were alternate surface locations considered for this well or surface facility?

☒ No, alternate sites did not seem necessary or more desirable

☐ Yes, the following locations were considered

Why were they rejected in favor of the proposed location?

## H. 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."

| Donald P. Bozell, President | D P Bozell | 10/25/05 |
|---|---|---|
| Name and title (printed or typed) | Authorized Signature | Date |

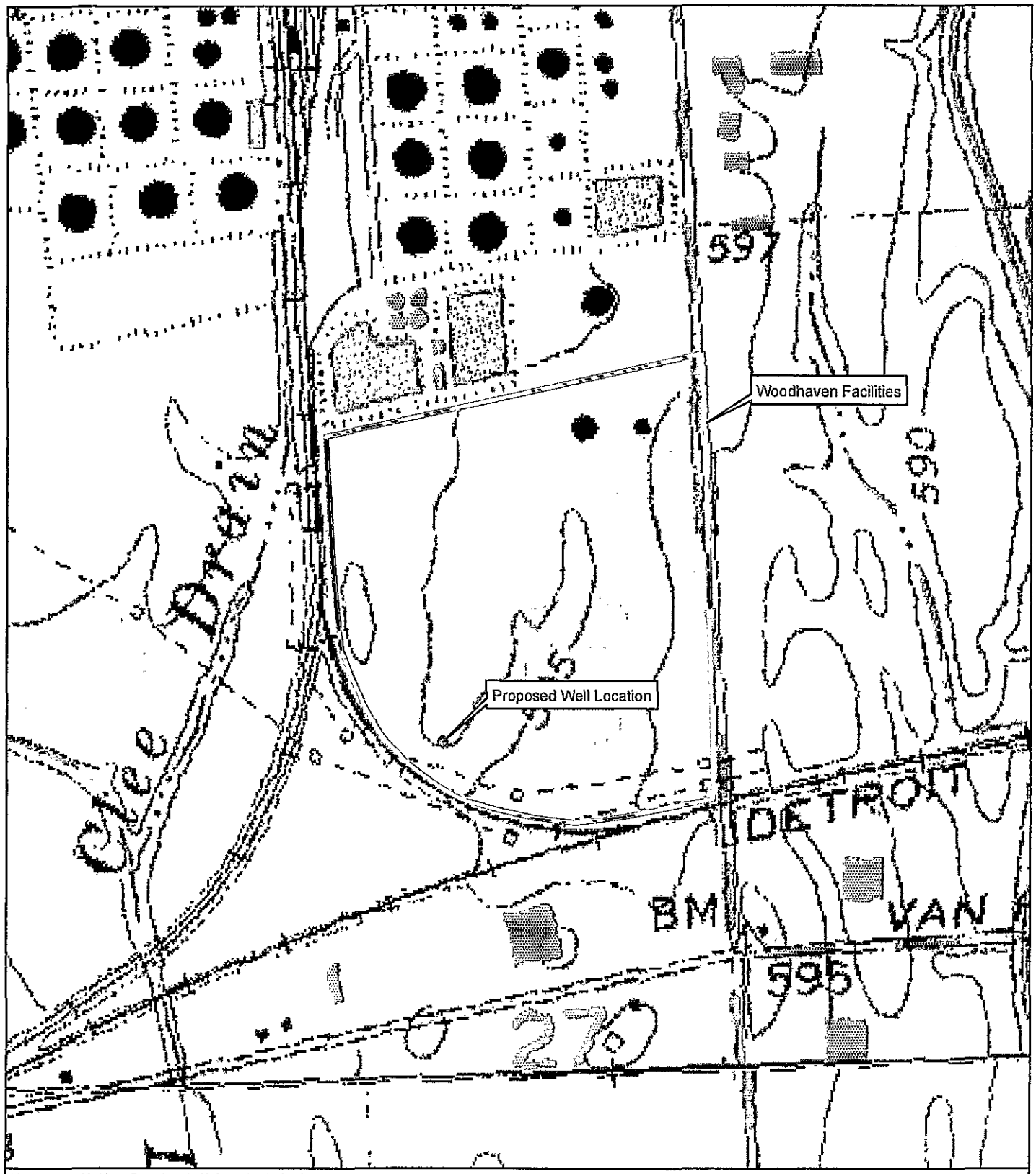
Enclose with *Application For Permit To Drill*

## Table 1
## Permits Required

| Agency | Clearance/Permits | Activity | Status |
|---|---|---|---|
| **Federal:** | | | |
| U.S. Fish and Wildlife Service (USFWS) | Federal Threatened and Endangered Species | Clearance that no Federally-listed threatened or endangered species will be impacted. | Received clearance 8 August 2005 |
| U.S. Army Corps of Engineers (ACOE) | Section 404 Permit[1] | Construction of pipeline under rivers, streams, floodplains and wetlands. | Joint Permit application not required. |
| **State:** | | | |
| State Historic Preservation Office (SHPO) | Letter of Clearance | Clearance that no historic or cultural resources will be impacted or that adequate mitigation has been provided if resources are crossed. | Received clearance 9 August 2005 |
| Michigan Department of Natural Resources (MDNR) Natural Heritage Program Wildlife Division | Letter of Clearance | Clearance that no State-listed threatened or endangered species will be impacted. | Received clearance 15 August 2005 |
| Michigan Department of Environmental Quality (MDEQ) Permit Consolidation Unit Geological and Land Management Division | Consolidated Permit | Construction of pipeline under rivers, streams, floodplains and wetlands. | Joint Permit application not required. |
| Michigan Department of Environmental Quality (MDEQ) Surface Water Quality Division | NPDES for Stormwater Discharge | Discharge of stormwater from construction site greater than 5 acres in size. | Not required. |
| Michigan Department of Environmental Quality (MDEQ) Office of Geological Survey | Application for Permit to Drill and Operate a Well | Drill test well for potenial hydrocarbon Storage | Pending |
| **Local:** | | | |
| Wayne County Department of Environment | Soil Erosion and Sedimentation Control Permit | Discharge of stormwater from construction site greater than 1 acre in size. | Pending |

Note:

1. United States Army Corps of Enginaers has delegated administration and enforcement authority of Section 404 of the Federal Clean Water Act to the MDEQ Land and Water Management Division.




Map Source: Michigan Department of Information technology, Center for Geographic information, wayne_drg24k.tif.

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N

Mapping done by Glacier Fox GIS, Inc
Map ID: 050008/ 050008A03_topo.mxd/ 09-14 2005

Sondoro Environmental, LLP

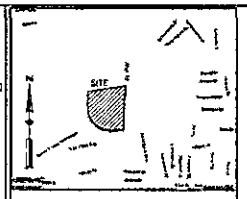
**Figure 1**
Topographic Map
Woodhaven Facilities
Wyandotte Quadrangle
Wayne County, Michigan
September 14, 2005

## LEGEND

GAS
SANITARY SEWER (SAN)
STORM SEWER (STM)
NATURAL (NG)
OVERHEAD WIRE
UNDERGROUND ELECTRIC (UGE)
UNDERGROUND PHONE (UP)
UNDERGROUND CABLE (UCA)
MANHOLE
CATCH BASIN
SEWER CLEAN OUT
GAS METER
GAS SHUT OFF VALVE
WE VALVE BOX
GATE VALVE & WELL
WATER SHUT OFF VALVE
FIRE HYDRANT
SPRINKLER VALVE BOX
LAWN SPRINKLER HEAD
HAND HOLE
ELECTRIC BOXES OR MOTOR
BUBBLER BOXES
CABLE TV BOXES
AIR CONDITION UNIT
UTILITY POLE
UTILITY POLE WITH TRANSFORMER
UTILITY POLE W/ GUY DIRECTION (ARROW INDICATES DIRECTION OF GUY)
LIGHT POLE
WOOD POLE WITH LAMP EXTENSION
TRAFFIC SIGNAL
POLE W/ TRAFFIC SIGNAL (OVER HEAD)
DOT POLE
DOT SIGN POLE
GROUND LIGHT OR DECORATIVE LIGHTING
FLAG POLE
PHONE OR PHONE BOOTH
CHAIN LINK FENCE (C.L.)
WOOD FENCE
WOOD WIRE FENCE (W.W.)
GUARD RAIL
METAL OR CONC. POST
MAILBOX
SIGN
WATER FOUNTAIN
PARKING METER
BILLBOARD OR LARGE SIGN
BENCH
BUILDING
STAIRS OR SCULPTURE
BENCH
INV. INVERT ELEVATION
CMP CORRUGATED METAL PIPE
CONCRETE OF STOOP
FOUNDATION
DITCH BANK/TOP OF SLOPE
PROPERTY LINES
STUMP
CONIFEROUS TREE
DECIDUOUS TREE
DECIDUOUS SHRUB
CONIFEROUS SHRUB
SECTION CORNER
BENCHMARK POINT
STRUCTURE NUMBER
SPA POINT #
SPOT ELEVATION
TC TOP OF CURB ELEVATION
G GUTTER ELEVATION
TP TOP OF PAVEMENT ELEVATION
EM EDGE OF METAL ELEVATION
TW TOP OF WALL ELEVATION
MWL TOP OF WALL ELEVATION
BW BOTTOM ELEVATION
U.G. UNDERGROUND
T.G. FINISH GRADE
CONC. CONCRETE
ASPHL. ASPHALT
L.S. LANDSCAPE
FF FINISH FLOOR ELEVATION
D.L. DOOR LEDGE ELEVATION
FI. FOUND IRON
FM. FOUND MONUMENT
FPK. FOUND PK NAIL
SI. SET IRON W/TOP CAP
SPK. SET PK NAIL
SP.W/TAG SET PK NAIL W/SPA TAG
MAG SET MAGNETIC NAIL
MAG/TAG SET MAGNETIC NAIL W/SPA TAG
M MEASURED
R RECORD
C CALCULATED
ELECTRIC TOWER

N

SCALE 1" = 200'
0 200 400




LOCATION MAP
NOT TO SCALE

PROVIDED PROPERTY DESCRIPTIONS

PARCEL 1

A PARCEL OF LAND IN THE SE 1/4 OF SECTION 22, T.04S., R.10E., CITY OF WOODHAVEN, (FORMERLY BROWNSTOWN TOWNSHIP), WAYNE COUNTY, MICHIGAN, DESCRIBED AS FOLLOWS:

[illegible]

PARCEL 2

THAT PARCEL OF LAND IN THE NORTH 1/2 OF THE SE 1/4 OF SECTION 22, T.04S., R.10E., CITY OF WOODHAVEN, (FORMERLY BROWNSTOWN TOWNSHIP), WAYNE COUNTY, MICHIGAN, DESCRIBED AS FOLLOWS:

COMMENCING AT A POINT ON THE EASTERLY LINE OF THE DETROIT & MONTON RR ROW OF 100 FEET WIDE, SAID POINT BEING S02°38'40"W 1398.55' ALONG THE E/W 1/4 LINE AND S01°30'01"W 450.26' FROM THE EAST 1/4 CORNER OF SAID SECTION 22; THENCE CONTINUING S01°30'01"W 363.21'; THENCE N52°30'40"E 1263.55' TO THE CENTERLINE OF ALLEN ROAD; THENCE N01°19'30"E 363.07' ALONG SAID CENTERLINE; THENCE S52°30'40"W 1362.33' TO THE POINT OF COMMENCEMENT AND CONTAINING 11.534 ACRES MORE OR LESS.

NOTES:

1. AS REPORTED BY AIR & WATER COMPLIANCE GROUP, LLC, THERE ARE NO ENVIRONMENTALLY SENSITIVE AREAS, THREATENED/ENDANGERED SPECIES, NATURAL RIVERS, CRITICAL DUNES AREAS, OR LAKES WITHIN 1320 FEET OF THE PROPOSED WELL.

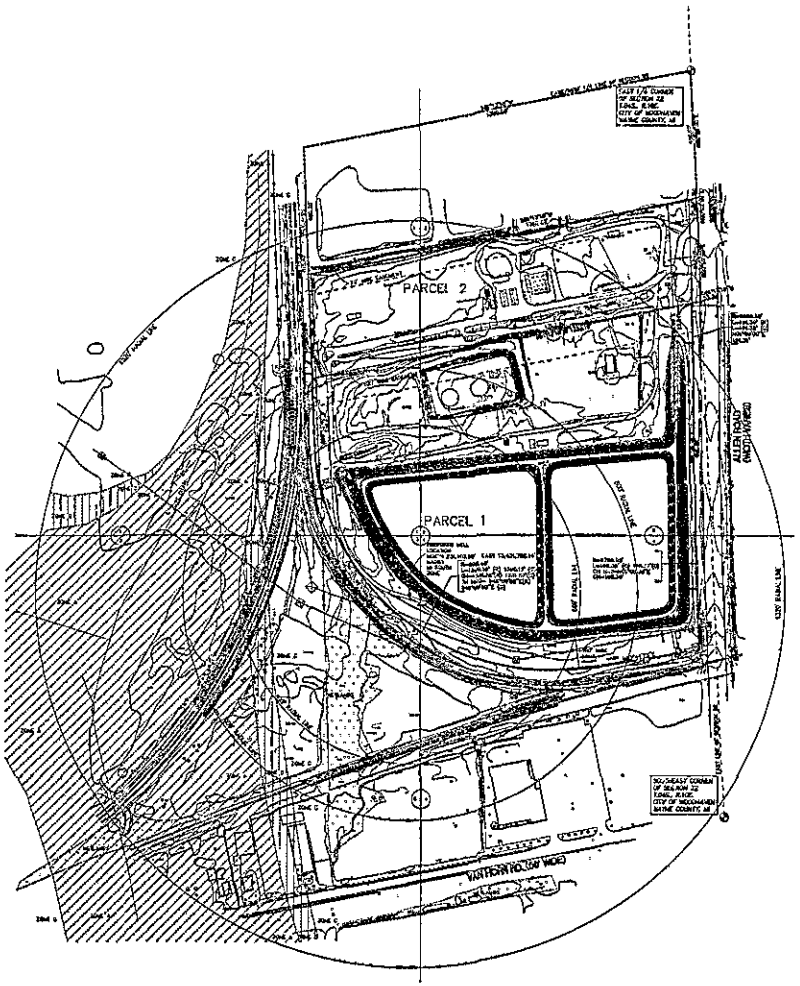
2. AS REPORTED BY AIR & WATER COMPLIANCE GROUP, LLC, THERE ARE NO TYPE I OR TYPE IIA PUBLIC SUPPLY WELLS WITHIN 2000 FEET OF THE PROPOSED WELL. THERE ARE NO TYPE IB OR TYPE II PUBLIC SUPPLY WELLS WITHIN 800 FEET OF THE PROPOSED WELL.

3. WETLAND LOCATIONS WERE FLAGGED BY AIR & WATER COMPLIANCE GROUP, LLC.

4. ON-SITE UNDERGROUND UTILITY INFORMATION WAS NOT AVAILABLE.

5. THE STATE PLANE COORDINATE (NAD83, MICHIGAN SOUTH ZONE, INTERNATIONAL FEET) FOR MONUMENT NUMBER 5 WAS USED. THE SITE WAS ROTATED TO FIT A STATE PLANE AZIMUTH BETWEEN MONUMENT NUMBER 5 AND MONUMENT NUMBER 6 (S45°22'47"E)(S). TO OBTAIN PROPERTY DESCRIPTION BEARINGS, ROTATE THE DRAWING TO MATCH THE PROVIDED BEARINGS FOR PARCEL 1. PARCEL 2 WAS ROTATED TO FIT PARCEL 1 BEARINGS.

6. ELEVATIONS ARE ON NGVD 1929.

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PRIOR TO CONSTRUCTION, ALL LOCATIONS AND DEPTHS OF EXISTING UTILITIES (IN CONFLICT WITH PROPOSED IMPROVEMENTS) SHALL BE VERIFIED IN THE FIELD. CARE MUST BE TAKEN BEFORE PRIOR TO CONSTRUCTION.


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# MARATHON ASHLAND WOODHAVEN FACILITY
## CITY OF WOODHAVEN
WAYNE COUNTY

WETLAND MAP

SECTION 22 PRIVATE CLAIM
TOWN OR SOUTH RANGE 10 EAST
CITY OF WOODHAVEN
WAYNE COUNTY MICHIGAN

| NO. | DATE | REVISION |
|---|---|---|
| | | |

| | |
|---|---|
| DRAWN J.STOICA | DATE 09-01-05 |
| DESIGNED CMDeDECKER | DATE |
| PROJ. MANAGER T.ANDERSON | PROJECT DIRECTOR C.I.McCOY |
| PROJECT ENGINEER CMDeDECKER | PROJECT MANAGER G.PLATZ |

NOTICE SCALE
BAR 2" ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

| | |
|---|---|
| JOB NO. SM05-105 | DRAWING NO. SM05105TP |
| SCALE 1"=200' | SHEET NO. 1 OF 1 |

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Map Source: Michigan Department of Information technology, Center for Geographic Information, wyandotte_sw.sid, 1998.

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Feet

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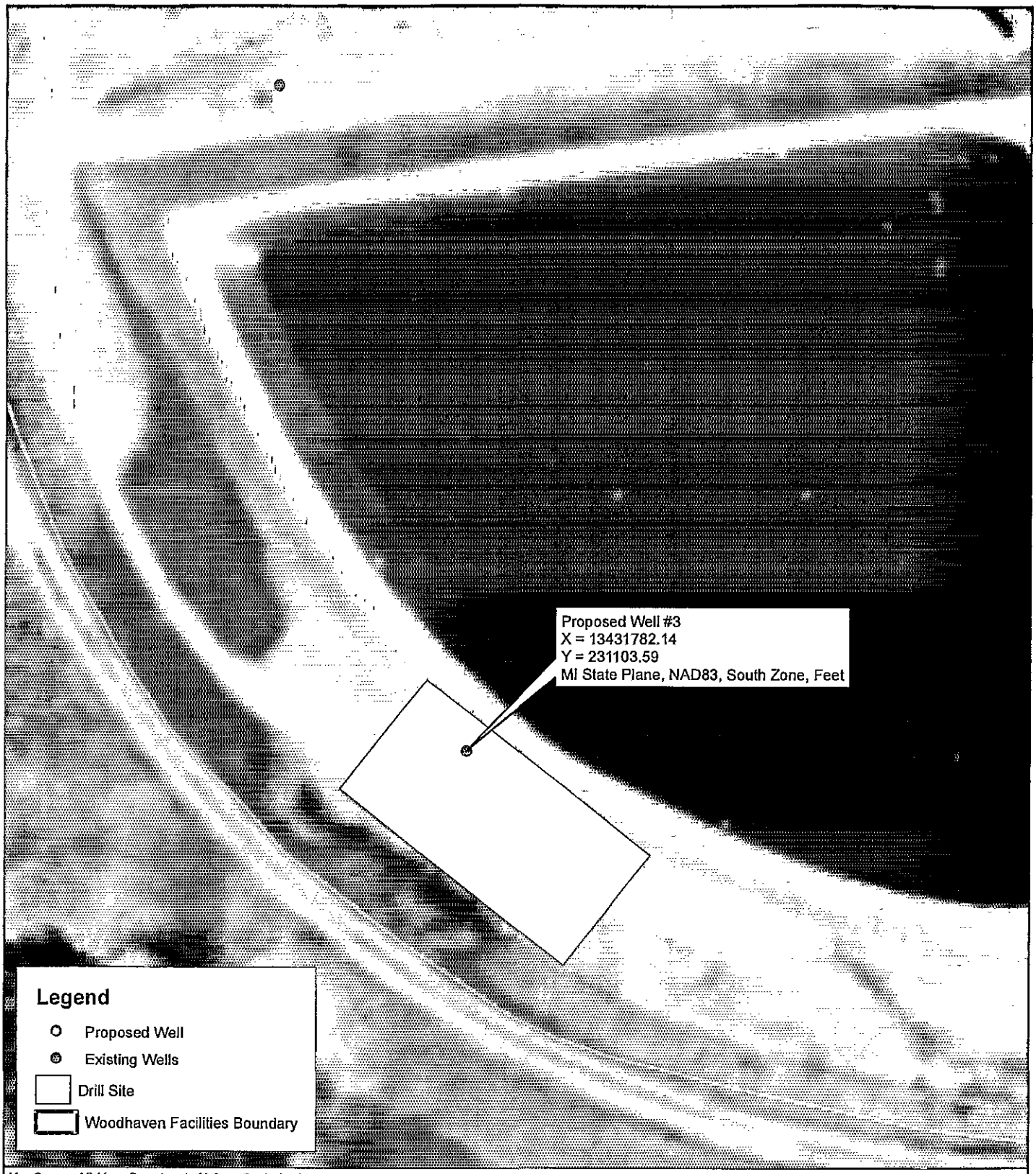
Mapping done by Glacier Fox GIS, Inc
Map ID: 050008/ 050008A07_B1.mxd/ 09-23-2005

Sendero Environmental, LLP

Drill Site Access (Part B1)
1998 Aerial Photograph
Woodhaven Well #3
Wyandotte Digital Quadrangle
Wayne County, Michigan
September 23, 2005




Map Source: Michigan Department of Information technology, Center for Geographic Information, wyandotte_sw.sid, 1998.

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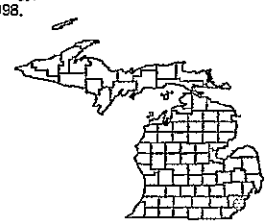
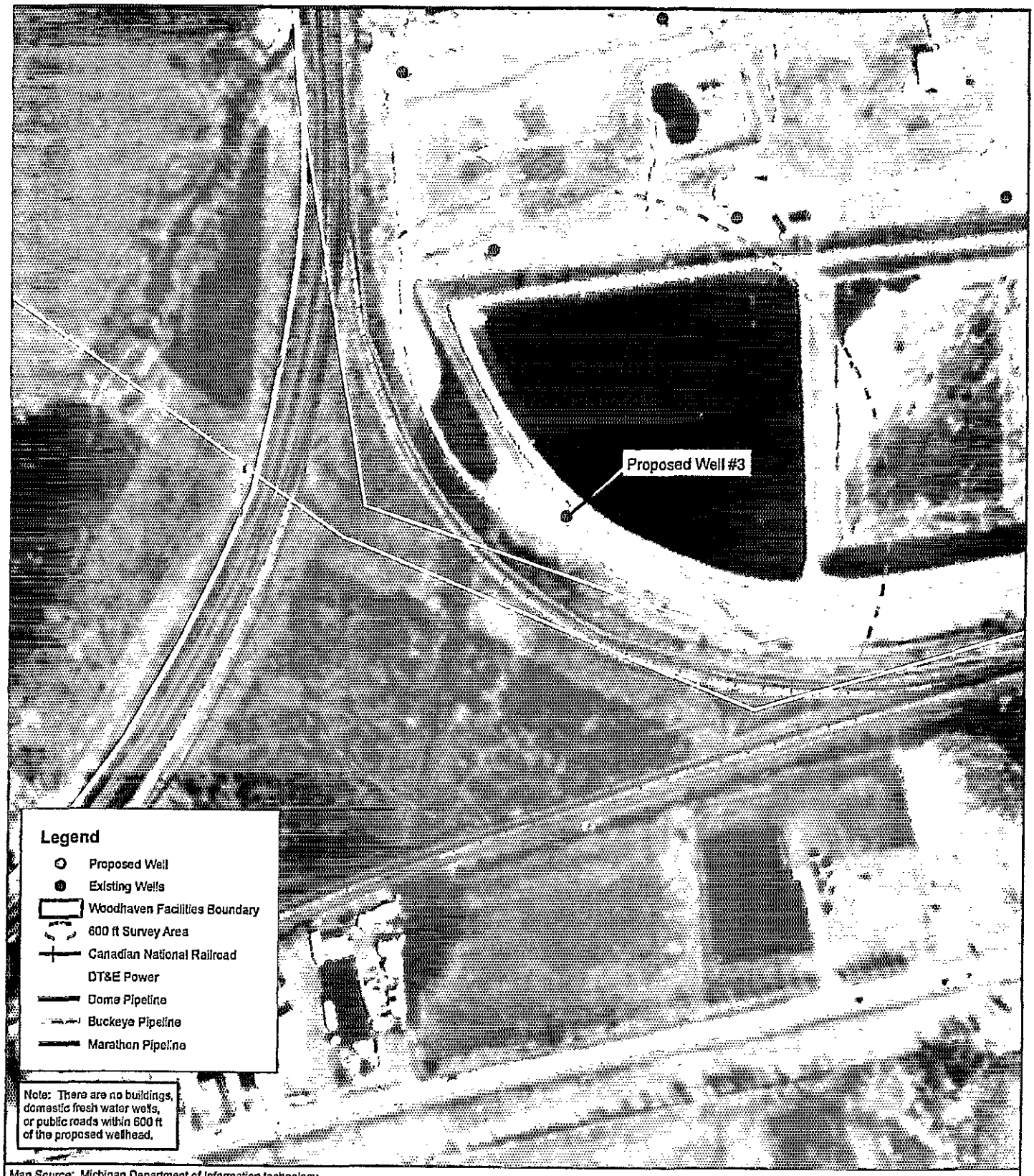


Sendero Environmental, LLP

Drill Site Dimensions (Part B2)
1998 Aerial Photograph
Woodhaven Well #3
Wyandotte Digital Quadrangle
Wayne County, Michigan
September 23, 2005

Mapping done by Glacier Fox GIS, Inc
Map ID: 050008/ 050008A08_B2.mxd/ 09-23-2005




Map Source: Michigan Department of Information technology, Center for Geographic Information, wyandotte_sw.sid, 1998.

0 125 250
Feet

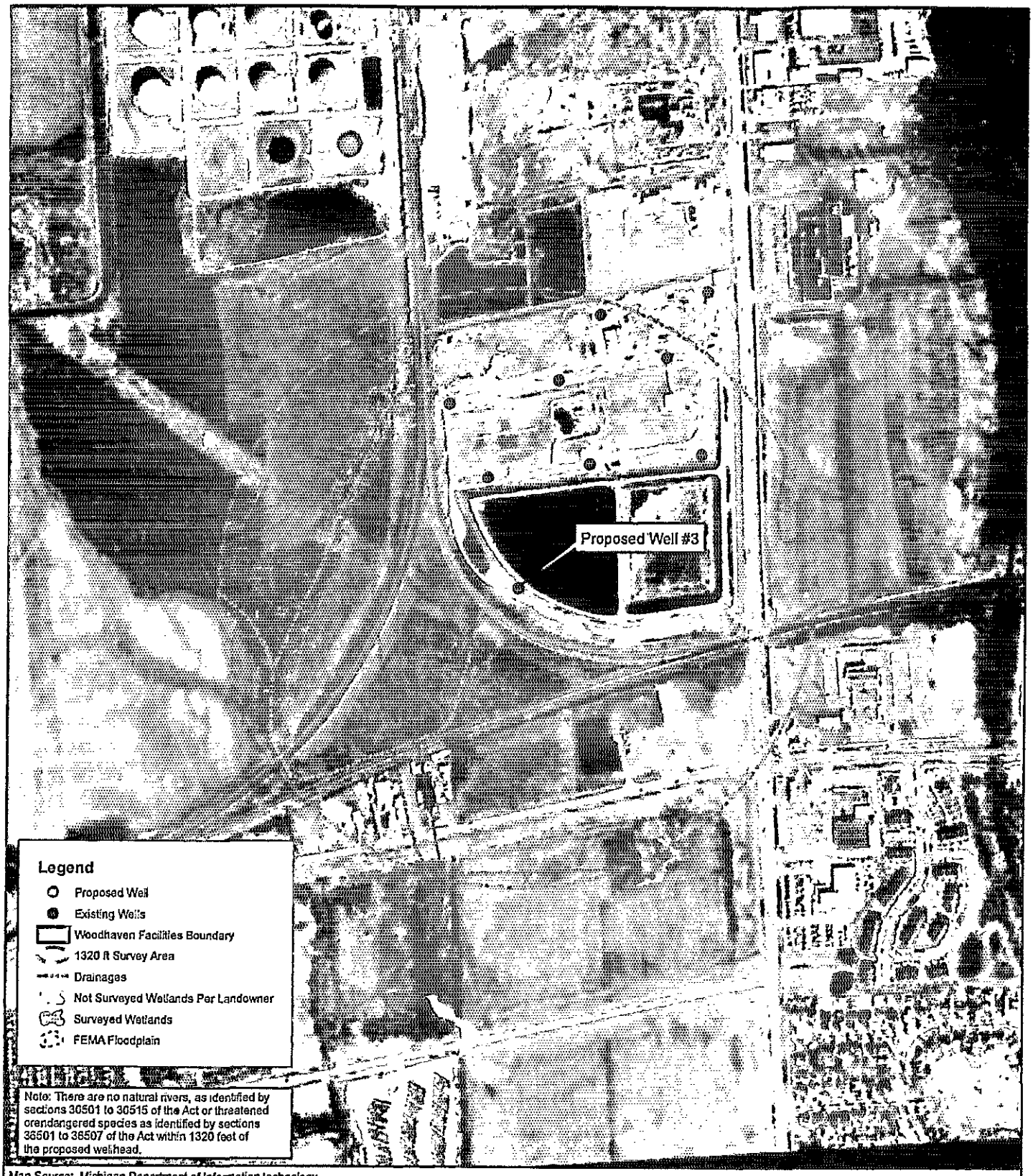
N

MARATHON

Sendero Environmental, LLP

600 Feet Survey Area (Part B5a)
1998 Aerial Photograph
Woodhaven Well #3
Wyandotte Digital Quadrangle
Wayne County, Michigan
September 23, 2005

Mapping done by Glacier Fox GIS, Inc
Map ID: 050008/ 050008A09_B4.mxd/ 09-23-2005




Map Source: Michigan Department of Information technology, Center for Geographic Information, wyandotte_sw.sid, 1998.

0 300 600
Feet

N

MARATHON

Sendero Environmental, LLP

1320 Feet Survey Area (Part B5c)
1998 Aerial Photograph
Woodhaven Well #3
Wyandotte Digital Quadrangle
Wayne County, Michigan
September 23, 2005

Mapping done by Glacier Fox GIS, Inc
Map ID: 050008/ 050008A10_B6.mxd/ 09-23-2005

AIR & WATER
COMPLIANCE
GROUP, LLC

**Transmittal Memorandum**

Date: October 13, 2005

To: Wayne County Clerks Office
2 Woodward Avenue, Room 201
Detroit, MI 48226

From: Jacob Koebbe

Subject: Marathon Pipe Line Company LLC
Woodhaven # 3 Well
Application for Permit to Drill
City of Woodhaven, Wayne County, Michigan
JN: 05010

Enclosed: Michigan Department of Environmental Quality
Office of Geological Survey
Application for Permit to Drill
Forms: 7200-1, 7200-2, 7200-3, 7200-4
7200-13, 7200-18, 7500-1

Remarks: Please record and file the enclosed Michigan Department of Environmental Quality Application for Permit to Drill. Please inform Tom Ross at (419) 421-3295 if there is anything else required from your office regarding this project.

Via: FedEx Priority

Copies to:

| | |
|---|---|
| Laura McKee | Bob Everett |
| Kirk Greenlee | Steve Binion |
| Tom Ross | Donna Henry |
| Project File | |

104 Fletcher Drive • Brooklyn, Michigan 49230
(517)592-2226 • Fax (517)592-2227 • www.awcgllc.com

AIR & WATER
COMPLIANCE
GROUP, LLC

**Transmittal Memorandum**

Date: October 13, 2005

To: Mr. Dan Hutchinson
Wayne County Department of Environment
3600 Commerce Court, Building E
Wayne, MI 48184

From: Jacob Koebbe

Subject: Marathon Pipe Line Company LLC
Woodhaven # 3 Well
Application for Permit to Drill
City of Woodhaven, Wayne County, Michigan
JN: 05010

Enclosed: Wayne County Soil Erosion Permit Application,
Project Description and Location Maps
Soil Erosion and Sedimentation Control Plan
Erosion, Sediment and Stormwater Control Handbook

Michigan Department of Environmental Quality
Application for Permit to Drill
Forms: 7200-1, 7200-2, 7200-3, 7200-4
7200-13, 7200-18, 7500-1

Remarks: Please inform Tom Ross at (419) 421-3295 if there is anything else required from your office regarding this project.

Via: FedEx Priority

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AIR & WATER
COMPLIANCE
GROUP, LLC

**Transmittal Memorandum**

Date: October 26, 2005

To: Mr. Rex Tefertiller
Michigan Department of Environmental Quality
Office of Geological Survey - Permits & Bonding Unit
Constitution Hall, South Tower, 1st Floor,
525 West Allegan Street,
Lansing, MI 48933

From: Jacob Koebbe

Subject: Marathon Pipe Line Company LLC
Woodhaven # 3 Well
***REVISED*** Application for Permit to Drill
City of Woodhaven, Wayne County, Michigan
JN: 05010

Enclosed: Two Copies of:

- Revised Application for Permit to Drill Forms: 7200-1, 7200-2, 7200-3 7200-4, 7200-13, 7200-18, 7200-19
- Soil Erosion and Sedimentation Control Plan
- Erosion, Sediment and Stormwater Control Handbook
- Fee Check for $300
- Bond Check for $10,000
- Transmittal to Wayne County Clerks Office
- Transmittal to Wayne County Department of Environment

Remarks: Please inform Tom Ross if there is anything else required from your office regarding this project.

Via: FedEx Priority

Copies to:

| | |
|---|---|
| Laura McKee | Bob Everett |
| Kirk Greenlee | Steve Binion |
| Tom Ross | Donna Henry |
| Project File | |

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Environmental, Safety and Regulatory Compliance

**Marathon Pipe Line LLC**

539 South Main Street
Room 4606
Findlay, OH 45840
Telephone: (419) 421-3295
FAX: (419) 421-3917

October 10, 2005

Michigan DEQ
Permits and Bonding Unit
Office of Geological Survey
PO Box 30256
Lansing, MI 48909-7756

Re: Application to Drill
Marathon Pipe Line LLC – Woodhaven Station

Dear Sirs:

Please find enclosed a completed application and associated fees for the Marathon Pipe Line LLC Woodhaven Station.

Please feel free to contact me with questions or concerns at 419-421-3295.

Regards,

Thomas A. Ross

Thomas A. Ross
HES Professional
Marathon Ashland Pipeline

Enclosures

/tar

Cc:

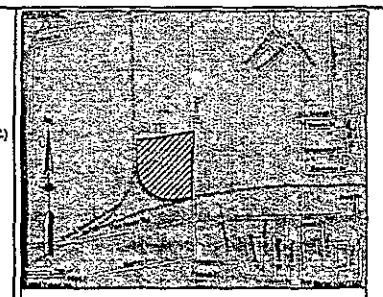
## LEGEND

- GAS
- SANITARY SEWER (SAN)
- STORM SEWER (STM)
- WATERMAIN (WM)
- OVERHEAD WIRE
- UNDERGROUND ELECTRIC (ELEC)
- UNDERGROUND PHONE (PH)
- UNDERGROUND CABLE (CBL)
- MANHOLE
- CATCH BASIN
- SEWER CLEAN OUT
- GAS METER
- GAS SHUT OFF VALVE
- VALVE BOX
- GATE VALVE IN WELL
- WATER SHUT OFF VALVE
- FIRE HYDRANT
- SPRINKLER VALVE BOX
- LAWN SPRINKLER HEAD
- HAND HOLE
- ELECTRIC RISER OR METER
- TELEPHONE RISER
- CABLE TV RISER
- AIR CONDITION UNIT
- UTILITY POLE
- UTILITY POLE WITH TRANSFORMER
- UTILITY POLE W/ LAMP EXTENSION (ARROW INDICATES DIRECTION OF ARM)
- LIGHT POLE
- LIGHT POLE WITH LAMP EXTENSION
- TRAFFIC SIGNAL
- POLE WITH TRAFFIC SIGNAL (OVER ROAD)
- GUY WIRE
- GP GUY POLE
- GROUND LEVEL OR DECORATIVE LIGHTING
- FLAG POLE
- PHONE OR PHONE BOOTH
- CHAIN LINK FENCE (C.L.)
- WOOD FENCE
- BARBED WIRE FENCE (B.W.)
- GUARD RAIL
- METAL OR CONC. POST
- MAILBOX
- SIGN
- WATER FOUNTAIN
- PARKING METER
- BILLBOARD OR LARGE SIGN
- BASKETBALL HOOP
- BOULDER
- STATUE OR SCULPTURE
- BENCH
- INV. INVERT ELEVATION
- CMP CORRUGATED METAL PIPE
- CONTOURS OF DITCH
- CULVERT
- DITCH BANK/TOP OF SLOPE
- PROPERTY LINES
- STUMP
- CONIFEROUS TREE
- DECIDUOUS TREE
- DECIDUOUS SHRUB
- CONIFEROUS SHRUB
- SECTION CORNER
- TRAVERSE POINT
- STRUCTURE NUMBER
- SDA POINT No.
- SPOT ELEVATION
- TC TOP OF CURB ELEVATION
- C GUTTER ELEVATION
- TP TOP OF PAVEMENT ELEVATION
- EM EDGE OF METAL ELEVATION
- TW TOP OF WALK ELEVATION
- WALL TOP OF WALL ELEVATION
- GE GROUND ELEVATION
- U.G. UNDERGROUND
- F.O. FIBER OPTIC
- CONC. CONCRETE
- ASPH. ASPHALT
- L.S. LANDSCAPED
- F.F. FINISH FLOOR ELEVATION
- D.L. DOOR LEDGE ELEVATION
- * F.I. FOUND IRON
- * F.M. FOUND MONUMENT
- * F.P.K. FOUND P.K. NAIL
- * S.I. SET IRON W/SDA CAP
- * S.P.K. SET P.K. NAIL
- * S.P.K./TAG SET P.K. NAIL W/SDA TAG
- * M.S. SET MAGNETIC NAIL
- * M.S./TAG SET MAGNETIC NAIL W/SDA TAG
- M MEASURED
- R RECORD
- C CALCULATED
- ELECTRIC TOWER

N

SCALE 1" = 200'

0 200 400



LOCATION MAP
NOT TO SCALE

PROVIDED PROPERTY DESCRIPTIONS

PARCEL 1

A PARCEL OF LAND IN THE SE 1/4 OF SECTION 22, T.04S., R.10E., CITY OF WOODHAVEN, (FORMERLY BROWNSTOWN TOWNSHIP), WAYNE COUNTY, MICHIGAN, DESCRIBED AS FOLLOWS:

COMMENCING AT THE EAST 1/4 CORNER OF SAID SECTION 22; THENCE ALONG THE EAST LINE OF SAID SECTION 22, S00°02'00"W 815.00'; THENCE S81°13'10"W 33.39' TO A POINT ON THE WESTERLY LINE OF ALLEN ROAD (120' WIDE); WHICH POINT IS THE POINT OF BEGINNING OF THIS DESCRIPTION; THENCE S81°13'10"W 1360.16' TO A POINT ON THE EASTERLY ROW LINE OF THE DT&I RAILROAD; THENCE ALONG THE EASTERLY ROW LINE OF THE DT&I RR S00°13'48"W 238.62' TO A POINT OF CURVE; THENCE CONTINUING ALONG THE ROW LINE OF THE DT&I RR ON THE ARC OF A CIRCULAR CURVE TO THE LEFT OF RADIUS 825.49', CENTRAL ANGLE OF 86°23'20", CHORD LENGTH 1231.55', AND CHORD BEARING S48°00'52"E, A DISTANCE OF 1390.10' TO A POINT OF TANGENCY; THENCE CONTINUING ALONG THE ROW LINE OF THE DT&I RR N83°44'28"E 404.44' TO A POINT ON THE WESTERLY LINE OF ALLEN ROAD (120' WIDE). SAID POINT BEING LOCATED 50.00' WESTERLY FROM THE EAST LINE OF SAID SECTION 22; THENCE ALONG THE WESTERLY LINE OF ALLEN ROAD N00°02'00"E 221.96' TO A POINT OF CURVE; THENCE CONTINUING ALONG THE WESTERLY LINE OF ALLEN ROAD ON THE ARC OF A CIRCULAR CURVE TO THE RIGHT OF RADIUS 5769.58', CENTRAL ANGLE OF 1°58'00", CHORD LENGTH 195.35', AND CHORD BEARING N01°00'00"E, A DISTANCE OF 195.36' TO A POINT OF TANGENCY; THENCE CONTINUING ALONG THE WESTERLY LINE OF ALLEN ROAD N01°58'00"E 806.95' TO A POINT OF CURVE; THENCE CONTINUING ALONG THE WESTERLY LINE OF ALLEN ROAD ON THE ARC OF A CIRCULAR CURVE TO THE LEFT OF RADIUS 5669.58', CENTRAL ANGLE 01°55'00", CHORD LENGTH 191.30' AND A CHORD BEARING N01°00'00"E, A DISTANCE OF 191.31' TO A POINT OF TANGENCY; THENCE CONTINUING ALONG THE WESTERLY LINE OF ALLEN ROAD N00°02'00"E 10.64' TO THE POINT OF BEGINNING. CONTAINING 32.067 ACRES, MORE OR LESS.

PARCEL 2

THAT PARCEL OF LAND IN THE NORTH 1/2 OF THE SE 1/4 OF SECTION 22, T.04S., R.10E., CITY OF WOODHAVEN, (FORMERLY BROWNSTOWN TOWNSHIP), WAYNE COUNTY, MICHIGAN, DESCRIBED AS FOLLOWS:

COMMENCING AT A POINT ON THE EASTERLY LINE OF THE DETROIT & IRONTON RR ROW OF 100 FEET WIDTH, SAID POINT BEING S82°30'40"W 1390.53' ALONG THE E/W 1/4 LINE AND S01°32'10"W 450.26' FROM THE EAST 1/4 CORNER OF SAID SECTION 22; THENCE CONTINUING S01°32'10"W 365.21'; THENCE N82°30'40"E 1393.59' TO THE CENTERLINE OF ALLEN ROAD; THENCE N01°16'30"E 365.00' ALONG SAID CENTERLINE; THENCE S82°30'40"W 1392.23' TO THE POINT OF COMMENCEMENT AND CONTAINING 11.534 ACRES MORE OR LESS.

NOTES:

1. AS REPORTED BY AIR & WATER COMPLIANCE GROUP, LLC, THERE ARE NO ENVIRONMENTALLY SENSITIVE AREAS, THREATENED/ENDANGERED SPECIES, NATURAL RIVERS, CRITICAL DUNES AREAS, OR LAKES WITHIN 1320 FEET OF THE PROPOSED WELL.

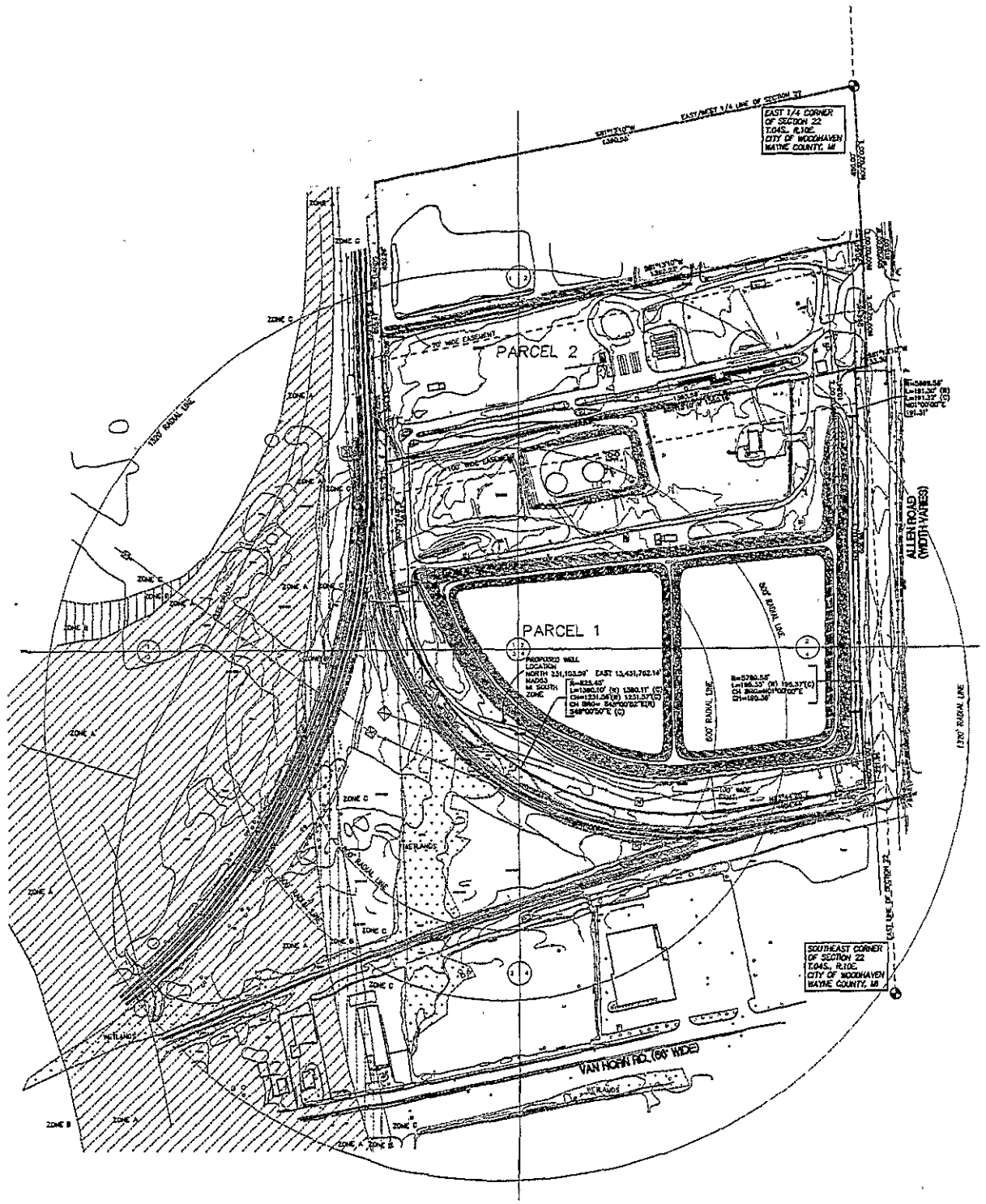
2. AS REPORTED BY AIR & WATER COMPLIANCE GROUP, LLC, THERE ARE NO TYPE I OR TYPE IIA PUBLIC SUPPLY WELLS WITHIN 2000 FEET OF THE PROPOSED WELL. THERE ARE NO TYPE IIB OR TYPE III PUBLIC SUPPLY WELLS WITHIN 800 FEET OF THE PROPOSED WELL.

3. WETLAND LOCATIONS WERE FLAGGED BY AIR & WATER COMPLIANCE GROUP, LLC.

4. ON-SITE UNDERGROUND UTILITY INFORMATION WAS NOT AVAILABLE.

5. THE STATE PLANE COORDINATE (NAD83, MICHIGAN SOUTH ZONE, INTERNATIONAL FEET) FOR MONUMENT NUMBER 5 WAS HELD. THE SITE WAS ROTATED TO FIT A STATE PLANE AZIMUTH BETWEEN MONUMENT NUMBER 5 AND MONUMENT NUMBER 8 (S45°32'47.6"W). TO OBTAIN PROPERTY DESCRIPTION BEARINGS, ROTATE THE DRAWING TO MATCH THE PROVIDED BEARINGS FOR PARCEL 1. PARCEL 2 WAS ROTATED TO FIT PARCEL 1 BEARINGS.

6. ELEVATIONS ARE ON NGVD 1929.

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DETROIT, MI 48226
PHONE: (313) 967-4700
FAX: (313) 967-4707

2505 W. JEFFERSON
TRENTON, MI 48183
PHONE: (734) 671-4344
FAX: (734) 671-4347

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3 WORKING DAYS
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1-800-482-7171
(not for members of MISS DIG)

NOTE: UTILITY INFORMATION ON THIS DRAWING MAY BE FROM INFORMATION DISCLOSED TO US FROM BY THE VARIOUS UTILITY COMPANIES, CITY/COUNTY AGENCIES AND OTHER VARIOUS SOURCES. UNDERGROUND UTILITIES WHICH ARE ON PRIVATE PROPERTY ARE USUALLY NOT DELINEATED UPON A UTILITY COMPANY'S PURCHASED PLANS. THEIR LOCATION, IF SHOWN UPON THIS SURVEY, ARE APPROXIMATED FROM FOUND PAINT MARKS/STAKES, ETC. AS LOCATED BY US FROM FROM SOURCES WHICH ARE UNKNOWN. NO GUARANTEE IS GIVEN AS TO THE COMPLETENESS OR ACCURACY THEREOF.

PRIOR TO CONSTRUCTION, ALL LOCATIONS AND DEPTHS OF EXISTING UTILITIES (IN CONFLICT WITH PROPOSED IMPROVEMENTS) SHALL BE VERIFIED IN THE FIELD. CALL MISS DIG 3 WORKING DAYS PRIOR TO CONSTRUCTION.


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# MARATHON ASHLAND WOODHAVEN FACILITY CITY OF WOODHAVEN

WAYNE COUNTY

## WETLAND MAP

SECTION 22 PRIVATE CLAIM
TOWN 04 SOUTH RANGE 10 EAST
CITY OF WOODHAVEN
WAYNE COUNTY MICHIGAN

| NO. | DATE | REVISION |
|---|---|---|
| 1 | 09-26-05 | CLIENT REQUEST |

| | |
|---|---|
| DRAFTER D.STOICA | DATE 09-01-05 |
| CHECKED CMDeDECKER | DATE |
| FIELD LEADER T.ANDERSON | PROJECT SURVEYOR C.BAGBY |
| PROJECT MANAGER CMDeDECKER | DEPARTMENT MANAGER G.PLATZ |

VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET, ADJUST SCALES ACCORDINGLY

| | |
|---|---|
| JOB NO. SM05-106 | DRAWING NO. SM05106TP |
| SCALE: 1"=200' | SHEET NO. 1 OF 1 |

# Marathon Pipe Line LLC
# Woodhaven Well # 3 Project
# Michigan Department of Environmental Quality
# Office of Geological Survey, Permits and Bonding Unit
# Application for Permit to Drill
# October 2005
# Revised

MARATHON®

$H_2S$ Contingency Plan Evaluation

Applicant: Marathon Oil Co

Application Number: 050817

Well Name and Number: Woodhaven well #3

_____ A contingency plan is required

X A contingency plan is not required

NA Anticipated $H_2S$ class

---

If a contingency plan is required:

_____ The plan meets requirements for Part II contingency plans set forth in R 324.1110, Act 451 PA 1994 as amended, Part 615, Supervisor of wells and the promulgated administrative rules.

_____ The plan does not meet requirements for Part II contingency plans set forth in R324.1110, Act 451 PA 1994 as amended, Part 615, Supervisor of wells and the promulgated administrative rules. The following information is required:

Raymond Vugrinovich

Raymond Vugrinovich
Senior Geologist
Petroleum Geology and Production Unit

**From:** Kimberly Borland
**To:** Bruce Waldo; James Duszynski
**Date:** 11/4/05 4:37PM
**Subject:** Environmental Review Response

Hello James and Bruce,
Here is one response:

File A050817 for Marathon Pipeline LLC
No impacts are expected to occur to known and recorded rare species or high quality natural communities at the proposed project site described in the application above.

Thanks

Kim Borland
Michigan Natural Features Inventory
P.O Box 30444
Lansing, MI 48909
(517)241-1756
Fax: (517)373-9566

# Land and Water Management Division - Spatial Interests

10/28/2005

**Spatial Location Lookup:**

4S, 10E

| | | | | | |
|---|---|---|---|---|---|
| 6 | 5 | 4 | 3 | 2 | 1 |
| 7 | 8 | 9 | 10 | 11 | 12 |
| 18 | 17 | 16 | 15 | 14 | 13 |
| 19 | 20 | 21 | 22 | 23 | 24 |
| 30 | 29 | 28 | 27 | 26 | 25 |
| 31 | 32 | 33 | 34 | 35 | 36 |

**New Search**

**Spatial Resources:**

- SiteMap
- IMap
- Lat/Lon Search
- Aerial Imagery
- Terra Server
- Mapquest
- TopoZone

**Spatial Data:**

- Geographic Data Library
- Geography Network

**Help**

## Spatial Interest Search

### 4S, 10E Section:22

**Spatial Mapping Resources**

- Aerial Imagery Archive
- DEQ's Environmental SiteMap
- MapQuest - Internet Mapping and Imagery
- TopoZone - Internet Topographic Quads
- Maps On Us - Free Internet mapping resource

**CIWPIS Special Interests**

| Organization | Description | Comment |
|---|---|---|
| Natural Heritage | State Threatened Animal | ARADB13061 |
| Remediation and Redevelopment | Act 307 Site ID | 82000170 |
| Remediation and Redevelopment | Act 307 Site ID | 82001487 |

**CIWPIS Permits**

| Permit Number | Applicant | Activity |
|---|---|---|
| 04820072 | | Construct Building-Commercial |
| 04820209 | | Dredging |
| 87140014 | SERVICES WAYNE PUBLIC | Submerged Pipeline |
| 90140879 | City of Woodhaven | Submerged Pipeline |
| 92140126 | City of Taylor | Discharge Structure |
| 99100948 | | Construct Building |

**Flood Discharge Requests**

| File Number | Watercourse | Location |
|---|---|---|
| 20050502-4 | Brownstown Creek | I-75 |
| 20050508 | Brownstown Creek | I-75 |

**Drinking Water Supply Wells**

| Well ID | Well Owner | Well Depth |
|---|---|---|
| 82000001603 | MARATHON OIL CO. | 73 |
| 82000001604 | MARATHON OIL | 1156 |
| 82000001605 | SOCONY MOBIL OIL CO. | 1162 |
| 82000001606 | MOBIL OIL CO. | 365 |
| 82000001607 | MARATHON OIL CO. | 1155 |
| 82000001608 | SOCONY MOBIL OIL CO. | 1158 |
| 82000001609 | MARATHON OIL CO. | 1153 |
| 82000001610 | SOCONY MOBIL OIL CO. | 1149 |
| 82000001611 | MARATHON OIL CO. | 1142 |

**1 My Town, Range and Section are:**

4s 10e 22

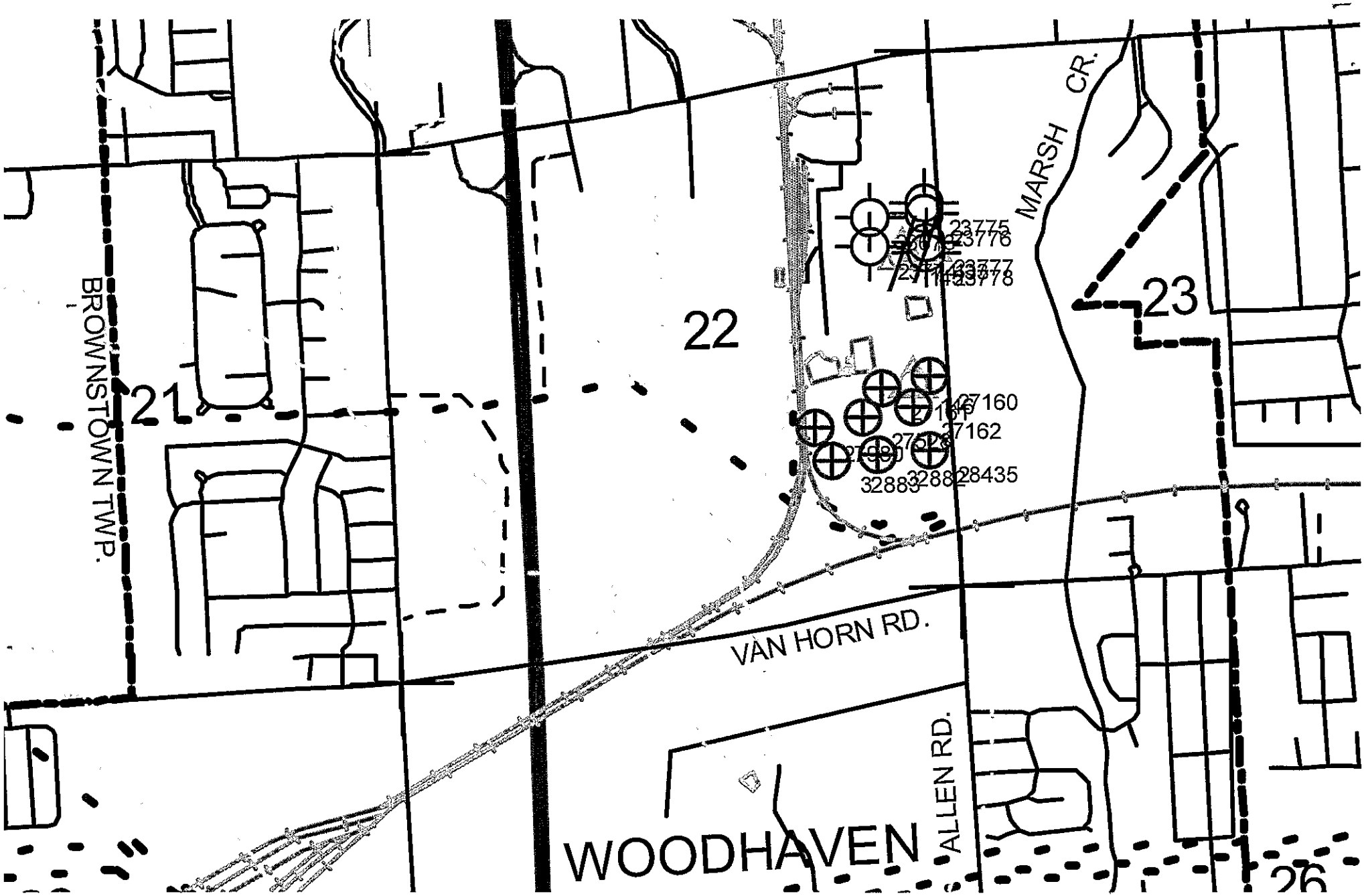
Use the Spatial Location Lookup for resolving place names into Town and Range.

**2 Begin Search:**

A search requires the Town, Range and Section values.

**Spatial Interest Data:**

Data is retrieved from various DEQ SQL databases. The data displayed here is only those data sets which have been made available to Intranet users to search and have records matching the town, range and section criteria. To include additional data bases to this search page please have the appropriate IT staff contact DEQ-Webmaster@michigan.gov.


BROWNSTOWN TWP.
21
22
23
MARSH CR.
VAN HORN RD.
ALLEN RD.
WOODHAVEN
23775
23776
23777
23778
27160
27162
28435
32883

# PART 615 - DRILLING PERMIT APPLICATION FLOW SHEET

| | | | |
|---|---|---|---|
| Application number AG50817 | Date application received 10/28/05 | | + 5 days Date to send to field 11/1/05 |
| Applicant Marathon Pipe Line, LLC | | Company No. 3223 | + 25 days Adm complete 11/26/05 |
| Well Name & No. Wood haven Well #3 | | Revision date | + 20 days Permit decision 12/16/05 |
| ☒ New Company<br>☒ Correct address and phone number Org Report ✓<br>☐ State Surface Date e-mailed to FMFM | | Pre-revision app no. | Days tolled<br>New date for permit dec. |
| ☐ Horizontal – no fee ☐ Drilling or Deepening ☒ Check #, Bank, City 11301, 5/3 Northern, OHIO | | | |

## INITIAL REVIEW

Reviewer: JRD

| | |
|---|---|
| ☒ Admin complete application | ☒ EQP 7200-1 ☒ EQP 7200-2 ☒ Supplemental plat ☒ BOP diagram ☒ Full drlng unit<br>☒ EIA ☒ Notice to landowner ☐ Directional plan ☒ Soil erosion ☐ Proper spacing<br>☒ Notice to Co Clerk ☐ Inj. well supplements ☐ Antrim EIA ☐ $H_2S$ cont plan ☐ Has surf rights<br>☒ Valid bond No. CONNUM 5156 8511 ☐ Blanket ☒ Single Cash ND, ☐ Half |
| ☒ Natural Features | ☐ No match found ☒ Match found Program State Threatened Animal of 307 Sites<br>☐ Application activity entered Personnel contacted Olson |
| ☒ Distribution | Area geologist: ☐ Cadillac ☐ Gaylord ☐ Lansing ☒ Livonia ☐ Bay City ☐ Kalamazoo<br>District geologist: ☐ Cadillac ☒ Lansing<br>☐ Copy sent to local emergency coord ☐ City or Twp over 70,000 population<br>☐ Confidential, copy provided to PGP<br>☒ Application activities entered Date sent to field 10/28/5 |

## REVIEW FOR COMPLETE AND ACCURATE INFORMATION

Reviewer: JRD

| | |
|---|---|
| ☒ Location | ☐ 7200-1 deficiencies or conflicts Bond Review 11/1/5 DD3<br>☐ 7200-2 deficiencies or conflicts<br>☒ Zoning Industrial Residential zoning date:<br>☒ Posted on map ☐ Special management area or wellhead protection zone |
| ☒ Drilling Unit<br>NA | Well type: ☐ Oil/Gas ☐ Complete drilling unit ☐ Unleased interests<br>☐ General Rule ☐ S.O. 1-73 ☐ S.O. 1-86 ☐ Field spacing order<br>☐ (A) 14-9-94 ☐ USP Request ☐ Approved USP<br>☐ USP density ☐ 1320' Conflicts<br>☐ 303 (2) ☐ Administrative approval ☐ Hearing petition<br>☐ Spacing problems |
| ☒ Injection wells<br>Hydrocarbon Cavern in Salt | Well type: ☐ BDW ☐ Gas storage ☐ Secondary recovery ☒ Hydrocarbon Storage<br>☐ Supplemental survey, all producing/plugged wells within 1320' ☐ All records of wells within 1320'<br>☐ 7200-14 complete ☐ No migration of inj fluids into wells within area of review<br>☐ Inj pressure below fracture gradient ☐ Injection into a producing pool<br>☐ Deficiencies |
| ☒ Ownership | ☒ Private surface ☒ Private minerals<br>☐ State surface ☐ State minerals State lease number<br>☐ Federal surface ☐ Federal minerals<br>☐ Deficiencies |
| ☒ $H_2S$ | ☒ Received $H_2S$ Determination ☒ Sweet ☐ Sour, Class<br>☐ Contingency plan enclosed ☐ Deficiencies |
| ☒ Casing & Sealing | ☒ Rotary ☐ Combination ☐ Cable<br>☒ Surface adequate R 408 ☒ BOP adequate ☐ Proper hole/casing size R 410(4)<br>☐ Int csg S.O. 2-73 ☐ 30% exception ☐ Short int exception<br>☐ Through gas storage R 417 ☐ Notice to storage operator ☐ LS csg, meets R 410(3)<br>☐ Deficiencies |
| ☒ EIA review | Features < 1320': ☐ Wetland ☐ Endangered specie ☐ Natural river ☐ Critical dune<br>☐ Surface Water ☐ Floodplain ☐ Great Lake less than 1500'<br>Man made features: ☐ Residence < 300' ☐ Private ww < 300' ☐ Public ww < 800 or 2000'<br>☐ Need additional information |
| ☒ Reconcile Field & Lansing review | ☐ Tolled, Date Reason<br>☐ Technical Deficiency, Date Reason<br>☐ Adm Complete, Date Reason<br>☒ Lansing staff recommend issuance Date 11/30/5<br>☐ Denial recommended to Division Chief Date<br>☐ Previously drilled wells at this surface location API# 11th, 12th digits |

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

DEQ

**APPLICATION TO:**

☐ **CHANGE WELL STATUS OR**

☒ **PLUG AND ABANDON WELL**

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, 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 or Gas Well ☐ Part 625 Mineral Well

| | |
|---|---|
| Permit number: 57361 | Type of well: DRY HOLE |
| API number: | |
| Name and address of permittee: MARATHON PIPELINE LLC ATTN: TOM ROSS, 539 S. MAIN ST., FINDLAY, OH 45840 | |
| Well name and number: WOODHAVEN WELL #3 | |
| Well location: NW 1/4 of SE 1/4 of SE 1/4 Section 22 T 04S R 10E | |
| Township: BROWNSTOWN | County: WAYNE |
| Date drilling completed: 12-14-05 | Date last produced/utilized: N/A |
| Work to be done by: WILL NOTIFY | Starting date: WILL NOTIFY |

Change of well status requested to:

☐ Plug back ☐ Perforate ☐ Temporarily abandon

☐ Convert to _____ ☐ Other _____

Last production/injection rate and type of fluid

Brief description of project

**CASING AND CEMENTING RECORD**

| Hole dia | Casing dia & wt/ft | Depths set | Cement quantity, type, additives | Cement top | Perforations |
|---|---|---|---|---|---|
| 20" | 16" 55# | 150' | 440 SX C-A | CTS | |
| 10 5/8" | | | | | |
| 7 7/8" | | | | | |
| | | | | | |
| | | | | | |

Formation record (formation and depth of top, oil, gas and water shows, etc.):

| formation | depth |
|---|---|
| B EVAP | 1080 |
| DTD | 1244 |

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JUN 21 2006

OFFICE OF GEOLOGICAL SURVEY
PERMITS & BONDING UNIT

Detail proposed procedures:

DRILL OUT CIBP AT 100 FT. GIH WITH TUBING TO 1244 FT. AND FILL WELLBORE WITH CLASS A CEMENT TO THE SURFACE. TOP OFF AS NECESSARY. CUT 16" CASING OFF AT LEAST 4 FT. BELOW GRADE AND CAP WITH WELDED 1/2" STEEL PLATE. THE WELL PERMIT NUMBER IS TO BE PERMANENTLY AFFIXED TO THE PLATE. RESTORE LOCATION.

Name/signature (authorized representative): Date:

FOR OFFICE OF GEOLOGICAL SURVEY USE ONLY

DEQ additional requirements:

PLEASE NOTIFY THIS OFFICE THE DAY BEFORE COMMENCING OPERATIONS AT 586-753-3856.

☐ Yes ☐ No ☒ Not applicable Production tests to commence within 10 days of completion and to be filed

☐ Yes ☒ No Service company records are to be filed

| Approved by DEQ: | Office: | Approval date: | Termination Date: |
|---|---|---|---|
| Bruce J. Waldo | WARREN | 6-14-06 | 6-14-07 |

Submit original and three (3) copies of this application to the District Office within 60 days ofchange of well status.
Note: Three copies of Record of Well Plugging or Change of Well status (EQP 7200-8) and any requested service company records are to be filed within 60 days of completion at the District Office.

Environmental, Safety and Regulatory Compliance

MARATHON

**Marathon Pipe Line LLC**

539 South Main Street
Room 4606
Findlay, OH 45840
Telephone: (419) 421-3295
FAX: (419) 421-3917

July 19, 2006

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AUG 03 2006
GEOLOGICAL SURVEY
LANSING DO

Walt Danyluk
Michigan DEQ
Office of Geological Survey
525 West Allegan Street
PO Box 30242
Lansing, MI 48909-7742

Re: Application – Change Well Status
Michigan Well Permit No. 57361
Marathon Pipe Line LLC – Woodhaven Station

Dear Mr. Danyluk:

Please find enclosed a completed application to change the well status to temporarily abandon for the Woodhaven Station Well #3, Michigan Well Permit No. 57361

The reason for said application is that Marathon Pipe Line (MPL) used the boring for well #3 as a geotechnical survey to help determine feasibility for reintroducing into production the existing Caverns #4 and #7. Our contractor, one PB Energy Group has been delinquent in finalizing the geotechnical data and does not foresee getting said data back to MPL before early October. At such time a decision as to the fate of Well #3 would have to be made. If the report is favorable to reintroduce caverns #4 and #7 back into production then MPL will plug and abandon Well #3. If said report is unfavorable for cavern #4 and #7 then MPL will wish to develop Well #3.

As the final date for development and or closure is in December, this would not leave MPL enough time to schedule/plan the logistics for either plugging and abandonment nor well development dependant upon the geotechnical review.

Therefore based on the above information, MPL is requesting a temporary extension for closure of Well #3.

Please feel free to contact me with questions or concerns at 419-421-3295.

Regards,

Thomas H. Rose

Thomas A. Ross
HES Professional
Marathon Ashland Pipeline

Enclosures

/tar

Cc: Woodhaven Well #3 File
S. Binion
C. Gordon

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AUG 03 2006
DEQ LANSING
GEOLOGICAL SURVEY

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

DEQ

**APPLICATION TO:**

☒ **CHANGE WELL STATUS OR**

☐ **PLUG AND ABANDON WELL**

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, 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 or Gas Well ☐ Part 625 Mineral Well

| | |
|---|---|
| Permit number: 57361 | Type of well: Dry Hole |
| API number: | |
| Name and address of permittee: Marathon Pipeline LLC ATTN: Thomas A. Ross, 539 South Main Street, Findlay, OH 45840 | |
| Well name and number: Woodhaven Well #3 | |
| Well location: 1/4 of 1/4 of 1/4 Section T R | |
| Township: Brownstown | County: Wayne |
| Date drilling completed: 12-14-05 | Date last produced/utilized: N/A |
| Work to be done by: | Starting date: |

Change of well status requested to:

☐ Plug back ☐ Perforate ☒ Temporarily abandon

☐ Convert to _____ ☐ Other _____

Last production/injection rate and type of fluid: N/A

Brief description of project:

RECEIVED AUG 03 2006 DEQ LANSING GEOLOGICAL SURVEY

**CASING AND CEMENTING RECORD**

| Hole dia | Casing dia & wt/ft | Depths set | Cement quantity, type, additives | Cement top | Perforations |
|---|---|---|---|---|---|
| 20" | 16" 55# | 150' | 440 SX C-A | CTS | |
| 10 5/8" | | | | | |
| 7 7/8" | | | | | |
| | | | | | |
| | | | | | |

Formation record (formation and depth of top, oil, gas and water shows, etc.):

| formation | depth |
|---|---|
| B EVAP | 1080 |
| DTD | 1244 |

Detail proposed procedures:

Drill out CIBP at 100 Ft. GIH with tubing to 1244 Ft. and fill wellbore with Class A cement to the surface. Top off as necessary. Cut 16" casing off at least 4 ft. below grade and cap with welded 1/2" steel plate. The well permit number is to be permanently affixed to the plate. Restore location.

Due to project delays in obtaining geotechnical results from original well drilling, Marathon Pipeline would like to apply for a temporary reprieve from well closure until such time as said data can be finally analyzed.

Name/signature (authorized representative): Thomas A. Ross

Date: 7-19-06

FOR OFFICE OF GEOLOGICAL SURVEY USE ONLY

DEQ additional requirements:

☐ Yes ☐ No ☒ Not applicable Production tests to commence within 10 days of completion and to be filed

☐ Yes ☒ No Service company records are to be filed

| Approved by DEQ | Office: | Approval date: | Termination Date: |
|---|---|---|---|
| [signature] | Lansing Dist | 8/15/2006 | 6/14/2007 |

Submit original and three (3) copies of this application to the District Office within 60 days ofchange of well status.
Note: Three copies of Record of Well Plugging or Change of Well status (EQP 7200-8) and any requested service company records are to be filed within 60 days of completion at the District Office.

Environmental, Safety and Regulatory Compliance

**Marathon Pipe Line LLC**

539 South Main Street
Findlay, OH 45840
Telephone: (419) 421-3295

July 19, 2006

Walt Danyluk
Michigan DEQ
Office of Geological Survey
525 West Allegan Street
PO Box 30242
Lansing, MI 48909-7742

Re: Well Log 7200-5.
Michigan Well Permit No. 57361
Marathon Pipe Line LLC – Woodhaven Station

Dear Mr. Danyluk:

Please find enclosed well log information for the drilling of Woodhaven Station Well #3, Michigan Well Permit No. 57361

My apologies for this information being submitted so late. Marathon Pipe Line (MPL) is in process of developing a plan forward that hinges completely on the results of the geotechnical data obtained from the drilling of Well #3. MPL was hoping to have this data in a more timely manner to be able to submit correct forms based on plan forward as result of said data.

Please feel free to contact me with questions or concerns at 419-421-3295.

Regards,

Thomas A. Ross

Thomas A. Ross
HES Professional
Marathon Ashland Pipeline

Enclosures

/tar

Cc: Woodhaven Well #3 file
S. Binion
C. Gordon

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AUG 15 2006
DEQ LANSING GO
GEOLOGICAL SURVEY
AUG 30 2006

Void - see revised

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

# RECORD OF WELL DRILLING OR DEEPENING

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

Permit number/Deepening number: 57361

(Submit 3 copies within 60 days of drilling completion.)

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

API number:

Well name and number: Woodhaven Well #3

Name and address of permittee:
Marathon Pipeline LLC
539 South Main Street
Findlay, OH 45840

Surface location: NW 1/4 of SE 1/4 of SE 1/4 Section 22 T4S R10E

Township: Brownstown | County: Wayne

Footages: 990 ft. from South line and 1070 ft. from East line of sec.

Name and address of drilling contractor:
Bigard & Hugoard
5580 Venture Way
Mt. Pleasant

Directionally drilled (check one): ☐ Yes ☒ No

Previous permit numbers:

Subsurface location (if directionally drilled): 1/4 of 1/4 of 1/4 Section T R

Township: County:

Date drilling began: 12/1/05 | Date drilling completed: 12/16/05

Total depth of well: Driller 1244 Log 14 | Formation at total depth: Saline "B"

Footages: North/South ft. from line and East/West ft. from line of sec.

Elevations: K.B. ft. R.F. ft. R.T. ft. Grd ft

Feet drilled - cable tools: from to

Feet drilled - rotary tools: from to

**Casing, Casing Liners and Cementing, Operating Strings**

| Size | Where set | Cement | T.O.C. | Ft. pulled |
|---|---|---|---|---|
| 16 | 162 | 125 | Surf | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Water Fill Up (F.U.) or Lost Circulation (L.C.) (X)**

| Formation | F.U. | L.C. | Depth | Amount |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**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 Line | Gas Log | Fill Up |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Depth Correction**

| Depth | Correction |
|---|---|
| | |
| | |
| | |
| | |

**Deviation Survey**

| Run at | Degrees |
|---|---|
| | |
| | |
| | |
| | |

**Plugged Back**

| Yes | No | Depth |
|---|---|---|
| X | | 100 ft |
| | | |
| | | |
| | | |

**Geophysical / Mechanical Logs** (list each type run)

| Brand | Log types | Logged intervals |
|---|---|---|
| Baker Atlas | GRN/FDL | 1 ft |
| Baker Atlas | Multipole Array Acoustic Imaging Log | 5 ft |
| Baker Atlas | Dipole Sonic Circumferential Borehole Log | 5 ft |
| | | |

RECEIVED AUG 15 2006 DEQ LANSING DO GEOLOGICAL SURVEY

Notice: Report complete sample and formation record, coring record, and drill stem test information on reverse side.

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

| Date | Name and title (print) | Signature |
|---|---|---|
| 7/31/06 | Thomas A. Ross ES&R Professional | Thomas A. Ross |

Submit to: OFFICE OF GEOLOGICAL SURVEY, MICHIGAN DEPT OF ENVIRONMENTAL QUALITY PO BOX 30256, LANSING, MI 48909-7756

AUG 30 2006

EQP 7200-5 (rev. 8/2004)

# FORMATION RECORD

Attach additional sheets if necessary

| API number | Permit number/Deepening number |
|---|---|
| | |

| Elevation used | Geologist name | Tops taken from |
|---|---|---|
| | | ☐ Driller's log ☐ Sample log ☐ Electric log |

Note: if well directionally drilled, add true vertical depth formation tops where appropriate

| From | To | Formation (type, color, hardness) |
|---|---|---|
| | | |

| From | To | Formation (type, color, hardness) |
|---|---|---|
| | | |

If well was cored, attach core description

DRILL STEM TEST DATA

LIST ATTACHMENTS

RECEIVED

AUG 15 2006

DEQ LANSING DO
GEOLOGICAL SURVEY

OFFICE OF GEOLOGICAL SURVEY USE ONLY

Reviewed by

Date of review

AUG 30 2006

57361

Environmental, Safety and Regulatory Compliance

**Marathon Pipe Line LLC**

539 South Main Street
Findlay, OH 45840
Telephone: (419) 421-3295

March 28, 2007

D. Michael Bricker
Michigan DEQ
Petroleum Geology & Production Unit
525 West Allegan Street
PO Box 30242
Lansing, MI 48909-7742

Re: Michigan Well Permit No. 57361
Marathon Pipe Line LLC – Woodhaven Station Well #3

Dear Mr. Bricker:

Per your letter of request dated March 13, 2007, please find enclosed well information for the drilling of Woodhaven Station Well #3, Michigan Well Permit No. 57361

Information includes the following:

1. Form 7200-5
2. Form 7200-12
3. EQP 7130
4. Topical Report RSI-1880, Description of Rock Core Recovered
5. Well electric Log Sheets.

Please feel free to contact me with questions or concerns at 419-421-3295.

Regards,

Thomas A. Ross

Thomas A. Ross
HES Professional
Marathon Pipe Line LLC

Enclosures

/tar

Cc: Woodhaven Well #3 file

APR 02 2007

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

# CERTIFICATION OF CASING AND SEALING OF SURFACE HOLE

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, of Act 451 PA 1994, as amended Non-submission and/or falsification of this information may result in fines and/or imprisonment

Permit number: 57361

Well name: Woodhaven Well #3

Township: Brownstown

County: Wayne

Surface location: NW 1/4 of SE 1/4 of SE1/4 Section 22 T 04S R 10E

Name and address of permittee:
MARATHON PIPE LINE LLC: TOM ROSS
539 SOUTH MAIN STREET
FINDLAY, OH 45840

Name and address of drilling contractor:
BIGGARD & HUDDARD
5580 Venture Wav
Mt. Pleasantm MI

## SURFACE HOLE

| Hole diameter (Note reductions | Depth to bedrock | Base of specified aquifer (see permit) | Total depth of surface hole | Formation at surface casing seat | Date drilling completed |
|---|---|---|---|---|---|
| 20 inch | <150 ft | limestone - 128 ft | 162 ft | B Salt | 12/14/2005 |
| | | | | | |

Narrative of unusual drilling circumstances or problems encountered

No Problems Encountered

Name and address of geologist/mud logger

No Mud Logger

Signature

Date

## SURFACE CASING

| Casing O.D. (in) | Casing depth | Cement type and additives | Amount of cement (sacks) | Volume (bbls) Pumped | Volume (bbls) Returned to surface | Plug down date & time |
|---|---|---|---|---|---|---|
| 16 | 162 ft | Class A | 125 | 135 sks | yes | 12/7/05 |
| | | (w/CaCL2) | 10 | | | |

Narrative of problems encountered running or cementing casing. Note any cement fallback, grouting, or lost circulation zones.

No Problems Encountered.

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

Signature of permittee or company officer: Thomas A. Ross

Date: 3-28-07

Submit the original and one copy, typewritten or legible printed, within 30 days after drilling is completed to:

OFFICE OF GEOLOGICAL SURVEY
MICHIGAN DEPT OF ENVIRONMENTAL QUALITY
PO BOX 30256
LANSING MI 48909-7756

EQP 7200-12 (rev. 8/2004)

APR 02 2007

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY REVISED

# RECORD OF WELL DRILLING OR DEEPENING

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

Permit number/Deepening number: 57361

(Submit 3 copies within 60 days of drilling completion.)

API number: 21-163-57361-00-00

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

Well name and number: Woodhaven Well #3

Name and address of permittee
Marathon Pipeline LLC
539 South Main Street
Findlay, OH 45840

Surface location: NW 1/4 of SE 1/4 of SE 1/4 Section 22 T4S R10E

Township: Brownstown County: Wayne

Footages North/South 990 ft. from South line and East/West 1070 ft. from East line of sec.

Name and address of drilling contractor
Bigard & Huggard
5580 Venture Way
Mt. Pleasant

Directionally drilled (check one): ☐ Yes ☒ No

Previous permit numbers:

Subsurface location (if directionally drilled): 1/4 of 1/4 of 1/4 Section T R

Township County

Date drilling began: 12/1/05

Date drilling completed: 12/16/05

Total depth of well: Driller 1244 Log 1244

Formation at total depth: Saline "B"

Footages North/South ft. from line and East/West ft. from line of sec.

Elevations: K.B. 11 ft. R.F. ft. R.T. ft. Grd 600 ft

Feet drilled - cable tools: from to

Feet drilled - rotary tools: from 0 to 1244

**Casing, Casing Liners and Cementing, Operating Strings**

| Size | Where set | Cement | T.O.C. | Ft. pulled |
|---|---|---|---|---|
| 16 | 162 | 125 | Surf | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Water Fill Up (F.U.) or Lost Circulation (L.C.) (X)**

| Formation | F.U. | L.C. | Depth | Amount |
|---|---|---|---|---|
| N/A | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

**Gross Pay Intervals**

| Formation | Oil or Gas | From | To |
|---|---|---|---|
| N/A | | | |
| | | | |
| | | | |
| | | | |
| | | | |

**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 |
|---|---|---|---|---|---|---|---|---|
| N/A | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

**Depth Correction**

| Depth | Correction |
|---|---|
| N/A | |
| | |
| | |
| | |

**Deviation Survey**

| Run at | Degrees |
|---|---|
| | |
| | |
| | |
| | |

**Plugged Back**

| Yes | No | Depth |
|---|---|---|
| X | | 100 ft |
| | | |
| | | |
| | | |

**Geophysical / Mechanical Logs** (list each type run)

| Brand | Log types | Logged intervals |
|---|---|---|
| Baker Atlas | GRN/FDL | 50-1210 ft |
| Baker Atlas | Multipole Array Acoustic Imaging Log | 740-1233 ft |
| Baker Atlas | Dipole Sonic Circumferential Borehole Log | 100-1210 ft |
| | | |

Notice: Report complete sample and formation record, coring record, and drill stem test information on reverse side.

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

| Date | Name and title (print) | Signature |
|---|---|---|
| 3/28/07 | Thomas A. Ross ES&R Professional | Thomas A. Ross |

Submit to: OFFICE OF GEOLOGICAL SURVEY, MICHIGAN DEPT OF ENVIRONMENTAL QUALITY PO BOX 30256, LANSING, MI 48909-7756

EQP 7200-5 (rev. 8/2004)

APR 02 2007

REVISED

# FORMATION RECORD

Attach additional sheets if necessary

| API number | Permit number/Deepening number |
|---|---|
| 21-163-57361-00-00 | 57361 |

| Elevation used | Geologist name | Tops taken from |
|---|---|---|
| | | ☐ Driller's log ☐ Sample log ☐ Electric log |

Note: if well directionally drilled, add true vertical depth formation tops where appropriate

| From | To | Formation (type, color, hardness) |
|---|---|---|
| N/A | | |

| From | To | Formation (type, color, hardness) |
|---|---|---|
| | | |

If well was cored, attach core description

DRILL STEM TEST DATA

N/A

LIST ATTACHMENTS

OFFICE OF GEOLOGICAL SURVEY USE ONLY

Reviewed by

Date of review

APR 02 2007

57361

# DESCRIPTION OF ROCK CORE RECOVERED FROM WOODHAVEN WELL #3 WOODHAVEN, MICHIGAN

Topical Report RSI-1880

*prepared for*

PB Energy Storage Services, Inc.
11757 Katy Freeway, Suite 600
Houston, Texas 77079

March 2007

RESPEC
CONSULTING & SERVICES

APR 02 2007

57361

# DESCRIPTION OF ROCK CORE RECOVERED FROM WOODHAVEN WELL #3 WOODHAVEN, MICHIGAN

Topical Report RSI-1880

*by*

Paul E. Nelson

RESPEC
P.O. Box 725
Rapid City, South Dakota 57709

*prepared for*

PB Energy Storage Services, Inc.
11757 Katy Freeway, Suite 600
Houston, Texas 77079

March 2007

APR 02 2007

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# 1.0 BACKGROUND

Marathon Ashland Petroleum LLC (Marathon) engaged by PB Energy Storage Services, Inc. (PB ESS) to undertake a geomechanical study of the caverns at their underground storage facility in Woodhaven, Michigan. In support of the study, Marathon drilled a well at the facility for the purpose of recovering rock core for laboratory testing, performing geophysical logging of the stratigraphy, and carrying out in situ stress measurements.

RESPEC was engaged by PB ESS to examine, log, and photograph the core recovered from Woodhaven Well #3. In addition, RESPEC prepared the core for shipment and secured transportation for the core samples to the RESPEC laboratory in Rapid City, South Dakota. Field activities were carried out under the supervision of Mr. Paul Nelson of RESPEC with the assistance of Mr. Louis Venegas of PB ESS.

Marathon's Woodhaven facility is located in the city of Woodhaven, Michigan, approximately 16 miles southwest of downtown Detroit. The site is situated on the eastern edge of the Michigan sedimentary basin. The storage caverns at the Woodhaven facility are located in the Silurian-age Salina Group. The Salina Group contains several salt sequences separated by intervals of shale and dolomite. The caverns at the Woodhaven facility are located in the B Unit of the Salina Group. The B Unit in the Michigan Basin is a sequence of relatively thin salt beds separated by beds of shale and dolomite (e.g., Johnson and Gonzales [1978]).

Coring began on December 12, 2005, and was completed on December 14, 2005. The cored interval in Woodhaven Well #3 started in the nonsalt units overlying the B Unit of the Salina Group. This was done to collect core samples of the nonsalt units that form the roof of the existing storage caverns. The well was subsequently drilled through the B Unit salt and terminated in the nonsalt units below. The cored interval extended from 975 to 1,184 feet. All depths are measured relative to the Rotary Kelley Bushing (RKB) elevation, 12 feet above ground level. This report describes the coring activities for Woodhaven Well #3 and includes the field description of the core lithology.

Field activities are described in Chapter 2.0, and Chapter 3.0 summarizes the lithology of the core recorded in the field. Cited references are listed in Chapter 4.0. Appendix A is the lithologic description of the core as recorded in the field. Appendix B contains a photographic log of the core.



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# 2.0 FIELD OPERATIONS

All activities completed at the field site are in accordance with the following RESPEC procedures or as modified to meet specific conditions encountered:

- Test Procedure TP-01, RSI *Standard Procedure for Sample Acquisition, Storage, and Shipping, Rev. 3.*
- Test Procedure TP-09, *RSI Standard Procedure for Logging and Preserving Rock Core at a Field* Site, *Rev. 1.*

## 2.1 GENERAL OPERATIONS DESCRIPTION

The coring assembly was nominally 60 feet in length and the core was nominally 4 inches in diameter. The core was removed from the core barrel on the rig floor. The core was recovered in pieces short enough to be easily handled. Each core piece was hand-carried off the rig floor, "reassembled," and measured on the trailer used to carry the coring tools. After washing, the core was laid out in a heated van located near the drill rig where the core was logged, photographed, and packaged for shipment.

The individual pieces of core were reassembled as well as possible so that a valid measurement of the actual length of the core could be obtained. The core was marked at 1-foot intervals, beginning with the top of each core run. Two colored parallel lines (red on the right and yellow on the left when viewed from the bottom of the core) were also scribed on the core to maintain orientation of the pieces. A lithologic description of the core was recorded and photographs were taken. Upon completion of these tasks, the core was enclosed in plastic wrap, carefully wrapped in "bubble-wrap" material, and placed in 6-inch- by 5-foot-long polyvinyl chloride (PVC) tubes. End caps were fastened to the PVC tubes to secure the core during transportation. After the completion of field activities, the core tubes were transported to the Yellow Freight dispatch center in Detroit, Michigan, for shipment to the RESPEC offices in Rapid City, South Dakota.

## 2.2 CORING ACTIVITIES

Coring activities began in the early morning of December 12, 2005, when the core point (the top of the first core run) was reached at a depth of 975 feet RKB (963 feet below ground level). The final core run, Run 4, was recovered on December 14, 2005, and terminated at a depth of 1,184 feet RKB. Drilling ceased at a total depth of 1,244.8 feet RKB.



APR 0 2 2007

# 3.0 LITHOLOGIC DESCRIPTION

The cored section of Woodhaven Well #3 is within the Silurian-age Salina Group. The cored interval includes all or part of the C, B, and A-2 Units of the Salina Group (in order of increasing depth).

The top of the first core run, Run 1, is at a depth of 975 feet and ends at a depth of 1,004 feet (all depths are relative to RKB). Run 1 covered a 29-foot interval of the C Unit of the Salina Group and is composed predominately of a gray dolomite with varying amounts of light gray to white anhydrite. The top of Run 2 is located at a depth of 1,004 feet and ends at a depth of 1,063.2 feet. Run 2, cored the base of the C Unit and top of the B Unit, encountered a similar lithology as Run 1—dolomite with varying amounts of anhydrite. The transition between the Salina B and C Units occurs at a depth of 1,018 feet and is marked by a shift in the gamma ray trace, indicating a lower clay content in the Salina B Unit. The top of Run 3 is at a depth of 1,063.2 feet and terminated at a depth of 1,124 feet. The top of Run 3 encountered dolomite with anhydrite. The top of salt was encountered by Run 3 at a depth of 1,079.6 feet (1,067.6 feet below ground level). The salt encountered by Run 3 varied from clean to very dirty, giving the salt a color variation of clear to black. The salt is interbedded or mixed with dolomite. The top of Run 4 is located at a depth of 1,124 feet and terminates at a depth of 1,184 feet. Run 4 encountered salt mixed and interbedded with dolomite. Run 4 exited the salt sequence at a depth of 1,142.7 feet, indicating a total salt thickness of 63.1 feet. Run 4 indicated interbedded dolomite and anhydrite immediately underlying the salt.

Figure 3-1 shows a stratigraphic column developed from the core log of Woodhaven Well #3, and Table 3-1 summarizes the field description of the core. Appendix A contains field notes for each core run, and Appendix B contains photographs taken of the core.



APR 02 2007

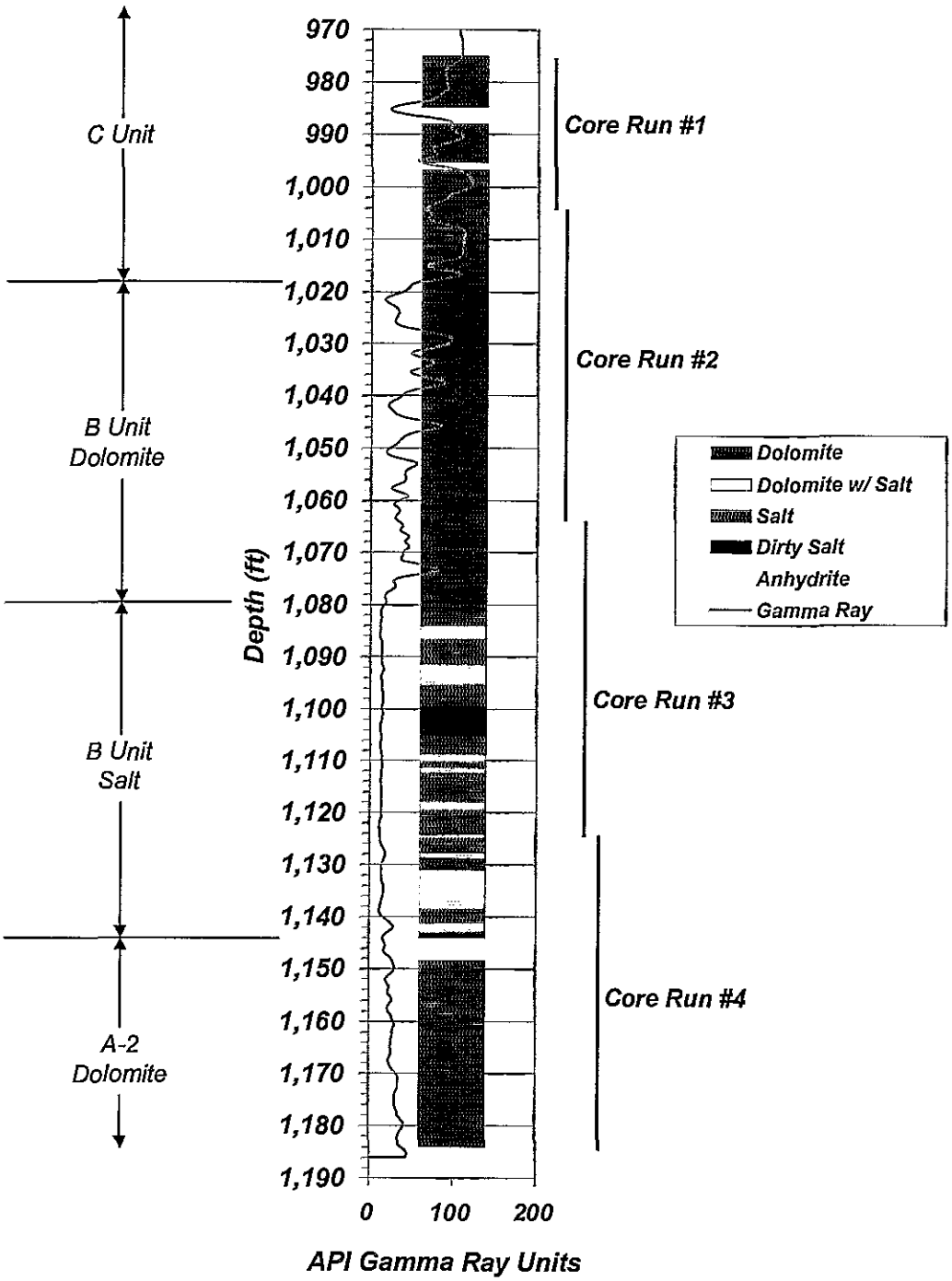


**Figure 3-1.** Stratigraphic Section of Woodhaven Well #3.



APR 02 2007

**Table 3-1. Field Description of Woodhaven Well #3 Core (Page 1 of 2)**

| Depth Interval | Lithology | Description |
|---|---|---|
| 975.0–984.9 | Dolomite | Dolomite, light gray, massive, with white to light-gray masses of anhydrite. Anhydrite content typically less than 10 percent with some intervals approaching 50 percent. Anhydrite typically occurs as masses, with some thin beds and irregular bands less than ¼ inch in thickness. Very few fractures (subvertical filled fracture at 983.3). |
| 984.9–988.0 | Anhydrite | Anhydrite, white to light-gray, massive, competent, with light-gray dolomite, generally less than 5 percent. Subvertical fracture at 986.8). |
| 988.0–995.4 | Dolomite | Dolomite, light-gray, massive, with bands of white to light-gray anhydrite. |
| 995.4–996.7 | Anhydrite | Anhydrite, white to light-gray, massive, competent, with light-gray dolomite. |
| 996.7–1,079.6 | Dolomite | Dolomite, light-gray, massive, with white to light gray masses of anhydrite. Anhydrite typically occurs as masses with some bands. Beds of predominately anhydrite from 1,018 to 1,029; 1,039 to 1,045; 1,047 to 1,053; 1,067 to 1,069; and 1,078 to 1,079.6. Fracture at 1,046.1. |
| 1,079.6–1,080.2 | Salt | Salt, black, very dirty. |
| 1,080.2–1,081.1 | Dolomite | Dolomite, light-gray, massive. |
| 1,081.1–1,084.2 | Salt | Salt, black to dark-gray contains anhydrite inclusions. Top 1 foot very dirty. |
| 1,084.2–1,086.7 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,086.7–1,091.6 | Salt | Salt, dark-gray to black to light-gray. Contains anhydrite inclusions. |
| 1,091.6–1,095.2 | Dolomite With Salt | Dolomite, light-gray with salt-filled voids 1,093.0 to 1,096.6 (breccia). |
| 1,095.2–1,099.4 | Salt | Salt, light-gray to black to clear, with dolomite beds at 1,096.6 to 1,108.8. |
| 1,099.4–1,104.7 | Dirty Salt | Salt, dark-gray to black, very dirty |
| 1,104.7–1,108.9 | Salt | Salt, clear to dark-gray |
| 1,108.9–1,110.2 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |



APR 02 2007

**Table 3-1. Field Description of Woodhaven Well #3 Core (Page 2 of 2)**

| Depth Interval | Lithology | Description |
|---|---|---|
| 1,110.2–1,111.5 | Salt | Salt, dark-gray to black, dirty. |
| 1,111.5–1,112.4 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,112.4–1,118.0 | Salt | Salt, dark-gray to black to clear. Very dirty at top becoming cleaner down section. Dolomite masses at 1,115.4, 1,115.7, 1,116.0, 1,116.4, 1,116.8, 1,117.1, and 1,117.8. |
| 1,118.0–1,119.5 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,119.5–1,123.7 | Salt | Salt, light-gray to black to clear. 1-inch anhydrite seam at 1,120.2. 1-inch to 3-inch anhydrite seam at 1,121.2. Thin (<¼ inch) anhydrite seam at 1,121.5. Broken anhydrite seam at 1,121.9. Thin (1/16 inch) anhydrite seams at 1,122.3, 1,122.7, and 1,123.0. |
| 1,123.7–1,124.1 | Dolomite | Dolomite, light-gray, with salt-filled vuggy porosity. |
| 1,124.1–1,124.3 | Salt | Salt, clear with dolomite masses |
| 1,124.3–1,124.9 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,124.9–1,128.0 | Salt | Salt, clear to smoky. Broken dolomite bands at 1,125.1 to 1,125.3, 1,125.55 to 1,126.65, 1,126.2, 1,126.7 to 1,126.8, and 1,127.5 to 1,127.7. |
| 1,128.0–1,128.7 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. Structure appears to dip about 10° near top of section about 30° at 1,135.4. |
| 1,128.7–1,131.2 | Dolomite | Dolomite, light-gray. |
| 1,131.2–1,138.5 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,138.5–1,141.3 | Salt | Salt, clear to smoky with dolomite masses distributed throughout. |
| 1,141.3–1,142.7 | Dolomite With Salt | Dolomite with salt-filled voids. Breccia in appearance. |
| 1,142.7–1,144.0 | Dolomite | Dolomite, light-brown, bedded, with darker bands. |
| 1,144.0–1,148.4 | Anhydrite | Anhydrite, white, with darker bands, wavy to mottled, appears cross-bedded. |
| 1,148.4–1,184.0 | Dolomite | Dolomite, brown to light-gray, with dark bands, bedded in part. |



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# 4.0 REFERENCES

**Johnson, K. S. and S. Gonzales, 1978.** *Salt Deposits in the United States and Regional Geologic Characteristics Important for Storage of Radioactive Waste*, prepared by Earth Resource Associates, Inc., Athens, GA, for The Office of Waste Isolation, Union Carbide Corporation, U.S. Department of Energy, Washington, DC.



APR 02 2007

DEQ

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY – OFFICE OF GEOLOGICAL SURVEY

# RECORD OF WELL COMPLETION

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.

(Submit 3 copies within 60 days of well completion.)

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

| Permit number/deepening permit no. | API number |
|---|---|
| 57361 | NA |

Type of well (after completion): Test

Well name & number: Woodhaven Well#3

Name and address of permittee
MARATHON PIPE LINE LLC: TOM ROSS
539 SOUTH MAIN STREET
FINDLAY, OH 45840

| Directionally drilled (check one) | Previous permit numbers | Total depth of well |
|---|---|---|
| ☐ Yes ☒ No | | M.D. 1244 T.V.D. 1244 |

| Surface location | Subsurface location (if directionally drilled) |
|---|---|
| NW ¼ of SE ¼ of SE ¼ Section 22 T 4S R 10E | NW ¼ of SE ¼ of SE ¼ Section 22 T 4S R 10E |

| Township | County | Township | County |
|---|---|---|---|
| City of Woodhaven | Wayne | City of Woodhaven | Wayne |

| Footages: North/South | East/West | Footages: North/South | East/West |
|---|---|---|---|
| 990 Ft. from S line and | 1070 Ft. from E line of Sac. | 990 Ft. from S line and | 1070 Ft. from E line of Sec. |

| Part 615 - oil/gas wells | | | Part 625 - mineral wells | | |
|---|---|---|---|---|---|
| Date well completed | Producing formation(s) | Injection formation(s) | Date of first injection | Disposal formation(s) | Solution formation(s) |
| 12/16/2005 | NA | NA | | | |

## COMPLETION INTERVALS(S)

| Date | Number holes | Perforation or open hole interval | Open Yes | Open No |
|---|---|---|---|---|
| | | NA | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## STIMULATION BY ACID OR FRACTURING

| Date | Interval treated | Materials and amount used |
|---|---|---|
| | NA | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## PRODUCTION TEST DATA

| Oil Bbls/day | Gravity °API | Condensate Bbls/day | Gas MCF/day | Water Bbls/day | $H_2S$ Grains/100 $ft^3$. | B.H.P. and depth |
|---|---|---|---|---|---|---|
| 0 | NA | 0 | 0 | 0 | 0 | |

CERTIFICATION "I state that I am authorized by said owner. 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 and title (print or type) | Signature | Date |
|---|---|---|
| Thomas Ross ESA Professional | Thomas A. Ross | 3-28-07 |

**Submit to:** OFFICE OF GEOLOGICAL SURVEY
MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
PO BOX 30256
LANSING MI 48909-7756

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EQP 7130 (rev. 8/2004)

57361

# APPENDIX A

# FIELD LOGS



APR 02 2007

D

**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 1

PAGE 1 of 4

SITE Marathon - Woodhaven
CORE BARREL LENGTH 60'
CORE BARREL DIAMETER 4"
TOP CORE INTERVAL 975'
BOTTOM CORE INTERVAL 1004
LENGTH CORED INTERVAL 29'

RECOVERY 28.85'
TIME RECOVERED 11:40 am
DATE RECOVERED 12-12-05
RUN RQD
LOGGED BY Nelson

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| Upper 8' more competent | 975 | 0 | Dolo | | 1 | 0-2.1 Dolomite - lt. gray, irreg massive + orh (wh) < 3% | |
| | 976 | 1 | | | | | #1 3.9' |
| | 977 | 2 | | | 2 | 2.1-3.9 - same, orh more irreg ~10% ~50% at 976-977.9 | |
| | 978 | 3 | | | | | |
| | 979 | 4 | | | 3 | 3.9-5.2 - same, small blems of orh | |
| | 980 | 5 | | | 4 | 5.2-6.85 - same, some bedding orh? from 980.3-980.6 | #2 4.75 |
| | 981 | 6 | | | | | |
| | 982 | 7 | | | 5 | 6.85-8.1: same, irreg orh, orh bands wavy from 982.9-983.2 | |
| | 983 | 8 | | | | | |

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 1



SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| | 983 | 8 | | | 6 | 8.1 - 8.65: Dolo/Anh, 50/50 subvert. anh filled fracture @ 983.3 | |
| | | | | | 7 | 8.65 - 9.9: Dolo, Anh bands 984.3-984.8 Anh, 984.8 - 984.9 | |
| | 984 | 9 | | | | | |
| | 985 | 10 | | | 8 | 9.9 - 10.35: Anh w/ some dolo < 5% | |
| | | | | | 9 | 10.35 - 10.9 Anh w/ some dolo < 5% | |
| | 986 | 11 | | | 10 | 10.9 - 11.1: some, wavy fracture | |
| | | | | | 11 | 11.1 - 11.6: some | |
| | | | | | 12 | 11.6 - 11.9: some 60° frac @ 986.8 | |
| | 987 | 12 | | | 13 | 11.9 - 13.1 Some, incr dolo Dolo @ 988.0 | #3 4.55 |
| | 988 | 13 | | | 14 | 13.1 - 13.3: Dolo w/ Anh bands | |
| | | | | | 15 | 13.3 - 14.1: ~~Some~~ Dolo/Anh bedded | |
| | 989 | 14 | | | 16 | 14.1 - 14.75: Dolo w/ Anh | #4 4.75 |
| | 990 | 15 | | | 17. | 14.75 - 16.1: Dolo, Anh bands to 990.5 | |
| | 991 | 16 | | | | | |

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RAPID CITY, SD

# CORE LOG DATA SHEET

CORE RUN # 1



SITE

CORE BARREL LENGTH

CORE BARREL DIAMETER

TOP CORE INTERVAL

BOTTOM CORE INTERVAL

LENGTH CORED INTERVAL

RECOVERY

TIME RECOVERED

DATE RECOVERED

RUN RQD

LOGGED BY

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| | 991 | 16 | | | 18 | 16.1 – 17.6 : Dolo w/ flattened nodules anh 991.6 & 991.9-992.6 | |
| | 992 | 17 | | | | | |
| | 993 | 18 | | | 19 | 17.6-18.95 : Dolo w/ thin laminae anh, anh incr. @ 993.4 | |
| | 994 | 19 | | | 20 | 18.95 - 19.4 : same | #5 4.5 |
| | | | | | 21 | 19.4 – 19.9 : same | |
| | 995 | 20 | | | 22 | 19.9 – 20.15 : same | |
| | | | | | 23 | 20.15 - 20.6 : same, anh @ 995.4 | |
| | 996 | 21 | | | 24 | 20.6 – 21.6 : Anh w/ some dolo | |
| | 997 | 22 | | | 25 | 21.6 - 22.1 : anh to 996.7, dolo | |
| | | | | | 26 | 22.1 – 23.6 : dolo, anh blems @ 998.3 | #6 4.7 |
| | 998 | 23 | | | | | |
| | 999 | 24 | | | 27 | 23.6 – 25.1 : dolo | |

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 1

PAGE 4 of 4

SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 999 | 24 | | | | |
| | 1000 | 25 | | | 28 | 25.1-26.4: dolo |
| | 1001 | 26 | | | | |
| | | | | | 29 | 26.4 - 26.8 : dolo |
| | 1002 | 27 | | | 30 | 26.8 - 27.5 : dolo + anh mass 1002.1 - 1002.3 |
| | | | | | 31 | 27.5 - 28.4 : dolo |
| | 1003 | 28 | | | | |
| | | | | | 32 | 28.4 - 28.6 : dolo |
| | | | | | 33 | 28.6 - 28.85 : dolo |
| | | 29 | | | | |

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 2 1625 thru

PAGE 1 of 8

SITE Marathon - Woodhaven
CORE BARREL LENGTH 60'
CORE BARREL DIAMETER 4"
TOP CORE INTERVAL 1004.0
BOTTOM CORE INTERVAL 1063.2
LENGTH CORED INTERVAL 59.2'

RECOVERY ~~60.8~~ 60.5
TIME RECOVERED 2:00 am
DATE RECOVERED 12-13-05
RUN RQD
LOGGED BY Nelson/Venegas

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1004 | 0 | | | 1 | 0-.55: Ddo, banded [illegible] @ 1004.1-1004.8 #8 5.1 |
| | | | | | 2 | .55-1.65: same, increase [illegible] 1004-1005.7 |
| | 1005 | 1 | | | | |
| | | | | | 3 | 1.65-2.2: same |
| | 1006 | 2 | | | | |
| | | | | | 4 | 2.2-3.0: same |
| | 1007 | 3 | | | | |
| | | | | | 5 | 3.0-4.0 [illegible] |
| | 1008 | 4 | | | | |
| | | | | | 6 | 4.0-5.1: ddo |
| | 1009 | 5 | | | | |
| | | | | | 7 | 5.1-6.75 ddo, band [illegible] @ 1009.8 #9 |
| | 1010 | 6 | | | | |
| | 1011 | 7 | | | 8 | 6.75-8.8 ddo, [illegible] 1011.4 |
| | 1012 | 8 | | | | |

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 2

PAGE 2 of 8

SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1012 | 8 | | | | |
| | 1013 | 9 | | | 9 | 8.8 – 11.3, dolo, minor bands cahy |
| | | | | | | broke |
| | 1014 | 10 | | | | |
| | 1015 | 11 | | | | |
| | | | | | 10 | 11.3 – 11.6, some, min bands |
| | | | | | 11 | 11.6 – 11.75, dolo |
| | 1016 | 12 | | | 12 | 11.75 – 12.4, dolo |
| | | | | | 13 | 12.4 – 12.65, dolo |
| | 1017 | 13 | | | 14 | 12.65 – 13.6, dolo, [illegible] |
| | | | | | 15 | 13.6 – 13.75, dolo |
| | 1018 | 14 | | | 16 | 13.75 – 14.05, " |
| | | | | | 17 | 14.05 – 14.7, " |
| | 1019 | 15 | | | 18 | 14.7 – 15.8, dolo, incr cahy |
| | 1020 | 16 | | | | |

#10

#11

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 2



SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| | 1020 | 16 | | | 19 | 15.8 - 17.25, dolo w/ bands anh y | |
| | 1021 | 17 | | | 20 | 17.25 - 18.3, " | |
| | 1022 | 18 | | | 21 | 18.3 - 18.55, " | 1' #12 |
| | | | | | 22 | 18.55 - 19.25, dolo/anh y | |
| | 1023 | 19 | | | 23 | 19.25 - 19.45, dolo | |
| | | | | | 24 | 19.45 - 21.0, dolo, dicr anh | |
| | 1024 | 20 | | | | | |
| | 1025 | 21 | | | 25 | 21.0 - 22.7, dolo w/ anh | |
| | 1026 | 22 | | | | | |
| | 1027 | 23 | | | 26 | 22.7 - 23.6, [illegible] | 2' #13 |
| | 1028 | 24 | | | 27 | 23.6 - 24.6, dolo | |

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 2

PAGE 4 of 8

SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| | 1028 | 24 | | | | | |
| | | | | | 28 | 24.6 – 25.4, dolo | |
| | 1029 | 25 | | | | | |
| | | | | | 29 | 25.4 - 25.6, " | |
| | | | | | 30 | 25.6 – 25.9, " | |
| | 1030 | 26 | | | 31 | 25.9 - 27, " | |
| | 1031 | 27 | | | 32 | 27 – 27.45, " | 3' #14 |
| | | | | | 33 | 27.45 - 27.6, " | |
| | | | | | 34 | 27.6 - 27.7, " | |
| | | | | | 35 | 27.7 - 28, " | |
| | 1032 | 28 | | | 36 | 28.0 - 28.3, " | |
| | | | | | 37 | 28.3 - 28.6, " | |
| | | | | | 38 | 28.6 - 29.4 dolo w/ calcite | |
| | 1033 | 29 | | | | | |
| | | | | | 39 | 29.4 - 29.65, " | |
| | | | | | 40 | 29.64 - 30.45, " | |
| | 1034 | 30 | | | 41 | 30.45 - 31, " | |
| | 1035 | 31 | | | 42 | 31.0 - 31.4, " | |
| | | | | | 43 | 31.4 - 31.8, " | 1' #15 |
| | 1036 | 32 | | | 44 | 31.8 – 31.95 | |

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 2



SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1036 | 32 | | | 45 | 31.95 - 32.3, dolo w/ crin |
| | | | | | 46 | 32.3 - 32.5, " |
| | | | | | 47 | 32.5 - 32.75, " |
| | | | | | 48 | 32.75 - 33.0, dolo w/ crin |
| | 1037 | 33 | | | 49 | 33.0 - 33.7, " |
| | | | | | 50 | 33.7 - 34.1, dolo |
| | 1038 | 34 | | | 51 | 34.1 - 34.5, " |
| | | | | | 52 | 34.5 - 35.6, " |
| | 1039 | 35 | | | | |
| | | | | | 53 | 35.6 - 36, " |
| | 1040 | 36 | | | 54 | 36 - 37.1, dolo w/ crin |
| | 1041 | 37 | | | 55 | 37.1 - 37.4, " |
| | | | | | 56 | 37.4 - 39.1, dolo w/ crin |
| | 1042 | 38 | | | | |
| | 1043 | 39 | | | 57 | 39.1 - 39.5, " |
| | | | | | 58 | 39.5 - 40, " |
| | 1044 | 40 | | | | |

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#16

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**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 2

PAGE 6 of 8

SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1044 | ~~40~~ | | | 59 | 40 - 40.3, ddo w/ cnh |
| | | | | | 60 | 40.3 - 40.75, " |
| | | | | | | - 41.1, " |
| | 1045 | 41 | | | 61 | |
| | | | | | 62 | - 41.6, " |
| | | | | | 63 | - 42.3, " , frac @ 42.1 |
| | 1046 | 42 | | | | |
| | | | | | 64 | - 42.9, " |
| | | | | | 65 | - 43.0, " |
| | 1047 | 43 | | | 66 | - 43.3, " |
| | | | | | 67 | - 43.5 |
| | | | | | 68 | - 43.9 |
| | 1048 | 44 | | | 69 | - 44.3 |
| | | | | | 70 | - 44.7 |
| | | | | | 71 | - 45.1 |
| | 1049 | 45 | | | 72 | - 45.3 |
| | | | | | 73 | - 45.8 |
| | | | | | 74 | ddo w/ very fine cnts only |
| | 1050 | 46 | | | 75 | |
| | | | | | 76 | |
| | | | | | 77 | |
| | 1051 | 47 | | | 78 | |
| | | | | | 79 | |
| | | | | | 80 | |
| | 1052 | 48 | | | | |

79

#17

72

#18

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #**_____

PAGE #7 of 8

SITE_____

CORE BARREL LENGTH_____ RECOVERY_____

CORE BARREL DIAMETER_____ TIME RECOVERED_____

TOP CORE INTERVAL_____ DATE RECOVERED_____

BOTTOM CORE INTERVAL_____ RUN RQD_____

LENGTH CORED INTERVAL_____ LOGGED BY_____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1052 | 48 | | | | |
| | 1053 | 49 | | | | |
| | 1054 | 50 | | | | #18 |
| | 1055 | 51 | | | | #19 |
| | 1056 | 52 | | | | |
| | 1057 | 53 | | | | #19 |
| | 1058 | 54 | | | | #20 |
| | 1059 | 55 | | | | |
| | 1060 | 56 | | | | |

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RAPID CITY, SD

# CORE LOG DATA SHEET

CORE RUN #_____



SITE_____

CORE BARREL LENGTH_____

CORE BARREL DIAMETER_____

TOP CORE INTERVAL_____

BOTTOM CORE INTERVAL_____

LENGTH CORED INTERVAL_____

RECOVERY_____

TIME RECOVERED_____

DATE RECOVERED_____

RUN RQD_____

LOGGED BY_____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1060 | 56 | | | | |
| | 1061 | 57 | | | | |
| | 1062 | ~~58~~ X | | | | |
| | 1063 | 59 | | | | |
| | 1064 | 60 | | | | |
| | | 61 | | | | |
| | | 62 | | | | |
| | | 63 | | | | |

#20

#21

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 3



SITE Marathon - Woodhaven

CORE BARREL LENGTH 60'

CORE BARREL DIAMETER 4"

TOP CORE INTERVAL 1063.2

BOTTOM CORE INTERVAL 1124.0

LENGTH CORED INTERVAL 60.8

RECOVERY 60.7'

TIME RECOVERED 11:30 am

DATE RECOVERED 12-13-05

RUN RQD

LOGGED BY

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| | 1063.2 | 0 | Dol | | | Dolo - Lt gray anhy ~~beds~~ & mt brown beds? | 1071.6 #21 Start C |
| | 1064.2 | 1 | | | | | 1062.9 |
| | 1065.2 | 2 | | | | | |
| | 1066.2 | 3 | | | | | #21 1066.4 |
| | | | | | | 1166.58 - 1167 - wavy structure | #22 |
| | 1067.2 | 4 | | | | | |
| | 1068.2 | 5 | | | | | |
| | 1069.2 | 6 | | | | | #22 1069.7 |
| | 1070.2 | 7 | | | | | #23 |
| | 1071.2 | 8 | | | | | |

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RAPID CITY, SD

# CORE LOG DATA SHEET

CORE RUN # 3



SITE

CORE BARREL LENGTH

CORE BARREL DIAMETER

TOP CORE INTERVAL

BOTTOM CORE INTERVAL

LENGTH CORED INTERVAL

RECOVERY

TIME RECOVERED

DATE RECOVERED

RUN RQD

LOGGED BY

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1071.2 | 8 | | | | |
| | 1072.2 | 9 | | | | |
| | 1073.2 | 10 | | | | |
| | 1074.2 | 11 | | | | |
| | 1075.2 | 12 | | | | |
| | 1076.2 | 13 | | | | |
| | 1077.2 | 14 | | | | |
| | 1078.2 | 15 | | | | |
| | 1079.2 | 16 | | | | |

723
1074.4
#24
#24
1078.8
#25

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 3



SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| | 1079.2 | 16 | Dol | | | | |
| | | | | | | — TOS | |
| | | | Salt | | | Salt 1079.6 – 1080.2 v. dirty ~~blk w/ dk inclusions~~ dol? inclusions | |
| | 1080.2 | 17 | | | | Dol.: 1080.2 – 1081.1 | |
| | | | Dol | | | | |
| | 1081.2 | 18 | | | | Salt, blk w/ dk gray ~~clay~~ dol inclusions to lt. gray v. dirty @ top 1' | #25 |
| | | | | | | | 1080.2 |
| | 1082.2 | 19 | | | | | #26 |
| | | | Salt | | | | |
| | 1083.2 | 20 | | | | | |
| | 1084.2 | ~~21~~ | | | | | |
| | 1085.2 | 22 | Dol Breccia | | | 1084.2 – 1086.7 ~~1185.5 – 1188~~ ~~clay~~, lt gray w/ salt filled voids dol breccia | #26 |
| | 1086.2 | 23 | | | | | 1086.7 |
| | 1087.2 | 24 | Salt | | | Salt dk gray to blk lt clm Dol inclusions | #27 |

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**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 3



SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1087.2 | 24 | | | | |
| | 1088.2 | 25 | | | | Salt, dk gray to lt. gray in lith w/ ~~clay~~ dol |
| | 1089.2 | 26 | Salt | | | |
| | 1090.2 | 27 | | | | |
| | 1091.2 | 28 | | | | #27 1091.6 #28 |
| | 1092.2 | 29 | Dol | | | |
| | 1093.2 | 30 | | | | Dol ~~Clay~~, lt. gray w/ salt filled voids 1093 – 1096.6 breccia |
| | 1094.2 | 31 | | | | |
| | 1095.2 | 32 | | | | #28 1095.0 #29 |

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RAPID CITY, SD

# CORE LOG DATA SHEET

CORE RUN # 3



SITE

CORE BARREL LENGTH

CORE BARREL DIAMETER

TOP CORE INTERVAL

BOTTOM CORE INTERVAL

LENGTH CORED INTERVAL

RECOVERY

TIME RECOVERED

DATE RECOVERED

RUN RQD

LOGGED BY

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1095.2 | 32 | | | | |
| | | | Salt | | | |
| | 1096.2 | 33 | | | | |
| | | | | | | Salt, lt. gray to blk, w/ ~~clay~~ dol seams 1096.6 – 1108.? |
| | 1097.2 | 34 | | | | |
| | | | | | | mostly blk gray to blk w/ ~~white~~ bands of clear salt intermittent |
| | 1098.2 | 35 | | | | ~~clay~~ dol seam @ 1098.2 1/4" thk |
| | | | | | | #29 1099.4 |
| | 1099.2 | 36 | | | | |
| | | | | | | #30 |
| | | | | | | Salt ~~quite~~ dirty between 1099.2 – 1104.7 |
| | 1100.2 | 37 | | | | |
| | | | Dirty salt | | | |
| | | | | | | ~~clay~~ dol blems @ 1101.2 1/2" x 1" |
| | 1101.2 | 38 | | | | |
| | 1102.2 | 39 | | | | |
| | 1103.2 | 40 | | | | |

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**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 3



SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| | 1103.2 | 40 | | | | | #30 1103.3 |
| | | | | | | | #31 |
| | 1104.2 | 41 | | | | | |
| | 1105.2 | 42 | | | | | |
| | | | | | | 1" dol bed @ 1104.7 | |
| | 1106.2 | 43 | | | | | |
| | | | Salt | | | | |
| | 1107.2 | 44 | | | | thin dol bed @ 1107.1 | #31 1107.6 |
| | | | | | | | #32 |
| | 1108.2 | 45 | | | | | |
| | | | | | | Dol ~~Ston~~ breccia in salt matrix 1108.9 – 1110.2 | |
| | 1109.2 | 46 | Dol breccia | | | | |
| | 1110.2 | 47 | | | | | |
| | 1111.2 | 48 | | | | | |

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**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 3



SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| | 1111.2 | 48 | | | | | |
| | | | Dol breccia | | | Dol ~~Clay~~ w/ salt filled voids ~~1112.4 – 1113.4~~ 1111.4 – 1112.4 | |
| | 1112.2 | 49 | | | | | #32 1112.6 |
| | | | Salt | | | Salt, dk gray to blk w/ bands of clear | #33 |
| | 1113.2 | 50 | | | | ~~1113.4 – 1119.4~~ 112.4 – 118.1 ~~very~~ v. dirty at top becoming cleaner downsection | |
| | 1114.2 | 51 | | | | | |
| | 1115.2 | 52 | | | | | |
| | 1116.2 | 53 | | | | Dol blebs @ 1115.4, 1115.7, 1116.0, 1116.4, 1116.8, 1117.1, 1117.8 | #33 1116.7 #34 |
| | 1117.2 | 54 | | | | | |
| | 1118.2 | 55 | | | | Dol ~~Clay~~, lt gray, bedded & broken | |
| | | | Dol breccia | | | breccia, in salt matrix 1118.0 – 1119.5 | |
| | 1119.2 | 56 | | | | | |

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**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 3

PAGE 8 of 8

SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1119.2 | 56 | | | | |
| | | | Salt | | | Salt, lt gray to blk, w/ bands of clear |
| | 1120.2 | 57 | | | | 1" clay seam @ 1120.2 dol? |
| | 1121.2 | 58 | | | | 1" to 3" dol? clay seam @ 1121.2 |
| | | | | | | narrow <1/4" dol? ~~clay~~ seam @ 1121.5 #34 1121.7 |
| | | | | | | broken clay seam @ 1121.9 #35 |
| | 1122.2 | 59 | | | | narrow <1/16" " @ 1122.3 |
| | | | | | | 1122.7 |
| | | | | | | 1123 |
| | 1123.2 | 60 | | | | |
| | | | Dol | | | Dol v. porous, salt filled 1123.6 |

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# CORE LOG DATA SHEET

**CORE RUN #** 4



SITE Marathon - Woodhaven

CORE BARREL LENGTH 60'

CORE BARREL DIAMETER 4"

TOP CORE INTERVAL 1124.0

BOTTOM CORE INTERVAL 1184.0

LENGTH CORED INTERVAL 60'

RECOVERY 60.5'

TIME RECOVERED 11:00 pm

DATE RECOVERED 12-13-05

RUN RQD

LOGGED BY Nelson

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| | 1124 | 0 | Dol, Salt | | | Dol., brecciated, filled w/ salt<br>Salt, clear, w/ dol blebs<br>Dol. brecciated, filled w/ salt | 1121.7 #35 |
| | | | Dol w/ salt | | | | |
| | 1125 | 1 | Salt | | | Salt, clr to smky<br>brkn dol bands @ 1125.1 - 1125.3<br>1125.55 - 1125.65<br>1126.2<br>1126.7 - 1126.8<br>1127.5 - 1127.7 | #35<br>1126.7 |
| | 1126 | 2 | | | | | |
| | 1127 | 3 | | | | | #36 |
| | 1128 | 4 | Dol w/ salt | | | Dol, wvy structure<br>(Tom Doe says these are algal mats, cool!)<br>dipping ~ 10° | |
| | 1129 | 5 | Dol | | | | |
| | 1130 | 6 | | | | 1130 - 1131.2 : more compact | |
| | 1131 | 7 | | | | 1131.3 - 1135.4 : increasing void space + salt | #36<br>1131.1<br>#37 |
| | 1132 | 8 | Dol silt | | | | |

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**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 4



SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | 1132 | 8 | Dol w/ salt | | | |
| | 1133 | 9 | | | | |
| | 1134 | 10 | | | | |
| | 1135 | 11 | | | | 1135.4 – dipping to 30° break follows bedding |
| | 1136 | 12 | | | | 1135.4 – 1136 more compact |
| | 1137 | 13 | | | | |
| | 1138 | 14 | | | | |
| | | | Salt | | | Salt: clr to smky w/ dol blebs dol incr out |
| | 1139 | 15 | | | | |
| | 1140 | 16 | | | | |

#37
1136
#38

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**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 4



SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description | |
|---|---|---|---|---|---|---|---|
| | 1140 | 16 | Salt | | | | #38 1140.8 |
| | 1141 | 17 | Dol/Anh | | | Dol/Anh mix | #39 |
| | 1142 | 18 | | | | | |
| | 1143 | 19 | Sh? | | | Sh?, lt. br. ~~bandect~~ bedded w/ dk bands | |
| | 1144 | 20 | Dol | | | Dol, off wh w/ dk bands, some wavy, looks x-bedded ↳ tr mottled | |
| | 1145 | 21 | | | | | #39 1145.5 |
| | 1146 | 22 | | | | | |
| | 1147 | 23 | | | | | |
| | 1148 | 24 | | | | | |

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RAPID CITY, SD

# CORE LOG DATA SHEET

CORE RUN # 4

PAGE 4 of 8

SITE

CORE BARREL LENGTH

CORE BARREL DIAMETER

TOP CORE INTERVAL

BOTTOM CORE INTERVAL

LENGTH CORED INTERVAL

RECOVERY

TIME RECOVERED

DATE RECOVERED

RUN RQD

LOGGED BY

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | | 24 | Dol | | | |
| | | | Sh? | | | Sh, br, brittle |
| | | 25 | | | | br lt lt gray |
| | | 26 | | | | |
| | | 27 | | | | |
| | | 28 | | | | |
| | | 29 | | | | |
| | | 30 | | | | |
| | | 31 | | | | |
| | | 32 | | | | |

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RAPID CITY, SD

# CORE LOG DATA SHEET

CORE RUN # 4



SITE _____

CORE BARREL LENGTH _____

CORE BARREL DIAMETER _____

TOP CORE INTERVAL _____

BOTTOM CORE INTERVAL _____

LENGTH CORED INTERVAL _____

RECOVERY _____

TIME RECOVERED _____

DATE RECOVERED _____

RUN RQD _____

LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | | 32 | | | | |
| | | 33 | | | | |
| | | 34 | | | | |
| | | 35 | | | | |
| | | 36 | | | | |
| | | 37 | | | | |
| | | 38 | | | | |
| | | 39 | | | | |
| | | 40 | | | | |

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 4



SITE _____

CORE BARREL LENGTH _____ RECOVERY _____

CORE BARREL DIAMETER _____ TIME RECOVERED _____

TOP CORE INTERVAL _____ DATE RECOVERED _____

BOTTOM CORE INTERVAL _____ RUN RQD _____

LENGTH CORED INTERVAL _____ LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | | 40 | | | | |
| | | 41 | | | | |
| | | 42 | | | | |
| | | 43 | | | | |
| | | 44 | | | | |
| | | 45 | | | | |
| | | 46 | | | | |
| | | 47 | | | | |
| | | 48 | | | | |

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RESPEC
RAPID CITY, SD

# CORE LOG DATA SHEET

CORE RUN # 4



SITE _____

CORE BARREL LENGTH _____

CORE BARREL DIAMETER _____

TOP CORE INTERVAL _____

BOTTOM CORE INTERVAL _____

LENGTH CORED INTERVAL _____

RECOVERY _____

TIME RECOVERED _____

DATE RECOVERED _____

RUN RQD _____

LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | | 48 | | | | |
| | | 49 | | | | |
| | | 50 | | | | |
| | | 51 | | | | |
| | | 52 | | | | |
| | | 53 | | | | |
| | | 54 | | | | |
| | | 55 | | | | |
| | | 56 | | | | |

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**RESPEC**
**RAPID CITY, SD**

# CORE LOG DATA SHEET

**CORE RUN #** 4

PAGE 8 of 8

SITE _____

CORE BARREL LENGTH _____

CORE BARREL DIAMETER _____

TOP CORE INTERVAL _____

BOTTOM CORE INTERVAL _____

LENGTH CORED INTERVAL _____

RECOVERY _____

TIME RECOVERED _____

DATE RECOVERED _____

RUN RQD _____

LOGGED BY _____

| General | Depth | Core Length | Lith | RQD | Interval | Description |
|---|---|---|---|---|---|---|
| | | 56 | | | | |
| | | 57 | | | | |
| | | 58 | | | | |
| | | 59 | | | | |
| | | 60 | | | | |

APR 02 2007

# APPENDIX B

# FIELD PHOTOGRAPHS OF CORE



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RSI-1583-06-001

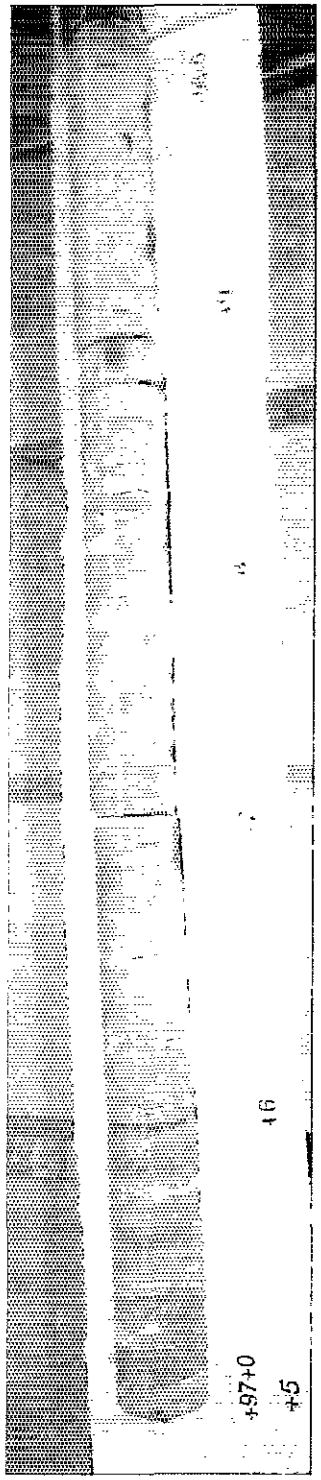


**Figure B-1.** Core Run 1: 975 to 980 Feet.

RSI-1583-06-002

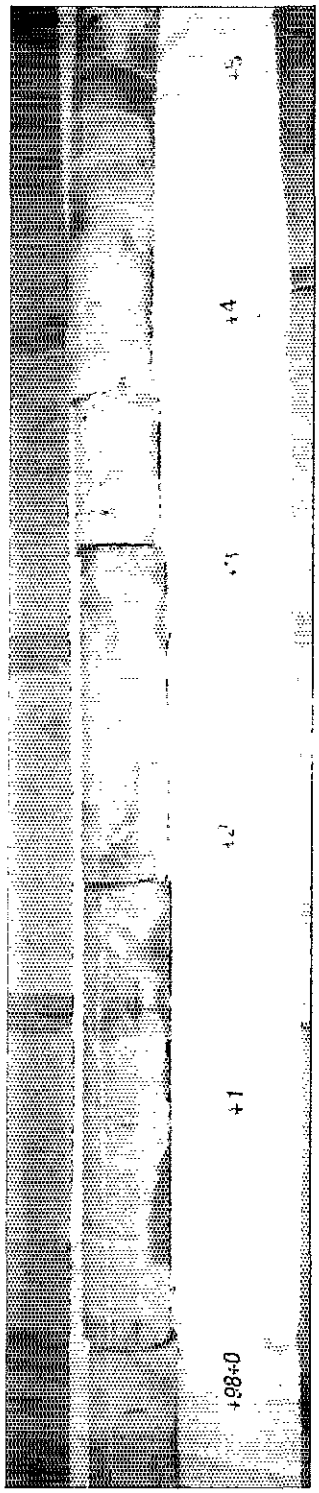


**Figure B-2.** Core Run 1: 980 to 985 Feet.



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RSI-1583-06-003

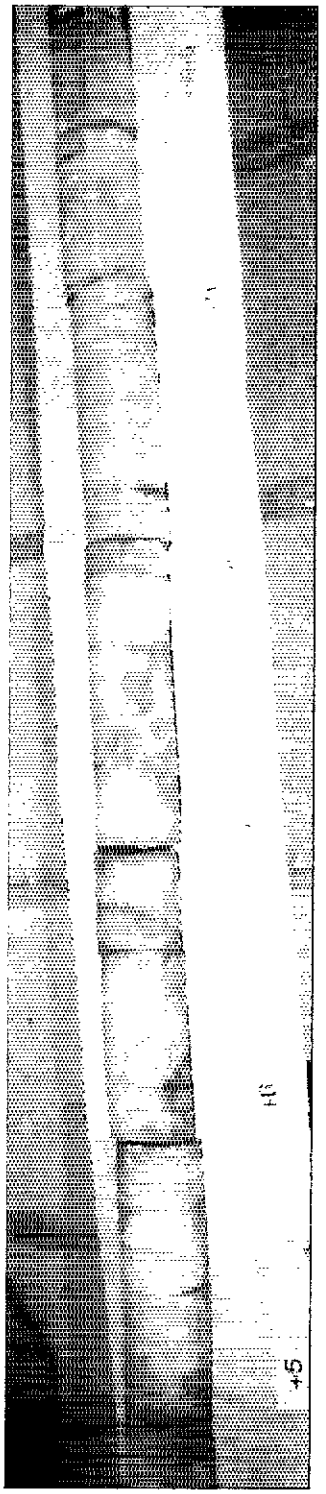

**Figure B-3.** Core Run 1: 985 to 990 Feet.

RSI-1583-06-004

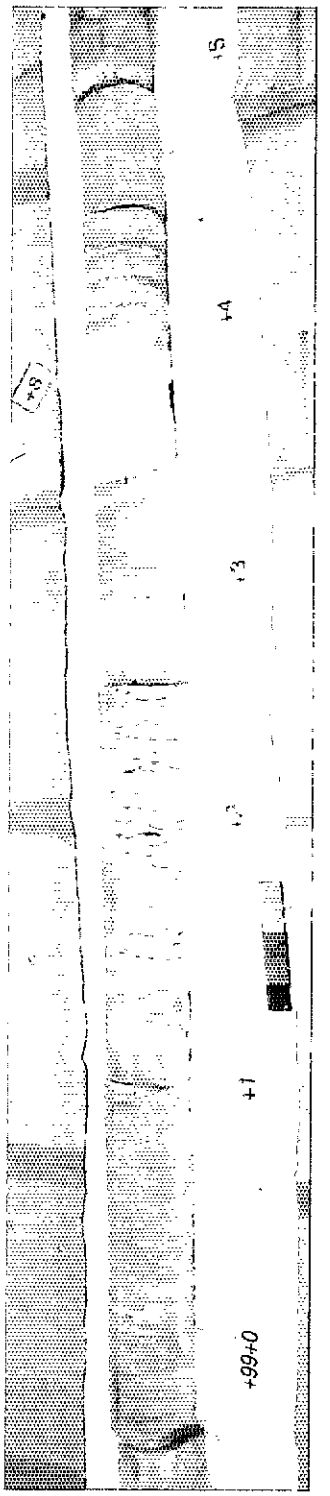


**Figure B-4.** Core Run 1: 990 to 995 Feet.



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RSI-1583-06-005

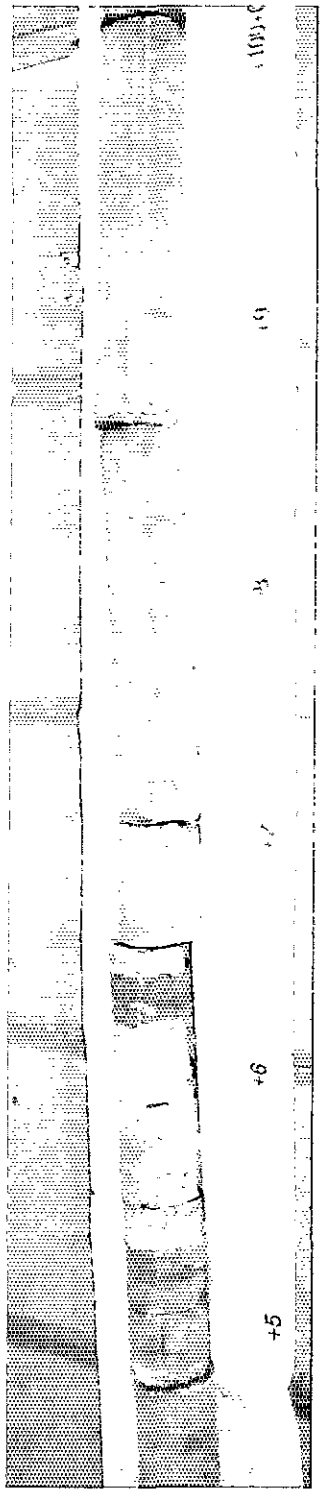


**Figure B-5.** Core Run 1: 995 to 1,000 Feet.

RSI-1583-06-006

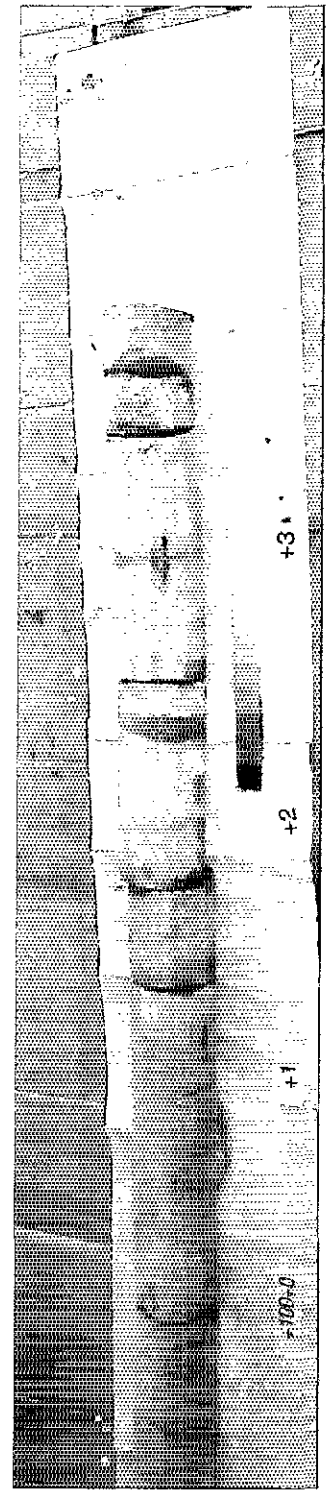


**Figure B-6.** Core Run 1: 1,000 to 1,003.85 Feet.



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RSI-1583-06-007

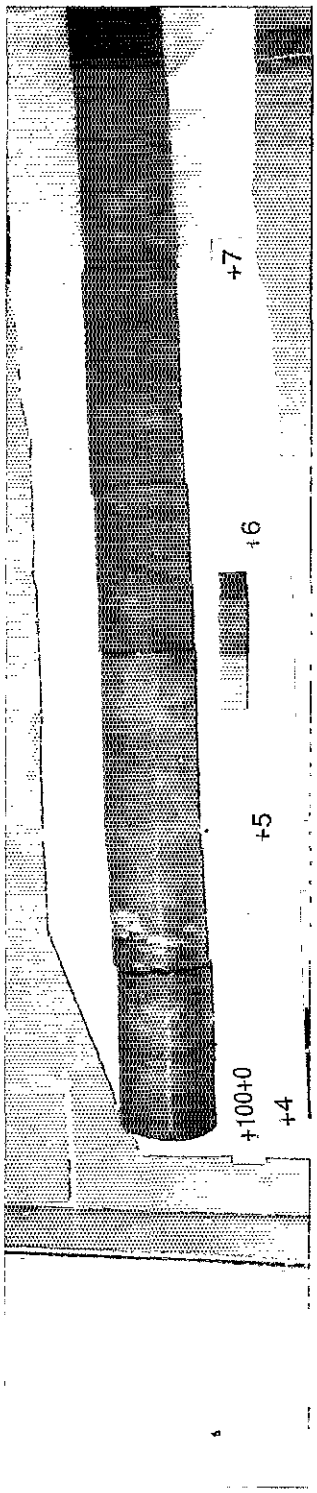


**Figure B-7.** Core Run 2: 1,004 to 1,007 Feet.

RSI-1583-06-008

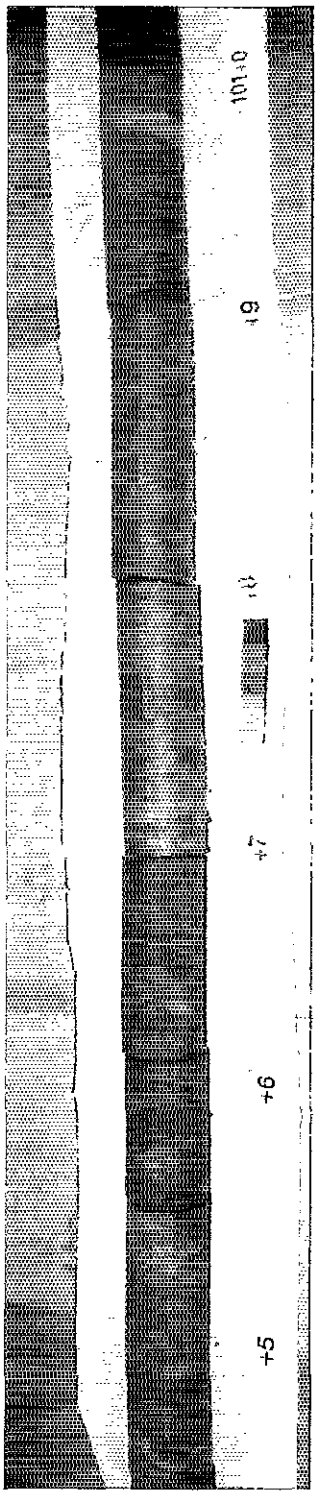


**Figure B-8.** Core Run 2: 1,005 to 1,010 Feet.



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RSI-1583-06-009

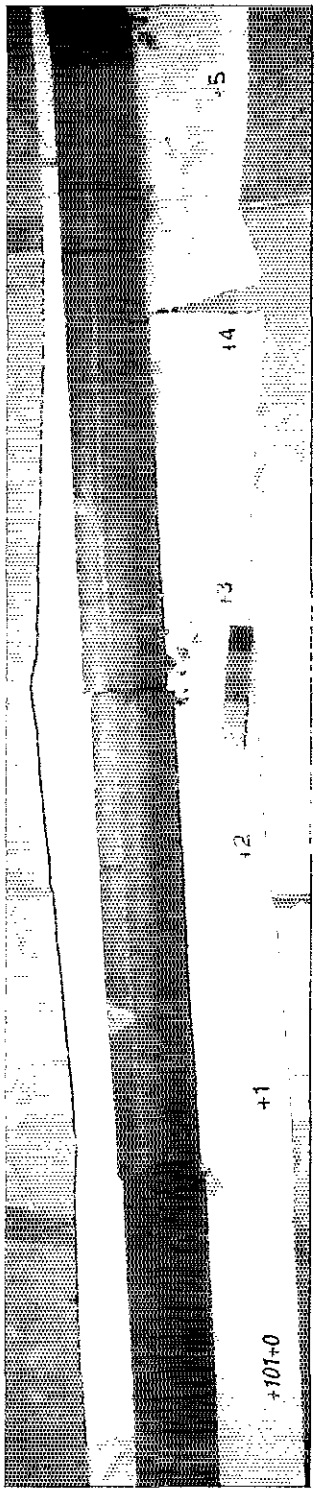


**Figure B-9.** Core Run 2: 1,010 to 1,015 Feet.

RSI-1583-06-010

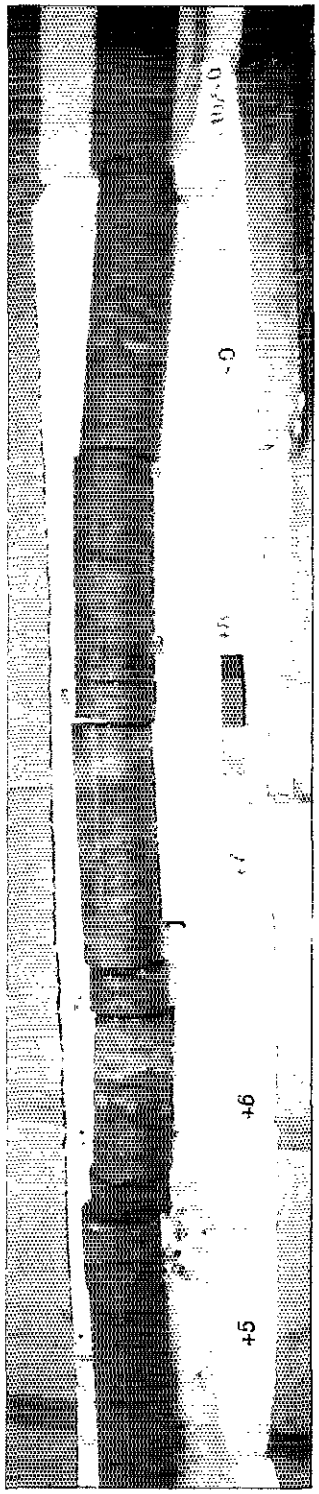


**Figure B-10.** Core Run 2: 1,015 to 1,020 Feet.



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RSI-1583-06-011

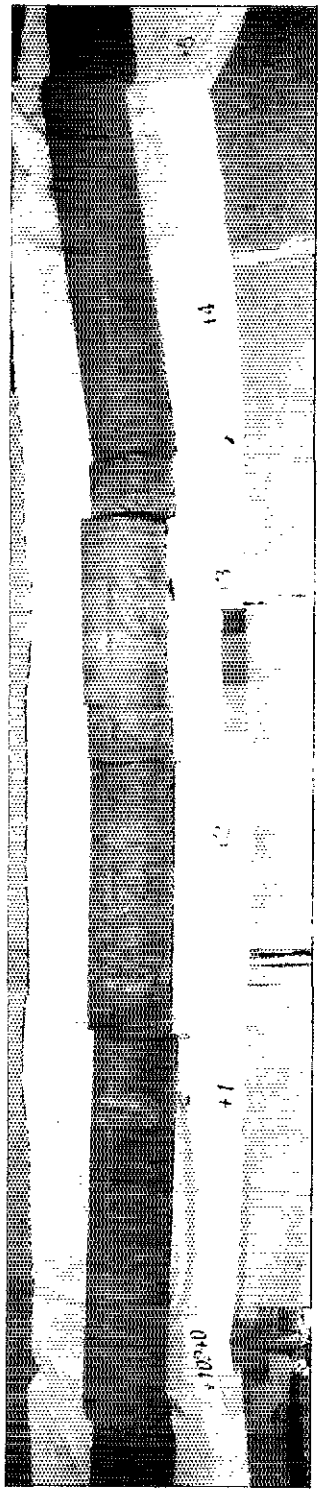


**Figure B-11.** Core Run 2: 1,020 to 1,025 Feet.

RSI-1583-06-012

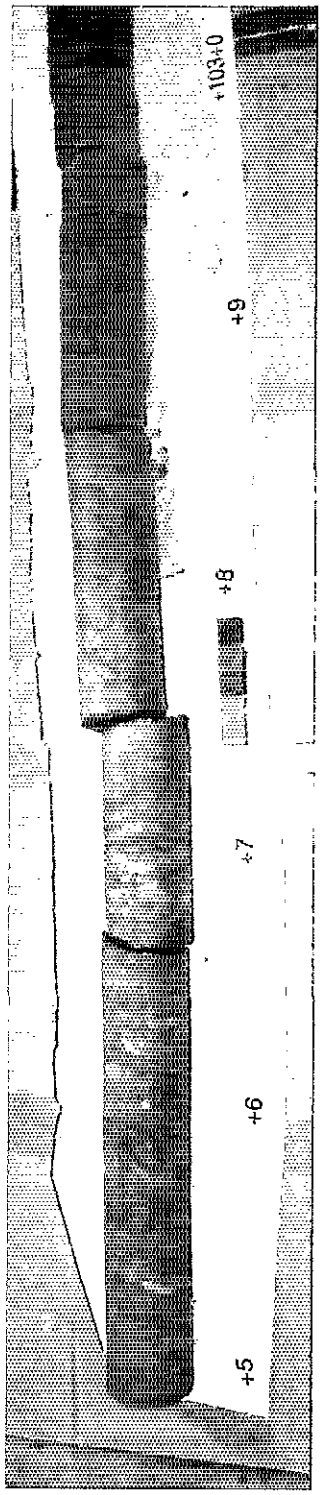


**Figure B-12.** Core Run 2: 1,025 to 1,030 Feet.



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RSI-1583-06-013

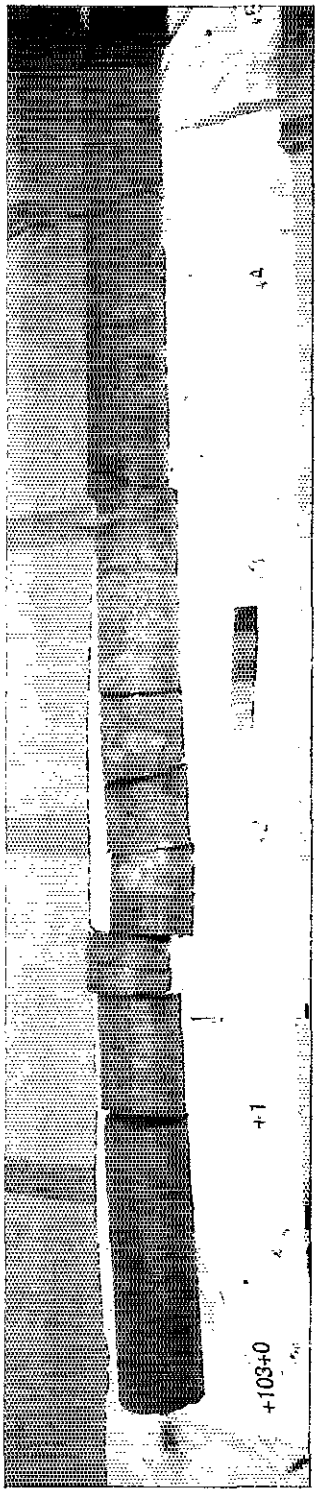


**Figure B-13.** Core Run 2: 1,030 to 1,035 Feet.

RSI-1583-06-014

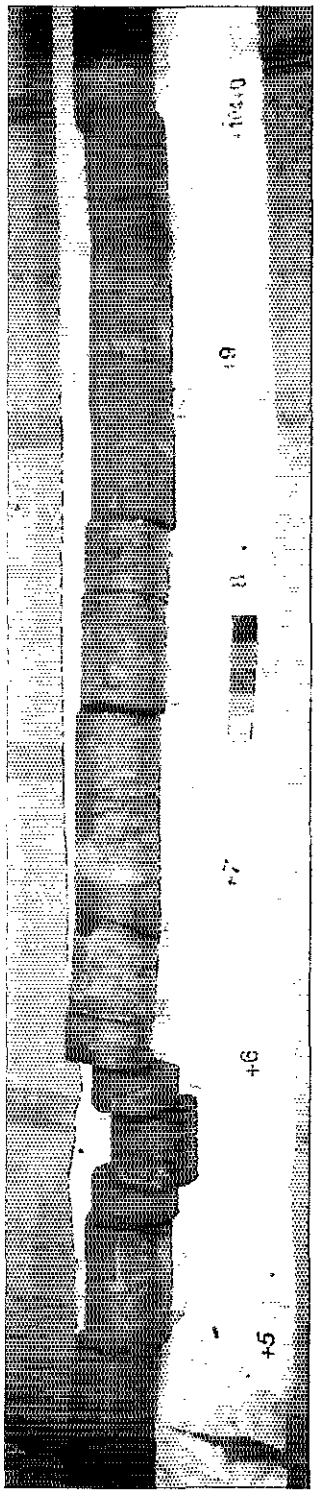


**Figure B-14.** Core Run 2: 1,035 to 1,040 Feet.



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RSI-1583-06-015

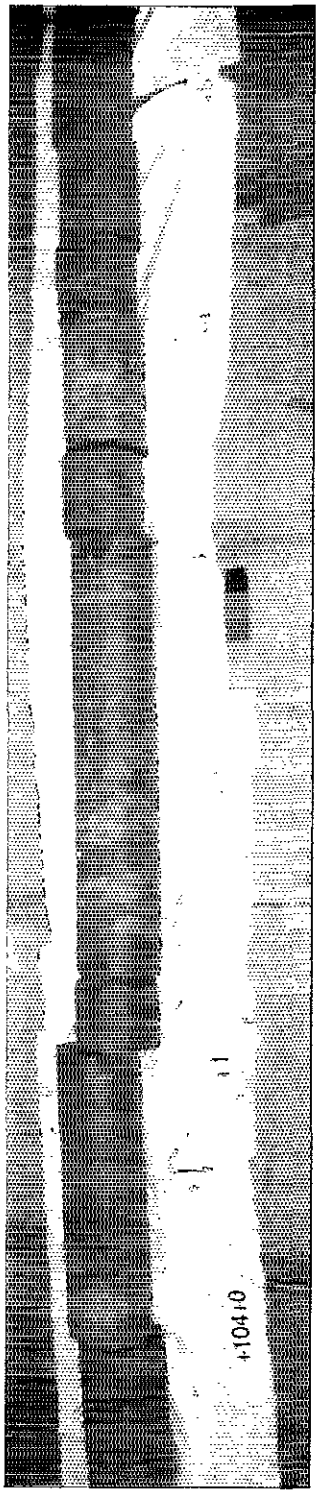


**Figure B-15.** Core Run 2: 1,040 to 1,045 Feet.

RSI-1583-06-016

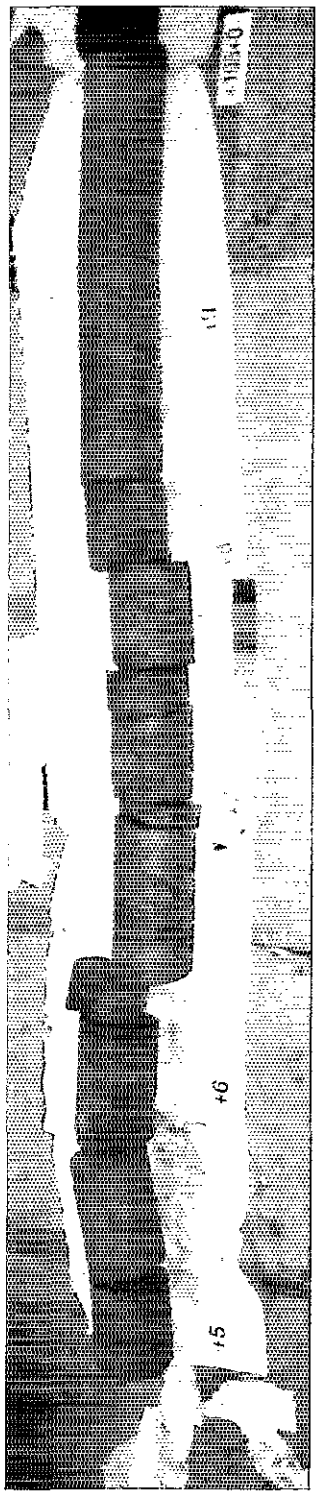


**Figure B-16.** Core Run 2: 1,045 to 1,050 Feet.



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RSI-1583-06-017

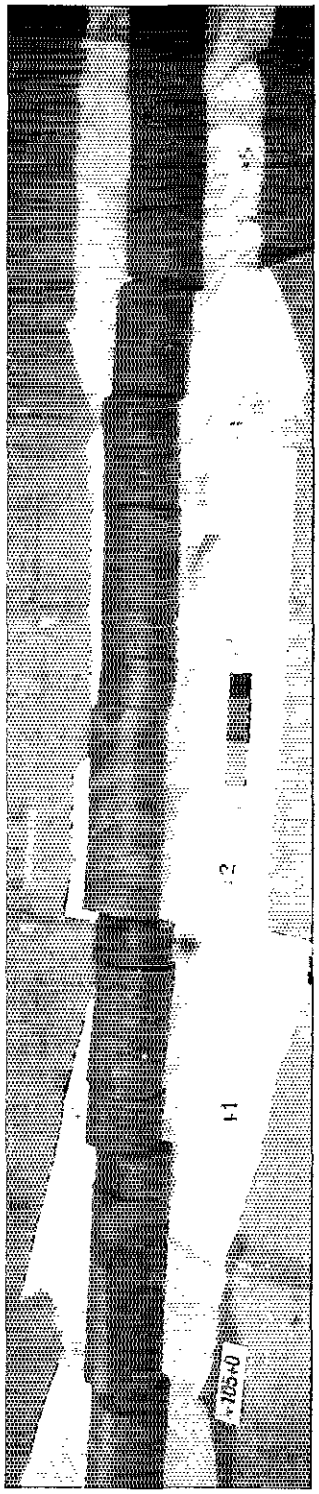


**Figure B-17.** Core Run 2: 1,050 to 1,055 Feet.

RSI-1583-06-018

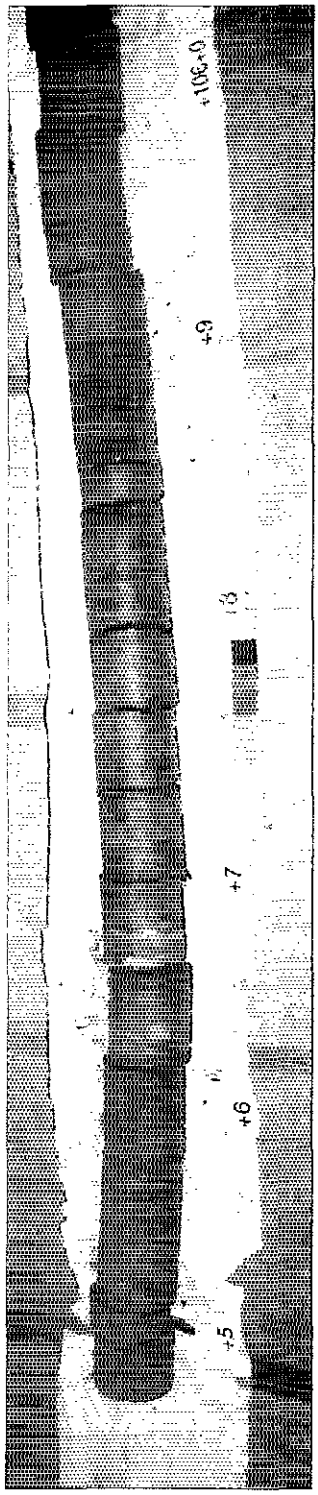


**Figure B-18.** Core Run 2: 1,055 to 1,060 Feet.



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RSI-1583-06-019

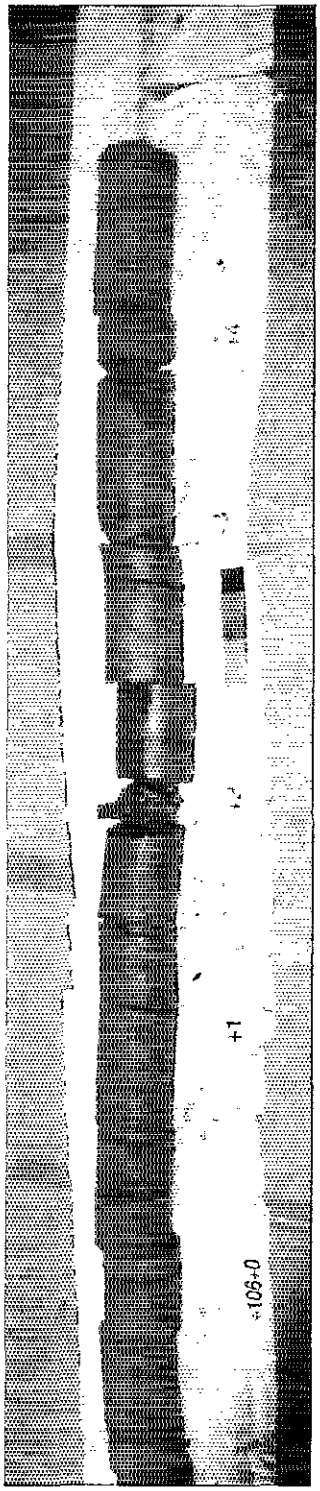


**Figure B-19.** Core Run 2: 1,060 to 1,064.5 Feet.

RSI-1583-06-020

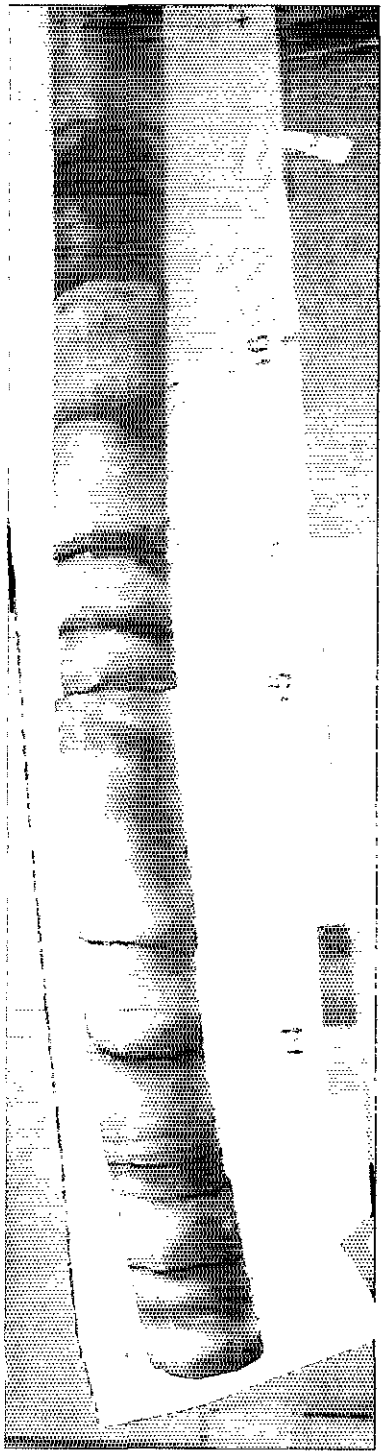

**Figure B-20.** Core Run 3: 1,063.2 to 1,067 Feet.



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RSI-1583-06-021

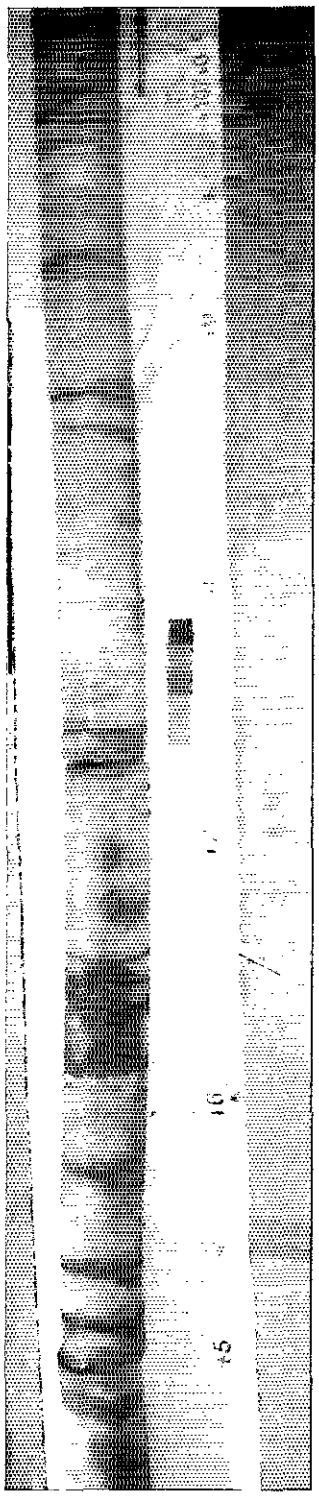

**Figure B-21.** Core Run 3: 1,065 to 1,070 Feet.

RSI-1583-06-022

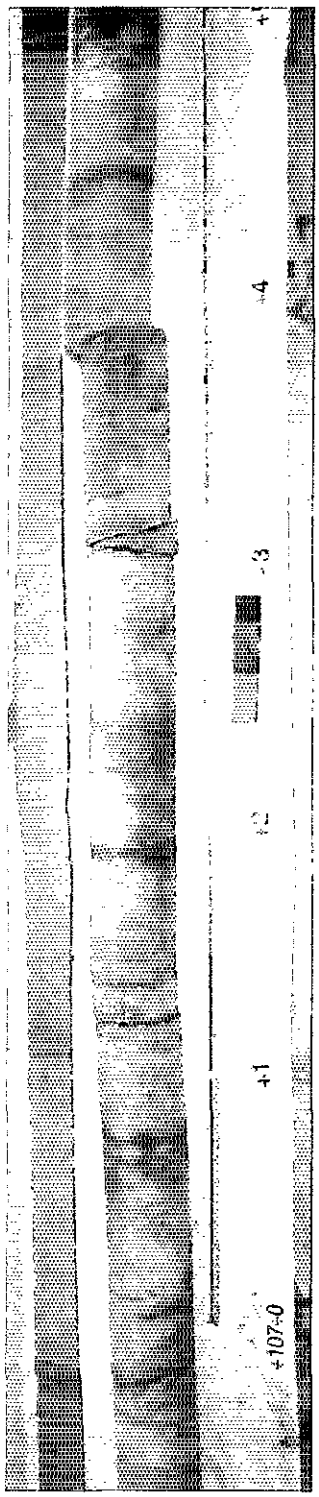

**Figure B-22.** Core Run 3: 1,070 to 1,075 Feet.



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RSI-1583-06-023

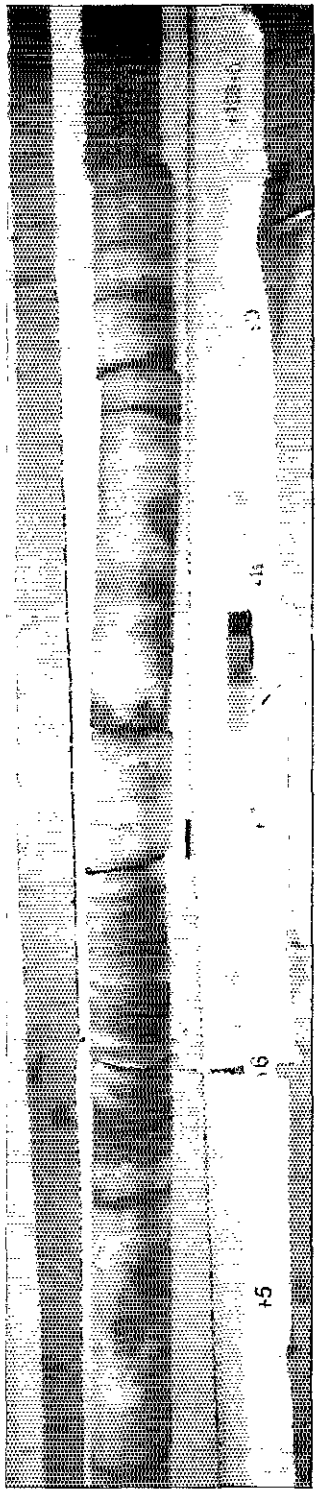

**Figure B-23.** Core Run 3: 1,075 to 1,080 Feet.

RSI-1583-06-024

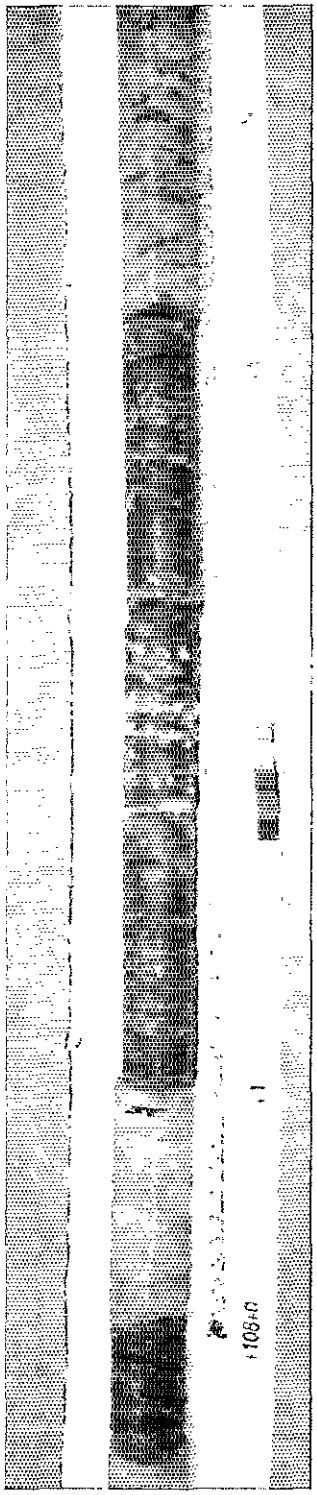

**Figure B-24.** Core Run 3: 1,080 to 1,085 Feet.



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RSI-1583-06-025

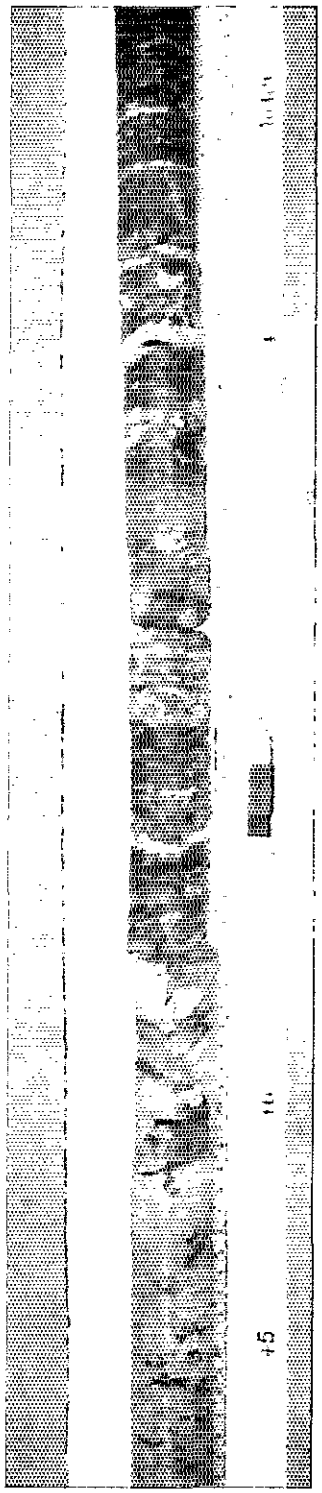

**Figure B-25.** Core Run 3: 1,085 to 1,090 Feet.

RSI-1583-06-026

**Figure B-26.** Core Run 3: 1,090 to 1,095 Feet.



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RSI-1583-06-027

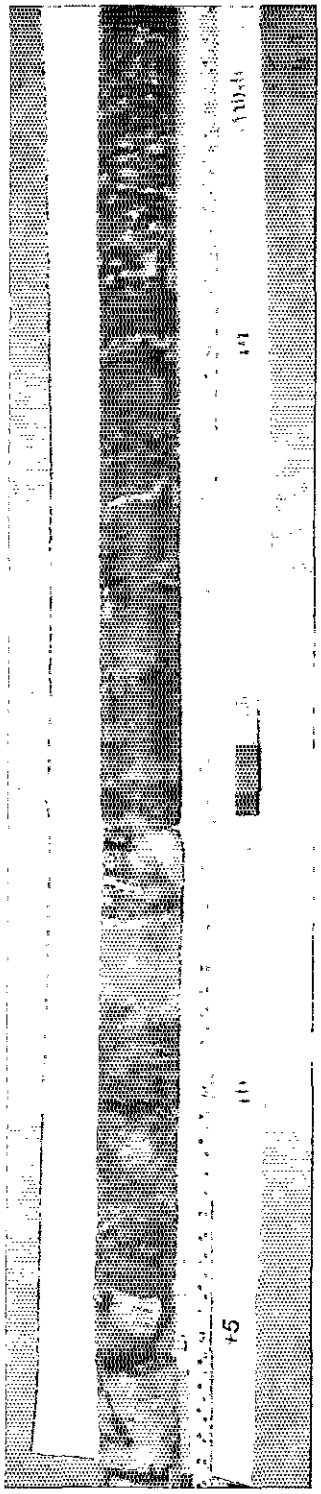

**Figure B-27.** Core Run 3: 1,095 to 1,100 Feet.

RSI-1583-06-028

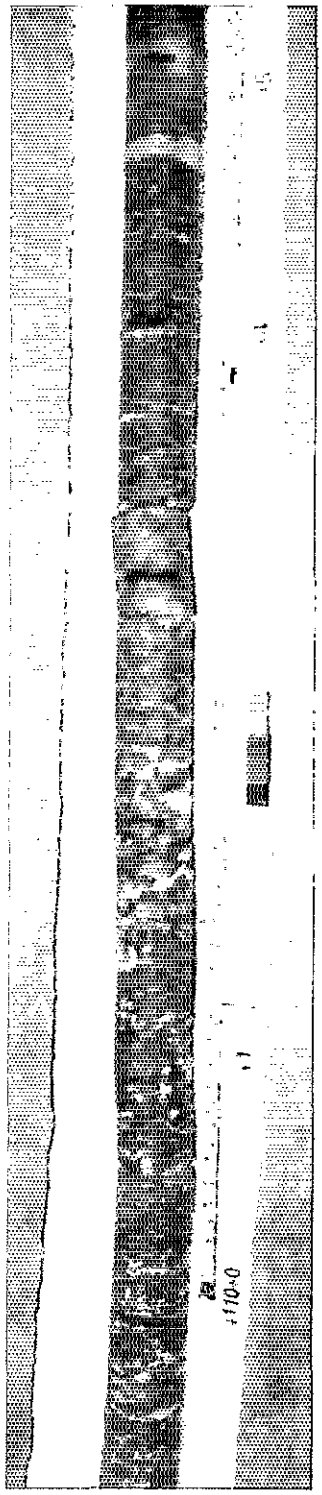

**Figure B-28.** Core Run 3: 1,100 to 1,105 Feet.



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RSI-1583-06-029

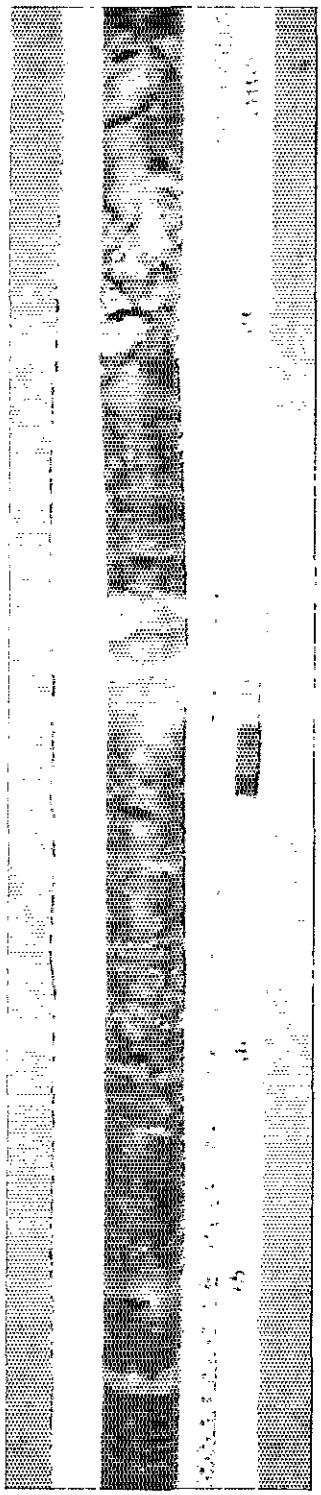

**Figure B-29.** Core Run 3: 1,105 to 1,110 Feet.

RSI-1583-06-030

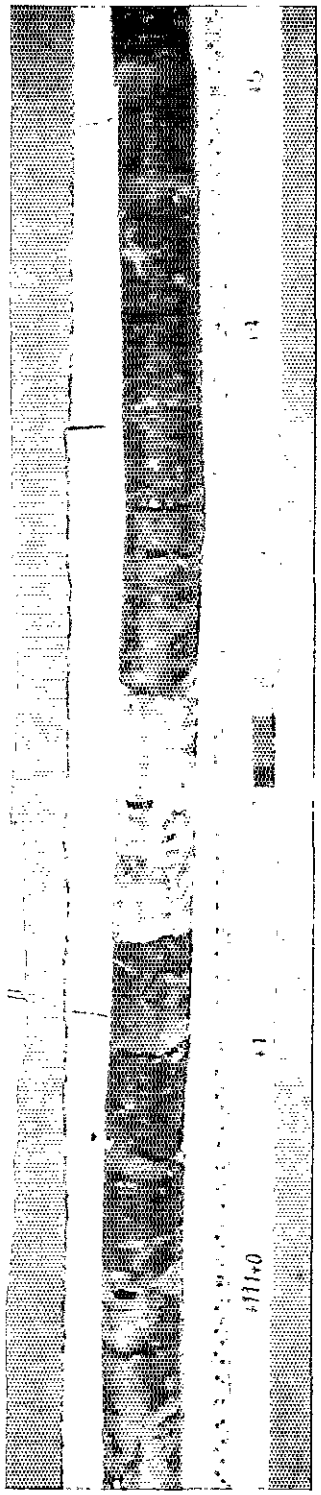

**Figure B-30.** Core Run 3: 1,110 to 1,115 Feet.



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RSI-1583-06-031

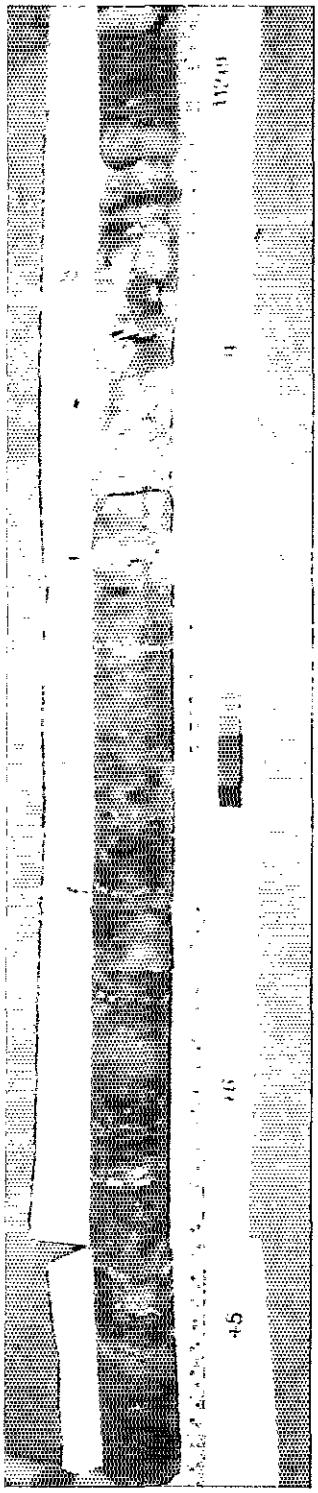

**Figure B-31.** Core Run 3: 1,115 to 1,120 Feet.

RSI-1583-06-032

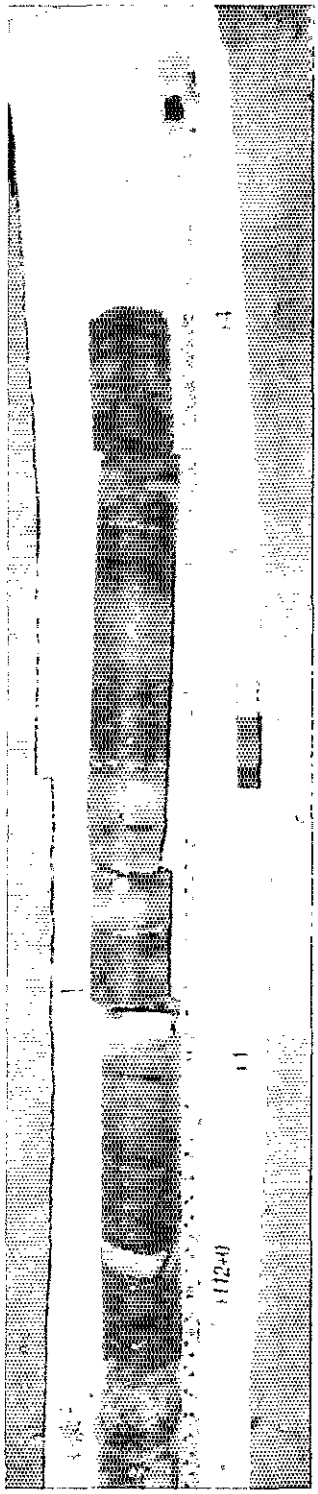

**Figure B-32.** Core Run 3: 1,120 to 1,124 Feet.



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RSI-1583-06-033

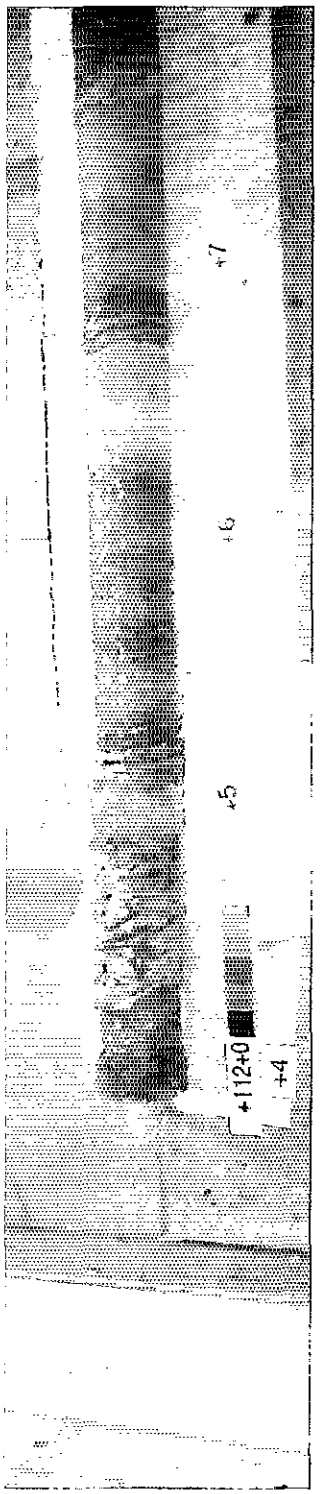


**Figure B-33.** Core Run 4: 1,124 to 1,125 Feet.

RSI-1583-06-034

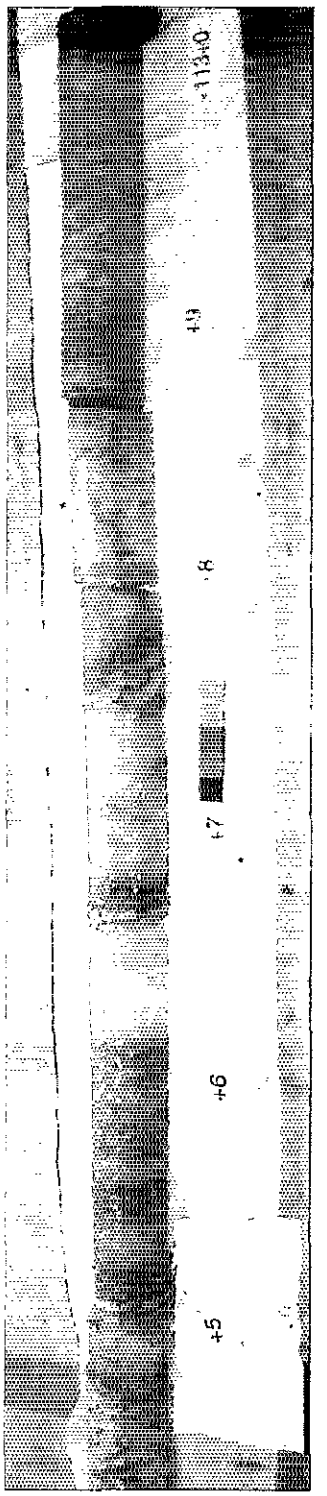


**Figure B-34.** Core Run 4: 1,125 to 1,130 Feet.



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RSI-1583-06-035

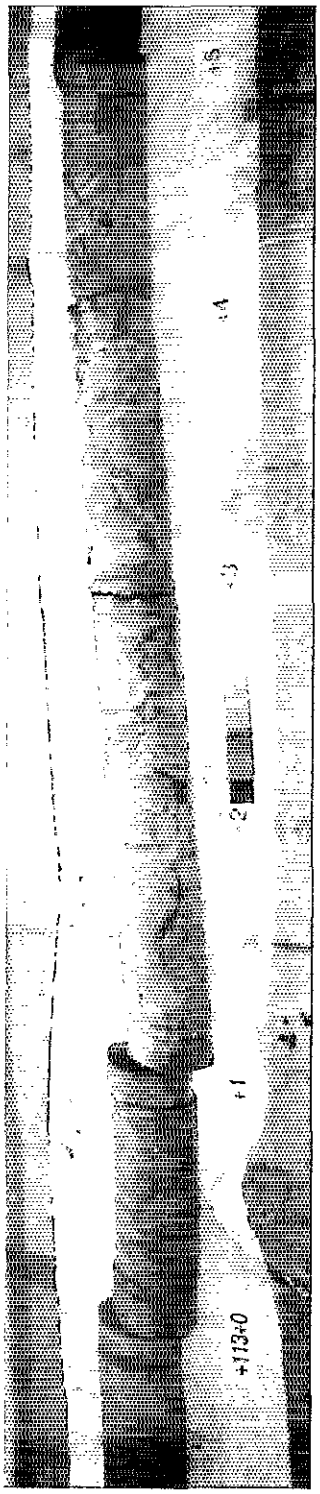


**Figure B-35.** Core Run 4: 1,130 to 1,135 Feet.

RSI-1583-06-036

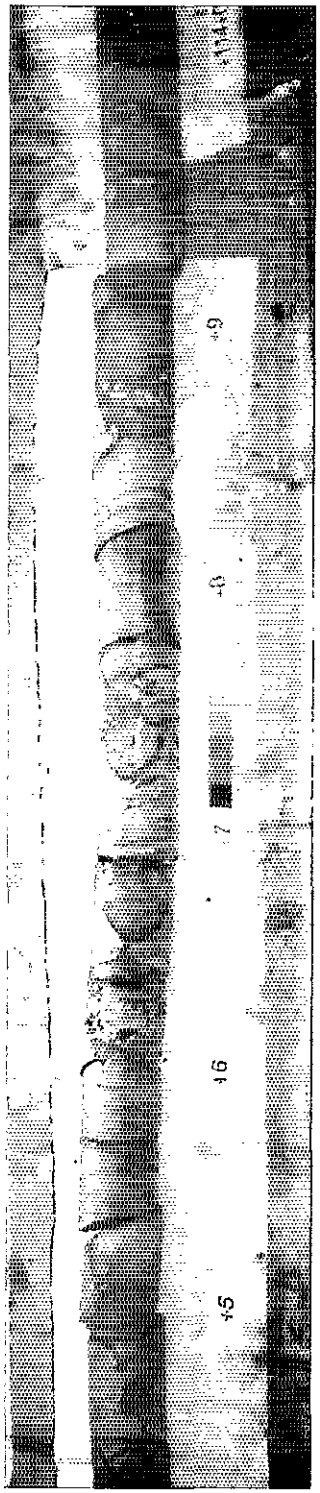

**Figure B-36.** Core Run 4: 1,135 to 1,140 Feet.



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RSI-1583-06-037

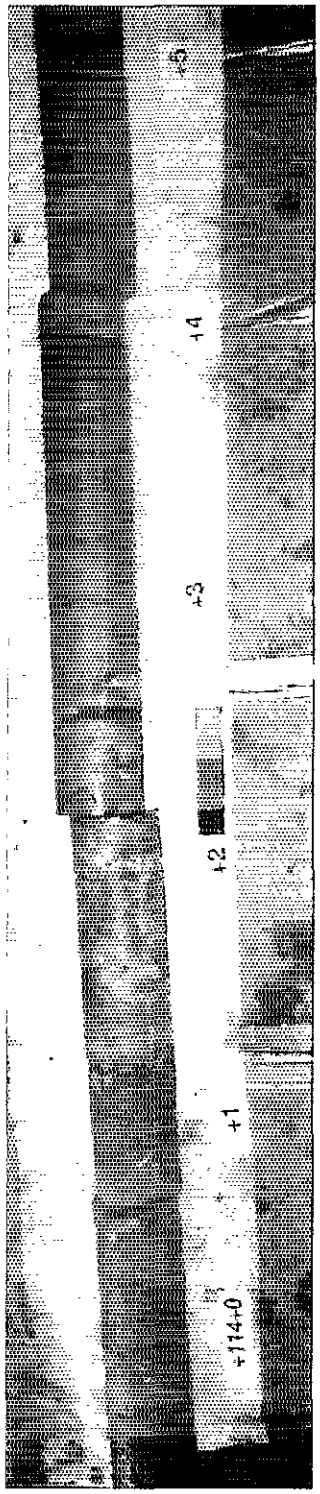


**Figure B-37.** Core Run 4: 1,140 to 1,145 Feet.

RSI-1583-06-038

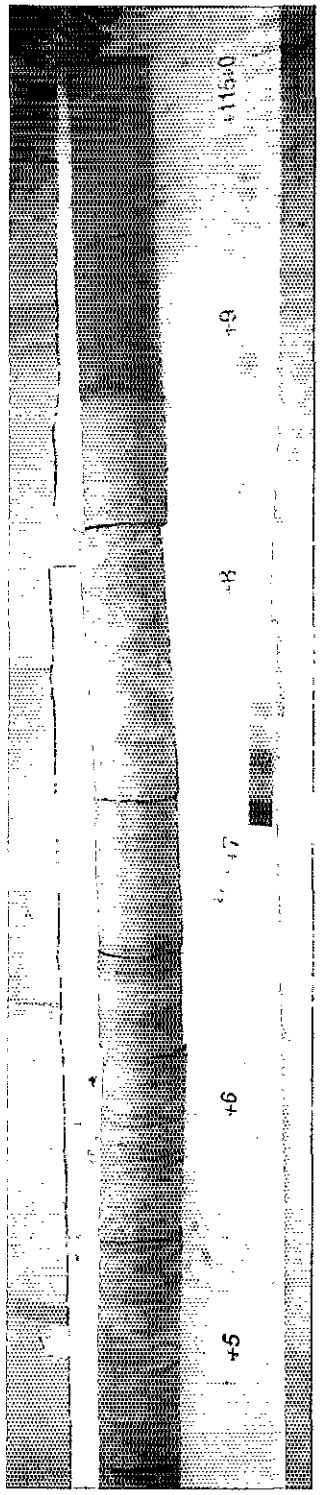


**Figure B-38.** Core Run 4: 1,145 to 1,150 Feet.



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RSI-1583-06-039

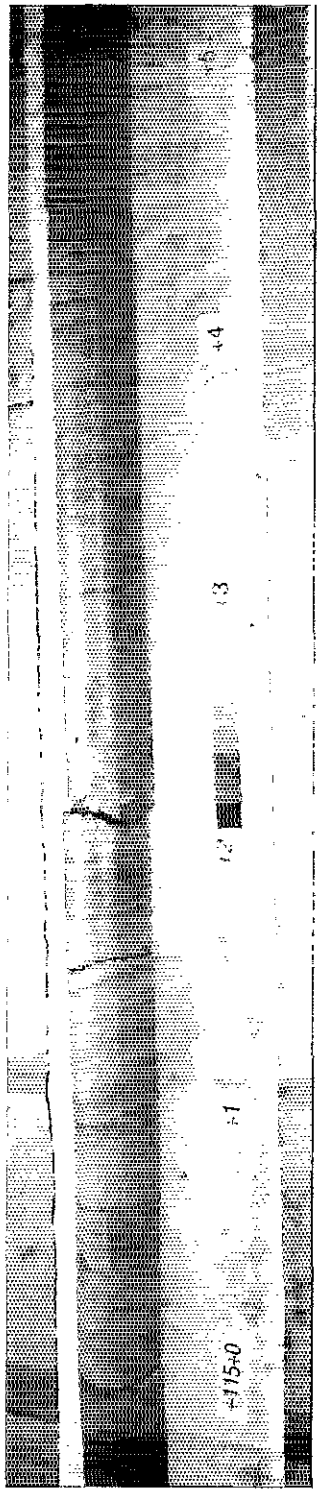


**Figure B-39.** Core Run 4: 1,150 to 1,155 Feet.

RSI-1583-06-040

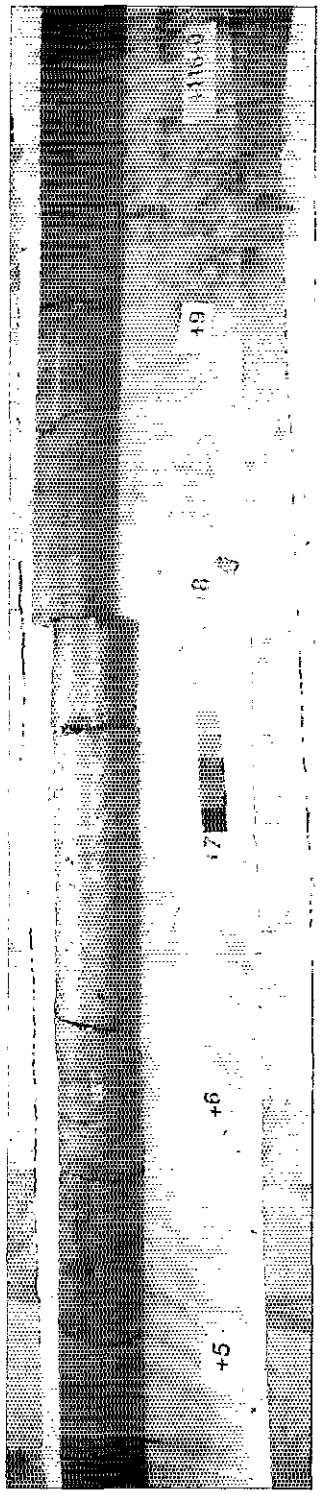


**Figure B-40.** Core Run 4: 1,155 to 1,160 Feet.



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RSI-1583-06-041

**Figure B-41.** Core Run 4: 1,160 to 1,165 Feet.

RSI-1583-06-042

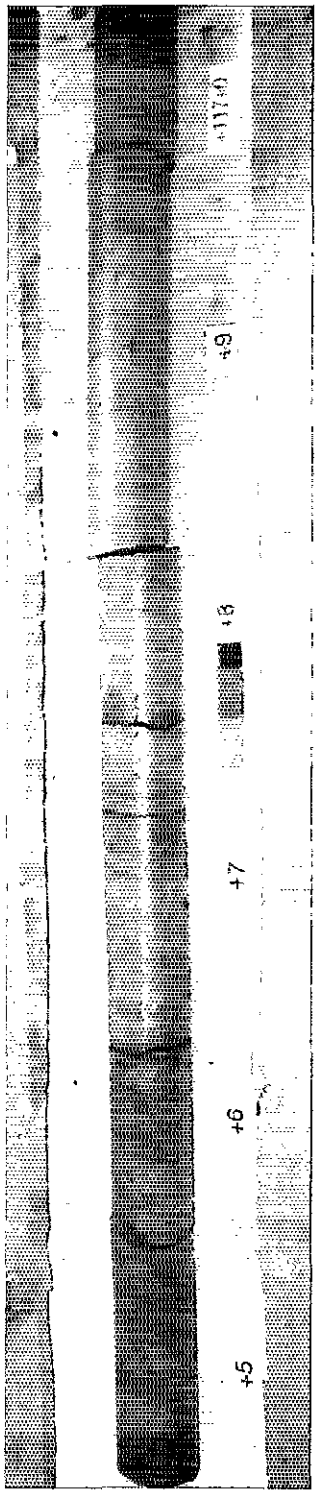


**Figure B-42.** Core Run 4: 1,165 to 1,170 Feet.



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RSI-1583-06-043

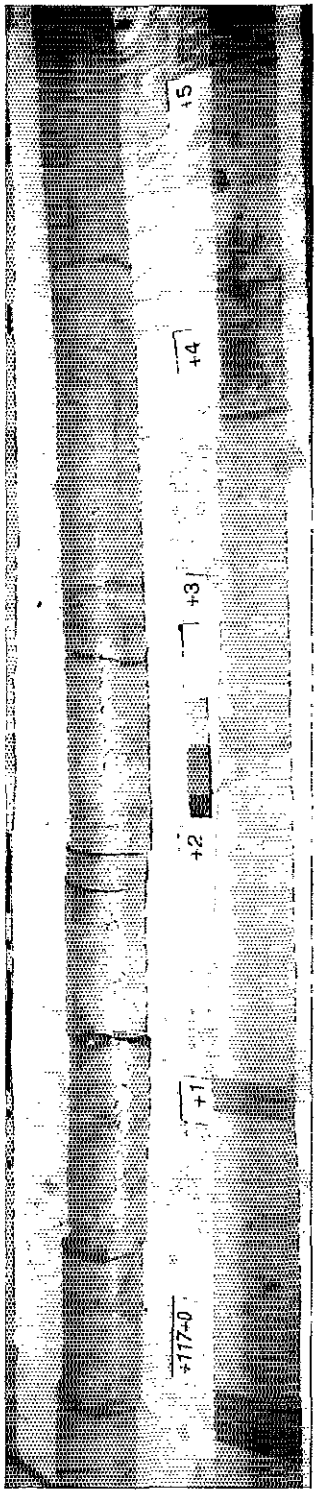


**Figure B-43.** Core Run 4: 1,170 to 1,175 Feet.

RSI-1583-06-044

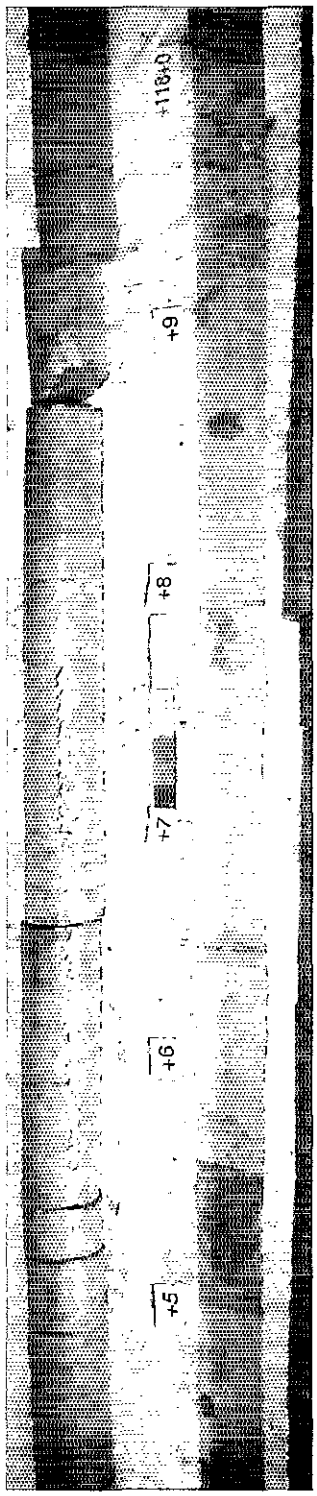


**Figure B-44.** Core Run 4: 1,175 to 1,180 Feet.



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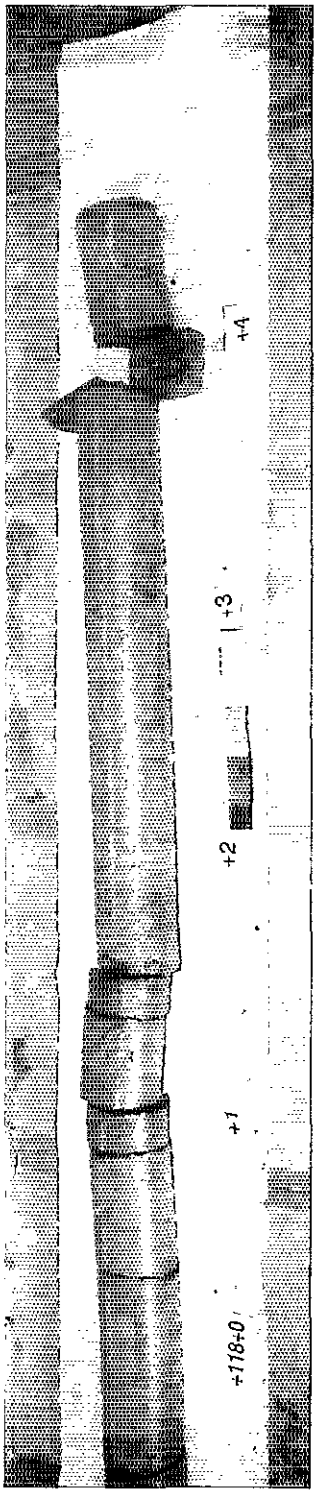


**Figure B-45.** Core Run 4: 1,180 to 1,184.5 Feet.



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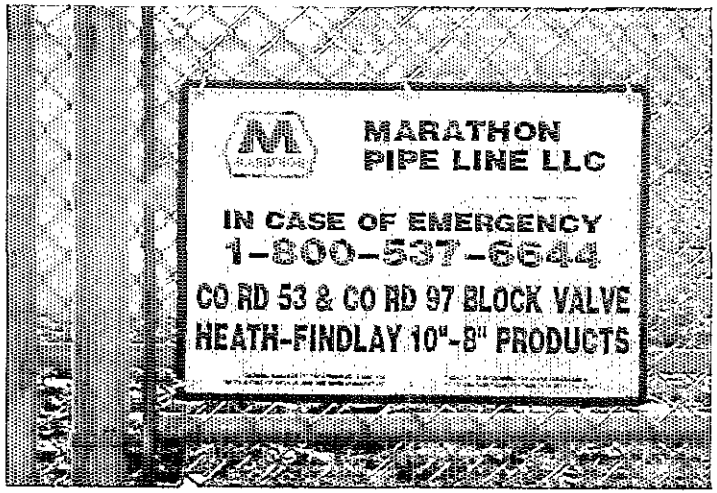
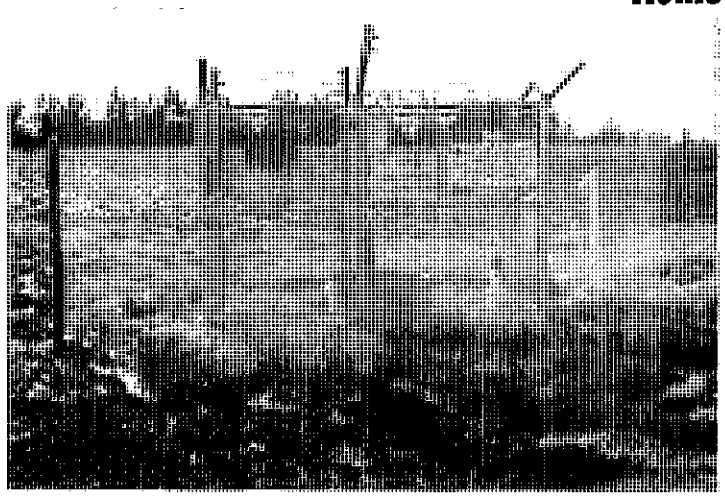
HEATH-FINDLAY 10"-8"

Home




CO RD 53 & CO RD 97 BV



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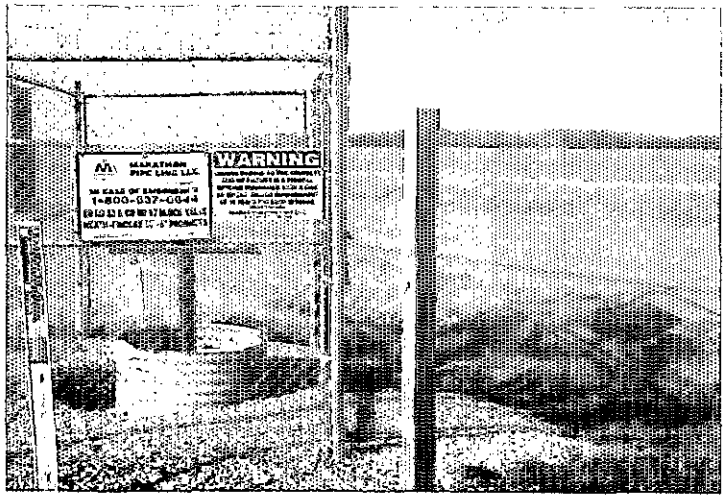

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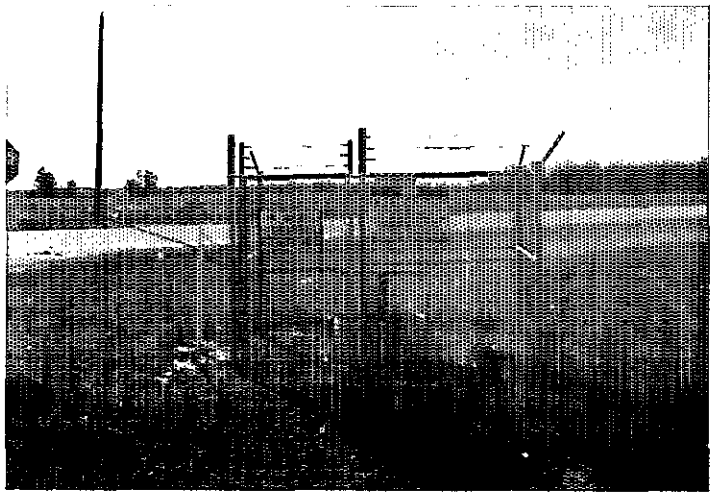
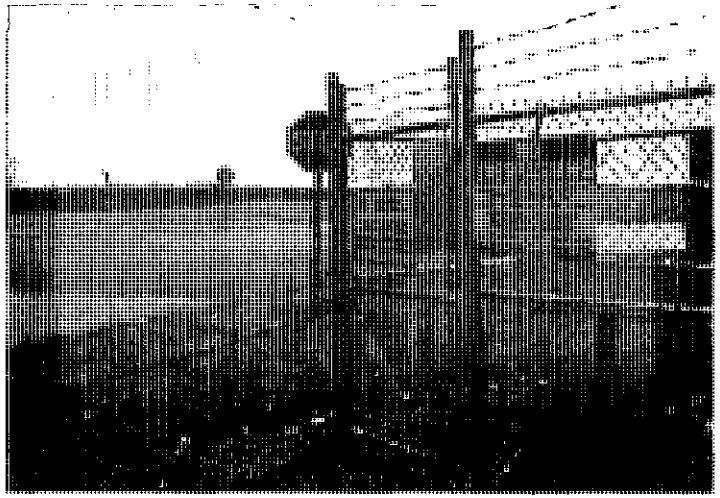
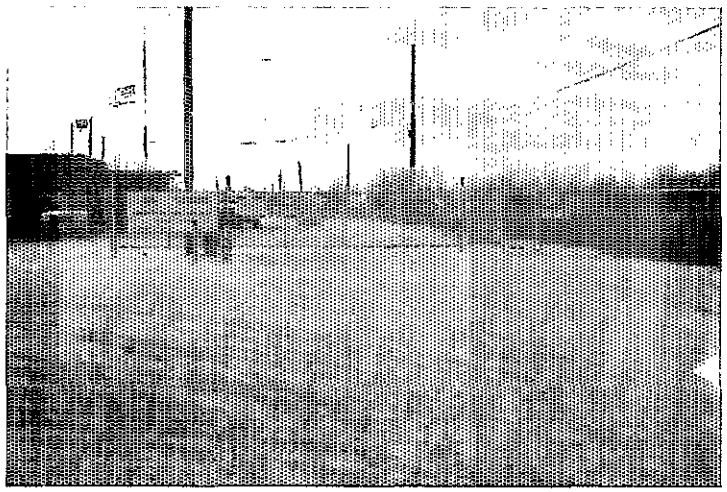


State RT 103 & TWP RD 191



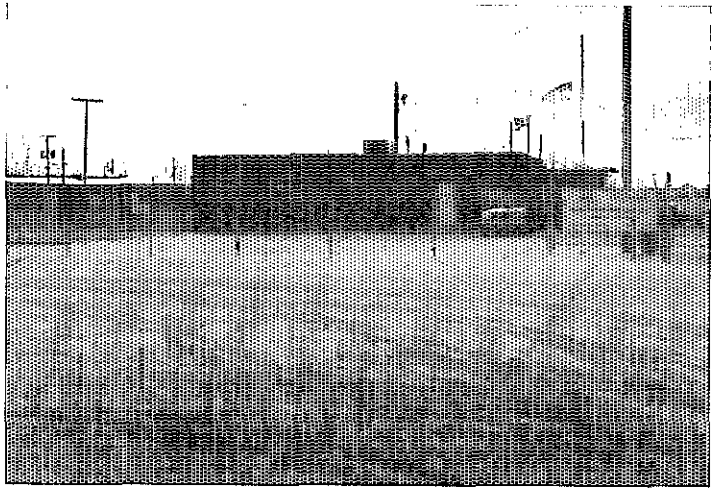
State RT 103 & TWP RD 191

State RT 103 & TWP RD 191

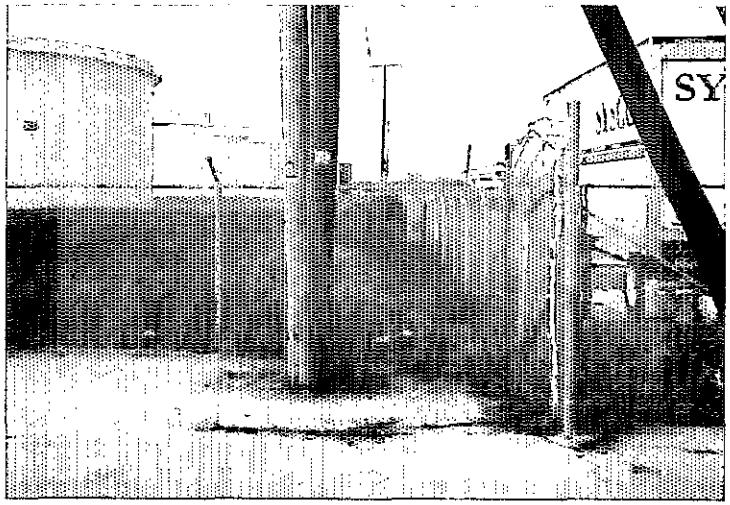


APR 0 2 2007

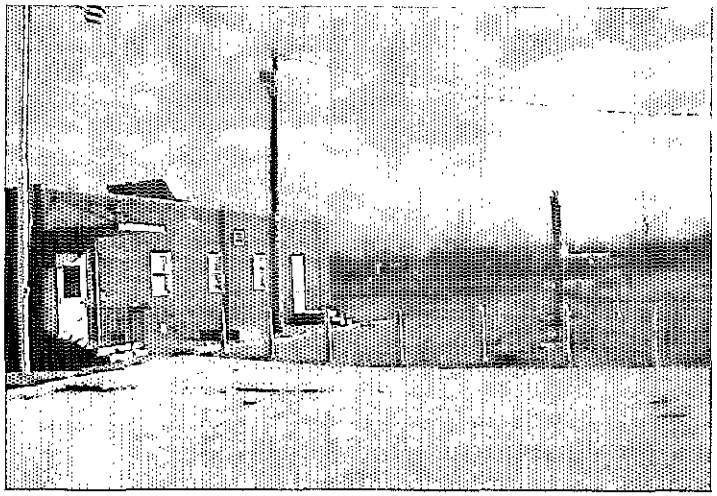
Findlay front gate entrance



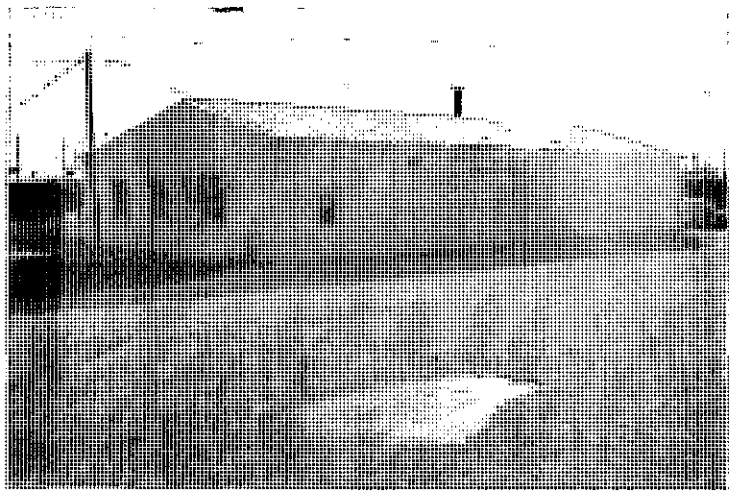
Findlay front gate entrance




Findlay front gate entrance



Findlay looking west on north fence line



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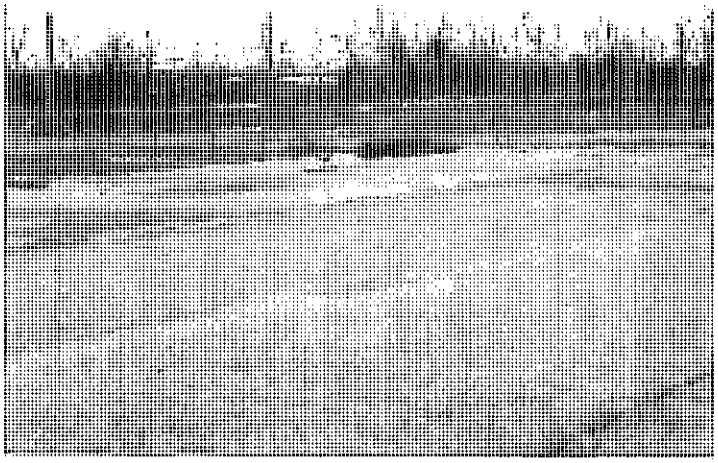
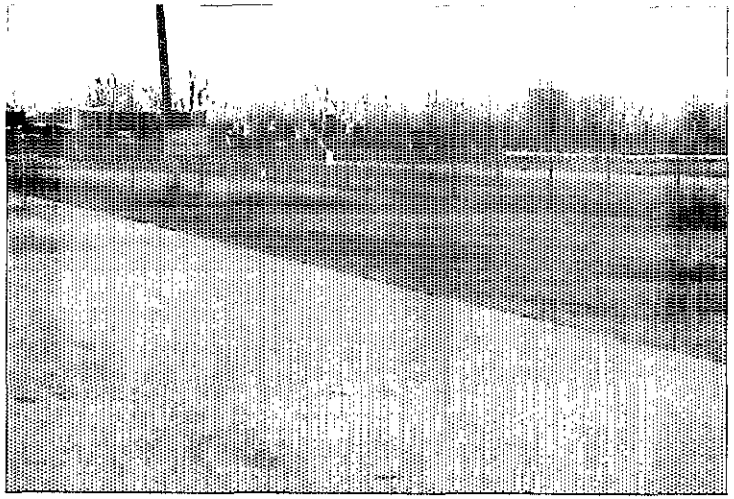
Findlay oil water seperator area

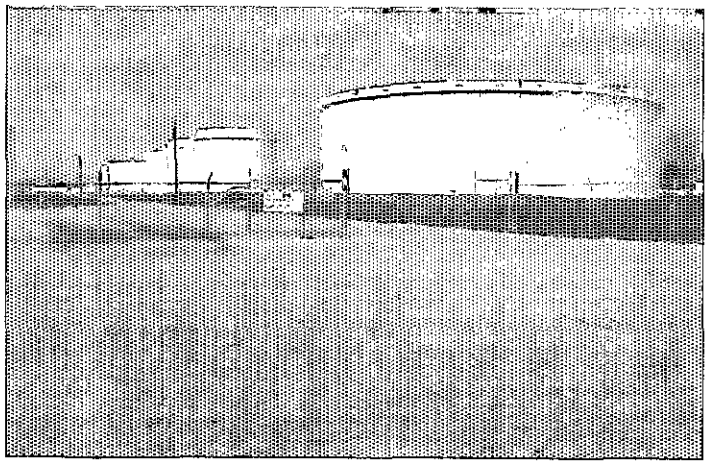
Findlay Garge area

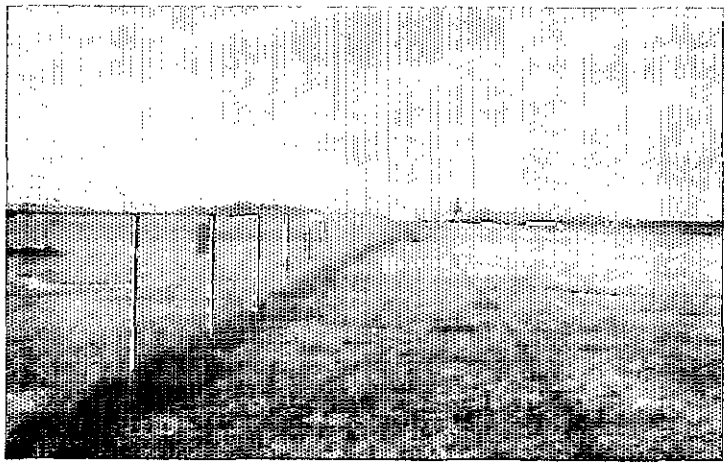


Findlay in fron t of garage looking south

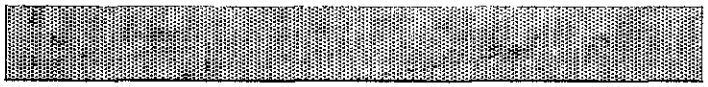


Findlay in fron t of garage looking south west



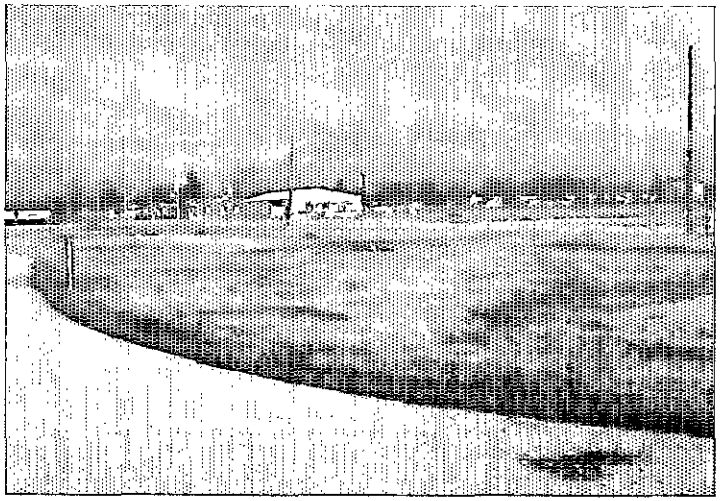


APR 0 2 2007

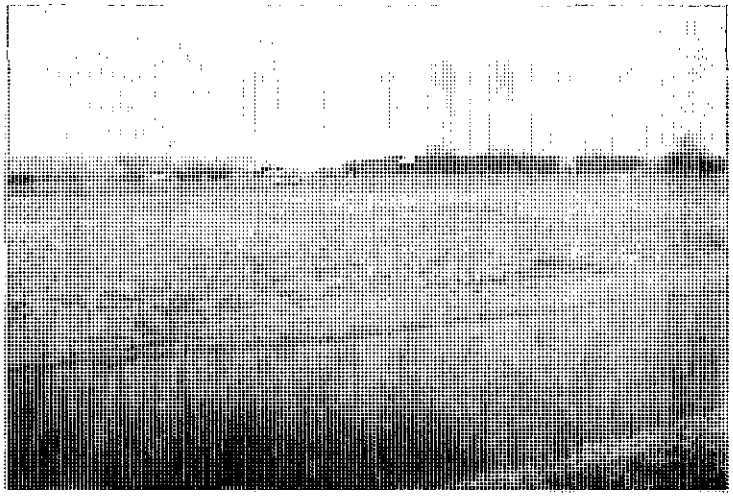


Findlay tank and manifold gate entrance

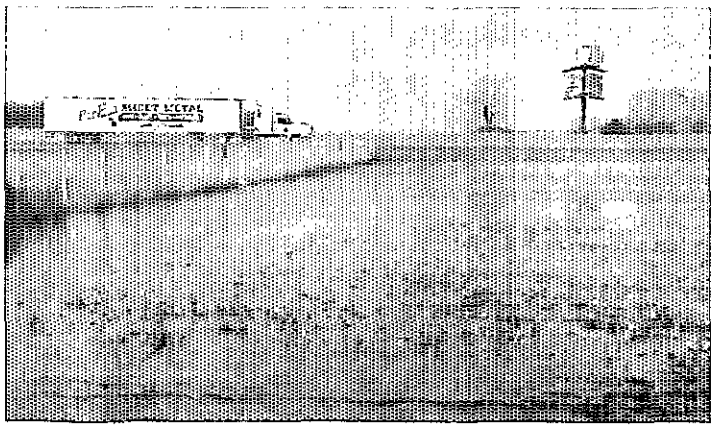
Findlay south side of facility lookingtoward I75

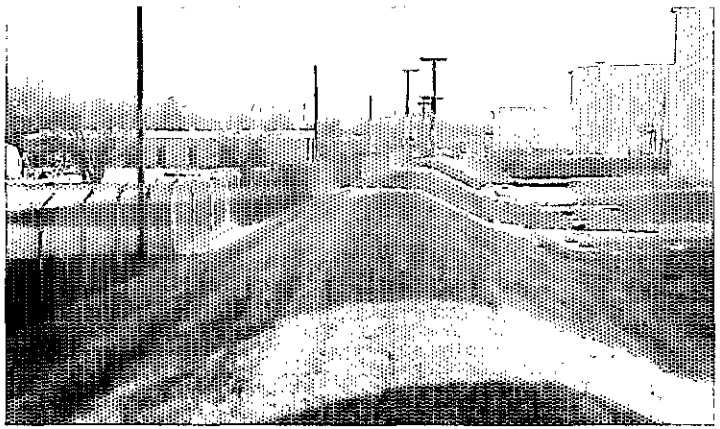


Findlay south side looking North toward office and garage

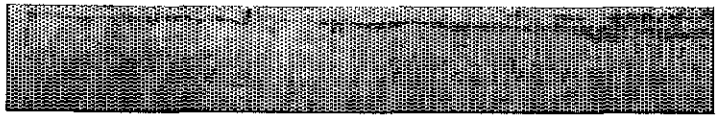


Findlay south looking toward I75

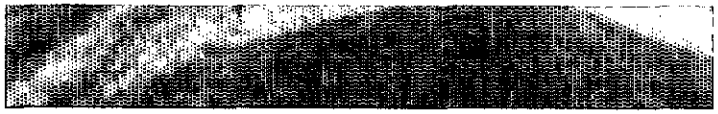




APR 0 2 2007

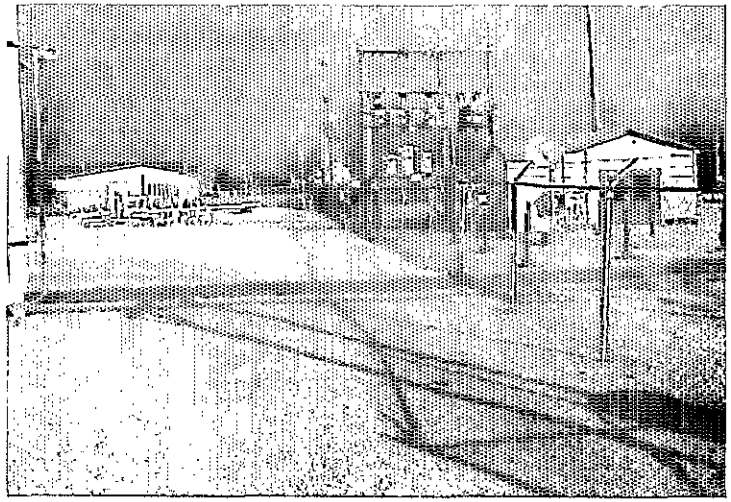


Findlay south side of facility looking west

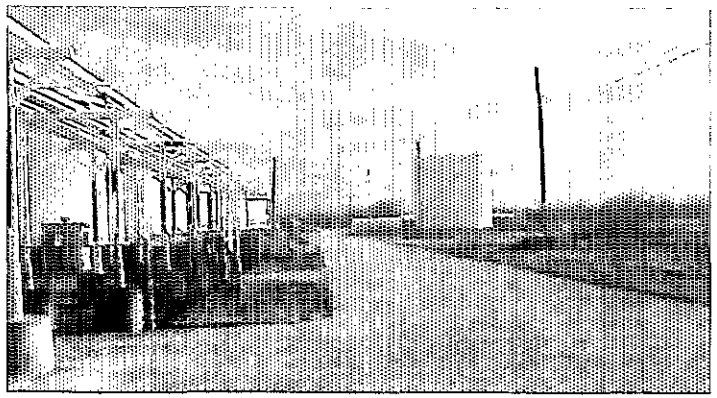


Findlay north side looking east behind tanks

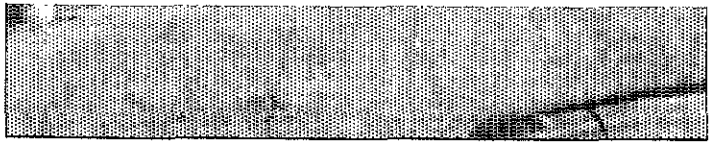
Findlay NW corner looking at I75



Findlay looking north from manifold toward meters



APR 0 3 2007



Findlay looking east from out front of Control Room

APR 02 2007

Environmental, Safety and Regulatory Compliance

**Marathon Pipe Line LLC**

539 South Main Street
Findlay, OH 45840
Telephone: (419) 421-3295

April 4, 2007

Walt Danyluk
Michigan DEQ
Office of Geological Survey
525 West Allegan Street
PO Box 30242
Lansing, MI 48909-7742

Re: Application to Change Well Status – Form 7200-6.
Michigan Well Permit No. 57361
Marathon Pipe Line LLC – Woodhaven Station Well #3

Dear Mr. Danyluk:

Per our conversation of 4-3-07, please find attached the Michigan DEQ Form 7200-6, Application to Change Well Status.

Marathon Pipe Line (MPL) continues to evaluate the Rock Mechanics Study associated with the drilling of Woodhaven Well #3. The evaluation is critical to MPL as the conclusion of the evaluation will dictate if Caverns #4 and #7 are able to be brought back into service. Therefore it is critical that MPL have adequate time to review the information and explore all possible scenarios and potential risks associated with the report and cavern re-activation.

Based on the above information MPL would like to petition Michigan DEQ to extend closure of the well #3 for a time period not to exceed 1 calendar year from the original closure date of June 1, 2007.

Thanks in advance for your assistance and please feel free to contact me with questions or concerns at 419-421-3295.

Regards,

Thomas A. Ross

Thomas A. Ross
HES Professional
Marathon Pipe Line

RECEIVED
APR 16 2007
DEQ LANSING DO
GEOLOGICAL SURVEY

Enclosures

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

DEQ

**APPLICATION TO:**

☒ **CHANGE WELL STATUS OR**

☐ **PLUG AND ABANDON WELL**

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, 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 or Gas Well ☐ Part 625 Mineral Well

| | |
|---|---|
| Permit number: 57361 | Type of well: Test |
| API number: | |
| Name and address of permittee: Marathon Pipeline LLC, 539 South Main Street, Findlay, OH 45840 | |
| Well name and number: Woodhaven Well #3 | |
| Well location: NW 1/4 of SE 1/4 of SE 1/4 Section 22 T 4S R 10E | |
| Township: Brownstown | County: Wayne |
| Date drilling completed: 12/16/05 | Date last produced/utilized: N/A |
| Starting date: N/A | |

Change of well status requested to:

☐ Plug back ☐ Perforate ☐ Temporarily abandon

☐ Convert to _____ ☒ Other forego well closure

Last production/injection rate and type of fluid: N/A

Brief description of project: Due to slow return on the rock mechanics study Marathon requests ability to keep well open to allow more time to complete study and determine well feasibility.

Work to be done by: N/A

**CASING AND CEMENTING RECORD**

| Hole dia | Casing dia & wt/ft | Depths set | Cement quantity, type, additives | Cement top | Perforations |
|---|---|---|---|---|---|
| 20 | 16 | 162 | Class A (w/CaCL2) 125 bags | surface | N/A |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Formation record (formation and depth of top, oil, gas and water shows, etc.):

formation depth
N/A

Detail proposed procedures:

Woodhaven Well #3 was drilled to obtain rock mechanics information to conduct a rock mechanics study. Said study is being used to develop a plan forward for bringing two existing underground salt caverns back into service. Caverns #4 and #7. Well #3 is also a back-up well in the event that the Rock Mechanics study reveals that Caverns #4 and #7 are not feasibly able to be brought back into service. At such time we would wish to mine well #3 into a cavern. Said Rock Mechanics study is taking significantly longer than expected. Thus Marathon Pipeline would like to request an extension of 1 calendar year from original expected closure date to allow sufficient time to complete the Rock Mechanics Study and. At the end of such time Marathon Pipeline will either close or develop well #3 based on the above information.

Name/signature (authorized representative): THOMAS A. ROSS Thomas A. Ross

Date: 4/3/07

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DEQ additional requirements:

☐ Yes ☐ No ☒ Not applicable Production tests to commence within 10 days of completion and to be filed

☐ Yes ☒ No Service company records are to be filed

| Approved by DEQ: | Office: | Approval date: | Termination Date: |
|---|---|---|---|
| [signature] | LANSING DIST. | 4/16/07 | 4/16/08 |

Submit original and three (3) copies of this application to the District Office within 60 days ofchange of well status.
Note: Three copies of Record of Well Plugging or Change of Well status (EQP 7200-8) and any requested service company records are to be filed within 60 days of completion at the District Office.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

| APPLICATION TO: | Permit number | API number |
|---|---|---|
| ☒ CHANGE WELL STATUS OR<br>☐ PLUG AND ABANDON WELL | 57361 | |
| | Well name and number<br>Woodhaven Well #3 | |

Continuation of proposed procedures

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GEOLOGICAL SURVEY

Environmental, Safety and Regulatory Compliance

**Marathon Pipe Line LLC**

539 South Main Street
Findlay, OH 45840
Telephone: (419) 421-3295

February 12, 2008

Walt Danyluk
Michigan DEQ
Office of Geological Survey
525 West Allegan Street
PO Box 30242
Lansing, MI 48909-7742

Re: Application to Change Well Status – Form 7200-6.
Michigan Well Permit No. 57361
Marathon Pipe Line LLC – Woodhaven Station Well #3

Dear Mr. Danyluk:

Per our conversation of 2-12-08, please find attached the Michigan DEQ Form 7200-6, Application to Change Well Status.

Marathon Pipe Line (MPL) is in the process of closing out the above referenced well. However we are unable to transport a drilling rig to the Woodhaven location. This is due to the Michigan Frost regulations that limit transport of certain size vehicles during certain time periods. Therefore we will be unable to meet our original closure date of April 15th.

Based on the above information MPL would like to petition Michigan DEQ to extend closure of the well #3 through until June 30, 2008.

Thanks in advance for your assistance and please feel free to contact me with questions or concerns at 419-421-3295.

Regards,

Thomas A. Ross
HES Professional
Marathon Pipe Line

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Enclosures

/tar

Cc: Woodhaven Well #3 file
B. Lewandowski
C. Gordon

FEB 15 2008

DE[illegible] GEOLOGICAL SURVEY

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

DEQ

**APPLICATION TO:**

☒ **CHANGE WELL STATUS OR**

☐ **PLUG AND ABANDON WELL**

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, 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 or Gas Well ☐ Part 625 Mineral Well

| | |
|---|---|
| Permit number: 57361 | Type of well: Test |
| API number: | |
| Name and address of permittee: Marathon Pipeline LLC, 539 South Main Street, Findlay, OH 45840 | |
| Well name and number: Woodhaven Well #3 | |
| Well location: NW 1/4 of SE 1/4 of SE 1/4 Section 22 T 4S R 10E | |
| Township: Brownstown | County: Wayne |
| Date drilling completed: 12/16/05 | Date last produced/utilized: N/A |
| Starting date: N/A | |

Change of well status requested to:

☐ Plug back ☐ Perforate ☐ Temporarily abandon

☐ Convert to _____ ☒ Other forego well closure

Last production/injection rate and type of fluid: N/A

Brief description of project: Closure of the above referenced well
Push out closure until 6-08.

Work to be done by: N/A

**CASING AND CEMENTING RECORD**

| Hole dia | Casing dia & wt/ft | Depths set | Cement quantity, type, additives | Cement top | Perforations |
|---|---|---|---|---|---|
| 20 | 16 | 162 | Class A (w/CaCL2) 125 bags | surface | N/A |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

Formation record (formation and depth of top, oil, gas and water shows, etc.):

formation depth
N/A

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PERMITS & BONDING UNIT

Detail proposed procedures:

Marathon Pipe Line (MPL) is in the process of closing out the above referenced well. However we are unable to transport a drilling rig to the Woodhaven location. This is due to the Michigan Frost regulations that limit transport of certain size vehicles during certain time periods. Therefore we will be unable to meet our original closure date of April 15th.

Based on the above information MPL would like to petition Michigan DEQ to extend closure of the well #3 through until June 30, 2008.

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GEOLOGICAL SURVEY

Name/signature (authorized representative): Thomas J. Rolo

Date: 2/12/08

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DEQ additional requirements:

☐ Yes ☐ No ☒ Not applicable Production tests to commence within 10 days of completion and to be filed

☐ Yes ☒ No Service company records are to be filed

| Approved by DEQ: | Office: | Approval date: | Termination Date: |
|---|---|---|---|
| Walter Stanczyk | LANSING DIST | 2/20/08 | 8/20/08 |

Submit original and three (3) copies of this application to the District Office within 60 days ofchange of well status.
Note: Three copies of Record of Well Plugging or Change of Well status (EQP 7200-8) and any requested service company records are to be filed within 60 days of completion at the District Office.

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

| APPLICATION TO: | Permit number | API number |
|---|---|---|
| ☒ CHANGE WELL STATUS OR<br>☐ PLUG AND ABANDON WELL | 57361 | |
| | Well name and number<br>Woodhaven Well #3 | |

Continuation of proposed procedures

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GEOLOGICAL SURVEY

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY - OFFICE OF GEOLOGICAL SURVEY

DEQ

**APPLICATION TO:**

☐ **CHANGE WELL STATUS OR**

☒ **PLUG AND ABANDON WELL**

Required by authority of Part 615 Supervisor of Wells or Part 625 Mineral Wells, 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 or Gas Well ☐ Part 625 Mineral Well

| | |
|---|---|
| Permit number: 57361 | Type of well: Dry Hole |
| API number: 21-163-57361-00-00 | |
| Name and address of permittee: Marathon Pipeline LLC ATTN: Tom Ross, 539 S. Main St., Findlay, OH 45840 | |
| Well name and number: Woodhaven Well #3 | |
| Well location: NW 1/4 of SE 1/4 of SE 1/4 Section 22 T 04S R 10E | |
| Township: Brownstown | County: Wayne |
| Date drilling completed: 12-14-05 | Date last produced/utilized: N.A. |
| Work to be done by: Will notify | Starting date: Will notify |

Change of well status requested to:

☐ Plug back ☐ Perforate ☐ Temporarily abandon

☐ Convert to _____ ☐ Other _____

Last production/injection rate and type of fluid

Brief description of project

**CASING AND CEMENTING RECORD**

| Hole dia | Casing dia & wt/ft | Depths set | Cement quantity, type, additives | Cement top | Perforations |
|---|---|---|---|---|---|
| 20" | 16" 55# H-40 | 150' | 440 sx C-A | CTS | |
| 10 5/8" | | | | | |
| 7 7/8" | | | | | |
| | | | | | |
| | | | | | |

Formation record (formation and depth of top, oil, gas and water shows, etc.):

| formation | depth |
|---|---|
| B Evap | 1080 |
| DTD | 1244 |

Detail proposed procedures:

Drill out CIBP at 100 ft. GIH with tubing to 1244 ft. and fill wellbore with Class A cement to the surface. Top off as necessary. Cut 16" casing off at least 4 ft. below grade and cap with a welded 1/2" steel plate. The well permit number is to be permanently affixed to the plate. Restore location.

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MAR 13 2008

OFFICE OF GEOLOGICAL SURVEY
PERMITS & BONDING UNIT

Name/signature (authorized representative): Date:

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DEQ additional requirements:

Please notify this office the day before commencing operations at 586-753-3856.

☐ Yes ☐ No ☒ Not applicable Production tests to commence within 10 days of completion and to be filed

☐ Yes ☒ No Service company records are to be filed

| Approved by DEQ: | Office: | Approval date: | Termination Date: |
|---|---|---|---|
| Bruce J. Waldo | Warren | 3-11-08 | 3-11-09 |

Submit original and three (3) copies of this application to the District Office within 60 days ofchange of well status.
Note: Three copies of Record of Well Plugging or Change of Well status (EQP 7200-8) and any requested service company records are to be filed within 60 days of completion at the District Office.

(C)

35-4S-10E
Brownstown Twp., (Wayne Co.)

TD 2820 in Black River Dry

W. E. Ellis

Location: NE¼ NE¼ section 35, T 4S, R 10E
Brownstown Twp., on the Miller Road, 2 miles southwest of Trenton, about 700' south of road.

Elevation: About 585 feet above sea level

Record by: W. Osgood & R. B. Newcombe from samples furnished by J. F. Miller, & Driller's log. Spudded in April 11, 1927.
Driller: Frank C. Cheers

| | Thickness (Feet) | Depth (Feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Surface deposits | 20 | 20 |
| DEVONIAN: | | |
| Detroit River: | | |
| Dolomite, light buff | 70 | 90 |
| " , gray | 15 | 105 |
| " , light buff | 11 | 116 |
| " , dark brown, bituminous | 20 | 136 |
| " , buff, light | 44 | 180 |
| Sylvania: | (160) | |
| Sandstone, gray, cemented by dolomite | 10 | 190 |
| " , white (hole full water 215) | 70 | 260 |
| " , gray (dolomite cem.) | 20 | 280 |
| Sandstone | 10 | 290 |
| SILURIAN: | (110) | |
| Bass Island-Salina: | | |
| Dolomite, gray, cherty | 10 | 300 |
| " , sandy | 10 | 310 |
| " , gray to buff, cherty (much chert 310-60) | 140 | 450 |
| " " " " | 90 | 540 |
| Dolomite, gray | 10 | 550 |
| " , buff | 10 | 560 |
| " , gray with some gypsum | 20 | 580 |
| " , light buff | 25 | 605 |
| " , gray | 15 | 620 |
| " , dark gray to black with some anhydrite | 110 | 730 |
| " , brown | 20 | 750 |
| " , dark gray with anhydrite | 30 | 780 |
| " , buff | 10 | 790 |
| " , gray | 30 | 820 |
| " , buff | 10 | 840 |
| " , gray & brown | 30 | 870 |
| " " | 130 | 1000 |
| " , brown & anhydrite | 80 | 1080 |
| " , gray | 30 | [illegible] |
| " , light gray & anhydrite | 30 | 1140 |
| " , light buff(water enough to drill with at 1195, more 1280) | 110 | 1250 |
| Dolomite, brown | 30 | [illegible] |
| " , gray & brown | 90 | 1370 |
| " , gray (6 bailers of water) | 20 | [illegible] |
| | (1100) | |

| | Thickness (Feet) | Depth (Feet) |
|---|---|---|
| Guelph: | | |
| Dolomite, white or bluish white | 10 | 1400 |
| Dolomite, milky white, crystalline | 10 | 1410 |
| Dolomite, light brown, iron stained | 20 | 1430 |
| Dolomite, iron stained | 30 | 1460 |
| Dolomite, light blue | 30 | 1490 |
| Dolomite, blue to gray | 10 | 1500 |
| | (110) | |
| Lockport: | | |
| Dolomite, light buff (Lithographic) | 10 | 1510 |
| Dolomite, gray and greenish gray shale | 10 | 1520 |
| | (20) | |
| Cataract: | | |
| Cabot Head: | | |
| Shale, purple and green and dolomite | 20 | 1540 |
| Shale, soft greenish gray | 40 | 1580 |
| Dolomite, gray and purple shales (iron stained) | 10 | 1590 |
| | (70) | |
| Manitoulin: | | |
| Dolomite, gray to buff (Iron stained) | 10 | 1600 |
| Dolomite, gray to greenish gray, shaly | 10 | 1610 |
| Dolomite, light gray to buff, hard crystalline | 20 | 1630 |
| | (40) | |
| ORDOVICIAN: | | |
| Cincinnatian: | | |
| Shale, greenish gray to purple | 10 | 1640 |
| Shale, greenish gray | 10 | 1650 |
| Shale, light red | 10 | 1660 |
| Shale, greenish gray to purple | 30 | 1690 |
| Shale, soft red | 70 | 1760 |
| Shale, light red | 10 | 1770 |
| Shale, purple and green (purple predominating) | 10 | 1780 |
| Shale, purple and green (green predominating) | 10 | 1790 |
| Shale, soft light gray | 10 | 1800 |
| Dolomite, gray, shaly | 10 | 1810 |
| Shale, light to dark gray and shaly dolomite | 30 | 1840 |
| Shale, purple with some green | 20 | 1860 |
| Shale, greenish gray with some purple | 20 | 1880 |
| Shale, light greenish gray | 10 | 1890 |
| Shale, hard gray | 250 | 2140 |
| Shale, gray, hard | 60 | 2200 |
| Shale, brownish, gray (Utica?) | 40 | 2240 |
| Gray, brownish, shale & dolomite (some Pyrite) | 10 | 2250 |
| | (620) | |
| Trenton-Black River: | | |
| Limestone, buff dolomitic and blue-gray shale (Steel line measurement shows top of Trenton - 2660') | 30 | 2280 |
| Limestone, brown (some blue shale) | 20 | 2300 |
| Limestone, light gray | 10 | 2310 |
| Limestone, buff & light gray with some blue shale (fossils) | 36 | 2346 |
| (show of oil and gas at 2344, oil at 2342-2352. After standing overnight made about 2 quarts of oil.) | | |
| Dolomite, buff | 8 | 2354 |
| Limestone, wh[illegible]ff, cherty | 16 | 2370 |

| | Thickness (Feet) | Depth (Feet) |
|---|---|---|
| Trenton-Black River: (Contd.): | | |
| Limestone, light gray | 20 | 2390 |
| Limestone, dark gray to buff | 30 | 2420 |
| Limestone, light gray | 10 | 2430 |
| Limestone, buff to dark gray (fossils) | 20 | 2450 |
| Limestone, buff, fossiliferous and dark blue gray shale | 20 | 2470 |
| Limestone, buff | 50 | 2520 |
| Shale, dark gray (some buff limestone) | 20 | 2540 |
| Limestone, buff (fossils) | 40 | 2580 |
| Limestone, dark gray (some shale) | 60 | 2640 |
| Limestone, light buff, fine grained, nearly lithographic limestone | 180 (570+) | 2820 |
| TOTAL DEPTH | | 2820 |

Casing record:
10" 147'
8 1/4" 610'
6 5/8" (2) 1798'

7-13-56-C

Muskegon Twp. (Muskegon County)

Reed Oil Company

Heinz #6 Permit #419

Drilling Contractor: J. B. Reed

Location: NW¼ of SE¼ of section 8, T.10N.,R.16W.
1795 feet from south and 2100 feet from east line of quarter section.

Elevation: 587 feet above sea level.

Record by: O. F. Poindexter from driller's log.

| | Thickness (Feet) | Depth (Feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Drift | 199 | 199 |
| MISSISSIPPIAN: | | |
| Lower Marshall: | | |
| Lime (sandstone and shale ?) | 71 | 270 |
| Coldwater: | | |
| Shale | 239 | 509 |
| Limestone | 49 | 558 |
| Blue shale | 230 | 788 |
| Red limestone | 22 | 810 |
| Bedford: | | |
| Green shale | 522 | 1332 |
| MISSISSIPPIAN-DEVONIAN: | | |
| Antrim: | | |
| Brown shale | 165 | 1497 |
| DEVONIAN: | | |
| Traverse: | | |
| Gray limestone | 99 | 1596 |
| No record (gas 1596-1606; oil 1606-1610) | 14 | 1610 |
| Limestone | 250 | 1860 |
| Shale and limestone | 120 | 1980 |
| Dundee: | | |
| Limestone (oil and gas) | 10 | 1990 |

587
199
388

Casing record:
10" 202'
8¼" 290'
6-5/8" 1980'

Commenced: 10-10-29
Completed: 11-4-29
Initial Production: 100 bbls. oil

# APPENDIX

# B DRILLING PROGRAM (SEE ATTACHMENT L)

Operator Name: Buckeye Terminals, LLC
Well: Cavern Well
Field: Woodhaven Terminal
County: Wayne
Lease Name: N/A
EPA Region: V

Permit No.: N/A
API #: N/A
Section: NA
Block: NA
Survey: N/A
Abstract: N/A

## WELLBORE CONFIGURATION AND CASING PROGRAM

Proposed wellbore configuration:

28” Conductor Pipe: 0 - Approx. 100 feet (FT) or refusal (Augered)
20” Surface Casing: 0 - Approx. 420 FT (26” Hole)
13-3/8” Final Casing: 0 – Approx. 1015 FT (17-1/2” Hole)
8-5/8” Outer Leaching Casing: 0 – 1085 FT
5-1/2” Inner Leaching CasingL 0 – 1140 FT
Total Depth: 1150 FT (12-1/4” Hole)
Bottom of USDW – 300 FT
Top of Caprock – Approx. 700 FT
Top of Salt – Approx. 1000 FT

## WORK SEQUENCING PLAN

1. Move in an appropriate sized drilling rig with a 22” rotary and set up on the new site. Install required H2S and gas monitoring equipment.
2. Rig up an augering drill system and auger in 32-36” hole and run 28” to +/- 100 feet from ground level (GL). Install 22” rotary and nipple up flow line.
3. Cut the 28” casing and weld on a fabricated 28” by 21-1/4” 2000 flange, NU diverter spool, and NU a 21-1/4” annular BOP. Nipple up diverter lines and a flow line. Install a 2” drain plug in the conductor casing below ground level.
4. Pick up and run in a 17 1/2” rock bit with center punch assembly to TD. Center punch 15-20’ of 17-1/2” hole. Lay down the stabilizer. Drill a 17 1/2” pilot hole to +/- 420 FT Run a deviation survey (TOTCO) every 90 FT (every 30 FT if deviation is a problem). There shall be no more than 1 degree per 100 FT
5. Circulate and condition the hole for running logs.

6. Rig up a wireline service company. Run the appropriate logs (See Logging Program). Rig down and move out the wireline company.

7. Pick up and run in a 26" hole-opener with a 17 1/2" rock bit strapped to the bottom. Open the 17-1/2" pilot hole to 26" to +/- 420 FT GL. If practical, make the hole to fit the casing length.

8. Circulate and condition the hole.

9. POOH with the 26" hole opening assembly.

10. Rig up a wireline service company and run a 30" 4-arm XY Caliper log from TD to conductor pipe.

11. Rig up a casing crew service and run approx. 10 joints of 20", 94# J-55, STC or BTC casing to +/- 420 FT GL. Float shoe and float collar (stinger type) will be installed on the first joint before it is delivered to site install centralizers in the middle of the first two joints then one on every other joint to surface.

12. Notify the MDEQ (or EPA Region V) office at least 8 hrs. prior to cementing.

13. Pick up and run in a cementing string of 5" drill pipe with a stinger sub on bottom and a bow centralizer in the middle of the first joint, to the top of the float collar. Install a 20" cement head. Strip a 4-1/2" pack-off assembly over the string. Make it up onto the cementing head. Sting into the float collar then pack off the drill pipe (fill the 20"" by 4-1/2" annulus before packing off). Circulate the well with the rig pumps until the cement pumping units are rigged up and the mud viscosity is similar to the planned cement viscosity.

14. Rig up a cementing company. Cement the 20" casing to surface. Top off if necessary. Pull the 4-1/2" cementing string out of the stab-in float collar. Test float equipment. Circulate the well "indirect" to check that the cementing string is clear. Drain the annular and wash the cement out of the BOP.

15. After 24 hours wait on cement (WOC), pressure test the 20" casing. (Pressure to be determined) Hold the test for 30 minutes, record it on a pressure test recorder. Use a chart recorder to record this test. There shall not be more than a 10% drop in pressure. If so, then the test must be repeated. Bleed off the pressure.

16. Unpack the drill pipe. Loosen the pack off assembly on top of the cementing head. Remove the cementing head from the casing. Pull the cementing string out of the hole.

17. Cut the 20" casing and install the 21-1/4" annular and double gate BOPE. Install drilling nipple and nipple up a flow line.

18. Pick up and run in a 17 1/2" bit to the top of the float collar.

19. Circulate and condition the hole. Test the casing and blowout preventers.

20. Drill out the float collar, cement, float shoe, cement, and 10 - 15 feet of new formation.

21. Conduct a formation pressure test for 10 minutes at pressure TBD.

22. Circulate hole clean and treat mud for cement contamination.

23. Drill a 17 1/2" hole to +/- 750 FT GL (Top of Salina B salt expected at approx. 1000' GL), running a deviation survey (TOTCO) every 90 FT (every 30 FT if deviation is a problem). There shall be no more than 1 degree per 100 FT

24. Displace freshwater mud system with salt brine based mud system.

25. Run in hole with 8" core assembly and make several core runs to log 750 FT GL to 1000 FT GL (250 FT total) (top of Salina B salt). (This is recommended by RESPEC in the 2014 Pre-Feasibility study)

26. Continue coring with 8" core assembly and core from 1000 FT GL to 1100 FT GL (100 FT total).

27. Remove core assembly and run back in with 17-1/2" bit and drill core hole from 750 FT GL to 1030 FT GL.

28. Circulate and condition the hole for running logs.

29. Rig up a wireline logging service company. Run the appropriate open hole logs including a 30" XY Caliper log from total depth to surface. Rig down and move out the wireline service company.

30. Run in with drill pipe and dump formation sand to fill up 8" core hole to 1030 FT GL (or top of the Salina B as determined from the logs). Sand will be used to pump the cement against.

31. Rig up a casing crew service and run approx. 25 joints of 13 3/8", 61 lb/FT, 0.430" WT, J-55, 8 rd casing to +/- 1015 FT GL. Install a float shoe and float collar on the first joint of casing . Install centralizers in the middle of the first two joints then one on every other joint to surface. Run casing to total depth. Chain the casing to the substructure to prevent it from floating while cementing.

32. Rig up a cementing company. (If returns were not lost during drilling of this section, salt saturated cement will be used for the entire job. If returns were lost and not regained, the bottom section in the salt will be cemented with salt saturated cement and the upper section will be cemented with fresh water cement pumped down the backside of the 13 3/8" casing. Cement the 13 3/8" casing to surface. Top off if necessary. Drain the cement out of the BOPE and wash clean.

33. AFTer 72 hours (cement is salt saturated) WOC observe surface samples, if set up sufficiently, Release. If not set up, wait an additional 8 hrs and check. Remove the BOPE.

Cut the 13 3/8” casing and nipple up a 13-5/8” casinghead. Install 13-5/8” double gate BOP and Annular BOP. Install drilling nipple and flow line.

34. Pick up and run in a 12-1/4” bit in the well.
35. Circulate and condition the hole.
36. Drill out the float collar, cement, float shoe, cement, and 10 - 15 feet of new formation.
37. Conduct a formation integrity test for 10 minutes.
38. Circulate hole clean and treat mud for cement contamination.
39. Drill 12-1/4” hole to total depth at 1150 FT
40. Rig up a wireline logging service company. Run the appropriate openhole logs. Rig down and move out the wireline service company.
41. Circulate the drilling mud out of the hole and haul it off to a disposal site. Circulate clean 10 lb/gal brine water until the well is clean.
42. Pull out of the hole laying down the drilling assembly.
43. Install the 13-3/8” casing spool. Energize the ‘P’ seals then test the 13 3/8” casing section to the appropriate test pressure for 15 minutes.
44. Rig up to run +/-1070 FT of 8-5/8”, 32 lb/FT, J-55 casing with a BT&C thread. Run casing, externally testing to 80% of collapse on each connection under tension for 60 to 90 seconds each (if possible).
45. Install the 9” 2M” casing spool. Energize the ‘P’ seals then test the 8-5/8” hanger section to the appropriate test pressure for 15 minutes.
46. Rig up to run +/-1140 FT of 5 1/2”, 14 lb/FT, J-55 casing having a BT&C connection.
47. Install the 9” 2M x 5 1/2” 2M spool. Energize the ‘P’ seals then test the 5-1/2” hanger section to the appropriate test pressure for 15 minutes.
48. Install valves and flanges as needed to secure the well.
49. Rig down and move out the drilling rig.

## LOGGING PROGRAM

1. 17-1/2" Pilot Hole for 20" Surface Casing (420 FT to 100 FT) – Freshwater Mud
   - Resistivity Log w/ SP and Gamma Ray
   - Compensated Neutron Log (Porosity)
   - Litho Density Log

2. 26" Open Hole for 20" Surface Casing
   - 4-Arm (X-Y) Caliper Log for 26" open hole from 420 FT to Surface. The 4-Arm (X-Y) Caliper Log should have a volume totalizer.

3. 17-1/2" Hole for 13-3/8" Intermediate Casing (1015 FT to 420 FT)– Saltwater Mud
   - Resistivity Log w/ SP and Gamma Ray
   - Compensated Neutron Log (Porosity)
   - Litho Density Log
   - 4-Arm (X-Y) Caliper Log. The 4-Arm (X-Y) Caliper Log should have a volume totalizer.

4. 12-1/4" Hole (1,015 FT to 1,180 FT) – Saltwater Mud
   - Resistivity Log (Laterolog) and Gamma Ray
   - Compensated Neutron Log (Porosity)
   - Litho Density Log
   - Natural Gamma Ray – Spectralog (Detection of Potassium, Thorium and Uranium in Salt)
   - Full Wave Sonic/Monopole Sonic/Dipole Sonic Log

5. 12-1/4" Open Hole & 13-3/8" Cased Hole from 1,180 FT (TD) to Surface
   - Gyroscopic Multi-shot Directional Survey (50 FT and 100 FT stations) inside the drill pipe prior to the displacement of the drilling with brine. A shot is to be taken every 100 FT from TD (1170 FT) to the 13-3/8" casing shoe (1015 FT) and 50 FT stations from the 13-3/8" casing shoe to surface.

6. 20" Cased Hole Logs from 420 FT to Surface
   - Segmented Bond Log (360° cement bond evaluation)

7. 13-3/8" Cased Hole Logs from 1020 FT to Surface
   - Segmented Bond Log (360° cement bond evaluation)
   - Vertilog (Magniflux – internal/external casing corrosion evaluation)

## MUD PROGRAM

Surface Casing Hole: Surface – 420 FT GL. (17-1/2" pilot – 23" HO)

Type - Fresh water Bentonite (Low Solids)
Weight - 8.5 to 8.8 lb/gal
Viscosity - 35 to 65 seconds (Marsh Funnel) as required
Water loss - 15 – 20 cc
Surface Capacity - Approx. 1000 bbls

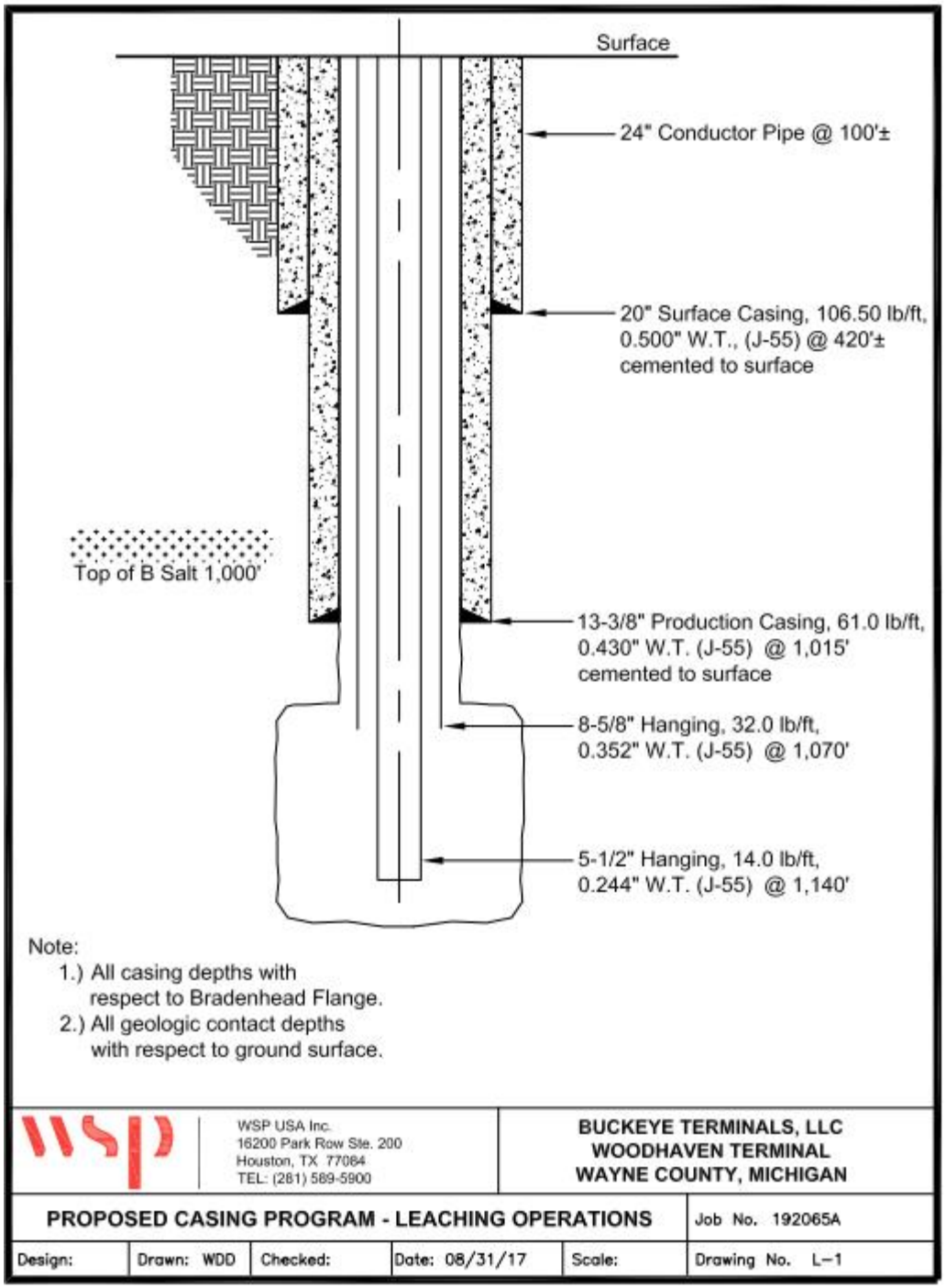
Intermediate Casing Hole Lower: 420 FT – 1015 FT GL (17-1/2" Hole)

Type - Salt saturated brine Water Drilling Clay (Low Solids)
Weight - 9.8-10.0 lb/gal
Viscosity - 35 to 50 seconds (Marsh Funnel) as required
Water loss - 20 cc
Surface Capacity - Approx. 1000 bbls

Cavern Interval: 1015 FT – 1150 FT GL (12-1/4" Hole)

Type - Salt saturated brine Water Drilling Clay (Low Solids)
Weight - 9.8-10.0 lb/gal
Viscosity - 35 to 50 seconds (Marsh Funnel) as required
Water loss - No Control
Surface Capacity - Approx. 1000 bbls

## WELLBORE SCHEMATIC



# APPENDIX

# C EPA PLUGGING AND ABANDONMENT PLAN - EPA FORM 7540-14 (SEE ATTACHMENT Q)

October 11, 2017

Mr. Grant McHardy
Buckeye Partners, LP
One Greenway Plaza
Suite 600
Houston, TX 77046

Re: Plugging and Abandonment Costs
Proposed Class III Salt Cavern Solution Mining Wells CW 1 through 4

Dear Mr. McHardy:

WSP has completed an estimate for the plugging and abandonment procedures and associated costs for the closure of Buckeye Partners, LP Woodhaven Terminal Wells CW 1 through 4. Field plugging procedures provided with this application were used as a basis for this estimate. This estimate reflects current rates applicable to the Midwest for oilfield services including workover rigs, oilfied supplies and cementing equipment. A summary of the cost to plug and abandon each cavern well (October, 2017) is provided below. Complete cost estimates are provided as attachments.

| WELL NO. | P&A ESTIMATE |
|---|---|
| CW 1 | $224,050 |
| CW 2 | $224,050 |
| CW 3 | $224,050 |
| CW 4 | $224,050 |
| **Total** | $896,200 |

Kind regards,

Brandon Schulte
Mgr. Permitting & Well Integrity

Enclosures

WSP USA
Suite 200
16200 Park Row
Houston, TX 77084

Tel.: +1 281 589-5900
Fax: +1 281 759-5164
wsp.com

# BUDGET COST ESTIMATE

| | |
|---|---|
| Client Name: | Buckeye Parterns, LP |
| Project Name: | P&A Cost Estimate Per Well (CW 1, 2, 3, & 4) |
| Date: | 10/11/2017 |
| Project No.: | 192065A |
| Estimate By: | Tim Jones |
| Reviewed By: | Brandon Schulte |

Rev. 0

| | | | |
|---|---|---|---|
| **01** | **MANAGEMENT COST** | | |
| 01 | LABOR - OFFICE | | $6,200 |
| 02 | LABOR - FIELD | | $12,000 |
| 03 | EXPENSES | | $1,800 |
| 04 | MISCELLANEOUS | | $0 |
| 05 | SPECIAL LABOR & SERVICES | | $0 |
| 06 | SPECIAL EXPENSES | | $0 |
| | **SUBTOTAL - 01 MANAGEMENT COST** | | **$20,000** |
| **02** | **SERVICES AND RENTALS** | | |
| 01 | LOCATION | | $0 |
| 02 | RIG MOBILIZATION/DEMOBILIZATION | | $0 |
| 03 | DRILLING RIG | | $0 |
| 04 | FUEL | | $0 |
| 05 | DRILLING WATER | | $0 |
| 06 | DRILLING FLUIDS & SOLIDS CONTROL | | $0 |
| 07 | BITS, HOLE OPENERS, AND UNDERREAMERS | | $0 |
| 08 | RENTAL TOOLS, FISHING TOOLS AND SERVICES | | $30,000 |
| 09 | DIRECTIONAL DRILLING | | $0 |
| 10 | CEMENT, CEMENT SERVICES, HARDWARE | | $35,000 |
| 11 | LOGGING, PERFORATING & WIRELINE SERVICES | | $40,000 |
| 12 | CORING & CORE ANALYSIS | | $0 |
| 13 | WORKOVER RIG | | $50,000 |
| 14 | MUDLOGGING, RESERVOIR TESTING & ANALYSIS, ETC. | | $0 |
| 15 | STIMULATION, NITROGEN, PUMP TRUCKS | | $0 |
| 16 | CASING CREWS & TOOLS, EXT. TESTERS, SPEAR SERVICES | | $20,000 |
| 17 | WELDING | | $500 |
| 18 | TESTING , INSPECTION, & REPAIR SERVICES | | $0 |
| 19 | TRANSPORTATION | | $0 |
| 20 | HAULING, VACUUM TRUCKS & DISPOSAL | | $0 |
| 21 | MISCELLANEOUS MATERIALS & SUPPLIES | | $0 |
| 22 | MISCELLANEOUS SERVICES & EQUIPMENT | | $0 |
| 23 | SITE COMMUNICATIONS | | $0 |
| 24 | HEALTH, SAFETY & ENVIRONMENTAL | | $0 |
| 25 | CONSULTANTS AND SPECIAL SERVICES | | $0 |
| | **SUBTOTAL - 02 SUBCONTRACTS, SERVICES, RENTALS** | | **$175,500** |
| **03** | **MATERIALS** | | |
| 01 | CASING | | $0 |
| 02 | WELLHEAD EQUIPMENT | | $0 |
| 03 | COMPLETION EQUIPMENT | | $10,000 |
| | **SUBTOTAL - 03 MATERIALS** | | **$10,000** |
| **04** | **TAXES** | | |
| 01 | SALES TAX - LOCAL & STATE - INCLUDED IN LINE ITEMS | | |
| 02 | CONTRACTOR'S TAX | **0%** | $0 |
| | **SUBTOTAL - 04 TAXES** | | **$0** |
| **05** | **PROJECT CONTINGENCIES** | | |
| 01 | SERVICES | **0%** | $0 |
| 02 | MATERIALS | **0%** | $0 |
| | **SUBTOTAL - 05 PROJECT CONTINGENCIES** | | **$0** |
| **06** | **PROJECT MANAGEMENT FEES** | | |
| 01 | SERVICES | **10%** | $17,550 |
| 02 | MATERIALS | **10%** | $1,000 |
| | **SUBTOTAL - 06 PROJECT MANAGEMENT FEES** | | **$18,550** |
| | **TOTAL COST ESTIMATE** | | **$224,050** |

OMB No. 2040-0042 Approval Expires 12/31/2018

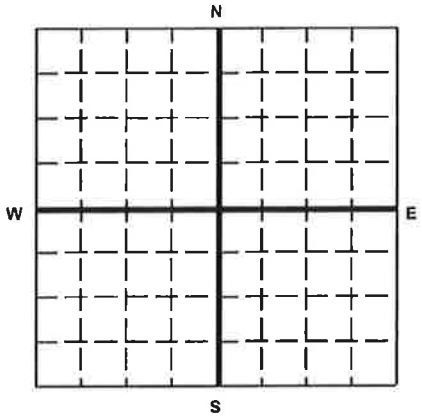
EPA

United States Environmental Protection Agency
Washington, DC 20460

# PLUGGING AND ABANDONMENT PLAN

| Name and Address of Facility | Name and Address of Owner/Operator |
|---|---|
| Buckeye Woodhaven Terminal<br>Woodhaven, MI | Buckeye Terminals, LLC |

Locate Well and Outline Unit on Section Plat - 640 Acres




| State | County | Permit Number |
|---|---|---|
| Michigan | Wayne | |

Surface Location Description

nw 1/4 of NE 1/4 of nw 1/4 of NE 1/4 of Section 22 Township 04S Range 10E

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

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

TYPE OF AUTHORIZATION

- [ ] Individual Permit
- [x] Area Permit
- [ ] Rule

Number of Wells 4

Lease Name

WELL ACTIVITY

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

Well Number CW 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 |
|---|---|---|---|---|
| 24 | | | 100 | |
| 20 | 94 | | 420 | 26 |
| 13 3/8 | 61 | | 1015 | 17 1/2 |
| | | | | |

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- [x] The Balance Method
- [ ] The Dump Bailer Method
- [ ] The Two-Plug Method
- [ ] Other

| CEMENTING TO PLUG AND ABANDON DATA: | PLUG #1 | PLUG #2 | PLUG #3 | PLUG #4 | PLUG #5 | PLUG #6 | PLUG #7 |
|---|---|---|---|---|---|---|---|
| Size of Hole or Pipe in which Plug Will Be Placed (inche | 12.515 | 12.515 | | | | | |
| Depth to Bottom of Tubing or Drill Pipe (ft | 1000 | 600 | | | | | |
| Sacks of Cement To Be Used (each plug) | 347.5 | 521.2 | | | | | |
| Slurry Volume To Be Pumped (cu. ft.) | 410.0 | 615.0 | | | | | |
| Calculated Top of Plug (ft.) | 600 | 0 | | | | | |
| Measured Top of Plug (if tagged ft.) | 600 | 0 | | | | | |
| Slurry Wt. (Lb./Gal.) | 15.6 | 15.3 | | | | | |
| Type Cement or Other Material (Class III) | H | H | | | | | |

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

| From | To | From | To |
|---|---|---|---|
| 1015 | 1150 | | |
| | | | |
| | | | |
| | | | |

Estimated Cost to Plug Wells

$224,050

## 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 |
|---|---|---|
| Carl A. Ostach, VP Domestic Field Operations | Carl A. Ostach | 12/15/17 |

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OMB No. 2040-0042 Approval Expires 12/31/2018

United States Environmental Protection Agency
Washington, DC 20460

# PLUGGING AND ABANDONMENT PLAN

| Name and Address of Facility | Name and Address of Owner/Operator |
|---|---|
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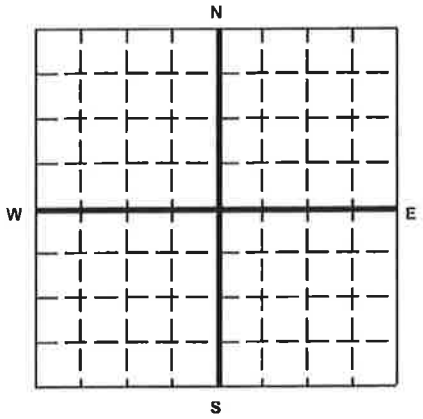
Locate Well and Outline Unit on Section Plat - 640 Acres




| State | County | Permit Number |
|---|---|---|
| Michigan | Wayne | |

Surface Location Description

nw 1/4 of NE 1/4 of nw 1/4 of NE 1/4 of Section 22 Township 04S Range 10E

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

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

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

Number of Wells 4

Lease Name

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

Well Number CW 2

CASING AND TUBING RECORD AFTER PLUGGING

| SIZE | WT (LB/FT) | TO BE PUT IN WELL (FT) | TO BE LEFT IN WELL (FT) | HOLE SIZE |
|---|---|---|---|---|
| 24 | | | 100 | |
| 20 | 94 | | 420 | 26 |
| 13 3/8 | 61 | | 1015 | 17 1/2 |
| | | | | |

METHOD OF EMPLACEMENT OF CEMENT PLUGS
- [x] The Balance Method
- [ ] The Dump Bailer Method
- [ ] The Two-Plug Method
- [ ] Other

| CEMENTING TO PLUG AND ABANDON DATA: | PLUG #1 | PLUG #2 | PLUG #3 | PLUG #4 | PLUG #5 | PLUG #6 | PLUG #7 |
|---|---|---|---|---|---|---|---|
| Size of Hole or Pipe in which Plug Will Be Placed (Inche | 12.515 | 12.515 | | | | | |
| Depth to Bottom of Tubing or Drill Pipe (ft | 1000 | 600 | | | | | |
| Sacks of Cement To Be Used (each plug) | 347.5 | 521.2 | | | | | |
| Slurry Volume To Be Pumped (cu. ft.) | 410.0 | 615.0 | | | | | |
| Calculated Top of Plug (ft.) | 600 | 0 | | | | | |
| Measured Top of Plug (If tagged ft.) | 600 | 0 | | | | | |
| Slurry Wt. (Lb./Gal.) | 15.6 | 15.3 | | | | | |
| Type Cement or Other Material (Class III) | H | H | | | | | |

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

| From | To | From | To |
|---|---|---|---|
| 1015 | 1150 | | |
| | | | |
| | | | |
| | | | |

Estimated Cost to Plug Wells

$224,050

## Certification

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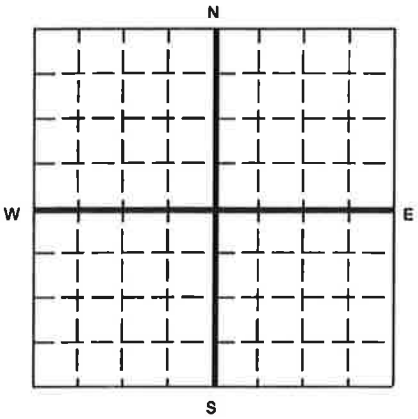


| State | County | Permit Number |
|---|---|---|
| Michigan | Wayne | |

Surface Location Description

nw 1/4 of NE 1/4 of nw 1/4 of NE 1/4 of Section 22 Township 04S Range 10E

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

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

TYPE OF AUTHORIZATION

- [ ] Individual Permit
- [✓] Area Permit
- [ ] Rule

Number of Wells 4

Lease Name

WELL ACTIVITY

- [ ] CLASS I
- [ ] CLASS II
  - [ ] Brine Disposal
  - [ ] Enhanced Recovery
  - [ ] Hydrocarbon Storage
- [✓] CLASS III

Well Number CW 3

CASING AND TUBING RECORD AFTER PLUGGING

| SIZE | WT (LB/FT) | TO BE PUT IN WELL (FT) | TO BE LEFT IN WELL (FT) | HOLE SIZE |
|---|---|---|---|---|
| 24 | | | 100 | |
| 20 | 94 | | 420 | 26 |
| 13 3/8 | 61 | | 1015 | 17 1/2 |
| | | | | |

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- [✓] The Balance Method
- [ ] The Dump Bailer Method
- [ ] The Two-Plug Method
- [ ] Other

| CEMENTING TO PLUG AND ABANDON DATA: | PLUG #1 | PLUG #2 | PLUG #3 | PLUG #4 | PLUG #5 | PLUG #6 | PLUG #7 |
|---|---|---|---|---|---|---|---|
| Size of Hole or Pipe in which Plug Will Be Placed (inche | 12.515 | 12.515 | | | | | |
| Depth to Bottom of Tubing or Drill Pipe (ft | 1000 | 600 | | | | | |
| Sacks of Cement To Be Used (each plug) | 347.5 | 521.2 | | | | | |
| Slurry Volume To Be Pumped (cu. ft.) | 410.0 | 615.0 | | | | | |
| Calculated Top of Plug (ft.) | 600 | 0 | | | | | |
| Measured Top of Plug (If tagged ft.) | 600 | 0 | | | | | |
| Slurry Wt. (Lb./Gal.) | 15.6 | 15.3 | | | | | |
| Type Cement or Other Material (Class III) | H | H | | | | | |

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

| From | To | From | To |
|---|---|---|---|
| 1015 | 1150 | | |
| | | | |
| | | | |
| | | | |

Estimated Cost to Plug Wells

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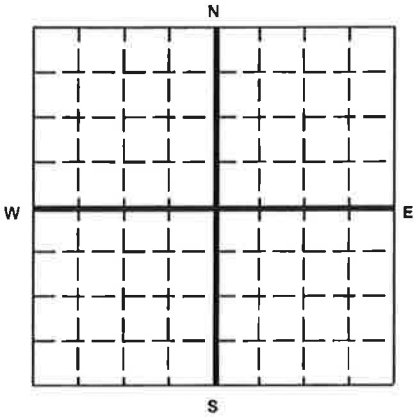


| State | County | Permit Number |
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- [x] Area Permit
- [ ] Rule

Number of Wells 4

Lease Name

WELL ACTIVITY

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

Well Number CW 4

CASING AND TUBING RECORD AFTER PLUGGING

| SIZE | WT (LB/FT) | TO BE PUT IN WELL (FT) | TO BE LEFT IN WELL (FT) | HOLE SIZE |
|---|---|---|---|---|
| 24 | | | 100 | |
| 20 | 94 | | 420 | 26 |
| 13 3/8 | 61 | | 1015 | 17 1/2 |
| | | | | |

METHOD OF EMPLACEMENT OF CEMENT PLUGS

- [x] The Balance Method
- [ ] The Dump Bailer Method
- [ ] The Two-Plug Method
- [ ] Other

| CEMENTING TO PLUG AND ABANDON DATA: | PLUG #1 | PLUG #2 | PLUG #3 | PLUG #4 | PLUG #5 | PLUG #6 | PLUG #7 |
|---|---|---|---|---|---|---|---|
| Size of Hole or Pipe in which Plug Will Be Placed (Inche | 12.515 | 12.515 | | | | | |
| Depth to Bottom of Tubing or Drill Pipe (ft | 1000 | 600 | | | | | |
| Sacks of Cement To Be Used (each plug) | 347.5 | 521.2 | | | | | |
| Slurry Volume To Be Pumped (cu. ft.) | 410.0 | 615.0 | | | | | |
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| Measured Top of Plug (If tagged ft.) | 600 | 0 | | | | | |
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| Type Cement or Other Material (Class III) | H | H | | | | | |

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

| From | To | From | To |
|---|---|---|---|
| 1015 | 1150 | | |
| | | | |
| | | | |
| | | | |

Estimated Cost to Plug Wells

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**Paperwork Reduction Act Notice**

The public reporting and record keeping burden for this collection of information is estimated to average 4.5 hours for operators of Class I hazardous wells, 1.5 hours for operators of Class I non-hazardous wells, 3 hours for operators of Class II wells, and 1.5 hours for operators of Class III wells.
Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to the collection of information; search data sources; complete and review the collection of information; and, transmit or otherwise disclose the information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR Part 9 and 48 CFR Chapter 15.
Please send comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including the use of automated collection techniques to Director, Office of Environmental Information, Collection Strategies Division, U.S. Environmental Protection Agency (2822), Ariel Rios Building, 1200 Pennsylvania Ave., NW., Washington, DC 20460; and to the Office of Information and Regulatory Affairs, Office of Management and Budget, 725 17th Street, NW., Washington, DC 20503, Attention: Desk Officer for EPA. Please include the EPA ICR number and OMB control number in any correspondence.