US EPA RECORDS CENTER REGION 5
483408

# SAMPLING DATA

[illegible] FORD ROAD ■ GARDEN CITY, MICHIGAN 48135 ■ PHONE: (313) 422-7474

April 9, 1984

Total Petroleum
East Superior Street
Alma, Michigan 48801

Attention: Bernie Shaver

Dear Mr. Shaver:

Pursuant to your request we have completed the study of your three (3) samples and have previously submitted the report that covered the Priority Pollutant examination. Enclosed kindly find the additional report that covers the examinations of Total Toxic Organics as specified in Federal Register, Volume 48, No. 137, Friday July 15, 1983, Rules and Regulations.

In addition the Methylene Chloride as reported in our subsequent report to you, kindly be advised that no other organic was detected, other that the Methylene Chloride. The complete list of Toxic Organics as specified in the monologue above was completely negative.

The Total Organic Carbon Analysis was as follows:

| | Well# | |
|---|---|---|
| Sample #1 | 21 | Less than 1.0 ppm |
| Sample #2 | 17 | 8.4 ppm |
| Sample #3 | 19 | 6.6 ppm |

CERTIFIED LABORATORY – U.S. DEPARTMENT OF AGRICULTURE
U.S. DRUG ENFORCEMENT ADMINISTRATION
UNITED STATES FOOD AND DRUG ADMINISTRATION
UNITED STATES NUCLEAR REGULATORY COMMISSION
AMERICAN COUNCIL OF INDEPENDENT LABORATORIES
INSTITUTE OF FOOD TECHNOLOGISTS

FELLOW – AMERICAN INSTITUTE OF CHEMISTS
DIPLOMAT – AMERICAN BOARD OF BIOANALYSTS
AMERICAN CHEMICAL SOCIETY
AMERICAN SOCIETY FOR MICROBIOLOGY
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS

RECEIVED
MAY 29 1987

# AQUIFER TEST ANALYSIS

# SOIL FARM AREA

# FOR

# TOTAL PETROLEUM, INC.

# ALMA, MICHIGAN

PREPARED BY:

FISHBECK, THOMPSON, CARR & HUBER, INC.
6090 E. FULTON, P.O. BOX 211
ADA, MICHIGAN 49301
(616) 676-2666

PROJECT NO. F86208 2015X

MAY 1987

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FIGURE NO. 5 - GROUNDWATER ELEVATION VERSUS TIME MONITOR WELL NO. 30A

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## LIST OF APPENDICES


APPENDIX A - GROUNDWATER FLOW VOLUME DATA

APPENDIX B - BAROMETRIC PRESSURE DATA

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## INTRODUCTION

In 1983, water quality monitoring around the Total Petroleum (Total) soil farm indicated that leachate from buried waste pits had degraded groundwater in the upper aquifer at the site. To isolate these buried pits, Total is evaluating the feasibility of installing a slurry wall around the area.

The soil farm area is underlain by an areally extensive clay layer, which on-site and regional well logs indicate is at least 40 feet thick. Wells and soil borings in the soil farm area have penetrated this clay layer.

The integrity of the clay beneath the site has become suspect. An aquifer test analysis was completed by Fishbeck, Thompson, Carr & Huber, Inc. (FTC&H) at the request of Total to provide evidence of the absence or presence of a hydraulic interconnection between the shallow (less than 20 feet) aquifer and the deep usable aquifer (between 60 to 120 feet) in the soil farm area.

The aquifer test was completed using the plant production wells to pump groundwater from the deep aquifer at a measured rate while monitoring groundwater levels within several shallow monitor wells and the deep production wells. The groundwater levels within the deep aquifer were measured using the air-line method while groundwater levels in the shallow aquifer were measured using remote recording units with pressure transducers. The test was conducted for 10,000 minutes (seven days).

## AQUIFER TEST PROCEDURES

The aquifer test was conducted to provide water level data from both the shallow and deep aquifers while pumping from the deep aquifer. The test data included:

- Groundwater Flow Volumes
- Barometric Pressure Data
- Groundwater Elevation Data-Shallow Aquifer
- Groundwater Level Data-Deep Aquifer

The aquifer test was originally started on February 19, 1987. Due to insufficient flow through the master flow meter to register a pumping rate, the test was aborted. The test was restarted on February 23, 1987 utilizing both production wells within the deep aquifer. Readings from the flow meter totalizer, together with average pumping rates, are included within Appendix A.

The initial phase of the test included collection of groundwater elevation data and barometric pressure readings in a nonpumping state for a period of 5,600 minutes. The second phase of the test was the start-up of both production wells in the soil farm area and monitoring of water levels (shallow and deep aquifers), flow volumes and barometic pressure. The pumping portion lasted 10,000 minutes.

The barometric pressure, flow volumes and water levels within the production wells were measured by Total at four hour intervals. Water levels within the production wells were measured using the air-line method. The water levels within the shallow aquifer zone were measured and recorded with the aid of remote environmental data loggers to within 0.01 feet. Data collected during both phases were obtained following a preprogrammed logarithmic time cycle in the data logger. The flow rate data are included in Appendix A, barometric pressure data are in Appendix B, and the groundwater elevation data of the shallower aquifer are in Appendix C.

## FLOW RATE DATA

The groundwater flow volumes were measured during the aquifer test by Total's staff. The staff was instructed to collect flow meter readings at four-hour intervals for the duration of the test. The two production wells in the soil farm area connect to a single main that feeds water to the plant. Prior to test start-up, the gallonage was recorded from an in-line flow meter. Total's staff collected a totalized flow measurement at each interval. The flow rate data are presented in Appendix A and are graphically shown on Figure 1.

The groundwater flow rate fluctuated between 159 gallons per minute and 435 gallons per minute with an average flow of 300 gallons per minute. The flow rate data are an average over a four-hour period. The flow rate trend indicates higher flows during the day with lower flows at night.

## BAROMETRIC PRESSURE DATA

The on-site barometric pressure was measured during the aquifer test at four-hour intervals by Total's staff. The barometric pressure data are presented in Appendix B with graphical presentation on Figure 2.

The barometric pressure data were converted to feet of water by the following relationship:

$$\underset{\text{(feet of water)}}{\underline{\text{Barometric Pressure}}} = \underset{\text{(inches of mercury)}}{\underline{\text{Barometric Pressure x 1.13}}}$$

By use of the conversion factor, data are presented so that barometric pressure changes could be related to the groundwater level changes within each monitor well.

The data indicate that from the start of the test (time = 0 minutes), the atmospheric pressure increased for 4,740 minutes; the pressure then decreased until 8,820 minutes into the test, then increased until the test ended. The trend in barometric pressure is significant in interpreting changes in the groundwater level data.

## AQUIFER TEST DATA ANALYSIS

The aquifer test data collected from the four shallow aquifer monitor wells (26, 29, 30A and 38) are included in Appendix C and have been presented in two ways. The data are presented as actual groundwater elevation versus time (Figures 3 through 6) and as drawdown in feet versus time (Figures 7 through 10). All four shallow monitor wells used during this test are completed within confined aquifer conditions. This condition was confirmed by interpretation of the atmospheric pressure data together with the groundwater level data.

The barometric pressure was recorded at the site for the full duration of the pump test. This pressure is presented in terms of feet of water and illustrated on Figure 2. An atmospheric low passed over the study site during the last 3,000 minutes of the pump test. The magnitude of the atmospheric low was equivalent to approximately one foot of water.

Water level measurements recorded in the four shallow monitor wells indicated changes in groundwater elevations which corresponds very closely to changes in atmospheric pressure. In particular, the fluctuations in groundwater elevations in each of the monitor wells in the confined portion of the upper aquifer reflect most of the recorded changes in atmospheric pressure. The magnitude of the groundwater elevation fluctuation in monitor well 26, however, was diminished relative to the changes in atmospheric pressure and the groundwater elevation changes observed at the other monitor wells. This reduction in water level fluctuation is the result of the barometric efficiency at monitor well 26.

Generally, changes in atmospheric pressure do not affect water level elevations in monitor wells set in unconfined aquifers, however, these pressure changes do cause water level changes in wells set in confined aquifers. This change should be an inverse reflection of the change in atmospheric pressure (i.e., an increase in atmospheric pressure results in a decrease in water level in the well casing and vice versa).

Inspection of the data plots showing water elevations or drawdown versus time (Figure Nos. 3 through 10) reveal a very consistent trend in water level fluctuations. This trend is evidenced in all monitor wells and is directly attributable to changes in atmospheric pressure. A plot of barometric readings is shown on Figure No. 2. A comparison of this figure with plots of groundwater levels versus time substantiates the effect of atmospheric pressure on groundwater levels. Because of water use patterns within the refinery, it was not possible to maintain a constant pumping rate during the testing period. A plot of flow rate versus time is shown on Figure No. 1. Since we were not attempting to determine the hydraulic characteristics of either aquifer during this test, this fluctuating flow rate was not critical and did not affect the test results. As mentioned earlier in this report, an average flow rate of 300 gpm was maintained throughout the testing period. The variations in pumping rate from the deeper aquifer were not detected in the shallow aquifer system.

## CONCLUSIONS

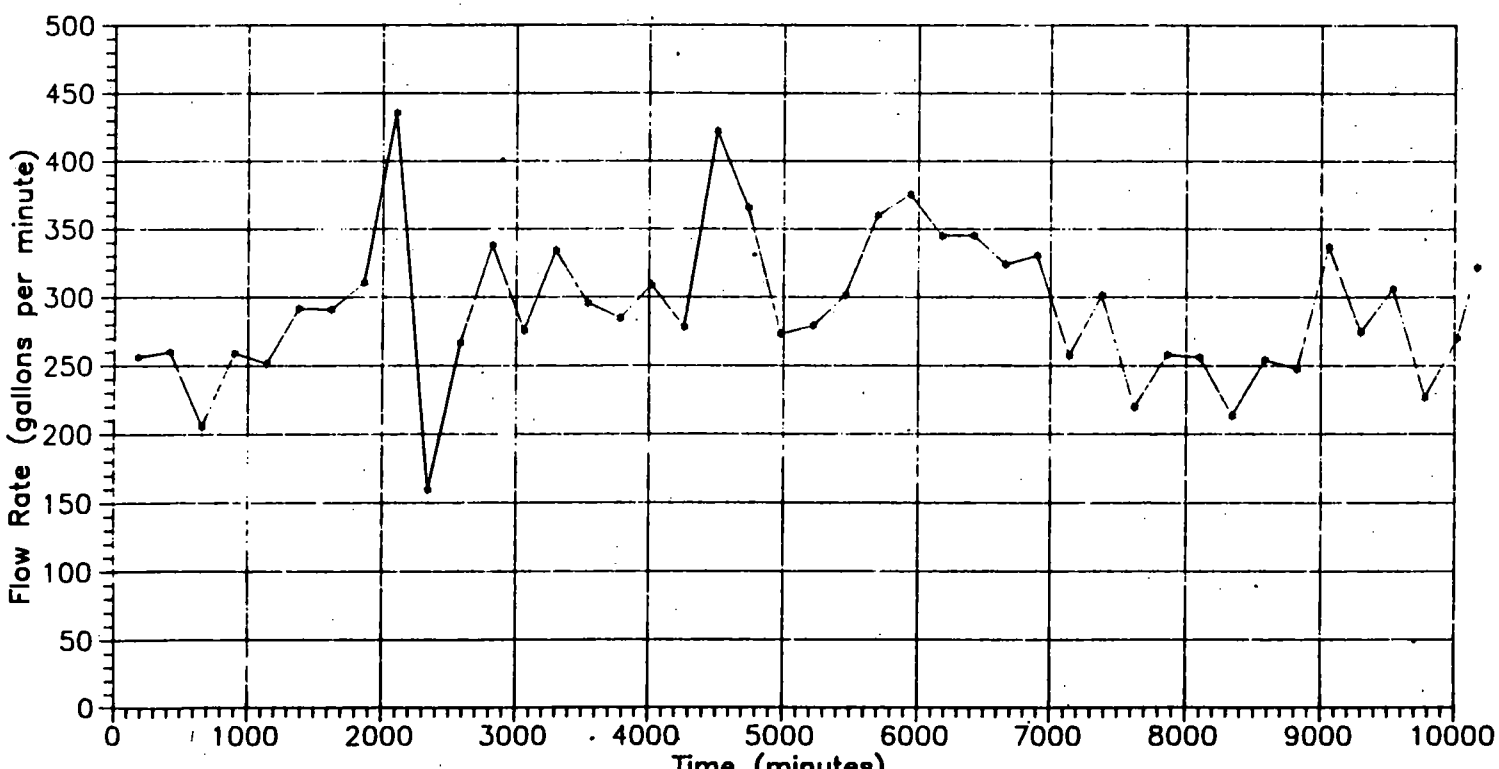
1. Inspection of drilling logs from monitor wells suggest that monitor well Nos. 29, 30A and 38 may exist in a semi-confined condition. However, plots of water levels with time indicate that all monitor wells exist in a confined condition.

2. The deeper usable aquifer (between 60 and 120 feet deep) appears to be adequately protected from the shallow saturated system by the presence of approximately 40 feet of clay.

3. The difference in static water levels between the shallow saturated zone (less than 10 feet) and the deep (greater than 40 feet) aquifer provides additional assurance of the lack of a hydraulic connection between the two saturated zones.

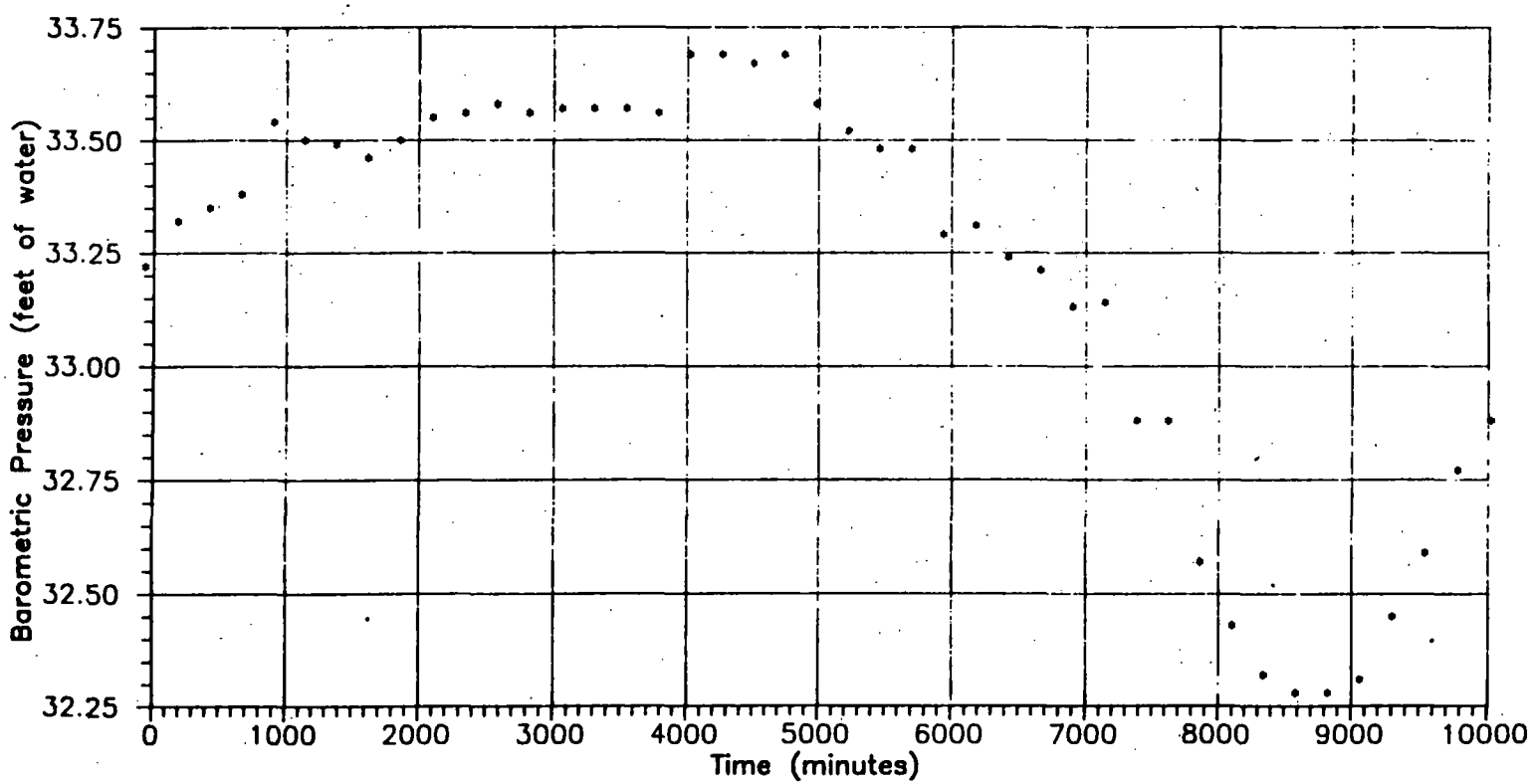
4. The results of this recent pumping test confirm the integrity of the aquiclude by the complete absence of a hydraulic connection during pumping of the deeper aquifer.

Total Petroleum Long Term Pumping Test
Flow Rate Measurements of The Two Production Wells
Starting Time: 2/23/87 1300 Hours (Measurements Averaged Over Four Hours)
Flow Measurements Collected by Total Petroleum Staff




TOTAL PETROLEUM, INC.
ALMA, MICHIGAN
AQUIFER TEST ANALYSIS
1

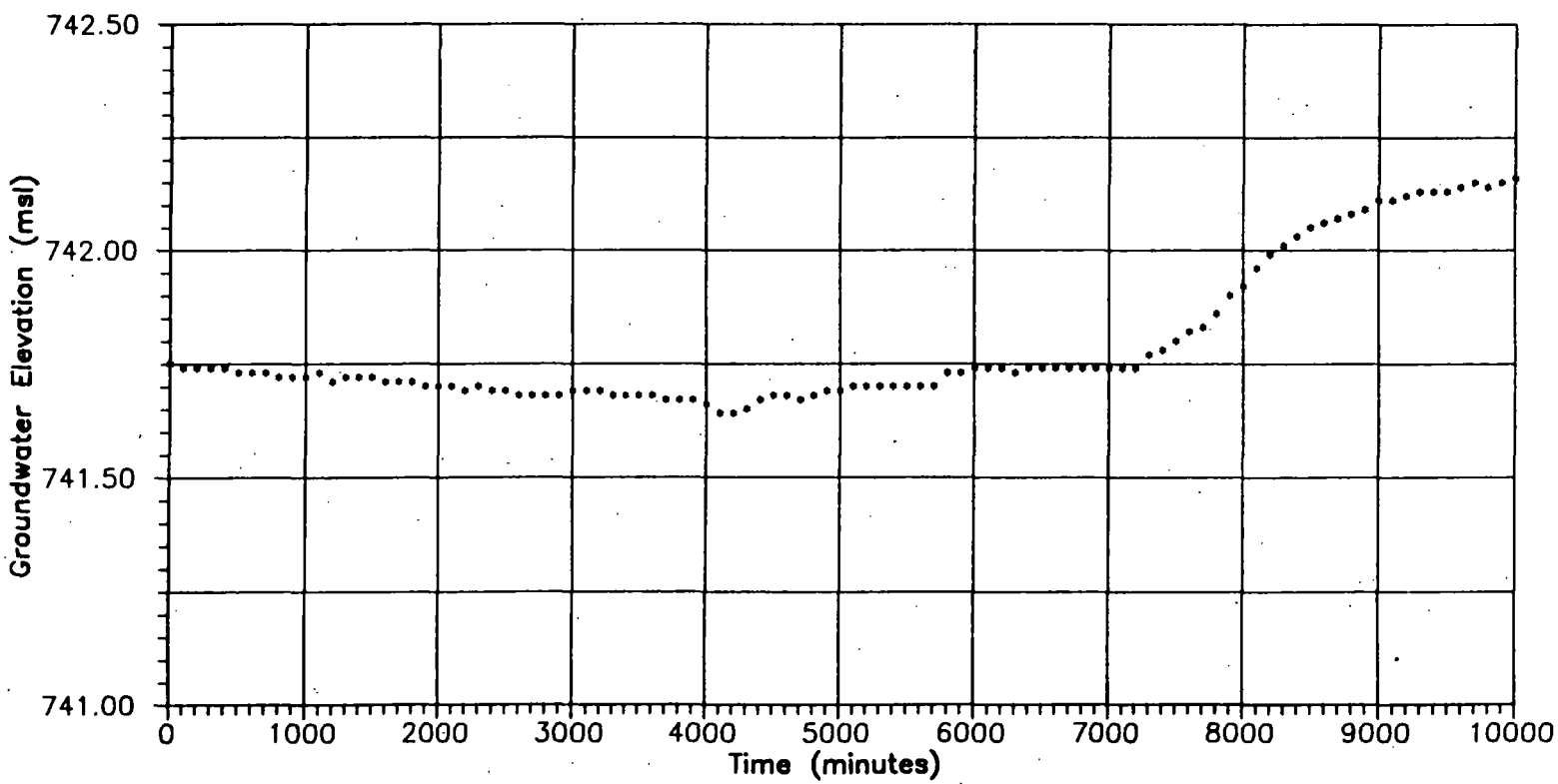
Total Petroleum Long Term Pumping Test
Barometric Pressure Measurements
Start Data Recording: 2/23/87 1200 Hours
Measurements Collected By Total Petroleum Staff




TOTAL PETROLEUM, INC.
ALMA, MICHIGAN
AQUIFER TEST ANA 3

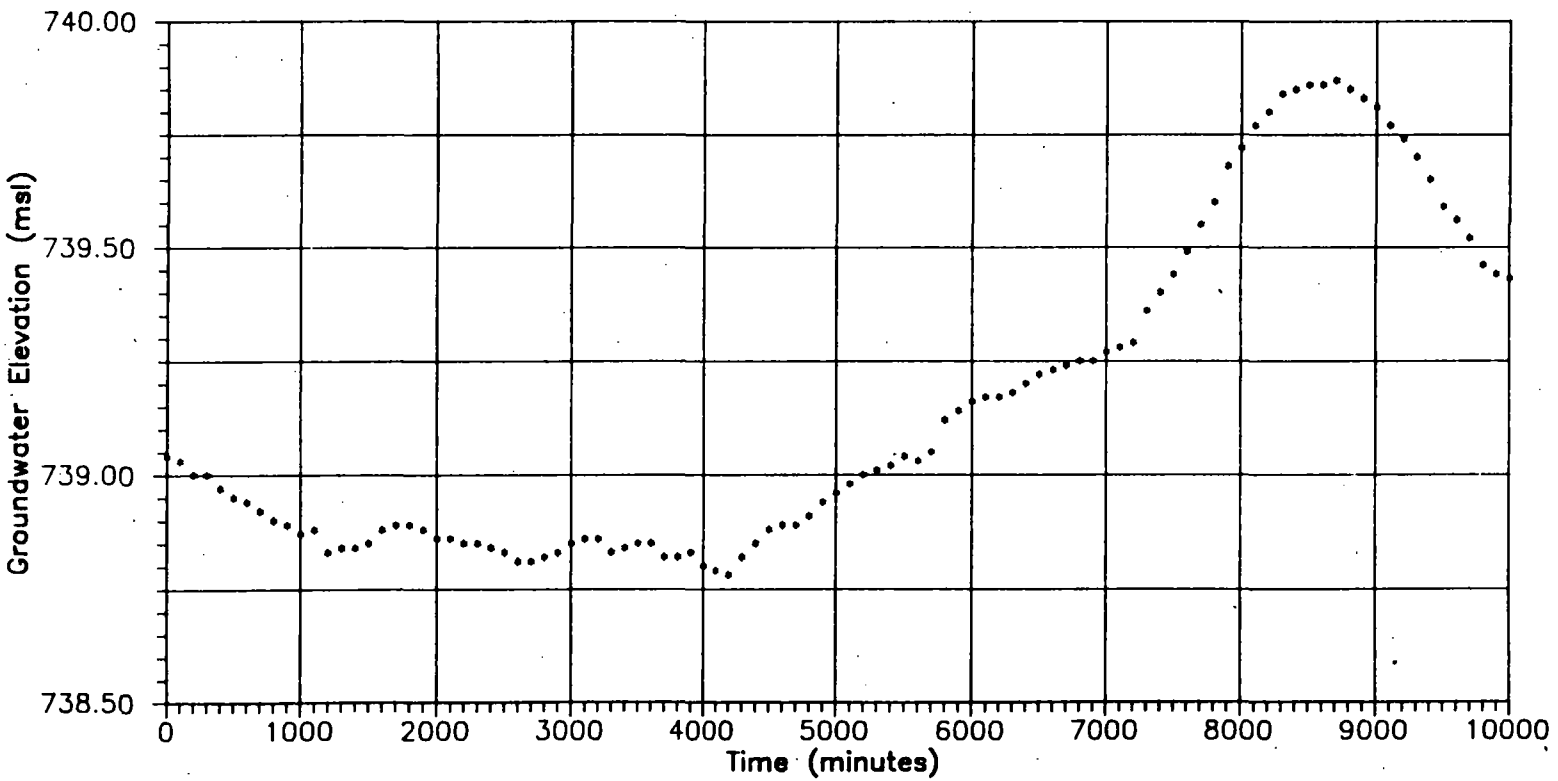
2

Total Petroleum Long Term Pumping Test
Monitor Well No. 26
Starting Time: 2/23/87 1300 Hours




TOTAL PETROLEUM, INC.
ALMA MICHIGAN

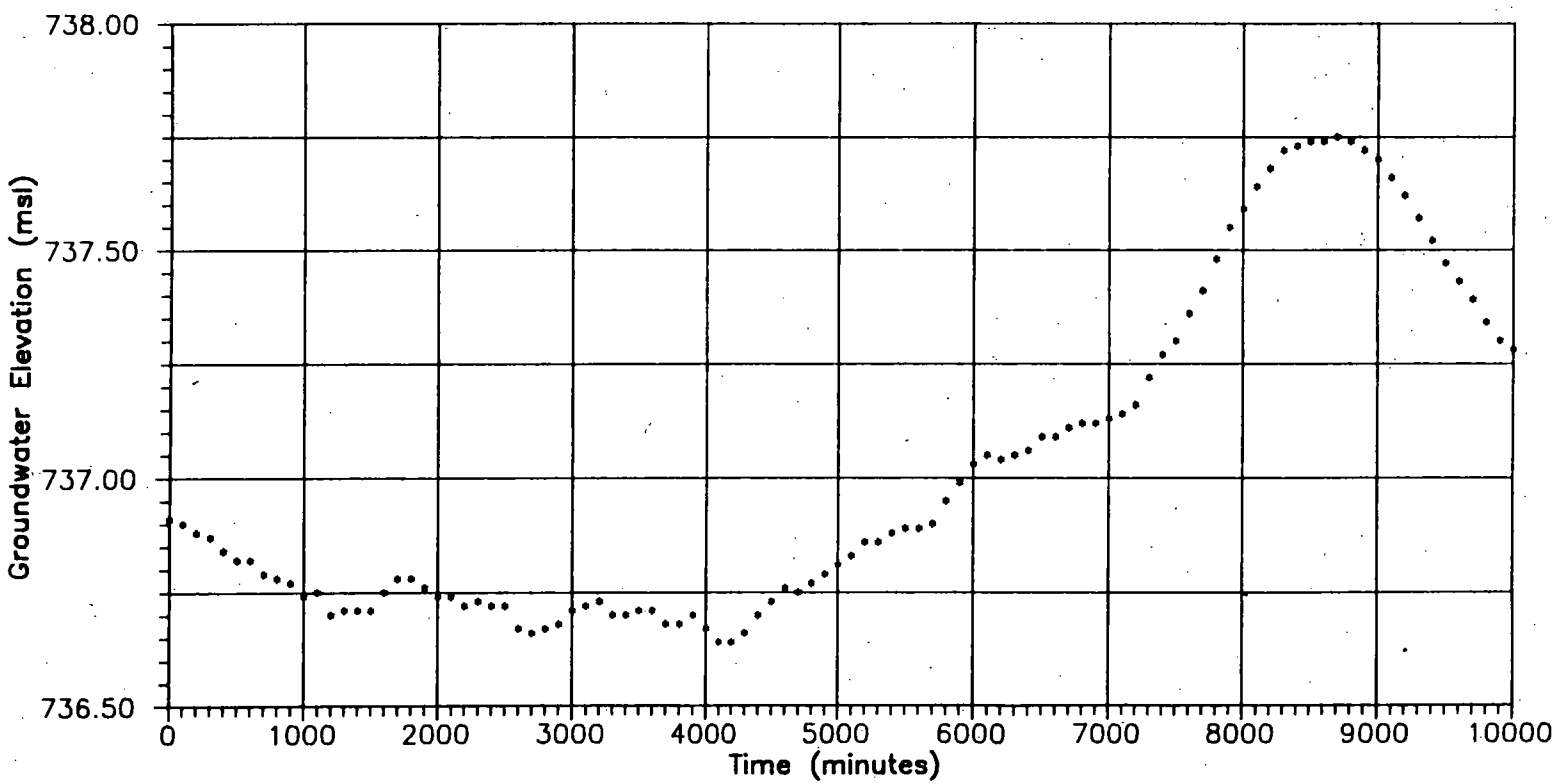
Total Petroleum Long Term Pumping Test
Monitor Well No. 29
Starting Time: 2/23/87 1300 Hours




TOTAL PETROLEUM, INC.
ALMA MICHIGAN
AQUIFER TEST ANA S

4

Total Petroleum Long Term Pumping Test
Monitor Well No. 30A
Starting Time: 2/23/87 1300 Hours

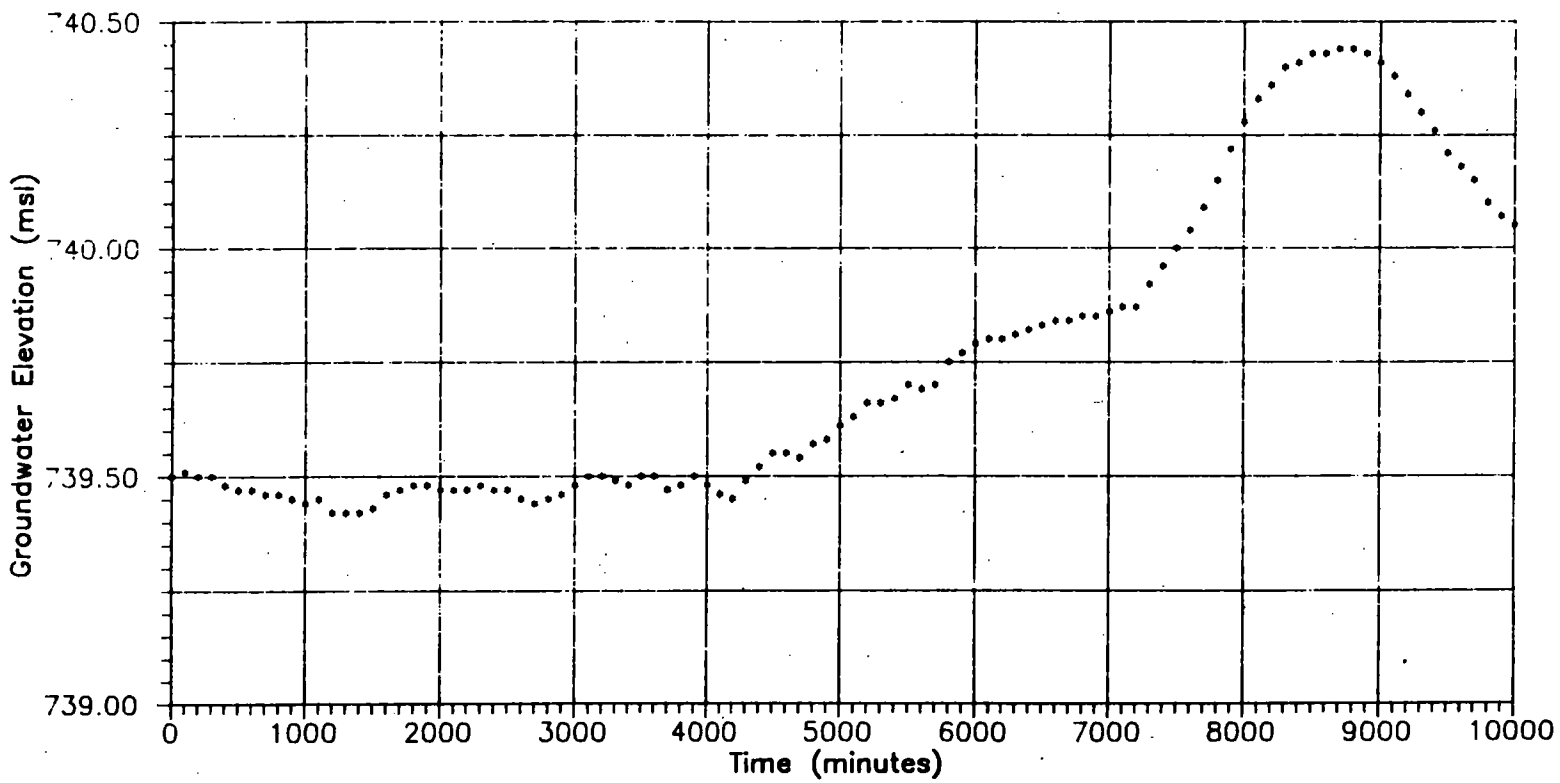



TOTAL PETROLEUM, INC.
ALMA, MICHIGAN

AQUIFER TEST ANALY

5

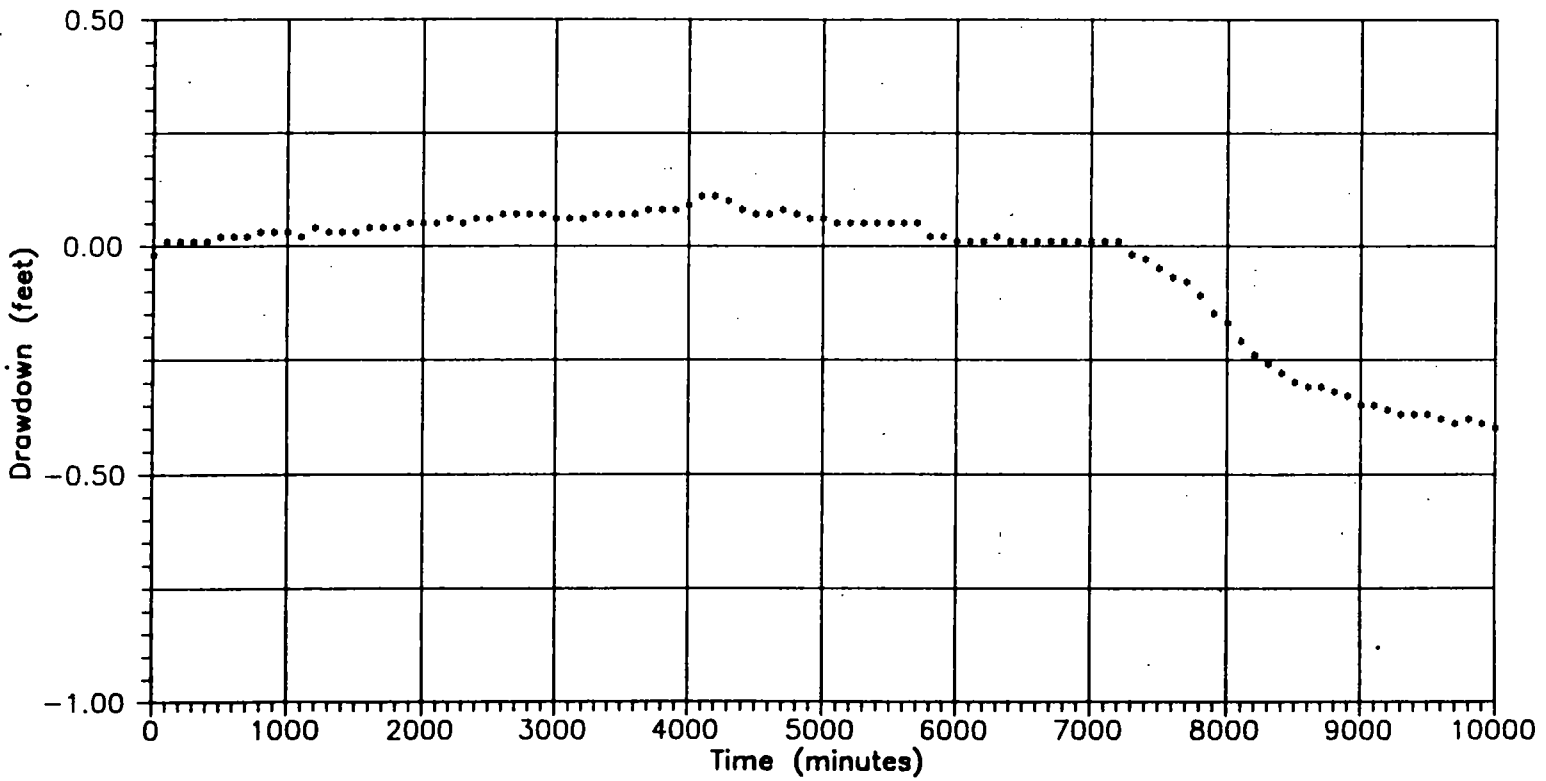
Total Petroleum Long Term Pumping Test
Monitor Well No. 38
Starting Time: 2/23/87 1300 Hours




TOTAL PETROLEUM, INC.
ALMA, MICHIGAN
AQUIFER TEST ANA 3

6

Total Petroleum Long Term Pumping Test
Monitor Well No. 26
Starting Time: 2/23/87 1300 Hours



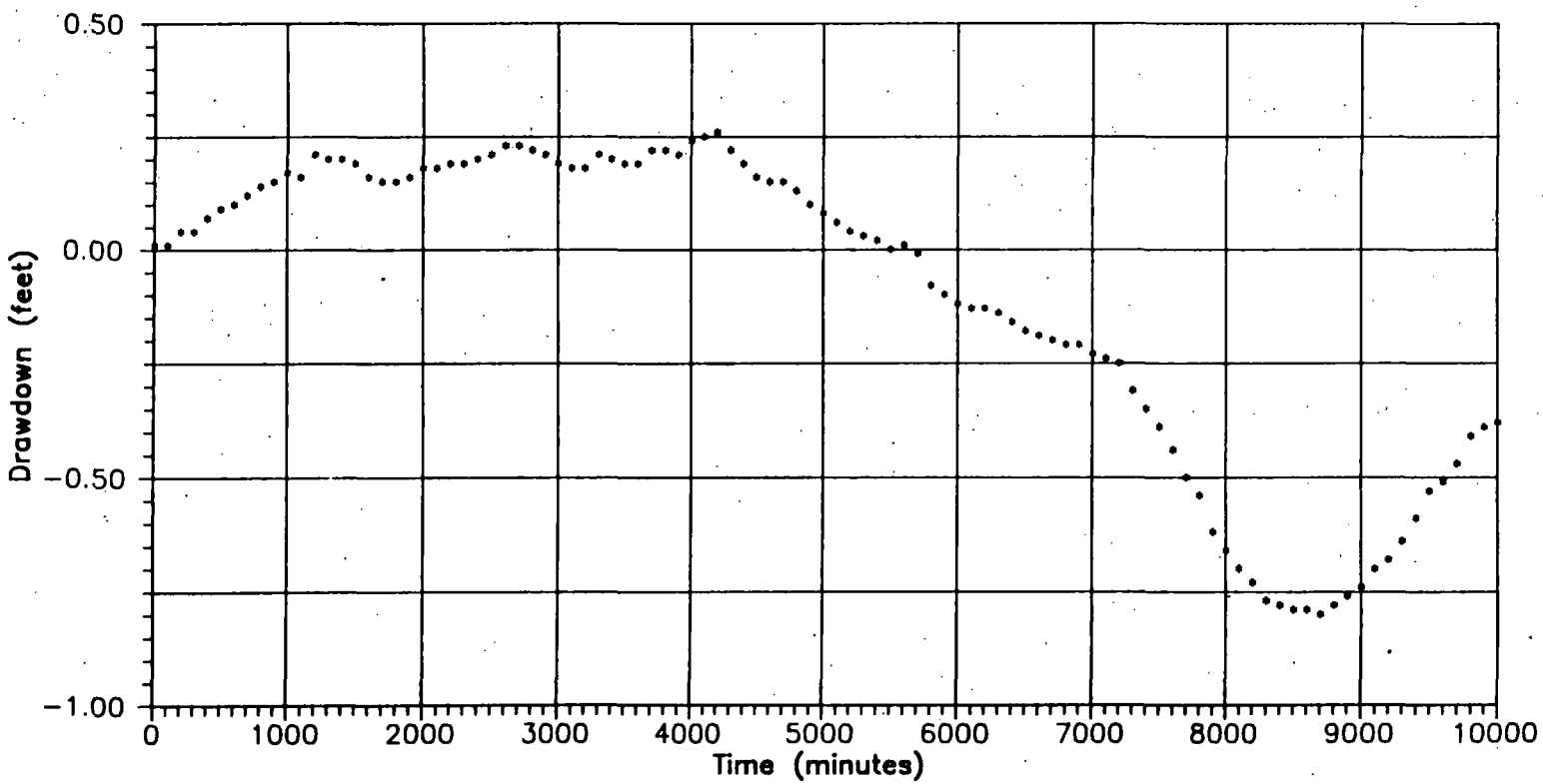

AN INCREASE IN ELEVATION IS A NEGATIVE DRAWDOWN

TOTAL PETROLEUM, INC.
ALMA MICHIGAN

AQUIFER TEST ANALYSIS

7

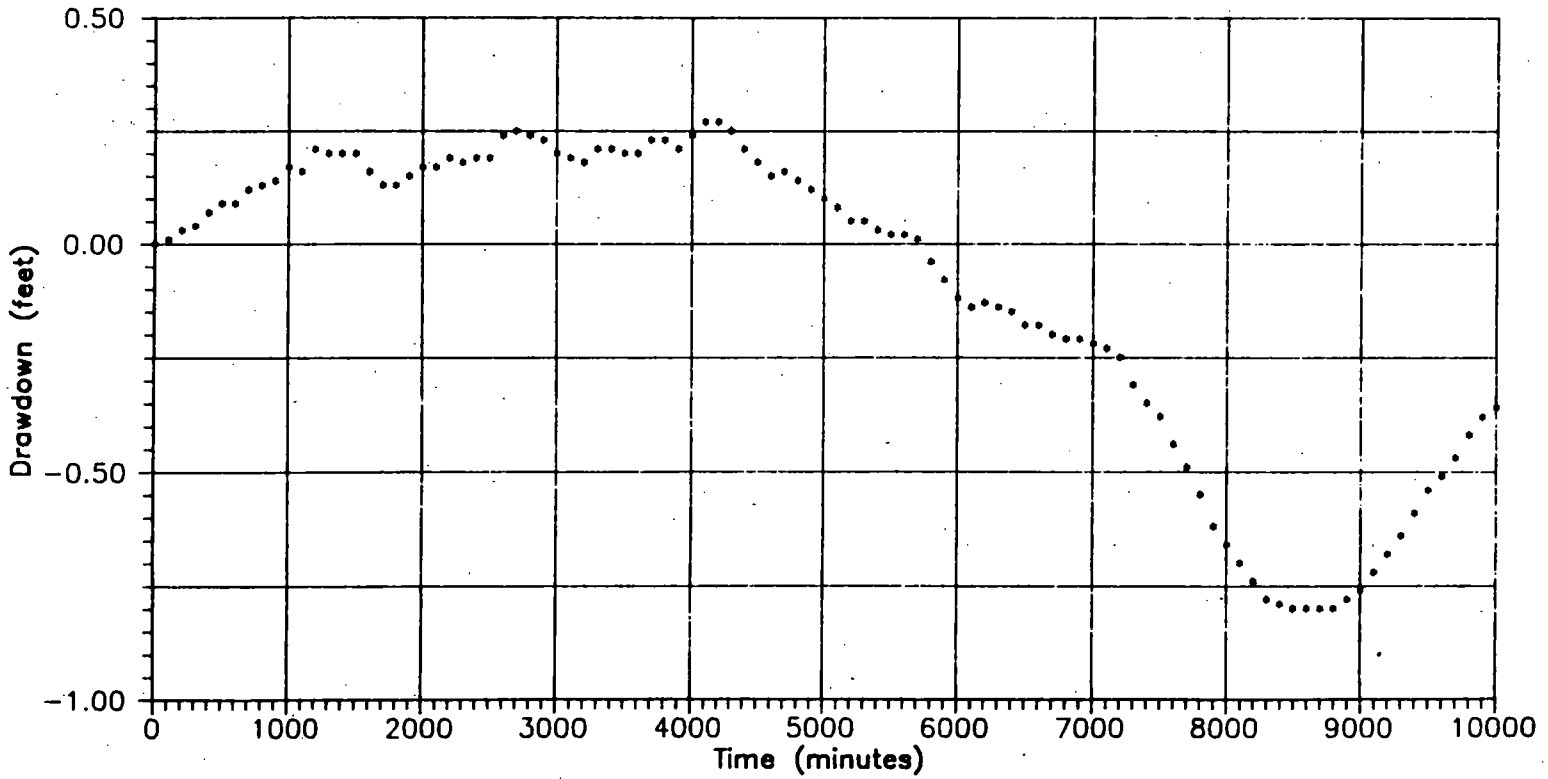
Total Petroleum Long Term Pumping Test
Monitor Well No. 29
Starting Time: 2/23/87 1300 Hours




TOTAL PETROLEUM, INC.
ALMA, MICHIGAN
AQUIFER TEST ANA

8

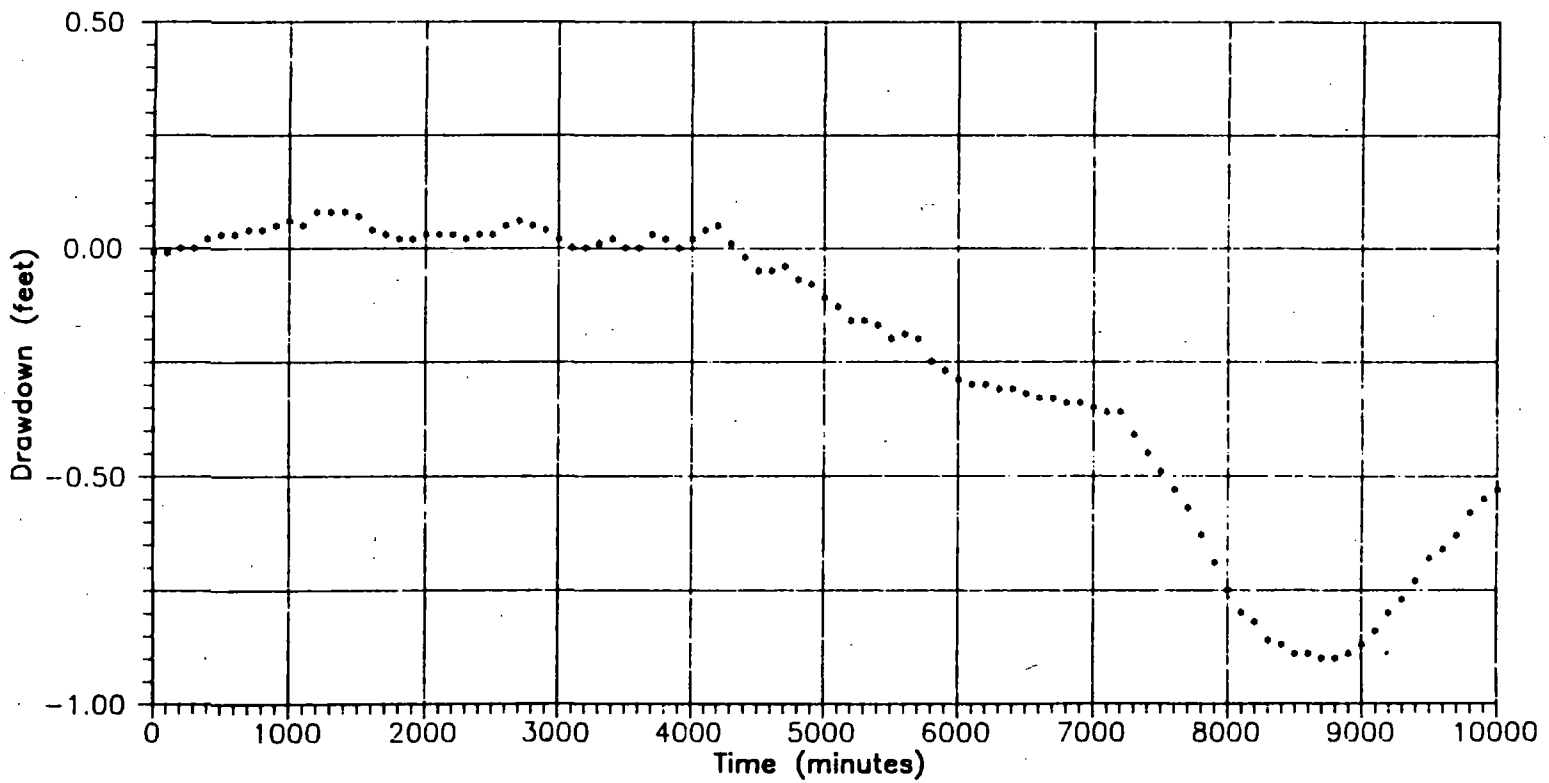
Total Petroleum Long Term Pumping Test
Monitor Well No. 30A
Starting Time: 2/23/87 1300 Hours




TOTAL PETROLEUM, INC.
ALMA MICHIGAN
AQUIFER TEST ANA S

9

Total Petroleum Long Term Pumping Test
Monitor Well No. 38
Starting Time: 2/23/87 1300 Hours




TOTAL PETROLEUM, INC.
ALMA MICHIGAN
AQUIFER TEST ANAL

10

# APPENDIX A

Total Petroleum, Inc.
Alma, MI

Production Well Flow Rate

| Date | Time | Totallized Meter Reading gallons | Calculated Flow Rate gallons/minute |
|---|---|---|---|
| 2/17/87 | 4 PM | | |
| | 8 PM | | |
| 2/18/87 | 12 AM | | |
| | 4 AM | | |
| | 8 AM | | |
| | 12 PM | | |
| | 4 PM | | |
| | 8 PM | | |
| 2/19/87 | 12 AM | | |
| | 4 AM | | |
| | 8 AM | | |
| | 12 PM | | |
| | 4 PM | 14919700 | |
| | 8 PM | 14974000 | 226.25 |
| 2/20/87 | 12 AM | 15035000 | 254.17 |
| | 4 AM | 15085900 | 212.08 |
| | 8 AM | 15136600 | 211.25 |
| | 12 PM | 15200200 | 265.00 |
| 2/21/87 | 1:30 PM | 15226100 | 287.78 |
| 2/22/87 | 8 AM | | |
| | 12 PM | | |
| | 4 PM | | |
| | 8 PM | | |
| 2/23/87 | 12 AM | | 0 |
| | 4 AM | | |
| | 8 AM | | |
| | 1 PM | 15226100 | |
| | 4 PM | 15272200 | 256.11 |
| | 8 PM | 15334600 | 260.00 |
| 2/24/87 | 12 AM | 15383900 | 205.42 |
| | 4 AM | 15446100 | 259.17 |
| | 8 AM | 15506400 | 251.25 |
| | 12 PM | 15576400 | 291.67 |
| | 4 PM | 15646200 | 290.83 |
| | 8 PM | 15720700 | 310.42 |
| 2/25/87 | 12 AM | 15825200 | 435.42 |
| | 4 AM | 15863400 | 159.17 |
| | 8 AM | 15927400 | 266.67 |
| | 12 PM | 16008500 | 337.92 |
| | 4 PM | 16074600 | 275.42 |
| | 8 PM | 16154800 | 334.17 |
| 2/26/87 | 12 AM | 16225700 | 295.42 |
| | 4 AM | 16293900 | 284.17 |
| | 8 AM | 16368000 | 308.75 |
| | 12 PM | 16434700 | 277.92 |
| | 4 PM | 16536000 | 422.08 |
| | 8 PM | 16623700 | 365.42 |
| 2/27/87 | 12 AM | 16689200 | 272.92 |
| | 4 AM | 16756200 | 279.17 |
| | 8 AM | 16828500 | 301.25 |
| | 12 PM | 16914900 | 360.00 |
| | 4 PM | 17005000 | 375.42 |
| | 8 PM | 17087700 | 344.58 |

Total Petroleum, Inc.
Alma, MI

Production Well Flow Rate

| Date | Time | Totallized Meter Reading gallons | Calculated Flow Rate gallons/minute |
|---|---|---|---|
| 2/28/87 | 12 AM | 17170500 | 345.00 |
| | 4 AM | 17248200 | 323.75 |
| | 8 AM | 17327500 | 330.42 |
| | 12 PM | 17389200 | 257.08 |
| | 4 PM | 17461500 | 301.25 |
| | 8 PM | 17514100 | 219.17 |
| 3/01/87 | 12 AM | 17576000 | 257.92 |
| | 4 AM | 17637400 | 255.83 |
| | 8 AM | 17688500 | 212.92 |
| | 12 PM | 17749500 | 254.17 |
| | 4 PM | 17808800 | 247.08 |
| | 8 PM | 17889600 | 336.67 |
| 3/02/87 | 12 AM | 17955400 | 274.17 |
| | 4 AM | 18028800 | 305.83 |
| | 8 AM | 18083100 | 226.25 |
| | 12 PM | 18147800 | 269.58 |
| | 2:30 PM | 18196040 | 321.60 |

# APPENDIX B

Total Petroleum, Inc.
Alma, MI

Barometric Pressure Data

| Date | Time | Barometric Pressure inches Hg | Barometric Pressure feet water |
|---|---|---|---|
| 2/17/87 | 4 PM | 29.50 | 33.33 |
| | 8 PM | 29.50 | 33.33 |
| 2/18/87 | 12 AM | 29.50 | 33.33 |
| | 4 AM | 29.60 | 33.45 |
| | 8 AM | 29.56 | 33.40 |
| | 12 PM | 29.58 | 33.43 |
| | 4 PM | 29.56 | 33.40 |
| | 8 PM | 29.62 | 33.47 |
| 2/19/87 | 12 AM | 29.62 | 33.47 |
| | 4 AM | 29.62 | 33.47 |
| | 8 AM | 29.68 | 33.54 |
| | 12 PM | 29.71 | 33.57 |
| | 4 PM | 29.70 | 33.56 |
| | 8 PM | 29.70 | 33.56 |
| 2/20/87 | 12 AM | 29.75 | 33.62 |
| | 4 AM | 29.76 | 33.63 |
| | 8 AM | 29.78 | 33.65 |
| | 12 PM | 29.68 | 33.54 |
| 2/22/87 | 8 AM | 29.22 | 33.02 |
| | 12 PM | 29.11 | 32.89 |
| | 4 PM | 29.08 | 32.86 |
| | 8 PM | 29.05 | 32.83 |
| 2/23/87 | 12 AM | 29.10 | 32.88 |
| | 4 AM | 29.15 | 32.94 |
| | 8 AM | 29.29 | 33.10 |
| | 12 PM | 29.40 | 33.22 |
| | 4 PM | 29.49 | 33.32 |
| | 8 PM | 29.51 | 33.35 |
| 2/24/87 | 12 AM | 29.54 | 33.38 |
| | 4 AM | 29.68 | 33.54 |
| | 8 AM | 29.65 | 33.50 |
| | 12 PM | 29.64 | 33.49 |
| | 4 PM | 29.61 | 33.46 |
| | 8 PM | 29.65 | 33.50 |
| 2/25/87 | 12 AM | 29.69 | 33.55 |
| | 4 AM | 29.70 | 33.56 |
| | 8 AM | 29.72 | 33.58 |
| | 12 PM | 29.70 | 33.56 |
| | 4 PM | 29.71 | 33.57 |
| | 8 PM | 29.71 | 33.57 |
| 2/26/87 | 12 AM | 29.71 | 33.57 |
| | 4 AM | 29.70 | 33.56 |
| | 8 AM | 29.81 | 33.69 |
| | 12 PM | 29.81 | 33.69 |
| | 4 PM | 29.80 | 33.67 |
| | 8 PM | 29.81 | 33.69 |
| 2/27/87 | 12 AM | 29.72 | 33.58 |
| | 4 AM | 29.66 | 33.52 |
| | 8 AM | 29.63 | 33.48 |
| | 12 PM | 29.63 | 33.48 |
| | 4 PM | 29.46 | 33.29 |
| | 8 PM | 29.48 | 33.31 |

Total Petroleum, Inc.
Alma, MI

Barometric Pressure Data

| Date | Time | Barometric Pressure inches Hg | Barometric Pressure feet water |
|---|---|---|---|
| 2/28/87 | 12 AM | 29.42 | 33.24 |
| | 4 AM | 29.39 | 33.21 |
| | 8 AM | 29.32 | 33.13 |
| | 12 PM | 29.33 | 33.14 |
| | 4 PM | 29.10 | 32.88 |
| | 8 PM | 29.10 | 32.88 |
| 3/01/87 | 12 AM | 28.82 | 32.57 |
| | 4 AM | 28.70 | 32.43 |
| | 8 AM | 28.60 | 32.32 |
| | 12 PM | 28.57 | 32.28 |
| | 4 PM | 28.57 | 32.28 |
| | 8 PM | 28.59 | 32.31 |
| 3/02/87 | 12 AM | 28.72 | 32.45 |
| | 4 AM | 28.84 | 32.59 |
| | 8 AM | 29.00 | 32.77 |
| | 12 PM | 29.10 | 32.88 |

# APPENDIX C

SE1000B
Environmental Logger
03/02 19:32

Total Petroleum. Inc.
Alma, Michigan
Long Term Pumping Test

Unit # 00000 Test # 2
INPUT 1: Level (F) TOC

Monitor Well No. 26

Reference 741.75
Scale factor 10.04
Offset 0.00

Step # 0 02/23 13:00

| Elapsed Time (minutes) | Water Elevation (msl) | Drawdown (feet) |
|---|---|---|
| 0.0000 | 741.75 | .00 |
| .0033 | 741.77 | -.02 |
| .0066 | 741.77 | -.02 |
| .0099 | 741.77 | -.02 |
| .0133 | 741.77 | -.02 |
| .0166 | 741.77 | -.02 |
| .0200 | 741.77 | -.02 |
| .0233 | 741.77 | -.02 |
| .0266 | 741.77 | -.02 |
| .0300 | 741.77 | -.02 |
| .0333 | 741.77 | -.02 |
| .0500 | 741.75 | .00 |
| .0666 | 741.75 | .00 |
| .0833 | 741.74 | .01 |
| .1000 | 741.74 | .01 |
| .1166 | 741.74 | .01 |
| .1333 | 741.74 | .01 |
| .1500 | 741.74 | .01 |
| .1666 | 741.74 | .01 |
| .1833 | 741.74 | .01 |
| .2000 | 741.74 | .01 |
| .2166 | 741.74 | .01 |
| .2333 | 741.74 | .01 |
| .2500 | 741.74 | .01 |
| .2666 | 741.74 | .01 |
| .2833 | 741.74 | .01 |
| .3000 | 741.74 | .01 |
| .3166 | 741.74 | .01 |
| .3333 | 741.74 | .01 |
| .4167 | 741.74 | .01 |
| .5000 | 741.74 | .01 |
| .5833 | 741.74 | .01 |
| .6667 | 741.74 | .01 |
| .7500 | 741.74 | .01 |
| .8333 | 741.74 | .01 |
| .9167 | 741.74 | .01 |
| 1.0000 | 741.74 | .01 |
| 1.0833 | 741.74 | .01 |
| 1.1667 | 741.74 | .01 |
| 1.2500 | 741.74 | .01 |

| | | | |
|---|---|---|---|
| 1.3333 | 741.74 | .01 | Total Petroleum, Inc. |
| 1.4166 | 741.74 | .01 | Alma, Michigan |
| 1.5000 | 741.74 | .01 | Long Term Pumping Test |
| 1.5833 | 741.74 | .01 | |
| 1.6667 | 741.74 | .01 | Monitor Well No. 26 |
| 1.7500 | 741.74 | .01 | |
| 1.8333 | 741.74 | .01 | |
| 1.9167 | 741.74 | .01 | |
| 2.00 | 741.74 | .01 | |
| 2.50 | 741.74 | .01 | |
| 3.00 | 741.74 | .01 | |
| 3.50 | 741.75 | .00 | |
| 4.00 | 741.75 | .00 | |
| 4.50 | 741.74 | .01 | |
| 5.00 | 741.74 | .01 | |
| 5.50 | 741.74 | .01 | |
| 6.00 | 741.74 | .01 | |
| 6.50 | 741.74 | .01 | |
| 7.00 | 741.74 | .01 | |
| 7.50 | 741.74 | .01 | |
| 8.00 | 741.74 | .01 | |
| 8.50 | 741.74 | .01 | |
| 9.00 | 741.74 | .01 | |
| 9.50 | 741.74 | .01 | |
| 10 | 741.74 | .01 | |
| 12 | 741.74 | .01 | |
| 14 | 741.75 | .00 | |
| 16 | 741.74 | .01 | |
| 18 | 741.75 | .00 | |
| 20 | 741.75 | .00 | |
| 22 | 741.75 | .00 | |
| 24 | 741.75 | .00 | |
| 26 | 741.75 | .00 | |
| 28 | 741.74 | .01 | |
| 30 | 741.74 | .01 | |
| 32 | 741.75 | .00 | |
| 34 | 741.75 | .00 | |
| 36 | 741.75 | .00 | |
| 38 | 741.74 | .01 | |
| 40 | 741.75 | .00 | |
| 42 | 741.75 | .00 | |
| 44 | 741.75 | .00 | |
| 46 | 741.75 | .00 | |
| 48 | 741.75 | .00 | |
| 50 | 741.75 | .00 | |
| 52 | 741.74 | .01 | |
| 54 | 741.74 | .01 | |
| 56 | 741.75 | .00 | |
| 58 | 741.75 | .00 | |
| 60 | 741.75 | .00 | |
| 62 | 741.74 | .01 | |
| 64 | 741.74 | .01 | |
| 66 | 741.75 | .00 | |
| 68 | 741.75 | .00 | |
| 70 | 741.75 | .00 | |
| 72 | 741.75 | .00 | |
| 74 | 741.75 | .00 | |
| 76 | 741.75 | .00 | |

| | | | |
|---|---|---|---|
| 78 | 741.75 | .00 | Total Petroleum, c. |
| 80 | 741.75 | .00 | Alma, Michigan |
| 82 | 741.75 | .00 | Long Term Pumping Test |
| 84 | 741.75 | .00 | |
| 86 | 741.75 | .00 | Monitor Well No. 26 |
| 88 | 741.75 | .00 | |
| 90 | 741.74 | .01 | |
| 92 | 741.75 | .00 | |
| 94 | 741.75 | .00 | |
| 96 | 741.74 | .01 | |
| 98 | 741.74 | .01 | |
| 100 | 741.74 | .01 | |
| 110 | 741.75 | .00 | |
| 120 | 741.75 | .00 | |
| 130 | 741.75 | .00 | |
| 140 | 741.75 | .00 | |
| 150 | 741.75 | .00 | |
| 160 | 741.75 | .00 | |
| 170 | 741.75 | .00 | |
| 180 | 741.74 | .01 | |
| 190 | 741.74 | .01 | |
| 200 | 741.74 | .01 | |
| 210 | 741.74 | .01 | |
| 220 | 741.74 | .01 | |
| 230 | 741.74 | .01 | |
| 240 | 741.74 | .01 | |
| 250 | 741.74 | .01 | |
| 260 | 741.74 | .01 | |
| 270 | 741.74 | .01 | |
| 280 | 741.74 | .01 | |
| 290 | 741.74 | .01 | |
| 300 | 741.74 | .01 | |
| 310 | 741.74 | .01 | |
| 320 | 741.74 | .01 | |
| 330 | 741.74 | .01 | |
| 340 | 741.74 | .01 | |
| 350 | 741.74 | .01 | |
| 360 | 741.74 | .01 | |
| 370 | 741.74 | .01 | |
| 380 | 741.74 | .01 | |
| 390 | 741.74 | .01 | |
| 400 | 741.74 | .01 | |
| 410 | 741.74 | .01 | |
| 420 | 741.74 | .01 | |
| 430 | 741.73 | .02 | |
| 440 | 741.73 | .02 | |
| 450 | 741.73 | .02 | |
| 460 | 741.73 | .02 | |
| 470 | 741.73 | .02 | |
| 480 | 741.73 | .02 | |
| 490 | 741.73 | .02 | |
| 500 | 741.73 | .02 | |
| 510 | 741.73 | .02 | |
| 520 | 741.73 | .02 | |
| 530 | 741.73 | .02 | |
| 540 | 741.73 | .02 | |
| 550 | 741.73 | .02 | |
| 560 | 741.73 | .02 | |

| | | | |
|---|---|---|---|
| 570 | 741.73 | .02 | Total Petroleum, [illegible] |
| 580 | 741.73 | .02 | Alma, Michigan |
| 590 | 741.73 | .02 | Long Term Pumping Test |
| 600 | 741.73 | .02 | |
| 610 | 741.73 | .02 | Monitor Well No. 26 |
| 620 | 741.73 | .02 | |
| 630 | 741.73 | .02 | |
| 640 | 741.73 | .02 | |
| 650 | 741.73 | .02 | |
| 660 | 741.73 | .02 | |
| 670 | 741.73 | .02 | |
| 680 | 741.73 | .02 | |
| 690 | 741.73 | .02 | |
| 700 | 741.73 | .02 | |
| 710 | 741.73 | .02 | |
| 720 | 741.73 | .02 | |
| 730 | 741.72 | .03 | |
| 740 | 741.73 | .02 | |
| 750 | 741.73 | .02 | |
| 760 | 741.72 | .03 | |
| 770 | 741.72 | .03 | |
| 780 | 741.72 | .03 | |
| 790 | 741.72 | .03 | |
| 800 | 741.72 | .03 | |
| 810 | 741.73 | .02 | |
| 820 | 741.73 | .02 | |
| 830 | 741.73 | .02 | |
| 840 | 741.73 | .02 | |
| 850 | 741.73 | .02 | |
| 860 | 741.73 | .02 | |
| 870 | 741.72 | .03 | |
| 880 | 741.72 | .03 | |
| 890 | 741.72 | .03 | |
| 900 | 741.72 | .03 | |
| 910 | 741.72 | .03 | |
| 920 | 741.72 | .03 | |
| 930 | 741.72 | .03 | |
| 940 | 741.72 | .03 | |
| 950 | 741.72 | .03 | |
| 960 | 741.72 | .03 | |
| 970 | 741.72 | .03 | |
| 980 | 741.72 | .03 | |
| 990 | 741.72 | .03 | |
| 1000 | 741.72 | .03 | |
| 1100 | 741.73 | .02 | |
| 1200 | 741.71 | .04 | |
| 1300 | 741.72 | .03 | |
| 1400 | 741.72 | .03 | |
| 1500 | 741.72 | .03 | |
| 1600 | 741.71 | .04 | |
| 1700 | 741.71 | .04 | |
| 1800 | 741.71 | .04 | |
| 1900 | 741.70 | .05 | |
| 2000 | 741.70 | .05 | |
| 2100 | 741.70 | .05 | |
| 2200 | 741.69 | .06 | |
| 2300 | 741.70 | .05 | |
| 2400 | 741.69 | .06 | |

| | | | |
|---|---|---|---|
| 2500 | 741.69 | .06 | Total Petroleum, nc. |
| 2600 | 741.68 | .07 | Alma, Michigan |
| 2700 | 741.68 | .07 | Long Term Pumping Test |
| 2800 | 741.68 | .07 | |
| 2900 | 741.68 | .07 | Monitor Well No. 26 |
| 3000 | 741.69 | .06 | |
| 3100 | 741.69 | .06 | |
| 3200 | 741.69 | .06 | |
| 3300 | 741.68 | .07 | |
| 3400 | 741.68 | .07 | |
| 3500 | 741.68 | .07 | |
| 3600 | 741.68 | .07 | |
| 3700 | 741.67 | .08 | |
| 3800 | 741.67 | .08 | |
| 3900 | 741.67 | .08 | |
| 4000 | 741.66 | .09 | |
| 4100 | 741.64 | .11 | |
| 4200 | 741.64 | .11 | |
| 4300 | 741.65 | .10 | |
| 4400 | 741.67 | .08 | |
| 4500 | 741.68 | .07 | |
| 4600 | 741.68 | .07 | |
| 4700 | 741.67 | .08 | |
| 4800 | 741.68 | .07 | |
| 4900 | 741.69 | .06 | |
| 5000 | 741.69 | .06 | |
| 5100 | 741.70 | .05 | |
| 5200 | 741.70 | .05 | |
| 5300 | 741.70 | .05 | |
| 5400 | 741.70 | .05 | |
| 5500 | 741.70 | .05 | |
| 5600 | 741.70 | .05 | |
| 5700 | 741.70 | .05 | |
| 5800 | 741.73 | .02 | |
| 5900 | 741.73 | .02 | |
| 6000 | 741.74 | .01 | |
| 6100 | 741.74 | .01 | |
| 6200 | 741.74 | .01 | |
| 6300 | 741.73 | .02 | |
| 6400 | 741.74 | .01 | |
| 6500 | 741.74 | .01 | |
| 6600 | 741.74 | .01 | |
| 6700 | 741.74 | .01 | |
| 6800 | 741.74 | .01 | |
| 6900 | 741.74 | .01 | |
| 7000 | 741.74 | .01 | |
| 7100 | 741.74 | .01 | |
| 7200 | 741.74 | .01 | |
| 7300 | 741.77 | -.02 | |
| 7400 | 741.78 | -.03 | |
| 7500 | 741.80 | -.05 | |
| 7600 | 741.82 | -.07 | |
| 7700 | 741.83 | -.08 | |
| 7800 | 741.86 | -.11 | |
| 7900 | 741.90 | -.15 | |
| 8000 | 741.92 | -.17 | |
| 8100 | 741.96 | -.21 | |
| 8200 | 741.99 | -.24 | |

| | | | |
|---|---|---|---|
| 8300 | 742.01 | -.26 | Total Petroleum, Inc. |
| 8400 | 742.03 | -.28 | Alma, Michigan |
| 8500 | 742.05 | -.30 | Long Term Pumping Test |
| 8600 | 742.06 | -.31 | |
| 8700 | 742.07 | -.32 | Monitor Well No. 26 |
| 8800 | 742.08 | -.33 | |
| 8900 | 742.09 | -.34 | |
| 9000 | 742.11 | -.36 | |
| 9100 | 742.11 | -.36 | |
| 9200 | 742.12 | -.37 | |
| 9300 | 742.13 | -.38 | |
| 9400 | 742.13 | -.38 | |
| 9500 | 742.13 | -.38 | |
| 9600 | 742.14 | -.39 | |
| 9700 | 742.15 | -.40 | |
| 9800 | 742.14 | -.39 | |
| 9900 | 742.15 | -.40 | |
| 10000 | 742.16 | -.41 | |

END

SE1000B
Environmental Logger
03/02 18:35

Total Petroleum, Inc.
Alma, Michigan
Long Term Pumping Test

Unit # 0000 Test # 2

Monitor Well No. 29

INPUT 1: Level (F) TOC

Reference 739.04
Scale factor 10.07
Offset 0.00

Step # 0 02/23 13:00

| Elapsed Time (minutes) | Water Elevation (msl) | Drawdown (feet) |
|---|---|---|
| 0.0000 | 739.04 | .00 |
| .0033 | 739.03 | .01 |
| .0066 | 739.03 | .01 |
| .0099 | 739.03 | .01 |
| .0133 | 739.03 | .01 |
| .0166 | 739.03 | .01 |
| .0200 | 739.03 | .01 |
| .0233 | 739.03 | .01 |
| .0266 | 739.03 | .01 |
| .0300 | 739.03 | .01 |
| .0333 | 739.03 | .01 |
| .0500 | 739.03 | .01 |
| .0666 | 739.03 | .01 |
| .0833 | 739.03 | .01 |
| .1000 | 739.03 | .01 |
| .1166 | 739.03 | .01 |
| .1333 | 739.03 | .01 |
| .1500 | 739.03 | .01 |
| .1666 | 739.03 | .01 |
| .1833 | 739.03 | .01 |
| .2000 | 739.03 | .01 |
| .2166 | 739.03 | .01 |
| .2333 | 739.03 | .01 |
| .2500 | 739.03 | .01 |
| .2666 | 739.03 | .01 |
| .2833 | 739.03 | .01 |
| .3000 | 739.03 | .01 |
| .3166 | 739.03 | .01 |
| .3333 | 739.03 | .01 |
| .4167 | 739.03 | .01 |
| .5000 | 739.03 | .01 |
| .5833 | 739.03 | .01 |
| .6667 | 739.03 | .01 |
| .7500 | 739.03 | .01 |
| .8333 | 739.03 | .01 |
| .9167 | 739.03 | .01 |
| 1.0000 | 739.03 | .01 |
| 1.0833 | 739.03 | .01 |
| 1.1667 | 739.03 | .01 |
| 1.2500 | 739.03 | .01 |

| | | | |
|---|---|---|---|
| 1.3333 | 739.03 | .01 | Total Petroleum, Inc. |
| 1.4166 | 739.03 | .01 | Alma, Michigan |
| 1.5000 | 739.03 | .01 | Long Term Pumping Test |
| 1.5833 | 739.03 | .01 | |
| 1.6667 | 739.03 | .01 | Monitor Well No. 29 |
| 1.7500 | 739.03 | .01 | |
| 1.8333 | 739.03 | .01 | |
| 1.9167 | 739.03 | .01 | |
| 2.00 | 739.03 | .01 | |
| 2.50 | 739.03 | .01 | |
| 3.00 | 739.03 | .01 | |
| 3.50 | 739.03 | .01 | |
| 4.00 | 739.03 | .01 | |
| 4.50 | 739.03 | .01 | |
| 5.00 | 739.03 | .01 | |
| 5.50 | 739.03 | .01 | |
| 6.00 | 739.03 | .01 | |
| 6.50 | 739.03 | .01 | |
| 7.00 | 739.03 | .01 | |
| 7.50 | 739.03 | .01 | |
| 8.00 | 739.03 | .01 | |
| 8.50 | 739.03 | .01 | |
| 9.00 | 739.03 | .01 | |
| 9.50 | 739.03 | .01 | |
| 10 | 739.03 | .01 | |
| 12 | 739.03 | .01 | |
| 14 | 739.03 | .01 | |
| 16 | 739.03 | .01 | |
| 18 | 739.03 | .01 | |
| 20 | 739.03 | .01 | |
| 22 | 739.03 | .01 | |
| 24 | 739.03 | .01 | |
| 26 | 739.03 | .01 | |
| 28 | 739.03 | .01 | |
| 30 | 739.03 | .01 | |
| 32 | 739.03 | .01 | |
| 34 | 739.03 | .01 | |
| 36 | 739.03 | .01 | |
| 38 | 739.03 | .01 | |
| 40 | 739.03 | .01 | |
| 42 | 739.03 | .01 | |
| 44 | 739.03 | .01 | |
| 46 | 739.03 | .01 | |
| 48 | 739.03 | .01 | |
| 50 | 739.03 | .01 | |
| 52 | 739.03 | .01 | |
| 54 | 739.03 | .01 | |
| 56 | 739.03 | .01 | |
| 58 | 739.03 | .01 | |
| 60 | 739.03 | .01 | |
| 62 | 739.03 | .01 | |
| 64 | 739.03 | .01 | |
| 66 | 739.03 | .01 | |
| 68 | 739.03 | .01 | |
| 70 | 739.03 | .01 | |
| 72 | 739.03 | .01 | |
| 74 | 739.03 | .01 | |
| 76 | 739.03 | .01 | |

| | | | |
|---|---|---|---|
| 78 | 739.03 | .01 | Total Petroleum, Inc. |
| 80 | 739.03 | .01 | Alma, Michigan |
| 82 | 739.03 | .01 | Long Term Pumping Test |
| 84 | 739.03 | .01 | |
| 86 | 739.03 | .01 | Monitor Well No. 29 |
| 88 | 739.03 | .01 | |
| 90 | 739.03 | .01 | |
| 92 | 739.03 | .01 | |
| 94 | 739.03 | .01 | |
| 96 | 739.03 | .01 | |
| 98 | 739.03 | .01 | |
| 100 | 739.03 | .01 | |
| 110 | 739.03 | .01 | |
| 120 | 739.03 | .01 | |
| 130 | 739.03 | .01 | |
| 140 | 739.02 | .02 | |
| 150 | 739.02 | .02 | |
| 160 | 739.01 | .03 | |
| 170 | 739.01 | .03 | |
| 180 | 739.01 | .03 | |
| 190 | 739.00 | .04 | |
| 200 | 739.00 | .04 | |
| 210 | 739.00 | .04 | |
| 220 | 739.00 | .04 | |
| 230 | 739.00 | .04 | |
| 240 | 739.00 | .04 | |
| 250 | 739.00 | .04 | |
| 260 | 739.00 | .04 | |
| 270 | 739.00 | .04 | |
| 280 | 739.00 | .04 | |
| 290 | 739.00 | .04 | |
| 300 | 739.00 | .04 | |
| 310 | 738.99 | .05 | |
| 320 | 738.99 | .05 | |
| 330 | 738.99 | .05 | |
| 340 | 738.98 | .06 | |
| 350 | 738.98 | .06 | |
| 360 | 738.98 | .06 | |
| 370 | 738.97 | .07 | |
| 380 | 738.97 | .07 | |
| 390 | 738.97 | .07 | |
| 400 | 738.97 | .07 | |
| 410 | 738.97 | .07 | |
| 420 | 738.96 | .08 | |
| 430 | 738.96 | .08 | |
| 440 | 738.96 | .08 | |
| 450 | 738.96 | .08 | |
| 460 | 738.96 | .08 | |
| 470 | 738.96 | .08 | |
| 480 | 738.96 | .08 | |
| 490 | 738.96 | .08 | |
| 500 | 738.95 | .09 | |
| 510 | 738.95 | .09 | |
| 520 | 738.95 | .09 | |
| 530 | 738.94 | .10 | |
| 540 | 738.94 | .10 | |
| 550 | 738.94 | .10 | |
| 560 | 738.94 | .10 | |

| | | | |
|---|---|---|---|
| 570 | 738.94 | .10 | Total Petroleum, Inc. |
| 580 | 738.95 | .09 | Alma, Michigan |
| 590 | 738.94 | .10 | Long Term Pumping Test |
| 600 | 738.94 | .10 | |
| 610 | 738.93 | .11 | Monitor Well No. 29 |
| 620 | 738.93 | .11 | |
| 630 | 738.93 | .11 | |
| 640 | 738.93 | .11 | |
| 650 | 738.93 | .11 | |
| 660 | 738.93 | .11 | |
| 670 | 738.93 | .11 | |
| 680 | 738.92 | .12 | |
| 690 | 738.92 | .12 | |
| 700 | 738.92 | .12 | |
| 710 | 738.92 | .12 | |
| 720 | 738.91 | .13 | |
| 730 | 738.91 | .13 | |
| 740 | 738.91 | .13 | |
| 750 | 738.91 | .13 | |
| 760 | 738.91 | .13 | |
| 770 | 738.90 | .14 | |
| 780 | 738.90 | .14 | |
| 790 | 738.90 | .14 | |
| 800 | 738.90 | .14 | |
| 810 | 738.90 | .14 | |
| 820 | 738.91 | .13 | |
| 830 | 738.90 | .14 | |
| 840 | 738.90 | .14 | |
| 850 | 738.90 | .14 | |
| 860 | 738.90 | .14 | |
| 870 | 738.89 | .15 | |
| 880 | 738.89 | .15 | |
| 890 | 738.89 | .15 | |
| 900 | 738.89 | .15 | |
| 910 | 738.89 | .15 | |
| 920 | 738.89 | .15 | |
| 930 | 738.89 | .15 | |
| 940 | 738.88 | .16 | |
| 950 | 738.88 | .16 | |
| 960 | 738.88 | .16 | |
| 970 | 738.87 | .17 | |
| 980 | 738.87 | .17 | |
| 990 | 738.87 | .17 | |
| 1000 | 738.87 | .17 | |
| 1100 | 738.88 | .16 | |
| 1200 | 738.83 | .21 | |
| 1300 | 738.84 | .20 | |
| 1400 | 738.84 | .20 | |
| 1500 | 738.85 | .19 | |
| 1600 | 738.88 | .16 | |
| 1700 | 738.89 | .15 | |
| 1800 | 738.89 | .15 | |
| 1900 | 738.88 | .16 | |
| 2000 | 738.86 | .18 | |
| 2100 | 738.86 | .18 | |
| 2200 | 738.85 | .19 | |
| 2300 | 738.85 | .19 | |
| 2400 | 738.84 | .20 | |

| | | | |
|---|---|---|---|
| 2500 | 738.83 | .21 | Total Petroleum, c. |
| 2600 | 738.81 | .23 | Alma, Michigan |
| 2700 | 738.81 | .23 | Long Term Pumping Test |
| 2800 | 738.82 | .22 | |
| 2900 | 738.83 | .21 | Monitor Well No. 29 |
| 3000 | 738.85 | .19 | |
| 3100 | 738.86 | .18 | |
| 3200 | 738.86 | .18 | |
| 3300 | 738.83 | .21 | |
| 3400 | 738.84 | .20 | |
| 3500 | 738.85 | .19 | |
| 3600 | 738.85 | .19 | |
| 3700 | 738.82 | .22 | |
| 3800 | 738.82 | .22 | |
| 3900 | 738.83 | .21 | |
| 4000 | 738.80 | .24 | |
| 4100 | 738.79 | .25 | |
| 4200 | 738.78 | .26 | |
| 4300 | 738.82 | .22 | |
| 4400 | 738.85 | .19 | |
| 4500 | 738.88 | .16 | |
| 4600 | 738.89 | .15 | |
| 4700 | 738.89 | .15 | |
| 4800 | 738.91 | .13 | |
| 4900 | 738.94 | .10 | |
| 5000 | 738.96 | .08 | |
| 5100 | 738.98 | .06 | |
| 5200 | 739.00 | .04 | |
| 5300 | 739.01 | .03 | |
| 5400 | 739.02 | .02 | |
| 5500 | 739.04 | .00 | |
| 5600 | 739.03 | .01 | |
| 5700 | 739.05 | -.01 | |
| 5800 | 739.12 | -.08 | |
| 5900 | 739.14 | -.10 | |
| 6000 | 739.16 | -.12 | |
| 6100 | 739.17 | -.13 | |
| 6200 | 739.17 | -.13 | |
| 6300 | 739.18 | -.14 | |
| 6400 | 739.20 | -.16 | |
| 6500 | 739.22 | -.18 | |
| 6600 | 739.23 | -.19 | |
| 6700 | 739.24 | -.20 | |
| 6800 | 739.25 | -.21 | |
| 6900 | 739.25 | -.21 | |
| 7000 | 739.27 | -.23 | |
| 7100 | 739.28 | -.24 | |
| 7200 | 739.29 | -.25 | |
| 7300 | 739.36 | -.32 | |
| 7400 | 739.40 | -.36 | |
| 7500 | 739.44 | -.40 | |
| 7600 | 739.49 | -.45 | |
| 7700 | 739.55 | -.51 | |
| 7800 | 739.60 | -.56 | |
| 7900 | 739.68 | -.64 | |
| 8000 | 739.72 | -.68 | |
| 8100 | 739.77 | -.73 | |
| 8200 | 739.80 | -.76 | |

| | | | |
|---|---|---|---|
| 8300 | 739.84 | -.80 | Total Petroleum, Inc. |
| 8400 | 739.85 | -.81 | Alma, Michigan |
| 8500 | 739.86 | -.82 | Long Term Pumping Test |
| 8600 | 739.86 | -.82 | |
| 8700 | 739.87 | -.83 | Monitor Well No. 29 |
| 8800 | 739.85 | -.81 | |
| 8900 | 739.83 | -.79 | |
| 9000 | 739.81 | -.77 | |
| 9100 | 739.77 | -.73 | |
| 9200 | 739.74 | -.70 | |
| 9300 | 739.70 | -.66 | |
| 9400 | 739.65 | -.61 | |
| 9500 | 739.59 | -.55 | |
| 9600 | 739.56 | -.52 | |
| 9700 | 739.52 | -.48 | |
| 9800 | 739.46 | -.42 | |
| 9900 | 739.44 | -.40 | |
| 10000 | 739.43 | -.39 | |

END

SE1000B
Environmental Logger
03/02 19:11

Total Petroleum, Inc.
Alma, Michigan
Long Term Pumping Test

Unit # 00000 Test # 2

Monitor Well No. 30A

INPUT 1: Level (F) TOC

Reference 736.91
Scale factor 10.03
Offset 0.00

Step # 0 02/23 13:00

| Elapsed Time (minutes) | Water Elevation (msl) | Drawdown (feet) |
|---|---|---|
| 0.0000 | 736.91 | .00 |
| .0033 | 736.91 | .00 |
| .0066 | 736.92 | -.01 |
| .0099 | 736.91 | .00 |
| .0133 | 736.91 | .00 |
| .0166 | 736.91 | .00 |
| .0200 | 736.91 | .00 |
| .0233 | 736.91 | .00 |
| .0266 | 736.91 | .00 |
| .0300 | 736.91 | .00 |
| .0333 | 736.91 | .00 |
| .0500 | 736.90 | .01 |
| .0666 | 736.89 | .02 |
| .0833 | 736.89 | .02 |
| .1000 | 736.89 | .02 |
| .1166 | 736.89 | .02 |
| .1333 | 736.89 | .02 |
| .1500 | 736.89 | .02 |
| .1666 | 736.89 | .02 |
| .1833 | 736.89 | .02 |
| .2000 | 736.89 | .02 |
| .2166 | 736.89 | .02 |
| .2333 | 736.89 | .02 |
| .2500 | 736.89 | .02 |
| .2666 | 736.89 | .02 |
| .2833 | 736.89 | .02 |
| .3000 | 736.89 | .02 |
| .3166 | 736.89 | .02 |
| .3333 | 736.89 | .02 |
| .4167 | 736.89 | .02 |
| .5000 | 736.89 | .02 |
| .5833 | 736.89 | .02 |
| .6667 | 736.89 | .02 |
| .7500 | 736.89 | .02 |
| .8333 | 736.89 | .02 |
| .9167 | 736.89 | .02 |
| 1.0000 | 736.89 | .02 |
| 1.0833 | 736.89 | .02 |
| 1.1667 | 736.89 | .02 |
| 1.2500 | 736.89 | .02 |

| | | | |
|---|---|---|---|
| 1.3333 | 736.89 | .02 | Total Petroleum, Inc. |
| 1.4166 | 736.89 | .02 | Alma, Michigan |
| 1.5000 | 736.89 | .02 | Long Term Pumping Test |
| 1.5833 | 736.89 | .02 | |
| 1.6667 | 736.89 | .02 | Monitor Well No. 30A |
| 1.7500 | 736.89 | .02 | |
| 1.8333 | 736.89 | .02 | |
| 1.9167 | 736.89 | .02 | |
| 2.00 | 736.89 | .02 | |
| 2.50 | 736.89 | .02 | |
| 3.00 | 736.89 | .02 | |
| 3.50 | 736.89 | .02 | |
| 4.00 | 736.90 | .01 | |
| 4.50 | 736.89 | .02 | |
| 5.00 | 736.89 | .02 | |
| 5.50 | 736.89 | .02 | |
| 6.00 | 736.89 | .02 | |
| 6.50 | 736.89 | .02 | |
| 7.00 | 736.90 | .01 | |
| 7.50 | 736.90 | .01 | |
| 8.00 | 736.90 | .01 | |
| 8.50 | 736.90 | .01 | |
| 9.00 | 736.89 | .02 | |
| 9.50 | 736.90 | .01 | |
| 10 | 736.89 | .02 | |
| 12 | 736.90 | .01 | |
| 14 | 736.90 | .01 | |
| 16 | 736.91 | .00 | |
| 18 | 736.90 | .01 | |
| 20 | 736.90 | .01 | |
| 22 | 736.90 | .01 | |
| 24 | 736.91 | .00 | |
| 26 | 736.91 | .00 | |
| 28 | 736.90 | .01 | |
| 30 | 736.90 | .01 | |
| 32 | 736.90 | .01 | |
| 34 | 736.91 | .00 | |
| 36 | 736.90 | .01 | |
| 38 | 736.90 | .01 | |
| 40 | 736.90 | .01 | |
| 42 | 736.90 | .01 | |
| 44 | 736.90 | .01 | |
| 46 | 736.90 | .01 | |
| 48 | 736.90 | .01 | |
| 50 | 736.90 | .01 | |
| 52 | 736.90 | .01 | |
| 54 | 736.90 | .01 | |
| 56 | 736.90 | .01 | |
| 58 | 736.90 | .01 | |
| 60 | 736.90 | .01 | |
| 62 | 736.90 | .01 | |
| 64 | 736.90 | .01 | |
| 66 | 736.90 | .01 | |
| 68 | 736.90 | .01 | |
| 70 | 736.91 | .00 | |
| 72 | 736.90 | .01 | |
| 74 | 736.91 | .00 | |
| 76 | 736.90 | .01 | |

| | | | |
|---|---|---|---|
| 78 | 736.90 | .01 | Total Petroleum, Inc. |
| 80 | 736.90 | .01 | Alma, Michigan |
| 82 | 736.90 | .01 | Long Term Pumping Test |
| 84 | 736.90 | .01 | |
| 86 | 736.90 | .01 | Monitor Well No. 30A |
| 88 | 736.89 | .02 | |
| 90 | 736.90 | .01 | |
| 92 | 736.90 | .01 | |
| 94 | 736.90 | .01 | |
| 96 | 736.90 | .01 | |
| 98 | 736.90 | .01 | |
| 100 | 736.90 | .01 | |
| 110 | 736.90 | .01 | |
| 120 | 736.91 | .00 | |
| 130 | 736.91 | .00 | |
| 140 | 736.90 | .01 | |
| 150 | 736.90 | .01 | |
| 160 | 736.90 | .01 | |
| 170 | 736.89 | .02 | |
| 180 | 736.89 | .02 | |
| 190 | 736.89 | .02 | |
| 200 | 736.88 | .03 | |
| 210 | 736.88 | .03 | |
| 220 | 736.88 | .03 | |
| 230 | 736.88 | .03 | |
| 240 | 736.88 | .03 | |
| 250 | 736.88 | .03 | |
| 260 | 736.88 | .03 | |
| 270 | 736.87 | .04 | |
| 280 | 736.87 | .04 | |
| 290 | 736.87 | .04 | |
| 300 | 736.87 | .04 | |
| 310 | 736.87 | .04 | |
| 320 | 736.87 | .04 | |
| 330 | 736.87 | .04 | |
| 340 | 736.86 | .05 | |
| 350 | 736.86 | .05 | |
| 360 | 736.85 | .06 | |
| 370 | 736.85 | .06 | |
| 380 | 736.85 | .06 | |
| 390 | 736.85 | .06 | |
| 400 | 736.84 | .07 | |
| 410 | 736.84 | .07 | |
| 420 | 736.84 | .07 | |
| 430 | 736.84 | .07 | |
| 440 | 736.84 | .07 | |
| 450 | 736.84 | .07 | |
| 460 | 736.83 | .08 | |
| 470 | 736.83 | .08 | |
| 480 | 736.83 | .08 | |
| 490 | 736.83 | .08 | |
| 500 | 736.82 | .09 | |
| 510 | 736.83 | .08 | |
| 520 | 736.82 | .09 | |
| 530 | 736.82 | .09 | |
| 540 | 736.82 | .09 | |
| 550 | 736.82 | .09 | |
| 560 | 736.81 | .10 | |

| | | | |
|---|---|---|---|
| 570 | 736.81 | .10 | Total Petroleum, Inc. |
| 580 | 736.82 | .09 | Alma, Michigan |
| 590 | 736.82 | .09 | Long Term Pumping Test |
| 600 | 736.82 | .09 | |
| 610 | 736.82 | .09 | Monitor Well No. 30A |
| 620 | 736.81 | .10 | |
| 630 | 736.81 | .10 | |
| 640 | 736.81 | .10 | |
| 650 | 736.81 | .10 | |
| 660 | 736.80 | .11 | |
| 670 | 736.80 | .11 | |
| 680 | 736.80 | .11 | |
| 690 | 736.80 | .11 | |
| 700 | 736.79 | .12 | |
| 710 | 736.79 | .12 | |
| 720 | 736.78 | .13 | |
| 730 | 736.79 | .12 | |
| 740 | 736.79 | .12 | |
| 750 | 736.78 | .13 | |
| 760 | 736.78 | .13 | |
| 770 | 736.78 | .13 | |
| 780 | 736.78 | .13 | |
| 790 | 736.78 | .13 | |
| 800 | 736.78 | .13 | |
| 810 | 736.78 | .13 | |
| 820 | 736.78 | .13 | |
| 830 | 736.78 | .13 | |
| 840 | 736.78 | .13 | |
| 850 | 736.77 | .14 | |
| 860 | 736.78 | .13 | |
| 870 | 736.77 | .14 | |
| 880 | 736.77 | .14 | |
| 890 | 736.76 | .15 | |
| 900 | 736.77 | .14 | |
| 910 | 736.76 | .15 | |
| 920 | 736.76 | .15 | |
| 930 | 736.76 | .15 | |
| 940 | 736.76 | .15 | |
| 950 | 736.76 | .15 | |
| 960 | 736.76 | .15 | |
| 970 | 736.75 | .16 | |
| 980 | 736.75 | .16 | |
| 990 | 736.75 | .16 | |
| 1000 | 736.74 | .17 | |
| 1100 | 736.75 | .16 | |
| 1200 | 736.70 | .21 | |
| 1300 | 736.71 | .20 | |
| 1400 | 736.71 | .20 | |
| 1500 | 736.71 | .20 | |
| 1600 | 736.75 | .16 | |
| 1700 | 736.78 | .13 | |
| 1800 | 736.78 | .13 | |
| 1900 | 736.76 | .15 | |
| 2000 | 736.74 | .17 | |
| 2100 | 736.74 | .17 | |
| 2200 | 736.72 | .19 | |
| 2300 | 736.73 | .18 | |
| 2400 | 736.72 | .19 | |

| | | | |
|---|---|---|---|
| 2500 | 736.72 | .19 | Total Petroleum, Inc. |
| 2600 | 736.67 | .24 | Alma, Michigan |
| 2700 | 736.66 | .25 | Long Term Pumping Test |
| 2800 | 736.67 | .24 | |
| 2900 | 736.68 | .23 | Monitor Well No. 30A |
| 3000 | 736.71 | .20 | |
| 3100 | 736.72 | .19 | |
| 3200 | 736.73 | .18 | |
| 3300 | 736.70 | .21 | |
| 3400 | 736.70 | .21 | |
| 3500 | 736.71 | .20 | |
| 3600 | 736.71 | .20 | |
| 3700 | 736.68 | .23 | |
| 3800 | 736.68 | .23 | |
| 3900 | 736.70 | .21 | |
| 4000 | 736.67 | .24 | |
| 4100 | 736.64 | .27 | |
| 4200 | 736.64 | .27 | |
| 4300 | 736.66 | .25 | |
| 4400 | 736.70 | .21 | |
| 4500 | 736.73 | .18 | |
| 4600 | 736.76 | .15 | |
| 4700 | 736.75 | .16 | |
| 4800 | 736.77 | .14 | |
| 4900 | 736.79 | .12 | |
| 5000 | 736.81 | .10 | |
| 5100 | 736.83 | .08 | |
| 5200 | 736.86 | .05 | |
| 5300 | 736.86 | .05 | |
| 5400 | 736.88 | .03 | |
| 5500 | 736.89 | .02 | |
| 5600 | 736.89 | .02 | |
| 5700 | 736.90 | .01 | |
| 5800 | 736.95 | -.04 | |
| 5900 | 736.99 | -.08 | |
| 6000 | 737.03 | -.12 | |
| 6100 | 737.05 | -.14 | |
| 6200 | 737.04 | -.13 | |
| 6300 | 737.05 | -.14 | |
| 6400 | 737.06 | -.15 | |
| 6500 | 737.09 | -.18 | |
| 6600 | 737.09 | -.18 | |
| 6700 | 737.11 | -.20 | |
| 6800 | 737.12 | -.21 | |
| 6900 | 737.12 | -.21 | |
| 7000 | 737.13 | -.22 | |
| 7100 | 737.14 | -.23 | |
| 7200 | 737.16 | -.25 | |
| 7300 | 737.22 | -.31 | |
| 7400 | 737.27 | -.36 | |
| 7500 | 737.30 | -.39 | |
| 7600 | 737.36 | -.45 | |
| 7700 | 737.41 | -.50 | |
| 7800 | 737.48 | -.57 | |
| 7900 | 737.55 | -.64 | |
| 8000 | 737.59 | -.68 | |
| 8100 | 737.64 | -.73 | |
| 8200 | 737.68 | -.77 | |

| | | | |
|---|---|---|---|
| 8300 | 737.72 | -.81 | Total Petroleum, Inc. |
| 8400 | 737.73 | -.82 | Alma, Michigan |
| 8500 | 737.74 | -.83 | Long Term Pumping Test |
| 8600 | 737.74 | -.83 | |
| 8700 | 737.75 | -.84 | Monitor Well No. 30A |
| 8800 | 737.74 | -.83 | |
| 8900 | 737.72 | -.81 | |
| 9000 | 737.70 | -.79 | |
| 9100 | 737.66 | -.75 | |
| 9200 | 737.62 | -.71 | |
| 9300 | 737.57 | -.66 | |
| 9400 | 737.52 | -.61 | |
| 9500 | 737.47 | -.56 | |
| 9600 | 737.43 | -.52 | |
| 9700 | 737.39 | -.48 | |
| 9800 | 737.34 | -.43 | |
| 9900 | 737.30 | -.39 | |
| 10000 | 737.28 | -.37 | |

END

SE1000B
Environmental Logger
03/02 20:40

Total Petroleum, Inc.
Alma, Michigan
Long Term Pumping Test

Unit # 00000 Test # 2

Monitor Well No. 38

INPUT 1: Level (F) TOC

Reference 739.49
Scale factor 10.06
Offset 0.00

Step # 0 02/23 13:00

| Elapsed Time (minutes) | Water Elevation (msl) | Drawdown (feet) |
|---|---|---|
| 0.0000 | 739.50 | .00 |
| .0033 | 739.51 | -.01 |
| .0066 | 739.51 | -.01 |
| .0099 | 739.51 | -.01 |
| .0133 | 739.51 | -.01 |
| .0166 | 739.51 | -.01 |
| .0200 | 739.51 | -.01 |
| .0233 | 739.51 | -.01 |
| .0266 | 739.51 | -.01 |
| .0300 | 739.51 | -.01 |
| .0333 | 739.51 | -.01 |
| .0500 | 739.49 | .01 |
| .0666 | 739.49 | .01 |
| .0833 | 739.49 | .01 |
| .1000 | 739.49 | .01 |
| .1166 | 739.49 | .01 |
| .1333 | 739.49 | .01 |
| .1500 | 739.49 | .01 |
| .1666 | 739.49 | .01 |
| .1833 | 739.49 | .01 |
| .2000 | 739.50 | .00 |
| .2166 | 739.50 | .00 |
| .2333 | 739.50 | .00 |
| .2500 | 739.50 | .00 |
| .2666 | 739.50 | .00 |
| .2833 | 739.50 | .00 |
| .3000 | 739.50 | .00 |
| .3166 | 739.50 | .00 |
| .3333 | 739.50 | .00 |
| .4167 | 739.50 | .00 |
| .5000 | 739.50 | .00 |
| .5833 | 739.50 | .00 |
| .6667 | 739.50 | .00 |
| .7500 | 739.50 | .00 |
| .8333 | 739.50 | .00 |
| .9167 | 739.51 | -.01 |
| 1.0000 | 739.51 | -.01 |
| 1.0833 | 739.51 | -.01 |
| 1.1667 | 739.51 | -.01 |
| 1.2500 | 739.51 | -.01 |

| | | | |
|---|---|---|---|
| 1.3333 | 739.51 | -.01 | Total Petroleum, Inc. |
| 1.4166 | 739.51 | -.01 | Alma, Michigan |
| 1.5000 | 739.51 | -.01 | Long Term Pumping Test |
| 1.5833 | 739.51 | -.01 | |
| 1.6667 | 739.52 | -.02 | Monitor Well No. 38 |
| 1.7500 | 739.52 | -.02 | |
| 1.8333 | 739.52 | -.02 | |
| 1.9167 | 739.52 | -.02 | |
| 2.00 | 739.52 | -.02 | |
| 2.50 | 739.53 | -.03 | |
| 3.00 | 739.54 | -.04 | |
| 3.50 | 739.54 | -.04 | |
| 4.00 | 739.54 | -.04 | |
| 4.50 | 739.55 | -.05 | |
| 5.00 | 739.55 | -.05 | |
| 5.50 | 739.55 | -.05 | |
| 6.00 | 739.55 | -.05 | |
| 6.50 | 739.56 | -.06 | |
| 7.00 | 739.55 | -.05 | |
| 7.50 | 739.55 | -.05 | |
| 8.00 | 739.56 | -.06 | |
| 8.50 | 739.55 | -.05 | |
| 9.00 | 739.55 | -.05 | |
| 9.50 | 739.55 | -.05 | |
| 10 | 739.55 | -.05 | |
| 12 | 739.55 | -.05 | |
| 14 | 739.55 | -.05 | |
| 16 | 739.55 | -.05 | |
| 18 | 739.55 | -.05 | |
| 20 | 739.54 | -.04 | |
| 22 | 739.53 | -.03 | |
| 24 | 739.52 | -.02 | |
| 26 | 739.52 | -.02 | |
| 28 | 739.52 | -.02 | |
| 30 | 739.52 | -.02 | |
| 32 | 739.52 | -.02 | |
| 34 | 739.52 | -.02 | |
| 36 | 739.52 | -.02 | |
| 38 | 739.51 | -.01 | |
| 40 | 739.51 | -.01 | |
| 42 | 739.52 | -.02 | |
| 44 | 739.51 | -.01 | |
| 46 | 739.52 | -.02 | |
| 48 | 739.52 | -.02 | |
| 50 | 739.51 | -.01 | |
| 52 | 739.51 | -.01 | |
| 54 | 739.51 | -.01 | |
| 56 | 739.51 | -.01 | |
| 58 | 739.51 | -.01 | |
| 60 | 739.51 | -.01 | |
| 62 | 739.51 | -.01 | |
| 64 | 739.51 | -.01 | |
| 66 | 739.52 | -.02 | |
| 68 | 739.52 | -.02 | |
| 70 | 739.52 | -.02 | |
| 72 | 739.52 | -.02 | |
| 74 | 739.52 | -.02 | |
| 76 | 739.51 | -.01 | |

| | | | |
|---|---|---|---|
| 78 | 739.51 | -.01 | Total Petroleum, Inc. |
| 80 | 739.51 | -.01 | Alma, Michigan |
| 82 | 739.51 | -.01 | Long Term Pumping Test |
| 84 | 739.51 | -.01 | |
| 86 | 739.51 | -.01 | Monitor Well No. 38 |
| 88 | 739.52 | -.02 | |
| 90 | 739.51 | -.01 | |
| 92 | 739.51 | -.01 | |
| 94 | 739.51 | -.01 | |
| 96 | 739.51 | -.01 | |
| 98 | 739.51 | -.01 | |
| 100 | 739.51 | -.01 | |
| 110 | 739.52 | -.02 | |
| 120 | 739.52 | -.02 | |
| 130 | 739.52 | -.02 | |
| 140 | 739.51 | -.01 | |
| 150 | 739.51 | -.01 | |
| 160 | 739.51 | -.01 | |
| 170 | 739.50 | .00 | |
| 180 | 739.50 | .00 | |
| 190 | 739.50 | .00 | |
| 200 | 739.50 | .00 | |
| 210 | 739.50 | .00 | |
| 220 | 739.50 | .00 | |
| 230 | 739.50 | .00 | |
| 240 | 739.51 | -.01 | |
| 250 | 739.50 | .00 | |
| 260 | 739.50 | .00 | |
| 270 | 739.50 | .00 | |
| 280 | 739.50 | .00 | |
| 290 | 739.50 | .00 | |
| 300 | 739.50 | .00 | |
| 310 | 739.50 | .00 | |
| 320 | 739.50 | .00 | |
| 330 | 739.49 | .01 | |
| 340 | 739.49 | .01 | |
| 350 | 739.49 | .01 | |
| 360 | 739.49 | .01 | |
| 370 | 739.49 | .01 | |
| 380 | 739.49 | .01 | |
| 390 | 739.49 | .01 | |
| 400 | 739.48 | .02 | |
| 410 | 739.48 | .02 | |
| 420 | 739.48 | .02 | |
| 430 | 739.47 | .03 | |
| 440 | 739.47 | .03 | |
| 450 | 739.47 | .03 | |
| 460 | 739.47 | .03 | |
| 470 | 739.47 | .03 | |
| 480 | 739.47 | .03 | |
| 490 | 739.47 | .03 | |
| 500 | 739.47 | .03 | |
| 510 | 739.47 | .03 | |
| 520 | 739.47 | .03 | |
| 530 | 739.46 | .04 | |
| 540 | 739.46 | .04 | |
| 550 | 739.46 | .04 | |
| 560 | 739.46 | .04 | |

| | | | |
|---|---|---|---|
| 570 | 739.47 | .03 | Total Petroleum, Inc. |
| 580 | 739.47 | .03 | Alma, Michigan |
| 590 | 739.47 | .03 | Long Term Pumping Test |
| 600 | 739.47 | .03 | |
| 610 | 739.46 | .04 | Monitor Well No. 38 |
| 620 | 739.46 | .04 | |
| 630 | 739.46 | .04 | |
| 640 | 739.46 | .04 | |
| 650 | 739.46 | .04 | |
| 660 | 739.46 | .04 | |
| 670 | 739.46 | .04 | |
| 680 | 739.46 | .04 | |
| 690 | 739.46 | .04 | |
| 700 | 739.46 | .04 | |
| 710 | 739.46 | .04 | |
| 720 | 739.45 | .05 | |
| 730 | 739.45 | .05 | |
| 740 | 739.47 | .03 | |
| 750 | 739.47 | .03 | |
| 760 | 739.46 | .04 | |
| 770 | 739.46 | .04 | |
| 780 | 739.46 | .04 | |
| 790 | 739.46 | .04 | |
| 800 | 739.46 | .04 | |
| 810 | 739.46 | .04 | |
| 820 | 739.46 | .04 | |
| 830 | 739.46 | .04 | |
| 840 | 739.46 | .04 | |
| 850 | 739.46 | .04 | |
| 860 | 739.46 | .04 | |
| 870 | 739.45 | .05 | |
| 880 | 739.45 | .05 | |
| 890 | 739.45 | .05 | |
| 900 | 739.45 | .05 | |
| 910 | 739.45 | .05 | |
| 920 | 739.45 | .05 | |
| 930 | 739.45 | .05 | |
| 940 | 739.44 | .06 | |
| 950 | 739.45 | .05 | |
| 960 | 739.44 | .06 | |
| 970 | 739.44 | .06 | |
| 980 | 739.44 | .06 | |
| 990 | 739.44 | .06 | |
| 1000 | 739.44 | .06 | |
| 1100 | 739.45 | .05 | |
| 1200 | 739.42 | .08 | |
| 1300 | 739.42 | .08 | |
| 1400 | 739.42 | .08 | |
| 1500 | 739.43 | .07 | |
| 1600 | 739.46 | .04 | |
| 1700 | 739.47 | .03 | |
| 1800 | 739.48 | .02 | |
| 1900 | 739.48 | .02 | |
| 2000 | 739.47 | .03 | |
| 2100 | 739.47 | .03 | |
| 2200 | 739.47 | .03 | |
| 2300 | 739.48 | .02 | |
| 2400 | 739.47 | .03 | |

| | | | |
|---|---|---|---|
| 2500 | 739.47 | .03 | Total Petroleum, Inc. |
| 2600 | 739.45 | .05 | Alma, Michigan |
| 2700 | 739.44 | .06 | Long Term Pumping Test |
| 2800 | 739.45 | .05 | |
| 2900 | 739.46 | .04 | Monitor Well No. 38 |
| 3000 | 739.48 | .02 | |
| 3100 | 739.50 | .00 | |
| 3200 | 739.50 | .00 | |
| 3300 | 739.49 | .01 | |
| 3400 | 739.48 | .02 | |
| 3500 | 739.50 | .00 | |
| 3600 | 739.50 | .00 | |
| 3700 | 739.47 | .03 | |
| 3800 | 739.48 | .02 | |
| 3900 | 739.50 | .00 | |
| 4000 | 739.48 | .02 | |
| 4100 | 739.46 | .04 | |
| 4200 | 739.45 | .05 | |
| 4300 | 739.49 | .01 | |
| 4400 | 739.52 | -.02 | |
| 4500 | 739.55 | -.05 | |
| 4600 | 739.53 | -.05 | |
| 4700 | 739.54 | -.04 | |
| 4800 | 739.57 | -.07 | |
| 4900 | 739.58 | -.08 | |
| 5000 | 739.61 | -.11 | |
| 5100 | 739.63 | -.13 | |
| 5200 | 739.66 | -.16 | |
| 5300 | 739.66 | -.16 | |
| 5400 | 739.67 | -.17 | |
| 5500 | 739.70 | -.20 | |
| 5600 | 739.69 | -.19 | |
| 5700 | 739.70 | -.20 | |
| 5800 | 739.75 | -.25 | |
| 5900 | 739.77 | -.27 | |
| 6000 | 739.79 | -.29 | |
| 6100 | 739.80 | -.30 | |
| 6200 | 739.80 | -.30 | |
| 6300 | 739.81 | -.31 | |
| 6400 | 739.82 | -.32 | |
| 6500 | 739.83 | -.33 | |
| 6600 | 739.84 | -.34 | |
| 6700 | 739.84 | -.34 | |
| 6800 | 739.85 | -.35 | |
| 6900 | 739.85 | -.35 | |
| 7000 | 739.86 | -.36 | |
| 7100 | 739.87 | -.37 | |
| 7200 | 739.87 | -.37 | |
| 7300 | 739.92 | -.42 | |
| 7400 | 739.96 | -.46 | |
| 7500 | 740.00 | -.50 | |
| 7600 | 740.04 | -.54 | |
| 7700 | 740.09 | -.59 | |
| 7800 | 740.15 | -.65 | |
| 7900 | 740.22 | -.72 | |
| 8000 | 740.28 | -.78 | |
| 8100 | 740.33 | -.83 | |
| 8200 | 740.36 | -.86 | |

Total Petroleum, Inc.
Alma, Michigan
Aquifer Test Data

Test # 2
East Production Well
Observer: W.J. Bosze (FTCH)
B.E. White (Total)
How Measured: Air Line Direct Reading Gage

| Date | Clock Time | Water Level (feet) | Drawdown (feet) | Remarks |
|---|---|---|---|---|
| 2/23/87 | 11:55 | ~~60~~ 40 | | |
| | 13:00 | ~~60~~ 40 | 0 | Start Test |
| | 13:01 | 64 | 24 | |
| | 13:02 | 66 | 26 | |
| | 13:05 | 70 | 30 | |
| | 13:06 | 74 | 34 | |
| | 13:07 | 77 | 37 | |
| | 13:11 | 77 | 37 | |
| | 13:15 | 77 | 37 | |
| | 13:33 | | | Flow = 260 gpm |
| | 13:38 | | | Flow = 260 gpm |
| | 17:07 | 61 | 21 | |
| 2/24/87 | 08:38 | 66 | 26 | |
| | 17:02 | 65 | 25 | |
| 2/25/87 | 09:10 | 68 | 28 | |
| | 17:03 | 67 | 27 | |
| 2/26/87 | 08:48 | 69 | 29 | |
| | 16:53 | 76 | 36 | |
| 2/27/87 | 09:14 | 74 | 34 | |
| | 16:45 | 73 | 33 | |
| 3/02/87 | 08:57 | 67 | 27 | |
| | 14:10 | 70 | 30 | |

Total Petroleum. Inc.
Alma, Michigan
Aquifer Test Data

Test # 2
West Production Well
Observer: W.J. Bosze (FTCH)
B.E. White (Total)
How Measured: Air Line Direct Reading Gage

| Date | Clock Time | Water Level (feet) | Drawdown (feet) | Remarks |
|---|---|---|---|---|
| 2/23/87 | 11:50 | 40 | | |
| | 13:00 | 40 | 0 | Start Test |
| | 13:03 | 57 | 17 | |
| | 13:04 | 57 | 17 | |
| | 13:08:30 | 62 | 22 | |
| | 13:09:30 | 67 | 27 | |
| | 13:10 | 69 | 29 | |
| | 13:20 | 60 | 20 | |
| | 13:33 | | | Flow = 260 gpm |
| | 13:38 | | | Flow = 260 gpm |
| | 17:03 | 53 | 13 | |
| 2/24/87 | 08:35 | 57 | 17 | |
| | 17:06 | 57 | 17 | |
| 2/25/87 | 09:07 | 59 | 19 | |
| | 17:06 | 61 | 21 | |
| 2/26/87 | 08:44 | 60 | 20 | |
| | 16:58 | 64 | 24 | |
| 2/27/87 | 09:11 | 63 | 23 | |
| | 16:48 | 63 | 23 | |
| 3/02/87 | 08:52 | 60 | 20 | |
| | 14:20 | 62 | 22 | |

T # 59277

11/84 MICHIGAN DEPT OF NATURAL RESOURCES ENVIRONMENTAL LABORATORY ? not expected YES NO = INFO ON BACK

MATRIX = WATER ANALYSIS REQUEST SHEET ***** SAFETY WARNING *****

LAB LOGG 8360 PROJ CODE HT COST CENTER 60583 PR II RECEIVED AT LAB MR DATE TIME 5/23/86 0820 AM PM

LOCATION SAMPLED Total Petroleum - Alma COLLECTED BY Browne/Takacs TRANSFERED TO

SAMPLE REMARKS SEND RESULTS TO (NAME & SECTION) Liz Browne - HWD-TSS

| LAB USE ONLY | # | FIELD ID OR DESCRIPTION | SAMPLE INFORMATION | YY/MM/DD | HH:MM |
|---|---|---|---|---|---|
| | | | cont | | |
| 59277 | 01 | MW 15 | 1650 | 860522 | 1055 |
| 59278 | 02 | MW 18 | 650 | 860522 | 1000 |
| 59279 | 03 | MW 19 | 2100 | 860522 | 1230 |
| 59280 | 04 | MW 20 | 1750 | 860522 | 1155 |
| 59281 | 05 | MW 21 | 1850 | 860522 | 1250 |
| 59282 | 06 | MW 30 | 2500 | 860522 | 1350 |
| 59283 | 07 | FB | — | 860522 | 1300 |
| | 08 | | | | |
| | 09 | | | | |
| | 10 | | | | |

**ORGANIC**

PO1 #1 HALOCARBONS....1 2 3 4 5 6 7 8 9 10

PO2 #2 AROMATIC HC....1 2 3 4 5 6 7 8 9 10

OBN #3 CL HC&PEST &PCB.1 2 3 4 5 6 7 8 9 10
#6 PHTHALATES.....1 2 3 4 5 6 7 8 9 10
#7 PNA.....1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

OA #8 PHENOLS.....1 2 3 4 5 6 7 8 9 10

OG OIL & GREASE-IR..1 2 3 4 5 6 7 8 9 10
OIL & GREASE-GRAV..1 2 3 4 5 6 7 8 9 10

1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10
2 3 4 5 6 7 8 9 10

**INORGANIC**

MAD FIELD FILTER+PRES.1 2 3 4 5 6 7 8 9 10
MD LAB FILTRATION.....1 2 3 4 5 6 7 8 9 10

MA CA MG NA K.....1 2 3 4 5 6 7 8 9 10
CD CR CU NI PB ZN.1 2 3 4 5 6 7 8 9 10
HG MERCURY.....1 2 3 4 5 6 7 8 9 10
AS ARSENIC.....1 2 3 4 5 6 7 8 9 10
SE SELENIUM.....1 2 3 4 5 6 7 8 9 10
SB ANTIMONY.....1 2 3 4 5 6 7 8 9 10
OTHERS (CIRCLE)
AG AL BA BE CO FE.1 2 3 4 5 6 7 8 9 10
LI MN MO TI V.....1 2 3 4 5 6 7 8 9 10
FURNACE- CD.....1 2 3 4 5 6 7 8 9 10
* CR CU NI PB.....1 2 3 4 5 6 7 8 9 10

MN PH, CONDUCTANCE....1 2 3 4 5 6 7 8 9 10
CL SO4 TOTAL ALK.1 2 3 4 5 6 7 8 9 10
FLUORIDE.....1 2 3 4 5 6 7 8 9 10
CR+6.....1 2 3 4 5 6 7 8 9 10
HCO3- CO3=.....1 2 3 4 5 6 7 8 9 10
CA MG NA K -DISS. 1 2 3 4 5 6 7 8 9 10

MB BRINE (CIRCLE)
* CL SO4 BR 1 2 3 4 5 6 7 8 9 10
* ALK HCO3- CO3=..1 2 3 4 5 6 7 8 9 10
* CA MG K K 1 2 3 4 5 6 7 8 9 10

**GENERAL CHEMISTRY**

DO DISS OXYGEN....1 2 3 4 5 6 7 8 9 10

GN O-PHOS NO2-....1 2 3 4 5 6 7 8 9 10
RES-NF (SS)....1 2 3 4 5 6 7 8 9 10
RES-TF (TDS)...1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10
BOD TOT 5 DAY.1 2 3 4 5 6 7 8 9 10
BOD CARB 5 DAY.1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

GA COD.....1 2 3 4 5 6 7 8 9 10
TOC.....1 2 3 4 5 6 7 8 9 10
NO3+NO2 NH3....1 2 3 4 5 6 7 8 9 10
KJEL N, TOT P..1 2 3 4 5 6 7 8 9 10
PHENOLICS.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

GB TOTAL CN.....1 2 3 4 5 6 7 8 9 10
FREE CN.....1 2 3 4 5 6 7 8 9 10

BC FECAL COLI.....1 2 3 4 5 6 7 8 9 10
TOTAL COLI.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

CA CHLOROPHYLL....1 2 3 4 5 6 7 8 9 10

L 8360 #59277

SAMPLE HAZARD INFORMATION
FOR EMPLOYEE SAFETY

If you checked (✓) yes on the front side of this form indicating a safety warning, please complete the information below.

I. Type of Samples:

✓ Environmental (surface, groundwater, soil, bottom sediment)
____ Waste Water
____ Municipal Sludge
____ Industrial Sludge
____ Landfill Leachate
____ Contaminated Soil
____ Spill Material
____ Waste Drums
____ Other, specify _____

II. Which of these causes you to think these samples are potentially hazardous?

____ Site Use History
____ Site Inspections
____ Critical Materials Report(s)
____ Permit Application(s)
____ Monthly Operating Reports
____ Citizen Complaint
____ Previous Analyses (results pending)
____ Previous Analyses--Log No's. if known: 7340 / 6982
____ Inspection Crew Reaction: _____
____ Other _____

some Pentachlorophenol found in MW15 at one time

III. Indicate the type of potential hazard:

____ Toxic
____ Pathogenic
____ Flammable
____ Reactive (generates HCN, $H_2S$, etc.)

ARE VOLATILE TOXICS KNOWN OR LIKELY TO BE PRESENT IN CONCENTRATIONS OF CONCERN?

____ Yes ✓ No

PLEASE SPECIFY IF KNOWN: _____

WHAT SPECIAL PRECAUTIONS WERE TAKEN DURING THE COLLECTION OF THESE SAMPLES?

MICHIGAN DEPT OF NATURAL RESOURCES ENVIRONMENTAL LABORATORY

MATRIX = WATER GENERAL CHEMISTRY UNIT 2/84

LAB LOG# 8360 PROJ CODE COST CENTER PR EXAMINER DATE REPORTED

LOCATION SAMPLED COMMENTS

| LAB NO. | OXYGEN DISS MG/L 00300 | ORTH.P TOTAL MG/L P 70507 | NO2 TOTAL MG/L N 00615 | RES-NF SS-105 MG/L 00530 | RES-TF TDS180 MG/L 70301 | | BOD-5 TOTAL MG/L 00310 | | TURB. HACH FTU 00076 | C.O.D. LOW MG/L 00335 | REF NO. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 59277 | | | | | | | | | | | 1 |
| 78 | | | | | | | | | | | 2 |
| 79 | | | | | | | | | | | 3 |
| 80 | | | | | | | | | | | 4 |
| 81 | | | | | | | | | | | 5 |
| 82 | | | | | | | | | | | 6 |
| 83 | | | | | | | | | | | 7 |
| | | | | | | | | | | | 8 |
| | | | | | | | | | | | 9 |
| | | | | | | | | | | | 10 |

| T.O.C. MG/L 00680 | NO3+NO2 TOTAL MG/L N 00630 | NO3 TOTAL MG/L N 00620 | NH3 TOTAL MG/L N 00610 | KJEL N TOTAL MG/L N 00625 | ORG N TOTAL MG/L N 00605 | PHOS. TOTAL MG/L P 00665 | PHENOL T. REC UG/L 32730 | CN TOTAL MG/L 00720 | FECAL COLI MF. 31616 | REF NO. |
|---|---|---|---|---|---|---|---|---|---|---|
| 9.6 | | | | | | | 1 | | | 1 |
| 1.6 | | | | | | | K1 | | | 2 |
| 48. | | | | | | | 2.3 | | | 3 |
| 20. | | | | | | | 1.4 | | | 4 |
| 29. | | | | | | | 2.9 | | | 5 |
| 57. | | | | | | | 12. | | | 6 |
| K0.2 | | | | | | | 1.2 | | | 7 |
| | | | | | | | | | | 8 |
| | | | | | | | | | | 9 |
| | | | | | | | | | | 10 |

EL066

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL LABORATORY
INORGANIC UNIT

EXAMINER .....Nordlund.....

ANALYTICAL RESULTS

| LOC # | LAB # | PARAMETER | CODE | VALUE | UNITS | ANALYSIS | MATRIX | RUN # |
|---|---|---|---|---|---|---|---|---|
| 8060 | 89277 | ALKALINITY | | 520.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8060 | 89277 | ALK, CO3= | K | 5.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8060 | 89277 | CHLORIDE | | 200.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8060 | 89277 | ALK, HCO3- | | 520.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8060 | 89277 | SULFATE | | 220.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8060 | 89277 D | CALCIUM | | 197.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8060 | 89277 D | CADMIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89277 D | CHROMIUM | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89277 D | COPPER | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89277 D | IRON | | 2,460.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89277 D | POTASSIUM | | 1.9 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8060 | 89277 D | LITHIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89277 D | MAGNESIUM | | 72.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8060 | 89277 D | SODIUM | | 110.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8060 | 89277 D | NICKEL | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89277 D | LEAD | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89277 D | ZINC | | 190.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89278 | ALKALINITY | | 260.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8060 | 89278 | ALK, CO3= | K | 5.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8060 | 89278 | CHLORIDE | | 14.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8060 | 89278 | ALK, HCO3- | | 260.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8060 | 89278 | SULFATE | | 56.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8060 | 89278 D | CALCIUM | | 105.7 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8060 | 89278 D | CADMIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89278 D | CHROMIUM | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89278 D | COPPER | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89278 D | IRON | | 1,050.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89278 D | POTASSIUM | | 1.4 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8060 | 89278 D | LITHIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89278 D | MAGNESIUM | | 30.4 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8060 | 89278 D | SODIUM | | 4.5 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8060 | 89278 D | NICKEL | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89278 D | LEAD | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89278 D | ZINC | | 270.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8060 | 89279 | ALKALINITY | | 770.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8060 | 89279 | ALK, CO3= | K | 5.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8060 | 89279 | CHLORIDE | | 170.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8060 | 89279 | ALK, HCO3- | | 770.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8060 | 89279 | SULFATE | | 250.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8060 | 89279 D | CALCIUM | | 177.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8060 | 89279 D | CADMIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |

RESULT CODES: "K" =Less Than; "HT" =Holding Time Exceeded; "PB" =Possible Interference; "DL" =Not optimum Dilution
"IT" =Interference; "CNS" =Insufficient Sample; "NOS" =No Sample Received; "ACC" =Lab Accident; "NAV" =Not Available
LAB CODES: "P","R","B","D" =Repeat Results; "F" =Furnace Results

29-OCT-8[illegible]

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL LABORATORY
INORGANIC UNIT

EXAMINER .....BN.....

ANALYTICAL RESULTS

| LOC # | LAB # | PARAMETER | CODE | VALUE | UNITS | ANALYSIS | MATRIX | RUN # |
|---|---|---|---|---|---|---|---|---|
| 8360 | 59279 D | CHROMIUM | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59279 D | COPPER | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59279 D | IRON | | 1,500.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59279 D | POTASSIUM | | 2.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59279 D | LITHIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59279 D | MAGNESIUM | | 61.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59279 D | SODIUM | | 311.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59279 D | NICKEL | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59279 D | LEAD | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59279 D | ZINC | | 85.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59280 | ALKALINITY | | 320.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8360 | 59280 | ALK, CO3= | K | 5.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8360 | 59280 | CHLORIDE | | 240.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8360 | 59280 | ALK, HCO3- | | 320.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8360 | 59280 | SULFATE | | 360.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8360 | 59280 D | CALCIUM | | 229.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59280 D | CADMIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59280 D | CHROMIUM | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59280 D | COPPER | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59280 D | IRON | | 1,700.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59280 D | POTASSIUM | | 2.1 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59280 D | LITHIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59280 D | MAGNESIUM | | 90.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59280 D | SODIUM | | 91.2 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59280 D | NICKEL | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59280 D | LEAD | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59280 D | ZINC | | 3,100.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59281 | ALKALINITY | | 580.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8360 | 59281 | ALK, CO3= | K | 5.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8360 | 59281 | CHLORIDE | | 340.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8360 | 59281 | ALK, HCO3- | | 550.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8360 | 59281 | SULFATE | | 170.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8360 | 59281 D | CALCIUM | | 215.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59281 D | CADMIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59281 D | CHROMIUM | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59281 D | COPPER | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59281 D | IRON | | 1,450.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59281 D | POTASSIUM | | 2.1 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59281 D | LITHIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59281 D | MAGNESIUM | | 71.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59281 D | SODIUM | | 18.1 | MG / L (ppm) | DISSOLVED | WATER | 16200 |

RESULT CODES: "K" =Less Than; "HT" =Holding Time Exceeded; "PB" =Possible Interference; "DL" =Not optimum Dilution
"INT" =Interference; "DNS" =Insufficient Sample; "NCS" =No Sample Received; "ACD" =Lab Accident; "NAV" =Not Available
LAB CODES: "R","P","D","O" =Repeat Results; "F" =Furnace Results

DA-[illegible]-86.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL LABORATORY
INORGANIC UNIT

EXAMINER .....[signature].....

ANALYTICAL RESULTS

| LOG # | LAB # | PARAMETER | CODE | VALUE | UNITS | ANALYSIS | MATRIX | RUN # |
|---|---|---|---|---|---|---|---|---|
| 8360 | 59281 D | NICKEL | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59281 D | LEAD | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59281 D | ZINC | | 1,700.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59282 | ALKALINITY | | 880.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8360 | 59282 | ALK, CO3= | K | 5.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8360 | 59282 | CHLORIDE | | 370.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8360 | 59282 | ALK, HCO3- | | 880.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8360 | 59282 | SULFATE | | 170.0 | MG / L (ppm) | TOTAL | WATER | 390 |
| 8360 | 59282 D | CALCIUM | | 246.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59282 D | CADMIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59282 D | CHROMIUM | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59282 D | COPPER | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59282 D | IRON | | 790.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59282 D | POTASSIUM | | 2.8 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59282 D | LITHIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59282 D | MAGNESIUM | | 85.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59282 D | SODIUM | | 348.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59282 D | NICKEL | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59282 D | LEAD | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59282 D | ZINC | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59283 | ALKALINITY | K | 5.0 | MG / L (ppm) | TOTAL | WATER | 392 |
| 8360 | 59283 | ALK, CO3= | K | 5.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8360 | 59283 | CHLORIDE | K | 1.0 | MG / L (ppm) | TOTAL | WATER | 393 |
| 8360 | 59283 | ALK, HCO3- | K | 5.0 | MG / L (ppm) | TOTAL | WATER | 95 |
| 8360 | 59283 | SULFATE | K | 1.0 | MG / L (ppm) | TOTAL | WATER | 392 |
| 8360 | 59283 D | CALCIUM | K | 1.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59283 D | CADMIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59283 D | CHROMIUM | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59283 D | COPPER | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59283 D | IRON | K | 100.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59283 D | POTASSIUM | K | .1 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59283 D | LITHIUM | K | 20.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59283 D | MAGNESIUM | K | 1.0 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59283 D | SODIUM | | 1.6 | MG / L (ppm) | DISSOLVED | WATER | 16200 |
| 8360 | 59283 D | NICKEL | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59283 D | LEAD | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |
| 8360 | 59283 D | ZINC | K | 50.0 | UG/L (ppb) | DISSOLVED | WATER | 00862 |

RESULT CODES: "K" =Less Than; "HT" =Holding Time Exceeded; "PS" =Possible Interference; "DL" =Not optimum Dilution
"INT" =Interference; "GNS" =Insufficient Sample; "NCS" =No Sample Received; "ACC" =Lab Accident; "NAV" =Not Available
LAB# CODES: "R","P","D","C" =Repeat Results; "F" =Furnace Results

MICH DNR ENVIRONMENTAL LAB
ORGANIC RESULTS FOR LAB LOG #8360
==========

| | | | | |
|---|---|---|---|---|
| LAB# 59277 REC# 2719 | ug/L | ppb | SCAN 1 | COMMENTS |
| | | 2.80 | 1*2-DICHLOROETHANE | UC |
| | | 5.00 | Det limit methylene chloride, chlorobenzene | |
| | | 1.00 | Detection limit all others | |
| LAB# 59277 REC# 2748 | ug/L | ppb | SCAN 2 | COMMENTS |
| | | 5.00 | Detection limit | |
| LAB# 59277 REC# 2947 | ug/L | ppb | SCAN 8 | COMMENTS |
| | | 5.10 | Detection limit | |
| LAB# 59277 REC# 3257 | mg/L | ppm | OIL & GREASE (Gravimetric) | COMMENTS |
| | | 4.20 | GRAVIMETRIC | * * * * |
| | | 2.00 | Detection limit | |
| LAB# 59278 REC# 2720 | ug/L | ppb | SCAN 1 | COMMENTS |
| | | 5.00 | Det limit methylene chloride, chlorobenzene | |
| | | 1.00 | Detection limit all others | |
| LAB# 59278 REC# 2749 | ug/L | ppb | SCAN 2 | COMMENTS |
| | | 5.00 | Detection limit | |
| LAB# 59278 REC# 2948 | ug/L | ppb | SCAN 8 | COMMENTS |
| | | 5.10 | Detection limit | |
| LAB# 59278 REC# 3258 | mg/L | ppm | OIL & GREASE (Gravimetric) | COMMENTS |
| | | 2.00 | Detection limit | |

LAB LOG #8360 cont.
==========

| | | | | |
|---|---|---|---|---|
| LAB# 59279<br>REC# 2721 | ug/L | ppb | SCAN 1 | COMMENTS |
| | | 25.00 | Det limit methylene chloride, chlorobenzene | |
| | | 5.00 | Detection limit all others | |
| LAB# 59279<br>REC# 2750 | ug/L | ppb | SCAN 2 | COMMENTS |
| | | | UNID PEAK | * * * * |
| | | 5.00 | Detection limit | |
| LAB# 59279<br>REC# 2949 | ug/L | ppb | SCAN 8 | COMMENTS |
| | | | UN ID PKS | * * * * |
| | | 51.00 | Detection limit | |
| LAB# 59279<br>REC# 3259 | mg/L | ppm | OIL & GREASE (Gravimetric) | COMMENTS |
| | | 2.00 | Detection limit | |
| LAB# 59280<br>REC# 2722 | ug/L | ppb | SCAN 1 | COMMENTS |
| | | 5.00 | Det limit methylene chloride, chlorobenzene | |
| | | 1.00 | Detection limit all others | |
| LAB# 59280<br>REC# 2751 | ug/L | ppb | SCAN 2 | COMMENTS |
| | | 5.00 | Detection limit | |
| LAB# 59280<br>REC# 2950 | ug/L | ppb | SCAN 8 | COMMENTS |
| | | | UN ID PKS | * * * * |
| | | 5.10 | Detection limit | |

LAB LOG #8360 cont.
==========

| | | | | |
|---|---|---|---|---|
| LAB# 59280<br>REC# 3260 | mg/L | ppm | OIL & GREASE (Gravimetric) | COMMENTS |
| | | 44.00 | GRAVIMETRIC | * * * * |
| | | 2.00 | Detection limit | |

| | | | | |
|---|---|---|---|---|
| LAB# 59281<br>REC# 2723 | ug/L | ppb | SCAN 1 | COMMENTS |
| | | 5.00 | Det limit methylene chloride, chlorobenzene | |
| | | 1.00 | Detection limit all others | |

| | | | | |
|---|---|---|---|---|
| LAB# 59281<br>REC# 2752 | ug/L | ppb | SCAN 2 | COMMENTS |
| | | 5.00 | Detection limit | |

| | | | | |
|---|---|---|---|---|
| LAB# 59281<br>REC# 2952 | ug/L | ppb | SCAN 8 | COMMENTS |
| | | | UN ID PKS | * * * * |
| | | 5.10 | Detection limit | |

| | | | | |
|---|---|---|---|---|
| LAB# 59281<br>REC# 3263 | mg/L | ppm | OIL & GREASE (Gravimetric) | COMMENTS |
| | | 2.00 | Detection limit | |

| | | | | |
|---|---|---|---|---|
| LAB# 59282<br>REC# 2724 | ug/L | ppb | SCAN 1 | COMMENTS |
| | | 5.00 | Det limit methylene chloride, chlorobenzene | |
| | | 1.00 | Detection limit all others | |

| | | | | |
|---|---|---|---|---|
| LAB# 59282<br>REC# 2753 | ug/L | ppb | SCAN 2 | COMMENTS |
| | | | UNID PEAK | * * * * |
| | | 5.00 | Detection limit | |

LAB LOG #8360 cont.

| | | | | |
|---|---|---|---|---|
| LAB# 59282<br>REC# 2954 | ug/L | ppb | SCAN 8 | COMMENTS |
| | | | UN ID PKS | * * * * |
| | | 52.00 | Detection limit | |
| LAB# 59282<br>REC# 3264 | mg/L | ppm | OIL & GREASE (Gravimetric) | COMMENTS |
| | | 3.50 | GRAVIMETRIC | * * * * |
| | | 2.00 | Detection limit | |
| LAB# 59283<br>REC# 2725 | ug/L | ppb | SCAN 1 | COMMENTS |
| | | 5.00 | Det limit methylene chloride, chlorobenzene | |
| | | 1.00 | Detection limit all others | |
| LAB# 59283<br>REC# 2726 | ug/L | ppb | SCAN 2 | COMMENTS |
| | | 5.00 | Detection limit | |
| LAB# 59283<br>REC# 2955 | ug/L | ppb | SCAN 8 | COMMENTS |
| | | 5.00 | Detection limit | |
| LAB# 59283<br>REC# 3265 | mg/L | ppm | OIL & GREASE (Gravimetric) | COMMENTS |
| | | 2.00 | Detection limit | |

Unless noted above under COMMENTS, analyses were performed for the compounds on attached scan list. Concentrations are rounded to 2 significant figures.

Approved John Peck

JUN 2 0 1986

ORGANIC SCAN LIST
MATRIX: WATER
MAY 1986

SCAN 1 - Purgeable Halocarbons

Bromodichloromethane
Bromoform
Carbon tetrachloride
Chlorobenzene
Chloroform
Dibromochloromethane
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
1,2-Dichloroethene (cis & trans)
1,2-Dichloropropane
1,3-Dichloropropene (cis & trans)
Methylene chloride
1,1,2,2-Tetrachloroethane
Tetrachloroethene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene

SCAN 2 - Purgeable Aromatic Hydrocarbons

Benzene
Ethylbenzene
Toluene
Xylene isomers (o, m, and p)

SCAN 3 - Chlorinated Hydrocarbons, PCBs & Organochlorine Pesticides

Aldrin
*Aroclor 1016
*Aroclor 1221
*Aroclor 1232
Aroclor 1242
*Aroclor 1248
Aroclor 1254
Aroclor 1260
*Aroclor 1262
*Aroclor 1268
g-BHC (lindane)
BP-6 (PBB)
a-Chlordane
g-Chlordane
2-Chloronaphthalene
4,4'-DDD
4,4'-DDE
1,4'-DDT
4,4'-DDT
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
Heptachlor
Heptachlor epoxide
Hexabromobenzene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Methoxychlor
Mirex
Pentachloronitrobenzene
*Toxaphene
1,2,4-Trichlorobenzene

SCAN 6 - Phthalate Esters & Polar Pesticides

Bis(2-ethylhexyl)phthalate
Butylbenzylphthalate
Di-n-butylphthalate
Diethylphthalate
Dimethylphthalate
Di-n-octylphthalate
Dieldrin
Endosulfan I
Endrin

SCAN 7 - Polynuclear Aromatic Hydrocarbons

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(ghi)perylene
Benzo(a)pyrene
Chrysene
Dibenzo(a,h)anthracene
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
Naphthalene
Phenanthrene
Pyrene

SCAN 8 - Phenols

4-Chloro-3-methylphenol[1]
2-Chlorophenol
2,4-Dichlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2-Methyl-4,6-dinitrophenol[2]
2-Nitrophenol
4-Nitrophenol
Pentachlorophenol
Phenol
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol

SCAN 9 - Aromatic Amines (method not validated)

Curene(4,4'-Methylene(bis)2-chloroaniline)
3,3'-Dichlorobenzidine

*Standards for these seldom encountered compounds are analyzed when their pattern is recognized. Results are coded as semi-quantitative (Type II).

[1]Reported as 4-chloro-m-cresol

[2]Reported as 4,6-Dinitro-o-cresol

# Total Petroleum, Inc - Alma

| Parameter | Units | Date Sampled 5-22-86 | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | mg/l unless noted | MW 15 | MW 18 | MW 19 | MW 20 | MW 21 | MW 30 | Field Blank |
| Spec Cond | umhos/cm | 1650 | 650 | 2100 | 1750 | 1850 | 2500 | — |
| TOC | | 9.6 | 1.6 | 48. | 20. | 29. | 57. | <0.2 |
| Phenol | ug/l | 1 | <1 | 2.3 | 1.4 | 2.9 | 12. | 1.2 |
| Alkalinity | | 520 | 260 | 770 | 320 | 580 | 880 | <5.0 |
| Carbonate | | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Chloride | | 200 | 14. | 170 | 240 | 340 | 370 | <1.0 |
| Bicarbonate | | 520 | 260 | 770 | 320 | 580 | 880 | <5.0 |
| Sulfate | | 220 | 96. | 250 | 360 | 170 | 170 | <1.0 |
| Calcium - diss | | 193 | 105.7 | 177 | 229 | 215 | 246 | <1.0 |
| Cadmium - diss | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Chromium - diss | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Copper - diss | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Iron - diss | | 2.46 | 1.05 | 1.5 | 3.7 | 1.45 | 0.79 | <0.1 |
| Potassium - diss | | 1.9 | 1.4 | 2.0 | 2.1 | 2.1 | 2.8 | <0.1 |
| Lithium - diss | | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 | <0.02 |
| Magnesium - diss | | 72. | 30.4 | 61. | 90. | 71. | 85. | <1.0 |
| Sodium - diss | | 110 | 4.5 | 311 | 91.2 | 18.1 | 348 | 1.6 |
| Nickel - diss | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Lead - diss | | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Zinc - diss | | 0.19 | 0.27 | 0.085 | 3.1 | 1.7 | <0.05 | <0.05 |
| | ug/l | | | | | | | |
| 1,2 Dichloroethane | | 2.8 UC | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Methylene Chloride | | <5.0 | <5.0 | <25. | <5.0 | <5.0 | <5.0 | <5.0 |
| Chlorobenzene | | <5.0 | <5.0 | <25. | <5.0 | <5.0 | <5.0 | <5.0 |
| Others in Scan 1 | | <1.0 | <1.0 | <5.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Unidentified Peaks | | — | — | * | — | — | * | — |
| Others in Scan 2 | | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 | <5.0 |
| Unidentified Peaks | | — | — | * | * | * | * | — |
| Others in Scan 8 | | <5.1 | <5.1 | <51. | <5.1 | <5.1 | <52. | <5.0 |
| Oil and Grease (mg/l) | | 4.2 | <2.0 | <2.0 | 44. | <2.0 | 3.5 | <2.0 |

UC - No attempt has been made to confirm the identity of the reported compound by a second independent technique due to equipment problems.

* unidentified peaks reported for these samples

## *COMPARISON OF MDNR/TOTAL DATA*

TOTAL PETROLEUM, INC.--ALMA 5/22/86

| | UNITS | MW-15 DNR | TOTAL | | ESI |
|---|---|---|---|---|---|
| CONDUCTIVITY | umhos/cm | 1650.00 | 1830.00 | 1850.00 | |
| | | | 1850.00 | 1840.00 | |
| PHENOL | ug/l | 1.00 | <5 | | |
| CHROMIUM | mg/l | <0.05 | <0.005 | | <0.005 |
| LEAD | ug/l | <50 | <5 | | 12.10 |
| OIL & GREASE | mg/l | 4.20 | <1 | | |

| | UNITS | MW-18 DNR | TOTAL | | ESI |
|---|---|---|---|---|---|
| CONDUCTIVITY | umhos/cm | 650.00 | 707.00 | 706.00 | |
| | | | 706.00 | 707.00 | |
| PHENOL | ug/l | <1 | <5 | | |
| CHROMIUM | mg/l | <0.05 | <0.005 | | <0.005 |
| LEAD | ug/l | <50 | <5 | | 8.00 |
| OIL & GREASE | mg/l | <2.0 | <1 | | |

| | UNITS | MW-19 DNR | TOTAL | | ESI |
|---|---|---|---|---|---|
| CONDUCTIVITY | umhos/cm | 2100.00 | 2440.00 | 2450.00 | |
| | | | 2500.00 | 2480.00 | |
| PHENOL | ug/l | 2.30 | 8.00 | | |
| CHROMIUM | mg/l | <0.05 | <0.005 | | <0.005 |
| LEAD | ug/l | <0.05 | <5 | | <5 |
| OIL & GREASE | mg/l | <2.0 | 1.00 | | |

| | UNITS | MW-20 DNR | TOTAL | | ESI |
|---|---|---|---|---|---|
| CONDUCTIVITY | umhos/cm | 1750.00 | 2030.00 | 2060.00 | |
| | | | 2060.00 | 2060.00 | |
| PHENOL | ug/l | 1.40 | <5 | | |
| CHROMIUM | mg/l | <0.05 | <0.005 | | <0.005 |
| LEAD | ug/l | <50 | <5 | | 9.60 |
| OIL & GREASE | mg/l | 44.00 | 1.00 | | |

| | UNITS | MW-21 DNR | TOTAL | | ESI |
|---|---|---|---|---|---|
| CONDUCTIVITY | umhos/cm | 1850.00 | 2560.00 | 2560.00 | |
| | | | 2560.00 | 2560.00 | |
| PHENOL | ug/l | 2.90 | 6.00 | | |
| CHROMIUM | mg/l | <0.05 | <0.005 | | <0.005 |
| LEAD | ug/l | <50 | <5 | | 9.40 |
| OIL & GREASE | mg/l | <2.0 | 1.00 | | |

| | UNITS | MW-30 DNR | TOTAL | | ESI |
|---|---|---|---|---|---|
| CONDUCTIVITY | umhos/cm | 2500.00 | 3110.00 | 3120.00 | |
| | | | 3120.00 | 3120.00 | |
| PHENOL | ug/l | 12.00 | 32.00 | | |
| CHROMIUM | mg/l | <0.05 | <0.005 | | <0.005 |
| LEAD | ug/l | <50 | <5 | | <5 |
| OIL & GREASE | mg/l | 3.50 | 3.00 | | |

11/79 MICHIGAN DEPT OF NATURAL RESOURCES - ENVIRONMENTAL LABORATORY YES / NO - INFO ON BACK

MATRIX = WATER ANALYSIS REQUEST SHEET ***** SAFETY WARNING *****

LAB LOG# 7340 PROJ CODE HT COST CENTER 60583 PR II RECEIVED AT LAB RM DATE TIME 11/1/85 825 AM PM

LOCATION SAMPLED Total - Alma COLLECTED BY Browne / McNie TRANSFERED TO

SAMPLE REMARKS resample from 9-11-85 SEND RESULTS TO (NAME & SECTION) Liz Browne - HWD Tech Serv

| LAB USE ONLY | # | FIELD ID OR DESCRIPTION | SAMPLE INFORMATION pH | cond | YY/MM/DD | HH:MM |
|---|---|---|---|---|---|---|
| 54212 | 01 | MW5 | 7.1 | 805 | 851031 | 1050 |
| 54213 | 02 | MW 15 | 7.2 | 1675 | 851031 | 1120 |
| 54214 | 03 | MW 20 | 7.1 | 1800 | 851031 | 1200 |
| 54215 | 04 | MW 21 | 6.9 | 2250 | 851031 | 1015 |
| 54216 | 05 | MW 15 R (replicate) | 7.2 | 1675 | 851031 | 1120 |
| | 06 | | | | | |
| | 07 | | | | | |
| | 08 | | | | | |
| | 09 | | | | | |
| | 10 | | | | | |

**ORGANIC**

P01 #1 HALOCARBONS.....1 2 3 4 5 6 7 8 9 10

P02 #2 AROMATIC HC.....1 2 3 4 5 6 7 8 9 10

OBN #3 CL HC&PEST &PCB.1 2 3 4 5 6 7 8 9 10
#6 PHTHALATES.....1 2 3 4 5 6 7 8 9 10
#7 PNA.....1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

OA #8 PHENOLS.....1 2 3 4 5 6 7 8 9 10

O6 OIL & GREASE-IR....1 2 3 4 5 6 7 8 9 10
OIL & GREASE-GRAV..1 2 3 4 5 6 7 8 9 10

1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10
.....1 2 3 4 5 6 7 8 9 10

**INORGANIC**

MAD FIELD FILTER+PRES..1 2 3 4 5 6 7 8 9 10
MD LAB FILTRATION.....1 2 3 4 5 6 7 8 9 10

MA CA MG NA K.....1 2 3 4 5 6 7 8 9 10
CD CR CU NI PB ZN..1 2 3 4 5 6 7 8 9 10
HG MERCURY.....1 2 3 4 5 6 7 8 9 10
AS ARSENIC.....1 2 3 4 5 6 7 8 9 10
SE SELENIUM.....1 2 3 4 5 6 7 8 9 10
SB ANTIMONY.....1 2 3 4 5 6 7 8 9 10
OTHERS (CIRCLE)
AG AL BA BE CO FE..1 2 3 4 5 6 7 8 9 10
LI MN MO TI V.....1 2 3 4 5 6 7 8 9 10
FURNACE- CD.....1 2 3 4 5 6 7 8 9 10
* CR CU NI PB.....1 2 3 4 5 6 7 8 9 10

MN PH, CONDUCTANCE....1 2 3 4 5 6 7 8 9 10
CL SO4 TOTAL ALK..1 2 3 4 5 6 7 8 9 10
FLUORIDE.....1 2 3 4 5 6 7 8 9 10
CR+6.....1 2 3 4 5 6 7 8 9 10
HCO3- CO3=.....1 2 3 4 5 6 7 8 9 10
CA MG NA K -DISS. 1 2 3 4 5 6 7 8 9 10

MB BRINE (CIRCLE)
* CL SO4 BR 1 2 3 4 5 6 7 8 9 10
* ALK HCO3- CO3=..1 2 3 4 5 6 7 8 9 10
* CA MG NA K .....1 2 3 4 5 6 7 8 9 10

**GENERAL CHEMISTRY**

DO DISS OXYGEN....1 2 3 4 5 6 7 8 9 10

GN O-PHOS NO2-....1 2 3 4 5 6 7 8 9 10
RES-NF (SS)....1 2 3 4 5 6 7 8 9 10
RES-TF (TDS)...1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10
BOD TOT 5 DAY.1 2 3 4 5 6 7 8 9 10
BOD CARB 5 DAY.1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

GA COD.....1 2 3 4 5 6 7 8 9 10
TOC.....1 2 3 4 5 6 7 8 9 10
NO3+NO2 NH3....1 2 3 4 5 6 7 8 9 10
KJEL N, TOT P..1 2 3 4 5 6 7 8 9 10
PHENOLICS.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

GB TOTAL CN.....1 2 3 4 5 6 7 8 9 10
FREE CN.....1 2 3 4 5 6 7 8 9 10

BC FECAL COLI.....1 2 3 4 5 6 7 8 9 10
TOTAL COLI.....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

CA CHLOROPHYLL....1 2 3 4 5 6 7 8 9 10
1 2 3 4 5 6 7 8 9 10

# Total Petroleum, Alma

| Parameter | Units | Date Sampled 10-31-85 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | mg/l unless noted | MW5 | MW15 | MW15R | MW20 | MW21 | | | |
| pH | su | 7.1 | 7.2 | 7.2 | 7.1 | 6.9 | | | |
| Spec. Cond. | µmhos/cm | 805 | 1675 | 1675 | 1800 | 2250 | | | |
| TOC | | 1.7 | 9.5 | – | 7.2 | 27 | | | |
| Alkalinity | | 320 | 407 | – | 290 | 630 | | | |
| Calcium | | 101.2 | 177 | – | 234 | 235 | | | |
| Chloride | | 26. | 156 | – | 394 | 359 | | | |
| Potassium | | 1.4 | 1.8 | – | 2.3 | 1.8 | | | |
| Magnesium | | 51. | 66. | – | 76. | 76. | | | |
| Sodium | | 19.4 | 113 | – | 108 | 213 | | | |
| Sulfate | | 32. | 182 | – | 187 | 148 | | | |
| Scan 8 | ug/l | <5.1 LP | <5.0 LP | <5.0 LP | <51. LP | <51. LP | | | |

LP- Quality control indicated that the precision of the result may have been less than normal.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Hazardous Waste Division

Geotechnical Subunit

Sampling Data Sheet

FACILITY: Total Petroleum LOCATION: Alma

CONTACT: Ben White

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sample# | | MW21 | MW5 | MW15 | MW20 | | |
| Date | | 10-31-85 | 10-31-85 | 10-31-85 | 10-31-85 | | |
| Time | | 1015 | 1050 | 1120 | 1200 | | |
| pH (field) | | 6.9 | 7.1 | 7.2 | 7.1 | | |
| Conductivity (field) | | 2250 | 805 | 1675 | 1800 | | |
| PO | 1 | | | | | | |
| PO | 2 | | | | | | |
| OBN | 3,4,6,7,9 | | | | | | |
| OA | 8 | ✓ | ✓ | ✓✓ | | | |
| OG | oil & grease | | | | | | |
| | | | | | | | |
| MA/~~B~~ | basic 6/Fe | | | | | | |
| | Ca/Mg/Na/K | ✓ | ✓ | ✓ | | | |
| | Hg/As/Se/~~Sb~~ | | | | | | |
| | | | | | | | |
| MN | Cl/$SO_4$/Alk | ✓ | ✓ | ✓ | | | |
| | $HCO_3$/$CO_3$ | | | | | | |
| | Fluoride/$Cr^{+6}$ | | | | | | |
| | | | | | | | |
| GA | ~~COD~~/TOC | ✓ | ✓ | ✓ | | | |
| | $NO_3NO_2$/$NH_3$ | | | | | | |
| | Kjel N/TotP | | | | | | |
| | Phenols | | | | | | |
| | | | | | | | |
| GB | Total/Free Cn | | | | | | |
| | | | | | | | |
| | | | | | | | |
| Sample Appearance | | clear w/flecks | clear | clear | Silty | | |

Additional Notes:

DNR sampling staff: Browne / McNiel

Facility sampling staff: Splitting DNR sample

(if purging and/or sampling methods differ, report facility method/DNR method)

| Monitor Well# | MW21 | MW5 | MW-15 | MW20 | | |
|---|---|---|---|---|---|---|
| SWL (DNR and method used) | ~~24.55~~ 8.48 | 13.26 | ~~6.21~~ | 9.18 | | |
| Sounding | 24.5 | 27 | 25 | 23 | | |
| Volume Purged | 8gal | 7gal | 8gal | 7gal | | |
| Purging Method | teflon bailer | teflon Bail | Teflon Bail | teflon bailer | | |
| Sampling Method | teflon bailer | teflon Bail | Teflon Bail | teflon bailer | | |
| Lysimeter# | | | | | | |
| Volume Purged | | | | | | |
| Sampling Method | | | | | | |
| Surface Water# | | | | | | |
| Description | | | | | | |
| Sampling Method | | | | | | |
| Detection System# | | | | | | |
| Sampling Method | | | | | | |
| Private Well # | | | | | | |
| Location Sampled | | | | | | |
| Length of Time Purged | | | | | | |

Facility Sampling Notes:

Potential External Sources of Contamination:

Precautions Taken:

Field Measurements Taken:

Handling/Preservation:

Sampling Bottles Used:

Replicates and/or Blanks Taken:

Decontamination Procedures:

Additional Notes: resample due to contamination found in MW15 on 9-11-85.
HNu reading @ each well was background

FY 1985 HAZARDOUS WASTE COMPLIANCE MONTORING AND ENFORCEMENT LOG New _____ Update _____

1. U.S. EPA ID MID005358130 3. CITY Alma

2. INSTALLATION NAME Total Petroleum, Inc

4. HANDLER TYPE ___ MAJOR
___ NON - MAJOR

5. DATE OF INITIAL EVALUATION WHICH IS THE BASIS FOR THIS REPORT 10 31 85 (M D Y)

6. TYPE OF EVALUATION COVERED BY THIS REPORT (Check only one)

- ___ 1 Evaluation Inspection
- √ 2 Sampling Inspection
- ___ 3 Record Review
- ___ 4 Groundwater Evaluation
- ___ 5 Followup Inspection
- ___ 6 Citizen Complaint
- ___ 7 Part B Call-In
- ___ 8 Withdrawal
- ___ 9 Closed Facility
- ___ 0 Other

7. DATE OF EVALUATION IF THE EVALUATION FOLLOWS AN INITIAL EVALUATION (Enter date only if different from 5.) ___ ___ ___ (M D Y)

8. AREA & CLASS OF VIOLATION (Enter 'X' in box if violations found. Enter '0' if no violations found.)

9. EVALUATION COMMENTS

| Class of Violation | Area of Violation | | | | | | | RESP Agency | Free Fields | |
|---|---|---|---|---|---|---|---|---|---|---|
| | GWM | CL/PC | FIN/RESP | PT B | CMPL/SCH | Manifest | Other | | 2 | 3 |
| I | | | | | | | | | | |
| II | | | | | | | | | | |

10. ENFORCEMENT ACTION (Most frequently used codes are listed below. See Instructions for additional codes.)

11. ENFORCEMENT COMMENTS

| Violation | | Action | | Compliance Date | | Status | | Penalty | | Resp Agency | Free Fields | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Class | Area | Type (use code) | Date Taken | Scheduled | Actual | Code | Date | Assess | Collect | | 2 | 3 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

Codes for Enforcement Actions:
03 = Warning Letter
04 = Compliance Complaint
05 = Administrative Order
10 = Informal

Codes for Enforcement Status:
A = Active/progressing to resolution
R = Resolved/no further action required
X = Pending/no response
P = Progressed to subsequent action

Codes for Responsible Agency:
S = State
J = Joint State/U.S. EPA

12. For State Use

file

FY 1985 HAZARDOUS WASTE COMPLIANCE MONTORING AND ENFORCEMENT LOG New _____ Update _____

1. U.S. EPA ID MID005358130 3. CITY Alma

2. INSTALLATION NAME Total Petroleum, Inc

4. HANDLER TYPE ___ MAJOR ___ NON - MAJOR

5. DATE OF INITIAL EVALUATION WHICH IS THE BASIS FOR THIS REPORT 10 (M) 31 (D) 85 (Y)

6. TYPE OF EVALUATION COVERED BY THIS REPORT (Check only one)

- ___ 1 Evaluation Inspection
- X 2 Sampling Inspection
- ___ 3 Record Review
- ___ 4 Groundwater Evaluation
- ___ 5 Followup Inspection
- ___ 6 Citizen Complaint
- ___ 7 Part B Call-In
- ___ 8 Withdrawal
- ___ 9 Closed Facility
- ___ 0 Other

7. DATE OF EVALUATION IF THE EVALUATION FOLLOWS AN INITIAL EVALUATION (Enter date only if different from 5.) ___ (M) ___ (D) ___ (Y)

8. AREA & CLASS OF VIOLATION (Enter 'X' in box if violations found. Enter '0' if no violations found.)

9. EVALUATION COMMENTS

| Class of Violation | Area of Violation | | | | | | | RESP Agency | Free Fields | |
|---|---|---|---|---|---|---|---|---|---|---|
| | GWM | CL/PC | FIN/RESP | PT B | CMPL/SCH | Manifest | Other | | 2 | 3 |
| I | | | | | | | | | | |
| II | | | | | | | | | | |

10. ENFORCEMENT ACTION (Most frequently used codes are listed below. See Instructions for additional codes.)

11. ENFORCEMENT COMMENTS

| Violation | | Action | | Compliance Date | | Status | | Penalty | | Resp Agency | Free Fields | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Class | Area | Type (use code) | Date Taken | Scheduled | Actual | Code | Date | Assess | Collect | | 2 | 3 |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

Codes for Enforcement Actions:
- 03 = Warning Letter
- 04 = Compliance Complaint
- 05 = Administrative Order
- 10 = Informal

Codes for Enforcement Status:
- A = Active/progressing to resolution
- R = Resolved/no further action required
- X = Pending/no response
- P = Progressed to subsequent action

Codes for Responsible Agency:
- S = State
- J = Joint State/U.S. EPA
- E = U.S. EPA

12. For State Use

TOTAL
Total Petroleum, Inc.

# MEMORANDUM

DATE 8-16-85

TO B. White, P. Lincoln, B. Shaver, L. Stinnett, B. Spitzley

FROM Phil Nelson

## SOIL ANALYSES - SSR 2286

From 5-22-85 to 5-29-85, IT Corporation made eight soil borings in Alma's Soil Farm to a depth of 20-30 ft. Samples were collected about every 2 ft. beginning at a depth of 2.5 ft.

Three samples from each boring, taken at depths of 2.5-4 ft., 5-6.5 ft. and 10-11.5 ft. were analyzed for pH, Cond., Oil and Grease, and RCRA metals, Pb, Cr, Zn.

In addition to the above analyses, four samples were analyzed for Pb, Cr and Zn by the 0.1N HCl leaching method. The data given is for the metal content in the soil and not the water used for the leaching.

Method used to produce the 1979 data.

Form 26-003 019 OPCo

| | pH | Cond. Micromho's | O&G ppm | R C R A (RCRA) Pb ppm | Cr ppm | Zn ppm | .1N HCl Leaching Pb ppm | Cr ppm | Zn ppm |
|---|---|---|---|---|---|---|---|---|---|
| Distilled water | 5.4 | | | | | | | | |
| **BORING 1** | | | | | | | | | |
| 2.5-4' | 7.5 | 1170 | 410 | <.06 | <.05 | .14 | | | |
| 5-6.5' | 10.3 | 722 | 80 | <.06 | .05 | .04 | .5 | .7 | 1.2 |
| 10-11.5' | 9.6 | 826 | <50 | <.06 | .11 | .05 | | | |
| **BORING 2** | | | | | | | | | |
| 2.5-4' | 7.5 | 302 | 1040 | <.06 | <.05 | .05 | | | |
| 5-6.5' | 8.2 | 117 | 60 | <.06 | .10 | .03 | | | |
| 10-11.5' | 8.2 | 156 | <50 | <.06 | .10 | .05 | | | |
| **BORING 3** | | | | | | | | | |
| 2.5-4' | 8.0 | 327 | 640 | <.06 | <.05 | .04 | | | |
| 5-6.5' | 8.0 | 229 | <50 | <.06 | .11 | .03 | | | |
| 11-11.5' | 8.0 | 259 | 60 | <.06 | .09 | .10 | | | |
| **BORING 4** | | | | | | | | | |
| 2.5-4' | 7.4 | 1170 | 45400 | .55 | .08 | .40 | | | |
| 5-6.5' | 8.9 | 263 | 140 | <.06 | <.05 | .03 | | | |
| 10-11.5' | 8.8 | 190 | 80 | <.06 | .07 | .11 | .9 | .7 | 2.7 |
| **BORING 5** | | | | | | | | | |
| 2.5-4' | 8.5 | 136 | < 50 | .11 | .10 | .05 | | | |
| 5-6.5' | 8.4 | 153 | 1330 | .10 | .13 | .10 | | | |
| 10-11.5' | 8.4 | 163 | 860 | .11 | .13 | .06 | | | |
| **BORING 6** | | | | | | | | | |
| 2.5-4' | 8.0 | 263 | 1340 | <.06 | <.05 | .09 | 12.8 | 1.0 | 10.0 |
| 5-6.5' | 8.5 | 151 | 60 | <.06 | .10 | .04 | | | |
| 10-11.5' | 8.3 | 272 | 70 | <.06 | .12 | .06 | | | |
| **BORING 7** | | | | | | | | | |
| 2.5-4 | 9.0 | 85 | < 50 | <.06 | <.05 | .05 | | | |
| 7.5-8' | 8.5 | 246 | 50 | <.06 | .12 | .05 | | | |
| 10-11.5' | 8.5 | 163 | 60 | <.06 | .13 | .07 | | | |
| **BORING 8** | | | | | | | | | |
| 2.5-4' | 7.8 | 674 | 3950 | 6.2 | .07 | .29 | 280 | 4.5 | 11.7 |
| 5-6.5' | 10.4 | 1000 | 17500 | .20 | <.05 | .10 | | | |
| 10-11.5' | 10.5 | 1470 | 360 | .06 | .12 | .07 | | | |

Rocky Mountain Analytical Laboratory

RECEIVED
JUL 30 1984
Region III Headquarters

June 25, 1984

P. A. Lincoln
Total Petroleum, Inc.
Alma, MI 48802

Dear Mr. Lincoln:

The analysis of the water sample under Purchase Order No. 14474 for base/neutral and volatile organics is now complete. The results are enclosed.

Please call if you have any questions.

Sincerely,

John A. Josey
Chemist
Industrial Organic Chemistry

Approved by:

Michael P. Phillips, Ph.D.
Manager
Industrial Organic Chemistry

JAJ/MPP/crc
Enclosures

RMA # 3891

# SAMPLE DESCRIPTION INFORMATION

for

**Total Petroleum, Inc.**

| RMA Sample No. | Sample Description | Sample Type | Date Sampled | Date Received |
|---|---|---|---|---|
| 3891-01 | Observation Well 1-12-1 | Water | 6/4/84 | 6/5/84 |

June 25, 1984

# ANALYTICAL RESULTS

for

## Total Petroleum

## Methodology and Discussion

The sample was directly injected into a gas chromatograph/mass spectrometer (GC/MS) equipped with a column for separating compounds in the volatility range from ethanol up to xylene. A table listing typical volatile compounds found in this analysis is attached. The sample chromatogram was also screened for any additional compounds that might be present. None were found above a detection limit of 1-2 mg/l.

The sample was also extracted at a neutral pH and analyzed by GC/MS using a fused silica capillary column. The table labelled base/neutral compounds contains typical compounds expected in this type of analysis. The only compound detected in the table was the common plasticizer bis(2-ethylhexyl)phthalate at 23 ug/l. In addition, the sample chromatogram was screened for any additional compounds that might be present. Five compounds were detected whose mass spectra indicated that they were either unsaturated aliphatic hydrocarbons (i.e. alkenes) or cycloalkanes. The retention times and mass spectra indicated that the compounds were in the $C_8$ to $C_{14}$ range. Although these compounds could not be identified specifically, the total concentration was estimated at 0.626 mg/l based on a comparison of their response to $d_{10}$-phenanthrene (internal standard). Adding the concentration of bis(2-ethylhexyl)phthalate gives a total of 0.649 mg/l.

# ANALYTICAL RESULTS

for

Total Petroleum, Inc.

## VOLATILE ORGANICS

| Parameter | | Units | Detection Limit | 3891-01 |
|---|---|---|---|---|
| 1V | Acrolein | mg/l | 20 | ND |
| 2V | Acrylonitrile | mg/l | 20 | ND |
| 3V | Benzene | mg/l | 1 | ND |
| 4V | Bis(chloromethyl)ether | mg/l | 1 | ND |
| 5V | Bromoform | mg/l | 1 | ND |
| 6V | Carbon tetrachloride | mg/l | 1 | ND |
| 7V | Chlorobenzene | mg/l | 1 | ND |
| 8V | Chlorodibromomethane | mg/l | 1 | ND |
| 9V | Chloroethane | mg/l | 2 | ND |
| 10V | 2-Chloroethylvinyl ether | mg/l | 1 | ND |
| 11V | Chloroform | mg/l | 1 | ND |
| 12V | Dichlorobromomethane | mg/l | 1 | ND |
| 13V | Dichlorodifluoromethane | mg/l | 2 | ND |
| 14V | 1,1-Dichloroethane | mg/l | 1 | ND |
| 15V | 1,2-Dichloroethane | mg/l | 1 | ND |
| 16V | 1,1-Dichloroethylene | mg/l | 1 | ND |
| 17V | 1,2-Dichloropropane | mg/l | 1 | ND |
| 18V | 1,3-Dichloropropylene | mg/l | 1 | ND |
| 19V | Ethylbenzene | mg/l | 1 | ND |
| 20V | Methylbromide | mg/l | 2 | ND |
| 21V | Methylchloride | mg/l | 2 | ND |
| 22V | Methylene chloride | mg/l | 2 | ND |
| 23V | 1,1,2,2-Tetrachloroethane | mg/l | 1 | ND |
| 24V | Tetrachloroethylene | mg/l | 1 | ND |
| 25V | Toluene | mg/l | 1 | ND |
| 26V | 1,2-trans-Dichloroethylene | mg/l | 1 | ND |
| 27V | 1,1,1-Trichloroethane | mg/l | 1 | ND |
| 28V | 1,1,2-Trichloroethane | mg/l | 1 | ND |
| 29V | Trichloroethylene | mg/l | 1 | ND |
| 30V | Trichlorofluoromethane | mg/l | 2 | ND |
| 31V | Vinyl chloride | mg/l | 2 | ND |

ND = Not detected. NR = Not requested.

# ANALYTICAL RESULTS

for

**Total Petroleum, Inc.**

## BASE/NEUTRAL COMPOUNDS

| Parameter | Units | Detection Limit | 3891-01 |
|---|---|---|---|
| 1B Acenaphthene | ug/l | 5 | ND |
| 2B Acenaphthylene | ug/l | 5 | ND |
| 3B Anthracene | ug/l | 5 | ND |
| 4B Benzidine | ug/l | 50 | ND |
| 5B Benzo(a)anthracene | ug/l | 5 | ND |
| 6B Benzo(a)pyrene | ug/l | 5 | ND |
| 7B 3,4-Benzofluoranthene | ug/l | 5 | ND |
| 8B Benzo (ghi) perylene | ug/l | 5 | ND |
| 9B Benzo (k) fluoranthene | ug/l | 5 | ND |
| 10B Bis(2-chloroethoxy)methane | ug/l | 5 | ND |
| 11B Bis (2-chloroethyl)ether | ug/l | 5 | ND |
| 12B Bis (2-chloroiso-propyl)ether | ug/l | 5 | ND |
| 13B Bis (2-ethylhexyl)phthalate | ug/l | 5 | 23 |
| 14B 4-Bromophenyl phenylether | ug/l | 5 | ND |
| 15B Butyl benzyl phthalate | ug/l | 5 | ND |
| 16B 2-Chloronaphthalene | ug/l | 5 | ND |
| 17B 4-Chlorophenyl phenylether | ug/l | 5 | ND |
| 18B Chrysene | ug/l | 5 | ND |
| 19B Dibenzo(a,h) anthracene | ug/l | 5 | ND |
| 20B 1,2-Dichlorobenzene | ug/l | 5 | ND |
| 21B 1,3-Dichlorobenzene | ug/l | 5 | ND |
| 22B 1,4-Dichlorobenzene | ug/l | 5 | ND |
| 23B 3,3'-Dichlorobenzidine | ug/l | 20 | ND |
| 24B Diethyl phthalate | ug/l | 20 | ND |
| 25B Dimethyl phthalate | ug/l | 5 | ND |
| 26B Di-n-butyl phthalate | ug/l | 5 | ND |
| 27B 2,4-Dinitrotoluene | ug/l | 5 | ND |
| 28B 2,6-Dinitrotoluene | ug/l | 5 | ND |
| 29B Di-n-octyl phthalate | ug/l | 5 | ND |
| 30B 1,2-Diphenylhydrazine* | ug/l | 5 | ND |
| 31B Fluoranthene | ug/l | 5 | ND |

ND = Not detected. NR = Not requested. *Measured as azobenzene.

# ANALYTICAL RESULTS

for

Total Petroleum, Inc.

**BASE NEUTRAL COMPOUNDS** (Cont.)

| Parameter | Units | Detection Limit | 3891-01 |
|---|---|---|---|
| 32B Fluorene | ug/l | 5 | ND |
| 33B Hexachlorobenzene | ug/l | 5 | ND |
| 34B Hexachlorobutadiene | ug/l | 5 | ND |
| 35B Hexachlorocyclo-pentadiene | ug/l | 5 | ND |
| 36B Hexachloroethane | ug/l | 5 | ND |
| 37B Indeno(1,2,3-cd)pyrene | ug/l | 5 | ND |
| 38B Isophorone | ug/l | 5 | ND |
| 39B Naphthalene | ug/l | 5 | ND |
| 40B Nitrobenzene | ug/l | 5 | ND |
| 41B N-Nitrosodimethylamine | ug/l | 5 | ND |
| 42B N-Nitrosodi-n-propylamine | ug/l | 5 | ND |
| 43B N-Nitrosodiphenylamine | ug/l | 5 | ND |
| 44B Phenanthrene | ug/l | 5 | ND |
| 45B Pyrene | ug/l | 5 | ND |
| 46B 1,2,4-Trichlorobenzene | ug/l | 5 | ND |

ND = Not detected. NR = Not requested.

# ROCKY MOUNTAIN ANALYTICAL LABORATORY

## Organic Analytical Methodology

| Parameter | Units | Nominal Detection Limit[a] | Methodology | Reference[1] | Preservation Bottle No. | Maximum Holding Time[b] |
|---|---|---|---|---|---|---|
| Purgeables | ug/l | 1 | Purge & Trap GC/MS | 624 | 11 | 14 days |
| Base/Neutrals | ug/l | 10 | Extraction/GC/MS | 625 | 12 | 7 days/40 days |
| Acids | ug/l | 10 | Extraction/GC/MS | 625 | 12 | 7 days/40 days |
| Organochlorine Pesticides/PCB's | ug/l | 0.01 | Extraction/GC/ECD | 608 | 13 | 7 days/40 days |
| | | 10 | Extraction/GC/MS | 625 | 12 | 7 days/40 days |
| Phenoxy Herbicides | ug/l | 0.01 | Extraction/GC/ECD | (2) | 14 | 7 days/40 days |
| Total Organic Halogen (TOX) | ug/l | 5 | Adsorbtion/Coulometric | 450.1(3) | 15 | - |
| Trihalomethanes (THM) | ug/l | 1 | Extraction/GC/ECD | (4) | 11 | 14 days |
| | | 1 | Purge & Trap GC/MS | (4) | 11 | 14 days |
| Dioxin | ug/l | 0.005 | Extraction/GC/MS/ECD | 613 | 16 | 7 days/40 days |
| Purgeable Halocarbons | ug/l | 0.01 | Purge & Trap/GC/Hall | 601 | 11 | 14 days |
| Purgeable Aromatics | ug/l | 1 | Purge & Trap/GC/FID | 602 | 17 | 14 days |
| Acrolein & Acrylonitrile | ug/l | 100 | Purge & Trap/GC/FID | 603 | 18 | 14 days |
| Phenols by GC | ug/l | 10 | Extraction/GC/FID | 604 | 16 | 7 days/40 days |
| Benzidines | ug/l | 0.1 | Extraction/HPLC | 605 | 19 | 7 days/40 days |
| Phthalate Esters | ug/l | 10 | Extraction/GC/FID | 606 | 12 | 7 days/40 days |
| Nitrosamines | ug/l | 1 | Extraction/GC/NPD | 607 | 20 | 7 days/40 days |
| Nitroaromatics/isophorone | ug/l | 1 | Extraction/GC/FID & GC/ECD | 609 | 12 | 7 days/40 days |
| Polynuclear Aromatics | ug/l | 0.5 | Extraction/HPLC | 610 | 20 | 7 days/40 days |
| Haloethers | ug/l | 1 | Extraction/GC/Hall | 611 | 17 | 7 days/40 days |
| Chlorinated Hydrocarbons | ug/l | 0.02 | Extraction/GC/ECD | 612 | 12 | 7 days/40 days |
| Organophosphorus Pesticides | ug/l | 0.1 | Extraction/GC/NPD | 622(5) | 12 | 7 days/40 days |
| Triazine Pesticides | ug/l | 0.1 | Extraction/GC/NPD | (6) | 12 | 7 days/40 days |

References


(1) Federal Register, Vol. 44, No. 233, Monday, December 3, 1979.
(2) "Method for Chlorinated Phenoxy Acid Herbicides in Industrial Effluents," Federal Register, Vol. 38, No. 75, Part II.
(3) "Total Organic Halide," US EPA-EMSL, Cincinnati, November, 1980.
(4) Federal Register, Vol. 44, No. 231, Thursday, November 29, 1979, Appendix, Part I.
(5) "Method 622- Organophosphorus Pesticides," Proposed EPA Method, 304 (h) Committee.
(6) Federal Register, Vol. 38, No. 75, 1973.


Notes

[a] Nominal values are the best achievable with the listed analytical method for a typical component. Interferrences in specific samples may result in a higher detection limit.

[b] Applicable to NPDES Wastes as updated by Robert C. Booth, Director, EMSL-Cincinnati, September 22, 1981. Where two times are given, the first refers to the time to extraction, the second to the time of instrumental analysis.

# MICHIGAN DEPARTMENT OF NATURAL RESOURCES

## INTEROFFICE COMMUNICATION

October 11, 1984

TO: Bob Basch, Lansing District, Hazardous Waste Division

FROM: Terry McNiel, Technical Services Section, Hazardous Waste Division

SUBJECT: Total Petroleum-Alma

I have reviewed Total's September 19, 1984, submittal. They have correctly determined that the 17 hydrocarbons which they analyze annually are not all aromatic hydrocarbons. They list eight compounds which will be analyzed on an annual basis in the future. Our environmental lab includes an additional parameter: styrene as a purgeable aromatic hydrocarbon. This compound should be included in their list.

There have been instances of positive results (greater than detection limits) for the non-aromatics: 1,1 dichloroethylene, trichloroethylene, 1,2 dichloropropane, plus the aromatics: benzene, toluene, ethylbenzene and xylene. Their permit requires that these positive results be confirmed immediately. This appears to not have been done. Three months elapsed in all cases before a confirmation sampling occurred. To be meaningful, new samples should be collected as soon as the positive results are realized, especially with the facility's TOC problem.

Because of these positive results, although not confirmed, the company's annual sampling for organics should also include the non-aromatics:

1,1 dichloroethylene
trichlorethylene
1,2 dichloropropane

I would recommend that the request to eliminate Wells No. 4 and No. 6 and to substitute Wells No. 18 and No. 19 be approved.

If there are any questions, please contact me.

Terry

cc: C. Riley, HWD
File

**TOTAL**
**Total Petroleum, Inc.**

EAST SUPERIOR STREET ALMA, MICHIGAN 48801 TELEPHONE 517 463-1161 TWX 510 441-2431

BENJAMIN E. WHITE, P. E.
ENVIRONMENTAL ENGINEER

September 19, 1984

Hazardous Waste Division
Michigan Department of Natural Resources
P.O. Box 30021
Lansing MI 48909

Gentlemen:

Enclosed is some hydrocarbon concentration data for our monitoring wells that we neglected to send you with our June 1984 sampling results. This data includes the yearly purgeable aromatic hydrocarbon analysis required by our Hazardous Waste Treatment Facility Permit.

On two previous occasions we have sent you data on 17 hydrocarbons analyzed for in our wells. However, upon review of those compounds we discovered an obvious error. Only five of the previously reported compounds are aromatic hydrocarbons, the other 12 are not aromatics. In addition, three other compounds should have been analyzed for.

The enclosed report provides the June 1984 data for 20 hydrocarbons. This includes the data for five aromatics and 12 non-aromatics that were previously reported, plus three additional aromatics that should have previously been included.

In the future, we will only analyze and report the data for the 8 aromatic compounds that are required in our permit to be analyzed for annually. Those 8 compounds include:

Benzene
Toluene
Chlorobenzene
Ethylbenzene
Xylene
1,2 Dichlorobenzene
1,3 Dichlorobenzene
1,4 Dichlorobenzene

We also have decided to in the future reduce the number of wells that will be monitored for purgeable aromatic Hydrocarbons. We will (until a permit change is approved) continue to analyze for these compounds in the four original wells as required by our permit. In addition, we will include the new background well (No.18) and our other two wells located immediately adjacent to the land treatment facility. Accordingly, the wells to be monitored in the future for Purgeable aromatics include wells:

3
4
5
6
18
19
20

We also request your permission to eliminate Wells No. 4 and No. 6 from this list. Well No. 4 was intended as a background well, however, a review of the potentiometric flow directions indicates that Well No. 18 is located in a position that is much more representative of background conditions. It would also be reasonable to eliminate Well No. 6 from the monitoring requirements because of its proximity to Well No. 19. But, Well No. 19 is closer to the facility and it would monitor any contamination from the facility before it reaches Well No. 6. We, therefore, believe that it would be appropriate to stop monitoring Wells No. 4 and No. 6 and substitute Wells No. 18 and No.19. However, this would require a modification to our permit. Your consideration of the request is appreciated.

If you have questions concerning this data and requested change to our permit please contact us.

Sincerely,

Benjamin E. White

Benjamin E. White

BEW:djw

cc: Bob Basch, District Supervisor
Hazardous Waste Div.

Terry McNiel
Hazardous Waste Div.

Analytic & Biological
Laboratories, Inc.

29079 FORD ROAD ▫ GARDEN CITY, MICHIGAN 48135 ▫ PHONE: (313) 422-7474

April 23, 1984

TOTAL PETROLEUM, INC.
East Superior Street
Alma, Michigan 48801

Attention: Bernie Shaver

Dear Mr. Shaver:

Enclosed kindly find the supplement to the original G/C Mass Spectrograph report that we mailed earlier.

The detection limits for the enclosed list are 0.1 mg / liter or 0.1 ppm.

There were no parameters detected up to C 25, other than the methylene chloride as already reported.

If you have anfy further questions regarding the enclosed examination or any other examination, please do not hesitate to contact me at the telephone number listed above.

Yours very truly,

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

Francis B. McLaughlin, FAIC
Director of Laboratories

FBM/lp
cc: Files

CERTIFIED LABORATORY – U.S. DEPARTMENT OF AGRICULTURE
U.S. DRUG ENFORCEMENT ADMINISTRATION
UNITED STATES FOOD AND DRUG ADMINISTRATION
UNITED STATES NUCLEAR REGULATORY COMMISSION
AMERICAN COUNCIL OF INDEPENDENT LABORATORIES
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ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS

| Organic Materials | Parameter Number |
|---|---|
| acetone cyanohydrin | 00075-86-5 |
| 2-acetylaminofluorene | 00053-96-3 |
| acrolein | 00107-02-8 |
| acrylic acid | 00079-10-7 |
| acrylonitrile | 00107-13-1 |
| allyl chloride | 00107-05-1 |
| 2-aminoanthraquinone | 00117-79-3 |
| aminoazobenzene | 00060-09-3 |
| o-aminoazotoluene | 00097-56-3 |
| 4-aminobiphenyl | 00092-67-1 |
| 3-amino-9-ethylcarbazole | 00132-32-1 |
| 1-amino-2-methylanthraquinone | 00082-28-0 |
| aminotriazole (amitrole) | 00061-82-5 |
| aniline | 00062-53-3 |
| o-anisidine | 00090-04-0 |
| o-anisidine hydrochloride | 00134-29-2 |
| benz(a)anthracene | 00056-55-3 |
| benzene | 00071-43-2 |
| benzidine | 00092-87-5 |
| benzidine salts | Class-08-7 |
| benzo(a)pyrene | 00050-32-8 |
| brucine | 00357-57-3 |
| carbon tetrachloride | 00056-23-5 |
| chlorinated dibenzofurans | Class-05-3 |
| chlorinated dioxins | Class-05-4 |
| 1-chloro-2,3-epoxypropane | 00106-89-8 |
| bis(2-chloroethyl)ether | 00111-44-4 |
| chloroform | 00067-66-3 |
| bis(chloromethyl)ether | 00542-88-1 |
| 3-(chloromethyl)pyridine hydrochloride | 06959-48-4 |
| p-chlorophenol | 00106-48-9 |
| 1-(4-chlorophenyl)-3, 3-dimethyl triazene | 07203-90-9 |
| 4-chloro-m-phenylenediamine | 05131-60-2 |
| 4-chloro-o-phenylenediamine | 00095-83-0 |
| chloroprene | 00126-99-8 |
| 5-chloro-o-toluidine | 00095-79-4 |
| p-cresidine (5-methyl-o-anisidine) | 00120-71-8 |
| 2,4-diaminoanisole sulfate | 39156-41-7 |
| 4,4'-diaminodiphenyl ether | 00101-80-4 |
| 2,4-diaminotoluene | 00095-80-7 |
| dibenz(a,h)anthracene | 00053-70-3 |
| tris(dibromopropyl)phosphate | 00126-72-7 |
| di-n-butyl phthalate | 00084-74-2 |
| 3,3'-dichlorobenzidine | 00091-94-1 |
| 3,3'-dichlorobenzidine salts | Class-08-8 |
| 1,2-dichloroethane | 00107-06-2 |
| 2,4-dichlorophenol | 00120-83-2 |
| 1,2:3,4-diepoxybutane | 00298-18-0 |
| diethyl sulfate | 00064-67-5 |
| 4-dimethylaminoazobenzene | 00060-11-7 |
| dimethylhydrazines | Class-06-2 |
| 4,6-dinitro-o-cresol | 00534-52-1 |
| -dinitrophenol | 00051-28-5 |
| 2,4-dinitrotoluene | 00121-14-2 |
| di-n-octyl phthalate | 00117-84-0 |
| 1,4-dioxane | 00123-91-1 |
| 2,3-epoxy-1-propanal | 00765-34-4 |
| ethylene dibromide | 00106-93-4 |
| ethylenimine | 00151-56-4 |
| ethylene oxide | 00075-21-8 |
| ethylene thiourea | 00096-45-7 |
| bis(2-ethylhexyl)phthalate | 00117-81-7 |
| ethylmethanesulfonate | 00062-50-0 |
| 2-(2-formylhydrazino)-4-(5-nitro-2-furyl)-thiazole | 03570-75-0 |
| hexachlorobenzene (HCB) | 00118-74-1 |
| hexachlorobutadiene | 00087-68-3 |
| hexachlorocyclohexane | 00608-73-1 |
| hexachlorocyclopentadiene | 00077-47-4 |
| hexachloroethane | 00067-72-1 |
| hydrazobenzene | 00122-66-7 |
| hydroquinone | 00123-31-9 |
| N-(2-hydroxyethyl)ethyleneimine | 01072-52-2 |
| lactonitrile | 00078-97-7 |
| malachite green (C.I. Basic Green 4) | 00569-64-2 |
| methylenebis(2-chloroaniline) | 00101-14-4 |
| 4,4'-methylenebis(2-methylaniline) | 00838-88-0 |
| 4,4'-methylenebis(N,N-dimethylaniline | 00101-61-1 |
| 1,2-(methylenedioxy)-4-propenyl benzene | 00120-58-1 |
| methyl hydrazine | 00060-34-4 |
| methyl mercaptan | 00074-93-1 |
| 1-methylnaphthalene | 00090-12-0 |
| 2-methyl-1-nitroanthraquinone | 00129-15-7 |
| mustard gas | 00505-60-2 |
| 1,5-naphthalenediamine | 02243-62-1 |
| 1-naphthylamine | 00134-32-7 |
| 2-naphthylamine | 00091-59-8 |
| 5-nitroacenaphthene | 00602-87-9 |
| 5-nitro-o-anisidine | 00099-59-2 |
| 4-nitrobiphenyl | 00092-93-3 |
| nitrogen mustard | 00051-75-2 |
| N-nitroso-n-butyl-N-(4-hydroxybutyl) amine | 03817-11-6 |
| N-nitroso-di-n-butylamine | 00924-16-3 |
| N-nitrosodiethylamine | 00055-18-5 |
| N-nitrosodimethylamine | 00062-75-9 |
| p-nitrosodiphenylamine | 00156-10-5 |
| N-nitroso-N-ethylurea | 00759-73-9 |
| N-nitroso-N-methylurea | 00684-93-5 |
| N-nitroso-N-methylurethane | 00615-53-2 |
| N-nitrosomorpholine | 00059-89-2 |
| N-nitroso-N-phenylhydroxylamine, ammonium salt | 00135-20-6 |
| N-nitrososarcosine | 13256-22-9 |
| pentachloronitrobenzene | 00082-68-8 |
| pentachlorophenol | 00087-86-5 |
| peroxyacetic acid | 00079-21-0 |
| piperonyl sulfoxide | 00120-62-7 |
| polybrominated biphenyls (PBB) | Class-07-8 |
| polychlorinated biphenyls (PCB) | Class-07-9 |
| 1,3-propane sultone | 01120-71-4 |
| B-propiolactone | 00057-57-8 |
| 5-propyl-1,3-benzodioxole | 00094-58-6 |
| propyleneimine | 00075-55-8 |
| semicarbazide | 00057-56-7 |
| styrene | 00100-42-5 |
| 1,1,2,2-tetrachloroethane | 00079-34-5 |
| tetrachloroethylene (perchloroethylene) | 00127-18-4 |
| thioacetamide | 00062-55-5 |
| 4,4'-thiodianiline | 00139-65-1 |
| thiourea | 00062-56-6 |
| o-toluidine | 00095-53-4 |
| o-toluidine hydrochloride | 00636-21-5 |
| triaryl phosphate esters | Class-09-4 |
| 1,1,2-trichloroethane | 00079-00-5 |
| trichloroethylene | 00079-01-6 |
| 2,4,5-trichlorophenol | 00095-95-4 |
| 2,4,6-trichlorophenol | 00088-06-2 |
| 2,4,5-trimethylaniline | 00137-17-7 |
| trimethylphosphate | 00512-56-1 |
| xylene | 01330-20-7 |

Pesticides (to be reported only by manufacturers and formulators).

| | Parameter Number |
|---|---|
| aldicarb | 00116-06-3 |
| aldrin | 00309-00-2 |
| 4-aminopyridine | 00504-24-5 |
| anilazine | 00101-05-3 |
| antimycin A | 01397-94-0 |
| azinphos-ethyl | 02642-71-9 |
| azinphos-methyl | 00086-50-0 |
| barban | 00101-27-9 |
| bendiocarb | 22781-23-3 |
| benomyl | 17804-35-2 |
| bromoxynil | 01689-84-5 |
| 2-(p-*tert*-butylphenoxy)-isopropyl-2-chloroethyl sulfite | 00140-57-8 |
| captafol | 02425-06-1 |
| captan | 00133-06-2 |
| carbaryl | 00063-25-2 |
| carbofuran | 01563-66-2 |
| carbophenothion | 00786-19-6 |
| chlordane | 00057-74-9 |
| chlordecone | 00143-50-0 |
| chlorfenvinphos | 00470-90-6 |
| chlorobenzilate | 00510-15-6 |
| chlorpyrifos | 02921-88-2 |
| clonitralid | 01420-04-8 |
| coumaphos | 00056-72-4 |
| crotoxyphos | 07700-17-6 |
| cycloheximide | 00066-81-9 |
| DDT | 00050-29-3 |
| demeton | 08065-48-3 |
| diallate | 02303-16-4 |
| diazinon | 00333-41-5 |
| dibromochloropropane (DBCP) | 00096-12-8 |
| dichlone | 00117-80-6 |
| dichlorvos | 00062-73-7 |
| dichrotophos | 00141-66-2 |
| dieldrin | 00060-57-1 |
| dimethoate | 00060-51-5 |
| dinocap | 39300-45-3 |
| dinoseb | 00088-85-7 |
| dioxathion | 00078-34-2 |
| disulfoton | 00298-04-4 |
| endosulfan | 00115-29-7 |
| endrin | 00072-20-8 |
| EPN | 02104-64-5 |
| ethion | 00563-12-2 |
| fensulfothion | 00115-90-2 |
| fenthion | 00055-38-9 |
| fluchloralin | 33245-39-5 |
| heptachlor | 00076-44-8 |
| heptachlor epoxide | 01024-57-3 |
| leptophos | 21609-90-5 |
| malathion | 00121-75-5 |
| methomyl | 16752-77-5 |
| methoxychlor | 00072-43-5 |
| methyl parathion | 00298-00-0 |
| mevinphos | 07786-34-7 |
| mexacarbate | 00315-18-4 |
| mirex | 02385-85-5 |
| monocrotophos | 06923-22-4 |
| naled | 00300-76-5 |
| nicotine | 00054-11-5 |
| nitrofen | 01836-75-5 |
| oxydemeton-methyl | 00301-12-2 |
| paraquat | 01910-42-5 |
| parathion | 00056-38-2 |
| phorate | 00298-02-2 |
| phosazetim | 04104-14-7 |
| phosmet | 00732-11-6 |
| phosphamidon | 13171-21-6 |
| rotenone | 00083-79-4 |
| silvex, propylene glycolbutyl ether ester | 02317-24-0 |
| sodium fluoroacetate | 00062-74-8 |
| strychnine | 00057-24-9 |
| sulfallate | 00095-06-7 |
| sulfotepp | 03689-24-5 |
| TDE | 00072-54-8 |
| TEPP | 00107-49-3 |
| terbufos | 13071-79-9 |
| tetrachlorvinphos | 00961-11-5 |
| thiram | 00137-26-8 |
| toxaphene | 08001-35-2 |
| bis (tri-n-butyl tin) oxide | 00055-35-9 |
| trichlorfon | 00052-68-6 |
| trichlorophenoxyacetic acid (2,4,5-T) | 00093-76-5 |
| trifluralin | 01582-09-8 |
| ziram | 00137-30-4 |

Analytic & Biological
Laboratories, Inc.

29079 FORD ROAD ◻ GARDEN CITY, MICHIGAN 48135 ◻ PHONE: (313) 422-7474

March 29, 1984

TOTAL PETROLEUM
East Superior Street
Alma, MI 48801

Attention: Bill Spitzley

Dear Mr. Spitzley:

Enclosed kindly find the report of your G.C. Mass Spectograms. They are enclosed for your examination. It is interesting to note that two (2) volatiles have been isolated as a result of our examinations.

This may account for the TOC values being elevated at various times during periodic testing.

If you have any further questions after receiving the results, kindly contact me at the above telephone number.

Yours very truly,

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

Francis B. McLaughlin, FAIC
Director of Laboratories

FBM/lp
cc: Files

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TOTAL PETROLEUM
March 29, 1984

PRIORITY POLLUTANT ANALYSIS

| Volatile Organic Compounds | 1-8-1 (ug/l) | 1-8-2 (ug/l) | 1-8-3 (ug/ |
|---|---|---|---|
| Acrolein | -100 | -100 | -100 |
| Acrylonitrile | -100 | -100 | -100 |
| Benzene | -10 | -10 | -10 |
| Bis(Chloromethyl) ether | -10 | -10 | -10 |
| Bromoform | -10 | -10 | -10 |
| Carbon Tetrachloride | -10 | -10 | -10 |
| Chlorobenzene | -10 | -10 | -10 |
| Chlorodibromomethane | -10 | -10 | -10 |
| Chloroethane | -10 | -10 | -10 |
| 2-Chloroethylvinyl | -10 | -10 | -10 |
| Chloroform | -10 | -10 | -10 |
| Dichlorobromomethane | -10 | -10 | -10 |
| Dichlorodifluoromethane | -10 | -10 | -10 |
| 1,1-Dichloroethane | -10 | -10 | -10 |
| 1,2-Dichloroethane | -10 | -10 | -10 |
| 1,1-Dichloroethylene | -10 | -10 | -10 |
| 1,2-Dichloropropane | -10 | -10 | -10 |
| 1,3-Dichloropropene | -10 | -10 | -10 |
| Ethylbenzene | -10 | -10 | -10 |
| Methyl Bromide | -10 | -10 | -10 |
| Methyl Chloride | -10 | -10 | -10 |
| Methylene Chloride | -10 | 800 | 410 |
| 1,1,2,2-Tetrachloroethane | -10 | -10 | -10 |
| Tetrachloroethylene | -10 | -10 | -10 |
| Toluene | -10 | -10 | -10 |

- denotes a quantity of "less than".

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

TOTAL PETROLEUM
March 29, 1984

PRIORITY POLLUTANT ANALYSIS

| Volatile Organic Compounds | 1-8-1 (ug/l) | 1-8-2 (ug/l) | 1-8-3 (ug/l |
|---|---|---|---|
| trans-1,2-dichloroethylene | -10 | -10 | -10 |
| 1,1,1-Trichloroethane | -10 | -10 | -10 |
| 1,1,2-Trichloroethane | -10 | -10 | -10 |
| Trichloroethylene | -10 | -10 | -10 |
| Trichlorofluoromethane | -10 | -10 | -10 |
| Vinyl Chloride | -10 | -10 | -10 |

- denotes a quantity of "less than".-

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

TOTAL PETROLEUM
March 29, 1984

PRIORITY POLLUTANT ANALYSIS

| Base/Neutral Compounds | 1-8-1 (ug/l) | 1-8-2 (ug/l) | 1-8-3 (ug/ |
|---|---|---|---|
| Acenaphthene | -50 | -50 | -50 |
| Acenaphthylene | -50 | -50 | -50 |
| Anthracene | -50 | -50 | -50 |
| Benzidine | -50 | -50 | -50 |
| Benzo (a) anthracene | -50 | -50 | -50 |
| Benzo (a) pyrene | -50 | -50 | -50 |
| 3,4-Benzofluoranthene | -50 | -50 | -50 |
| Benzo(ghi)perylene | -1250 | -1250 | -1250 |
| Benzo(k)fluoranthene | -50 | -50 | -50 |
| Bis(2-chloroethoxy)methane | -50 | -50 | -50 |
| Bis(2-chloroethyl)ether | -50 | -50 | -50 |
| Bis(2-chloroisoprophyl)ether | -50 | -50 | -50 |
| Bis(2-ehtylhexyl)phthalate | -50 | -50 | -50 |
| 4-Bromophenyl phenyl ether | -50 | -50 | -50 |
| Butyl benzyl phthalate | -50 | -50 | -50 |
| 2-Chloronaphthalene | -50 | -50 | -50 |
| 4-Chlorophenyl phenyl ether | -50 | -50 | -50 |
| Chrysene | -50 | -50 | -50 |
| Dibenzo(ah)anthracene | -1250 | -1250 | -1250 |

- denotes a quantity of "less than"

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

TOTAL PETROL. .M
March 29, 1984

PRIORITY POLLUTANT ANALYSIS

| Base/Neutral Compounds | 1-8-1 (ug/l) | 1-8-2 (ug/l) | 1-8-3 (ug/ |
|---|---|---|---|
| 1,2-Dichlorobenzene | -50 | -50 | -50 |
| 1,3-Dichlorobenzene | -50 | -50 | -50 |
| 1,4-Dichlorobenzene | -50 | -50 | -50 |
| 3,3'-Dichlorobenzidine | -50 | -50 | -50 |
| Diethyl phthalate | -50 | -50 | -50 |
| Dimethyl phthalate | -50 | -50 | -50 |
| Di-n-butyl phthalate | -50 | -50 | -50 |
| 2,4-Dinitrotoluene | -50 | -50 | -50 |
| 2,6-Dinitrotoluene | -50 | -50 | -50 |
| Di-n-octyl phthalate | -50 | -50 | -50 |
| 1,2-Diphenylhydraxine | -50 | -50 | -50 |
| Fluoranthene | -50 | -50 | -50 |
| Fluorene | -50 | -50 | -50 |
| Hexachlorobenzene | -50 | -50 | -50 |
| Hexachlorobutadiene | -50 | -50 | -50 |
| Hexachlorocylopentadiene | -50 | -50 | -50 |
| Hexachloroethane | -50 | -50 | -50 |
| Indeno91,2,3-cd)pyrene | -1250 | -1250 | -1250 |
| Isophorone | -50 | -50 | -50 |
| Naphthalene | -50 | -50 | -50 |
| Nitrobenzene | -50 | -50 | -50 |
| N-Nitrosodimethylamine | -50 | -50 | -50 |
| N-Nitroso-di-n-propylamine | -50 | -50 | -50 |
| N-Nitosodiphenylamine | -50 | -50 | -50 |
| Phenanthrene | -50 | -50 | -50 |
| Pyrene | -50 | -50 | -50 |
| 1,2,4-Trichlorobenzene | -50 | -50 | -50 |

- denotes a quantity of "less than".

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

TOTAL PETROLEUM
March 29, 1984

PRIORITY POLLUTANT ANALYSIS

| Acid Compounds | 1-8-2 (ug/l) | 1-8-2 (ug/l) | 1-8-3 (ug/l |
|---|---|---|---|
| 2-Chlorophenol | -50 | -50 | -50 |
| 2,4-Dichlorophenol | -50 | -50 | -50 |
| 2,4-Dimethylphenol | -50 | -50 | -50 |
| 4,6-Dinitro-o-cresol | -1250 | -1250 | -1250 |
| 2,4-dinitrophenol | -1250 | -1250 | -1250 |
| 2-Nitrophenol | -50 | -50 | -50 |
| 4-Nitrophenol | -50 | -50 | -50 |
| p-Chloro-m-cresol | -50 | -50 | -50 |
| Pentachlorphenol | -50 | -50 | -50 |
| Phenol | -50 | -50 | -50 |
| 2,4,6-Trichlorphenol | -50 | -50 | -50 |

- denotes a quantity of "less than".

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

Analytic & Biological
Laboratories, Inc.

29079 FORD ROAD ☐ GARDEN CITY, MICHIGAN 48135 ☐ PHONE: (313) 422-7474

April 9, 1984

Total Petroleum
East Superior Street
Alma, Michigan 48801

Attention: Bernie Shaver

Dear Mr. Shaver:

Pursuant to your request we have completed the study of your three (3) samples and have previously submitted the report that covered the Priority Pollutant examination. Enclosed kindly find the additional report that covers the examinations of Total Toxic Organics as specified in Federal Register, Volume 48, No. 137, Friday July 15, 1983, Rules and Regulations.

In addition the Methylene Chloride as reported in our subsequent report to you, kindly be advised that no other organic was detected, other that the Methylene Chloride. The complete list of Toxic Organics as specified in the monologue above was completely negative.

The Total Organic Carbon Analysis was as follows:

| | Well# | | |
|---|---|---|---|
| Sample #1 | 21 | Less than 1.0 | ppm |
| Sample #2 | 17 | 8.4 | ppm |
| Sample #3 | 19 | 6.6 | ppm |

CERTIFIED LABORATORY – U.S. DEPARTMENT OF AGRICULTURE
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We hope that this will satisfy the requirements for the examination of Toxic Organics as mandated in the monologue referred to above. If you have any further questions regarding the aforementioned analysis or any other analysis, please do not hesitate to contact me at the above telephone number.

Yours very truly,

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

Francis B. McLaughlin, FAIC
Director of Laboratories

FBM/lp
cc: Files

The term "TTO" shall mean total toxic organics, which is the summation of all quantifiable values greater than .01 milligrams per liter for the following toxic organics:

Acenaphthene
Acrolein
Acrylonitrile
Benzene
Benzidine
Carbon tetrachloride (tetrachloromethane)
Chlorobenzene
1,2,4-trichlorobenzene
Hexachlorobenzene
1,2,-dichloroethane
1,1,1-trichloroethane
Hexachloroethane
1,1-dichloroethane
1,1,2-trichloroethane
1,1,2,2-tetrachloroethane
Chloroethane
Bis (2-chloroethyl) ether
2-chloroethyl vinyl ether (mixed)
2-chloronaphthalene
2,4,6-trichlorophenol
Parachlorometa cresol
Chloroform (trichloromethane)
2-chlorophenol
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
N-nitrosodi-n-propylamine
Pentachlorophenol
Phenol
Bis (2-ethylhexyl) phthalate
Butyl benzyl phthalate
Di-n-butyl phthalate
Di-n-octyl phthalate
Diethyl phthalate
Dimethyl phthalate
1,2-benzanthracene
(benzo(a)anthracene)
Benzo(a)pyrene (3,4-benzopyrene)
3,4-Benzofluoranthene (benzo(b)fluoranthene)
11,12-benzofluoranthene
(benzo(k)fluoranthene)
Chrysene
Acenaphthylene
Anthracene
1,12-benzoperylene (benzo(ghi)perylene)
Fluorene
Phenanthrene
1,2,5,6-dibenzanthracene
(dibenzo(a,h)anthracene
Indeno(1,2,3-cd) pyrene (2,3-o-phenlene pyrene)
Pyrene
Tetrachloroethylene
Toluene
Trichloroethylene
Vinyl chloride (chloroethylene)
3,3-dichlorobenzidine
1,1-dichloroethylene
1,2-trans-dichloroethylene
2,4-dichlorophenol
1,2-dichloropropane (1,3-dichloropropene)
2,4-dimethylphenol
2,4-dinitrotoluene
2,6-dinitrotoluene
1,2-diphenylhydrazine
Ethylbenzene
Fluoranthene
4-chlorophenyl phenyl ether
4-bromophenyl phenyl ether
Bis (2-chloroisopropyl) ether
Bis (2-chloroethoxy) methane
Methylene chloride (dichloromethane)
Methyl chloride (chloromethane)
Methyl bromide (bromomethane)
Bromoform (tribromomethane)
Dichlorobromomethane
Chlorodibromomethane
Hexachlorobutadiene
Hexachlorocyclopentadiene
Isophorone
Naphthalene
Nitrobenzene
2-nitrophenol
4-nitrophenol
2,4-dinitrophenol
4,6-dinitro-o-cresol
N-nitrosodimethylamine
N-nitrosodimethylamine
Aldrin
Dieldrin
Chlordane (technical mixture and metabolites)
4,4-DDT
4,4-DDE (p,p-DDX)
4,4-DDD (p,p-TDE)
Alpha-endosulfan
Beta-endosulfan
Endosulfan sulfate
Endrin
Endrin aldehyde
Heptachlor
Heptachlor epoxide (BHC-hexachlorocyclohexane)
Alpha-BHC
Beta-BHC
Gamma-BHC
Delta-BHC
(PCB-polychlorinated biphenyls)
PCB-1242 (Arochlor 1242)
PCB-1254 (Arochlor 1254)
PCB-1221 (Arochlor 1221)
PCB-1232 (Arochlor 1232)
PCB-1248 (Arochlor 1248)
PCB-1260 (Arochlor 1260)
PCB-1016 (Arochlor 1016)
Toxaphene
2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)

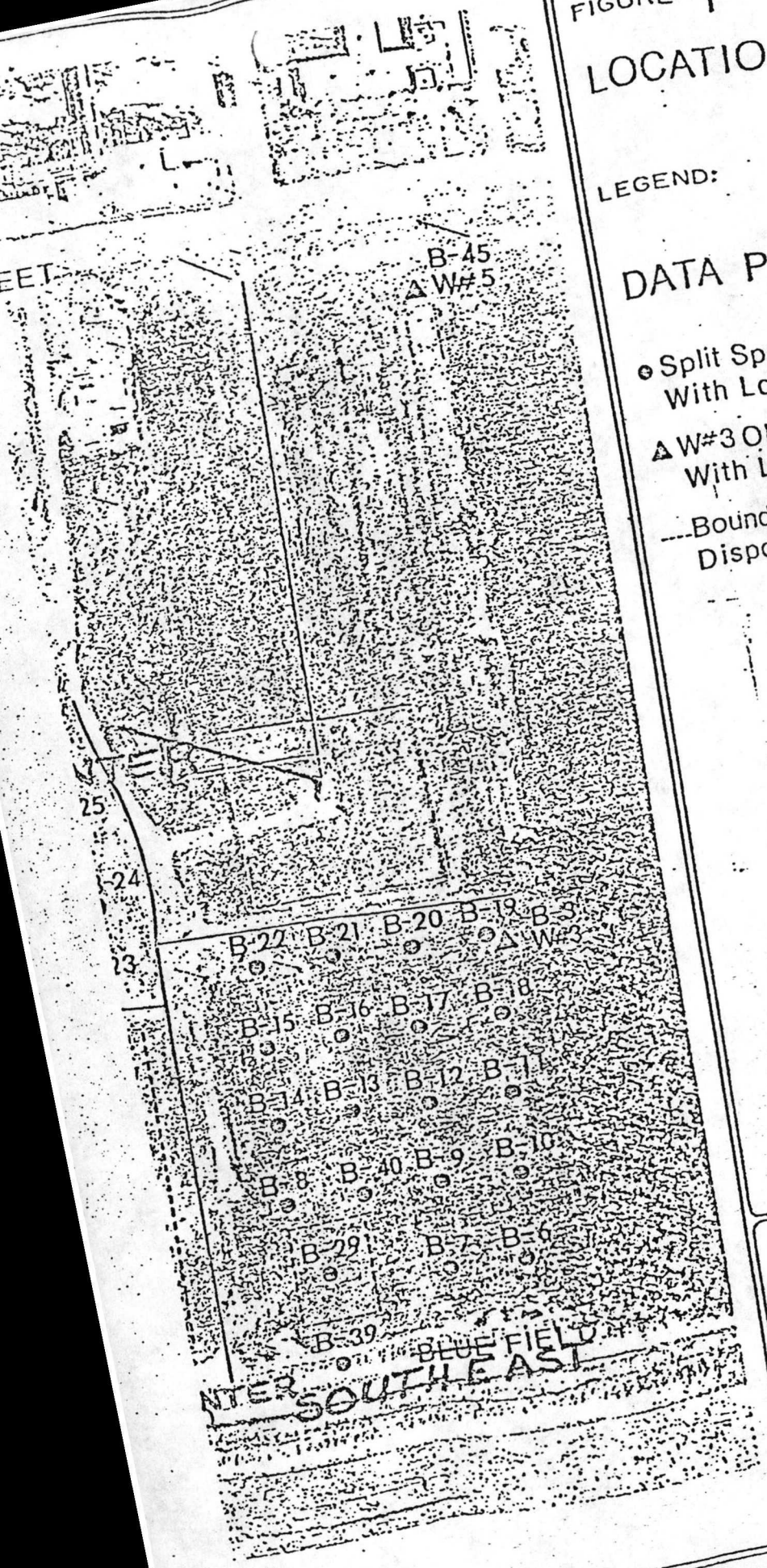
FIGURE 1

# LOCATION MAP

LEGEND:

## DATA POINTS

- ⊙ Split Spoon Boring With Log Number
- △ W#3 Observation Well With Log Number
- ---- Boundary of Subsurface Disposal Pit




TOTAL PETROLEUM, INC.

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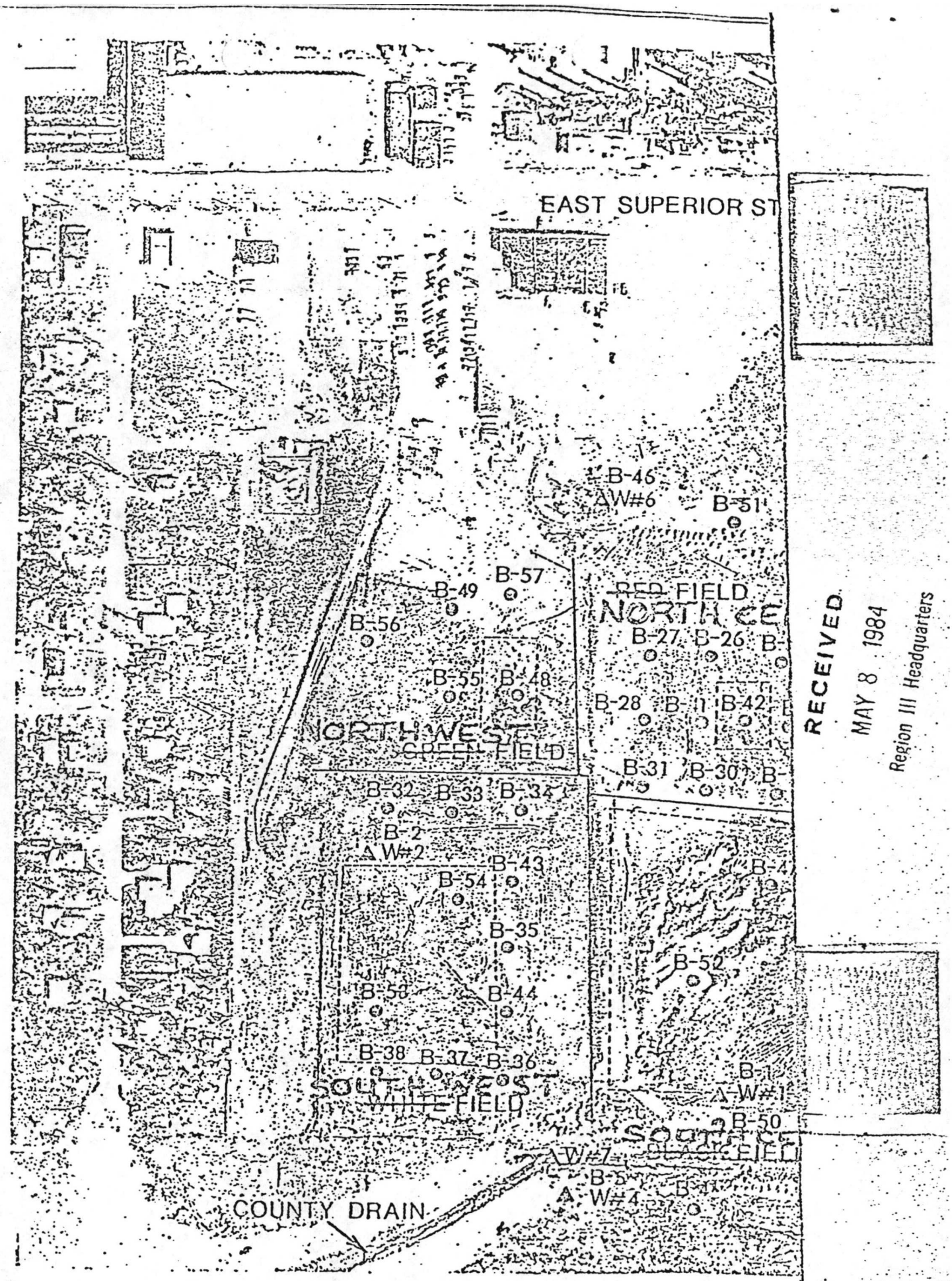


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MAY 8 1984
Region III Headquarters

WILLIAMS & WORKS, INC. GRAND RAPIDS, MICHIGAN

**TOTAL**
**Total Petroleum, Inc.**

EAST SUPERIOR STREET ALMA, MICHIGAN 48801 TELEPHONE 517 463-1161 TWX 510 441-2431

BENJAMIN E. WHITE, P. E.
ENVIRONMENTAL ENGINEER

December 31, 1986

Mr. Robert E. Basch, Supervisor
DNR - Region III
HWD - Lansing District
P.O. Box 30028
Lansing, Michigan 48909

Dear Mr. Basch:

This is in reply to your letter of December 15, 1986 regarding our previous responses to Terry McNeil's CME report. We offer the following information as an update and to reply to your correspondence relative to that report.

1. We have received the analytical results from the outside laboratory of the samples that were sent to them for an acid extractable phenol analysis. Total Petroleum's laboratory also analyzed duplicates of those samples for phenols. The complete set of that data is listed below:

| Parameter | MW 1 mg/L | MW 2 mg/L | MW 26 mg/L | MW 27 mg/L | MW 29 mg/L | MW 30 mg/L |
|---|---|---|---|---|---|---|
| Phenol (by Total Pet. lab) | 114 | .113 | .033 | 730 | 5.3 | .037 |
| Phenol (By ESI) | 28 | <.050 | <.050 | 520 | <.050 | <.050 |
| 3,4,5-Trichlorophenol | <.050 | <.050 | <.050 | <.050 | <.050 | <.050 |
| 4-Methylphenol | 27 | <.050 | <.050 | 250 | <.050 | <.050 |
| 2-Methylphenol | 13 | <.050 | <.050 | 160 | <.050 | <.050 |
| 2-Chlorophenol | <.050 | <.050 | <.050 | <.050 | <.050 | <.050 |
| 2,4-Dichlorophenol | <.050 | <.050 | <.050 | <.050 | <.050 | <.050 |
| 2,4,6-Trichlorophenol | <.050 | <.050 | <.050 | <.050 | <.050 | <.050 |
| Pentachlorophenol | <.050 | <.050 | <.050 | <.050 | <.050 | <.050 |
| 4-Chloro-3-Methylphenol | <.050 | <.050 | <.050 | <.050 | <.050 | <.050 |
| 2-Nitrophenol | <.050 | <.050 | <.050 | <.050 | <.050 | <.050 |
| 4-Nitrophenol | <.050 | <.050 | <.050 | <.050 | <.050 | <.050 |
| 2,4-Dinotrophenol | <.500 | <.500 | <.500 | <.500 | <.500 | <.500 |
| 2-Methyl-4,6-Dinitrophenol | <.250 | <.250 | <.250 | <.250 | <.250 | <.250 |
| 2,4-Dimethylphenol | 78 | <.050 | <.050 | 490 | 16.9 | <.050 |

2. The two additional monitoring wells described in our letter of November 13, 1986 have been installed. The logs for those new wells are enclosed. Also enclosed are three maps showing (1) the potentiometric surface of the facility on December 9, 1986; (2) the specific conductance of the groundwater on 12/9/86; and (3) the groundwater TOC on 12/9/86. The two new wells are numbered 36 and 37 on those maps.

   The groundwater surface elevation for Well No. 37 was measured at 742.00 feet on December 9, 1986. This elevation is considerably higher than would be expected in this well if it were screened in the same aquifer as the other area wells. The log for this well indicates that the well screen for this well is higher than expected when compared to the other area wells; however, it was installed so as to monitor the only shallow groundwater that was found while boring at this location. The limited amount of groundwater in this vicinity was expected because soil boring 5, shown on Exhibit 8 of our closure plan, was completely dry even though it was drilled to 25 feet below the surface. SB5 was located approximately 150 feet northwest of MW 37.

3. We also have installed a new well, numbered MW 38, located near one of our water supply wells. It is shown on the maps described in item 2 above. This well will be used to monitor the drawdown, or lack of drawdown, in the shallow aquifer while the water supply well is being pumped. This drawdown study will be scheduled in the near future.

   During the search for the proper location for this new monitoring well (38) a boring was made along the west side of the land treatment facility near our other water supply well. A shallow monitoring well was not installed at that location because no shallow groundwater was found in that boring. This boring again reinforced our belief that very little shallow groundwater exists along the westerly boundary of the land treatment facility. The limited amount of shallow groundwater in this area also indicates that the westerly limit of the plume has been located because no plume of any kind exists there.

   We have scheduled the drilling of the boring south of the land treatment area for early in January 1987. This boring will be drilled into the bottom clay layer and samples taken at various depths. Permeability tests will be conducted on those samples.

4. The outside laboratory has recently reported to us that detectable levels of 1,2-dichloroethane were not found in the sample of MW 15 that we sent to them on October 27, 1986. Their limit of detection for this parameter is 1.0 mg/L.

   This sample was sent to the outside laboratory after we learned that the MDNR laboratory had reported an unconfirmed concentration of 2.8 mg/L in the sample that the DNR obtained from this well on May 22, 1986. This unconfirmed analysis was described in your letter of October 9, 1986 as a violation that must be corrected. Although no violation existed, we trust that this data eliminates your concern about your laboratory's unconfirmed analysis.

In addition to responding to your letter of December 15, 1986 we ask that you review a question that we have. Our question is relative one of the concerns expressed by the MDNR and USEPA about our closure plan.

Both the MDNR and the USEPA have indicated that the post closure cost estimate and financial assurance instrument must provide adequate, third party funding to assure that the purge well system, treatment system and groundwater monitoring can be operated into perpetuity. Mr. Scott Bristol of Total Petroleum, Inc.'s Risk Management Department has discussed this matter with Peter Quackenbush of the MDNR. Mr. Quackenbush also referred Mr. Bristol to another DNR official. The purpose of Mr. Bristol's inquiry was to learn what method is acceptable and reasonable for providing financial assurance into perpetuity. However, Mr. Bristol was unable to obtain an answer to that question. In addition, Mr. Bristol was told that there is no regulation requiring that post closure plans extend beyond 30 years after closure.

Based upon our present knowledge concerning the post closure requirements, Total Petroleum, Inc. is proceeding to revise the post closure plan for our land treatment facility. That plan will extend to 30 years beyond closure and the financial assurances will be provided for that time period. If this is not acceptable to you please tell us how to provide the kind of assurance that you believe is necessary.

We hope this information is satisfactory to you, and if you have any questions please contact us.

Sincerely,

Benjamin E. White

Benjamin E. White

BEW/lf

Enc.

**WESTERN MICHIGAN**
**ENVIRONMENTAL SERVICES, INC.**
245 EAST LAKEWOOD BLVD.
HOLLAND, MI 49424-2066
PHONE 616-396-1209

TO: Total Petroleum
East Superior Street
Alma, Michigan 48801

Attn: Ben White

DATE: December 4, 1986

ANALYSIS: OF WATER SAMPLES

REPORTED BY: Robert W. Hamm
Robert W. Hamm, Laboratory Director

SAMPLING DATE: Received from client on October 29, 1986.

RESULTS: Expressed as noted.

| ESI # | SAMPLE I.D. | PARAMETER | CONCENTRATION |
|---|---|---|---|
| 8610147-1 | 1-30-1 | See Attached Tables | |
| -2 | 1-30-2 | | |
| -3 | 1-30-3 | | |
| -4 | 1-30-4 | | |
| -5 | 1-30-5 | | |
| -6 | 1-30-6 | | |
| -7 | 1-30-7 | | |
| -8 | 1-30-8 | | |

TABLE 1
Results for Total Petroleum
Received October 29, 1986. Reported December 4, 1986.
Expressed as micrograms per liter (µg/ℓ).

| Parameter | 1-30-1 | 1-30-2 | 1-30-3 | 1-30-4 | 1-30-5 | 1-30-6 | 1-30-7 | 1-30-8 |
|---|---|---|---|---|---|---|---|---|
| 2,4,5-Trichlorophenol | <50 | <50 | <50 | <50 | <50 | <50 | <50 | -- |
| 4-methyl phenol | <50 | <50 | 250,000 | <50 | <50 | 27,000 | <50 | -- |
| 2-methyl phenol | <50 | <50 | 160,000 | <50 | <50 | 13,000 | <50 | -- |
| 1,2-dichloroethane | -- | -- | -- | -- | -- | -- | -- | <1.0 |
| ESI #8610147 | -1 | -2 | -3 | -4 | -5 | -6 | -7 | -8 |

TABLE 2
ACID EXTRACTABLE PRIORITY POLLUTANTS
Results for Total Petroleum
Received October 29, 1986. Reported December 4, 1986.
Expressed as micrograms per liter (µg/ℓ).
Limit of detection is 50 µg/ℓ except where noted in parentheses.

| Parameter | 1-30-1 | 1-30-2 | 1-30-3 | 1-30-4 | 1-30-5 | 1-30-6 | 1-30-7 |
|---|---|---|---|---|---|---|---|
| phenol | N.D. | N.D. | 520,000 | N.D. | N.D. | 28,000 | N.D. |
| 2-chlorophenol | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| 2,4-dichlorophenol | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| 2,4,6-trichlorophenol | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| pentachlorophenol | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| 4-chloro-3-methylphenol | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| 2-nitrophenol | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| 4-nitrophenol | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| 2,4-dinitrophenol(500) | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| 2-methyl-4,6-dinitrophenol(250) | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. | N.D. |
| 2,4-dimethylphenol | N.D. | N.D. | 490,000 | 16,900 | N.D. | 78,000 | N.D. |
| ESI #8610147 | -1 | -2 | -3 | -4 | -5 | -6 | -7 |

N.D. = Not Detected

Total's lab phenol 37 33 73,000 5,300 37 111,000 113

Job No. 86609

J.L. WILCOX & ASSOCIATES, INC.
Engineers and Surveyors
7230 N. U.S. — 131 • Manton, Michigan 49663

# WELL RECORD

MW# 30A

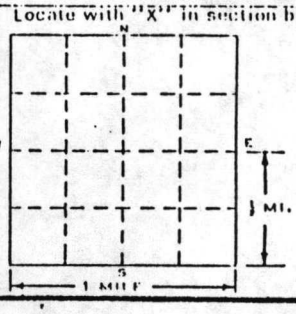
**1 LOCATION OF WELL**

| County | Township Name | Fraction | Section Number | Town Number | Range Number |
|---|---|---|---|---|---|
| Gratiot | Pine River | ¼ ¼ ¼ | 35 | 12 X N/S. | 3 X E/W. |

Distance And Direction from Road Intersections

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:




**3 OWNER OF WELL:**

Address: Total Petroleum
East Superior Street
Alma, Michigan 48801

**4 WELL DEPTH:** (completed) 18' ft. Date of Completion 11-26-86

**5** [ ] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [X] Auger

**6 USE:** [ ] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [X] Test Well [ ]

**7 CASING:** Threaded [X] Welded [ ]
Diam. Galvanized Steel
2" in. to 16' ft. Depth
___ in. to ___ ft. Depth
Height: Above/~~Below~~ Surface 3' ft.
Weight ___ lbs./ft.
Drive Shoe? Yes [ ] No [ ]

**8 SCREEN:**
Type: Stainless Steel Dia.: 2"
Slot/~~Gauze~~ 7 Length 2'
Set between 16' ft. and 18' ft.
Fittings:

**9 STATIC WATER LEVEL**
14'+ ft. below land surface

**10 PUMPING LEVEL below land surface**
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

**11 WATER QUALITY in Parts Per Million:**
Iron (Fe) ___ Chlorides (Cl) ___
Hardness ___ Other ___

**12 WELL HEAD COMPLETION:** [ ] In Approved Pit [ ] Pitless Adapter [X] 36" Above Grade & Capped

**13** Well Grouted? [X] Yes [ ] No
[ ] Neat Cement [X] Bentonite [ ] ___
Depth: From ___ ft. to ___ ft.

**14** Nearest Source of possible contamination
___ feet ___ Direction ___ Type
Well disinfected upon completion [ ] Yes [X] No

**15 PUMP:** [X] Not installed
Manufacturer's Name ___
Model Number ___ HP ___ Volts ___
Length of Drop Pipe ___ ft. capacity ___ G.P.M.
Type: [ ] Submersible [ ] [ ] Jet [ ] Reciprocating

**2**

| FORMATION | THICKNESS OF STRATUM | DEPTH TO BOTTOM OF STRATUM |
|---|---|---|
| Soft, Red Clay | 6' | 6' |
| Stiff, Brown Clay | 9' | 15' |
| Fine, Gray Sand | 3'+ | 18'+ |

USE A 2ND SHEET IF NEEDED

**16** Remarks, elevation, source of data, etc.
Well is Gravel Packed

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

J. L. WILCOX & ASSOCIATES, INC.
WILCOX WELL DRILLING
Name William (Bill) Pearson

Signed Bill Pearson Date 12-23-86

Job No. 86609

J.L. WILCOX & ASSOCIATES, INC.
Engineers and Surveyors
7230 N. U.S. — 131 • Manton, Michigan 49663

# WELL RECORD

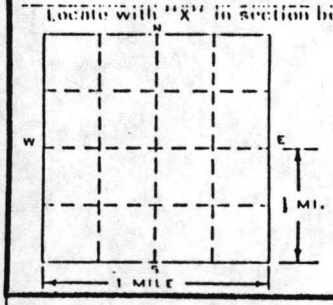
**1 LOCATION OF WELL** MW# 36

| County | Township Name | Fraction | Section Number | Town Number | Range Number |
|---|---|---|---|---|---|
| Gratiot | Pine River | ¼ ¼ ¼ | 35 | 12 N/~~S~~ | 3 ~~E~~/W. |

Distance And Direction from Road Intersections

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:




**3 OWNER OF WELL:**
Address: Total Petroleum
East Superior Street
Alma, Michigan 48801

**4 WELL DEPTH:** (completed) 33' ft. Date of Completion 11-26-86

**5** [ ] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [X] Auger

**6 USE:** [ ] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [X] Test Well [ ]

**7 CASING:** Threaded [X] Welded [ ] Height: Above/~~Below~~ Surface 2 ft.
Diam Galvanized Steel
2" in. to 31' ft. Depth Weight ____ lbs./ft.
____ in. to ____ ft. Depth Drive Shoe? Yes [ ] No [X]

**8 SCREEN:**
Type: Stainless Steel Dia.: 2"
Slot/Gauze 7 Length 2'
Set between 31' ft. and 33' ft.
Fittings: 2" Drive Screen

**9 STATIC WATER LEVEL**
18'± ft. below land surface

**10 PUMPING LEVEL** below land surface
____ ft. after ____ hrs. pumping ____ g.p.m.
____ ft. after ____ hrs. pumping ____ g.p.m.

**11 WATER QUALITY** in Parts Per Million:
Iron (Fe) ____ Chlorides (Cl) ____
Hardness ____ Other ____

**12 WELL HEAD COMPLETION:** [ ] In Approved Pit [ ] Pitless Adapter [X] Above Grade & Capped

**13** Well Grouted? [X] Yes [ ] No
[ ] Neat Cement [X] Bentonite [ ] ____
Depth: From ____ ft. to ____ ft.

**14** Nearest Source of possible contamination
____ feet ____ Direction ____ Type
Well disinfected upon completion [ ] Yes [X] No

**15 PUMP:** [X] Not installed
Manufacturer's Name ____
Model Number ____ HP ____ Volts ____
Length of Drop Pipe ____ ft. capacity ____ G.P.M.
Type: [ ] Submersible [ ] [ ] Jet [ ] Reciprocating

**2**

| FORMATION | THICKNESS OF STRATUM | DEPTH TO BOTTOM OF STRATUM |
|---|---|---|
| Soft, Red Clay | 7' | 7' |
| Stiff, Brown Clay | 11' | 18' |
| Waterbearing, Fine, Gray Sand | 12' | 30' |
| Waterbearing, Coarse, Gray Sand & Gravel | 4.5' | 34.5' |
| Hard, Gray Till at 34.5' | | 34.5'+ |

USE A 2ND SHEET IF NEEDED

**16** Remarks, elevation, source of data, etc.

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name J. L. WILCOX & ASSOCIATES, INC.
WILCOX WELL DRILLING
William (Bill) Pearson

Signed Bill Pearson Date 12-23-86

Job No. 86609

J.L. WILCOX & ASSOCIATES, INC.
Engineers and Surveyors
7230 N. U.S. — 131 • Manton, Michigan 49663

# WELL RECORD

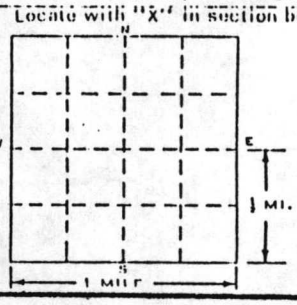
**1 LOCATION OF WELL** MW# ~~36~~ 37

| County | Township Name | Fraction | Section Number | Town Number | Range Number |
|---|---|---|---|---|---|
| Gratiot | Pine River | ¼ ¼ ¼ | 35 | 12 N/S X | 3 X W. |

Distance And Direction from Road Intersections

Street address & City of Well Location

Locate with "X" in section below — Sketch Map:




**3 OWNER OF WELL:**
Address: Total Petroleum
East Superior Street
Alma, Michigan 48801

**4 WELL DEPTH:** (completed) 13' ft. Date of Completion 11-26-86

**5** [ ] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [X] Auger

**6 USE:** [ ] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [X] Test Well [ ]

**7 CASING:** Threaded [X] Welded [ ]
Diam. Galvanized Steel
2" in. to 11' ft. Depth
___ in. to ___ ft. Depth
Height: Above/Below Surface 1' ft.
Weight ___ lbs./ft.
Drive Shoe? Yes [ ] No [X]

**8 SCREEN:**
Type: Stainless Steel Dia.: 2"
Slot/Gauze 7 Length 2'
Set between 11' ft. and 13' ft.
Fittings: 2" Drive Screen

**9 STATIC WATER LEVEL**
9'+ ft. below land surface

**10 PUMPING LEVEL below land surface**
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

**11 WATER QUALITY in Parts Per Million:**
Iron (Fe) ___ Chlorides (Cl) ___
Hardness ___ Other ___

**12 WELL HEAD COMPLETION:** [ ] In Approved Pit [ ] Pitless Adapter [X] 12" Above Grade & Capped

**13** Well Grouted? [X] Yes [ ] No
[ ] Neat Cement [X] Bentonite [ ] ___
Depth: From ___ ft. to ___ ft.

**14** Nearest Source of possible contamination
___ feet ___ Direction ___ Type
Well disinfected upon completion [ ] Yes [X] No

**15 PUMP:** [X] Not installed
Manufacturer's Name ___
Model Number ___ HP ___ Volts ___
Length of Drop Pipe ___ ft. capacity ___ G.P.M.
Type: [ ] Submersible [ ] [ ] Jet [ ] Reciprocating

**2**

| FORMATION | THICKNESS OF STRATUM | DEPTH TO BOTTOM OF STRATUM |
|---|---|---|
| Soft, Red Clay | 7' | 7' |
| Stiff , Brown Clay | 4' | 11' |
| Real Fine, Gray Sand | 1' | 12' |
| Stiff, Brown Clay | 8'+ | 20'+ |

USE A 2ND SHEET IF NEEDED

**16 Remarks, elevation, source of data, etc.**
Well is Gravel Packed.

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

Name J. L. WILCOX & ASSOCIATES, INC.
WILCOX WELL DRILLING
William (Bill) Pearson

Signed Bill Pearson Date 12-23-86

Job No. 86609

J.L. WILCOX & ASSOCIATES, INC.
Engineers and Surveyors
7230 N. U.S. — 131 • Manton, Michigan 49663

# WELL RECORD

**1 LOCATION OF WELL** MW# 38

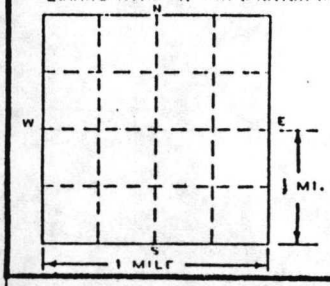
| County | Township Name | Fraction | Section Number | Town Number | Range Number |
|---|---|---|---|---|---|
| Gratiot | Pine River | ¼ ¼ ¼ | 35 | 12 N/~~S~~ | 3 ~~E~~/W. |

Distance And Direction from Road Intersections

Street address & City of Well Location

Locate with "X" in section below

Sketch Map:




**3 OWNER OF WELL:**
Address: Total Petroleum
East Superior Street
Alma. Michigan 48801

**4 WELL DEPTH:** (completed) 18' ft. Date of Completion 11-26-86

**5** [ ] Cable tool [ ] Rotary [ ] Driven [ ] Dug [ ] Hollow rod [ ] Jetted [ ] Bored [X] Auger

**6 USE:** [ ] Domestic [ ] Public Supply [ ] Industry [ ] Irrigation [ ] Air Conditioning [ ] Commercial [X] Test Well [ ]

**7 CASING:** Threaded [X] Welded [ ]
Diam. Galvanized Steel
2" in. to 16' ft. Depth
___ in. to ___ ft. Depth
Height: Above/~~Below~~ Surface 2' ft.
Weight ___ lbs./ft.
Drive Shoe? Yes [ ] No [X]

**8 SCREEN:**
Type: Stainless Steel Dia.: 2"
Slot/~~Gauze~~ 7 Length 2'
Set between 16' ft. and 18' ft.
Fittings: 2" Drive Screen

**9 STATIC WATER LEVEL**
9'+ ft. below land surface

**10 PUMPING LEVEL below land surface**
___ ft. after ___ hrs. pumping ___ g.p.m.
___ ft. after ___ hrs. pumping ___ g.p.m.

**11 WATER QUALITY in Parts Per Million:**
Iron (Fe) ___ Chlorides (Cl) ___
Hardness ___ Other ___

**12 WELL HEAD COMPLETION:** [ ] In Approved Pit [ ] Pitless Adapter [X] Above Grade & Capped

**13** Well Grouted? [ ] Yes [X] No
[ ] Neat Cement [X] Bentonite [ ] ___
Depth: From ___ ft. to ___ ft.

**14** Nearest Source of possible contamination
___ feet ___ Direction ___ Type
Well disinfected upon completion [ ] Yes [X] No

**15 PUMP:** [X] Not installed
Manufacturer's Name ___
Model Number ___ HP ___ Volts ___
Length of Drop Pipe ___ ft. capacity ___ G.P.M.
Type: [ ] Submersible [ ] Jet [ ] Reciprocating

**2**

| FORMATION | THICKNESS OF STRATUM | DEPTH TO BOTTOM OF STRATUM |
|---|---|---|
| Soft, Red Clay | 4' | 4' |
| Stiff, Brown Clay | 5' | 9' |
| Fine, Waterbearing Gray Sand | 5' | 14' |
| Medium, Waterbearing Gray Sand | 6'+ | 20'+ |

USE A 2ND SHEET IF NEEDED

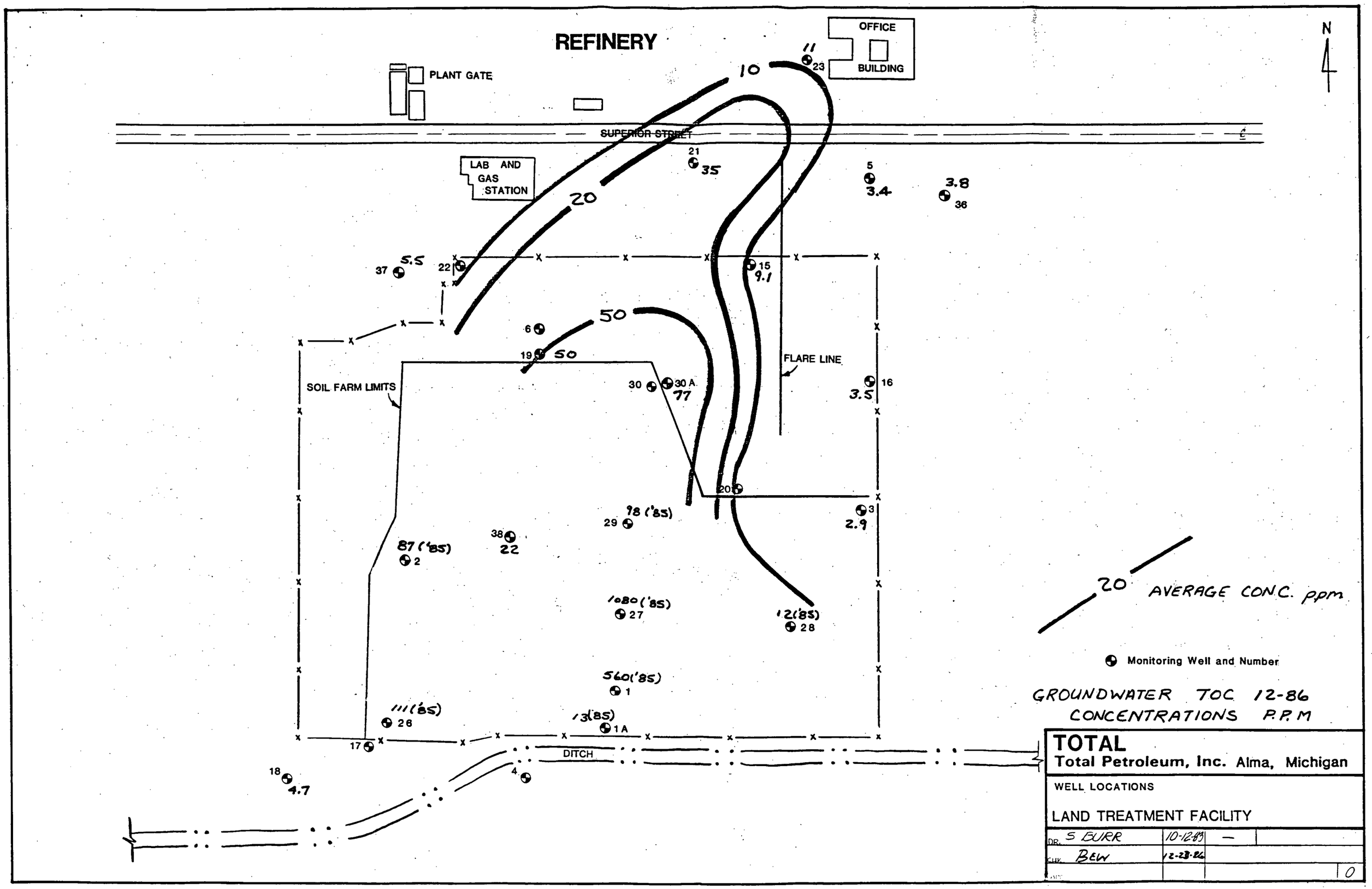
**16** Remarks, elevation, source of data, etc.

This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.

J. L. WILCOX & ASSOCIATES, INC.
WILCOX WELL DRILLING

Name ~~William (Bill)~~ Pearson

Signed Bill Pearson Date 12-23-86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LAB AND GAS STATION
SOIL FARM LIMITS
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GROUNDWATER TOC 12-86
CONCENTRATIONS P.P.M
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Total Petroleum, Inc. Alma, Michigan
WELL LOCATIONS
LAND TREATMENT FACILITY
DR. S EURR 10-12-83
CHK. BEW 12-23-86
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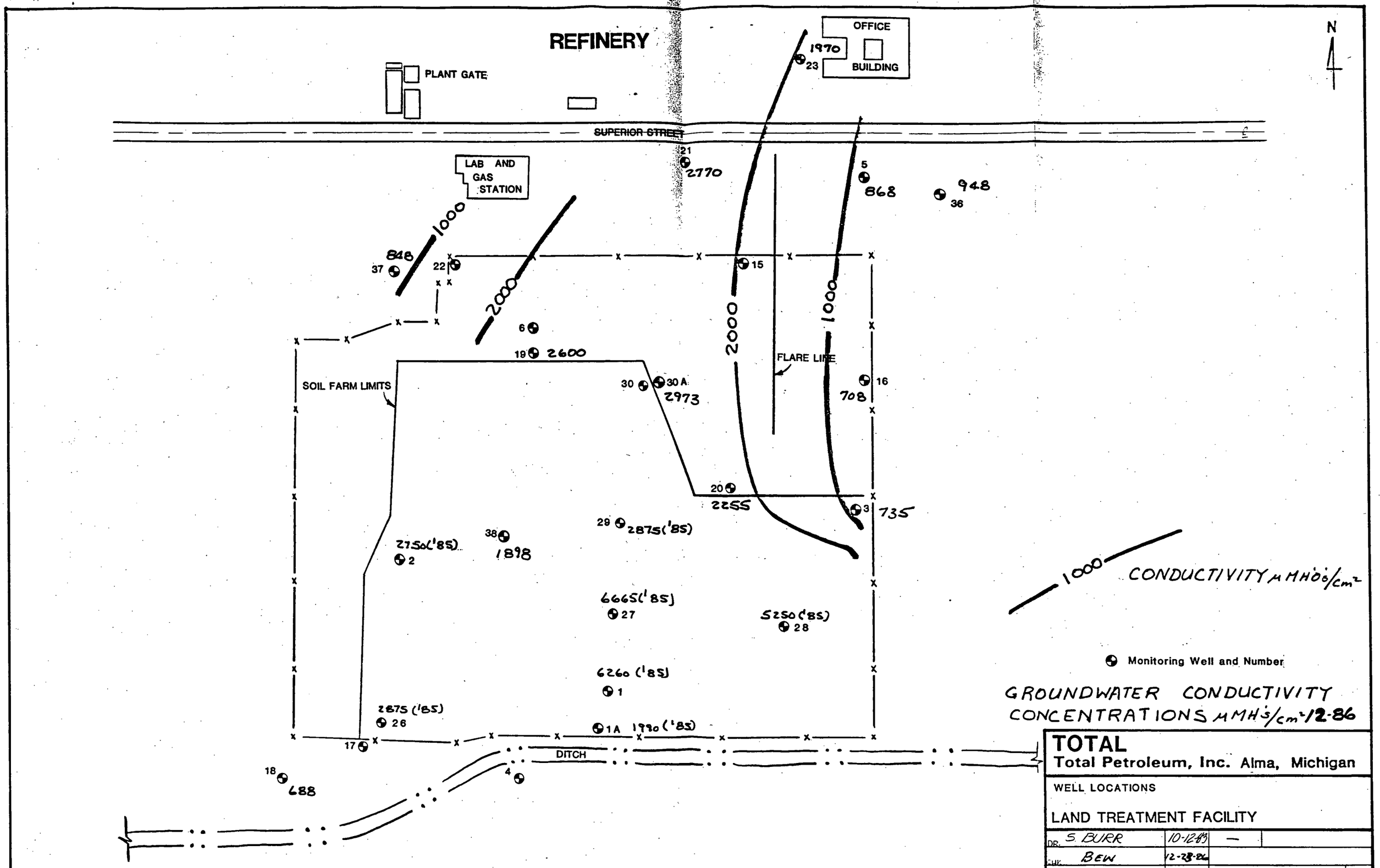
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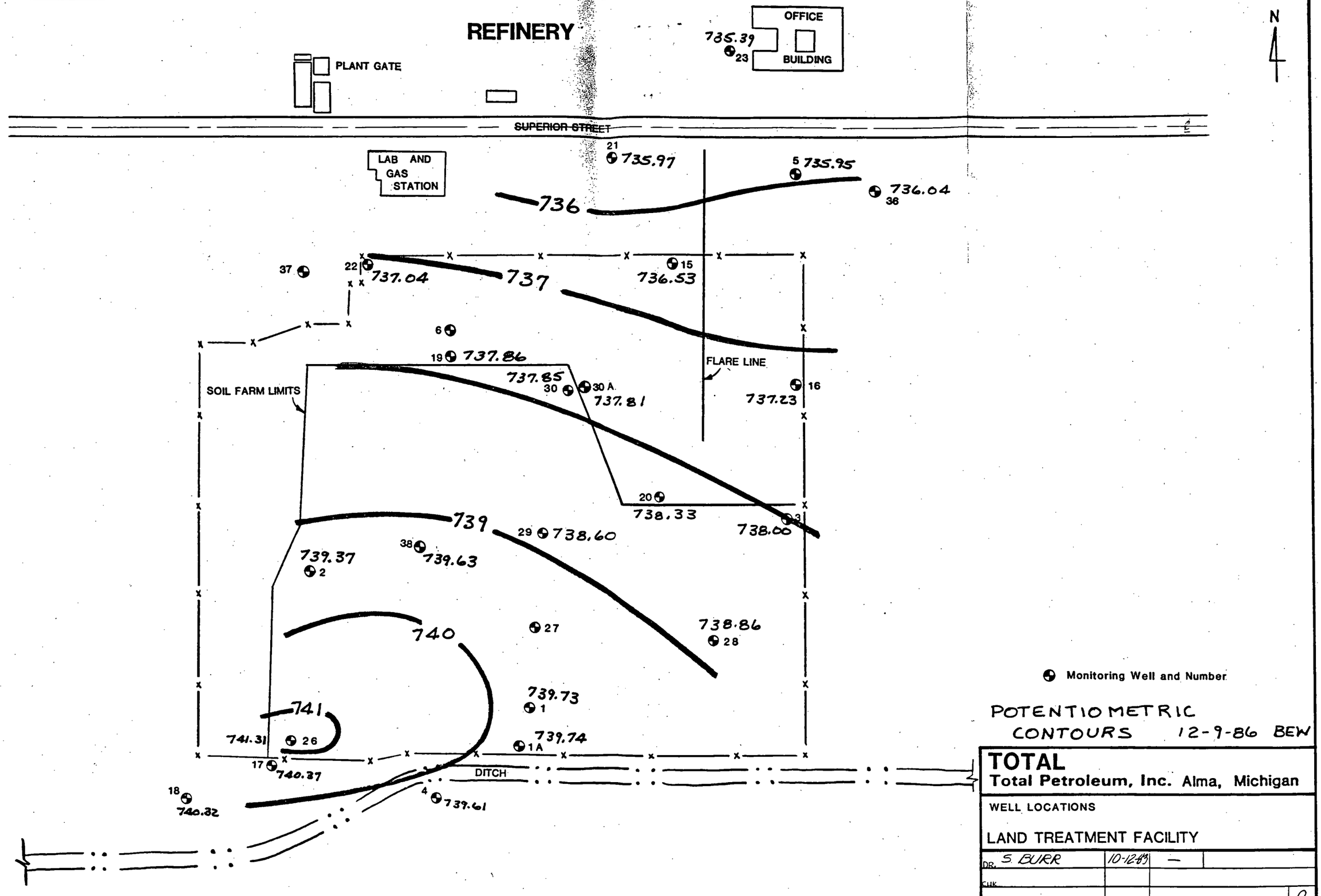
Total Petroleum, Inc. Alma, Michigan
WELL LOCATIONS
LAND TREATMENT FACILITY
DR. S. BURR 10-12-83 —
CHK. BEW 12-28-86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Monitoring Well and Number
POTENTIOMETRIC CONTOURS 12-9-86 BEW
TOTAL
Total Petroleum, Inc. Alma, Michigan
WELL LOCATIONS
LAND TREATMENT FACILITY
DR. S. BURR 10-12-89 —
CHK
0

File
Total Petroleum
Correspondence

MICHIGAN DEPARTMENT OF NATURAL RESOURCES
ENVIRONMENTAL PROTECTION BUREAU
SURFACE WATER QUALITY DIVISION

Report of an Industrial Wastewater Survey
Conducted at
TOTAL PETROLEUM
All Outfalls No. 290006
NPDES Permit No. MI0001066
Gratiot County
Alma, Michigan
October 1-2, 1985

Survey Summary

Wastewater monitoring was performed during one twenty-four hour survey period starting October 1, 1985.

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SWQD PERMIT

# TOTAL PETROLEUM

## Survey Procedure

The flows and samples were obtained as follows:

| Sample Description | Flow Measurement | Sampling Method |
|---|---|---|
| 290024(001) Collected just up from 90° V-notch weir. | Company 90° V-notch weir and staff installed water level recorder. | Automatic air-activated composite sampler and individual grab samples. |

A water level recorder provides a continuous account of the liquid level or head above the crest of a weir or through a flume. A head versus time graph is obtained for the duration of the survey period. The total volume of wastewater over the weir or through the flume during the survey period is computed from the graph.

An automatic sampler composites samples at timed intervals. Samples may be proportional to the instantaneous flow over the weir or through the flume.

Extractable organic and sulfide composite samples are collected by the grab composite method.

A grab composite consists of a series of individual grabs composited into one sample.

An individual grab is a single instantaneous sample.

Samples were analyzed by the Environmental Protection Bureau Laboratories located in Lansing.

Samples were preserved according to Table 5. The results of the physical, chemical, and bacteriological analyses are presented in Tables 1 and 2. Letter codes for laboratory results are defined in Table 5. A parameter listing for the organic scans is presented in Table 6. Unless otherwise specified, all parameters in the scan were analyzed.

## TOTAL PETROLEUM

Table 1 - Analyses of composite samples.

| Outfalls | 290024(001) | |
|---|---|---|
| Survey Period From | 10-1-85 1045 | |
| To | 10-2-85 1045 | |
| Computed Flow Rate (MGD) | (0.57) | |
| | mg/l | lbs/day |
| Suspended solids | 10 | 48 |
| Dissolved solids | 2400 | 11400 |
| $BOD_5$ | 12 | 57 |
| $CBOD_5$ | 11. | 52 |
| COD | 120 | 570 |
| TOC | 28. | 133 |
| Nitrite & nitrate nitrogen-N | 0.11 DS | 0.52 |
| Ammonia nitrogen-N | 15. | 71 |
| Organic nitrogen-N | 3.3 | 15.7 |
| Kjeldahl nitrogen-N | 18.0 | 86 |
| Total phosphorus-P | 0.16 DS | 0.8 |
| Sulfide | 0.04 | 0.2 |
| | ug/l | lbs/day |
| Phenols | 20 | 0.1 |
| Total cadmium (Cd) | <20 | --- |
| Total chromium (Cr) | <50 | --- |
| Hexavalent chromium (Cr+6) | <5 | --- |
| Total copper (Cu) | <20 | --- |
| Total iron (Fe) | 545 | 3 |
| Total nickel (Ni) | 90 | 0.4 |
| Total lead (Pb) | <50 | --- |
| Total zinc (Zn) | 90 | 0.4 |

Flow rates used in the computation of lbs/day.
Figure shown in ( ) obtained from company/plant MOR/totalizer.

TOTAL PETROLEUM

ble 1 - Continued

tfalls 290024(001)

| | ug/l | lbs/day |
|---|---|---|
| AN 3 - Chlorinated Hydrocarbons, Polychlorinated Biphenyl, and Organochlorine Pesticides | | |
| BHC (lindane) | <0.01 | --- |
| Chloronaphthalene | <0.1 | --- |
| 2-Dichlorobenzene | <0.1 | --- |
| 3-Dichlorobenzene | <0.1 | --- |
| 4-Dichlorobenzene | <0.1 | --- |
| xachlorobenzene | <0.01 | --- |
| xachlorobutadiene | <0.01 | --- |
| exachlorocyclopentadiene | <0.01 | --- |
| xachloroethane | <0.01 | --- |
| ctachlorocyclopentene | <0.01 | --- |
| entachloronitrobenzene | <0.01 | --- |
| ,2,4-Trichlorobenzene | <0.01 | --- |
| thers | <0.01 | --- |
| roclor 1242 | <0.1 | --- |
| roclor 1254 | <0.1 | --- |
| roclor 1260 | <0.1 | --- |
| ldrin | <0.01 | --- |
| P-6 (PBB) | <0.01 | --- |
| -Chlordane | <0.01 | --- |
| -Chlordane | <0.01 | --- |
| ,4'-DDD | <0.01 | --- |
| ,4'-DDE | <0.01 | --- |
| ,4'-DDT | <0.01 | --- |
| ,4'-DDT | <0.01 | --- |
| eptachlor | <0.01 | --- |
| eptachlor epoxide | <0.01 | --- |
| exabromobenzene | <0.01 | --- |
| ethoxychlor | <0.01 | --- |
| irex | <0.01 | --- |
| thers | <0.01 | --- |

## TOTAL PETROLEUM

Table 2 - Analyses of grab samples.

| Date | Time | Temp.[1] °F | pH[1] S.U. | Susp. Solids mg/l | Diss. Solids mg/l | Diss. Oxygen mg/l | $BOD_5$ mg/l | $CBOD_5$ mg/l |
|---|---|---|---|---|---|---|---|---|
| 290024(001) | | | | | | | | |
| 10-1-85 | 1400 | 58 | 7.1 | 4 | 2400 | 7.5 | 11 | 8.1 |
| 10-2-85 | 0840 | 50 | 7.2 | 4 | 2400 | 7.5 | 9.9 | 8.4 |

| Date | Time | COD mg/l | TOC mg/l | Nitrite & Nitrate Nitrogen-N mg/l | Ammonia Nitrogen mg/l | Organic Nitrogen mg/l | Kjeldahl Nitrogen mg/l |
|---|---|---|---|---|---|---|---|
| 240024(001) | | | | | | | |
| 10-1-85 | 1400 | 120 | 28. | 0.11 DS | 15. | 2.0 | 17. |
| 10-2-85 | 0840 | 130 | 27. | 0.12 DS | 15. | 5.1 | 20. |

| Date | Time | Total Phosphorus mg/l | Sulfide mg/l | Phenols ug/l | Total Cadmium ug/l | Total Chromium ug/l |
|---|---|---|---|---|---|---|
| 240024(001) | | | | | | |
| 10-1-85 | 1400 | 0.14 DS | 0.03 | 25 | <20 | <50 |
| 10-2-85 | 0840 | 0.16 DS | 0.03 | 27 | <20 | <50 |

| Date | Time | Hexavalent Chromium ug/l | Total Copper ug/l | Total Nickel ug/l | Total Lead ug/l | Total Zinc ug/l | Total Iron ug/l | O & G Grav. mg/l |
|---|---|---|---|---|---|---|---|---|
| 240024(001) | | | | | | | | |
| 10-1-85 | 1400 | <5 | <20 | 75 | <50 | <50 | 525 | 4.2 |
| 10-2-85 | 0840 | <5 | <20 | 75 | <50 | 90 | 480 | 3.2 |

1 - Values determined in the field at time of sampling.

TOTAL PETROLEUM

Table 2 - (Continued)

SCAN 1 - Purgeable Halocarbons

| Date | Time | 1,2 Dichloro-ethane ug/l | Trichloro-ethane ug/l | 1,1,1 Tri-chloroethane ug/l | Others ug/l |
|---|---|---|---|---|---|
| 290024(001) | | | | | |
| 10-1-85 | 1400 | <18 INT | <1 INT | <1 | <1 |
| 10-2-85 | 0840 | <1 | <1 | <7 INT | <1 |

| Date | Time | SCAN 2 - Purgeable Aromatic Hydrocarbons ug/l |
|---|---|---|
| 290024(001) | | |
| 10-1-85 | 1400 | <5 |
| 10-2-85 | 0840 | <5 |

SCAN 3 - Chlorinated Hydrocarbons, Polychlorinated Biphenyl, & Organochlorine Pesticides

| Date | Time | Aroclor 1242 ug/l | Other Aroclors, Dichlorobenzenes, 2-Chloronaphthalene ug/l | 1,2,4-Tri-chlorobenzene ug/l | Others ug/l |
|---|---|---|---|---|---|
| 290024(001) | | | | | |
| 10-1-85 | 1400 | <0.14 BLK | <0.1 | <0.01 | <0.01 |
| 10-2-85 | 0840 | <0.14 BLK | --- | 0.03 BK UC | <0.01 |

Table 3 - Comparison of survey results with the facility's NPDES Permit and Monthly Operating Report.

| Parameter (Unit) | NPDES Interim Permit Limitations | | October Monthly Operating Report | | | | Survey Results[1] |
|---|---|---|---|---|---|---|---|
| 290024(001) | 30-Day Average | Daily Maximum | Monthly Average | Monthly Maximum | 10-1-85 | 10-2-85 | |
| Flow MGD | --- | 0.54 | 0.454 | 0.743 | 0.642 | 0.533 | 0.57 |
| $CBOD_5$ mg/l | --- | --- | --- | --- | --- | --- | 11(8.1, 8.4) |
| lbs/day | --- | --- | 28 | 51 | --- | 22 | 52 |
| $BOD_5$ mg/l | --- | --- | --- | --- | --- | --- | 12(11, 9.9) |
| lbs/day | 283 | 510 | 42 | 82 | 38 | 69 | 57 |
| Ammonia Nitrogen mg/l | --- | --- | --- | --- | --- | --- | 15(15, 15) |
| lbs/day | 146 | 321 | 62 | 83 | --- | 69 | 71 |
| Suspended Solids mg/l | --- | --- | --- | --- | --- | --- | 10(4, 4) |
| lbs/day | 175 | 296 | 61 | 113 | 67 | 78 | 48 |
| Dissolved Oxygen mg/l | --- | --- | 9.1 | 10.3 | --- | 7.7 | (7.5, 7.5) |
| COD mg/l | --- | --- | --- | --- | --- | --- | 120 |
| lbs/day | 1870 | 3600 | 438 | 669 | 567 | 515 | 570 |
| Oil & Grease mg/l | --- | 10 | 2.8 | 6.4 | 3.6 | 5.0 | (4.2, 3.2) |
| lbs/day | 82 | 154 | 10 | 22 | 19 | 22 | --- |
| Phenol ug/l | --- | --- | --- | --- | --- | --- | 20(25, 27) |
| lbs/day | 1.7 | 3.6 | 0.042 | 0.084 | 0.064 | 0.084 | 0.1 |
| Sulfide | --- | --- | --- | --- | --- | --- | 0.04(0.03, 0.03) |
| lbs/day | 1.49 | 3.25 | 0.045 | 0.115 | --- | 0.115 | 0.2 |
| Hex. Chromium ug/l | --- | --- | --- | --- | --- | --- | <5(<5, <5) |
| lbs/day | 0.15 | 0.34 | <0.021 | 0.03 | <0.027 | <0.022 | --- |
| Total Chromium ug/l | | | | | | | 50( 50, 50) |
| lbs/day | 1.86 | 5.34 | <0.408 | --- | <0.535 | <0.444 | --- |
| Benzene mg/l | --- | 0.3 | <0.001 | --- | --- | --- | (<0.005, <0.005) |
| pH (S.U.) | Not <6.0 | Nor >9.0 | --- | 7.4 | 7.0 | 6.9 | (7.1, 7.2) |
| | | | MIN | 6.4 | | | --- |

1 - Survey results are for the composite sample. Grab sample results are shown in parentheses ( ).
Flows in excess of 0.54 MGD are assumed to be stormwater and are permitted as such.

## TOTAL PETROLEUM

Table 4 - Comparison of the laboratory analytical results obtained by Total Petroleum and the Environmental Protection Bureau from the split grab sample

| | | |
|---|---|---|
| Outfall | 290024(001) | |
| Sample Date & Time | 10-2-85 0840 | |
| | Total mg/l | E.P.B. mg/l |
| Suspended Solids | 17.5 | 4 |
| $BOD_5$ | 15.5 | 9.9 |
| Ammonia Nitrogen | 15.5 | 15. |
| COD | 116 | 130 |
| Sulfide | 0.026 | 0.03 |
| | ug/l | ug/l |
| Phenol | 19 | 27 |

## TOTAL PETROLEUM

Table 5 - Sample Preservation

| Parameter | Preservative |
|---|---|
| COD/TOC/Phenol/Nutrients (Chlorine Absent) | 5 drops conc. $H_2SO_4$/250 ml (to pH <2). |
| Phenols (Chlorine Present) | Dechlorinated w/ferrous ammonium sulfate (0.141 N). 1 drop/mg/l $Cl_2$/250 ml. $H_2SO_4$ to pH <2. |
| Cyanide/Thiocyanates | Dechlorinate, if needed, with sodium thiosulfate. (1 drop 0.141 N/mg/l $Cl_2$/250 ml). 10 drops 10 N. NaOH (to pH ≥12)/250 ml. |
| D.O. | Fixed on site. |
| Total Metals | 2 ml 1:1 $HNO_3$/250 ml (to pH <2). |
| Dissolved Metals (Field Filtered) | 2 ml 1:1 $HNO_3$/250 ml (to pH <2). |
| Microbiology | 2 drops 10% sodium thiosulfate/125 ml to dechlorinate sample. |
| Oil & Grease | 10 drops conc. $H_2SO_4$/250 ml (to pH <2). |
| Sulfides | 10 drops 1M ZnAc/250 ml. |
| Base-neutral Extractables Purgeable Organics | Dechlorinated, if needed, with sodium thiosulfate. (1 drop 0.141 N/mg/l $Cl_2$/250 ml). |
| Acid Extractables | Dechlorinated, if needed, with sodium thiosulfate. (1 drop 0.141 N/mg/l $Cl_2$/250 ml). 40 drops $H_2SO_4$/1000 ml (to pH <2). |

Samples preserved as required, cooled to 4°C with chain of custody maintained.

## TOTAL PETROLEUM

Table 5 - (Continued)

Lab Letter Codes

BK - Reported value has been corrected for a laboratory blank was greater than half of the detection limit but less than half of the reported value.
DS - Sample was diluted due to other high values on a multi-channel analytical system.
UC - No attempt has been made to confirm the identity of the reported compound by a second independent technique due to equipment or sample problems.
BLK - No value reported because the laboratory blank was greater than half of the detection limit and greater than half of the quantified value.
INT - Interference encountered during analysis resulted in no obtainable result.


Survey and Report by: John Ecklund
Water Quality Technician
Lansing District Office
Surface Water Quality Division
Environmental Protection Bureau
Department of Natural Resources

Gloria Taylor
Environmental Quality Analyst
Lansing District Office
Surface Water Quality Division
Environmental Protection Bureau
Department of Natural Resources

Certified Operator: Bernard Shaver

Laboratory Analyses by: Environmental Protection Bureau Laboratory

OMB No. 158-R0073

# NPDES COMPLIANCE INSPECTION REPORT (Coding Instructions on back of last page)

| TRANSACTION CODE | | NPDES | YR MO DA | TYPE | INSPECTOR | FAC TYPE | TIME |
|---|---|---|---|---|---|---|---|
| N | 5 | M1000 1066 | 85 1002 | S | S | 2 | a.m. p.m. |

REMARKS

ADDITIONAL

SECTION A - Permit Summary

NAME AND ADDRESS OF FACILITY (Include County, State and ZIP code)
TOTAL PETROLEUM
EAST SUPERIOR STREET
ALMA, MICHIGAN, 48802

EXPIRATION DATE: JAN 31, 1990
ISSUANCE DATE: MAR 25, 1985

| RESPONSIBLE OFFICIAL | TITLE | PHONE |
|---|---|---|
| BEN WHITE | ENVIRONMENTAL ENGINEER | 517-463-1161 |
| FACILITY REPRESENTATIVE | TITLE | PHONE |
| BERNIE SHAVER | ENVIRONMENTAL CHEMIST | 517-463-1161 |

SECTION B - Effluent Characteristics (Additional sheets attached 1 of 4 PROCESS WATER- INTERIM LIMITS BASED ON MOR'S FROM JUL. 1984- JUL. 1985

| PARAMETER/ OUTFALL #001 | | MINIMUM | AVERAGE | MAXIMUM | ADDITIONAL |
|---|---|---|---|---|---|
| FLOW (MGD) | SAMPLE MEASUREMENT | .286 MGD | .518 MGD | .54 MGD | |
| | PERMIT REQUIREMENT | — | — | .54 MGD | FLOW OVER .54 MGD IS |
| TOTAL BOD5 #/DAY | SAMPLE MEASUREMENT | 16# | 79.75# | 268# | STORM WATER |
| | PERMIT REQUIREMENT | — | 283# | 510# | |
| AMMONIA #/DAY | SAMPLE MEASUREMENT | 5# | 35.8# | 76# | |
| | PERMIT REQUIREMENT | — | 146# | 321# | |
| TOT. SUS SOLIDS #/DAY | SAMPLE MEASUREMENT | 4# | 99.25# | 261# | |
| | PERMIT REQUIREMENT | — | 175# | 296# | |
| COD #/DAY | SAMPLE MEASUREMENT | 253# | 582# | 1736# | |
| | PERMIT REQUIREMENT | — | 1870# | 3600# | |

SECTION C - Facility Evaluation (S = Satisfactory, U = Unsatisfactory, N/A = Not applicable)

| | | |
|---|---|---|
| EFFLUENT WITHIN PERMIT REQUIREMENTS | S OPERATION AND MAINTENANCE | S SAMPLING PROCEDURES |
| S RECORDS AND REPORTS | S COMPLIANCE SCHEDULE | S LABORATORY PRACTICES |
| S PERMIT VERIFICATION | S FLOW MEASUREMENTS BROKEN. | — OTHER: |

SECTION D - Comments

SECTION E - Inspection/Review

| SIGNATURES | AGENCY | DATE |
|---|---|---|
| INSPECTED BY Gloria J Taylor | MDNR | Oct 2, 1985 |
| INSPECTED BY | | |
| REVIEWED BY | | |

ENFORCEMENT DIVISION USE ONLY
COMPLIANCE STATUS
☐ COMPLIANCE
☐ NONCOMPLIANCE

| 1 | 2 | 3 | 11 | 12 | 17 | 18 | 19 | 20 | a.m. | p.m. |
|---|---|---|---|---|---|---|---|---|---|---|
| N | 5 | M | 0 0 0 1 1 0 6 6 | S | 5 1 0 0 2 | S | S | E | | |

REMARKS

21 64

ADDITIONAL

65 70

SECTION A - Permit Summary

NAME AND ADDRESS OF FACILITY (Include County, State and ZIP code)
TOTAL PETROLEUM
EAST SUPERIOR ST.
ALMA, MICHIGAN 48802

EXPIRATION DATE: JAN 31, 1990

ISSUANCE DATE: MAR 25, 1985

PHONE

FACILITY REPRESENTATIVE: BERNIE SHAVER

TITLE: ENVIRONMENTAL CHEMIST

PHONE: 517-463-1161

SECTION B - Effluent Characteristics (Additional sheets attached 2 of 4 PROCESS WATER - INTERIM LIMITS JUL 1984 - JUL 1985

| PARAMETER/ OUTFALL #001 | | MINIMUM | AVERAGE | MAXIMUM | ADDITIONAL |
|---|---|---|---|---|---|
| OIL + GREASE MG/L | SAMPLE MEASUREMENT | — | — | 8mg/l | |
| | PERMIT REQUIREMENT | — | — | 10mg/l. | |
| OIL + GREASE #/DAY | SAMPLE MEASUREMENT | — | 7.5# | 22# | - |
| | PERMIT REQUIREMENT | — | 82# | 154#* | -NEW PERMIT REQUIREMENT. ∴ ONLY 2 MONTHS DATA. |
| PHENOL #/DAY | SAMPLE MEASUREMENT | — | .63# | .287# | |
| | PERMIT REQUIREMENT | — | 1.7# | 3.6# | |
| SULFIDE #/DAY | SAMPLE MEASUREMENT | — | .205# | 3.52# | |
| | PERMIT REQUIREMENT | — | 1.49# | 3.25# | |
| HEX CHROME #/DAY | SAMPLE MEASUREMENT | — | 0.035 | 0.141 | |
| | PERMIT REQUIREMENT | — | 0.15# | 0.34# | -NEW PERMIT REQUIREMENT. ONLY 2 MO. DATA. |

SECTION C - Facility Evaluation (S = Satisfactory, U = Unsatisfactory, N/A = Not applicable)

| | | |
|---|---|---|
| EFFLUENT WITHIN PERMIT REQUIREMENTS | OPERATION AND MAINTENANCE | SAMPLING PROCEDURES |
| RECORDS AND REPORTS | COMPLIANCE SCHEDULE | LABORATORY PRACTICES |
| PERMIT VERIFICATION | FLOW MEASUREMENTS | OTHER: |

SECTION D - Comments

SECTION E - Inspection/Review

| SIGNATURES | AGENCY | DATE |
|---|---|---|
| INSPECTED BY Gloria J. Taylor | MDNR | 10/2/85 |
| INSPECTED BY | | |
| REVIEWED BY | | |

ENFORCEMENT DIVISION USE ONLY

COMPLIANCE STATUS
☐ COMPLIANCE
☐ NONCOMPLIANCE

Form Approved
OMB No. 158-R0073

# NPDES COMPLIANCE INSPECTION REPORT (Coding Instructions on back of last page)

| TRANSACTION CODE | | NPDES | YR MO DA | TYPE | INSPECTOR | FAC TYPE | TIME |
|---|---|---|---|---|---|---|---|
| N | 5 | M10001066 | 85 10 02 | S | S | 2 | a.m. p.m. |
| 1 | 2 | 3 11 | 12 17 | 18 | 19 | 20 | |

REMARKS

21 64

ADDITIONAL

65 70

## SECTION A - Permit Summary

| NAME AND ADDRESS OF FACILITY (Include County, State and ZIP code) | | EXPIRATION DATE |
|---|---|---|
| TOTAL PETROLEUM<br>EAST SUPERIOR STREET<br>ALMA, MICHIGAN, 48802 | | JAN 31, 1990<br>ISSUANCE DATE<br>MAR 25, 1985 |
| RESPONSIBLE OFFICIAL<br>BEN WHITE | TITLE<br>ENVIRONMENTAL ENGINEER | PHONE<br>517-463-1161 |
| FACILITY REPRESENTATIVE<br>BERNIE SHAVER | TITLE<br>ENVIRONMENTAL CHEMIST | PHONE<br>517-463-1161 |

## SECTION B - Effluent Characteristics (Additional sheets attached 3 of 4 - PROCESS WATER - INTERIM LIMITS JUL 1984 - JUL 1985.

| PARAMETER/ OUTFALL #001 | | MINIMUM | AVERAGE | MAXIMUM | ADDITIONAL |
|---|---|---|---|---|---|
| TOTAL CHROME #/DAY | SAMPLE MEASUREMENT | | NOT ENOUGH INFO AVAILABLE. | | |
| | PERMIT REQUIREMENT | | 1.86# | 5.34# | - NEW PERMIT REQUIREMENT |
| BENZENE mg/l | SAMPLE MEASUREMENT | | NOT ENOUGH INFO AVAILABLE | | |
| | PERMIT REQUIREMENT | | | .30mg/l | NEW PERMIT REQUIREMENT. |
| pH | SAMPLE MEASUREMENT | 6.4 | | 9.3 x | - THE OLD PERMIT HAD A 9.5 MAXIMUM FOR PH. |
| | PERMIT REQUIREMENT | 6 | | 9.0 | |
| | SAMPLE MEASUREMENT | | | | |
| | PERMIT REQUIREMENT | | | | |
| | SAMPLE MEASUREMENT | | | | |
| | PERMIT REQUIREMENT | | | | |

## SECTION C - Facility Evaluation (S = Satisfactory, U = Unsatisfactory, N/A = Not applicable)

| | | | | | |
|---|---|---|---|---|---|
| | EFFLUENT WITHIN PERMIT REQUIREMENTS | | OPERATION AND MAINTENANCE | | SAMPLING PROCEDURES |
| | RECORDS AND REPORTS | | COMPLIANCE SCHEDULE | | LABORATORY PRACTICES |
| | PERMIT VERIFICATION | | FLOW MEASUREMENTS | | OTHER: |

## SECTION D - Comments

## SECTION E - Inspection/Review

| SIGNATURES | AGENCY | DATE | ENFORCEMENT DIVISION USE ONLY |
|---|---|---|---|
| INSPECTED BY - Gloria J. Taylor | MDNR | 10/02/85 | COMPLIANCE STATUS<br>☐ COMPLIANCE<br>☐ NONCOMPLIANCE |
| INSPECTED BY | | | |
| REVIEWED BY | | | |

Form Approved
OMB No. 158-R0073

# NPDES COMPLIANCE INSPECTION REPORT (Coding Instructions on back of last page)

| TRANSACTION CODE | | NPDES | YR MO DA | TYPE | INSPECTOR | FAC TYPE | TIME |
|---|---|---|---|---|---|---|---|
| N | 5 | M10001066 | 85/10/02 | S | S | 2 | a.m. p.m. |
| 1 | 2 | 3 11 | 12 17 | 18 | 19 | 20 | |

REMARKS

21 64

ADDITIONAL

65 70

**SECTION A - Permit Summary**

| NAME AND ADDRESS OF FACILITY (Include County, State and ZIP code) | | EXPIRATION DATE |
|---|---|---|
| TOTAL PETROLEUM<br>EAST SUPERIOR ST.<br>ALMA MICH 48802 | | JAN 31, 1990<br>ISSUANCE DATE<br>MAR 25, 1985 |
| RESPONSIBLE OFFICIAL<br>PAT LINCOLN | TITLE MANAGER OF ENVIRONMENTAL AFFAIRS | PHONE<br>517-463-1161 |
| FACILITY REPRESENTATIVE<br>(1) BEN WHITE (2) BERNIE SHAVER | TITLE<br>(1) ENV. ENG. (2) ENV. CHEMIST | PHONE<br>517-463-1161 |

**SECTION B - Effluent Characteristics** (Additional sheets attached 4 of 4) STORM WATER - BASED ON MOR'S FROM JUL, 84 → JUN 8

| PARAMETER/ OUTFALL | | MINIMUM | AVERAGE | MAXIMUM | ADDITIONAL |
|---|---|---|---|---|---|
| FLOW | SAMPLE MEASUREMENT | | .0834 | .702 | - BASED ON 164 DAYS REPORTED STORM WATER |
| | PERMIT REQUIREMENT | | | GREATER THAN .54 MGD | - AFTER JUNE, 1985 STORM |
| $BOD_5$ (TOTAL) | SAMPLE MEASUREMENT | | .18#/1000gal | .496#/1000gal | WATER. $BOD_5$, S.S and O&G values |
| | PERMIT REQUIREMENT | | .22#/1000gal | .40#/1000gal | added to allowed loading |
| TOTAL SUSP SOLIDS | SAMPLE MEASUREMENT | | .0112#/1000 | .483#/1000gal | for process water. Storm $H_2O$ |
| | PERMIT REQUIREMENT | | .18#/1000gal | .25#/1000gal | loadings based on per 1000 gal |
| COD* NEW PARAMETER | SAMPLE MEASUREMENT | | NOT ENOUGH DATA AVAILABLE. | | - ALL STORM WATER GOES THRU |
| | PERMIT REQUIREMENT | | 1.5#/1000gal | 3.0#/1000gal | API SEPARATOR ± WW TREATMENT |
| OIL AND GREASE | SAMPLE MEASUREMENT | | .009#/1000gal | .037#/1000gal | PONDS - MIXED WITH PROCESS |
| | PERMIT REQUIREMENT | | .07#/1000gal | .13#/1000gal | $H_2O$ + DISCHARGED THRU SAME OUTFALL |

**SECTION C - Facility Evaluation** (S = Satisfactory, U = Unsatisfactory, N/A = Not applicable)

| | | | | | |
|---|---|---|---|---|---|
| S | EFFLUENT WITHIN PERMIT REQUIREMENTS | S | OPERATION AND MAINTENANCE | S | SAMPLING PROCEDURES |
| S | RECORDS AND REPORTS | N/A | COMPLIANCE SCHEDULE | S | LABORATORY PRACTICES |
| S | PERMIT VERIFICATION | S | FLOW MEASUREMENTS - BROKEN. | N/A | OTHER: |

**SECTION D - Comments**

**SECTION E - Inspection/Review**

| SIGNATURES | AGENCY | DATE |
|---|---|---|
| INSPECTED BY Gloria J Taylor | MDNR | 10/02/85 |
| INSPECTED BY | | |
| REVIEWED BY | | |

ENFORCEMENT DIVISION USE ONLY

COMPLIANCE STATUS

☐ COMPLIANCE

☐ NONCOMPLIANCE

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Sections F thru L: Complete on all inspections, as appropriate. N/A = Not Applicable

PERMIT NO. M10001066

**SECTION F - Facility and Permit Background**

ADDRESS OF PERMITTEE IF DIFFERENT FROM FACILITY *(Including City, County and ZIP code)*

DATE OF LAST PREVIOUS INVESTIGATION BY ~~EPA~~ STATE: 8/2/84

FINDINGS: NEEDED TO ESTABLISH A QUALITY ASSURANCE PROGRAM IN LAB

**SECTION G - Records and Reports**

RECORDS AND REPORTS MAINTAINED AS REQUIRED BY PERMIT. ☒ YES ☐ NO ☐ N/A *(Further explanation attached _____)*
DETAILS:

| | | | |
|---|---|---|---|
| (a) ADEQUATE RECORDS MAINTAINED OF: | | | |
| (i) SAMPLING DATE, TIME, EXACT LOCATION (ALWAYS BETWEEN 8 & 9 AM) | ☒ YES | ☐ NO | ☐ N/A |
| (ii) ANALYSES DATES, TIMES (DONE SAME DAY SAMPLE TAKEN) | ☒ YES | ☐ NO | ☐ N/A |
| (iii) INDIVIDUAL PERFORMING ANALYSIS | ☒ YES | ☐ NO | ☐ N/A |
| (iv) ANALYTICAL METHODS/TECHNIQUES USED | ☒ YES | ☐ NO | ☐ N/A |
| (v) ANALYTICAL RESULTS *(e.g., consistent with self-monitoring report data)* | ☒ YES | ☐ NO | ☐ N/A |
| (b) MONITORING RECORDS *(e.g., flow, pH, D.O., etc.)* MAINTAINED FOR A MINIMUM OF THREE YEARS INCLUDING ALL ORIGINAL STRIP CHART RECORDINGS *(e.g. continuous monitoring instrumentation, calibration and maintenance records)*. | ☒ YES | ☐ NO | ☐ N/A |
| (c) LAB EQUIPMENT CALIBRATION AND MAINTENANCE RECORDS KEPT. | ☒ YES | ☐ NO | ☐ N/A |
| (d) FACILITY OPERATING RECORDS KEPT INCLUDING OPERATING LOGS FOR EACH TREATMENT UNIT. | ☒ YES | ☐ NO | ☐ N/A |
| (e) QUALITY ASSURANCE RECORDS KEPT. | ☒ YES | ☐ NO | ☐ N/A |
| (f) RECORDS MAINTAINED OF MAJOR CONTRIBUTING INDUSTRIES *(and their compliance status)* USING PUBLICLY OWNED TREATMENT WORKS. | ☐ YES | ☐ NO | ☒ N/A |

**SECTION H - Permit Verification**

INSPECTION OBSERVATIONS VERIFY THE PERMIT. ☒ YES ☐ NO ☐ N/A *(Further explanation attached _____)*
DETAILS:

| | | | |
|---|---|---|---|
| (a) CORRECT NAME AND MAILING ADDRESS OF PERMITTEE. ZIP CODE IS 48802 | ☒ YES | ☐ NO | ☐ N/A |
| (b) FACILITY IS AS DESCRIBED IN PERMIT. | ☒ YES | ☐ NO | ☐ N/A |
| (c) PRINCIPAL PRODUCT(S) AND PRODUCTION RATES CONFORM WITH THOSE SET FORTH IN PERMIT APPLICATION. | ☒ YES | ☐ NO | ☐ N/A |
| (d) TREATMENT PROCESSES ARE AS DESCRIBED IN PERMIT APPLICATION. | ☒ YES | ☐ NO | ☐ N/A |
| (e) NOTIFICATION GIVEN TO EPA/STATE OF NEW, DIFFERENT OR INCREASED DISCHARGES. | ☐ YES | ☐ NO | ☒ N/A |
| (f) ACCURATE RECORDS OF RAW WATER VOLUME MAINTAINED. | ☐ YES | ☐ NO | ☒ N/A |
| (g) NUMBER AND LOCATION OF DISCHARGE POINTS ARE AS DESCRIBED IN PERMIT. | ☒ YES | ☐ NO | ☐ N/A |
| (h) CORRECT NAME AND LOCATION OF RECEIVING WATERS. | ☒ YES | ☐ NO | ☐ N/A |
| (i) ALL DISCHARGES ARE PERMITTED. | ☒ YES | ☐ NO | ☐ N/A |

**SECTION I - Operation and Maintenance**

TREATMENT FACILITY PROPERLY OPERATED AND MAINTAINED. ☒ YES ☐ NO ☐ N/A *(Further explanation attached _____)*
DETAILS:

| | | | |
|---|---|---|---|
| (a) STANDBY POWER OR OTHER EQUIVALENT PROVISIONS PROVIDED. (INCLUDES WEEKENDS) | ☒ YES | ☐ NO | ☐ N/A |
| (b) ADEQUATE ALARM SYSTEM FOR POWER OR EQUIPMENT FAILURES AVAILABLE. (DAILY INSP) | ☒ YES | ☐ NO | ☐ N/A |
| (c) REPORTS ON ALTERNATE SOURCE OF POWER SENT TO EPA/STATE AS REQUIRED BY PERMIT. | ☒ YES | ☐ NO | ☐ N/A |
| (d) SLUDGES AND SOLIDS ADEQUATELY DISPOSED. API SEPARATOR TO WAYNE DISP. | ☒ YES | ☐ NO | ☐ N/A |
| (e) ALL TREATMENT UNITS IN SERVICE. | ☒ YES | ☐ NO | ☐ N/A |
| (f) CONSULTING ENGINEER RETAINED OR AVAILABLE FOR CONSULTATION ON OPERATION AND MAINTENANCE PROBLEMS. | ☐ YES | ☒ NO | ☐ N/A |
| (g) QUALIFIED OPERATING STAFF PROVIDED. | ☒ YES | ☐ NO | ☐ N/A |
| (h) ESTABLISHED PROCEDURES AVAILABLE FOR TRAINING NEW OPERATORS. 1 on 1 JOB TRAIN | ☒ YES | ☐ NO | ☐ N/A |
| (i) FILES MAINTAINED ON SPARE PARTS INVENTORY, MAJOR EQUIPMENT SPECIFICATIONS, AND PARTS AND EQUIPMENT SUPPLIERS. | ☒ YES | ☐ NO | ☐ N/A |
| (j) INSTRUCTIONS FILES KEPT FOR OPERATION AND MAINTENANCE OF EACH ITEM OF MAJOR EQUIPMENT. | ☒ YES | ☐ NO | ☐ N/A |
| (k) OPERATION AND MAINTENANCE MANUAL MAINTAINED. | ☒ YES | ☐ NO | ☐ N/A |
| (l) SPCC PLAN AVAILABLE. | ☒ YES | ☐ NO | ☐ N/A |
| (m) REGULATORY AGENCY NOTIFIED OF BY PASSING. *(Dates _____ _____)* | ☐ YES | ☐ NO | ☒ N/A |
| (n) ANY BY-PASSING SINCE LAST INSPECTION. | ☐ YES | ☒ NO | ☐ N/A |
| (o) ANY HYDRAULIC AND/OR ORGANIC OVERLOADS EXPERIENCED. | ☐ YES | ☒ NO | ☐ N/A |

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PERMIT NO. MI0001066

## SECTION J - Compliance Schedules

PERMITTEE IS MEETING COMPLIANCE SCHEDULE. ☐ YES ☐ NO ☒ N/A *(Further explanation attached _____)*

CHECK APPROPRIATE PHASE(S):

- ☐ (a) THE PERMITTEE HAS OBTAINED THE NECESSARY APPROVALS FROM THE APPROPRIATE AUTHORITIES TO BEGIN CONSTRUCTION.
- ☐ (b) PROPER ARRANGEMENT HAS BEEN MADE FOR FINANCING *(mortgage commitments, grants, etc.)*.
- ☐ (c) CONTRACTS FOR ENGINEERING SERVICES HAVE BEEN EXECUTED.
- ☐ (d) DESIGN PLANS AND SPECIFICATIONS HAVE BEEN COMPLETED.
- ☐ (e) CONSTRUCTION HAS COMMENCED.
- ☐ (f) CONSTRUCTION AND/OR EQUIPMENT ACQUISITION IS ON SCHEDULE.
- ☐ (g) CONSTRUCTION HAS BEEN COMPLETED.
- ☐ (h) START-UP HAS COMMENCED.
- ☐ (i) THE PERMITTEE HAS REQUESTED AN EXTENSION OF TIME.

## SECTION K - Self-Monitoring Program

### Part 1 – Flow measurement *(Further explanation attached _____)*

| | | | |
|---|---|---|---|
| PERMITTEE FLOW MEASUREMENT MEETS THE REQUIREMENTS AND INTENT OF THE PERMIT. DETAILS: | ☒ YES | ☐ NO | ☐ N/A |
| (a) PRIMARY MEASURING DEVICE PROPERLY INSTALLED. | ☒ YES | ☐ NO | ☐ N/A |
| TYPE OF DEVICE: ☒ WEIR ☐ PARSHALL FLUME ☐ MAGMETER ☐ VENTURI METER ☐ OTHER *(Specify _____)* | | | |
| (b) CALIBRATION FREQUENCY ADEQUATE. *(Date of last calibration* OCT 84 *)* | ☒ YES | ☐ NO | ☐ N/A |
| (c) PRIMARY FLOW MEASURING DEVICE PROPERLY OPERATED AND MAINTAINED. BROKEN-DAY OF INSP | ☐ YES | ☒ NO | ☐ N/A |
| (d) SECONDARY INSTRUMENTS *(totalizers, recorders, etc.)* PROPERLY OPERATED AND MAINTAINED. | ☒ YES | ☐ NO | ☐ N/A |
| (e) FLOW MEASUREMENT EQUIPMENT ADEQUATE TO HANDLE EXPECTED RANGES OF FLOW RATES. | ☒ YES | ☐ NO | ☐ N/A |

### Part 2 – Sampling *(Further explanation attached _____)* ORDERED NEW COMPOSITE SAMPLER & FLOW METER.

| | | | |
|---|---|---|---|
| PERMITTEE SAMPLING MEETS THE REQUIREMENTS AND INTENT OF THE PERMIT. DETAILS: | ☒ YES | ☐ NO | ☐ N/A |
| (a) LOCATIONS ADEQUATE FOR REPRESENTATIVE SAMPLES. | ☒ YES | ☐ NO | ☐ N/A |
| (b) PARAMETERS AND SAMPLING FREQUENCY AGREE WITH PERMIT. | ☒ YES | ☐ NO | ☐ N/A |
| (c) PERMITTEE IS USING METHOD OF SAMPLE COLLECTION REQUIRED BY PERMIT. BROKEN IF NO, ☒ GRAB ☐ MANUAL COMPOSITE ☐ AUTOMATIC COMPOSITE FREQUENCY _____ | ☐ YES | ☒ NO | ☐ N/A |
| (d) SAMPLE COLLECTION PROCEDURES ARE ADEQUATE. | ☒ YES | ☐ NO | ☐ N/A |
| (i) SAMPLES REFRIGERATED DURING COMPOSITING | ☒ YES | ☐ NO | ☐ N/A |
| (ii) PROPER PRESERVATION TECHNIQUES USED | ☒ YES | ☐ NO | ☐ N/A |
| (iii) FLOW PROPORTIONED SAMPLES OBTAINED WHERE REQUIRED BY PERMIT | ☒ YES | ☐ NO | ☐ N/A |
| (iv) SAMPLE HOLDING TIMES PRIOR TO ANALYSES IN CONFORMANCE WITH 40 CFR 136.3 | ☒ YES | ☐ NO | ☐ N/A |
| (e) MONITORING AND ANALYSES BEING PERFORMED MORE FREQUENTLY THAN REQUIRED BY PERMIT. (CHLORIDES)(TDS) | ☒ YES | ☐ NO | ☐ N/A |
| (f) IF (e) IS YES, RESULTS ARE REPORTED IN PERMITTEE'S SELF-MONITORING REPORT. ON WORK DATA SHEETS. | ☒ YES | ☐ NO | ☐ N/A |

### Part 3 – Laboratory *(Further explanation attached _____)*

| | | | |
|---|---|---|---|
| PERMITTEE LABORATORY PROCEDURES MEET THE REQUIREMENTS AND INTENT OF THE PERMIT. DETAILS: | ☒ YES | ☐ NO | ☐ N/A |
| (a) EPA APPROVED ANALYTICAL TESTING PROCEDURES USED. *(40 CFR 136.3)* | ☒ YES | ☐ NO | ☐ N/A |
| (b) IF ALTERNATE ANALYTICAL PROCEDURES ARE USED, PROPER APPROVAL HAS BEEN OBTAINED. | ☐ YES | ☐ NO | ☒ N/A |
| (c) PARAMETERS OTHER THAN THOSE REQUIRED BY THE PERMIT ARE ANALYZED. | ☒ YES | ☐ NO | ☐ N/A |
| (d) SATISFACTORY CALIBRATION AND MAINTENANCE OF INSTRUMENTS AND EQUIPMENT. | ☒ YES | ☐ NO | ☐ N/A |
| (e) QUALITY CONTROL PROCEDURES USED. | ☒ YES | ☐ NO | ☐ N/A |
| (f) DUPLICATE SAMPLES ARE ANALYZED. 5 % OF TIME. | ☒ YES | ☐ NO | ☐ N/A |
| (g) SPIKED SAMPLES ARE USED. 5 % OF TIME. | ☒ YES | ☐ NO | ☐ N/A |
| (h) COMMERCIAL LABORATORY USED. (ONLY FOR BENZENE) | ☒ YES | ☐ NO | ☐ N/A |
| (i) COMMERCIAL LABORATORY STATE CERTIFIED. | ☒ YES | ☐ NO | ☐ N/A |

LAB NAME AQUATIC SYSTEMS

LAB ADDRESS LUDINGTON, MICHIGAN.

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OMB No. 158-R0073

PERMIT NO. M10001066

**SECTION L - Effluent/Receiving Water Observations** *(Further explanation attached _____)*

| OUTFALL NO. | OIL SHEEN | GREASE | TURBIDITY | VISIBLE FOAM | VISIBLE FLOAT SOL | COLOR | OTHER |
|---|---|---|---|---|---|---|---|
| 001 | No | No | SLIGHT | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

(Sections M and N: Complete as appropriate for sampling inspections)

**SECTION M - Sampling Inspection Procedures and Observations** *(Further explanation attached _____)*

- [x] GRAB SAMPLES OBTAINED
- [x] COMPOSITE OBTAINED
- [ ] FLOW PROPORTIONED SAMPLE
- [x] AUTOMATIC SAMPLER USED — SAMPLES AT TIMED INTERVALS
- [x] SAMPLE SPLIT WITH PERMITTEE
- [x] CHAIN OF CUSTODY EMPLOYED
- [ ] SAMPLE OBTAINED FROM FACILITY SAMPLING DEVICE

COMPOSITING FREQUENCY _____ PRESERVATION _____

SAMPLE REFRIGERATED DURING COMPOSITING: ☐ YES ☐ NO

SAMPLE REPRESENTATIVE OF VOLUME AND NATURE OF DISCHARGE _____

**SECTION N - Analytical Results** *(Attach report if necessary)*

29070 FORD ROAD ■ GARDEN CITY, MICHIGAN 48135 ■ PHONE: (313) 422-7474

March 29, 1984

TOTAL PETROLEUM
East Superior Street
Alma, MI 48801

Attention: Bill Spitzley

Dear Mr. Spitzley:

Enclosed kindly find the report of your G.C. Mass Spectograms. They are enclosed for your examination. It is interesting to note that two (2) volatiles have been isolated as a result of our examinations.

This may account for the TOC values being elevated at various times during periodic testing.

If you have any further questions after receiving the results, kindly contact me at the above telephone number.

Yours very truly,

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

Francis B. McLaughlin, FAIC
Director of Laboratories

FBM/lp
cc: Files

CERTIFIED LABORATORY – U.S. DEPARTMENT OF AGRICULTURE
U.S. DRUG ENFORCEMENT ADMINISTRATION
UNITED STATES FOOD AND DRUG ADMINISTRATION
UNITED STATES NUCLEAR REGULATORY COMMISSION
AMERICAN COUNCIL OF INDEPENDENT LABORATORIES
INSTITUTE OF FOOD TECHNOLOGISTS

FELLOW – AMERICAN INSTITUTE OF CHEMISTS
DIPLOMAT – AMERICAN BOARD OF BIOANALYSTS
AMERICAN CHEMICAL SOCIETY
AMERICAN SOCIETY FOR MICROBIOLOGY
AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE
ASSOCIATION OF OFFICIAL ANALYTICAL CHEMISTS

## PRIORITY POLLUTANT ANALYSIS

| Volatile Organic Compounds | I-8-1 (ug/l) | I-8-2 (ug/l) | I-8-3 (ug |
|---|---|---|---|
| Acrolein | -100 | -100 | -100 |
| Acrylonitrile | -100 | -100 | -100 |
| Benzene | -10 | -10 | -10 |
| Bis(Chloromethyl) ether | -10 | -10 | -10 |
| Bromoform | -10 | -10 | -10 |
| Carbon Tetrachloride | -10 | -10 | -10 |
| Chlorobenzene | -10 | -10 | -10 |
| Chlorodibromomethane | -10 | -10 | -10 |
| Chloroethane | -10 | -10 | -10 |
| 2-Chloroethylvinyl | -10 | -10 | -10 |
| Chloroform | -10 | -10 | -10 |
| Dichlorobromomethane | -10 | -10 | -10 |
| Dichlorodifluoromethane | -10 | -10 | -10 |
| 1,1-Dichloroethane | -10 | -10 | -10 |
| 1,2-Dichloroethane | -10 | -10 | -10 |
| 1,1-Dichloroethylene | -10 | -10 | -10 |
| 1,2-Dichloropropane | -10 | -10 | -10 |
| 1,3-Dichloropropene | -10 | -10 | -10 |
| Ethylbenzene | -10 | -10 | -10 |
| Methyl Bromide | -10 | -10 | -10 |
| Methyl Chloride | -10 | -10 | -10 |
| Methylene Chloride | -10 | 800 | 410 |
| 1,1,2,2-Tetrachloroethane | -10 | -10 | -10 |
| Tetrachloroethylene | -10 | -10 | -10 |
| Toluene | -10 | -10 | -10 |

- denotes a quantity of "less than".

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

## PRIORITY POLLUTANT ANALYSIS

| Volatile Organic Compounds | 1-8-1 (ug/l) | 1-8-2 (ug/l) | 1-8-3 (ug |
|---|---|---|---|
| trans-1,2-dichloroethylene | -10 | -10 | -10 |
| 1,1,1-Trichloroethane | -10 | -10 | -10 |
| 1,1,2-Trichloroethane | -10 | -10 | -10 |
| Trichloroethylene | -10 | -10 | -10 |
| Trichlorofluoromethane | -10 | -10 | -10 |
| Vinyl Chloride | -10 | -10 | -10 |

- denotes a quantity of "less than".

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

| Base/Neutral Compounds | I-8-1 (ug/l) | I-8-2 (ug/l) | I-8-3 (u |
|---|---|---|---|
| Acenaphthene | -50 | -50 | -50 |
| Acenaphthylene | -50 | -50 | -50 |
| Anthracene | -50 | -50 | -50 |
| Benzidine | -50 | -50 | -50 |
| Benzo (a) anthracene | -50 | -50 | -50 |
| Benzo (a) pyrene | -50 | -50 | -50 |
| 3,4-Benzofluoranthene | -50 | -50 | -50 |
| Benzo(ghi)perylene | -1250 | -1250 | -1250 |
| Benzo(k)fluoranthene | -50 | -50 | -50 |
| Bis(2-chloroethoxy)methane | -50 | -50 | -50 |
| Bis(2-chloroethyl)ether | -50 | -50 | -50 |
| Bis(2-chloroisopropyl)ether | -50 | -50 | -50 |
| Bis(2-ehtylhexyl)phthalate | -50 | -50 | -50 |
| 4-Bromophenyl phenyl ether | -50 | -50 | -50 |
| Butyl benzyl phthalate | -50 | -50 | -50 |
| 2-Chloronaphthalene | -50 | -50 | -50 |
| 4-Chlorophenyl phenyl ether | -50 | -50 | -50 |
| Chrysene | -50 | -50 | -50 |
| Dibenzo(ah)anthracene | -1250 | -1250 | -1250 |

- denotes a quantity of "less than"

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

PRIORITY POLLUTANT ANALYSIS

| Base/Neutral Compounds | 1-B-1 (ug/l) | 1-B-2 (ug/l) | 1-B-3 (ug/ |
|---|---|---|---|
| 1,2-Dichlorobenzene | -50 | -50 | -50 |
| 1,3-Dichlorobenzene | -50 | -50 | -50 |
| 1,4-Dichlorobenzene | -50 | -50 | -50 |
| 3,3'-Dichlorobenzidine | -50 | -50 | -50 |
| Diethyl phthalate | -50 | -50 | -50 |
| Dimethyl phthalate | -50 | -50 | -50 |
| Di-n-butyl phthalate | -50 | -50 | -50 |
| 2,4-Dinitrotoluene | -50 | -50 | -50 |
| 2,6-Dinitrotoluene | -50 | -50 | -50 |
| Di-n-octyl phthalate | -50 | -50 | -50 |
| 1,2-Diphenylhydraxine | -50 | -50 | -50 |
| Fluoranthene | -50 | -50 | -50 |
| Fluorene | -50 | -50 | -50 |
| Hexachlorobenzene | -50 | -50 | -50 |
| Hexachlorobutadiene | -50 | -50 | -50 |
| Hexachlorocylopentadiene | -50 | -50 | -50 |
| Hexachloroethane | -50 | -50 | -50 |
| Indeno91,2,3-cd)pyrene | -1250 | -1250 | -1250 |
| Isophorone | -50 | -50 | -50 |
| Naphthalene | -50 | -50 | -50 |
| Nitrobenzene | -50 | -50 | -50 |
| N-Nitrosodimethylamine | -50 | -50 | -50 |
| N-Nitroso-di-n-propylamine | -50 | -50 | -50 |
| N-Nitosodiphenylamine | -50 | -50 | -50 |
| Phenanthrene | -50 | -50 | -50 |
| Pyrene | -50 | -50 | -50 |
| 1,2,4-Trichlorobenzene | -50 | -50 | -50 |

- denotes a quantity of "less than".

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

## PRIORITY POLLUTANT ANALYSIS

| Acid Compounds | 1-8-2 (ug/l) | 1-8-2 (ug/l) | 1-8-3 (ug/ |
|---|---|---|---|
| 2-Chlorophenol | -50 | -50 | -50 |
| 2,4-Dichlorophenol | -50 | -50 | -50 |
| 2,4-Dimethylphenol | -50 | -50 | -50 |
| 4,6-Dinitro-o-cresol | -1250 | -1250 | -1250 |
| 2,4-dinitrophenol | -1250 | -1250 | -1250 |
| 2-Nitrophenol | -50 | -50 | -50 |
| 4-Nitrophenol | -50 | -50 | -50 |
| p-Chloro-m-cresol | -50 | -50 | -50 |
| Pentachlorphenol | -50 | -50 | -50 |
| Phenol | -50 | -50 | -50 |
| 2,4,6-Trichlorphenol | -50 | -50 | -50 |

- denotes a quantity of "less than".

ANALYTIC & BIOLOGICAL LABORATORIES, INC.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

LANSING DISTRICT OFFICE

State Secondary Complex
P.O. Box 30028
Lansing, MI 48909

RECEIVED
DEC 12 1984
GQD-REMEDIAL ACTION

TO: Remedial Action Section
Groundwater Quality Division
Lansing

FROM: Lansing District Office
Groundwater Quality Division

DATE:

SUBJECT: New groundwater contamination site

We have recently discovered that groundwater is contaminated at the following site:

Site name: TOTAL PETROLEUM

Location and street address:
East Superior Street
Alma, Michigan 48802 Gratiot Co

Type of contamination:
Conductivity and TOC; Hazardous wastes

Wells contaminated:
Monitoring wells - yes

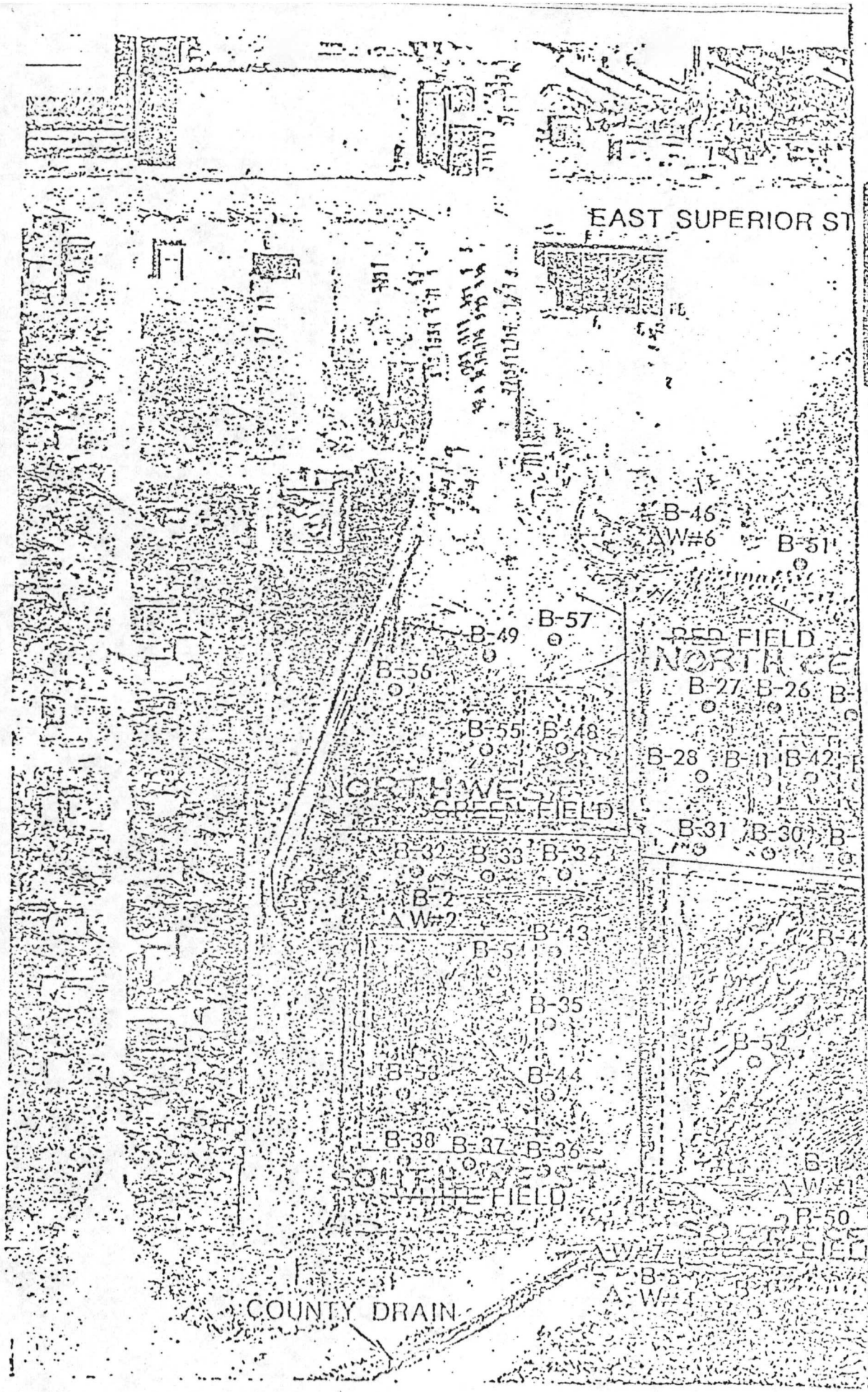
Current Status:
Attempting to secure Part B closure under RCRA; continuing hydro study; will attempt remedial action once studies are complete.

Please contact ~~this office~~ if you need more information.

Bob Basch HWD 21300

PER 8/14/85 Leroy Vahovick: plume has been defined. Methylene Chlor and others in mon wells.

BG 11/13 phone [illegible]
Found other problems while doing [illegible] site




RECEIVED
MAY 8 1984
Region III Headquarters

WILLIAMS & WORKS, INC. GRAND RAPIDS, MICHIGAN

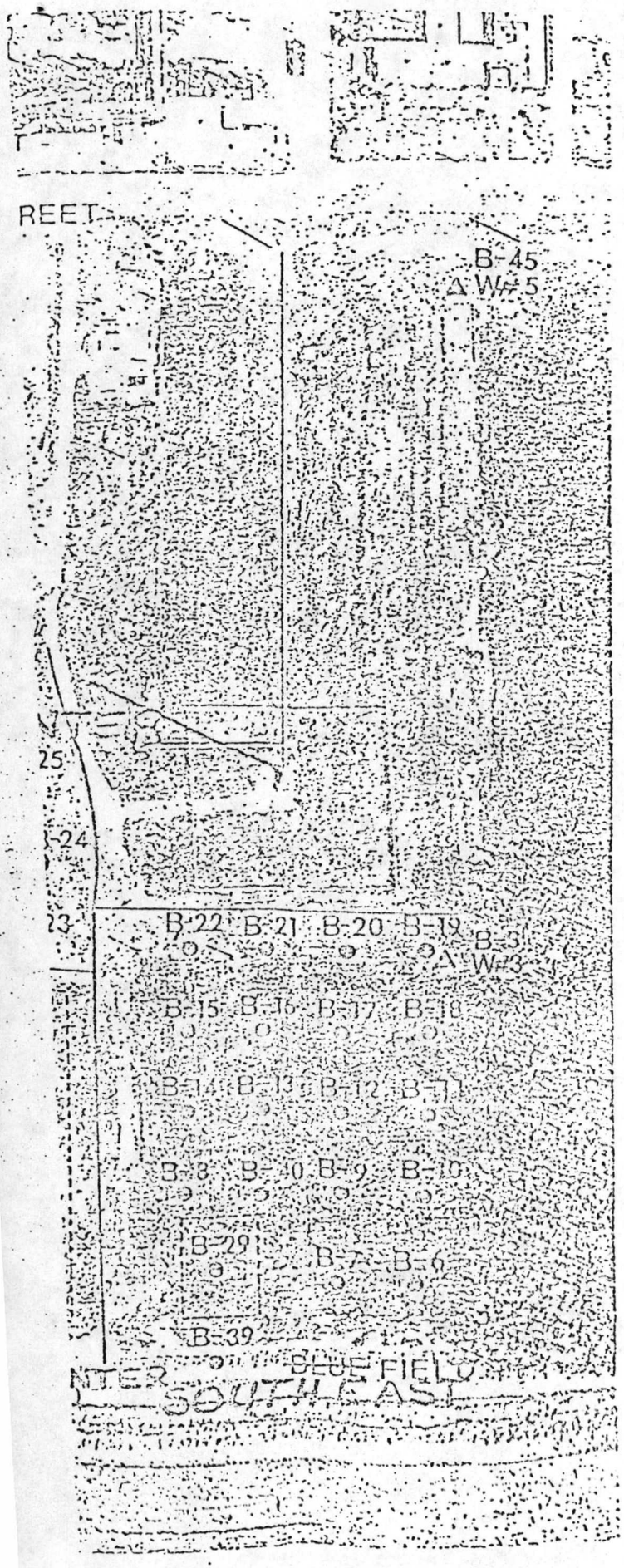



FIGURE 1

# LOCATION MAP

LEGEND:

## DATA POINTS

- ⊙ Split Spoon Boring With Log Number
- ▲ W#3 Observation Well With Log Number
- — Boundary of Subsurface Disposal Pit

TOTAL PETROLEUM, INC.

N

0 100 200

10/71

85496

SECTION A - SITE LOCATION FORMATION

SECTION A & B

SITE NAME: TOTAL PETROLEUM - ALMA REFINERY

STREET NUMBER AND NAME: EAST SUPERIOR STREET

CITY: ALMA

ZIP CODE: 48801-

ALTERNATE NAME:

ALTERNATE NAME:

TOWNSHIP: ARCADIA

COUNTY: GRATIOT

STATE COUNTY CODE: 29

FEDERAL COUNTY CODE: 57

LATITUDE: 432240.0

LONGITUDE: 843755.0

HOUSE: 89 | SENATE: 35 | CONG.: 10

LOCATION CODE: 29-11N-03W-02A-

DNR DISTRICT: LANSING

DIRECTIONS TO SITE: M-27 North toward Alma. Exit onto M 46 (BR 27) Heading West. Proceed 1/8 mile to Wright Ave + take that South 2 1/2 miles to the heart of Alma. Wright Ave intersects Superior St. Take Superior St. 1 1/2 miles + site is on Right Across from the Refinery.

SECTION B - ACT 307 LIST INFORMATION

FEB. 1984 SCORE: NONE | DATE:

DRAFT SCORE: 08 | DATE: 02/20/84

FINAL SCORE: | DATE:

SIC CODE: 2911

SIC CATEGORY: PETROLEUM REFINING

SOURCE OF CONTAMINATION

☐ SOURCE UNKNOWN

CONTAINMENT STRUCTURE

- ☐ Waste Pile
- ☐ Geologic Formation
- ☒ Lagoon
- ☐ Container
- ☐ Barrel
- ☐ Tank
- ☐ Pipeline
- ☐ Landfill
- ☐ Unknown
- ☐ None

POLLUTANT - By Waste Category

- ☐ Domestic/Comm.
- ☐ Light Industrial
- ☐ Heavy Mfg.
- ☐ Chem. Prod. Mfg.
- ☐ Brine
- ☐ Salt

| | RESOURCE AFFECTED | RESOURCE POTENTIALLY AFFECTED |
|---|---|---|
| Surface Water Sediment | ☐ | ☐ |
| Surface Water | ☐ | ☒ |
| Groundwater | ☒ | ☐ |
| Air | ☐ | ☐ |
| Soil | ☐ | ☒ |
| Wetland | ☐ | ☐ |
| Municipal Well | ☐ | ☐ |
| Res. Well | ☐ | ☐ |
| Fauna | ☐ | ☐ |
| Flora | ☐ | ☐ |

CHEMICALS BY NAME: METHYLENE CHLORIDE

DISTRIBUTION: White - Section Site File

R-5551

Quality Division

# ACI 97 MASTER DATA FORM - PART I

SECTION C

## ON C - SITE SCREENING

| NAME | COUNTY |
|---|---|
| Total Petroleum - Alma | Gratiot |

| CATEGORY | ANSWER/POINTS | SCORE |
|---|---|---|
| EXISTING EXPOSURE | YES (4)<br>NO (0)<br>MAYBE (?) | 0 |
| KNOWN ENVIRONMENTAL CONTAMINATION | GROUNDWATER (1)<br>SURFACE WATER (1)<br>AIR (1) | 1<br>0<br>0 |
| POPULATION | MORE THAN 100/MILE$^2$ (1) | 1 |
| UNSATURATED ZONE | ☐ LEGRAND STEP 1-9 (1)<br>☒ AQUIFER VULNERABILITY (1) | 1 |
| DIRECT CONTACT HAZARD | YES (1) | 0 |
| FIRE/EXPLOSION HAZARD | YES (1) | 0 |
| CHEMICAL CONCERN | ☐ HEAVY MFG. CATEGORY (2)<br>☒ CHEMICAL MFG. CATEGORY (2)<br>☐ PRIORITY POLLUTANT OR CMR (2) | 2 |
| VOLUME OF CHEMICALS | GREATER THAN 5 TONS (2)<br>LESS THAN 5 TONS (0)<br>UNKNOWN (?) | 2 |
| LIQUIDS | YES (1) | 1 |

| FEB 1984 SCORE | DRAFT SCORE | FINAL SCORE |
|---|---|---|
| NCNE | 08 | |
| DATE | DATE | DATE |

DATA DOCUMENTATION

| CATEGORY REFERENCE | SOURCE | COMMENTS |
|---|---|---|
| [illegible] | [illegible] | [illegible] |
| [illegible] | [illegible] | [illegible] methylene chloride |
| unsaturated zone | [illegible] | [illegible] groundwater [illegible] indicates vulnerable unsaturated zone. |

DISTRIBUTION: White - Section Site File
Canary - District

R-5551-1
8/84

(C) 34-12N-3W TD 775 in Michigan

Pine River Twp. (Gratiot Co.)

CITY WELL

Alma City Waterworks Well

Location: SW¼ SE¼ Section 34, On the river flats, T.12N., R.3W.

Elevation: 723 feet above sea level

Record by: W. E. Reynolds, City Manager, and from samples furnished by him

| | Thickness (feet) | Depth (feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Clay, gravel, and hardpan | 56 | 56 |
| Gravel, coarse, water bearing | 1½ | 57½ |
| Gravel, fine, with water | 10½ | 68 |
| Clay, buff, gritty | 53 | 121 |
| Sand, coarse, artesian water | 4 | 125 |
| Clay, brown, sticky with pebbles | 225 | [illegible] |
| Clay, red, and pebbles, very hard and shaly | 94 | [illegible] |
| | (444) | |
| PENNSYLVANIAN: | | |
| Saginaw: | | |
| Sandstone, buff, mixed with gray shale (water) | 2 | 446 |
| Shale, dark gray, laminated | 4 | 450 |
| Shale, black, laminated | 26 | 476 |
| Sandstone, pure white, quartz (3 veins of water) | 57 | 533 |
| Coal (no sample) | 1 | 534 |
| Shale, bluish black, laminated | 33 | 567 |
| Shale, gray | 105 | 672 |
| | (228) | |
| Parma: | | |
| Sandstone and shale; much pyrite | 8 | 680 |
| Sandstone, white, pyritic; lightly calcareous | 10 | 690 |
| | (18) | |
| MISSISSIPPIAN: | | |
| Bayport: | | |
| Dolomite, buff | 13 | 703 |
| Limestone, gray to buff | 17 | 720 |
| Limestone, gray, shaly | 1 | 721 |
| Limestone, buff to gray, shaly | 24 | 745 |
| | (55) | |
| Michigan: | | |
| Sandstone, shaly | 16 | 761 |
| Shale, green, plastic, calcareous | 12 | 773 |
| Dolomite, sandy, pyritic | 2 | 775 |
| | (30+) | |
| TOTAL DEPTH | | 775 |

9-22-59

| | Thickness (Feet) | Depth (Feet) |
|---|---|---|
| **DETAILS:** | | |
| Traverse formation: | | |
| Limestone, dolomitic | 30 | 2780 |
| Shale, blue | 20 | 2800 |
| | (50) | |
| Traverse limestone: | | |
| Limestone, sandy, dolomitic (mineral water 2825'; temp. 99°F.; gas) | 61 | 2861 |
| No report | 4 | 2865 |
| | (65+) | |
| TOTAL DEPTH | | 2865 |

Plugged in 1946
DRILLED 1889

Exploratory
34-12N-5W TD 2365 In Traverse
Pine River Twp., (Gratiot Co.) (Water)

Wilcox Hospital, Incorporated
(Formerly Alma Sanitorium Well)

Location: Section 34, T 12N, R 5W
620' north and 4130' west of SE corner

Elevation: About 745 feet above sea level (topographic sheet)

Record by: C. A. Davis from samples

| | Thickness (Feet) | Depth (Feet) |
|---|---|---|
| PLEISTOCENE: | | |
| Drift: | | |
| Clay & gravel (quicksand & water at 60', & 3' water-bearing gravel at 157') | 475 | 475 |
| Sand & gravel | 25 | 500 |
| PENNSYLVANIAN-PERMO-CARBONIFEROUS(?): | | |
| "Red-Beds"(?): | | |
| Sandstone, feldspathic | 50 | 550 |
| Saginaw: | | |
| Shale, black, pyritiferous; coal horizon | 25 | 575 |
| Shale, blue | 40 | 615 |
| Shale, white | 22 | 637 |
| Sandstone, pebbly | 38 | 675 |
| Shale, sometimes black, coal reported | 35 | 710 |
| Parma(?)-Bayport: | (160) | |
| Sandstone, pyritic; brine | 50 | 760 |
| MISSISSIPPIAN: | | |
| Michigan: | | |
| Shale, blue & black, sandy | 70 | 830 |
| Gypsum, blue & white | 35 | 865 |
| Limestone, red or blue, bituminous, dolomitic, argillaceous (cement rock) | 120 | 1015 |
| Marshall: | (285) | |
| Sandstone, clean, white, brine | 85 | 1100 |
| Shale, red, sandy | 200 | 1300 |
| Shale, blue | 50 | 1350 |
| Shales, red | 150 | 1500 |
| Coldwater: | (435) | |
| Shales, blue | 75 | 1575 |
| Grit, brownish, fine grained (no water) | 50 | 1625 |
| Shales, black | 35 | 1660 |
| Sand, light yellowish, fine | 40 | 1700 |
| Limestone, dark shale colored or shale | 60 | 1760 |
| Shale, dark blue | 510 | 2270 |
| Sunbury: | (750) | |
| Shale, black | 50 | 2320 |
| Bedford: | | |
| Shale, blue | 60 | 2380 |
| MISSISSIPPIAN-DEVONIAN: | | |
| Antrim: | | |
| Shale, black | 240 | 2620 |
| Shale, black with harder streaks (limestone shells?) (Sandy from 2830-70') | 115 | 2735 |
| | (355) | |

COMPLETED 1889
CASING RECORD Plugged in 1946

→ file

XC: JOHN, DIST
KEN → DE
ORIG: MOR
Total Alma

TOTAL
Total Petroleum, Inc.

EAST SUPERIOR STREET ALMA, MICHIGAN 48802 TELEPHONE 517 463-1161

BENJAMIN E. WHITE, P.E.
ENVIRONMENTAL ENGINEER

August 1, 1986

Hazardous Waste Division
Michigan Department of Natural Resources
P.O. Box 30028
Lansing MI 48909

Gentlemen:

Enclosed is our first quarter of 1986 groundwater monitoring data for our land treatment facility. These data include:

1. Quarterly sampling for the land treatment facility.

2. A tabulation of all of the lead analysis that has been done, since August of 1985, by both Environmental Science, Inc. (ESI) and the Total Petroleum laboratory.

3. A tabulation of all of the chromium analysis that has been done since August of 1985 by both Environmental Science, Inc. (ESI) and the Total Petroleum laboratory.

We previously reported that the Total Petroleum laboratory had experienced problems analyzing for both lead and chromium. As a result of those problems we began sending quarterly samples from the land treatment facility wells to ESI for lead and chromium analysis. In addition, a monthly sample of the background well (No. 18) is being sent to the ESI laboratory. Both the ESI laboratory and the Total Petroleum laboratory will be analyzing this water for lead and chromium. At the end of one year a new set of statistical data for the background well (No. 18) will be established for comparison purposes.

If you have questions concerning this information please contact us.

Sincerely,

Benjamin E. White

Benjamin E. White

BEW/lf
Att.
cc: Stinnett/McCoy
RC/CF 993.08

RECEIVED
AUG 05 1986
HAZARDOUS WASTE DIV.

TOTAL PETROLEUM INC ALMA MT.

LEAD ANALYSIS DATA in PPM.

Groundwater Monitoring Wells - Land Treatment Facility

- ppm -

| Well No. | 9-3-85 By ESI | 9-11-85 By ESI | 10-17-85 ESI | 10-17-85 Total | 11-18-85 ESI | 11-18-85 Total | 12-3-85 ESI | 1-21-86 ESI | 1-21-86 Total | 2-11-86 ESI | 2-11-86 Total | 3-3-86 ESI | 3-3-86 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | .018 | | | | | .0078 | | | | | <.005 | <.005 |
| 5 | | <.005 | | | | | .0065 | | | | | <.005 | <.005 |
| 15 | | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 16 | | .0059 | | | | | .0052 | | | | | <.005 | <.005 |
| 18 | <.005 <.005 <.005 | .0055 | .011 | <.005 | .014 | <.005 | .0059 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 |
| 19 | | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 20 | | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 21 | | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 23 | | <.005 | | | | | .0084 | | | | | <.005 | <.005 |
| 30 | | | | | | | .010 | | | | | <.005 (3/26) | <.005 |

| Well No. | 5-22-86 By ESI | 5-22-86 By Total |
|---|---|---|
| 3 | .0067 | <.005 |
| 5 | .0059 | <.005 |
| 15 | .0121 | <.005 |
| 16 | .0053 | <.005 |
| 18 | .008 | <.005 |
| 19 | <.005 | <.005 |
| 20 | .0096 | <.005 |
| 21 | .0094 | <.005 |
| 23 | .0089 | <.005 |
| 30 | <.005 | <.005 |

TOTAL PETROLEUM INC. ALMA MI.

CHROMIUM ANALYSIS DATA in ppm — ppm —

Groundwater Monitoring Wells Land Treatment Facility

| Well No | 9-11-85 By ESI | 10-17-85 By ESI | 10-17-85 By Total | 11-18-85 ESI | 11-18-85 Total | 12-3-85 ESI | 1-21-86 ESI | 1-21-86 Total | 2-11-86 ESI | 2-11-86 Total | 3-3-86 ESI | 3-3-86 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 5 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 15 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 16 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 18 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 |
| 19 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 20 | .018 | | | | | <.005 | | | | | <.005 | <.005 |
| 21 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 23 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 30 | | | | | | <.005 | | | | | <.005 | <.005 |

| | 5-22-86 By ESI | 5-22-86 By Total |
|---|---|---|
| 3 | <.005 | <.005 |
| 5 | <.005 | <.005 |
| 15 | <.005 | <.005 |
| 16 | <.005 | <.005 |
| 18 | <.005 | <.005 |
| 19 | <.005 | <.005 |
| 20 | <.005 | <.005 |
| 21 | <.005 | <.005 |
| 23 | <.005 | <.005 |
| 30 | <.005 | <.005 |

| Well No. | Date | pH (ppm) | Conduct. (ppm) | TOC (ppm) | LEAD (ppm) | CHROME (ppm) | Oil & Grease (ppm) | PHENOLS (ppm) | TOH (ppm) | Ni (ppm) | Zn (ppm) | SO4 (ppm) | CL (ppm) | Fe (ppm) | Se (ppm) | Na (ppm) | Mn (ppm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Background Mean + 2 std Deviations | | 7.14-7.42 | 797.1 | 9.22 | | | 1 | .006 | 0.029 | <.015 | 1.68 | 125.6 | 13 | 0.903 | <.002 | 5.35 | 0.26 |
| Well No. 3 | 3/3/86 | 7.3 7.3 7.3 7.3 | 672 671 | 6.1 6.1 5.9 | <.005 | <.005 | 1 | <.005 | <.005 (4/27) | <.015 | 0.80 | 31 | 8.8 | 0.81 | <.001 | 11 * | .03 |
| | 5/22/86 | 7.2 7.3 7.2 7.3 | 723 716 718 717 | 6.4 6.3 6.7 6.5 | | | | | | | | | | | | | |
| Well No. 5 | 3/3/86 | 7.1 7.2 7.2 7.2 | 767 771 772 768 | 4.3 4.2 4.3 4.3 | <.005 | <.005 | <1 | <.005 | <.005 (7/27) | <.015 | 3.2 * | 44 | 19 * | 0.93 * | <.001 | 16 * | .04 |
| | 5/22/86 | 7.3 7.3 7.3 7.4 | 875 882 882 884 | 2.4 2.3 2.4 2.4 | | | | | | | | | | | | | |
| Well No. 15 | 3/3/86 | 7.3 7.3 7.3 7.3 | 1670 1710 1710 1700 | 12 12 12 12 | <.005 | <.005 | <1 | <.005 | <.005 (4/27) | <.015 | 0.47 | 210 * | 200 * | 1.2 * | <.001 | 120 * | .08 |
| | 5/22/86 | 7.3 7.3 7.3 7.3 | 1830 1850 1850 1840 | 12 12 12 12 | | | | | | | | | | | | | |
| Well No. 16 | 3/3/86 | 7.3 7.3 7.3 7.3 | 642 642 644 637 | 2.5 2.5 2.5 2.5 | <.005 | <.005 | <1 | <.005 | <.005 (4/27) | <.015 | 0.06 | 30 | 13 | 0.09 | <.001 | 11 * | .02 |
| | 5/22/86 | 7.4 7.5 7.4 7.4 | 689 694 686 692 | 2.0 2.0 1.9 1.9 | | | | | | | | | | | | | |
| Well No 18 Background | 3/3/86 | 7.1 7.1 7.1 7.1 | 646 647 648 644 | 2.6 2.5 2.7 2.6 | <.005 | <.005 | <1 | <.005 | <.005 (4/27) | <.015 | 0.23 | 70 | 13 | 0.78 | <.001 | 4.6 | .22 |
| | 5/22/86 | 7.3 7.3 7.3 7.3 | 707 706 706 707 | 2.1 2.1 2.1 2.1 | | | | | | | | | | | | | |

* EXCEEDS CRITERIA VALUE

5116 IVORY, 5316 GREEN, 5516 WHITE, 5916 TRANSLUCENT

PRINTED IN U.S.A.

GROUNDWATER MONITORING

| Well No. | Date | pH (ppm) | Conductivity (ppm) | TOC (ppm) | LEAD (ppm) | CHROME (ppm) | Oil & Grease (ppm) | PHENOLS (ppm) | TOH (ppm) | Ni (ppm) | Zn (ppm) | SO4 (ppm) | CL (ppm) | Fe (ppm) | Se (ppm) | Na (ppm) | Mn (ppm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Background Mean + 2 std Dev | | 7.14-7.42 | 797.1 | 9.22 | | | 1 | .006 | .029 | <.015 | 1.68 | 125.6 | 13 | .903 | <.002 | 5.35 | 0.26 |
| Well No. 19 | 3/3/86 | 7.0 7.0 7.0 7.1 | 2250 2270 2270 2270 | 45 44 44 44 | <.005 | <.005 | 1 | .008 * | <.005 (4/27) | <.015 | 0.06 | 180 * | 190 * | 1.4 * | <.001 | 360 * | .19 |
| | 5/22/86 | 7.2 7.2 7.1 7.2 | 2440 2450 2500 2480 | 51 51 51 51 | | | | | | | | | | | | | |
| Well No. 20 | 3/3/86 | 7.2 7.2 7.2 7.2 | 1870 1880 1880 1870 | 25 25 25 24 | <.005 | <.005 | 1 | <.005 | <.005 (4/27) | <.015 | 3.3 * | 370 * | 260 * | 2.4 * | <.001 | 92 * | .23 |
| | 5/22/86 | 7.3 7.3 7.3 7.3 | 2030 2060 2060 2060 | 26 26 25 24 | | | | | | | | | | | | | |
| Well No. 21 | 3/3/86 | 7.3 7.4 7.3 7.4 | 2360 2370 2360 2360 | 31 32 31 31 | <.005 | <.005 | 1 | .006 | <.005 (4/27) | <.015 | 2.5 * | 110 | 400 * | 1.1 * | <.001 | 230 * | .16 |
| | 5/22/86 | 7.2 7.2 7.2 7.2 | 2560 2560 2560 2560 | 29 29 29 28 | | | | | | | | | | | | | |
| Well No. 23 | 3/3/86 | 7.3 7.3 7.3 7.4 | 1670 1670 1670 1660 | 12 12 12 12 | <.005 | <.005 | <1 | <.005 | <.005 (4/27) | <.015 | 0.29 | 65 | 190 * | 0.21 | <.001 | 180 * | .08 |
| | 5/22/86 | 7.4 7.4 7.4 7.4 | 1790 1790 1790 1790 | 11 11 12 12 | | | | | | | | | | | | | |
| Well No. 30 | 3/3/86 | 7.2 7.2 7.2 7.3 | 2860 2880 2860 2870 | 58 58 57 59 | <.005 | <.005 | 3 * | .032 * | <.005 (4/27) | <.015 | 0.01 | 120 | 450 * | 0.72 | <.001 | 360 * | .22 |
| | 5/22/86 | 7.2 7.2 7.2 7.2 | 3120 3120 3120 3120 | 55 54 55 56 | | | | | | | | | | | | | |

* EXCEEDS CRITERIA VALUE

File

BASEM

XC: [redacted]
DE
ORIG: KEN → MOR
TOTAL ALMA

**TOTAL**
**Total Petroleum, Inc.**

EAST SUPERIOR STREET
ALMA, MICHIGAN

TELEPHONE 517 463-1161

MAILING ADDRESS:
ALMA, MICHIGAN 48802

BENJAMIN E. WHITE, P. E.
ENVIRONMENTAL ENGINEER

November 21, 1986

RECEIVED
DEC 3 1986
REGION III HEADQUARTERS

Hazardous Waste Division
Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

Gentlemen:

Enclosed is our third quarter of 1986 groundwater monitoring data for our land treatment facility. These data include.

1. Quarterly sampling for the land treatment facility.

2. A tabulation of all the lead analysis that has been done since August of 1985, by both Environmental Science, Inc. (ESI) and the Total Petroleum laboratory. We have decided based upon a comparison of the two laboratory's data, that until further notice the ESI laboratory will be conducting our groundwater lead analysis.

3. A tabulation of all the chromium analysis data that has been done since August of 1985 by Environmental Science, Inc. (ESI) and by the Total Petroleum laboratory. After comparing the two laboratory's data, we have decided that the Total Petroleum Laboratory will be conducting our future chromium analysis.

4. Tabulations of all of the lead and chromium analysis data that has been collected for the background well (MW18) since August of 1985. The mean plus two standard deviations values for these data are presented on these sheets. These are the lead and chromium comparison values that will be used in the future to determine if there has been a significant downstream increase over background values.

5. A potentiometric contour map for the groundwater elevations measured on September 3, 1986.

If you have any questions concerning this information please contact is.

Sincerely,

Benjamin E. White

Benjamin E. White

HAZ.WASTE DIV

24 NOV 86 1:04

BEW:djw
enc.

TOTAL PETROLEUM ALMA MICH. — ND TREATMENT FACILITY — GROUNDWATER MONITORING

| | Well No. | Date | 1 pH | Conductivity | 3 TOC | 4 LEAD | 5 CHROME | Oil & Grease | 7 PHENOLS | 8 TDH | 9 Ni | 10 Zn | 11 SO4 | 12 Cl | 13 Fe | 14 Se | 15 Na | 16 Mn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | — | — ppm — | | — ppm — | | — ppm — | | — ppm — | | | — ppm — | | | — ppm — | | |
| | Background Mean + 2 std. Deviations | | 7.14-7.42 | 797.1 | 9.22 | .0215 | 2.005 | 1 | .006 | .029 | <.015 | 1.68 | 125.6 | 13 | 0.903 | <.002 | 5.35 | 0.26 |
| 1 | Well No. 3 | 3/3/86 | 7.3 7.3 7.3 | 648 672 671 | 6.1 6.1 6.9 | <.005 | <.005 | | | | | | | | | | | |
| 2 | | 5/22/86 | 7.2 7.2 7.2 | 723 715 717 | 6.3 6.7 6.5 | .0067 | <.005 | 1 | <.005 | <.005 (4/27) | <.015 | 0.80 | .31 | 8.8 | 0.84 | <.001 | 11 * | .03 |
| 3 | | 9/3/86 | 7.5 7.5 7.5 | 699 701 697 | 4.7 4.7 4.7 | <.0054 | <.005 | | | | | | | | | | | |
| 9 | Well No. 5 | 3/3/86 | 7.1 7.2 7.2 | 767 771 768 | 4.3 4.2 4.3 | <.005 | <.005 | | | | | | | | | | | |
| 10 | | 5/22/86 | 7.3 7.3 7.4 | 8751 8823 8843 | 2.4 2.3 2.4 | .0057 | <.005 | <1 | <.005 | <.005 (4/27) | <.015 | 3.2 * | 44 | 19 * | 0.93 * | <.001 | 16 * | .04 |
| 11 | | 9/3/86 | 7.3 7.3 7.4 | 8404 8442 8454 | 3.2 3.2 3.1 | .0058 | <.005 | | | | | | | | | | | |
| 17 | Well No. 15 | 3/3/86 | 7.3 7.3 7.3 | 16704 17104 17004 | 12.4 12.4 12.4 | <.005 | <.005 | | | | | | | | | | | |
| 18 | | 5/22/86 | 7.3 7.3 7.3 | 18300 18500 18504 | 12.7 12.4 12.4 | .0121 | <.005 | <1 | <.005 | <.005 (4/27) | <.015 | 0.47 | 210 * | 200 * | 1.2 * | <.001 | 120 * | .08 |
| 19 | | 9/3/86 | 7.3 7.3 7.3 | 17704 17704 17704 | 10.8 10.8 10.1 | <.005 | <.005 | | | | | | | | | | | |
| 25 | Well No. 16 | 3/3/86 | 7.3 7.3 7.3 | 642 642 637 | 2.5 2.5 2.5 | <.005 | <.005 | | | | | | | | | | | |
| 26 | | 5/22/86 | 7.4 7.5 7.4 | 683 694 692 | 2.0 2.0 1.9 | .0053 | <.005 | <1 | <.005 | <.005 (4/27) | <.015 | 0.06 | 30 | 13 | 0.09 | <.001 | 11 * | .02 |
| 27 | | 9/3/86 | 7.54 7.54 7.54 | 683 683 681 | 2.6 2.7 2.6 | .0059 | <.005 | | | | | | | | | | | |
| 33 | Well No 18 | 3/3/86 | 7.18 7.18 7.18 | 649 649 644 | 2.4 2.7 2.7 | <.005 | <.005 | | | | | | | | | | | |
| 34 | Background | 5/22/86 | 7.3 7.3 7.3 | 707 706 707 | 2.1 2.1 2.1 | .008 | <.005 | <1 | <.005 | <.005 (4/27) | <.015 | 0.23 | 70 | 13 | 0.78 | <.001 | 4.6 | .22 |
| 35 | | 9/3/86 | 7.2 7.2 7.3 | 678 679 676 | 2.3 2.4 2.4 | .0063 | <.005 | | | | | | | | | | | |

* EXCEEDS CRITERIA VALUE

3116 IVORY, 3316 GREEN, 3516 WHITE, 3916 TRANSLUCENT PRINTED IN U.S.A.

GROUNDWATER MONITORING

| | Well No. | Date | 1 pH | Conductivity | 3 TOC | 4 LEAD | 5 CHROME | Oil & Grease | 7 PHENOLS | 8 TOH | 9 Ni | 10 Zn | 11 SO4 | 12 Cl | 13 Fe | 14 Se | 15 Na | 16 Mn |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | — | — ppm. — | | | | — ppm. — | | — ppm — | | | — ppm — | | | — ppm — | | |
| | Background Mean + 2 Std Dev | | 7.14-7.42 | 797.1 | 9.22 | | | 1 | .006 | .029 | <.015 | 1.68 | 125.6 | 13 | .903 | <.002 | 5.35 | 0.26 |
| 1 | Well No. 19 | 3/3/86 | 7.08 7.08 7.18 | 2250 2270 * 2270 | 45 * 44 * 44 * | <.005 | <.005 | | | | | | | | | | | |
| 2 | | 5/22/86 | 7.2 7.2 7.2 | 2440 2450 2450 | 51 * 51 * 51 * | <.005 | <.005 | 1 | .008 * | <.005 (4/27) | <.015 | 0.06 | 180 * | 190 * | 1.4 * | <.001 | 360 * | .19 |
| 3 | | 9/3/86 | 7.14 * 7.14 7.14 | 2310 * 2340 * 2360 * | 53 * 53 * 52 * | .011 | <.005 | | | | | | | | | | | |
| 9 | Well No. 20 | 3/3/86 | 7.2 7.2 7.2 | 1870 * 1880 * 1880 * | 25 * 25 * 24 * | <.005 | <.005 | | | | | | | | | | | |
| 10 | | 5/22/86 | 7.3 7.3 7.3 | 2020 * 2060 * 2060 * | 26 * 25 * 24 * | .0096 | <.005 | 1 | <.005 | <.005 (4/27) | <.015 | 3.3 * | 370 * | 260 * | 2.4 * | <.001 | 92 * | .23 |
| 11 | | 9/3/86 | 7.2 7.2 7.2 | 2030 * 2040 * 2040 * | 8.9 8.8 8.8 | .0065 | <.005 | | | | | | | | | | | |
| 17 | Well No. 21 | 3/3/86 | 7.3 7.4 7.4 | 2360 * 2370 * 2360 * | 31 * 32 * 31 * | <.005 | <.005 | | | | | | | | | | | |
| 18 | | 5/22/86 | 7.2 7.2 7.2 | 2540 * 2560 * 2560 * | 29 * 27 * 28 * | .0094 | <.005 | 1 | .006 | <.005 (4/27) | <.015 | 2.5 * | 110 | 400 * | 1.1 * | <.001 | 230 * | .16 |
| 19 | | 9/3/86 | 7.14 * 7.14 * 7.14 * | 2510 * 2510 * 2510 * | 42 * 42 * 42 * | .0054 | <.005 | | | | | | | | | | | |
| 25 | Well No. 23 | 3/3/86 | 7.3 7.3 7.4 | 1670 * 1670 * 1660 * | 12 * 12 * 12 * | <.005 | <.005 | | | | | | | | | | | |
| 26 | | 5/22/86 | 7.4 7.4 7.4 | 1790 * 1790 * 1790 * | 12 * 12 * 12 * | .0089 | <.005 | <1 | <.005 | <.005 (4/27) | <.015 | 0.29 | 65 | 190 * | 0.21 | <.001 | 180 * | .08 |
| 27 | | 9/3/86 | 7.3 7.3 7.3 | 1680 * 1740 * 1750 * | 13 * 13 * 13 * | <.005 | <.005 | | | | | | | | | | | |
| 33 | Well No. 30 | 3/3/86 | 7.2 7.2 7.3 | 2860 * 2860 * 2870 * | 58 * 58 * 59 * | <.005 | <.005 | | | | | | | | | | | |
| 34 | | 5/22/86 | 7.2 7.2 7.2 | 3110 * 3120 * 3120 * | 55 * 54 * 56 * | <.005 | <.005 | 3 * | .032 * | <.005 (4/27) | <.015 | 0.01 | 120 | 450 * | 0.72 | <.001 | 360 * | .22 |
| 35 | | 9/3/86 | 7.2 7.2 7.2 | 2730 * 2740 * 2750 * | 69 * 70 * 70 * | <.005 | <.005 | | | | | | | | | | | |

* EXCEEDS CRITERIA VALUE

PRINTED IN U.S.A.

TOTAL PETROLEUM INC ALMA MT.

LEAD ANALYSIS DATA in PPM. — ppm —

Groundwater Monitoring Wells - Land Treatment Facility

| Well No. | 9-3-85 By ESI | 9-11-85 By ESI | 10-17-85 ESI | 10-17-85 Total | 11-18-85 ESI | 11-18-85 Total | 12-3-85 ESI | 1-21-86 ESI | 1-21-86 Total | 2-11-86 ESI | 2-11-86 Total | 3-3-86 ESI | 3-3-86 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | | .018 | | | | | .0078 | | | | | <.005 | <.005 |
| 5 | | <.005 | | | | | .0065 | | | | | <.005 | <.005 |
| 15 | | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 16 | | .0059 | | | | | .0052 | | | | | <.005 | <.005 |
| 18 | <.005 <.005 <.005 | .0055 | .011 | <.005 | .014 | <.005 | .0059 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 |
| 19 | | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 20 | | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 21 | | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 23 | | <.005 | | | | | .0084 | | | | | <.005 | <.005 |
| 30 | | | | | | | .010 | | | | | <.005 (3/26) | <.005 |

| Well No. | 5-22-86 By ESI | 5-22-86 By Total | 6-17-86 By ESI | 6-17-86 By Total | 7-22-86 By ESI | 7-22-86 By Total | 8-18-86 By ESI | 8-18-86 By Total | 9-9-86 By ESI | 9-9-86 By Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | .0067 | <.005 | | | | | | | .0054 | <.005 |
| 5 | .0059 | <.005 | | | | | | | .0058 | <.005 |
| 15 | .0121 | <.005 | | | | | | | <.005 | <.005 |
| 16 | .0053 | <.005 | | | | | | | .0059 | <.005 |
| 18 | .008 | <.005 | .0063 | <.005 | .006 .0086 <.005 <.005 | <.005 | .027 | <.005 | .0063 | <.005 |
| 19 | <.005 | <.005 | | | | | | | .011 | <.005 |
| 20 | .0096 | <.005 | | | | | | | .0065 | <.005 |
| 21 | .0094 | <.005 | | | | | | | .0054 | <.005 |
| 23 | .0089 | <.005 | | | | | | | <.005 | <.005 |
| 30 | <.005 | <.005 | | | | | | | <.005 | <.005 |

5114 IVORY; 5314 GREEN; 5514 WHITE

PRINTED IN U.S.A.

TOTAL PETROLEUM INC. ALMA MI.

CHROMIUM ANALYSIS DATA in ppm — ppm —

Groundwater Monitoring Wells Land Treatment Facility

| Well No | 9-11-85 By ESI | 10-17-85 By ESI | 10-17-85 By Total | 11-18-85 ESI | 11-18-85 Total | 12-3-85 ESI | 1-21-86 ESI | 1-21-86 Total | 2-11-86 ESI | 2-11-86 Total | 3-3-86 ESI | 3-3-86 Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 5 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 15 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 16 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 18 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 |
| 19 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 20 | .018 | | | | | <.005 | | | | | <.005 | <.005 |
| 21 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 23 | <.005 | | | | | <.005 | | | | | <.005 | <.005 |
| 30 | | | | | | <.005 | | | | | <.005 | <.005 |

| Well No | 5-22-86 By ESI | 5-22-86 By Total | 6-17-86 By ESI | 6-17-86 By Total | 7-22-86 By ESI | 7-22-86 By Total | 8-18-86 By ESI | 8-18-86 By Total | 9-3-86 By ESI | 9-3-86 By Total |
|---|---|---|---|---|---|---|---|---|---|---|
| 3 | <.005 | <.005 | | | | | | | <.005 | <.005 |
| 5 | <.005 | <.005 | | | | | | | <.005 | <.005 |
| 15 | <.005 | <.005 | | | | | | | <.005 | <.005 |
| 16 | <.005 | <.005 | | | | | | | <.005 | <.005 |
| 18 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 | <.005 |
| 19 | <.005 | <.005 | | | | | | | <.005 | <.005 |
| 20 | <.005 | <.005 | | | | | | | <.005 | <.005 |
| 21 | <.005 | <.005 | | | | | | | <.005 | <.005 |
| 23 | <.005 | <.005 | | | | | | | <.005 | <.005 |
| 30 | <.005 | <.005 | | | | | | | <.005 | <.005 |

TOPS FOLDER 5114 IVORY; 5314 GREEN; 5514 WHITE

PRINTED IN U.S.A.

LEAD DATA FROM ESI 9/85 → 9/86

TOTAL PETROLEUM INC BACKGROUND WELL NO. 18

Alma Mich. Groundwater Monitoring Land treatment Fac.

| DATE | lead Concentration ppm | | | |
|---|---|---|---|---|
| 9-3-85 | <.005, <.005, <.005 | | | |
| 10-17-85 | .011 | | | |
| 11-18-85 | .014 | | | |
| 12-3-85 | .0059 | | | |
| 1-21-86 | <.005 | | | |
| 2-11-86 | <.005 | | | |
| 3-3-86 | <.005 | | | |
| 5-22-86 | .008 | | | |
| 6-17-86 | .0063 | | | |
| 7-22-86 | .006, .0086, <.005, <.005 | | | |
| 8-18-86 | .027 | | | |
| 9-3-86 | .0063 | | | |
| MEAN | | .0087 | | |
| STANDARD DEVIATION | | .0064 | | |
| Mean + 2 Std. Deviations | | .0215 | | |

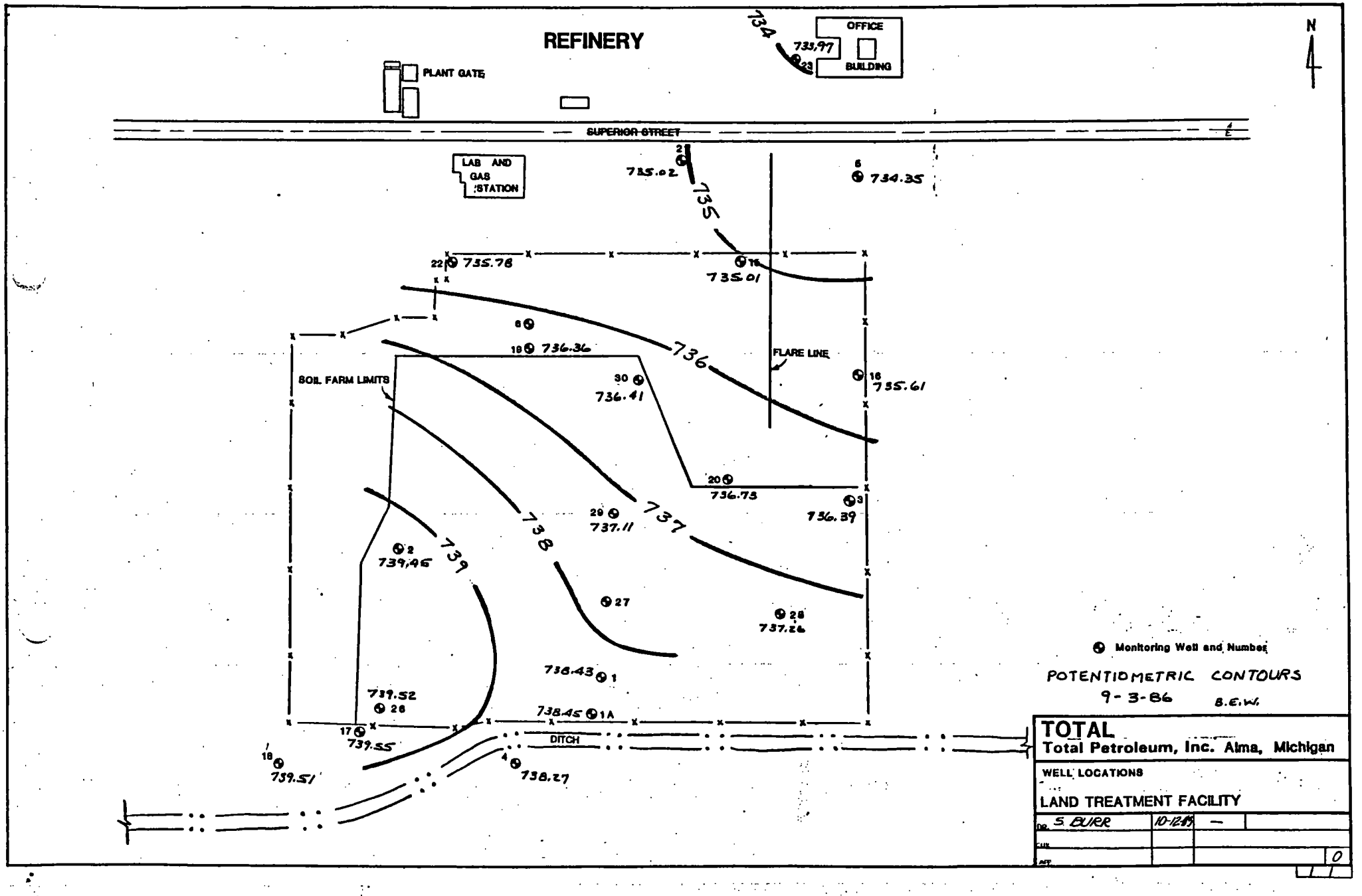
CHROMIUM DATA 9/85 - 9/86

Total Petroleum Inc BACKGROUND WELL NO. 18

Alma Mich. Groundwater Monitoring Land Treatment Facility

| DATE | Chromium Concentration ppm | | | |
|---|---|---|---|---|
| 9-11-85 | <.005 | | | |
| 10-17-85 | <.005 | | | |
| 11-18-85 | <.005 | | | |
| 12-3-85 | <.005 | | | |
| 1-21-86 | <.005 | | | |
| 2-11-86 | <.005 | | | |
| 3-3-86 | <.005 | | | |
| 5-22-86 | <.005 | | | |
| 6-17-86 | <.005 | | | |
| 7-22-86 | <.005 | | | |
| 8-18-86 | <.005 | | | |
| 9-3-86 | <.005 | | | |
| MEAN | | <.005 | | |
| VARIENCE | | 0 | | |
| STANDARD DEVIATION | | 0 | | |
| Mean + 2 Std. Deviations | | <.005 | | |

BOX 600 TULSA OK 74101 5004 IVORY; 5204 GREEN; 5404 WHITE PRINTED IN U.S.A.


REFINERY
PLANT GATE
OFFICE
BUILDING
733.97
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SUPERIOR STREET
LAB AND GAS STATION
2
735.02
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735.78
15
735.01
8
19
736.36
736
FLARE LINE
SOIL FARM LIMITS
30
736.41
16
735.61
20
736.73
3
736.39
29
737.11
737
738
739
2
739.46
27
28
737.26
738.43
1
739.52
26
738.45
1A
17
739.55
DITCH
18
739.51
4
738.27
Monitoring Well and Number
POTENTIOMETRIC CONTOURS
9-3-86
B.E.W.
TOTAL
Total Petroleum, Inc. Alma, Michigan
WELL LOCATIONS
LAND TREATMENT FACILITY
DR. S. BURR
10-12-86
—
0

Bob → Bob

RECEIVED
NOV 1 - 1986
Region III Headquarters

XL: COVER LETTER + 1st 8 PAGES OF REPORT:
TICKLE AL 12/1
~~Del~~ ~~Al~~ XC: to ✓ Ken ✓ ~~Chuck~~ Joan
✓ ~~John~~/Dist.
Original: KEN / C&E

# TOTAL
**Total Petroleum, Inc.**


EAST SUPERIOR STREET
ALMA, MICHIGAN

TELEPHONE 517 463-1161

MAILING ADDRESS:
ALMA, MICHIGAN 48802

BENJAMIN E. WHITE, P. E.
ENVIRONMENTAL ENGINEER


Bratiot Co.

BOB
KEN, PLS COORDINATE H.W. DIV. RESPONSE W/ DIST & EPA. AL

November 7, 1986

Note: REPORT IS OVER 1" THICK. DIST SHLD CONTACT COMPANY FOR A COPY. IF UNSUCCESSFUL WE'LL XL. AL

Hazardous Waste Division
Michigan Department of Natural Resources
P.O. Box 30028
Lansing, Michigan 48909

Gentlemen:

Enclosed is a copy of a request for determination that we sent to the United States Environmental Protection Agency on November 7, 1986.

If you have any questions concerning this submittal please contact us.

Sincerely,

Benjamin E. White

Benjamin E. White

BEW:djw
att.

RECEIVED
NOV 10 1986
HAZARDOUS WASTE DIV.

**TOTAL**
**Total Petroleum, Inc.**

EAST SUPERIOR STREET
ALMA, MICHIGAN

TELEPHONE 517 463-1161

MAILING ADDRESS:
ALMA, MICHIGAN 48802

BENJAMIN E. WHITE, P. E.
ENVIRONMENTAL ENGINEER

November 7, 1986

Regional Administrator
United States Environmental Protection Agency
Region 5
230 South Dearborn Street
Chicago, Illinois 60604

Gentlemen:

Re: Facility No. MID 005358130
NPDES Permit MI 0001066

This submittal is to apply for a determination of applicability, of paragraph (1) of Section 3005 (j) of the 1984 RCRA amendments, as it may or may not apply to our wastewater treatment ponds.

Section 3005 (j)(i) requires that surface impoundments shall not receive, store or treat hazardous wastes after November 8, 1988 unless such surface impoundment is in compliance with section 3004 (0)(1)(A). That section of the regulations requires the installation of two or more liners and a leachate collection system between such liners. However, section (3) of 3005 (j) indicates that paragraph (1) (the double lining requirement) shall not apply to any surface impoundment which contains treated wastewater during the secondary or subsequent phases of aggressive biological treatment subject to a permit issued under section 402 of the Clean Water Act and is in compliance with generally applicable groundwater monitoring requirements.

Total Petroleum Inc. questions whether the above regulations apply to our waste water treatment ponds and we are submitting evidence which demonstrates that those ponds do not treat hazardous wastes. We are also submitting information supporting our eligibility for an exemption from the double lining requirements because aggressive biological treatment and subsequent phases of that treatment is being conducted in those ponds. In addition, the effluent from those ponds is subject to a permit issued under section 402 of the Clean Water Act and groundwater monitoring being conducted around them.

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NOV 10 1986
HAZARDOUS WASTE DIV.

HAZARDOUS WASTE ARE NOT BEING TREATED

Exhibit 1 contains a letter from the USEPA stating that the waste water stream leaving our API separator and passing through the other waste water treatment units is not subject to regulation, unless the other return flows are found to be hazardous wastes. The other return flows specified in that letter are the return flow from the land treatment unit and the return flow from the centrifuge. Also included with Exhibit 1 is a copy of a USEPA memo. It provides guidance on how the agency will apply the "mixture" and "derived from" rules for refinery wastewaters.

Exhibit 2 is a tabulation of the concentrations of Appendix VIII constituents found in samples of the water and oil that flows to our API separator. Two of the columns provide information on the concentrations of constituents in the influent to the separator. The water portion and the free oil portion of this influent were analyzed separately and are listed separately. The result of the analysis that has been done on the returned water from both the land treatment facility and the centrifuge are also given in this data. In every case the quality of the returned waters were similar in composition and not significantly higher in concentration that the API influent water. When the entire influent to the API separator is considered, which would include the free oil portion, it becomes obvious that the quality of the returned water is better than the quality of the API separator influent.

Based upon the above analysis results we are submitting a revised part A application. A copy of that application is included as Exhibit 3 of this submittal.

Exhibit 4 are tabulations of the analysis that we have done on the sludges in our waste water ponds and our analysis of the influent and effluent waters of the ponds. The sludge data include the analysis results of samples of sludges that have settled at the bottom of the ponds and sludges that occasionally float on the surface.

These data demonstrate that none of the sludges exhibit hazardous waste features. In addition the influent to and the effluent waters from these ponds do not exhibit hazardous waste features. Therefore, we believe that it would be illogical to conclude that these ponds are hazardous waste treatment facilities.

CERTIFICATION

Exhibit 5 is a Certification letter from Walter W. Meinert P.E. stating that he has reviewed information concerning the impact that our wastewater ponds are having on the environment. He has concluded that the facility will comply with the requirements section 3005 (j)(3) of the 1984 RCRA amendments.

PART OF AN AGGRESSIVE BIOLOGICAL TREATMENT SYSTEM

Exhibit 6 shows a plan view of the waste water treatment system. Pond 2 of the seven pond, flow through system, is the major biological treatment basin and there are six fifteen-horsepower (90 H.P. total) floating aerators in this pond. The five ponds downstream of pond 2 each have subsurface aeration as shown in Exhibit 5. In addition, aeration has been installed in each of the No.1 flow through ponds and the No.1 standby pond.

The normal daily process flow rate through these ponds varies between 300,000 gallons per day and 540,000 gallons per day. The volume of the No. 1 flow through pond is approximately 1,048,000 gallons, therefore, the retention time in this pond under normal conditions varies between 1.9 days and 3.5 days.

The standby ponds are used to allow testing and possible treatment of water (containing high levels of pollutants such as high $BOD_5$ or $NH_3$) which may upset the biological activity of the flow through system. After testing and any necessary preliminary treatment, of any water in the standby ponds, it is pumped at a controlled rate into the No. 1 pond of the flow through system. This pumping is done soon after any water enters the standby system so that a low volume is maintained in it and, therefore, sufficient standby volume will be available if it is needed.

Exhibit 7 provides our monthly operating reports covering October 1985 through September of 1986. These reports have been submitted to the Michigan Department of Natural Resources. These data show that the NPDES permit limits are being complied with; except in May of 1986 when a significant amount of algae grew in the ponds: followed by a rain storm which flushed that algae out the effluent. The combination of increased storm water and algae resulted in a monthly average of total suspended solids (TSS) in the effluent that exceeded the allowable monthly average.

The following data summarizes the average pounds per day of total suspended solids (TSS) and Biological Oxygen Demand ($BOD_5$) in both the pond influent and effluent for the months of October 1985 through September 1986.

Average Pounds Per Day

| | TSS | | $BOD_5$ | |
|---|---|---|---|---|
| | Influent | Effluent | Influent | Effluent |
| October 1985 | 334 | 61 | 598 | 42 |
| November 1985 | 434 | 91 | 910 | 63 |
| December 1985 | 424 | 64 | 731 | 58 |
| January 1986 | 797 | 61 | 1,204 | 115 |
| February 1986 | 594 | 79 | 1,278 | 109 |
| March 1986 | 1,528 | 119 | 1,278 | 187 |
| April 1986 | 291 | 112 | 708 | 73 |
| May 1986* | 189 | 263 | 1,166 | 103 |
| June 1986* | 191 | 155 | 1,222 | 70 |
| July 1986* | 121 | 174 | 971 | 68 |
| August 1986* | 913 | 292 | 1,149 | 83 |
| September 1986* | 974 | 262 | 940 | 116 |

*Warm months when algae growth contributed to effluent TSS.

These data provide an indication in the difference in magnitude between the pond influent and effluent TSS and $BOD_5$. However, under normal conditions there is in the range of 30 days retention time in the entire system, therefore, a direct comparison of the same months influent and effluent data is not possible.

These data demonstrate that if there is no significant algae growth in the downstream ponds the waste water treatment pond system is achieving significant reductions in the Biological Oxygen Demand and total suspended solids (TSS). The water treatment process reductions in TSS during the warmer months are sometimes offset by algae growth. These algae, which are not related to the refinery process, increase the effluent TSS but they should not enter into an evaluation of the effectiveness of the wastewater system in reducing refinery generated TSS.

Exhibit 8 is a copy of the current NPDES permit which establishes limits for the effluent from these ponds. Included with that permit is a copy of Public Notice Fact Sheets that were issued by the Michigan Department of Natural Resources when they were proposing to issue the permit. The last paragraph of the second page of those sheets states that the effluent limitation contained in the proposed permit are based upon applicable guidance materials or engineering judgement reflecting "best practicable control technology currently available", "best available technology economically achievable" or "best conventional pollutant control technology", and the State Water Resources Commission Act, as amended, and the Water Quality Standards promulgated thereunder, whichever is the most restrictive.

TOXIC POLLUTANTS

As part of our NPDES permit requirements the pond effluent is being monitored for phenol, hexavalent chromium, total chromium and benzene. These are the more toxic pollutants that the Michigan DNR has concluded were more likely to be present in the influent and effluent of the ponds.

The one year of monitoring data included in Exhibit 7 demonstrates that the treatment system is achieving phenol levels that are in the range of 1/25 to 1/50 of the permitted limit.

There was only one day in the past year when a detectable concentration of hexavalent chromium was measured in the pond effluent. On that day a concentration .006 mg/L was measured, whereas the detection limit is .005/mg/L. Also, no detectable levels of total chromium was measured in the pond effluent during that 12-month period. These data have demonstrated that the levels of hexavalent chromium and total chromium in the pond effluent are well within the permitted limits.

The NPDES permit requires that we monitor the pond effluent for benzene twice per month until April 1, 1988. At that time we must begin monitoring for benzene once per week. The permit stipulates an effluent limit of .300 mg/L, however, if any analysis exceeds .050 mg/L we must begin analyzing for benzene on a weekly basis, plus investigate and report the possible cause of each excursion exceeding .050 mg/L. We must also report the steps that have been taken or are planned to reduce, eliminate or prevent a recurrance.

The monitoring that has been done, since we began monitoring for benzene on a twice per month schedule has shown one detectable concentration in the effluent. On that occasion .048 mg/L of benzene was measured. All of the other samples have not exceeded the detection limit of .001 mg/L.

The Michigan DNR and the United States Environmental Protection Agency have on several occasions conducted studies of the effluent from the Total Petroleum, Inc. wastewater ponds. The reports covering the more recent studies are provided in Exhibit 9. The following results were taken from those reports.

June 2-3, 1980 - Michigan DNR

| | mg/L |
|---|---|
| Free Cyanide | <.005 |
| Total Cyanide | <.005 |
| Total Cadmium | <.02 |
| Total Chromium | <.05 |
| Total Copper | <.02 |
| Total Nickel | .07 |
| Total Lead | <.05 |
| Total Zinc | <.05 |
| Total Cobalt | <.05 |
| PCB Aroclor 1242 | <.0001 |
| PCB Aroclor 1254 | <.0001 |
| PCB Aroclor 1260 | .00087 |
| Benzene | <.050 |
| Ethyl Dibromide | <.010 |
| Dichloropropane | <.200 |

Skinner Sherman Laboratories

These analyses were done to follow up the 1980 DNR PCB results.

| | | mg/L |
|---|---|---|
| 3/23/81 | PCB's calculated as Aroclor 1260 | <.0001 |
| 6/10/81 | PCB's calculated as Aroclor 1242 and 1260 | <.00025 |
| 7/20/81 | PCB's calculated as Aroclor 1242 and 1254 | <.0001 |

March 7-8, 1983 Michigan DNR

| | mg/L |
|---|---|
| Total Cyanide | .005 |
| Total Cadmium | .0002 |
| Total Chromium | .100 |
| Total Copper | .025 |
| Total Nickel | <.050 |
| Total Lead | <.050 |
| Total Zinc | <.050 |
| PCB scan | <.0001 |

July 17-18, 1984 USEPA

| | mg/L |
|---|---|
| Total Cyanide | .005 |
| Mercury | <.1 |
| Total Barium | .0731 |
| Total Beryllium | <.001 |
| Total Cadmium | <.002 |
| Total Chromium | .0134 |
| Hex. Chromium | <.005 |
| Total Copper | <.006 |
| Total Lead | <.070 |
| Total Zinc | <.050 |
| Total Arsenic | <.019 |
| Total Antimony | .0062 |
| PCB's | |
| Aroclor 1242 | <.0014 |
| Aroclor 1248 | <.0004 |
| Aroclor 1254 | <.0001 |
| Aroclor 1260 | <.0001 |

October 1-2, 1985 Michigan DNR

| | mg/L |
|---|---|
| Total Cadmium | <.020 |
| Total Chromium | <.050 |
| Hexavalent Chromium | <.005 |
| Total Copper | <.020 |
| Total Lead | <.050 |
| Total Zinc | .090 |
| PCB's | |
| Aroclor 1242 | <.0001 |
| Aroclor 1254 | <.0001 |
| Aroclor 1260 | <.0001 |

Those data demonstrated that toxic pollutants are not being found in the effluent from the Total Petroleum, Inc. waste water treatment ponds. One unconfirmed detectable concentration of PCB's was measured, however, additional sampling has shown no evidence of PCB's.

GROUNDWATER MONITORING

Exhibit 10 provides several items regarding the groundwater monitoring that is being conducted at the Total Petroleum, Inc. waste water treatment ponds.

1. Potentiometric contour maps for the first two quarters of monitoring.

2. Indicator Parameter Monitoring data for pH, conductivity, total organic carbon and total organic haledes.

3. Monitoring data for each well for the drinking water parameters, groundwater quality parameters and groundwater contamination parameters.

4. An anion/cation balance tabulation sheet. Although, a full year's data is not yet available, the first two quarters of data indicate that the conductivity in Well No. 34 exceeds the background concentrations. The anion/cation balance calculations show that sodium chloride is primarily responsible for the higher than background conductivity concentrations and that the compounds responsible for the elevated conductivity levels have been accounted for.

If you have any questions concerning this request and the information that is being submitted please contact us.

Sincerely,

Benjamin E. White

Benjamin E. White

BEW:djw

March 9, 1983

Mr. Benjamin K. White, P.E.
Total Petroleum Incorporated
East Superior Street
Alma, Michigan 48801

Dear Mr. White:

In accordance with Specific Condition 4.D of your permit for the Alma land treatment facility, we have selected the following deep aquifer parameters to be analyzed for on a semi-annual basis:

| | |
|---|---|
| Cadmium | Zinc |
| Chloride | Total Organic Carbons |
| Lead | pH |
| Copper | Chromium |
| Nickel | |

If you have questions regarding this sampling program, please contact Rick Lundgren at (517) 322-1687.

Sincerely,

Delbert Rector, Chief
Hazardous Waste Division

TJN:ej

cc: A. Howard/J. Fore
R. Lundgren
File

## HYDROGEOLOGICAL AND WATER QUALITY EVALUATION

The general area of land treatment area consists of glacial lake deposits. These deposits consist of interbedded sandy to silty clays and sands. A thin shallow aquifer exists which was an important source of water to domestic wells prior to the development of the Alma municipal water supply system. This is the upper most aquifer beneath the facility. It ranges from 5-15 feet in thickness. Beneath this sand are clayey lake sediments. This clay has been called a "leaky aquaclude." It ranges in thickness from 10 to 50+ feet. Below this unit is an outwash aquifer which consists of interbedded layers of permeable sediments with lenses of silty or clayey sands of relatively low permeability. This unit ranges in thickness from 50 to 75 feet. The uppermost aquifer appears to pinch out in spots. It does not appear that the westerly or easterly extent of this aquifer has been adequately delineated.

The facility is now in groundwater assessment due to statistically significant increases in specific conductance and TOC. Elevated levels of sodium and chloride account for the conductivity increase. The TOC increase has been more difficult to explain. Numerous analyses have been run at different laboratories with the conclusion being that the majority of the constituents accounting for the TOC are napthenic acids with lesser amounts of thiophenic sulfones and aliphatic alchohols. These are oxidation products of napthenes and thiaphene which are constituents of weathered petroleum.

The company has reported that no hazardous constituents have been found in the site's groundwater. This conclusion is based on the lack of an increase in chromium and lead (major constituents for listing their waste - K049, K051 and K052). However, phenols have been shown to be present above background concentrations in MW-19, MW-21 and MW-30.

The company has submitted plans for closure of the land treatment facility, as well as corrective action to address the groundwater contamination. The corrective action is proposed only for the land treatment facility and to capture water at the facility boundary. No specifics have been proposed to date. TOC and conductivity values continue to be elevated well downgradient of the boundary, however, and may or may not be due to activities at the hazardous waste management unit. Other potential sources include the refinery and tank farm.

Split sampling by MDNR on May 22, 1986, showed the presence of 1,2-Dichloroethane in MW-15. The presence or absence of this compound should be confirmed by the company.

Additional work needed at the site include: determination of the degree of or lack of interconnection between the surficial aquifer and the lower outwash aquifer; further delination of the easterly and westerly extent of the upper-most aquifer; and further work to define whether the elevated TOC and conductivity values found in the tank farm area are part of the plume from the land treatment area or due to other sources.

as many of the organic constituents as possible. In addition to repeating some of the analyses conducted previously, the program included infrared spectrophotometric analysis, high performance liquid chromatographic (HPLC) analysis, and solvent extraction procedures designed to extract the more polar constituents.

## SUMMARY

Samples of water taken from a well at the Total Petroleum landfarming site were collected by Total Petroleum personnel and submitted to Battelle for analyses. The analyses included direct analysis of the samples as well as solvent extraction and analysis of the extracts. Three different solvent extracts, a methylene chloride basic extract, a methylene chloride acidic extract, and an ethyl ether acidic extract, were analyzed. The analyses applied to the water and the solvent extracts included the determination of total organic carbon, volatile acids, purgeable components, solvent-extractable residue weights, gas chromatographic profiles, HPLC profiles, and infrared spectra.

The results obtained indicate that the majority of the organic material present is a mixture of naphthenic acids in which there are several carboxyl groups on each molecule. Lesser amounts of thiophenic sulfones and aliphatic alcohols may also be present.

## EXPERIMENTAL STUDIES

Wellwater samples were collected by Total Petroleum in two different types of sample containers. Forty-milliliter glass vials having a screw cap with a Teflon-lined silicone rubber insert were used for samples analyzed for purgeable components. The containers were filled completely full without any air bubbles and stored in an inverted position. Half-gallon wide-mouth glass bottles with Teflon-lined screw caps were used for the water required for all other samples.

The containers were provided by Battelle and were heated in an oven at 450°C to remove any potential contamination prior to being shipped to Total Petroleum. The samples were packed in ice for shipment to Battelle and were stored in a refrigerator at 0-5°C until analyzed.

The analyses involved direct analysis of the samples as well as solvent extraction and analysis of the extracts. The direct analyses included the determination of total organic carbon, volatile acids, purgeable components, and reverse phase HPLC profile of UV-absorbing components. The analyses of extracts included the determination of residue weight, gas chromatographic profile, infrared spectrum, and HPLC profile of UV-absorbing components.

## Direct Analyses

### Total Organic Carbon

The total organic carbon (TOC) contents of a water sample taken from one of the half-gallon containers and a sample taken from one of the 40-mL vials were determined using an O.I. Corp. Model 524C analyzer. The TOC contents found for the two samples were 58 and 44 ppm, respectively.

### Volatile Acids

The two water samples described above were analyzed by gas chromatography using a flame ionization detector and a 1 m x 4 mm I.D. glass column packed with 60-80 mesh Carbopack C coated with 0.3% Carbowax 20 M and 0.1% phosphoric acid and maintained at 80°C. The samples were acidified with phosphoric acid, treated with sodium chloride to give a 20% solution, and purged with nitrogen for four minutes prior to the analysis to decrease interferences and increase the sensitivity of the method. The detection limit of the method for determining acetic acid and propionic acid is 5 ppm. Neither acid was detected in the two samples.

## Purgeable Compounds

A water sample contained in a septum-capped glass vial was analyzed by EPA Methods 601 and 602. These methods involve a purge-trap-desorb procedure and gas chromatographic analysis. Method 601 involves the use of a Hall electrolytic conductivity detector for the determination of halocarbons and Method 602 involves the use of a photoionization detector for the determination of aromatic hydrocarbons. No halocarbons or aromatic hydrocarbons were detected in the sample at levels above 0.005 ppm.

## UV-Absorbing Compounds

The water was analyzed by reverse phase high performance liquid chromatography (HPLC) by injecting a 10 ul sample onto a 250 x 4.6 mm duPont Zorbax-ODS column and using gradient elution with an initial mobile phase of 50:50 acetonitrile: 0.1% $H_3PO_4$ in water changing to 100% acetonitrile over a 20-minute period. The flow rate was 1 mL/min and the column temperature was 21°C. The detector used was an ultraviolet detector set at 254 nm. The HPLC chromatogram obtained is shown in Figure 1. Most of the UV-absorbing material eluted within 5 minutes indicating that the material is quite polar. Hydrocarbon components would not elute until after 10 to 15 minutes.

## Solvent Extraction

Four different solvent extraction procedures were applied to the sample. A methylene chloride acidic extract was obtained by adjusting the pH of a one-liter sample to pH 2 by the addition of 18N $H_2SO_4$, extracting with three 60-mL portions of methylene chloride, and concentrating the combined extracts to 1 mL using a Kuderna-Danish apparatus. A methylene chloride basic extract was obtained similarly except that the pH was adjusted to pH 12 by the addition of 10N sodium hydroxide. An ethyl ether acidic extract was obtained by the same

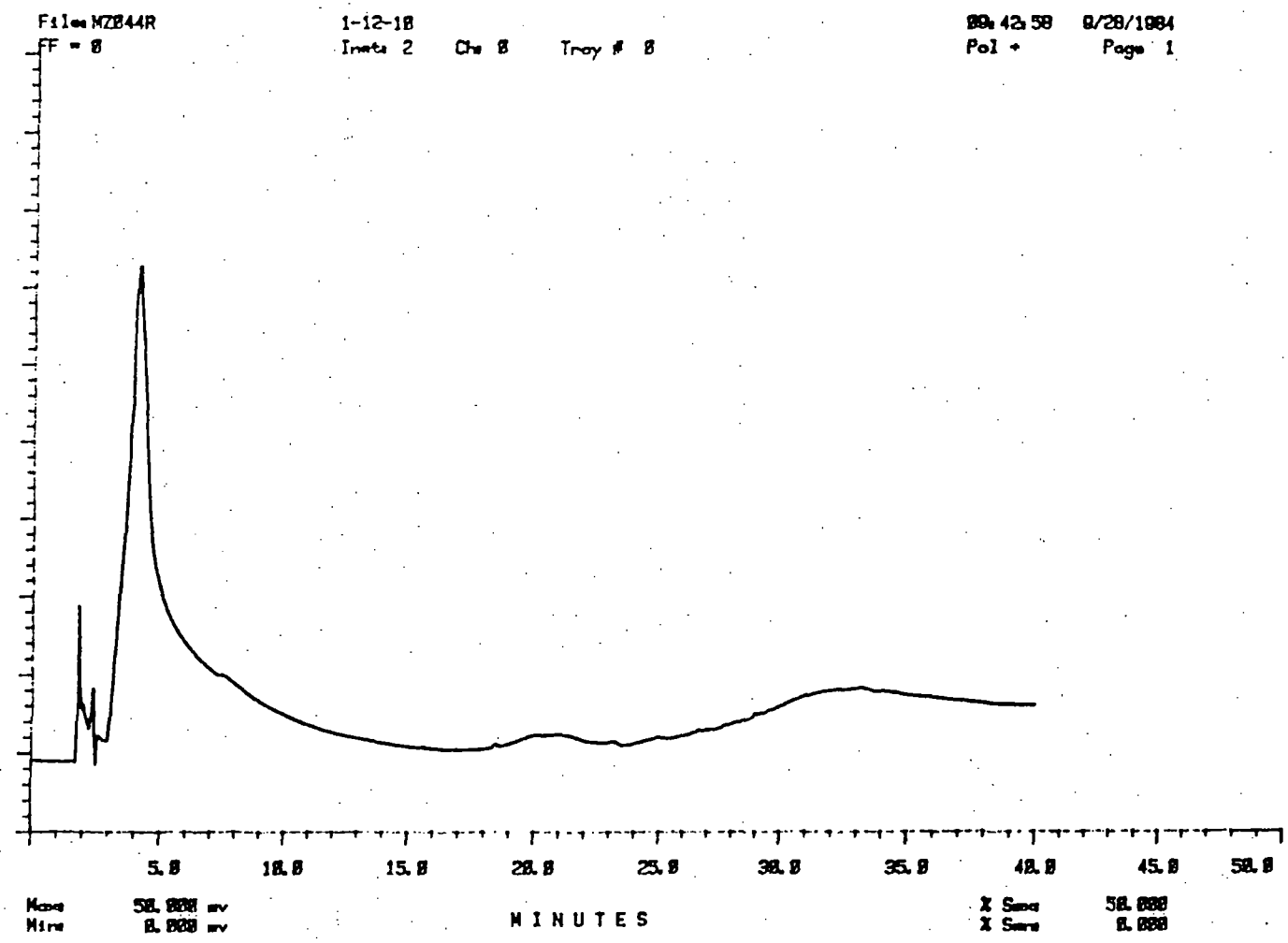



FIGURE 1. HPLC-UV CHROMATOGRAM OF SAMPLE NO. 1-12.

procedure used for obtaining the methylene chloride acidic extract except that the sample was salted by dissolving 300g of sodium chloride in a one-liter sample and ethyl ether was used as the extraction solvent. A dehydration-ethyl ether extract was obtained by adjusting the pH of a 100-mL sample to pH 10, concentrating to 5 mL at reduced pressure in a rotating evaporator, acidifying to pH 5, mixing with ethyl ether and anydrous magnesium sulfate, and concentrating the ether extract to 1 mL.

## Analysis of Solvent Extracts

### Residue Weight Determinations

The amount of semivolatile or nonvolatile material present in each extract was determined by placing 0.1 mL of the extract in a small aluminum foil dish, evaporating the solvent under controlled conditions, and weighing the residue on a microbalance. The residue weight data obtained are presented in Table 1. The low residue weight obtained for the dehydration-ethyl ether extract relative to that obtained for the ethyl ether acidic extract indicated that major amounts of material were lost during the processing, probably during the aqueous concentration step. A much higher recovery could probably be obtained by eliminating this step. However, since the residue weight of the ethyl ether acidic extract accounted for the majority of the total organic carbon content of the sample, no additional effort was made to improve the recovery of the dehydration-ethyl ether extraction process or to characterize the dehydration-ethyl ether extract.

### Gas Chromatographic Analysis

Each of the concentrated extracts obtained was analyzed by gas chromatography using a 50 m x 0.25 mm I.D. DB-5 fused silica capillary column, a column oven temperature programmed from 80 to 300°C at 8°C/minute, and a flame ionization detector. Representative gas chromatograms obtained are given in Figures 2-5.

TABLE 1. RESIDUE WEIGHT DATA

| Type of Extract | Residue Weight, mg per liter of water |
|---|---|
| Methylene chloride acidic | 17 |
| Blank methylene chloride acidic | <0.2 |
| Methylene chloride basic, rep. 1 | 0.6 |
| Methylene chloride basic, rep. 2 | 2.5 |
| Ethyl ether acidic, rep. 1 | 31 |
| Ethyl ether acidic, rep. 2 | 50 |
| Ethyl ether acidic, rep. 3 | 39 |
| Ethyl ether acidic, rep. 4 | 36 |
| Blank ethyl ether acidic | 0.3 |
| Dehydration-ethyl ether | 2.5 |

The gas chromatogram in Figure 2 shows the profile of neutral and basic compounds present in the methylene chloride basic extract. A comparison of Figure 2 with Figure 3 shows that the components present in the methylene chloride basic extract are also present in the acidic extract, indicating that these components are neutral rather than basic. The comparison also shows that the methylene chloride acidic extract contains a broad envelope of unresolved components that are not present in the basic extract, indicating that these unresolved components are acidic rather than neutral. The broad envelope of components is indicative of naphthenic acids. Figure 4 shows that the larger amount of material obtained in ethyl ether acidic extract represents a greater recovery of the same unresolved acidic components that were obtained in the methylene chloride acidic extract.

The chromatograms from all three extracts indicate the presence of a major component having a retention time of about 10.7 minutes. It is very likely that this component is some artifact introduced during sampling and processing instead of being a component of the landfarming leachate. However, as indicated by Figure 5, the chromatogram obtained from a methylene chloride acidic extraction process blank, the component was not introduced during the extraction process. It may be possible to identify the component by combined gas chromatography-mass spectrometry and thereby gain some insight concerning the source of the component.

## Infrared Analysis

Each of the concentrated extracts was analyzed by infrared spectrophotometry using a Perkin Elmer Model 521 infrared spectrophotometer. The sample was introduced by placing several drops of the extract onto a KBr plate, allowing the solvent to evaporate, placing a second KBr plate on top of the residue, and placing the KBr plates in the light path of the spectrophotometer. The infrared absorbance was scanned from 3800 to 600 $cm^{-1}$.

The infrared spectrum obtained for the methylene chloride acidic extract is shown in Figure 6. The strong carbonyl absorption at 1700

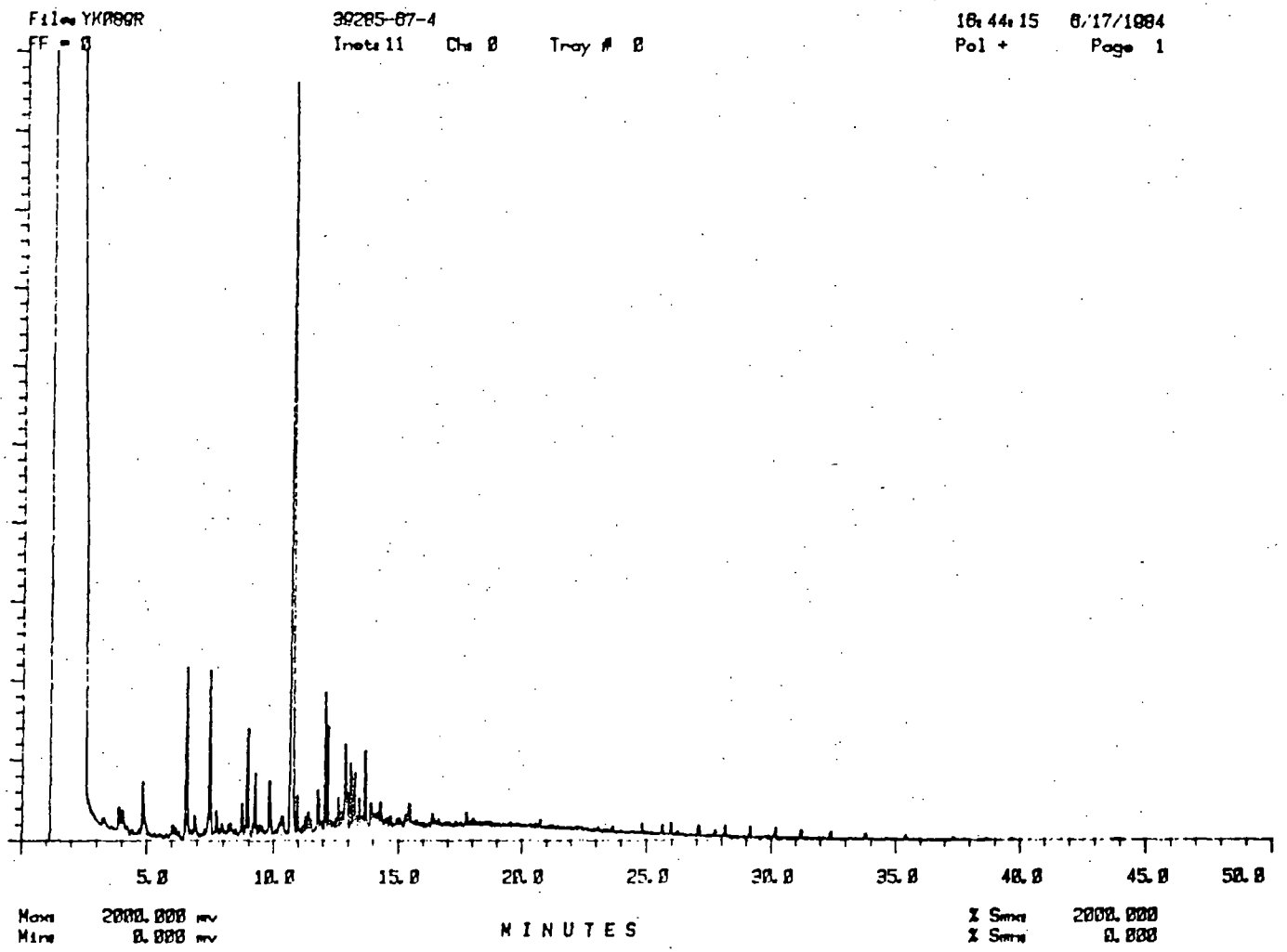



FIGURE 2. GAS CHROMATOGRAM OF METHYLENE CHLORIDE BASIC EXTRACT FROM SAMPLE NO. 1-12.

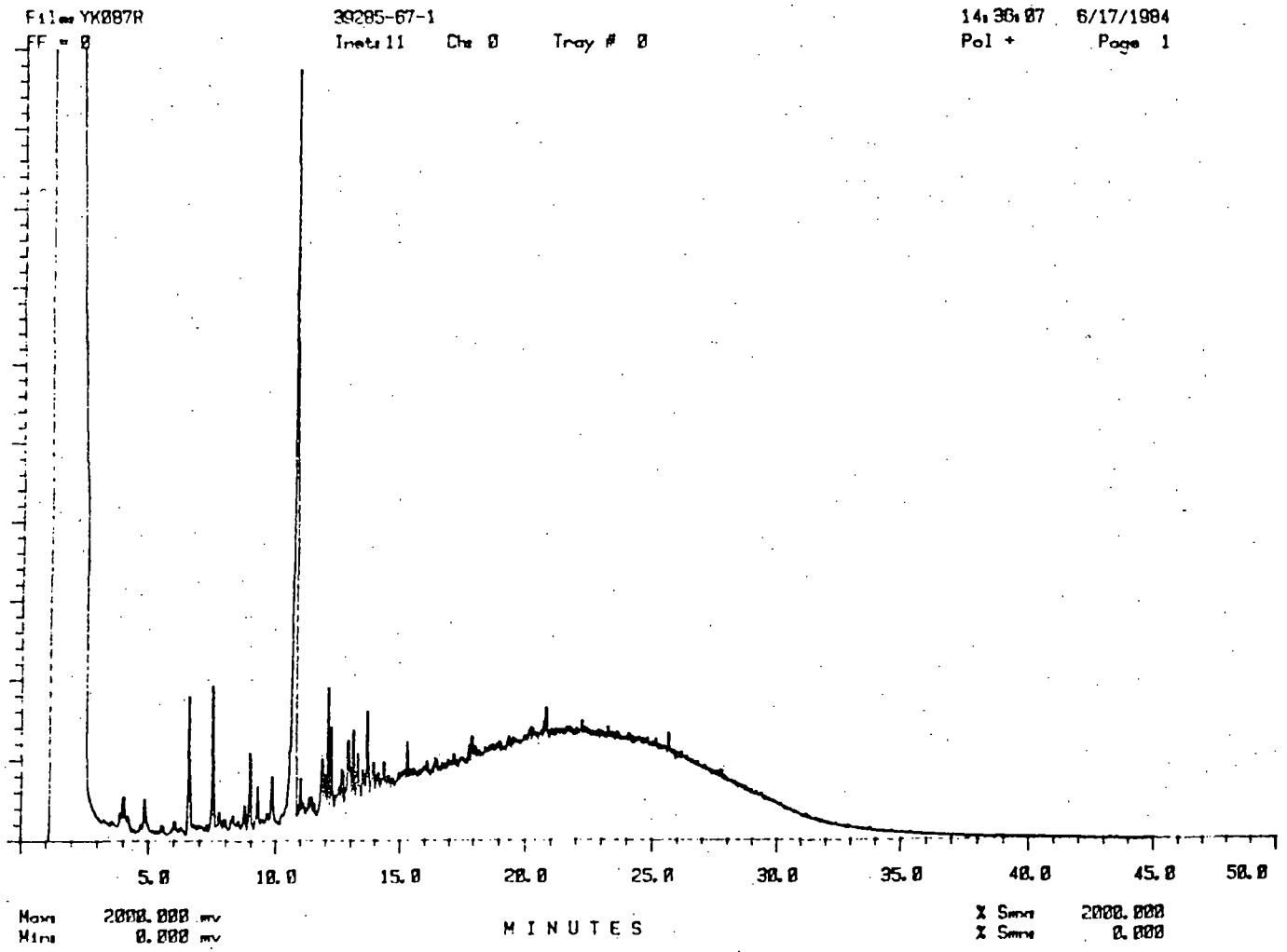



FIGURE 3. GAS CHROMATOGRAM OF THE METHYLENE CHLORIDE ACIDIC EXTRACT FROM SAMPLE NO. 1-12.

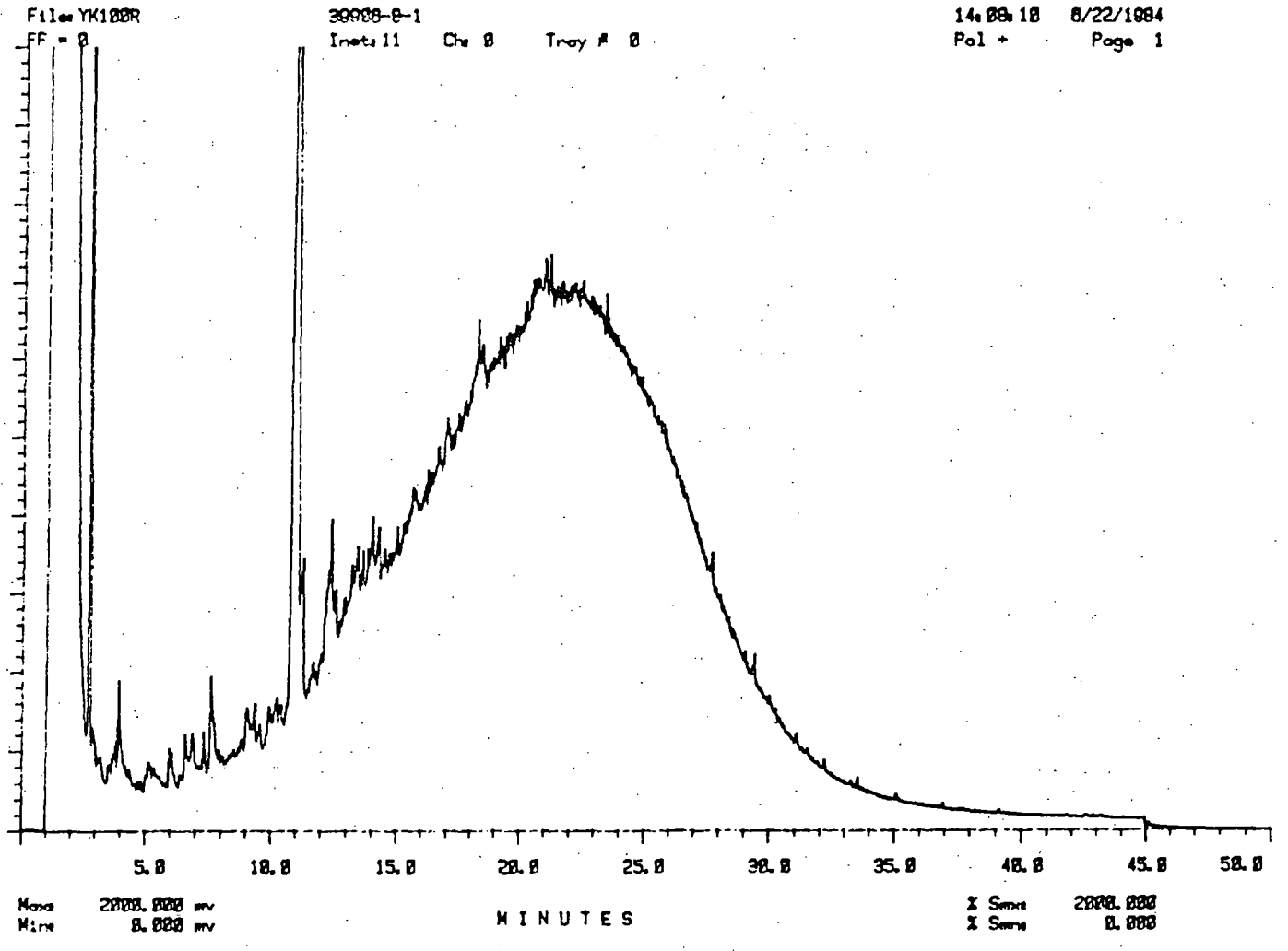



FIGURE 4. GAS CHROMATOGRAM OF THE ETHYL ETHER ACIDIC EXTRACT FROM SAMPLE NO. 1-12.

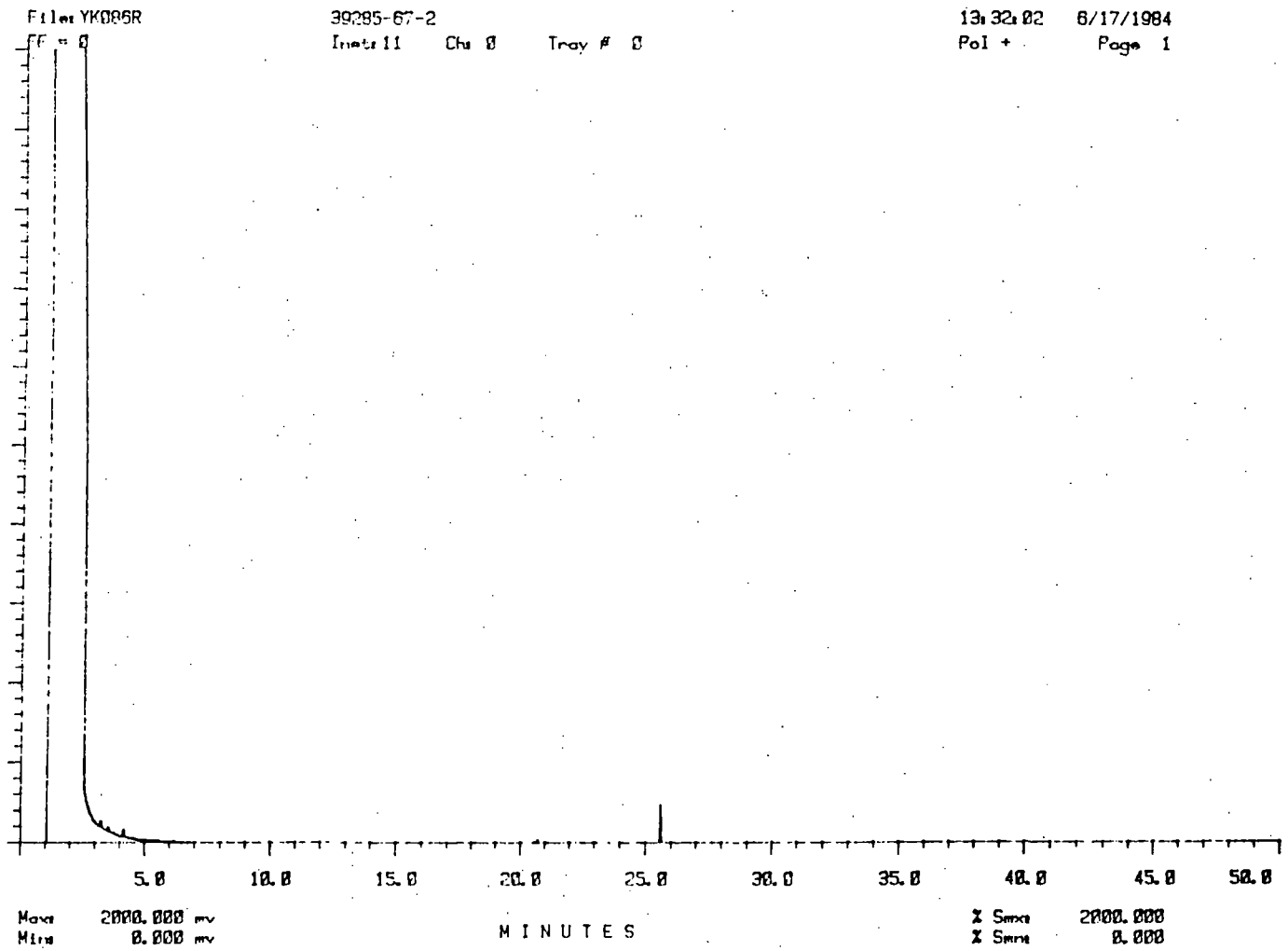



FIGURE 5. GAS CHROMATOGRAM OF THE METHYLENE CHLORIDE ACIDIC EXTRACT FROM A PROCESS BLANK.

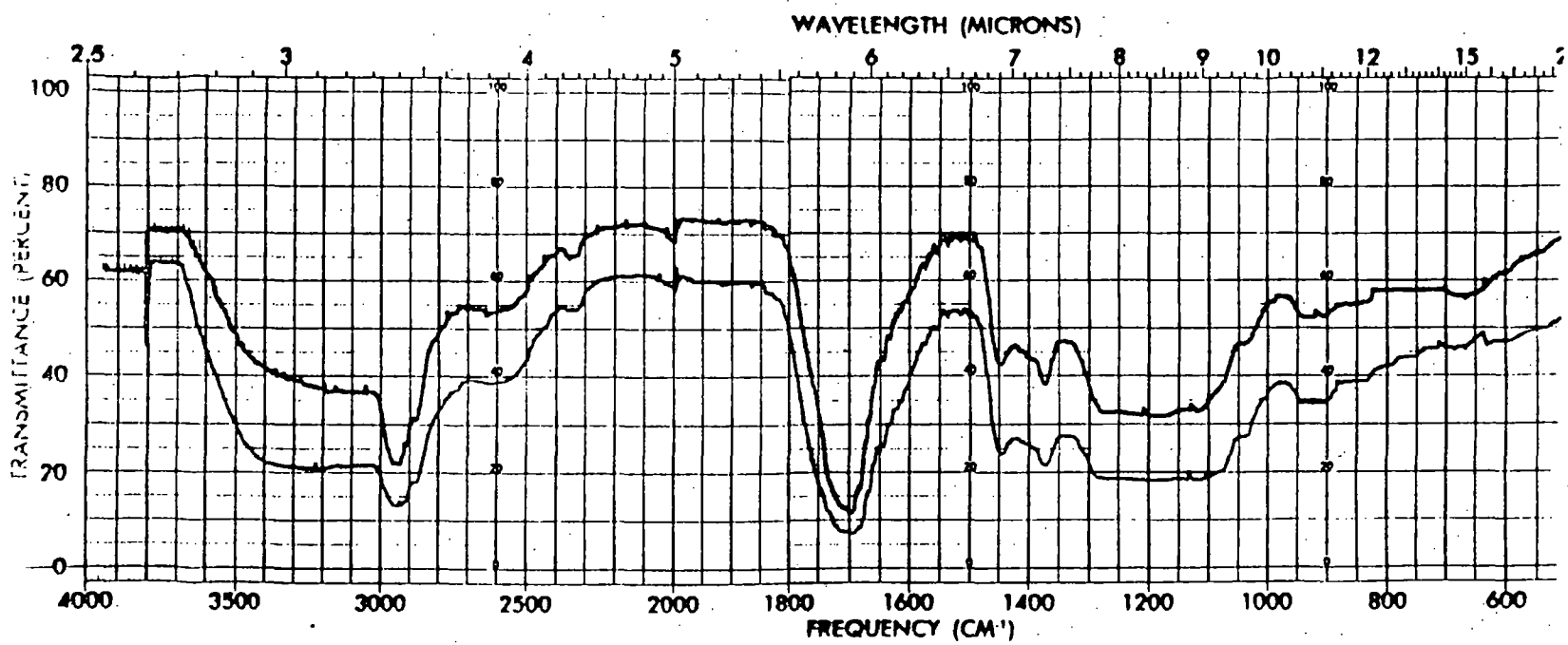



FIGURE 6. INFRARED SPECTRUM OF METHYLENE CHLORIDE ACIDIC EXTRACT FROM SAMPLE NO. 1-12.

$cm^{-1}$, along with a broad absorption at 3500-2500 $cm^{-1}$ resulting from the -OH of the carboxyl group and hydrogen bonding of acid dimers, and strong absorption at 1300-1200 $cm^{-1}$ resulting from the carbon-oxygen bond stretching vibration, indicate that the components are primarily carboxylic acids. There is no indication of any significant amount of aromatic components. The ratio of the carbonyl absorption at 1700 $cm^{-1}$ and the methylene absorption at 2940 $cm^{-1}$ indicates that there is one carboxyl group for every 6 to 8 methylene groups. This combination is indicative of naphthenic acids having at least two carboxyl groups per molecule. The infrared spectrum of the ethyl ether acidic extract, shown in Figure 7, is essentially identical to that of the methylene chloride acidic extract.

The infrared spectrum of the methylene chloride basic extract is quite different from that of the acidic extract. The spectrum is shown in Figure 8. The pair of absorption bands at 1100 $cm^{-1}$ and 1280 $cm^{-1}$ indicates a sulfone structure. There is also some unsaturation present as indicated by the absorption at 3050 $cm^{-1}$ and 1640 $cm^{-1}$. The unsaturation and sulfone structure indicate the presence of thiophenic sulfones derived from the sulfur-containing components of petroleum. The absorption at 2960 $cm^{-1}$, 3480 $cm^{-1}$, 1450 $cm^{-1}$, and 1370 $cm^{-1}$ are indicative of aliphatic carbon-hydrogen bonds, hydroxyl groups, methylene groups, and methyl groups, respectively. These spectral features indicate the presence of aliphatic alcohols.

## HPLC Analysis

Each extract was analyzed by HPLC analysis using the same conditions that were used for the direct analysis of the water. The acidic extracts gave only early eluting components, as were found in the direct analysis of the water, indicating that the components are highly polar. An HPLC chromatogram obtained from the ethyl ether acidic extract is given in Figure 9. The basic extract did not contain any significant amount of UV-absorbing material.

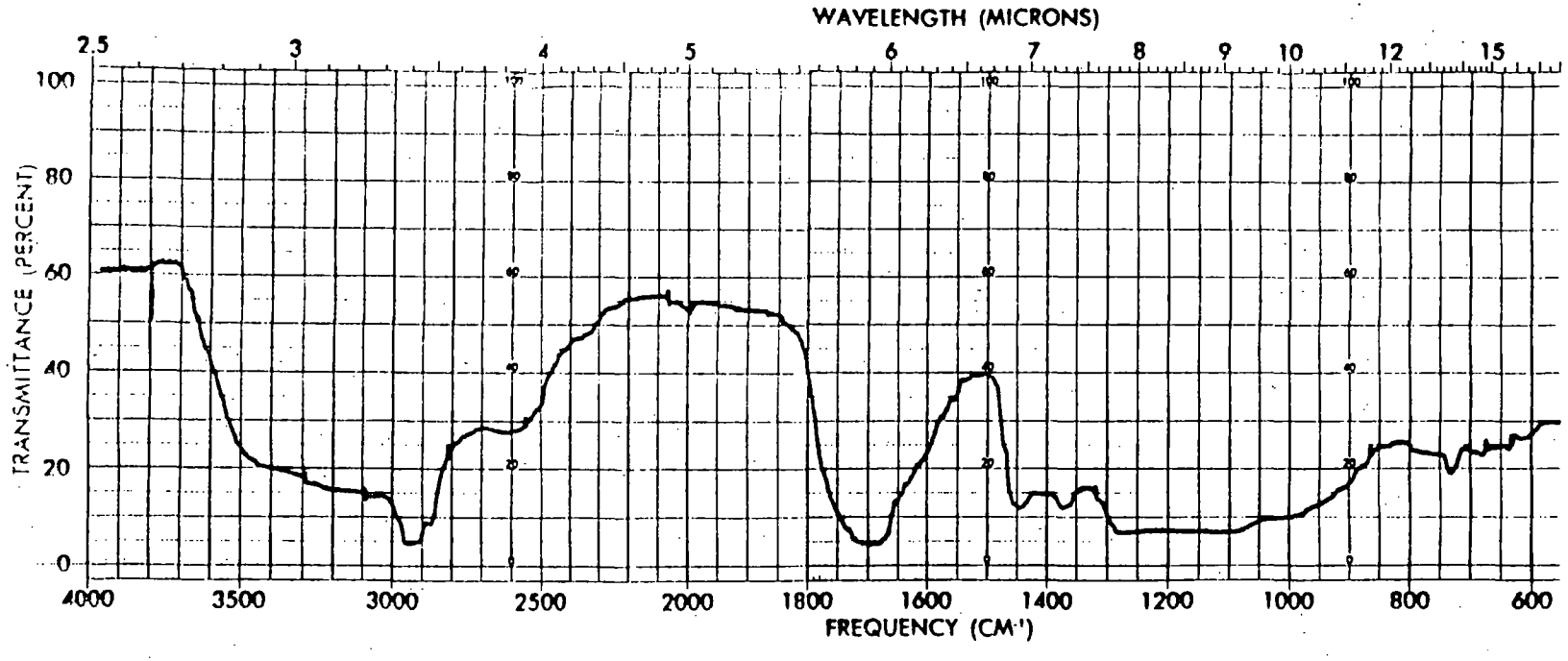



FIGURE 7. INFRARED SPECTRUM FROM ETHYL ETHER ACIDIC EXTRACT FROM SAMPLE NO. 1-12.

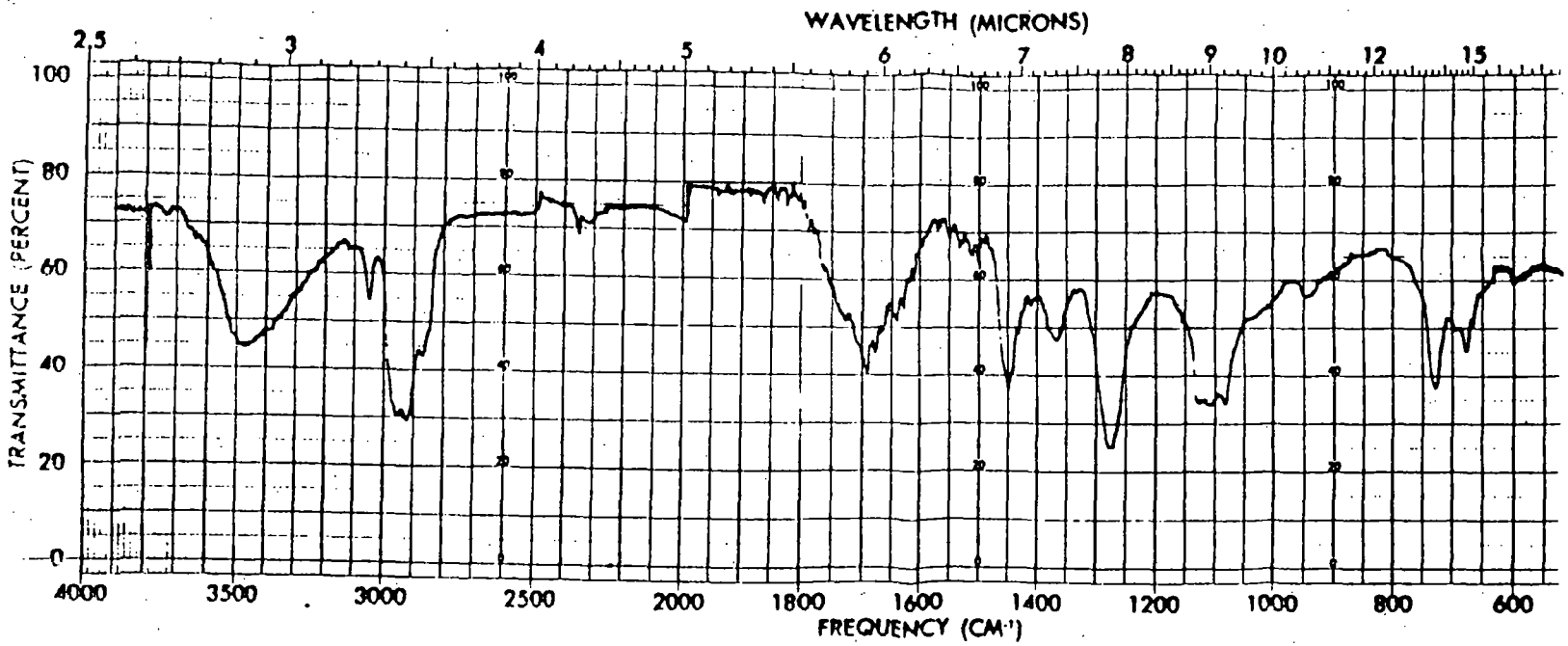



FIGURE 8. INFRARED SPECTRUM OF THE METHYLENE CHLORIDE BASIC EXTRACT FROM SAMPLE NO. 1-12.

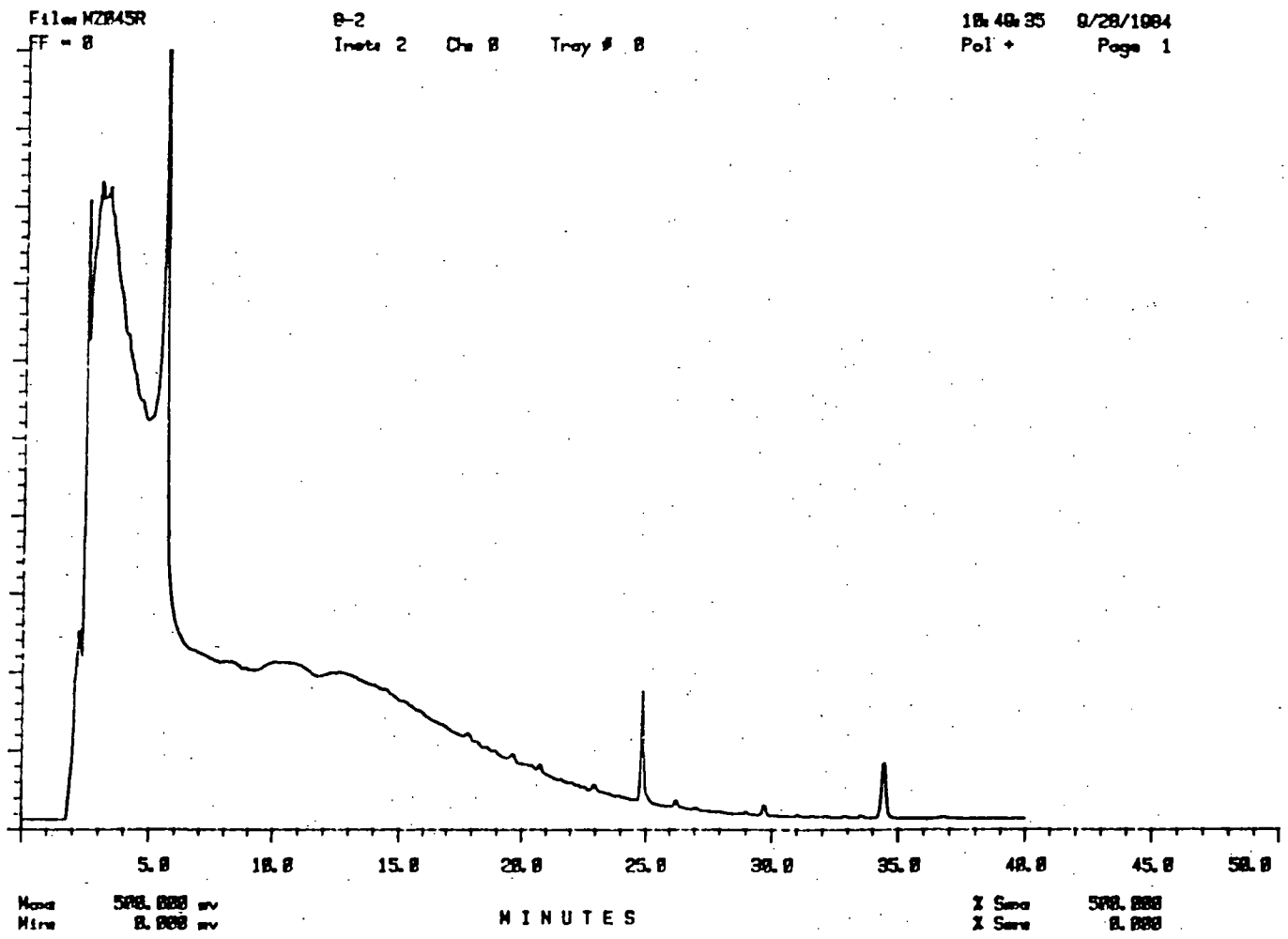



FIGURE 9. HPLC-UV CHROMATOGRAM OF ETHYL ETHER ACIDIC EXTRACT FROM SAMPLE NO. 1-12.

## CONCLUSIONS

The results obtained indicate that the majority of the organic material present in the wellwater sample is a mixture of naphthenic acids in which there are several carboxyl groups on each molecule. This conclusion is based on the following information: (1) the residue weight data show that the majority of the organic material present can be extracted from the water by solvent only if the sample is acidified to decrease the water solubility of acids, salted to decrease the water solubility of polar compounds, and extracted with an oxygenated solvent, ethyl ether, to promote the extractability of polar oxygenated components; (2) the gas chromatograms show that a broad unresolved envelope of compounds similar to that obtained from petroleum naphthenic compounds is obtained under acidic conditions but not under basic conditions and is obtained at a higher level when the sample is salted and extracted with an oxygenated solvent; (2) the infrared spectra of the acidic extracts indicate an overwhelming predominance of saturated carboxylic acids in which there is one carboxyl group for every 6 to 8 methylene groups; and (4) the HPLC profile of the unextracted water, as well as that of the acidic extract, indicates the predominance of early eluting and, therefore, highly polar components, such as dicarboxylic acids.

There also appear to be minor amounts of thiophenic sulfones and aliphatic alcohols present. This conclusion is based on (1) the infrared spectrum of the basic extract and (2) the gas chromatograms which show that all of the components detected in the basic extract are neutral components.

Naphthenic acids and thiophenic sulfones are oxidation products of naphthenes and thiophenes, respectively. Naphthenes and thiophenes are much less susceptible to microbiological degradation than are the paraffinic hydrocarbons and alkylaromatic hydrocarbons that are major constituents of fresh petroleum. Consequently, naphthenes and thiophenes become major constituents of weathered petroleum. These compounds would not be expected to leach into the groundwater because they are highly

water insoluble. However, as these compounds are slowly degraded to more water-soluble products, such as naphthenic acids and thiophenic sulfones, the products would be expected to slowly leach into the groundwater. Therefore, the tentative identification of the major organic constituents of the wellwater sample as naphthenic acids and thiophenic sulfones is a reasonable conclusion.

Further studies, including a literature search, mass spectrometric studies, and the study of model compounds, could help confirm this conclusion.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Hazardous Waste Division

Geotechnical Subunit

Groundwater Sampling Data Sheet

FACILITY: TOTAL PETROLEUM LOCATION: ALMA

TYPE OF FACILITY: OIL REFINERY, LAND TREATMENT

WELL INFORMATION

Name/Number: MW # 15 Cap Locked: Yes ____ No X

Depth: 24 Casing Materials: GALVANIZED

Diameter: 2" ~~Screen Slot Size~~: Unknown

Casing Height Above Ground: 1' 4" Screen Length: 3'

Top of casing Elevation: 745.07 Screen Material: Stainless Steel

SAMPLING INFORMATION

Static Water Level (top of casing to water level)

initial 7.93 @ ____

final ____ @ ____

measured by TAKACS, BROWNE

method DNR METER

Water Quality Observations

initial conductance: 1650 Stabilized Conductance: ____

water temperature: ____ pH: ____

visual observations: CLEAR

Sampling method: ~~PITCHER PUMP~~ PVC BAILER

Volume removed before collecting samples: 8 GALLONS

Samples collected on 5-22-86 (date) at 10:55 (time)

Samples collected by LIZ BROWNE, MIKE TAKACS

NOTES:

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Hazardous Waste Division

Geotechnical Subunit

Groundwater Sampling Data Sheet

FACILITY: TOTAL PETROLEUM LOCATION: ALMA

TYPE OF FACILITY: OIL REFINERY, LAND TREATMENT

WELL INFORMATION

Name/Number: #18

Depth: 23.7

Diameter: 2"

Casing Height Above Ground: 3' 7½"

Top of casing Elevation: 749.08

Cap Locked: Yes ____ No X

Casing Materials: GALVANIZED

Screen Slot Size: #10-Slot

Screen Length: 3'

Screen Material: Stainless Steel

SAMPLING INFORMATION

Static Water Level (top of casing to water level)

initial 8.45 @ ____

final ____ @ ____

measured by DNR (BROWNE, TAKACS)

method DNR METER

Water Quality Observations

initial conductance: 650 Stabilized Conductance: ____

water temperature: ____ pH: ____

visual observations: Clear, clean water

Sampling method: PITCHER PUMP

Volume removed before collecting samples: > 10 gallons

Samples collected on 5-22-86 (date) at 10:00 a.m. (time)

Samples collected by LIZ BROWNE, MIKE TAKACS

NOTES:

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Hazardous Waste Division

Geotechnical Subunit

Groundwater Sampling Data Sheet

FACILITY: TOTAL PETROLEUM LOCATION: ALMA

TYPE OF FACILITY: OIL REFINERY, LAND TREATMENT

WELL INFORMATION

Name/Number: MW # 19 Cap Locked: Yes ____ No X

Depth: 18.8 Casing Materials: GALVANIZED

Diameter: 2" ~~Screen Slot Size~~: Unknown

Casing Height Above Ground: ? Screen Length: 3'

Top of casing Elevation: 74477 Screen Material: Stainless Steel

SAMPLING INFORMATION

Static Water Level (top of casing to water level)

initial 6.31 @ ____

final ____ @ ____

measured by L. BROWNE

method DNR METER

Water Quality Observations

initial conductance: 2100 Stabilized Conductance: ____

water temperature: ____ pH: ____

visual observations: SILTY

Sampling method: PITCHER PUMP

Volume removed before collecting samples: 7 GALLONS

Samples collected on 5-22-86 (date) at 12:30 (time)

Samples collected by M. TAKACS, L. BROWNE (MDNR)

NOTES:

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Hazardous Waste Division

Geotechnical Subunit

## Groundwater Sampling Data Sheet

FACILITY: TOTAL PETROLEUM LOCATION: ALMA

TYPE OF FACILITY: OIL REFINERY, LAND TREATMENT

### WELL INFORMATION

Name/Number: MW # 20 Cap Locked: Yes ____ No X

Depth: 25 Casing Materials: GALVANIZED

Diameter: 2" Screen ~~Slot Size~~: #12 Slot

Casing Height Above Ground: 9 3/4" Screen Length: 3'

Top of casing Elevation: 746.96 Screen Material: Stainless Steel

### SAMPLING INFORMATION

Static Water Level (top of casing to water level)

initial 7.97 @ ____

final ____ @ ____

measured by BROWNE (MDNR)

method DNR METER

Water Quality Observations

initial conductance: 1750 Stabilized Conductance: ____

water temperature: ____ pH: ____

visual observations: A BIT FOAMY

Sampling method: PITCHER PUMP

Volume removed before collecting samples: 9 gallons

Samples collected on 5-22-86 (date) at ____ (time)

Samples collected by BROWNE, TAKACS

NOTES:

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Hazardous Waste Division

Geotechnical Subunit

Groundwater Sampling Data Sheet

FACILITY: TOTAL PETROLEUM LOCATION: ALMA

TYPE OF FACILITY: OIL REFINERY, LAND TREATMENT

WELL INFORMATION

Name/Number: MW-21 Cap Locked: Yes ____ No X

Depth: 24.1 Casing Materials: GALVANIZED

Diameter: 2" Screen Slot Size: Unknown

Casing Height Above Ground: 1' 7" Screen Length: 3'

Top of casing Elevation: 744.06 Screen Material: Stainless Steel

SAMPLING INFORMATION

Static Water Level (top of casing to water level)

initial 7.42 @ ____

final ____ @ ____

measured by DNR (BROWNE)

method DNR METER

Water Quality Observations

initial conductance: 1850 Stabilized Conductance: ____

water temperature: ____ pH: ____

visual observations: CLEAR, SLIGHLY FOAMY

Sampling method: PVC BAILER

Volume removed before collecting samples: 4 GALLONS (BAILED DRY) + 2.5 - 6.5

Samples collected on 5-22-86 (date) at 12:50 (time)

Samples collected by M. TAKACS, L. BROWNE

NOTES:

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Hazardous Waste Division

Geotechnical Subunit

## Groundwater Sampling Data Sheet

FACILITY: TOTAL PETROLEUM LOCATION: ALMA

TYPE OF FACILITY: OIL REFINERY, LAND TREATMENT

### WELL INFORMATION

Name/Number: MW-30 Cap Locked: Yes X No ~~X~~

Depth: 23 Casing Materials: ~~GALVANIZED~~ PVC

Diameter: ~~NA~~ 4" ~~Screen Slot Size:~~ ~~#10 Slot~~

Casing Height Above Ground: ? Screen Length: 10'

Top of casing Elevation: 747.63 Screen Material: Plastic (PVC?)

### SAMPLING INFORMATION

Static Water Level (top of casing to water level)

initial 9.26 @ _____

final _____ @ _____

measured by L. BROWNE

method DNR METER

Water Quality Observations

initial conductance: 2500 Stabilized Conductance: _____

water temperature: _____ pH: _____

visual observations: CLOUDY, FOAMY

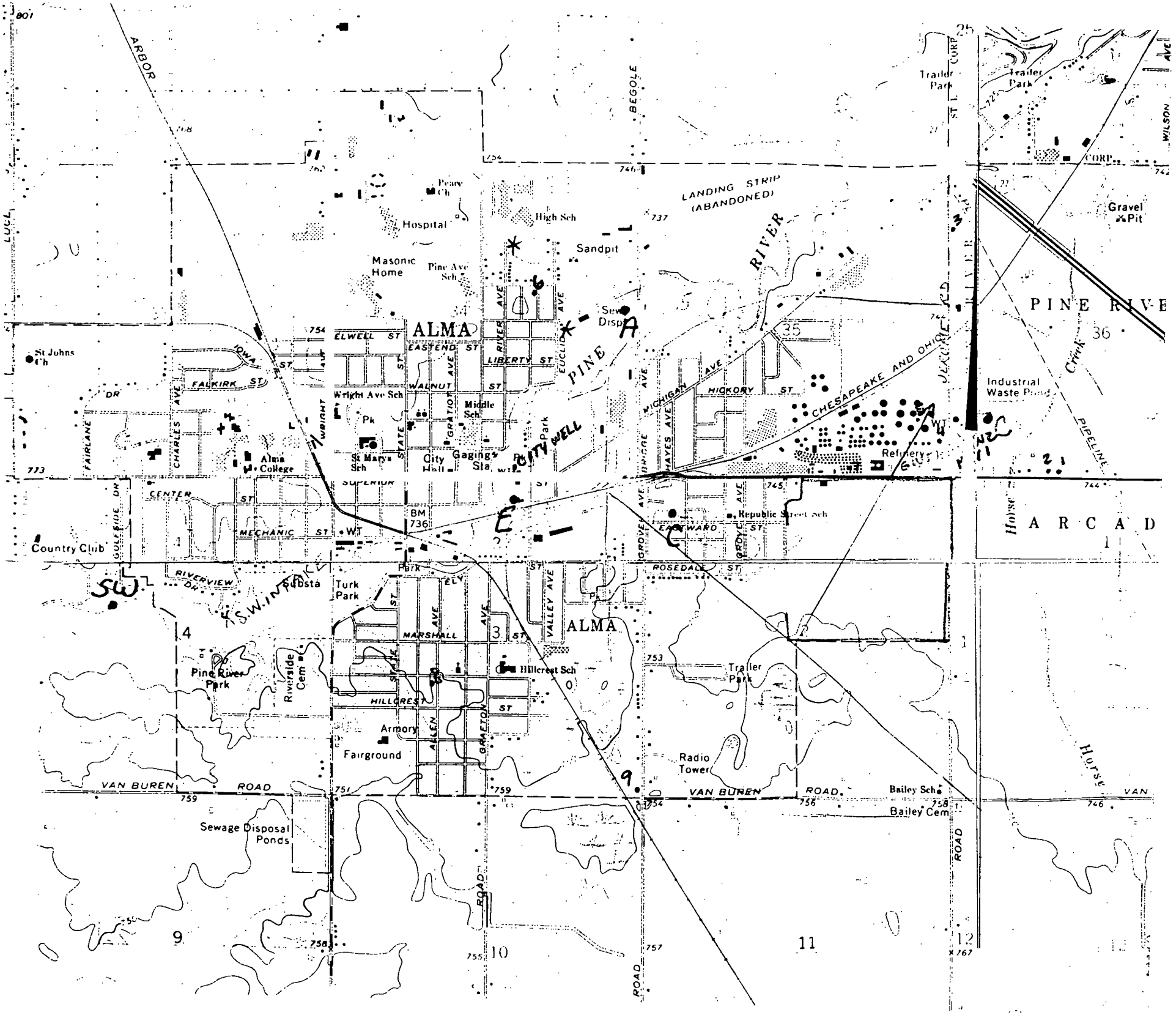
Sampling method: PITCHER PUMP

Volume removed before collecting samples: 28 GALLONS

Samples collected on 5-22-86 (date) at 1350 (time)

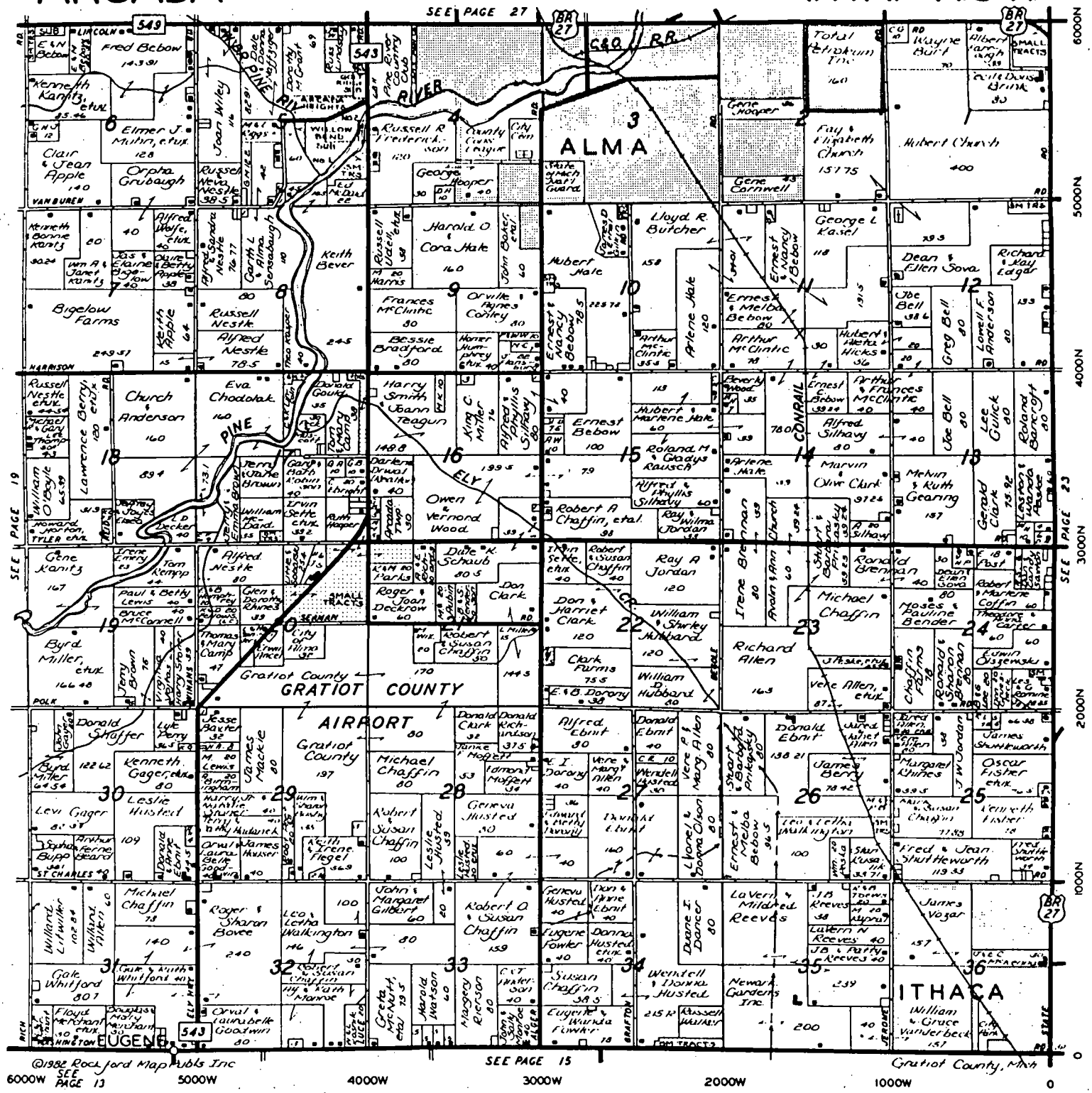
Samples collected by M. TAKACS, L. BROWNE (MDNR)

NOTES:



ARBOR
BEGOLE
LANDING STRIP (ABANDONED)
Trailer Park
Gravel Pit
Peace Ch
Hospital
High Sch
Sandpit
Masonic Home
Pine Ave Sch
Sewage Disp
PINE RIVER
ALMA
ELWELL ST
EASTEND ST
LIBERTY ST
WALNUT ST
IOWA ST
FALKIRK ST
St Johns Ch
Wright Ave Sch
Middle Sch
Pk
St Marys Sch
City Hall
Gaging Sta
Park
CITY WELL
MICHIGAN AVE
HICKORY ST
CHESAPEAKE AND OHIO
Industrial Waste Pond
Refinery
PIPELINE
Alma College
CENTER ST
MECHANIC ST
SUPERIOR
BM 736
Republic Street Sch
EASTWARD ST
ROSEDALE ST
Country Club
RIVERVIEW DR
Substa
Turk Park
MARSHALL ST
Hillcrest Sch
Trailer Park
Pine River Park
Riverside Cem
HILLCREST ST
Armory
Fairground
Radio Tower
VAN BUREN ROAD
Bailey Sch
Bailey Cem
Sewage Disposal Ponds
ARCAD
Horse Creek
SW

# ARCADA T.11N.–R.3W.





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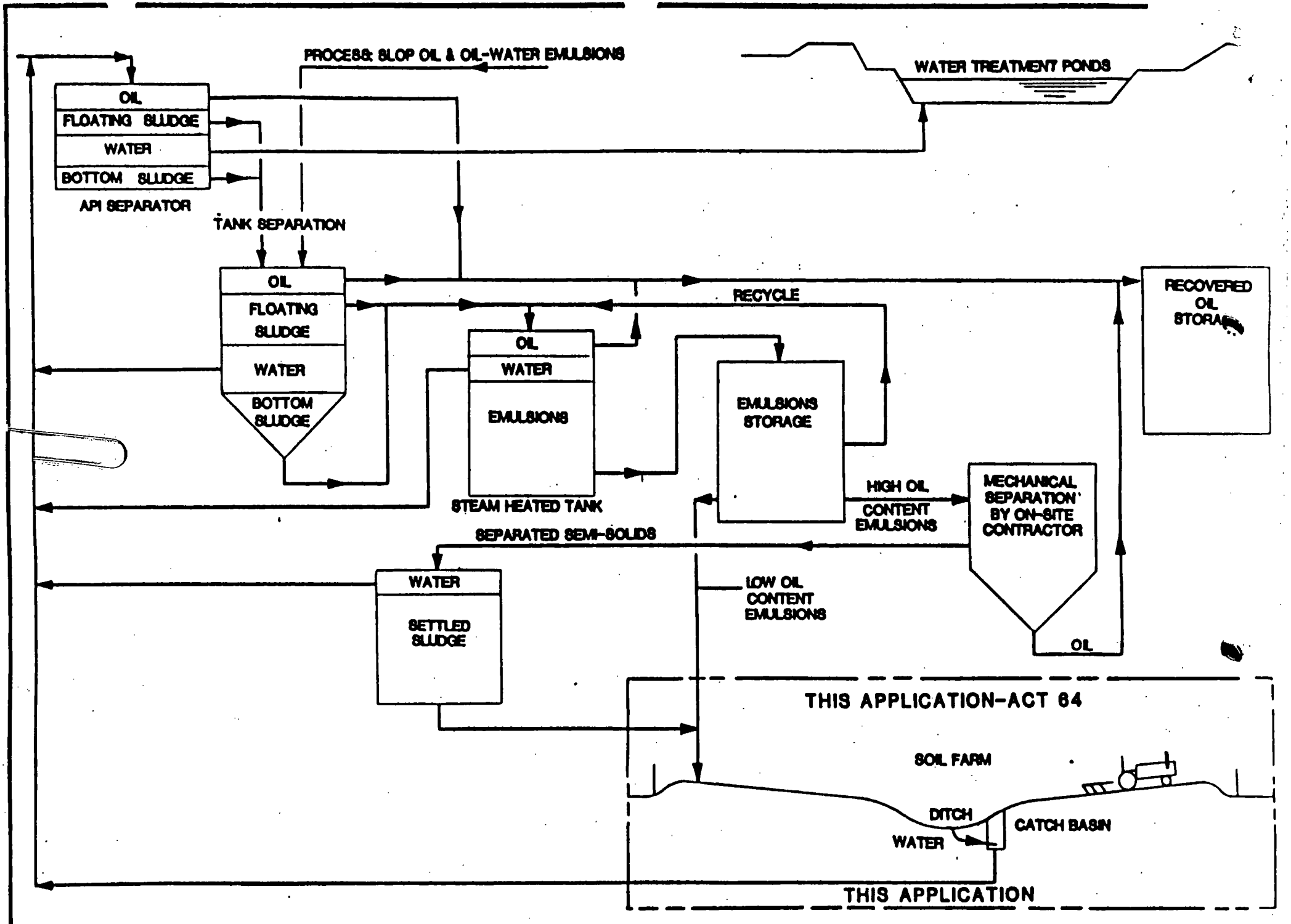
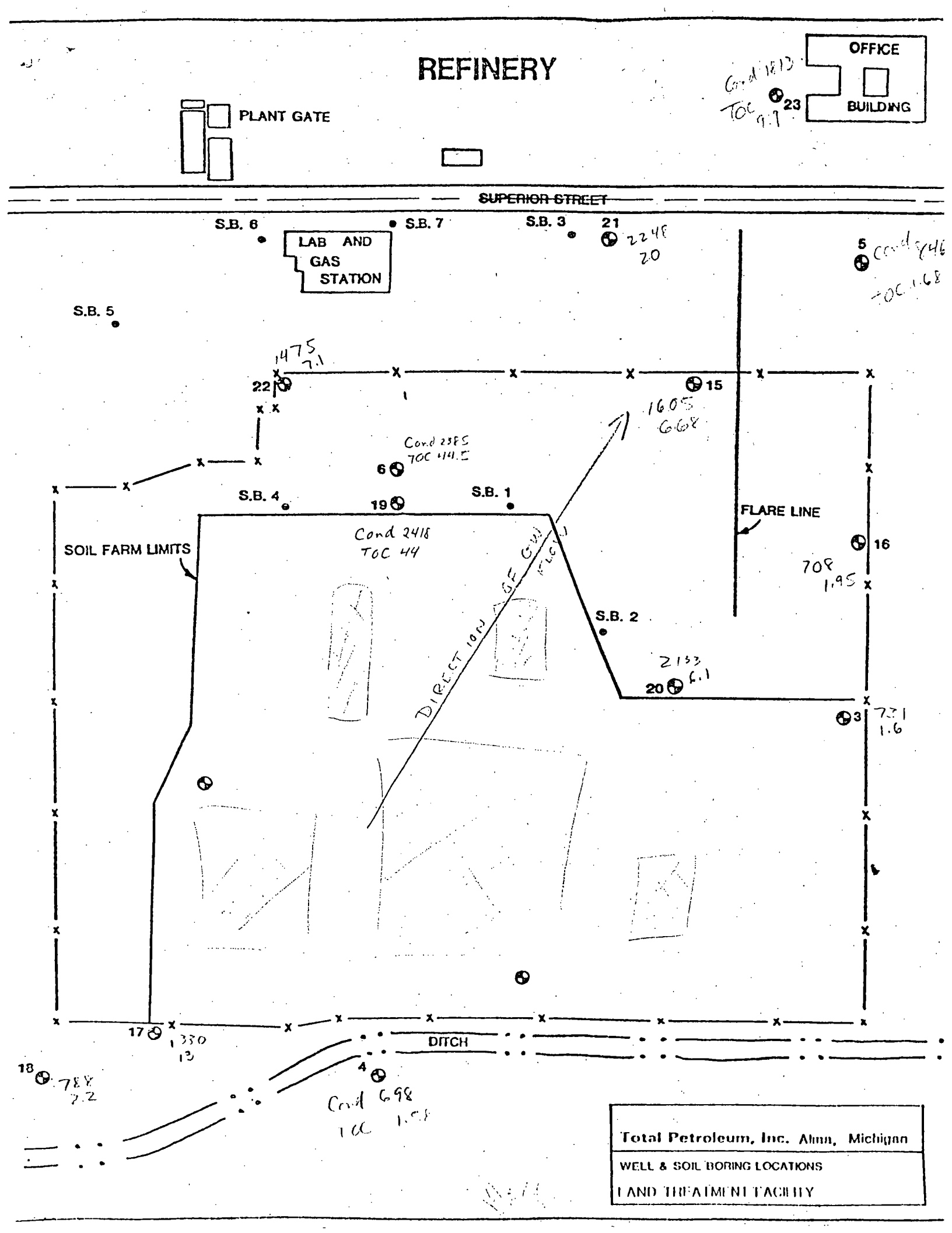



ALMA REFINERY WASTE MANAGEMENT PROCESS FLOW DIAGRAM


REFINERY
PLANT GATE
OFFICE
BUILDING
23
SUPERIOR STREET
S.B. 6
S.B. 7
S.B. 3
21
LAB AND
GAS
STATION
5
S.B. 5
22
15
6
S.B. 4
19
S.B. 1
FLARE LINE
16
SOIL FARM LIMITS
S.B. 2
20
3
17
DITCH
18
4
Total Petroleum, Inc. Alma, Michigan
WELL & SOIL BORING LOCATIONS
LAND TREATMENT FACILITY

A 1975 study states that the groundwater flow is toward a nearby creek; however, there are no water supply wells in that direction. Three of four monitoring wells at the site sampled in 1976 showed contamination of cyanide, nickel, zinc, and phenols. No further study has been done.

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

Total-Leonard Refining
Box 321
Alma, Michigan 48801

In 1949, a municipal water supply well at Alma developed a taste and odor problem and was temporarily removed from service. Further investigation revealed a concentration of phenols in the vicinity of a waste-detention pit at the Total-Leonard refinery. Municipal wells at Alma derive water from deposits of buried outwash. The waste pit, however, discharged liquids to a surficial aquifer consisting of about 30 feet of sand and gravel. The two aquifers are separated by an aquiclude composed of material ranging from clay to fine clayey sand.

An aquifer test conducted in the area by the Michigan Geological Survey showed hydraulic connection between the two aquifers in the vicinity of the contaminated area. Both the surficial sand and the buried outwash aquifers were contaminated for a distance of about 3,000 feet from the point of seepage and well 5 had to be abandoned. This created a serious situation at Alma for many years due to the difficulty in obtaining an adequate supply of groundwater.

* * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *

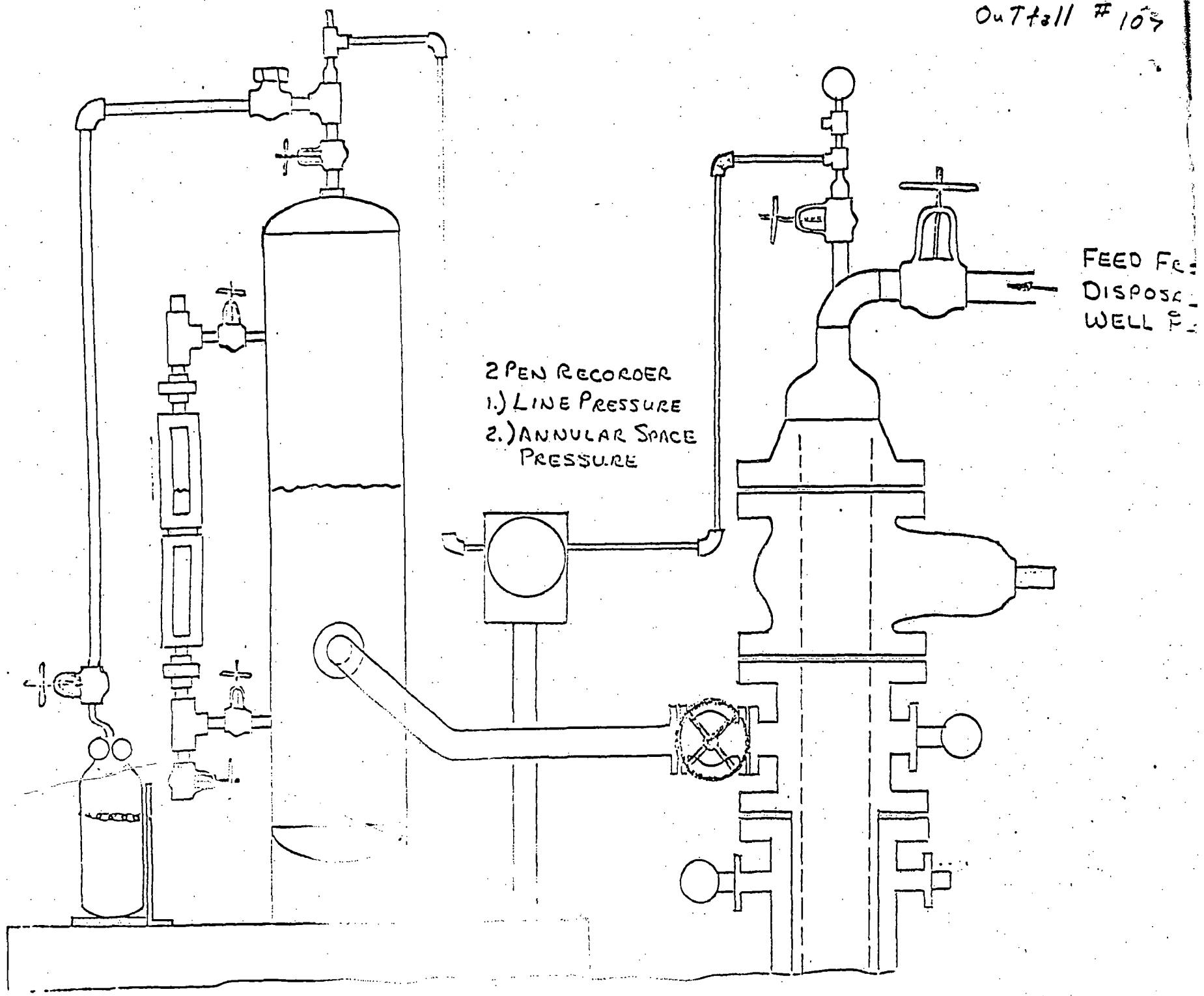
Velsicol Chemical Company
500 N. Bankson
St. Louis, Michigan 48880

Velsicol Chemical Company, formerly Michigan Chemical Company, produced a myriad of chemicals utilizing natural brines. Three of the more noted chemicals manufactured were PBB (polybrominated biphenyl) , DDT (diphenyl trichloroethane), and TRIS (2-3 dibromopropyl phosphate). These products have been removed from the market because of their adverse effects on human and animal health.

The company agreed to cease all operations at the St. Louis plant in September, 1978, and it has been closed ever since. There has been a systematic removal of wastes, products, raw materials under DNR supervision, and presently only a

Taken from Michigan Surface Assessment, compiled by Mich. dept DNR 1980

Wel 2
Outfall #107



| NAME OF OWNER OR OPERATOR | ADDRESS OF OWNER OR OPERATOR |
|---|---|
| Total Leonard Refineries, Inc. | E. Superior Street<br>Alma, Michigan 48801 |
| **NAME OF DRILLING CONTRACTOR** | **ADDRESS OF DRILLING CONTRACTOR** |
| North American Drilling Co. | 1104 N. Mission<br>Mt. Pleasant, Michigan 48858 |

| WELL NAME | WELL NUMBER | PERMIT NUMBER |
|---|---|---|
| Dundee Disposal Outfall #107 | 2 | 107-744-829 |

| LOCATION | SECTION | TWP. | RANGE |
|---|---|---|---|
| NE SW SE | 35 | 12N | 3E |

| TOWNSHIP | COUNTY |
|---|---|
| Pine River | Gratiot |

664 Ft. from south (N or S) Line and 1774 Ft. from east (E or W) Line of quarter section

| DATE DRILLING COMMENCED | DATE DRILLING COMPLETED | DATE WELL COMPLETED | TYPE OF WELL |
|---|---|---|---|
| 8/24/74 | 9/8/74 | 9/15/74 | Disposal Well |

| FORMATION COMPLETED IN | TOTAL DEPTH | ELEVATION | KB | RB | RT | RF | GN |
|---|---|---|---|---|---|---|---|
| Dundee | 3622 driller | | 755.2 | | | 754.2 | 742.2 |

| ROTARY TOOLS | CABLE TOOLS |
|---|---|
| From 0 Feet to 3622 Feet | From Feet to Feet |

## WELL CASING RECORD

| TUBING AND CASING DATA | | | | CEMENTING DATA | | | PERFORATIONS OR OPEN HOLE | | |
|---|---|---|---|---|---|---|---|---|---|
| SIZE | LB./FT. | GRADE | DEPTH | SACKS | TYPE | STAGING DEPTH(S) | NO. HOLES | FROM | TO |
| 20" | 60 | MR | 65' | Drove | | | open hole | 3325.92' | 3622' |
| 13 3/8" | 48 | H-40 | 510' | 450 | A | | | | |
| 5/8" | 36 | K-55 | 1530.67 | 600 | Reg Pos | 957.51' | | | |
| 7" | 23 | K-55 | 3325.92 | 600 | A | 2850.32' | | | |
| 4½" | 10.5 | K-55 | 3272.19 | or Packer | 59' below packer base | | tubing at | 3331.19' | |

### WATER ZONES

| FORMATION | FROM | TO | AMOUNT |
|---|---|---|---|
| (Fresh) | | | |
| | 2 | | ' |
| | | | ' |

### WIRE LINE LOGS RUN

| SERVICE COMPANY | TYPE LOG | INTERVAL LOGGED | COPY TO SURVEY |
|---|---|---|---|
| Schlumberger | GR-N | 0 - 3617 | X |
| | ual-Lat | 2700 - 3601 | X |
| | Bond | 0 - 3305 | X |

### FRACTURE OR ACID TREATMENT

| DATE | FROM | TO | QUANTITY |
|---|---|---|---|
| 9/13/74 | 3309 | | 10,000 gal 28% |

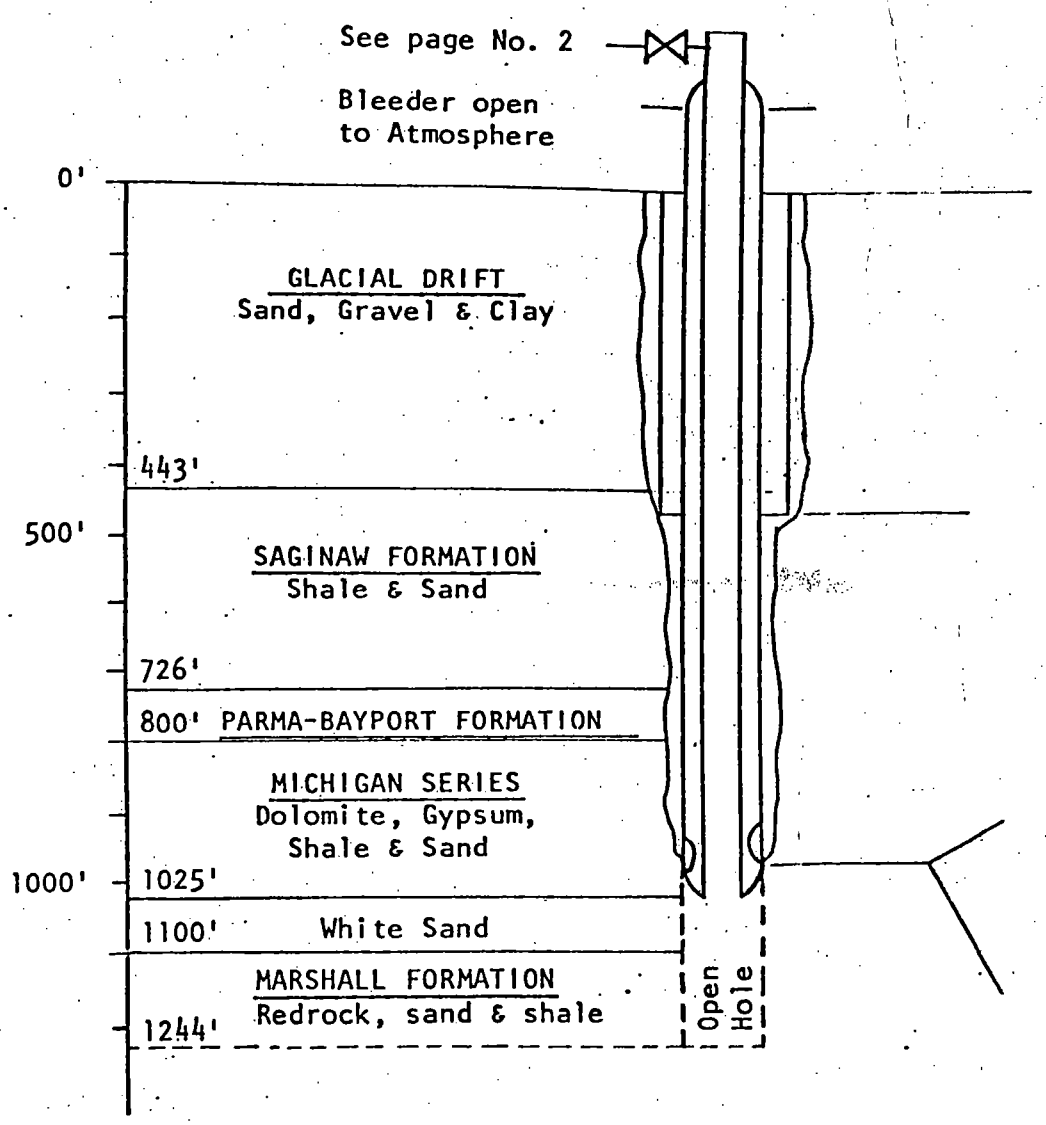
### SOLUTION MINING

NAME AND NUMBER OF INJECTION AND TARGET WELL – DISTANCE APART

The information in and attached to this report is complete and correct.

| SIGNATURE | TITLE | DATE |
|---|---|---|
| Earl C. Majeske | Consulting Geologist | October 10,74 |

GIVE COMPLETE FORMATION RECORD ON REVERSE SIDE




7" x 3-1/2", 2 in 1 Hindliter Head

10" Casing set at 452' Cemented to surface inside and outside.

7" Casing set at 1025' Cemented to surface outside only.

3-1/2" O.D., 9.2#, H-to smls. non-upset tubing. 10 round threads. Set at 1025'

3-1/2" O.D, 8V thread x 7" Spang Hook Wall Packer with 16" rubber.

Annular space between the 3" and 7" is full of water and open at the top so that any leakage in the 3" tubing will be indicated by water flow from the bleeder in the hindliter head.

(b) Cementing Program

| Pipe Size | Staging Depth | Cement Amount | Type | Additives |
|---|---|---|---|---|
| 10" | 452' | 265 sacks | HE | 3 sacks Dow Flake |
| 7" | 1025' | 225 sacks | Unknown | Unknown |

(c) Injection String or Tubing

Size 3 1/2" O.D., 9.2 #/Ft., Grade H-40 smls, Packer Depth 1025'

(d) Type of Logs Run Log attached'

(e) Coring Program

(f) Completion Data

1. Perforations or Open Hole Interval 1025 to 1244

2. Stimulation

a. Acid No

b. Frac No

6. INJECTION DATA:

A. Fluid Characteristics:

(1) Chemical (1) Spent sulfidic 15% caustic scrub 3,000 gal/wk. Saturated with $H_2S$ an less than 1% organic acids pH 13 sp. gr. 1.15 (2) Spent phenolic 15% caustic scrub 15 gal/wk 15% organic acid oils pH 13 sp. gr. 1.15 (3) Foul steam condensate 7,000 ga wk. contains ammonium chloride and is saturated with $H_2S$ sp. gr. 1.0, pH 8.5

Avg. pH

(2) Physical

Avg. S.G.

Avg. Viscosity Cp

(B) Buffer Water Volume 200,000 gallon

(C) Initial Inj. Rate Avg. 17 G/M, Date June 12, 19 July 1, 1957

Tubing Pressure 739 psig

Casing Pressure Atmospheric psi

June , 19 Date

COMPANY: TOTAL Leonard, Inc.

WELL NAME & NUMBER: W. D. #1 Outfall #02

LOCATION: SE ¼ SW ¼ SE ¼, Section 35 ; T. 1 N N/S, R. 3W E/W

Gratiot COUNTY Alma CITY

GEOLOGICAL DATA:

(a) Receiving Formation(s) Marshall

(b) Interval of Receiving Aquifer 1025 ' to 1244 '

(c) Effective Thickness 219 feet

(d) Effective Porosity Not determined %

(e) Effective Permeability Not determined Md

(f) Well Elevation (Above S.L.) 740'

4. RESERVOIR FLUID DATA:

(a) Reservoir Pressure:

Original Atmospheric psig

Present Approx. 200 psig after 16 days shut in

(b) Reservoir Fluid Chemical Analysis

Marshall Brine analysis by Michigan Chemical in 1953

Na 6.1% Mg 1.16% 235 ppm

Ca 4.7% Cl 21.0%

S.G.: 1.24 @ 25°C

Viscosity: Not determined Cp @ °F

pH: [illegible]

DISPOSAL WELL DATA: Cable Tools Rotary

(a) Casing Program

| Pipe Size | #/Ft | Grade | Set |
|---|---|---|---|
| 10" | Unknown | Unknown | 2' |
| [illegible] | Unknown | Unknown | 25' |

The company should analyze the oily wastes at County Drain #52, and the ground water near the 20 acre site for volatile aromatic hydrocarbons sooner. Total has been spreading oil contaminated dirt on the 20 acre site all during the summer of 1981. Of the two large piles of oil contaminated soil that has been sitting on the site for the last 10 years, only 100 cubic yards are left. On staff visit 7/21/81, learned that oily sludge breaks down in about one week after application and turning under.

Item 5d of memo - Total Petroleum has already conducted a hydrogeology study. It was done by Williams and Works. The results of the study were published October 26, 1979. A copy of the results is on file with district staff. Aerial views of the soil farm areas is also available from the district.

Regarding item 6 on water treatment additives - During staff visit to company 6/4/81, Mr. Bernie Shaver indicated company was seriously considering changing their water additives. Bring this up for discussion during August 19, 1981 meeting.

In the May 11, 1981 memo to Karl Zollner from John Suppnick of Comprehensive Studies, the recommendations for effluent limits for Total Petroleum are based on .51 MGD - does this or should it include storm water figures? Also, are the CBOD-5 limits and Nas $NH_3$ limits that Comp Studies suggests average or maximum figures?

During a conversation with Pat Lincoln during last site visit, he mentioned that he had looked at Federal Regulations 40 CFR-419.13, section 3C. He interprets the last sentence to mean that the company would be allowed better loading rates for storm water runoff.* He would like to discuss this at the August 19 meeting.

GT/jg
attach.
cc: WQD file

* for BPT but not for WQ considerations

INTEROFFICE COMMUNICATION

August 7, 1981

RECEIVED
AUG 11 1981
Water Quality-E & TS

TO: Chang Bek, Engineering and Technical Services, Water Quality Division

FROM: Gloria Taylor, Thomas Newell, District II, Water Quality Division

SUBJECT: Total Petroleum, Alma - Permit #MI0001066

District staff offers the following comments on points raised by Karl Zollner in regard to this permit and the requirements asked for by the Office of Toxic Materials Control.

District staff agrees with point #2 - i.e., the proposal to make this an interim permit with an expiration date of June 30, 1984. With this extended permit, company will be able to submit needed information requested in the memo from Comprehensive Studies (5/11/81) and the memo from Office of Toxic Materials Control (5/26/81).

District staff agrees with point #3 - i.e., establishing a schedule of compliance in the interim permit for Total Petroleum to submit a complete consolidated permit application. Suggest we discuss this with company on August 19 meeting - how long will it take to get sampling results back from laboratory?

Concerning point #5 - the company feels that they have found the probable source of the PCB found during survey (see enclosed memo to Scott Ross from Gloria Taylor - June 8, 1981). Company raises an interesting point on page 2. Should DNR collect further water samples or wait for results gathered by Total?

Staff talked to Jil Ann Gahsman (OTMC) regarding her office's request for Total to monitor outfall 001 weekly for a period of two months for volatile aromatic hydrocarbons including benzene and toluene. Their request was based on general knowledge of petroleum industry plus the amount of benzene and toluene found by the survey to be going down the deep disposal well. Company will probably point out that the June 2, 3, 1980 survey by Point Source found less than 50 ug/l benzene and no toluene at all in outfall 001.

Concerning 5c - i.e., the analysis of biological sludge for volatile aromatic hydrocarbons. Company officials have pointed out that they have in the past spread the biological sludge only once. They do not see the need for spreading the biological sludge for several more years. Staff suggests insertion of a phrase stating analysis to be done and submitted to OTMC 3-6 months before actual spreading of the biological sludge. This will give an up-to-date analysis of sludge to be spread and not what the sludge was in 1981 or 1982.

Briefing Memo
Total Petroleum Incorporated
East Superior Street
Alma, Michigan

9/82

I. Existing NPDES Permit No: MI0001066

II. Date of Expiration of Existing Permit: July 31, 1979

III. Date of Reapplication: December 13, 1978

IV. Description of Enterprise:

Total Petroleum, Incorporated, formerly known as Total Leonard, is located in Gratiot County, on East Superior Street, Alma, Michigan. This company employs 300 people at this location. The plant operates 24-hours a day, 7 days a week, 52 weeks per year. The main product of the plant is gasoline. Fuel oil, ~~jet fuel~~, and residual fuels are also produced. This company now purchases Michigan sweet crude as their stock supply. Three years ago, Total used Canadian and Wyoming sour crude. When the company discontinued using sour crude, they had to abandon their asphalt production.

Normally, this facility uses 42,000 barrels of crude oil stock per day. Parameters in this permit are based on the number of 1,000 barrels of crude oil processed per day (Federal regulations).

This facility is considered to be in the cracking subcategory of the Petroleum Refining Point Source Category Effluent Limitations Guidelines issued by the Environmental Protection Agency in the Federal Register 40 CFR, Part 149. This industry is classified as a major industry.

V. Plant Processes and Waste Streams

Most of the crude oil is transported to the plant by pipeline and the remainder by truck. The crude oil goes through desalters before being pumped to the prefractioner and the main column crude unit. This supplies the stock charge

for the catalytic cracker, hydrofiners, rheniformers, bender treater, and alkylation unit. This results in such petroleum products as propane, regular gasoline, no lead gasoline, jet fuel, flash solvent, mineral seal, kerosene, number one fuel oil and number two fuel oil. A new Dimersol unit blends propylene and butane to make high octane gasoline. There are over 100 storage tanks located in diked areas on this property. This company also maintains its own laboratory on the premises.

## VI. Water Supply

### Sanitary

The plant's domestic water is supplied by the City of Alma and is discharged to the city sanitary sewer system. More domestic water is used during the summer than in the winter, mainly due to the greater number of showers taken by the workers during the summer. From December to the end of May, the average amount of water used is 5,840 gallons per day. From June to the end of September, the average amount of water used is 13,423 gallons per day. For October and November, the average amount of water used and discharged to the sanitary sewer is 8,533 gallons per day. These figures were obtained from Monthly Operating Reports for 1978 and 1979.

### Cooling and Condensing Water

Figures used were based on Monthly Operating Reports, a 1977 flow chart, and a 1980 wastewater audit conducted by the company during the summer. The flow chart and 1980 wastewater audit can be found in the appendix of this permit.

The cooling and condensing water is obtained from the City of Alma and from 3 private wells located on company property. There isn't much of a seasonal variation in this water use. The company uses an average of 385,000 gallons per day from

the city and an average of 312,000 gallons per day from their private wells for cooling and condensing water. Of this 697,000 gallons per day, 50 gallons per minute or 72,000 gallons per day is non-segregated once through cooling water.

The rest of the cooling water is recycled through the cooling towers. The water that goes through each tower comes from specific unit areas. For example, the water that goes through the west cooling tower comes from the hydrofiner and the #2 crude unit.

All pumps and compressors are cooled with cooling tower water that is recycled back to the cooling towers.

The towers are of various sizes, but have a combined capacity of 350,000 gallons. The temperature drop for each tower is different, but the company uses an average $\Delta T$ of $17.5^{o}$. The recirculation rate is 21,000 - 22,000 gallons per minute through these three towers. Blowdown from the three cooling towers averages 51 gallons per minute or 73,400 gallons. Included in the cooling tower ~~boiler~~ blowdown is the mist from the cooling towers called drift. This water is routed through the API oil and water separator and from there goes to the primary settling lagoon of the wastewater treatment system. The company figures that evaporation from the cooling towers amounts to 385 gallons per minute or 554,000 gallons per day. Makeup water for the CT ~~boiler~~ blowdown and evaporation amounts to 627,800 gallons per day.

The company adds chromate and zinc corrosion inhibitors to the cooling water. Product used is Nalco 374. The company adds Nalco 374 whenever the tests for zinc concentration get below 2.3 parts per million and the chromate ($CrO_4$) goes below the 15 to 20 parts per million range.

The company also adds an organo phosphorus acrylite sediment inhibitor (Nalco 7387) Nalsperse 7348 and HTH chlorine to the cooling water about every

two weeks. The additions are slug fed and are dependent on control tests.

Process Water

The main sources of process water at Total Refinery are the desalting of the crude oil, condensate from the steam stripping operations and boiler blowdown.

Crude oil contains a lot of salt that must be removed before the oil is processed. If the salt is not removed, the oil processing machinery is soon severely damaged. The water used to desalt the crude oil comes from the City of Alma. The company's 1980 Wastewater Audit (see page 3 of Article 2 in Appendix) shows that an average of 101,000 gallons per day is used to wash salt from the 42,000 barrels of crude oil processed per day. After the crude oil is washed with water and the water soluble salts are removed by the polar water molecules, an electrical charge gives immediate separation of the water and oil. The desalted oil is removed from the top of the column. The water goes to the American Petroleum Institute (API) separator.

The desalted oil then goes through cracking and refining in large towers. Oily process water is removed from the various interfaces of the oil fractions in the tower by heat. As the heated process water comes off the various fractions as steam, it is used in a heat exchange to heat the incoming crude oil. From here the oily process condensate goes to the API oil separator and from there the water goes to the biological ponds for treatment. The company estimates that 59 gallons per minute or 86,000 gallons per day is driven off from the interfaces (see Article 1, Apprendix).

More process water is used in the winter than in the rest of the year. The average amount of water used from November to May 1 is 0.502 million gallons per day (based on 1979 Monthly Operating Reports). The average amount of water used from May 1 to October 30 is 0.38 million gallons per day.

One reason for the increase of water use in the winter is that more steam must be manufactured in cold weather for the heating and stripping process. Another reason is that during the winter months, the company has to keep water running continually in a number of hoses so that freeze up will not occur. Some examples of this are the eye bath center, safety showers, compressors, and fire hydrants at distant outposts. The company estimates that 150 gallons per minute or 216,000 gallons per day is used in the winter to prevent line freeze up. This water goes through the API separator and then to the biological ponds. Coupled with storm water in the form of snow, this means that there is a significant increase per day in the amount of water going to the wastewater system. While the company has met their effluent limits, the increase has generated problems which will be explained further

Boiler blowdown comes from the cooling tower at 13.4 gallons per minute or 19,296 gallons per day, from the boiler at ~~26~~ 55 gallons per minute or ~~37,440~~ 81,000 gallons per day and from the water treatment systems at 7 gallons per minute or 10,800 gallons per day (all from Article 1, Appendix).

Process water that is caustic or high in metals, phenols, ammonia and sulfates is disposed of through their number two main deep well (outfall #007). This deep disposal well is 3,622 feet deep and is in the Dundee formation. This well is located on plant property and is northeast of the north cooling tower of the refinery. Twenty five gallons per minute or 36,000 gallons per day is disposed of in the deep disposal wells.

The company also has another standby deep disposal well that ends in the Marshall formation. This disposal well is known as outfall #023 and has not been used in the past two years.

The company notes in their 1980 Wastewater Audit (Page 1, Article 2 of the Appendix) that the major difference between the 1977 and 1980 survey is the tightening up of the process water streams. The company is actively working to reduce the amount of wastewater going to the ponds. All of the pumps are cooled with cooling tower water that is recycled. Compressor water on the #2 reformer and the hydrofiner is recycled back to the cooling towers.

VI. Description of Treatment of Water

API Oil and Water Separator

There are two oil and water separators located at the lowest elevation on the north side of the refinery, adjacent to the railway tracks. The separators are rated at 1,000 gallons per minute capacity. The average rate of flow is 330 gallons per minute or 475,000 gallons per day. A breakdown of the types of water going to the separator [illegible] (see Appendix Article 1 - 1977 flow chart and Article 2 - 1980 Wastewater Audit).

| | |
|---|---|
| *Non-segregated* cooling water | 50 gpm or 72,000 gpd |
| Cooling Tower blowdown | 51 gpm or 73,000 gpd |
| Oily process water | 59 gpm or 85,000 gpd |
| Boiler blowdown | ~~26~~ 55 gpm or ~~38,000~~ 81,000 gpd |
| Desalter water | 70 gpd or 101,000 gpd |
| Water treatment | 7 gpm or 10,000 gpd |
| Sour water | 28 gpm or 40,000 gpd |
| Storm water (contaminated) | 19 gpm or 27,000 gpd |
| Storm water (uncontaminated) | 20 pgm or 29,000 gpd |
| Total | ~~330~~ 359 gpm or ~~475,000~~ 518,000 gpd |

The separators are equipped with a top and bottom skimming device to remove oil and solids from the separator. The oily waste material that is collected at the separator is stored in cone bottom tanks that are located in a diked area adjacent to the separator. Solid waste that collects in the bottom of the separator is picked up by a licensed waste hauler, Commercial Oil Services of Oregon, Ohio. The recovered oil is recycled to the refinery. The water is pumped to the stabilization ponds.

## Wastewater ~~Stabilization~~ Treatment ~~Ponds~~ Ponds

The wastewater from the API oil and water separator is treated in a series of seven ponds that are situated on the east side of Jordan Road and north of Superior Street. There is a primary settling pond, an aeration pond, an oxidation and settling pond, and four polishing lagoons. The total surface area is ~~3.5~~ 10 acres, the storage capacity is 17,500,000 gallons.

According to the U.S. Department of Agriculture, Soil Conservation Service, the ponds are built on Capac loam (see Gratiot County - map #18), a nearly level, somewhat poorly drained to very poorly drained clay loam. The ponds are separated

by compacted clay dikes into the seven sections. The water flows in series through each section, passing through tubes placed in the dikes below the surface of the water to prevent passage of floating materials.

The first lagoon is the primary settling lagoon. This lagoon is 11 feet deep. Retention time is 1-8 days. No settling floc is used. The floatable oil is recirculated back into the oil refinery system.

The second pond in the series is much larger and contains four 15 horsepower aerators and one 10 horsepower aerator. Retention time in this pond is 13 days. From this pond, the water flows to the oxidation and settling pond and from here to the four polishing ponds. The retention time in these lagoons is 17 days. Therefore, the total length of time in the lagoon system at process flow of 0.54 MGD is ~~can be as much as 38 days~~. 32 However, if there is a surge of water, either from rainfall or melted snow, the total retention time is shorter. Conversely, in the summer, when less process water is needed, and if there is no rain, the flow through the biological ponds can take up to 51 days.

There are also three additional ponds in this system that can be used in case of emergency spill. The capacity of these three ponds is 4,000,000 gallons.

The company recognizes the importance of enough retention time in the pond system so that the final effluent will meet permit regulations. With the addition of the storm water runoff from the 20 acre soil farm (TO BE EXPLAINED LATER) and the fact that no water will be drained off this soil farm during winter months, flow through the ponds becomes even more complex. Therefore, the company is developing a computer program to aid them in the best management of the water flow through the ponds.

## Storm Water

Federal Regulations for Oil Refineries permit a storm water allotment for uncontaminated rain water and melted snow runoff. The number 540,000 gallons per day was used in the original NPDES permit by district staff as the dividing point. That is, on any given day, any flow of water from outfall 001 was regarded as storm water if the flow was over 540,000 gallons.

The storm water is directed through the API oil and water separator and thence to the biological ponds. Therefore, the storm water is retained in the lagoons for a period of 30-56 days. The state required the company to monitor the storm water discharge for $BOD_5$ and TSS. The company did not have to monitor the storm water for phenol and sulfides as was required for the process water. The maximum and average figures for the storm water limits in the original permit was based on each 1,000 gallon flow over 540,000 gallons.

In June of 1978, the company installed new drains, curbing and pavement in the bulk storage area to help separate storm water from plant process water. This was done to even out the flow through the wastewater pond treatment system. However, there is no clear cut separation of storm water from other process water, and it is extremely difficult to determine how much of the water should actually be considered storm water.

When the Monthly Operating Reports for Total were analyzed, they showed that Total reported 25,214,000 gallons of water as storm water for 1977, 13,130,000 gallons as storm water in 1978, and 14,811,000 gallons in 1979. The majority of this storm water was reported in the winter months. For example, the company reported storm water for every day of January, February, and March

for a total of 7.85 million gallons. This is more than half of the total storm water reported by the company for 1978.

Therefore, prior to the development of this draft permit, precipitation records for Alma were obtained from the Alma Wastewater Treatment Plant for 1977, 1978, and 1979. The total precipitation recorded for Alma for 1977 was 27.2 inches, 1978 was 21.77 inches, and for 1979 23.8 inches. The precipitation recorded for January, February, and March of 1978 was 3.21 inches or 14.72 percent of the total precipitation for that year. ~~Assuming that one inch of rain yields 27,500 gallons of water per acre, then 3.21 inches would yield 88,725 gallons. If the area of the refinery drained is 45 acres, this would~~ amount to 3,992,625 gallons of water, which is 3½ million gallons less than that ~~reported by~~ the company as storm water.

When similar amounts of precipitation from a winter month were compared to precipitation from a summer month, it was noted that on the Monthly Operating Reports, that the company reported storm water only for the winter month.

The company acknowledges that they use more water in the winter months. Because of the figures in their present permit, some of the water they have been reporting as storm water actually reflects an increase in the amount of water used to prevent line freeze ups and to produce more steam for stripping.

The company desires to cut down on the amount of water used at the plant and to use the water more efficiently by recycling. Prompted by this desire and also by questions from district staff concerning the storm water and use of water at the refinery, Total conducted a wastewater audit in the summer of 1980. They studied the source, quantity, and chemistry of water used at the plant. One of the recommendations of that audit was that a detailed study be made of the use of water at the refinery in the winter.

Until that study is carried out, the company, using past experience, feels that an additional 70,000 gallons per day for process water would provide a more realistic figure for the winter months. The winter months would include November, December, January, February, March, and April. This would mean that for this period, any figure over 61 000 gallons per day would be regarded as storm water. This would bring Total's reported storm water values more in line with the actual precipitation experienc in the winter months.

Therefore, in the new permit, there will be two figures listed. For the period from November 1 to April 30, only that water flow that is over .61 million gallons per day will be regarded as storm water. For the period from May 1 to October 30, the old .54 million gallons per day will be the dividing line.

VIII. Receiving Stream

The lagoon effluent is discharged via outfall 001 to County Drain #52 (popularly known as Horse Creek). Outfall 001 is less than two miles upstream from the confluence of County Drain #52 with the Pine River. Approximately 9,000 feet of County Drain #52 is considered a natural stream. The Pine River is part of the Saginaw River Basin. The seven day, once in ten year drought flow for the Pine River is 28 cfs.

IX. Compliance History

The company samples for most of its parameters on a twice-weekly basis. They used to report a daily figure and concentration by interpolating the figures received from their required twice-weekly readings. The company, at the insistence of staff, discontinued this practice in March of 1979.

This company has generally been in compliance with their existing permit as far as pH, oil and grease, sulfide, and total suspended solids. Winter brings special problems to the operation of the biological ponds. Cold weather slows down the activity of the bacteria that break down the oil. There is also a greater amount of water used in the winter. As mentioned before, this excess usage is due to the fact that more steam must be produced and water must be kept running in hoses to prevent freeze up. The company is investigating methods of keeping the temperature of these biological ponds at a higher level to induce more activity in the bacteria.

In 1980, the company was on strike from January 12, 1980 to February 8, 1980. The plant was kept running by management. During this period, and due to shifts in responsibilities, some of the BOD-5 samples were not properly diluted, so correct figures for the Monthly Operating Reports were not available. Also the recording chart on the deep disposal well was not changed when it should have been, so figures from January 11 to January 20 were not sent in on the MOR's. In February, high BOD-5 readings were for 5 days.

In January of 1979, a power outage and failure of a safety relief valve allowed increased amounts of phenol to go to the waste treatment ponds instead of the deep disposal well. This knocked out the bacteria in the biological ponds. In spite of the addition of activated sludge from the City of Alma Wastewater Treatment Plant to the ponds at Total, the extremely cold weather prevented an immediate recovery of the ponds. As a result, there were 14 days in January, 6 days in February, and 1 day in March of 1979 that the company exceeded their BOD-5 limits. Because of these same conditions, the phenol limits were exceeded for 12 days in January 1979. The company has taken steps to prevent this from

happening again if a similar outage occurs. They have purchased a standby pump for the deep disposal well.

In 1978, the company exceeded their phenol limits 4 days in January. They also exceeded their oil and grease limits one day in June of 1978.

The company exceeded their total suspended solids in their storm water one day in April 1979.

X. Industrial Wastewater Surveys

An industrial wastewater survey was conducted at Total Petroleum November 13-14, 1978 and June 2-3, 1980. Also, in June 1980, two on-site toxicity evaluations were conducted at this facility. At the same time, the Office of Toxic Materials conducted a review of the critical materials used and discharged at Total Petroleum.

In the 1978 survey, there was a discrepancy in BOD-5 values between the DNR results, Total's split sample results, and the company's monthly operating reports. The company explained this difference in values on their practice of not seeding their samples for BOD-5, while the Environmental Protection Bureau laboratory does seed theirs. The company based this practice on their interpretation of the 14th Edition of Standard Methods for the Examination of Water and Waste Water (page 545), which states that if micro-organisms are already present, seeding is unnecessary and should not be used. In the case of the ponds at Total, Psuedomonas are present in the ponds and oxidize the organic matter in the wastewater.

However, studies done by EPA in 1979 on the wastewater characterization of petroleum refineries indicate that BOD-5 results are similar whether or not the

samples are seeded (see EPA - Volume II Treatability Manual, Section 14, Petroleum Refining, Table 14, 15).

In the split samples of the 1980 survey, the company reported higher readings for BOD-5, suspended solids, chemical oxygen demand, and ammonia nitrogen than the Environmental Protection Bureau laboratory. Because there was a significant difference in the readings, the company is evaluating their analytical procedures and also conferring with laboratory personnel at the EPB laboratory. The effluent from outfall 001 that was sampled during the survey was in compliance with their NPDES permit.

For the on-site toxicity evaluation, the test species used were Daphnia magna and Pimephales promelos. During the survey, the effluent was not toxic to either test species.

The environmental survey conducted by the Office of Toxic Material on June 2-3, 1980 found 0.41 ug/l PCB in the water of ~~Horse Creek~~ County Drain #52, but not in the stream sediment. The outfall (001) from the Total wastewater ponds empties into ~~Horse Creek~~ County Drain #52. The PCB (Aroclor 1260) was detected downstream of Total's outfall. The wastewater survey found 0.87 ug/l of Aroclor 1260 in the composite samples taken from outfall 001 on June 2-3, 1980. The company does not process any used oil, nor should there be any PCB in the crude oil used as feedstock. The only PCB on the premises is in the transformer in the hydrofiner building and this has proper containment (see Total PCB addendum to their PIP Plan). The company is investigating the source of PCB. Past practice was to recycle ~~the~~ used oil for other oil companies, before PCB was an issue.

XI. Proposed Limitations

The proposed limitations are based on the Federal Guidelines, Federal Register 40 CFS Part 149 and the EPA, Volume II Development Document, Section 14.

*The Federal Register* 40 CFR regulations are also known as best practical *treatment regulations* (BPT). Company figures taken from a two-year period of monthly operating reports were compared to Water Quality standards and also to the EPA's Best Available Technology Economically Available (BATEA limitations). Because the company is at this time not meeting BATEA limitations for phenols, a short-term permit is being drafted, with a reopener clause, based on BPT regulations. These Federal Guidelines set up a base limit plus a size factor based on the volume of feedstock per day. The permit limitations in the first permit issued in 1974 were based on a feedstock of 43,000 barrels of crude oil per day. The application for reissuance of the Total permit lists 42,000 barrels of crude oil processed. This is a 2 percent reduction in the amount of crude oil processed per day. Because the Federal Register ~~lists~~ regulations list first size factor as anything under 49,000 barrels of oil processed per day, this reduction will not affect any parameter limitations.

The EPA Volume II Development Document section on petroleum refining lists BOD-5, COD, TOC, oil and grease, ammonia as nitrogen, phenolic compounds, sulfide, chromium, and total suspended solids as the significant pollutant parameters for this industry.

The present BOD-5 limits are more stringent than the BATEA and BPT limits, but not as stringent as the Water Quality parameters. The parameters for BOD-5 will remain the same for this permit. The COD limits in the present permit are more strict than the Federal BCT regulations, so will remain the same. In this permit, a new parameter, TOC, will be added because the EPA lists it in their Development Document on Oil Refineries (Volume II). The company will be required to monitor only. The oil and grease parameters will remain at 10 mg/l. The ammonia limits now in effect for this facility are stricter than the BATEA and BPT limits.

Therefore, the ammonia limits will remain the same. For the phenols, the present permit limits are stricter than the BPT regulations so these limits will remain the same. The sulfide limits now in effect for this facility are stricter than the BATEA and BPT limits and will remain the same. Chromium testing was not in the first permit. The company will be required to monitor only for chromium in this permit. The limits for total suspended solids will remain the same for this permit.

The TOD requirement in the original permit was calculated using converted BOD-5 and $NH_3$-N figures. This requirement is being dropped because it is not listed as one of the parameters EPA considers essential for the oil refining category. Since TOD was also calculated from river flow, the company will no longer have to measure river flow from May to October.

The pH range will be changed from 6.5 - 9.5 to 6.0 - 9.0 to conform with Federal Regulations. The company will have no problems in meeting this change.

There have been no changes in the storm water parameters in the Federal Regulations so these figures will be the same as in the original permit. Storm water goes through the wastewater system of biological and polishing ponds.

The biggest change in the permit is the addition of the section on Land Application of Oily Waste and Biological Sludges. Since the EPA discusses this in Book 2 of their Hazardous Waste Management System, under the title of land treatment facility, this is how it will be designated in this permit.

XII. Land Treatment Facility

Under the Phase I RCRA rules, subpart M, (pages 33205-33209) of the May 19, 1980 Federal Register EPA states that the general objective of land treatment is the microbial degradation of organic waste constituents. Generally, operators apply the waste in thin layers and use common

farm practices such as tilling contouring, and erosion control. They may also add nitrogen and phosphorus fertilizers to enhance microbial degradation of the waste. There are no permitted soil farms for waste oil as yet in Michigan. ~~The practice is relatively new.~~ It is used primarily to treat oily wastes. Two other publications were used to develop this part of the permit.

1. Oily Waste Disposal by Soil Cultivation - Process published by the Office of Research and Monitoring, U.S. Environmental Protection Agency (1972).

2. Biodegradation of Oily Sludge by Soil Micro-organisms - by R. A. Weldon, Suntech Group, Marcus Hook, Pennsylvannia (1978).

Total Petroleum has 2 soil farm operations at the Alma Refinery. In the smaller one, biological sludge from the wastewater ponds is disposed of using soil cultivation methods on 8.[illegible] acres of land south of the biological ponds. Sludge was ~~last~~ spread in 1977. This was the only time the biosludge was spread. The Company does not anticipate that they will need to spread biosludge for several more years. ~~Sludge will probably be spread again in 1981.~~

This land application of the sludge from the ponds was not part of the original NPDES permit. Permission to spread the sludge was given in a letter dated June 10, 1976 after inspection by district staff. The company was limited to spreading 50 tons of dry solids per acre per year. The sludge was approximately 4 percent suspended solids, 1 percent oil and 95 percent water. Application was limited to the spring, summer, and fall seasons.

The company wishes to continue and expand their application of wastes to the land and have it included in their NPDES permit. Since the water from the soil farm area will be collected and pumped to the Total wastewater treatment system of settling biological and polishing ponds for treatment, including it in the NPDES permit is logical.

Every year, this company has in addition to the sludge from their biological ponds, truck loads of oil contaminated earth from oil spills and leaking oil

pipes from areas outside of the refinery. Total also has the sludge from the API oil and water separator that must be disposed of. At present, they are hauling their oil sludge to Ohio for disposal. However, with the closing down of so many disposal areas, the company wishes option to take care of its own oily wastes by disposing of the wastes on the land if possible.

They propose to do this on 20 acres of working fields owned by Total and located south of Superior Street across from the refinery. This land is flat, bounded on the east by the Total flare tower and to the south by a county drainage ditch. According to the U.S. Soil and Conservation Survey of Gratiot County (~~see~~ map #25), this 20 acres is Capac-Parkhill Metamora series of soil. This soil series is characterized by very poorly drained to somewhat poorly drained soils that have a loamy subsoil. This soil farm is located at the site formerly occupied by the waste sludge pits common to refineries in the 1940's, 1950's and 1960's. However, the oil degradation rates were so slow in the deep pits that the industry started to investigate soil farming during the mid 1950's.

Total Petroleum (then Leonard Refineries) began soil farm operations around 1970. The pit accumulations were removed, and the heavy sludges mixed with sandy earth for spreading on the soil farm. The two large piles of this mixture are now almost level. This material was used to slope the fields so that drainage would be towards the center. There are two large piles of this mixture remaining to be spread from this original work. This site has been used as a [illegible] pits, and for disposal of contaminated earth from oil spills.

The company hired Williams and Works to provide a hydrogeological study of the soil farm site. A preliminary study was performed in 1977 and completion of the soil borings and 7 observation wells was done in the summer of 1978. Ground

*water flow direction* has been determined. It is to the northeast with a gradient of 0.32 feet per 100 feet and approximately 20 feet below the land's surface. Due to its shallow depth and low yield capacities, the water bearing formation tapped by the observation wells is too small and shallow to be used as a potable industrial or agricultural water supply aquifer.

As mentioned before, the application of oily wastes to soil is a relatively new method of disposal, especially in Michigan. There is limited information on the suitability of this method of disposing of oily wastes. Soil farming of oil wastes has been investigated by a number of researchers in the American Petroleum Institute in Texas, Oklahoma, and Toledo, Ohio.

Total Petroleum is very eager to demonstrate that land application of oily wastes is a practical, workable method. The program will be carefully controlled and supervised by the Environmental Affairs Section of Total. If the disposal of oily wastes by land application is successful, this could be a good source of information for future use.

Total has diked the area to be used for application of oily wastes and contoured the land so that surface drainage is to a collection ditch that runs in a north-south direction in the center of the site. This water is then pumped across Superior Street to Total's wastewater ponds.

An independent report by Total states that the oil is degrading in the soil farm as would be predicted. Some areas within the old pits show evidence of their former use, but there is no sign of migration of oil from the area. The fields in the application site are underlain with heavy grey clay. There is a water bearing formation perched on the clay and that formation was used for the

observation wells. Flow to the wells is slow, and in some wells, it is necessary to pump several times over two or three days to obtain the recommended volume of flush before sampling. There is no evidence of migration of oils outside the site in the water samples collected in the study by Williams and Works. However, samples collected from County Drain #52, by the Office of Toxic Materials Control, on June 2-3, 1980 found a heavier concentration of heavy metals at the station located near the biosludge application area. ~~adjacent to the land application area~~.

## Proposed Method of Operation of Soil Farming

There were ~~are~~ two large piles of accumulated dirt from the removal of the old waste sludge pits. The company had ~~proposes~~ to spread the larger pile of dirt around the outside 10 to 20 feet of the soil farm fields. This will further facilitate surface runoff to the collection ditch in the center. There is about 4,400 cubic yards of dirt in this pile and it will take two or three years to spread this dirt in 6 inch layers and till it in.

The smaller pile of about 1,000 cubic yards is composed of dirt and weathered asphalt. This will be used to improve interior roads in the soil farm and within the refinery containment area. This material is very similar to asphalt paving and will degrade very little.

~~In order to prevent any inhibitory effect on soil microbial activity, the company will make it a strict policy to segregate the biological sludge from the oil contaminated soils. Biological sludge will be applied only to the 8.8 acres south of the biological ponds. None will be spread on the site south of Superior Street. There are 2 monitoring wells adjacent to the 8.8 acre site.~~

The company will not spread any oily sludge on the 8.8 acres, but would like to retain the option to spread

The fields will be worked with a disc or other suitable machinery to provide adequate aeration. Soil samples will be checked twice a year and lime or fertilizer added to maintain optimum conditions for biological growth. No crops for animals or human consumption will be grown.

## Schedule of Compliance for Land Treatment

In the schedule of compliance, the company is requested to submit a proposal of their plan for land application of wastes. They will be required to characterize the chemical nature of the wastes to be applied and the capability of the soils to receive it. Monitoring the ground water by wells and sampling the water in County Drain #52 will also be required. RCRA rules state that to get an accurate picture of the treatment process, EPA requires the installation of both soil core monitoring and soil pore water monitoring. These rules further state that the company must provide information on unsaturated zones, i.e., land on which no oily waste has been spread. This unsaturated zone monitoring plan must specify the operator's rationale for such key elements as depth of monitoring, number of samples, frequency of sampling and timing of sampling. These decisions must reflect a consideration of the variability of the waste and the waste/soil mixture proximity to ground water, manner of waste application, and soil permeability.

The company will be required to keep records as to application dates, application rates, quantities, results of waste analyses, and location of each hazardous waste placed in facility. This is specified in the RCRA rules.

Observation wells will be sampled quarterly for a determination of pH, sulfide, COD, phenols, chloride, and heavy metals (chromium, copper, lead, and zinc), for one year after that the observation wells will be sampled semi-annually

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Observation wells will be sampled quarterly for a determination of pH, sulfide, COD, phenols, chloride, and heavy metals (chromium, copper, lead, and zinc), for one year after that the observation wells will be sampled semi-annually.

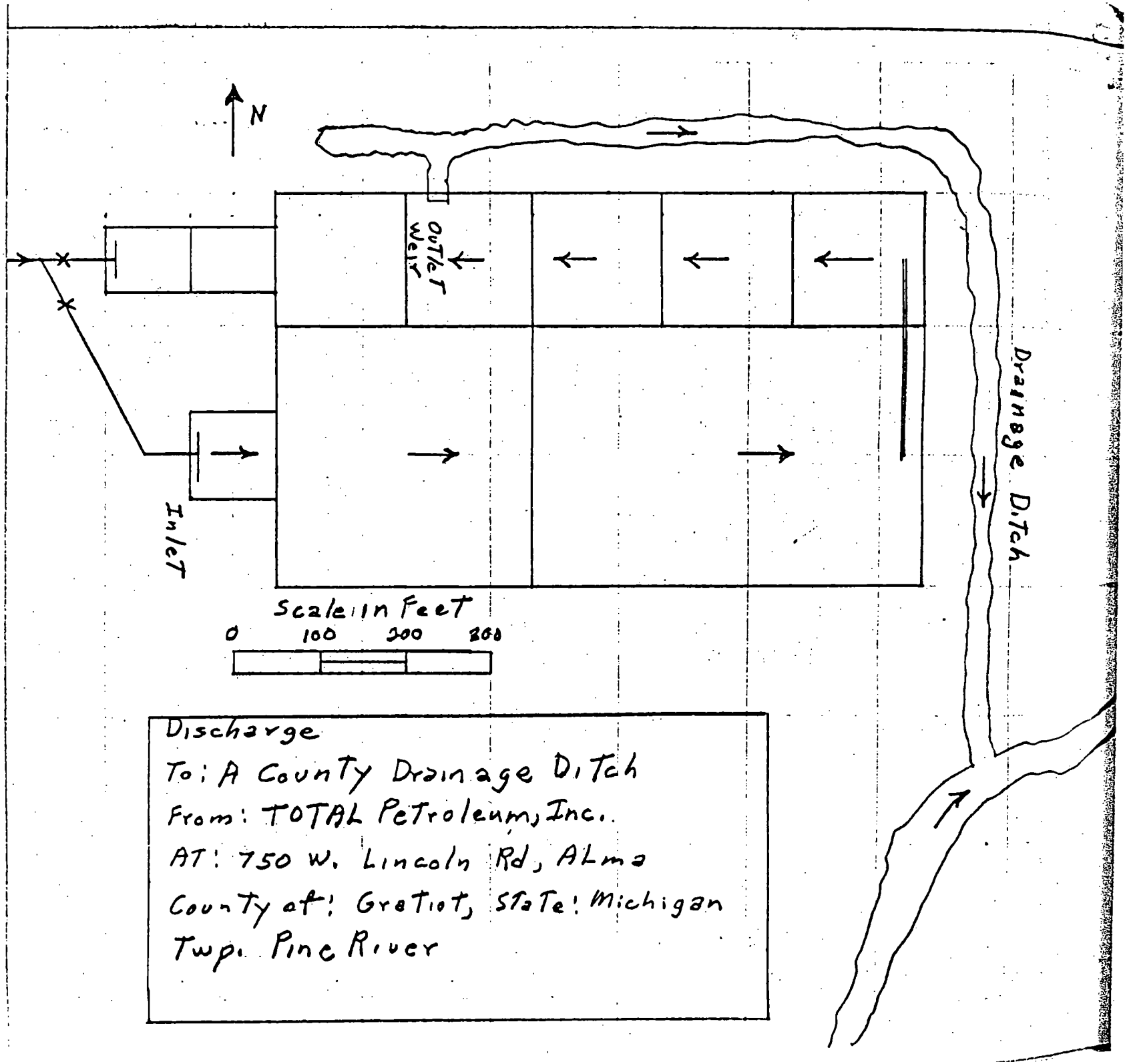
The company will be required to comply with the Part 22 Ground Water Rules, and the RCRA Land Application Rules.

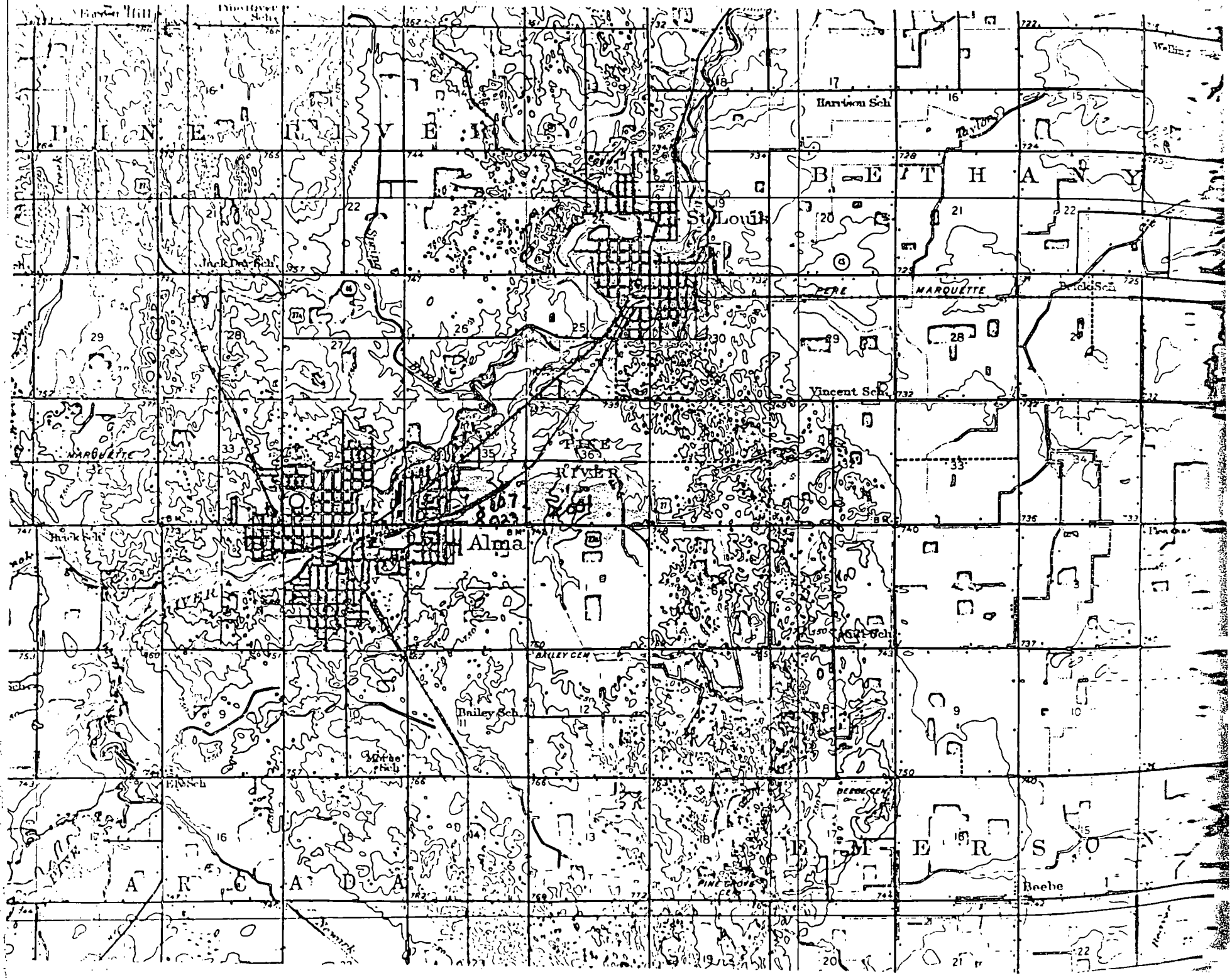
## XIII. Critical Materials

In the original permit application, the numbers reported on the critical materials section were based on the ranges of numbers from the 1978 Annual Wastewater Report. The new director of Environmental Affairs at Total sent in a clarifying letter regarding the toxic materials. This letter is attached to the original application. The company reports the use of chromium and zinc for cooling water corrosion control. The industrial waste water survey of June 1980 reveals less than 0.05 mg/liter of zinc and chromium in the effluent from outfall 001.

This waste water survey did show PCB (Aroclor 1260) in the effluent at 0.87 ug/l. The Office of Toxic Materials also found 0.41 ug/l PCB in ~~Horse Creek~~ County Drain #52. They also noted levels of 1,700 ug/l Aroclor 1260 in the waste being discharged to the deep disposal well. The company ~~does not~~ no longer process used oil as a fuel to other industries. There should not be any PCB in the crude oil. The company is conducting a study to determine the PCB source. This will include sampling of the dirt piles and sludges removed from the oil pits.

An environmental impact statement is not needed. Staff have determined that the effluent limitations meet appropriate guidelines and are adequate to assure compliance with water quality standards.


N
Outlet Weir
Inlet
Drainage Ditch
Scale in Feet
0
100
200
300
Discharge
To: A County Drainage Ditch
From: TOTAL Petroleum, Inc.
AT: 750 W. Lincoln Rd, Alma
County of: Gratiot, State: Michigan
Twp. Pine River



PINE RIVER
BETHANY
St Louis
Harrison Sch
Jack Day Sch
PERE MARQUETTE
Brick Sch
Vincent Sch
PINE RIVER
Alma
MARQUETTE
BAILEY CEM
Bailey Sch
Morse Sch
El Sch
BEEBE CEM
PINE GROVE CEM
Beebe
ARCADA
EMERSON

| I. INORGANIC MATERIALS | NAME | AMOUNT (lbs/yr) | NAME | AMOUNT (lbs/yr) |
|---|---|---|---|---|
| | Antimony | | Mercury | |
| | Arsenic | | Nickel | 1,0 1 to , |
| | Cadmium | | Selenium | |
| | Chromium | , to ,000 | Silver | |
| | Copper | | Sulfides | 1,000,0 |
| | Cyanides | 1,0 1 to 0 000 | Thallium | |
| | Lead | 1,000,000 | Zinc | 1,0 1 to 10, |

| II. ORGANIC MATERIALS | NAME | AMOUNT (lbs/yr) | NAME | AMOUNT (lbs/yr) |
|---|---|---|---|---|
| | Acridine | | Hexachlorobenzene (HCB) | |
| | Acrolein | | Hexachlorobutadiene (HCBD) | |
| | Aldrin | | Hydroquinone | |
| | Ammonia | , - , , | Isoprene | |
| | Amyl Acetate | | Lactonitrile | |
| | Anilines (incl. Benzidines) | | Mesitylene | >1 000,0 |
| | Benzaldehyde | | Mesityl Oxide | |
| | Benzene (Solvent) | 1,000,000 | Napthol | |
| | Benzyl Bromide | | Naphthenic Acid (Napthalene) | >1 000 000 |
| | Beta Propriolactone | | Nitrobenzenes | |
| | Butyl Alcohol | 101 to 1,000 | Phenolic Compounds | >1 000 000 |
| | Butyraldehydes | | Phenanthrene | |
| | Butyric Acid | | Phthalates | |
| | Carbon Disulfide | | Picramates (nitro-phenols) | |
| | Chlorinated Benzene Compounds | | Polychlorinated biphenyls (PCB'S) | 1 01 to 10 00 |
| | Crotonaldehyde | | Pyridines | |
| | Cumene | 1 000 000 | Quinoline | |
| | DDT | | Quinone | |
| | Dichloropropane | 1 0 1 to 10,000 | Styrene | |
| | Dieldrin | | Tordon | |
| | Diethylbenzene | 1 000 000 | Toxaphene | |
| | Endrin | | Vinyl Toluene | |
| | Ethyl Acrylate | | Xylenes | > ,000,00 |
| | Heptachlor | | 2-4-5 T (and its formulations) | |

Submitted in accordance with Section 8 (b), Act 245, Public Acts of 1929, as amended.

| Signature of Applicant | Date | If Partnership, Signature of Co-Owner | Date |
|---|---|---|---|
| | 12-13-78 | N/A | |
| Print or Type Applicant's Name and Title | | Print or Type Co-Owner's Name | |
| ohn E. Garner Dir. Env. Affairs | | N/A | |

NOTE: If sanitary sewage is to be discharged from housing developments, apartment buildings, shopping centers, or other comm developments into a system *other* than an approved municipal sanitary waste collection system, the following should be completed and sigr an authorized municipal official or township officer.

It is the policy of the Commission to request that applications involving the disposal of sewage of human origin from any entity *other* than government include the local government as a co-signer of the statement, and that all proceedings and hearings against the said entit include the local unit of government as a party by appropriate notice, and all permits issued as a result of such hearings and proceedings jointly against the said unit and entity.

| Signature of Authorized Local Government Representative | | Mailing Address of Local Government Representative |
|---|---|---|
| N/A | | |
| Print or Type Name of Local Government Representative | | |
| Title | Date | |

2. Deep well #2 Outfall #107

3. Deep well #1 (stand by only) Outfall #023

(b) DESCRIPTION OF EXPECTED CHARACTERISTICS OF WASTE AFTER TREATMENT (Bacterial, physical, chemical, other):

| Process Waste | | | |
|---|---|---|---|
| | COD | Oil & grease | TOD |
| | BOD | PH | |
| | TSS | Phenol | |
| | Ammonia (N) | Sulfide | |

| | | |
|---|---|---|
| COOLING AND CONDENSING WATER | List All Additives | zinc chromate, sludge dispersants, Chlorine, Organic Biocides |

| | | | | |
|---|---|---|---|---|
| ANTICIPATED TERMPERATURE OF DISCHARGE | Max. Summer 76 °F | Max. Winter 36 °F | ANTICIPATED TEMPERATURE OF INTAKE: | Ave. Winter 40 °F |
| | Ave. Summer 72 °F | Ave. Winter 33 °F | | Ave. Summer 70 °F |

SANITARY SEWAGE: Sanitary Sewage goes to City of Alma, Waste treatment Plant

OTHER (Specify): N/A

7. DISTANCE OF TREATMENT FACILITIES FROM NEAREST WELL:

PRIVATE WELL 600' FEET MUNICIPAL WELL _____ FEET

8. IF SUBSURFACE DISPOSAL OR OXIDATION POND IS PROPOSED, NEAREST DISTANCE TO A SURFACE WATERCOURSE: N/A FEET

9. IF DISCHARGE IS TO UNDERGROUND BY INJECTION WELL, INCLUDE COMPLETE DATA AS TO DEPTH AND DIAMETER OF WELL, MATERIALS AND DETAILS OF CONSTRUCTION, DATE OF DRILLING, SCREEN DATA, AND PROPOSED OPERATIONS OF INJECTION WELL ON A SEPARATE FLY SHEET.

See attachments

10. Provide herewith, either by drawing in the space below or by attaching a USGS map or county map with appropriate marking, each proposed discharge point for process wastes, cooling waters or sanitary wastes.

See Attachments

11. NAMES AND ADDRESSES OF PROPERTY OWNERS ADJACENT TO PROPOSED ENTERPRISE

| Name | Address |
|---|---|
| John A. Brink | 750 W. Lincoln Rd. Alma, MI 48801 |
| Everett Bebow | 465 Hoofman Rd. " " " |
| Mrs. L. Vance | 1836 Michigan Ave. " " " |

1. APPLICATION FOR (Check one)

[X] Existing Discharge [ ] New Discharge [ ] Increased Discharge

2. Name of Applicant: Total Petroleum Inc.

Telephone No.: 517-463-1161

No. and Street: East Su erior Street

City: 3

State and Zip Code:

3. (a) TYPE OF LEGAL ENTITY (Check one):

[ ] Sole Owner [X] Corporation [ ] Partnership

[ ] Governmental Unit [ ] Non-Profit Organization

If incorporated, indicate state in which articles of incorporation are filed: Michigan

(b) TYPE OF PROPOSED ENTERPRISE (Check one):

[ ] A. Municipal Wastewater, School, Trailer Park

[ ] B. Agricultural, Including Fish Farms

[X] C. Manufacturing and Mining

[ ] D. Wholesale and Retail Trade, Other Commercial Establishments

(c) DESCRIPTION OF PROPOSED ENTERPRISE:

Oil Refinery.

Refining of 42,000 barrels per day of crude oil.

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NOC—Permit

(d) LOCATION OF PROPOSED ENTERPRISE:

| Street Address | City or Village | County | Township | Town | Range | Section |
|---|---|---|---|---|---|---|
| East Superior Street | Alma | Gratiot | Pine River | 12 N | 3W | 35 |

4. SOURCE OF WATER (Example: private well, river, municipal supply):

| | | Amount (gal/day) | |
|---|---|---|---|
| PROCESS WATER | City of Alma | 397,320 | |
| COOLING AND CONDENSING | City of Alma Private Wells | 385,080 | 312,300 |
| DOMESTIC WATER | City of Alma Private Wells | 34,071 | 210 |
| OTHER (Specify) | | | |

5. PROPOSED LOCATION OF WASTE DISCHARGE (Example: groundwater, public, county drain, lake; give name where applicable):

| | | Amount (gal/day) |
|---|---|---|
| PROCESS WATER | County drain #52 open | 510,000 over 24 hrs. |
| COOLING AND CONDENSING | | |
| DOMESTIC WASTE WATER | City of Alma Sanitary Sewer | 34,281 over 24 hrs |
| OTHER (Specify) | | |