

Michael Cain

From: Mac McClelland [mac@otwellmawby.com]
Sent: Monday, October 24, 2011 2:45 PM
To: Michael Cain
Cc: Roger Mawby
Subject: Boyne City UST
Attachments: Boyne City UST MDEQ Closure Letter.pdf; Boyne City UST Sample Location Map.pdf

Michael:

Roger Mawby reviewed our file for the Boyne City DPW Underground Storage Tanks (USTs). Four USTs were removed on September 17, 1990. The following is a summary of due care consideration for development and background on the remediation project.

Summary: There was a release identified during the removal of four USTs. The site has been remediated, a Closure Report was prepared by Otwell Mawby and approved by the MDEQ, and a closure letter was sent by MDEQ on June 29, 2000 (attached). A site plan of the locations of the USTs and sample locations is also attached.

There does not appear to be any environmental due care considerations with respect to the LUSTs for additional development or expansion adjacent to the current City Hall.

There may be some concerns with historic uses of the property, including fill materials as a lumber yard and previous utility company operations. It may be advisable to conduct some investigation in the proposed expansion location to identify any underground conditions that may affect the development.

Background: On September 17, 1990, four Underground Storage Tanks (UST) and associated piping were removed from two locations, one from either side of the building at the Boyne City DPW garage. During the process of closure, a confirmed release from the UST system at each location was identified that impacted soil and groundwater. Subsequent phases of assessment and remediation include the removal of approximately 890 cubic yards of impacted soils and pumping of approximately 3,000 gallons of groundwater from the excavations.

Only minimal groundwater contamination was detected at the western release point while a more substantial plume was delineated in the area of the eastern source. A Corrective Action Plan was submitted on August 27, 1992 that outlined a 24 month plan for the monitoring of natural attenuation. In the case that the elevated contaminant levels persisted during that time, an air sparge/soil vent system was proposed to be installed. The system was never installed, however, due to the fact that contamination concentrations decreased during the monitoring period and have remained below MDEQ Risk Based Screening Levels.

During the process of executing the natural attenuation Corrective Action Plan, groundwater from monitor wells was sampled three times in 1993 and 1994, and annually from 1995 through 2000. The analytical data showed that the constituents of concern have been below Generic Residential Cleanup Criteria since May 1996. The Closure Report was prepared and submitted in May 2000, and the MDEQ issued the closure letter on June 29, 2000.

10/24/2011

I hope this information helps. Please contact me if you have questions or would like additional information.

Thanks. Mac

Mac McClelland
Otwell Mawby, P.C.
309 E. Front Street
Traverse City, Michigan 49684
231.946.5200
231.633.6303 cell
mac@otwellmawby.com
www.otwellmawby.com



JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

"Better Service for a Better Environment"

HOLLISTER BUILDING, PO BOX 30473, LANSING MI 48909-7973

INTERNET: www.deq.state.mi.us

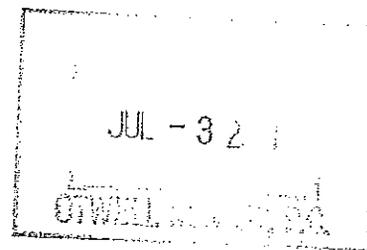
RUSSELL J. HARDING, Director

REPLY TO:

GAYLORD FIELD OFFICE
STORAGE TANK DIVISION
120 W. CHAPIN STREET
CADILLAC, MI 49734-5830

June 29, 2000

Mr. Butch Erber
City of Boyne City DPW
319 North Lake Street
Boyne City, MI 49712



COPY

Dear Mr. Erber:

SUBJECT: Closure Report Date: May 28, 2000
Facility Name: City of Boyne City DPW Garage (Charlevoix County)
Facility Address: 319 North Lake Street, Boyne City, MI 49712
Facility ID No: 0-005592
Confirmed Release Date: September 17, 1990 (C-1791-90)

Under the authority of Section 21315 of Part 213, Leaking Underground Storage Tanks, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451), the Department of Environmental Quality (DEQ), Storage Tank Division (STD), has conducted an audit of the corrective actions undertaken as the result of petroleum releases from the former underground storage tank system at the subject facility. The audit was conducted following receipt of a Closure Report on May 30, 2000. The Closure Report was prepared and submitted on behalf of the City of Boyne City by Otwell Mawby, P.C., Qualified Underground Storage Tank Consultant (QC), and certified by Mr. Roger L. Mawby, Certified Underground Storage Tank Professional (CP).

The audit consisted of a review of district file documents. Based on this audit, the STD agrees with the CP that corrective actions associated with the above-referenced release at this facility were completed in accordance with Part 213 of Act 451 and current departmental guidance and procedures available at the time the work was completed. The CP certified that a **Tier 1 Evaluation** had been conducted under the Risk-Based Corrective Action (RBCA) process and completion of corrective actions has resulted in **unrestricted closure** of the site for **residential land use**.

Please note the following conditions:

When contaminated soil and/or groundwater as a result of a release of a regulated substance remains on site consistent with site closure requirements, the owner/operator shall not remove or allow this soil and/or groundwater to be removed from the site to an off-site location without properly characterizing the soils and/or groundwater to determine

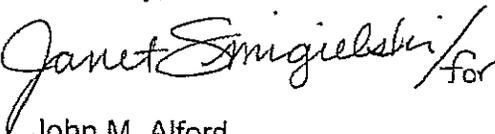
that they can be lawfully relocated without posing a threat to the public health safety, or welfare, or the environment. The determination shall consider whether the soil and/or groundwater is subject to regulations under Part 111, Hazardous Waste Management, of Act 451 and/or Part 115, Solid Waste Management, of Act 451.

Prospective purchasers of users of the property should conduct all appropriate inquiry to determine if their proposed land use might alter the conditions of the site closure and result in unacceptable risks to human health.

All groundwater monitoring wells and other similar devices installed as part of the corrective action activities at the site must be properly abandoned when they are no longer needed for their original purpose or modified purpose. Abandonment should be completed in accordance with American Society of Testing Materials Standard D 5299-92, "Standard Guide for Decommissioning Ground Water Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities." Proper abandonment of groundwater monitoring wells and other potential conduits for contamination should be performed within 60 days after use has been discontinued. Therefore, it is requested that you provide the Gaylord DEQ Office with a notice of on-site work activities at least 48 hours prior to commencing work. Also, please provide documentation of proper abandonment of each of the monitor wells.

If you have any questions, please contact Ms. Janet Smigielski in the Gaylord Field Office at telephone number 517-705-3417.

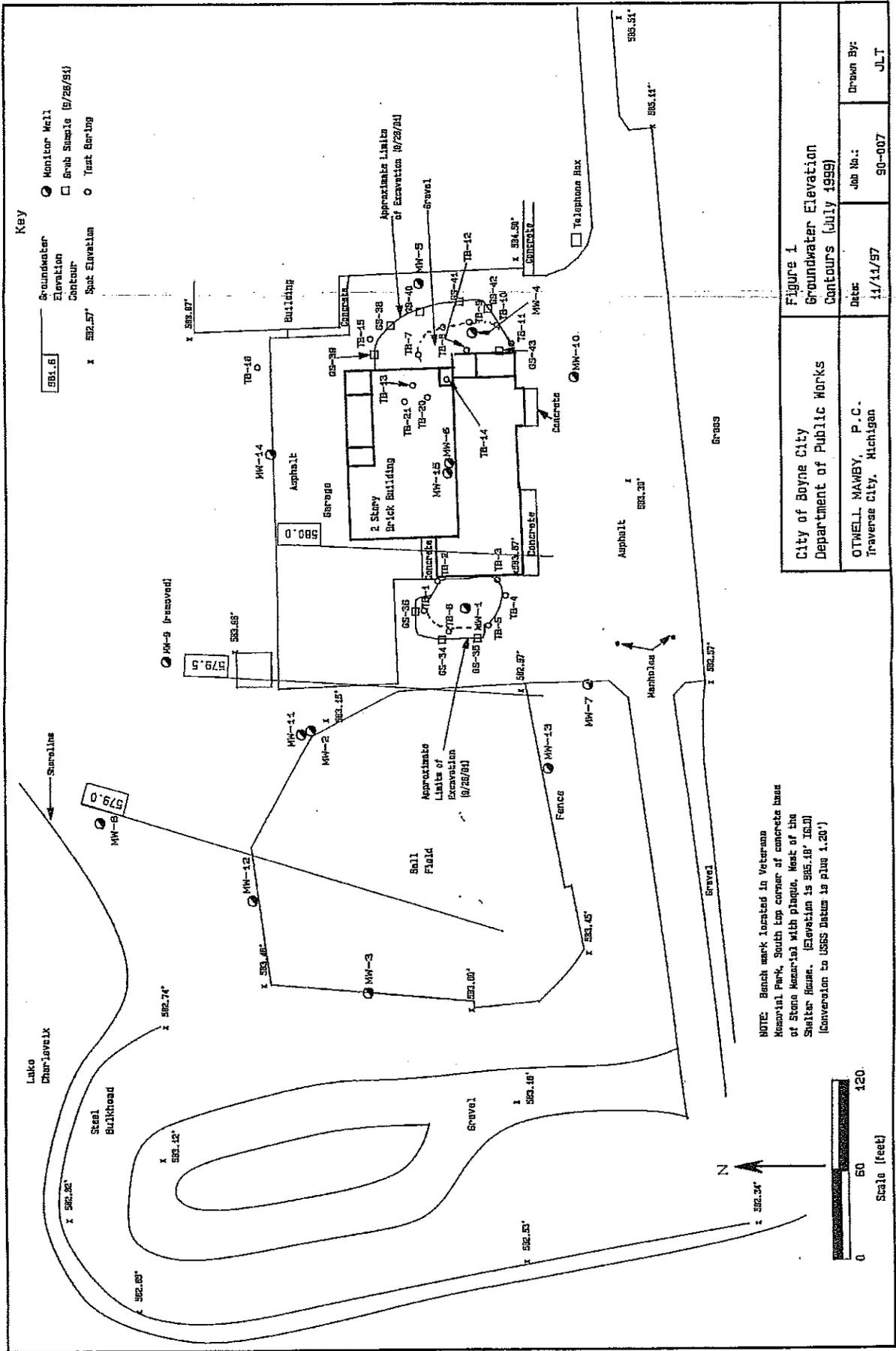
Sincerely,



John M. Alford
Cadillac District Supervisor
Storage Tank Division
231-775-3960, Extension 6435

jma/js/da

cc: Mr. Roger L. Mawby, Otwell Mawby, P.C.
Ms. Janet Smigielski, DEQ



Key

- Groundwater Elevation Contour
- Monitor Well
- Grab Sample (9/28/94)
- Test Boring

581.6

582.57

579.0

582.82

582.42

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NOTE: Bench mark located in Veterans Memorial Park, South top corner of concrete base of Stone Memorial with plaque. Most of the Shelter House. Elevation is 585.48' (IGD) (Conversion to USGS datum is plus 1.20')



Figure 1
Groundwater Elevation
Contours (July 1999)

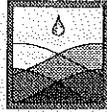
City of Boyne City
Department of Public Works

OTWELL MAMBY, P.C.
Traverse City, Michigan

Date:
11/11/97

Job No.:
90-007

Drawn By:
J.L.T.



Otwell Mawby, P.C.
Environmental Engineers

December 29, 1993

Ms. Janet Smigielski
Michigan Department of Natural Resources
1732 West M-32 Highway
P.O. Box 667
Gaylord, Michigan 49735

RE: City of Boyne City DPW
UST Release Quarterly Monitoring Report - December 1993
MUSTFA Claim Number 12990-743

Dear Ms. Smigielski:

Enclosed are the laboratory analytical results for the December 1993 quarterly sampling at the Boyne City DPW underground storage tank site. The analytical results are summarized in the attached Table 1. Table 2 summarizes the static water level elevations.

The results of the quarterly monitoring analytical data indicate non-detectable levels of BTEX at monitor wells MW-2, MW-3, MW-11 and MW-13. Remaining BTEX levels at the site meet Type B criteria, except for benzene in MW-1, MW-4, and MW-6, and xylene in monitor wells MW-1 and MW-6. BTEX levels are at or near the levels from previous monitoring results of August 1993. The monitoring data indicates that the plume is not advancing and is still confined to the DPW site.

Static water levels obtained in May 1993 indicate a northwesterly groundwater flow direction. This is depicted on the Site Plan attached as Figure 1. This flow is typical to the other groundwater flow patterns at this site.

The next quarterly sampling is scheduled for February 1994. If you have any questions, please feel free to call.

Very truly yours,

OTWELL MAWBY, P.C.

Roger L. Mawby, P.E.
Project Manager

RLM/lis
enclosures

cc: Mr. Mike Banfield, City of Boyne City
Sedgwick James

Table 1. Groundwater Analytical Results

| Location | Depth | Date | Benzene | Toluene | Ethylbenzene | Xylenes | Lead | PNA's | DO |
|----------|-----------|----------|---------|---------|--------------|---------|------|-------|-----|
| MW-1 | 8'-12' | 08/23/91 | 120 | 26 | ND | 120 | ND | ND | |
| MW-1 | 21'-25' | 08/23/91 | 2 | 5 | ND | 17 | ND | ND | |
| MW-1 | 7'-11' | 01/28/92 | 84 | 7 | 1 | 120 | NA | NA | |
| MW-1 | 7'-11' | 05/07/92 | 47 | ND | ND | 43 | NA | NA | |
| MW-1 | 7'-11' | 07/30/92 | 99 | 4 | 6 | 150 | ND | NA | |
| MW-1 | 7'-11' | 10/27/92 | 65 | 3 | ND | 277 | NA | NA | |
| MW-1 | 7'-11' | 03/03/93 | 28 | ND | ND | 170 | NA | NA | 1.5 |
| MW-1 | 7'-11' | 05/11/93 | 33 | ND | ND | 170 | NA | NA | 0.8 |
| MW-1 | 7'-11' | 08/13/93 | 10 | ND | ND | 120 | NA | NA | 1.8 |
| MW-1 | 7'-11' | 12/14/93 | 8 | 2 | ND | 150 | NA | NA | 0.9 |
| MW-2 | 8'-12' | 08/23/91 | ND | ND | ND | ND | 5 | ND | |
| MW-2 | 21'-25' | 08/23/91 | 48 | 70 | ND | 150 | ND | ND | |
| MW-2 | 7'-11' | 01/28/92 | ND | ND | ND | 44 | NA | NA | |
| MW-2 | 7'-11' | 05/07/92 | ND | ND | ND | ND | NA | NA | |
| MW-2 | 7'-11' | 07/30/92 | ND | ND | ND | ND | ND | NA | |
| MW-2 | 7'-11' | 10/27/92 | ND | ND | ND | ND | NA | NA | |
| MW-2 | 7'-11' | 03/03/93 | ND | ND | ND | ND | NA | NA | 1.8 |
| MW-2 | 7'-11' | 05/11/93 | ND | ND | ND | ND | NA | NA | 1.0 |
| MW-2 | 7'-11' | 08/13/93 | ND | ND | ND | ND | NA | NA | 1.3 |
| MW-2 | 7'-11' | 12/14/93 | ND | ND | ND | ND | NA | NA | 0.8 |
| TB-17 | 4'-8' | 01/08/92 | ND | ND | ND | ND | NA | NA | |
| TB-17 | 14'-18' | 01/08/92 | ND | ND | ND | ND | NA | NA | |
| TB-17 | 27'-31' | 01/08/92 | ND | ND | ND | ND | NA | NA | |
| MW-3 | 8'-12' | 08/23/91 | ND | ND | ND | ND | ND | ND | |
| MW-3 | 8'-12' | 05/07/92 | ND | ND | ND | ND | ND | ND | |
| MW-3 | 8'-12' | 07/30/92 | ND | ND | ND | ND | 2 | NA | |
| MW-3 | 8'-12' | 10/27/92 | ND | ND | ND | ND | NA | NA | |
| MW-3 | 8'-12' | 03/03/93 | ND | ND | ND | ND | NA | NA | 1.5 |
| MW-3 | 8'-12' | 05/11/93 | ND | ND | ND | ND | NA | NA | 1.7 |
| MW-3 | 21'-25' | 08/23/91 | ND | ND | ND | ND | ND | ND | |
| MW-3 | 8'-12' | 08/13/93 | ND | ND | ND | ND | NA | NA | 1.1 |
| MW-3 | 8'-12' | 12/14/93 | ND | ND | ND | ND | NA | NA | 1.5 |
| MW-4 | 2'-5' | 06/18/91 | 3 | 2 | ND | 36 | 4 | NA | |
| MW-4 | 5'-10' | 06/18/91 | 35 | ND | ND | 120 | 2 | NA | |
| MW-4 | 10'-15' | 06/18/91 | 2 | ND | ND | 3 | 1 | NA | |
| MW-4 | 15'-20' | 06/18/91 | ND | ND | ND | ND | 2 | NA | |
| MW-4 | 3.1'-5.1' | 01/29/92 | 4 | 2 | 5 | 64 | NA | NA | |
| MW-4 | 3.1'-5.1' | 05/07/92 | 6 | 2 | 7 | 54 | NA | NA | |
| MW-4 | 3.1'-5.1' | 07/30/92 | 9 | 4 | 5 | 73 | ND | NA | |
| MW-4 | 3.1'-5.1' | 10/27/92 | 7 | 2 | 6 | 75 | NA | NA | |
| MW-4 | 3.1'-5.1' | 03/03/93 | 3 | ND | 2 | 26 | NA | NA | 1.5 |
| MW-4 | 3.1'-5.1' | 05/11/93 | 3 | ND | 2 | 43 | NA | NA | 1.1 |
| MW-4 | 3.1'-5.1' | 08/13/93 | 6 | 2 | 4 | 110 | NA | NA | 1.3 |
| MW-4 | 3.1'-5.1' | 12/14/93 | 7 | ND | 5 | 40 | NA | NA | 1.5 |
| MW-5 | 4'-9' | 06/18/91 | ND | ND | ND | ND | 3 | NA | |
| MW-5 | 4'-9' | 01/28/92 | ND | ND | ND | ND | NA | NA | |
| MW-5 | 4'-9' | 05/07/92 | ND | ND | ND | ND | NA | NA | |
| MW-5 | 4'-9' | 07/30/92 | ND | ND | ND | 31 | 3 | NA | |
| MW-5 | 4'-9' | 10/27/92 | ND | ND | ND | ND | NA | NA | |
| MW-5 | 4'-9' | 03/03/93 | NA | NA | NA | NA | NA | NA | NA |
| MW-5 | 4'-9' | 05/11/93 | NA | NA | NA | NA | NA | NA | 1.4 |
| MW-5 | 4'-9' | 08/13/93 | NA | NA | NA | NA | NA | NA | 4.0 |
| MW-5 | 4'-9' | 12/14/93 | NA | NA | NA | NA | NA | NA | 5.2 |

continued on next page....

Table 1. Groundwater Analytical Results (continued)

| Location | Depth | Date | Benzene | Toluene | Ethylbenzene | Xylenes | Lead | PNA's | DO |
|----------|-----------|----------|---------|---------|--------------|---------|------|-------|-----|
| MW-6 | 3'-5' | 06/18/91 | 130 | 12 | ND | 500 | ND | NA | |
| MW-6 | 3'-5' | 05/07/92 | 27 | ND | ND | 350 | ND | NA | |
| MW-6 | 3'-5' | 07/30/92 | 55 | 4 | ND | 480 | ND | NA | |
| MW-6 | 3'-5' | 10/27/92 | 41 | 4 | ND | 510 | NA | NA | |
| MW-6 | 3'-5' | 03/03/93 | 23 | 3 | ND | 430 | NA | NA | 3.0 |
| MW-6 | 3'-5' | 05/11/93 | 11 | 2 | ND | 400 | NA | NA | 1.7 |
| MW-6 | 3'-5' | 08/13/93 | 9 | 2 | ND | 440 | NA | NA | 1.5 |
| MW-6 | 3'-5' | 12/14/93 | 8 | 19 | ND | 440 | NA | NA | 3.4 |
| TB-13 | 3.5'-5.5' | 06/18/91 | 260 | 66 | ND | 1,900 | 3 | NA | |
| TB-14 | 3.4'-4.7' | 06/18/91 | 1,100 | 310 | 160 | 2,400 | 3 | NA | |
| TB-15 | 3'-8' | 06/18/91 | ND | ND | ND | ND | ND | NA | |
| TB-15 | 8'-13' | 06/18/91 | ND | ND | ND | ND | ND | NA | |
| TB-15 | 15'-20' | 06/18/91 | ND | ND | ND | ND | ND | NA | |
| MW-7 | 4'-8' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-7 | 11'-15' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-7 | 12'-21' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-7 | 9'-13' | 01/28/92 | ND | ND | ND | ND | NA | NA | |
| MW-7 | 9'-13' | 05/07/92 | ND | ND | ND | ND | NA | NA | |
| MW-7 | 9'-13' | 07/30/92 | 1 | 3 | 16 | 140 | 3 | NA | |
| MW-7 | 9'-13' | 10/27/92 | ND | ND | ND | ND | NA | NA | |
| MW-7 | 9'-13' | 03/03/93 | NA | NA | NA | NA | NA | NA | NA |
| MW-7 | 9'-13' | 05/11/93 | NA | NA | NA | NA | NA | NA | 2.5 |
| MW-7 | 9'-13' | 08/13/93 | NA | NA | NA | NA | NA | NA | 3.1 |
| MW-7 | 9'-13' | 12/14/93 | NA | NA | NA | NA | NA | NA | 1.8 |
| MW-8 | 4'-8' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-8 | 14'-18' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-8 | 26'-30' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-8 | 21'-25' | 01/28/92 | ND | ND | ND | 7 | NA | NA | |
| MW-8 | 21'-25' | 05/07/92 | ND | ND | ND | ND | NA | NA | |
| MW-8 | 21'-25' | 07/30/92 | ND | ND | ND | 5 | 1 | NA | |
| MW-8 | 21'-25' | 10/27/92 | ND | ND | ND | ND | NA | NA | |
| MW-8 | 21'-25' | 03/03/93 | NA | NA | NA | NA | NA | NA | 2.8 |
| MW-8 | 21'-25' | 05/11/93 | NA | NA | NA | NA | NA | NA | 2.8 |
| MW-8 | 21'-25' | 08/13/93 | NA | NA | NA | NA | NA | NA | 2.2 |
| MW-8 | 21'-25' | 12/14/93 | NA | NA | NA | NA | NA | NA | 1.6 |
| MW-9 | 4'-8' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-9 | 14'-18' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-9 | 22'-26' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-9 | 15'-19' | 01/28/92 | ND | ND | ND | ND | NA | NA | |
| MW-9 | 15'-19' | 05/07/92 | ND | ND | ND | ND | NA | NA | |
| MW-9 | 15'-19' | 07/30/92 | ND | ND | ND | ND | 2 | NA | |
| MW-9 | 15'-19' | 10/27/92 | ND | ND | ND | ND | NA | NA | |
| MW-9 | 15'-19' | 03/03/93 | NA | NA | NA | NA | NA | NA | 3.5 |
| MW-9 | 15'-19' | 05/11/93 | NA | NA | NA | NA | NA | NA | 1.8 |
| MW-10 | 3'-7' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-10 | 14'-18' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-10 | 23'-27' | 01/09/92 | ND | ND | ND | ND | NA | NA | |
| MW-10 | 3'-7' | 01/28/92 | ND | ND | ND | ND | NA | NA | |
| MW-10 | 3'-7' | 05/07/92 | ND | ND | ND | ND | NA | NA | |
| MW-10 | 3'-7' | 07/30/92 | ND | ND | ND | ND | ND | NA | |
| MW-10 | 3'-7' | 03/03/93 | NA | NA | NA | NA | NA | NA | 3.2 |
| MW-10 | 3'-7' | 05/11/93 | NA | NA | NA | NA | NA | NA | 2.0 |
| MW-10 | 3'-7' | 08/13/93 | NA | NA | NA | NA | NA | NA | 3.1 |
| MW-10 | 3'-7' | 12/14/93 | NA | NA | NA | NA | NA | NA | 2.7 |

Table 1. Groundwater Analytical Results (continued)

| Location | Depth | Date | Benzene | Toluene | Ethylbenzene | Xylenes | Lead | PNA's | DO |
|----------|---------|----------|---------|---------|--------------|---------|------|-------|-----|
| MW-11 | 6'-10' | 05/11/92 | ND | ND | ND | ND | NA | NA | |
| MW-11 | 16'-20' | 05/11/92 | ND | ND | ND | ND | NA | NA | |
| MW-11 | 16'-20' | 07/30/92 | ND | ND | ND | ND | 3 | NA | |
| MW-11 | 20'-30' | 05/11/92 | ND | ND | ND | ND | NA | NA | |
| MW-11 | 16'-20' | 06/15/92 | ND | ND | ND | ND | NA | NA | |
| MW-11 | 16'-20' | 10/27/92 | ND | ND | ND | ND | ND | NA | |
| MW-11 | 16'-20' | 03/03/93 | ND | ND | ND | ND | NA | NA | 2.1 |
| MW-11 | 16'-20' | 05/11/93 | ND | ND | ND | ND | NA | NA | 1.2 |
| MW-11 | 16'-20' | 08/13/93 | ND | ND | ND | ND | NA | NA | 1.9 |
| MW-11 | 16'-20' | 12/14/93 | ND | ND | ND | ND | NA | NA | 0.8 |
| MW-12 | 6'-10' | 05/12/92 | ND | ND | ND | ND | NA | NA | |
| MW-12 | 16'-20' | 05/12/92 | ND | ND | ND | ND | NA | NA | |
| MW-12 | 26'-30' | 05/12/92 | ND | ND | ND | 1 | NA | NA | |
| MW-12 | 16'-20' | 06/15/92 | ND | ND | ND | ND | NA | NA | |
| MW-12 | 16'-20' | 07/30/92 | 2 | ND | ND | 1 | ND | NA | |
| MW-12 | 16'-20' | 10/27/92 | ND | ND | ND | ND | NA | NA | |
| MW-12 | 16'-20' | 03/03/93 | NA | NA | NA | NA | NA | NA | 2.9 |
| MW-12 | 16'-20' | 05/11/93 | NA | NA | NA | NA | NA | NA | 2.2 |
| MW-12 | 16'-20' | 08/13/93 | NA | NA | NA | NA | NA | NA | 3.3 |
| MW-12 | 16'-20' | 12/14/93 | NA | NA | NA | NA | NA | NA | 0.6 |
| MW-13 | 6'-10' | 05/11/92 | ND | ND | ND | ND | NA | NA | |
| MW-13 | 16'-20' | 05/11/92 | ND | ND | ND | ND | NA | NA | |
| MW-13 | 26'-30' | 05/11/92 | ND | ND | ND | ND | NA | NA | |
| MW-13 | 16'-20' | 06/15/92 | ND | ND | ND | 1 | NA | NA | |
| MW-13 | 16'-20' | 07/30/92 | ND | ND | ND | ND | 2 | NA | |
| MW-13 | 16'-20' | 10/27/92 | ND | ND | ND | ND | NA | NA | |
| MW-13 | 16'-20' | 03/03/93 | ND | ND | ND | ND | NA | NA | 2.8 |
| MW-13 | 16'-20' | 05/11/93 | ND | ND | ND | ND | NA | NA | 2.2 |
| MW-13 | 16'-20' | 08/13/93 | ND | ND | ND | ND | NA | NA | 2.1 |
| MW-13 | 16'-20' | 12/14/93 | ND | ND | ND | ND | NA | NA | 1.0 |
| MW-14 | 6'-10' | 05/12/92 | ND | ND | ND | ND | NA | NA | |
| MW-14 | 6'-10' | 06/15/92 | ND | ND | ND | ND | NA | NA | |
| MW-14 | 6'-10' | 07/30/92 | ND | ND | ND | ND | 3 | NA | |
| MW-14 | 6'-10' | 03/03/93 | NA | NA | NA | NA | NA | NA | 2.6 |
| MW-14 | 6'-10' | 05/11/93 | NA | NA | NA | NA | NA | NA | 2.0 |
| MW-14 | 26'-30' | 05/12/92 | ND | ND | ND | ND | NA | NA | |
| MW-14 | 26'-30' | 08/13/93 | NA | NA | NA | NA | NA | NA | 2.1 |
| MW-14 | 26'-30' | 12/14/93 | NA | NA | NA | NA | NA | NA | 2.3 |
| TB-20 | 5'-10' | 05/07/92 | 2 | ND | 3 | 10 | NA | NA | |
| TB-20 | 15'-20' | 05/07/92 | ND | ND | ND | ND | NA | NA | |
| TB-20 | 25'-30' | 05/07/92 | ND | ND | ND | ND | NA | NA | |
| TB-21 | 5'-10' | 05/08/92 | 1 | ND | ND | 56 | NA | NA | |
| TB-21 | 15'-20' | 05/11/92 | ND | ND | ND | ND | NA | NA | |
| TB-21 | 25'-30' | 05/11/92 | ND | ND | ND | ND | NA | NA | |

continued on next page

Table 1. Groundwater Analytical Results (continued)

| Location | Depth | Date | Benzene | Toluene | Ethylbenzene | Xylenes | Lead | PNA's | DO |
|----------------------|---------|----------|---------|---------|--------------|---------|------|-------|-----|
| MW-15 | 5'-10' | 05/08/92 | 20 | 1 | ND | 190 | NA | NA | |
| MW-15 | 15'-20' | 05/08/92 | ND | ND | ND | ND | NA | NA | |
| MW-15 | 23'-28' | 05/08/92 | ND | ND | ND | ND | NA | NA | |
| MW-15 | 30'-35' | 05/08/92 | ND | ND | ND | ND | NA | NA | |
| MW-15 | 15'-20' | 06/15/92 | ND | ND | ND | ND | NA | NA | |
| MW-15 | 15'-20' | 07/30/92 | ND | ND | ND | ND | 3 | NA | |
| MW-15 | 15'-20' | 10/27/92 | ND | ND | ND | ND | NA | NA | |
| MW-15 | 15'-20' | 03/03/93 | ND | ND | ND | ND | ND | NA | 3.0 |
| MW-15 | 15'-20' | 05/11/93 | ND | ND | ND | ND | NA | NA | 2.8 |
| MW-15 | 15'-20' | 08/13/93 | ND | ND | ND | ND | NA | NA | 2.0 |
| MW-15 | 15'-20' | 12/14/93 | ND | 3 | ND | 1 | NA | NA | 1.9 |
| Artesian Well | | 05/11/92 | ND | ND | ND | ND | NA | NA | |
| Type B Groundwater | | | 1.2 | 1,500 | 680 | 13,000 | --- | --- | --- |
| Esthetic Groundwater | | | NA | 790 | 74 | 280 | --- | --- | --- |
| Type B GSI | | | 60 | 110 | 31 | 59 | --- | --- | --- |

NOTE: ND - Not detectable (see lab report sheets in Appendix A for individual method detection limits)
 NA - Not applicable
 Units in micrograms per liter ($\mu\text{g/l}$)
 DO - Dissolved Oxygen (mg/l)

Table 2. Static Groundwater Summary

| Well | Top-Of-Casing Elevation | 6/91 | 7/91 | 8/91 | 9/91 | 11/91 | 12/91 | 1/9/92 | 1/28/92 | 5/29/92 | 6/15/92 | 7/30/92 | 03/03/93 | 05/11/93 | 08/13/93 | 12/14/93 | | |
|-------|----------------------------|--------|--------|--------|--------|--------|---------|--------|---------|---------|---------|---------|----------|----------|----------|----------|--------|--------|
| MW-1 | 583.29** | -- | -- | 580.09 | 579.99 | --- | 579.25 | 579.76 | 579.94 | 578.68 | 579.54 | 579.46 | 579.46 | 580.06 | 579.41 | 580.15 | 580.68 | 580.04 |
| MW-2 | 586.01** | -- | --- | 579.39 | 579.25 | 579.25 | 579.02 | 579.24 | 579.02 | 579.46 | 579.38 | 579.49 | 579.21 | 579.94 | 580.46 | 579.82 | | |
| MW-3 | 586.65** | --- | --- | 579.18 | 578.91 | 578.81 | 578.80 | 578.24 | 578.66 | 579.11 | 579.13 | 579.07 | 578.85 | 579.74 | 580.37 | 579.62 | | |
| MW-4 | 583.66* | 580.63 | 581.31 | 580.61 | 580.64 | --- | 580.43 | 580.54 | 580.21 | 580.34 | 580.26 | 580.44 | 580.61 | 580.14 | 581.24 | 580.85 | | |
| MW-5 | 583.80* | 580.96 | 581.54 | 580.95 | 580.98 | 581.52 | 580.63 | 580.87 | 580.41 | 580.52 | 580.53 | 580.53 | 580.60 | 581.11 | 581.16 | 580.96 | | |
| MW-6 | 584.12 | 580.27 | 580.62 | 580.95 | 580.25 | 580.18 | --- | --- | --- | 580.00 | 580.02 | 579.99 | 580.07 | 580.73 | 581.07 | 580.61 | | |
| MW-7 | 585.87** | --- | --- | --- | --- | --- | 579.22 | 578.99 | 578.99 | 579.64 | 579.56 | 579.37 | 579.37 | 580.14 | 580.52 | 580.08 | | |
| MW-8 | 585.32 | --- | --- | --- | --- | --- | 578.88 | 578.75 | 578.75 | 579.17 | 579.19 | 579.76 | 578.75 | 579.73 | 580.32 | 579.60 | | |
| MW-9 | 586.15 | --- | --- | --- | --- | --- | 579.19 | 578.96 | 578.96 | 579.35 | 579.26 | 579.35 | 579.16 | 579.92 | 580.32 | 580.32 | | |
| MW-10 | 583.59 | --- | --- | --- | --- | --- | 580.554 | 580.65 | 581.00 | 580.80 | 580.80 | 580.96 | 580.90 | 579.92 | 581.38 | 581.57 | | |
| MW-11 | 585.51 | --- | --- | --- | --- | --- | --- | --- | 579.34 | 579.25 | 579.25 | 579.34 | 579.05 | 579.78 | 580.31 | 581.20 | | |
| MW-12 | 585.75 | --- | --- | --- | --- | --- | --- | --- | 579.20 | 579.08 | 579.08 | 579.12 | 579.05 | 579.72 | 580.33 | 579.66 | | |
| MW-13 | 585.92** | --- | --- | --- | --- | --- | --- | --- | 579.40 | 579.33 | 579.33 | 579.36 | 579.24 | 579.96 | 580.43 | 579.70 | | |
| MW-14 | 585.77 | --- | --- | --- | --- | --- | --- | --- | 579.66 | 579.56 | 579.56 | 579.64 | 579.60 | 580.44 | 580.79 | 580.28 | | |
| MW-15 | 583.83 | --- | --- | --- | --- | --- | --- | --- | 580.30 | 580.21 | 580.21 | 580.23 | 580.28 | 580.85 | 581.16 | 580.76 | | |

NOTE: * MW-4 and MW-5 casing disturbed new elevation established January 1992
 ** MW-1, 2, 3, 7, 11 and MW-13 resurveyed June 1992. New elevations used to
 determine static water level elevations on May 29, June 14 and July 30, 1992
 *** Casing Bent

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| | | | |
|----------------|------------------|-------------|--------------------------------|
| Sample: | 35763-3940 | Matrix: | Water |
| Client Sample: | MW-1 | Location: | |
| COLLECTED: | 12/14/1993 | Project: | Otwell - Boyne City DPW 90-007 |
| RECEIVED: | 12/15/1993 12:49 | Sampled By: | DM |

| Test Description | Result | Unit | Detection Limit | Method | Date/Analyst |
|---------------------------------|--------|------|-----------------|------------------|---------------|
| <u>VOLATILE AROMATIC HYDRO.</u> | | | | | |
| Benzene | 8 | ug/L | 1 | SW-846 Mtd. 8020 | 12/17/1993 EE |
| Toluene | 2 | ug/L | 1 | " | 12/17/1993 EE |
| Ethylbenzene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Xylenes (Total) | 150 | ug/L | 1 | " | 12/17/1993 EE |

ND = Non Detectable

Project Manager


Maria G. Bissell

Reported : 12/20/1993

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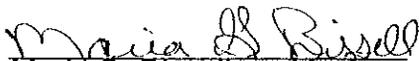
Otwell Consultants

| | | | |
|----------------|------------------|-------------|--------------------------------|
| Sample: | 35763-3937 | Matrix: | Water |
| Client Sample: | MW-2 | Location: | |
| COLLECTED: | 12/14/1993 : | Project: | Otwell - Boyne City DPW 90-007 |
| RECEIVED: | 12/15/1993 12:49 | Sampled By: | DM |

| Test Description | Result | Unit | Detection Limit | Method | Date/Analyst |
|---------------------------------|--------|------|-----------------|------------------|---------------|
| <u>VOLATILE AROMATIC HYDRO.</u> | | | | | |
| Benzene | ND | ug/L | 1 | SW-846 Mtd. 8020 | 12/17/1993 EE |
| Toluene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Ethylbenzene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Xylenes (Total) | ND | ug/L | 1 | " | 12/17/1993 EE |

ND = Non Detectable

Project Manager


Maria G. Bissell

Reported : 12/20/1993

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Sample: 35763-3934 Matrix: Water
Client Sample: MW-3 Location:
COLLECTED: 12/14/1993 Project: Otwell - Boyne City DPW 90-007
RECEIVED: 12/15/1993 12:49 Sampled By: DM

| Test Description | Result | Unit | Detection Limit | Method | Date/Analyst |
|---------------------------------|--------|------|-----------------|------------------|---------------|
| <u>VOLATILE AROMATIC HYDRO.</u> | | | | | |
| Benzene | ND | ug/L | 1 | SW-846 Mtd. 8020 | 12/17/1993 EE |
| Toluene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Ethylbenzene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Xylenes (Total) | ND | ug/L | 1 | " | 12/17/1993 EE |

ND = Non Detectable

Project Manager

Marja G. Bissell
Marja G. Bissell

Reported : 12/20/1993

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| | | | |
|----------------|------------------|-------------|--------------------------------|
| Sample: | 35763-3941 | Matrix: | Water |
| Client Sample: | MW-4 | Location: | |
| COLLECTED: | 12/14/1993 | Project: | Otwell - Boyne City DPW 90-007 |
| RECEIVED: | 12/15/1993 12:49 | Sampled By: | DM |

| Test Description | Result | Unit | Detection Limit | Method | Date/Analyst |
|---------------------------------|--------|------|-----------------|------------------|---------------|
| <u>VOLATILE AROMATIC HYDRO.</u> | | | | | |
| Benzene | 7 | ug/L | 1 | SW-846 Mtd. 8020 | 12/17/1993 EE |
| Toluene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Ethylbenzene | 5 | ug/L | 1 | " | 12/17/1993 EE |
| Xylenes (Total) | 40 | ug/L | 1 | " | 12/17/1993 EE |

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| | | | |
|----------------|------------------|-------------|--------------------------------|
| Sample: | 35763-3938 | Matrix: | Water |
| Client Sample: | MW-6 | Location: | |
| COLLECTED: | 12/14/1993 : | Project: | Otwell - Boyne City DPW 90-007 |
| RECEIVED: | 12/15/1993 12:49 | Sampled By: | DM |

| Test Description | Result | Unit | Detection Limit | Method | Date/Analyst |
|---------------------------------|--------|------|-----------------|------------------|---------------|
| VOLATILE AROMATIC HYDRO. | | | | | |
| Benzene | 8 | ug/L | 5 | SW-846 Mtd. 8020 | 12/17/1993 EE |
| Toluene | 19 | ug/L | 5 | " | 12/17/1993 EE |
| Ethylbenzene | ND | ug/L | 5 | " | 12/17/1993 EE |
| Xylenes (Total) | 440 | ug/L | 5 | " | 12/17/1993 EE |

ND = Non Detectable

Project Manager


Maria G. Bissell

Reported : 12/20/1993

| | | | |
|----------------|------------------|-------------|--------------------------------|
| Sample: | 35763-3936 | Matrix: | Water |
| Client Sample: | MW-11 | Location: | |
| COLLECTED: | 12/14/1993 | Project: | Otwell - Boyne City DPW 90-007 |
| RECEIVED: | 12/15/1993 12:49 | Sampled By: | DM |

| Test Description | Result | Unit | Detection Limit | Method | Date/Analyst |
|---------------------------------|--------|------|-----------------|------------------|---------------|
| <u>VOLATILE AROMATIC HYDRO.</u> | | | | | |
| Benzene | ND | ug/L | 1 | SW-846 Mtd. 8020 | 12/17/1993 EE |
| Toluene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Ethylbenzene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Xylenes (Total) | ND | ug/L | 1 | " | 12/17/1993 EE |

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Sample: 35763-3935 Matrix: Water
Client Sample: MW-13 Location:
COLLECTED: 12/14/1993 : Project: Otwell - Boyne City DPW 90-007
RECEIVED: 12/15/1993 12:49 Sampled By: DM

| Test Description | Result | Unit | Detection Limit | Method | Date/Analyst |
|---------------------------------|--------|------|-----------------|------------------|---------------|
| <u>VOLATILE AROMATIC HYDRO.</u> | | | | | |
| Benzene | ND | ug/L | 1 | SW-846 Mtd. 8020 | 12/17/1993 EE |
| Toluene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Ethylbenzene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Xylenes (Total) | ND | ug/L | 1 | " | 12/17/1993 EE |

ND = Non Detectable

Project Manager

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Reported : 12/20/1993

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| | | | |
|----------------|------------------|-------------|--------------------------------|
| Sample: | 35763-3939 | Matrix: | Water |
| Client Sample: | MW-15 | Location: | |
| COLLECTED: | 12/14/1993 : | Project: | Otwell - Boyne City DPW 90-007 |
| RECEIVED: | 12/15/1993 12:49 | Sampled By: | DM |

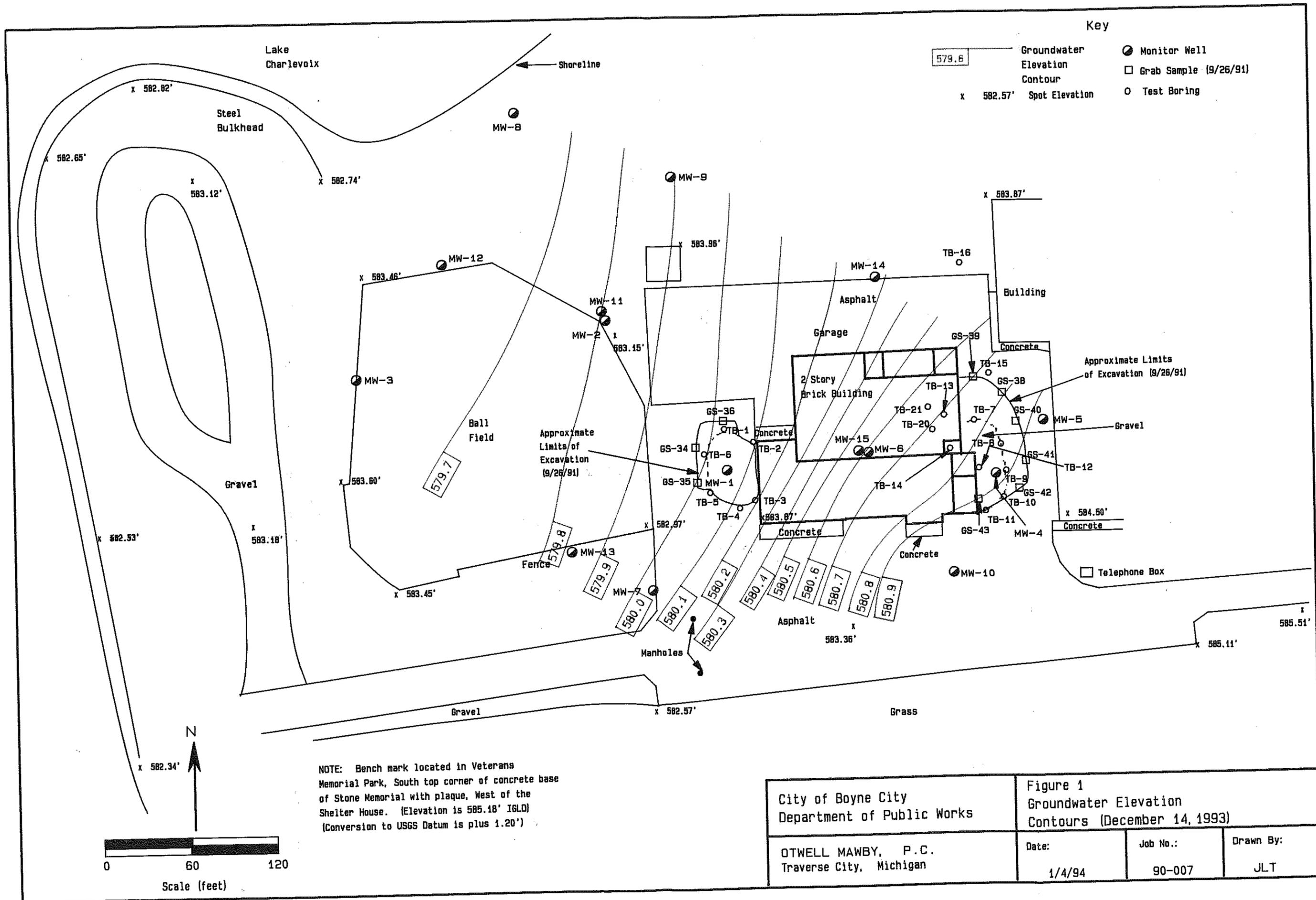
| Test Description | Result | Unit | Detection Limit | Method | Date/Analyst |
|---------------------------------|--------|------|-----------------|------------------|---------------|
| <u>VOLATILE AROMATIC HYDRO.</u> | | | | | |
| Benzene | ND | ug/L | 1 | SW-846 Mtd. 8020 | 12/17/1993 EE |
| Toluene | 3 | ug/L | 1 | " | 12/17/1993 EE |
| Ethylbenzene | ND | ug/L | 1 | " | 12/17/1993 EE |
| Xylenes (Total) | 1 | ug/L | 1 | " | 12/17/1993 EE |

ND = Non Detectable

Project Manager


Maria G. Bissell

Reported : 12/20/1993



Key

- 579.6 Groundwater Elevation Contour
- x 582.57' Spot Elevation
- Monitor Well
- Grab Sample (9/26/91)
- Test Boring

NOTE: Bench mark located in Veterans Memorial Park, South top corner of concrete base of Stone Memorial with plaque, West of the Shelter House. (Elevation is 585.18' IGLD) (Conversion to USGS Datum is plus 1.20')

| | | | |
|--|-----------------|---|------------------|
| City of Boyne City Department of Public Works | | Figure 1 Groundwater Elevation Contours (December 14, 1993) | |
| OTWELL MAWBY, P.C. Traverse City, Michigan | Date: 1/4/94 | Job No.: 90-007 | Drawn By: JLT |

