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STATUS REPORT
SOIL AND GROUNDWATER REMEDIATION
TANK FARM 94

Advanced Project Number 3114IE
February 17, 1994

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EXECUTIVE SUMMARY

TANK FARM 94

ANALYSIS OF IMPACTED AREA

1. A gasoline spill which occurred in the vicinity of the Tank Nos. 9 - 11, while removing the tanks, appears to be a source for the impacted soil at boring locations TB-1, TB-13, and MW-7S/7D in the smaller portion of the former Tank Farm 94 area.
2. Soil samples collected during the excavation of the larger portion of the Tank Farm 94 area (the former location of Tank Nos. 1 - 7) meet the Type B cleanup criteria.
3. The highest concentration of BTEX constituents in the groundwater (TB-13, MW-7) is also in the area with the highest BTEX concentration in the soil.
4. Analysis of the data collected from the area around TB-1 may also indicate migration of BTEX constituents.
5. The BTEX plume is on a north-south axis paralleling the 18-inch sewer line.
6. There appears to be a leak from either the fire suppression line or the hydrant located near the TB-14 boring location. This mounding will force the migration of constituents to the north.
7. The presence of underground utilities, such as a high-pressure fire suppression line and an 18-inch gravity sewer line, in the source area eliminates excavation, trenching, soil vapor extraction, and other invasive remedial alternatives.

SELECTION OF CLEANUP CRITERIA

1. A Generic Industrial Type C cleanup criteria for both soil and groundwater is proposed for this site, primarily because of the presence of a high-pressure fire suppression line which is close to the TB-13 source area and the existence of the 18-inch gravity sewer line.
2. The preferred remedial alternative is to use the existing MW-7S monitoring well as a recovery well and to install another recovery well in the TB-1 boring location. Diaphragm pumps will be located near the freon tank to protect them from traffic.

Effluent from the two recovery wells can be pumped into a tank mounted on stilts so that the effluent could be loaded into a tanker by gravity, eliminating the need for a vacuum truck. To contain groundwater migration to the north, either Monitoring Well MW-10 should be converted to a recharge well or a new recovery well to the north of MW-10 should be installed. If leakage from the area of TB-14 is insufficient to re-charge the source area, MW-11 could be converted to a recharge well as it is outside the plume area and there is no need to retain it as a monitoring well. This approach should ensure a Generic Industrial Type C closure for soil and groundwater for this site. A backup plan if the Generic Industrial Type C cleanup criteria for groundwater is not achieved within a reasonable time period is to install another recovery well in the TB-13 area.

3. It must be emphasized that the Generic Industrial Type C closure for the site also means satisfying the other Type C requirements such as deed restrictions, monitoring, financial responsibility, installing a marker on the site, and other applicable, appropriate and relevant requirements (possible RCRA capping requirements).
4. Under Michigan Act 307, another alternative exists for obtaining a Type B closure for the impacted soil on the site. This option entails collecting soil samples from the source area, running a leach test, and comparing the leachate results with the most restrictive of the drinking water criteria. If the leachate results are below the Type B drinking water levels, then a Type B closure may be possible. A fate and transport model would also be needed to verify that migrating groundwater will not affect the Flint River. This additional soil sampling should be conducted prior to requesting a Generic Industrial Type C cleanup for the site.

REPORTS

1. The draft WWES report entitled *Remedial Subsurface Investigation for Former Tank Farm 94* should be submitted in draft form with a cover letter stating that another consulting firm has replaced WWES on this site. The comments presented in Attachment 1 of the Status Report can be dealt with WWES separately.
2. A Corrective Action Plan (CAP) should be drafted and submitted for MDNR approval indicating the preferred alternative of using two recovery wells to attempt to retrieve the impacted groundwater and to flush the impacted soil.

SCHEDULE FOR IMPLEMENTATION

The following proposed schedule reflects the expected duration of the remediation based upon existing information:

<u>TASK</u>	<u>TIME LINE</u>
Respond to MDNR comments and modify CAP	Two weeks after receipt of MDNR letter
Prepare design for recovery well installation, recharge wells, and holding tank for effluent from recovery wells	Two months after approval of CAP
Complete bid package for loading, hauling, and disposing of the effluent from the recovery wells	Three months after approval of CAP
Complete bid package for quarterly monitoring of wells and water level measurements, laboratory analysis of groundwater samples and progress reports to MDNR	Three months after approval of CAP
Issue Notice to Proceed	Four months after approval of CAP
Laboratory Analysis of soil and groundwater samples and data interpretation	Six months after approval of CAP to five years or reaching an agreed-upon asymptote

1.0 INTRODUCTION/PURPOSE

The purpose of this report is to present the findings related to the Scope of Work outlined in the Advanced Environmental, Inc. (Advanced), Proposal for environmental services related to Tank Farm 94 including:

- (1) review existing data and reports for Tank Farm 94;
- (2) prepare a list of data and other information needed but not yet collected to complete an Industrial Type C closure request (e.g., review drawings);
- (3) determine if WW Engineering & Science (WWES) draft report dated November, 1992, can be finalized into an official report for submittal to the MDNR; and,
- (4) depending on review of the analytical data obtained to date, select either an Industrial Type C closure request or an interim response plan as the next task.

2.0. BACKGROUND/PREVIOUS REPORTS

Tank Farm 94 consisted of ten underground storage tanks (USTs), namely Tank Nos. 1 through 7 and Tank Nos. 9 through 11 of varying capacities as shown in Table 1. The Tank Farm (shown in Figure 1) is comprised of a larger area consisting of Tank Nos. 1 through 7 and a smaller area consisting of Tanks Nos. 9 through 11. Tank No. 8, holding diesel fuel, was removed in 1986.

A release was suspected during the sampling of eight monitoring wells installed in November, 1989. The UST Nos. 1 through 7, 9 and 10 in Tank Farm 94 were subsequently removed by GM personnel during the period of May 22 to July 12, 1991. Tank No. 11 (a 6,000-gallon capacity tank having an invert located approximately 23 feet below grade and used as a sump tank for overflow from other tanks in the Tank Farm) was purged, cleaned, and closed in-place because it partially lies beneath a canopy.

Soil samples collected from the excavation floor and sidewalls indicated the presence of benzene, toluene, ethylbenzene, and xylenes (BTEX) above the then-current Michigan Act 307 Type B criteria in the vicinity of Tank Nos. 9 through 11. Soil samples collected from the larger area consisting of Tank Nos. 1 through 7 indicated levels below the Type B cleanup criteria and therefore, meet the criteria for Type B closure.

The following reports related to the USTs for Tank Farm 94 were submitted to the Michigan Department of State Police, Fire Marshal Division (MSP/FMD) and/or the Michigan Department of Natural Resources (MDNR):

24-hour Notice of Confirmed Release was submitted to the Michigan State Police, Fire Marshal Division on February 16, 1990.

Initial Abatement Report was submitted to the State Fire Marshal on April 30, 1991.

Initial Site Characterization Report was submitted to the MDNR on April 30, 1991.

Free Product Removal Report was submitted to the MDNR on April 30, 1991.

WW Engineering & Science (WWES) observed the removal of the USTs performed by GM personnel as discussed in the report entitled *Underground Storage Tank Removal and Site Assessment Report* dated December, 1991. WWES then conducted a preliminary subsurface investigation of the Tank Farm area in November, 1991, another subsurface investigation beneath the floor of Building 84 in May, 1992, and a site remedial investigation in July, 1992. The results of these investigations are presented in the following reports:

Preliminary Subsurface Investigation for Former Tank Farm 94 dated February, 1993.

A Proposal for Supplemental Subsurface Investigation for the Former Tank Farm 94 dated March 11, 1992.

Draft Remedial Subsurface Investigation Report for Former Tank Farm 94 dated October 20, 1992.

These reports had site maps, boring logs, well logs, geologic descriptions and cross-sections, site hydrogeology, pump test results, laboratory analytical results from soil and groundwater sampling, and graphics that were used to formulate the remedial alternatives presented in this report. However, the last WWES report has not yet been finalized for submittal to the MDNR. Before the last report prepared by WWES is finalized, Advanced suggests that the questions outlined in Attachment 1 be submitted to WWES for their written response.

3.0 FINDINGS FROM REVIEW OF PREVIOUS REPORTS

3.1 Soil

Boring logs (Attachment 2), soil and groundwater sampling results (Attachment 3), and cross-sections of the soil profile in the former Tank Farm 94 (Figure 1/WWES Figure 3) were used in identifying potential sources, delineating extent of contamination, and evaluating remedial alternatives. Advanced reviewed the WWES reports entitled

Underground Storage Tank Removal and Site Assessment Report for Tank Farm 94 dated December, 1991, *Preliminary Subsurface Investigation for Former Tank Farm 94* dated February, 1992, and *Remedial Subsurface Investigation for Former Tank Farm No. 94*, dated October 20, 1992. The soil sampling results from these investigations compared to the current Type B and Generic Industrial Type C cleanup criteria are summarized in the following table.

TABLE 1
TANK FARM 94
SELECTED SOIL SAMPLING RESULTS
($\mu\text{g}/\text{kg}$)

Location/Parameter	TB-1 11.5' - 13.5'	MW-7D 8.5' - 10.5'	MW-10B 11' - 13'	TB-13 6' - 8'	Type B Criteria	Generic Industrial Type C Criteria
Benzene	< 500	MI	6,300	720	24	85,000
Ethylbenzene	12,000	95,000	ND	1,460	1,500	14,000,000
Toluene	6,000	17,000	ND	3,335	16,000	33,000,000
Xylenes	24,000	370,000	160,000	4,405	5,600	270,000,000
Benzo(a)anthracene				23,000	180(A=330)	2,100
Benzo(a)pyrene				18,000	180(A=330)	2,100
Benzo(b)fluoranthene				24,000	180(A=330)	2,100
Chrysene				27,000	180(A=330)	2,100
Dibenzo(a,h)anthracene				3,700	180(A=330)	2,600
Indeno(1,2,3-cd)pyrene				4,600	180(A=330)	2,100
Naphthalene			1,700		580	32,000,000
Phenanthrene		690			500	3,200,000

Notes:

- MI indicates matrix interference.
- ND indicates not detected using a detection level of 50 $\mu\text{g}/\text{L}$.
- A=330 indicates that the Type A cleanup criterion is 330 $\mu\text{g}/\text{kg}$.

From these previous reports, the following observations can be made:

- (1) Grab samples of the soil collected during the tank excavation indicated the presence of ethylbenzene, toluene, and xylenes in three sidewall samples collected east of Tank Nos. 9 through 11 and one sidewall sample collected west of Tank No. 11 (Figure 7);
- (2) Elevated concentrations of BTEX constituents are found at soil boring locations TB-1, TB-13, and the nearly adjacent MW-7D boring location; boring location MW-10 has decreased concentrations of BTEX constituents.
- (3) Floating free product was found in monitoring well MW-7S which is adjacent to MW-7D;
- (4) Only boring location TB-13 has concentrations of six polynuclear aromatic hydrocarbons (PNAHs) in the soil at the six to eight foot depth which exceed the Generic Industrial Type C cleanup criteria (as of September, 1993); the presence of PNAHs may be associated with the diesel fuel tank removed in 1986;
- (5) A review of the boring logs indicates the presence of BTEX constituents in the fill at boring locations TB-13 and MW-7D beginning just below the concrete roadway to a depth of just below the water table, suggesting a surficial spill may have occurred;
- (6) The boring log for TB-1 indicates the presence of BTEX constituents below the water table at TB-1 in a sand seam beneath a clay layer while the boring log for MW-10 indicates the presence of BTEX constituents in the silt and sand seams above and below the water table indicating migration (see cross sections in Figure 1/WWES Figure 3);
- (7) The general area of elevated concentrations of BTEX constituents in the soil with the source area is most likely in the TB-1, MW-7D, and TB-13 boring locations potentially resulting from spillage while pulling USTs near Building 84B;
- (8) There is a groundwater mound in the vicinity of the TB-14 boring and may be due to either leakage from a nearby fire suppression line, fire hydrant, or a source south of the hydrant;

- (9) The possible explanation of spillage during the removal and purging of USTs would be consistent with a table found in the *Underground Storage Tank Removal and Site Assessment Report* which indicated that the pulled tanks were in good condition.

3.2 Groundwater

Groundwater flow direction in the Tank Farm 94 area is shown in Figure 4/WWES Figure 4. The groundwater sample results for the site summarized in the following table are based on data from the WWES reports.

TABLE 2
SELECTED GROUNDWATER SAMPLE RESULTS
TANK FARM 94
($\mu\text{g/L}$)

Location	TB-6	MW-7S	MW-9	MW-10	TB-13	TB-14
Screened Interval or Grab Sample	17.5' - 22.5'	10' - 15'	13' - 18'	9' - 14'	11'	3.5'
Benzene	38	3,100	28	60	10,525	80(20)
Ethylbenzene	< 10	3,700	ND	1,000	2,950	2.7(ND)
Toluene	< 10	660	1.7	58	2,350	410(24)
Xylene	4	12,000	ND	6,600	9,475	630(96)
Naphthalene		120		100	41	110

Notes:

- Numbers in parenthesis are the results of duplicate water samples collected for TB-14.
- ND - non-detected using a detection level of 1 $\mu\text{g/L}$ for ethylbenzene and 3 $\mu\text{g/L}$ for xylenes.

The following observations can be made:

- (1) The highest concentrations of BTEX constituents in the groundwater (TB-13, MW-7S) is in the area with the highest BTEX concentrations in the soil;
- (2) There appears to be four possible sources for the presence of BTEX and PNAH constituents in the groundwater:
 - (a) possible spillage while removing and purging the USTs in the vicinity of Building 84B;
 - (b) potentially leaking USTs in the vicinity of underground Tank Nos. 9-11;
 - (c) possible leakage from Tank No. 8, a 15,000-gallon diesel fuel tank removed in 1986; and
 - (d) possible tramp oil related to the presence of wood debris and scrap metal at seven and one-half to eight and one-half feet below present grade at locations TB-13 and MW-7D (approximately 15 feet apart), just east of the former location of Tank Nos. 9-11;
- (3) Vinyl chloride detected in the groundwater at locations TB-6, TB-7B, MW-7D, and MW-15 does not appear to be related to the leaking USTs at Tank Farm 94, and will not be considered in this report.

4.0 COMPARISON OF SOIL AND GROUNDWATER SAMPLING RESULTS WITH TYPE B AND TYPE C CLEANUP CRITERIA

The MDNR revised its Type B cleanup criteria in *MERA Operational Memorandum #8, Revision #2*, dated July 16, 1993. This memorandum provides drinking water values, GSI (groundwater/surface water interface) values for groundwater, 20 X drinking water values, 20 X GSI values, and direct contact values for soil. The Type B cleanup criteria for drinking water for groundwater, and the 20 X drinking water valued for soil are frequently the more stringent of all the values provided.

On September 23, 1993, the MDNR issued a Generic Type C cleanup criteria for industrial areas. The Generic Industrial Type C cleanup criteria is provided in Michigan Environmental Response Act (MERA) *Operational Memorandum #14* on Generic Remedial Action Plans Using Industrial Site Risk Assessment Cleanup Criteria. The major difference between a site-specific Type C cleanup criteria and the new Generic Industrial Type C cleanup criteria is that generic risk assumptions are used for the latter, thereby eliminating the risk assessment study. The Industrial Type C cleanup criteria applies only to sites where the primary activity is manufacturing and the current zoning of the property is industrial (which must be documented).

The risk exposure assumptions for the Generic Industrial Type C cleanup is protective of a worker who spends a significant time outdoors. These exposure assumptions would also be protective of workers who are outdoors less often. A statement verifying these exposure assumptions is needed for a Generic Industrial Type C cleanup.

4.1 Generic Industrial Type C Cleanup Criteria for Soil

The Generic Industrial Type C cleanup criteria provides values for direct human contact with soil. Soil values protective of groundwater and of surface water will be used only if applicable and are frequently not provided by the MDNR. In other words, determining soil cleanup values using the Generic Industrial Type C cleanup criteria is more complex than with the Type B cleanup criteria.

4.1.1 Soil Value Protective of Groundwater

Groundwater is not used as a source of drinking water at the GM-BOC facility. For off-site property, the Ordinance of the City of Flint prohibits the installation of a drinking water well if the property is less than 200 feet from a City water main (phone conversation with Mr. Robert Davis, City of Flint, on November 30, 1993). Therefore, for all practical purposes, it is unlikely that there will be any off-site drinking water wells installed in the future.

Because groundwater is not used as a source of drinking water at the GM-BOC facility, the need for groundwater remediation is dictated by reasonably foreseeable off-site groundwater uses. However, it is unlikely there will be any other reasonably foreseeable off-site industrial groundwater uses as the Tank Farm 94 site lies approximately 1,000 feet from the Flint River (Figure 6/WWES

Figure 1). Interstate 475 and a few industries lie between the site and the Flint River. Therefore, a soil value protective of groundwater for drinking water either for on-site or off-site uses is not applicable to this site.

4.1.2 Soil Value Protective of Surface Water

There is no significant potential for storm water runoff to carry contaminated soil into surface water because the soil containing BTEX constituents is beneath a concrete roadway or in an area where percolation rates are so great that runoff is not significant. Therefore, this migration pathway is not applicable.

4.1.3 Direct Contact Value

The direct contact values are intended to protect workers at the site against risks from ingestion and dermal absorption of hazardous substances in the soil. The Generic Industrial Type C criteria is flexible in the sense that it allows for the application of direct contact values to shallow soils (0 to 2 feet) and higher concentrations in deeper soils provided there are land use restrictions.

The following table compares the Type B cleanup criteria with the Generic Industrial Type C cleanup criteria for soil.



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**TITLE: U.S. GEOLOGICAL SURVEY/TOPOGRAPHIC MAP
 FORMER TANK FARM NUMBER 94
 BOC FLINT AUTOMOTIVE DIVISION – FLINT, MI.**

FIGURE: 6

PROJECT MGR: CMB

SCALE: 1:24 000

PROJECT NO: 3114IE



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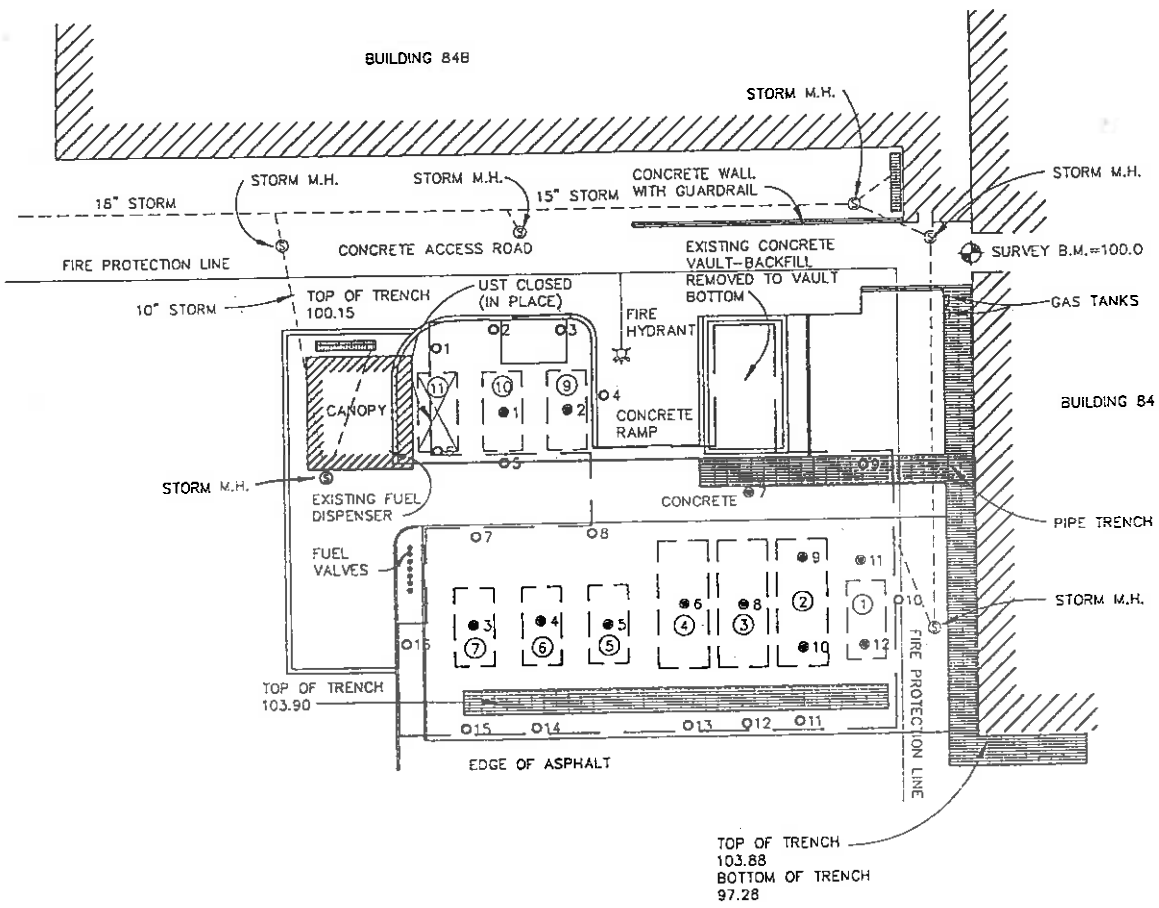
TITLE: U.S. GEOLOGICAL SURVEY/TOPOGRAPHIC MAP
 FORMER TANK FARM NUMBER 94
 BOC FLINT AUTOMOTIVE DIVISION - FLINT, MI.

FIGURE: 6

PROJECT MGR: CMB

SCALE: 1:24 000

PROJECT NO: 3114IE



LEGEND:

- 3 = FLOOR SOIL SAMPLE LOCATION
- 3 = WALL SOIL SAMPLE LOCATION
- ③ = TANK NUMBER
- — — = TANK OUTLINE
- — — = LIMIT OF EXCAVATION

SOURCE: Preliminary Subsurface Investigation for Former Tank Farm No.94 (WWES, February, 1992)



ADVANCED ENVIRONMENTAL, INC.	
ENVIRONMENTAL MANAGEMENT CONSULTANTS	
TITLE: TANK AND CLOSURE SAMPLING LOCATIONS FORMER TANK FARM NUMBER 94 BOC FLINT AUTOMOTIVE DIVISION - FLINT, MI.	
FIGURE: 7	PROJECT MGR: CMB
SCALE: NOT TO SCALE	PROJECT NO: 3114IE

TABLE 1A
 CONTENTS/CAPACITIES OF UNDERGROUND STORAGE TANKS
 AT TANK FARM 94

Tank Number	Capacity (Gallon)	Composition	Contents	Removal Date	Condition of Tank Upon Removal	Installed Date
103-1	6,000	Steel	Regular Gasoline	5/8/91	Good Condition	1959
99-2	15,000	Steel	Gasoline	5/13/91	Good Condition	1971
102-3	15,000	Steel	Howell EEE	5/16/91	Good Condition	1954
101-4	15,000	Steel	Howell EEE	5/21/91	Good Condition	1954
100-5	6,000	Steel	Gasoline	5/21/91	Good Condition	1966
97-6	6,000	Steel	Gasoline	5/21/91	Good Condition	1971
98-7	6,000	Steel	Varsol Stoddard	5/21/91	Good Condition	1971
95-9	6,000	Steel	Gasoline	5/21/91	Good Condition	1972
94-10	6,000	Steel	Gasoline	5/21/91	Good Condition	1972
96-11	6,000	Steel	Waste	NA	Closed-in-Place	1972
NN-8	15,000		#2 Diesel		Unknown	1980

ATTACHMENT 1

ATTACHMENT 1

Finalization of WWES Report - Tank Farm 94

Advanced Environmental, Inc. (Advanced), reviewed the Tank Farm 94 draft report prepared by WWES entitled Remedial Subsurface Investigation Report for Former Tank Farm 94 (October 20, 1992). The report should be modified as follows:

- (1) Tables 2 and 3 summarizing the soil and groundwater sampling results should be updated to reflect the Type B cleanup criteria issued July 16, 1993 and the Generic Remedial Action Plans Using Industrial Site Risk Assessment Cleanup Criteria issued September 23, 1993;
- (2) Relevant tables from previous reports such as the table listing the capacity and contents of each of the tanks and a table summarizing the first round of testing (soil borings TB-1 to TB-6) should be included in an appendix to the report.

Advanced suggests that WWES provide written answers to the following questions raised in the review of their (WWES) draft report:

- (1) Field notes of the drilling inside Building 84B should be double-checked to verify that the locations of TB-7A and TB-7B are correct as these boring locations are switched when the boring logs are compared to the figures in the report;
- (2) Minor revisions need to be made to the cross section shown on Figure 3 as there is an extra well screen between TB-1 and MW-10 and an unanchored well screen at TB-7A; errors in spelling on the figures (e.g. "vertcal") need to be corrected;
- (3) The boring log for TB(MW)-7S is not in the report and should be provided;
- (4) For MW-15, it may be advisable to have WWES explain its rationale for the setting the well screen at the depth shown in Figure 3. Similarly, WWES should provide the rationale for the depth of the well screen set at MW-11;
- (5) Explain why soil samples were not collected from the TB-6 boring location.
- (6) Explain the rationale for terminating TB-14 at eight feet below grade when the PID had a reading of 180 ppm.
- (7) Explain the rationale for not providing a plume map or BTEX concentrations in the soil for the impacted area.

ATTACHMENT 2

TABLE 3
SOIL CLEANUP CRITERIA
($\mu\text{g}/\text{kg}$)

	Type B	Generic Industrial Type C (direct contact)
Benzene	24	85,000
Ethylbenzene	1,500	14,000,000
Toluene	16,000	33,000,000
Xylenes	5,600	270,000,000
Benzo(a)anthracene	180	2,100
Benzo(b)fluoranthene	180	2,100
Benzo(a)pyrene	180	2,100
Chrysene	180	2,100
Dibenzo(a,h)anthracene	180	2,600
Indeno(1,2,3-cd)pyrene	180	2,100
Naphthalene	580	32,000,000
Phenanthrene	500	3,200,000

Comparing the soil sampling results found in Table 1 (condensed from Table 2 in the *Remedial Subsurface Investigation Report*) for Tank Farm 94 with the Type B soil cleanup criteria (20 X drinking water values) and with the Generic Industrial Type C direct contact cleanup criteria, only TB-13 (6 to 8 feet below grade) has six PNAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene] which exceed the Generic Industrial Type C direct contact cleanup criteria.

Because the PNAH concentrations exceed the Generic Industrial Type C cleanup criteria at only one location (TB-13) in deeper soils (6 to 8 feet below grade), a land use restriction to prevent excavating soil at this depth in the TB-13 location (without personal protective equipment) is needed for the Generic Industrial Type C Remedial Action Plan at Tank Farm 94.

4.2 Generic Industrial Type C Cleanup Criteria for Groundwater

The Generic Industrial Type C groundwater criteria is based on the applicability of health-based drinking water values and aesthetic drinking water values as one criterion and groundwater surface water interface (GSI) values as the other criterion.

4.2.1 Health-Based Drinking Water Values and Aesthetic Drinking Water Values

The health-based values developed for the Generic Industrial Type C groundwater cleanup criteria were designed to protect workers whose drinking water is from an on-site groundwater source. If the Generic Industrial Type C drinking water values or the aesthetic values are exceeded where groundwater is used as a source of drinking water at the industrial facility, then a corrective action plan will be needed to address groundwater. As stated above, groundwater is not used as a source of drinking water either at the industrial facility or off-site. Therefore, the Generic Industrial drinking water criteria are not applicable at the Tank Farm 94 site. Since this is the case, the need for groundwater remediation is dictated by reasonably foreseeable off-site groundwater uses. The area in the direction of groundwater flow from the site is either the I-475 expressway or other industry. There are no reasonably foreseeable off-site groundwater uses in this area.

4.2.2 Groundwater Surface Water Interface Values (GSI)

The GSI value defines the maximum allowable hazardous substance concentration at the groundwater/surface water interface. The Generic Industrial Type C groundwater cleanup criteria is the same as the Type B criterion as the same GSI values are used. It should be noted that according to MERA *Operational Memorandum #8, Revision #2*, it is not necessary that the GSI value be achieved throughout the aquifer. Monitoring at the interface is also acceptable as is predictive water quality modelling.

Groundwater/surface water interface (GSI) values for surface waters not protected as a drinking water source pursuant to Rule 323.1057 do not appear to be applicable to this site because the hydrogeological investigation for the 66-inch storm sewer line to the east of Tank Farm 94 indicated that groundwater on the

site flows into a bowl-like area. However, if this were not the case, groundwater with BTEX constituents might preferentially flow along the backfill of the 18-inch storm sewer which eventually flows into the Flint River at Outfall 008. Prior to designing a remediation system for this area, several soil samples should be collected from the source area and the backfill along the sewer between Tank Farm 94 and the outfall and analyzed for the presence of BTEX constituents. These soil samples should also be analyzed using a leach test and compared with drinking water values.

The following table provides the Type B cleanup criteria and the Generic Industrial Type C groundwater cleanup criteria as of September, 1993.

**TABLE 4
GROUNDWATER CLEANUP CRITERIA**

	Type B ($\mu\text{g/L}$)	Generic Industrial Type C ($\mu\text{g/L}$)
Benzene	1.2	12
Ethylbenzene	74	74
Toluene	790	790
Xylenes	280	280
Naphthalene	250	750

Comparing the above groundwater sample results to the Type B and the Generic Industrial Type C criteria yields the same BTEX exceedances for both Type B and Generic Industrial Type C:

TB-6: benzene
 MW-7S: benzene, ethylbenzene, xylene
 MW-9: benzene
 MW-10: benzene, ethylbenzene, xylene
 TB-13: benzene, ethylbenzene, toluene, xylene
 TB-14: benzene, xylene

It is recommended that the Generic Industrial Type C cleanup criteria be proposed for this site in a corrective action plan (CAP). However, prior to submitting the corrective action plan, soil samples should be collected in the source area. Leach tests should be conducted on these samples and the results compared with the most restrictive of the Type B drinking water values. If the results are favorable, then the proposed corrective action plan would be designed to meet the Type B cleanup criteria, with default to a Type C cleanup if the Type B cleanup criteria for benzene and/or naphthalene cannot be met within a reasonable time period, such as four years. The controlling variable is likely to be the cleanup level for benzene in groundwater. Figure 3/WWES Figure 5 depicts the groundwater Type B exceedance areas for benzene.

5.0 OTHER REQUIREMENTS FOR AN INDUSTRIAL TYPE C REMEDIAL ACTION PLAN

The corrective action plan for a Generic Industrial Type C closure must also demonstrate that it satisfies all the other administrative rules under MERA, including applicable or relevant and appropriate requirements (ARARS) associated with other environmental laws.

Attachment 4 provides for a list of requirements needed for a Type C closure request, whether industrial or site-specific.

Attachment 5 presents an outline for a Corrective Action Plan for the Tank Farm 94 area.

6.0 ALTERNATIVES FOR SOIL AND GROUNDWATER REMEDIATION

6.1 Soil

A Generic Industrial Type C cleanup level is proposed for this site if additional soil sampling and leach tests indicates that a Type B cleanup level is not achievable.

A reason for considering the Type B cleanup criteria for this site is that the majority of the soil samples collected from the excavation of the larger portion of the Tank Farm (where Tank Nos. 1 through 7 were formerly located) met Type B cleanup

levels. A Type B closure would avoid land use restrictions and other requirements associated with a Type C closure request.

Because constituent concentrations in the soil samples collected from the site do not exceed the MDNR direct-contact values (as of September, 1993) in the source area (TB-1, MW-7S, TB-13), a leach test could be performed on soil samples collected from this area. If the constituent concentrations in the leachate do not exceed the more restrictive of the drinking water values (health-based and aesthetic values), then a Type B closure is achievable. To negate potential regulatory opposition to this approach, a fate and transport water quality model should be used to assess the potential impact of impacted groundwater migration to the Flint River.

However, if leachate results from soil samples collected in the source area exceed the Type B drinking water values, then a Type B closure would be ruled out for this site.

The existence of a high-pressure fire suppression line and a gravity sewer line require that invasive remedial alternatives requiring excavation should be minimized unless the fire suppression line could be isolated in the source area and de-pressurized. The existence of these utilities precludes the installation of the infiltration gallery and excavating the TB-13 source area as well as other invasive alternatives such as soil vapor extraction. Therefore, a corrective action plan using the Generic Industrial Type C cleanup level is proposed for this site.

Assuming that the fire suppression line cannot be isolated and de-pressurized in the source area, then the preferred remedial alternative is to convert monitoring well MW-7S to a recovery well and install a new recovery well in the vicinity of TB-1. Because a groundwater mound exists in the vicinity of TB-14, either from a leaking fire hydrant or fire suppression line or a source south of the hydrant, this water will tend to flush the soil over time. The pumps for the recovery wells can be placed near the Freon® tank to avoid traffic areas and the effluent can be pumped into a tank mounted on stilts so that a tanker could be filled by gravity if needed, rather than using a vacuum truck. Monitoring well MW-10 could also be converted to a recharge well, if needed. Monitoring wells MW-15 and MW-9 would then be used to monitor that groundwater contaminants are not migrating but staying within the bowl shaped by the two recharge areas.

If results of samples collected from the monitoring wells indicate that natural recharge for flushing the impacted soil is proceeding too slow, than another recovery well may have to be installed in the TB-13 area.

A Generic Industrial Type C closure would necessitate land use restrictions (i.e., use of personal protective equipment when digging) in the area of TB-13, MW-7, and TB-1 as well as long-term monitoring.

6.2 Groundwater

Remedial alternatives for the affected groundwater are based on conventional "pump and treat" and "pump and haul" technology. It is proposed that groundwater with elevated BTEX concentrations will be purged using two (possibly three) recovery wells. Natural recharge will be relied upon to replenish the saturated zone as well as apparent leakage south of the source area. If possible, the purged groundwater will be directed to a process sewer where it can be treated by the BOC wastewater treatment plant; otherwise, the purged groundwater will be hauled to an approved treatment facility. BTEX will be monitored during groundwater remediation.

Figure 5 is a site plan depicting the location of the proposed recovery wells.

Slug tests were performed on selected monitoring wells in the Tank Farm 94 area by WWES on August 25, 1992. In-situ hydraulic conductivities for monitoring wells MW-11 and MW-15 (wells partially screened in the silt layer) along the north-south axis under the concrete roadway adjacent to Building 84B was 0.51 feet/day and 0.29 feet/day respectively, using the Bouwer/Rice method for an unconfined aquifer, while the hydraulic conductivity for MW-9 (screened in the water-bearing sand unit) was 19.84 feet/day. The vertical hydraulic conductivity of the soil sample collected from the lower clayey silt layer at TB-8 was 8.4×10^{-8} cm/sec, suggesting that this layer probably acts as a barrier to the downward migration of constituents.

7.0 COSTS OF REMEDIAL ALTERNATIVES

The costs of passively flushing the soil and recovering the impacted groundwater are presented in Table 5.

TABLE 5

**INDUSTRIAL TYPE C CLEANUP CRITERIA
REMEDIAL ALTERNATIVES
TANK FARM 94**

IMPACTED GROUNDWATER

(Estimated volume = 61,685 gallons)

	<u>CAPITAL COST</u>	<u>OPERATING COST</u>
3 Flushes (2 recovery wells)		
Haul and Treat at \$0.20/gallon*	\$ 5,000	\$ 12,337
Haul and Treat at \$.50/gallon	\$ 5,000	\$ 93,000
Haul and Treat at \$2/gallon	\$ 5,000	\$370,000
5 Flushes (2 recovery wells)		
Haul and Treat at \$0.20/gallon	\$ 5,000	\$ 61,685
Haul and Treat at \$0.50/gallon	\$ 5,000	\$154,000
Haul and Treat at \$2/gallon	\$ 5,000	\$617,000

* Assumes that groundwater has a flashpoint greater than 90°F. Estimates from Dynecol and Inland Water, both located in Detroit.

8.0 PERFORMANCE MONITORING PLAN

Groundwater samples from selected monitoring wells, as well as recovery wells, will be collected quarterly to provide data which will be plotted against time to assess the effectiveness of the groundwater remediation system. This plot should forecast a completion date for the remediation. If the plot clearly forecasts an asymptotic forecast implying that neither a Type B or a Generic Industrial Type C cleanup level can be reached, the project will be reviewed.

The monitoring wells (MW-9, MW-15) that will be sampled are proximate to the area with elevated BTEX concentrations (Figure 5). Static water levels will be taken prior to collecting water samples to be analyzed for the presence of BTEX constituents.

8.1 Land Use Restrictions

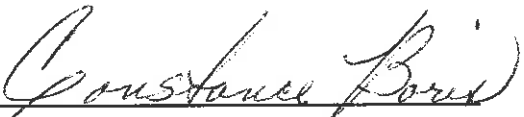
A land use restriction will be placed on excavating soils in the vicinity of TB-1, TB-13, MW-7S and MW-7D at depths greater than six feet without the use of personal protective equipment. Level C is suggested as the personal protective level.


8.2 Alternate Water Supplies

No domestic wells have been affected and no alternate water supplies are envisioned as municipal water supply is the source of water.

9.0 SIGNATURE BLOCK

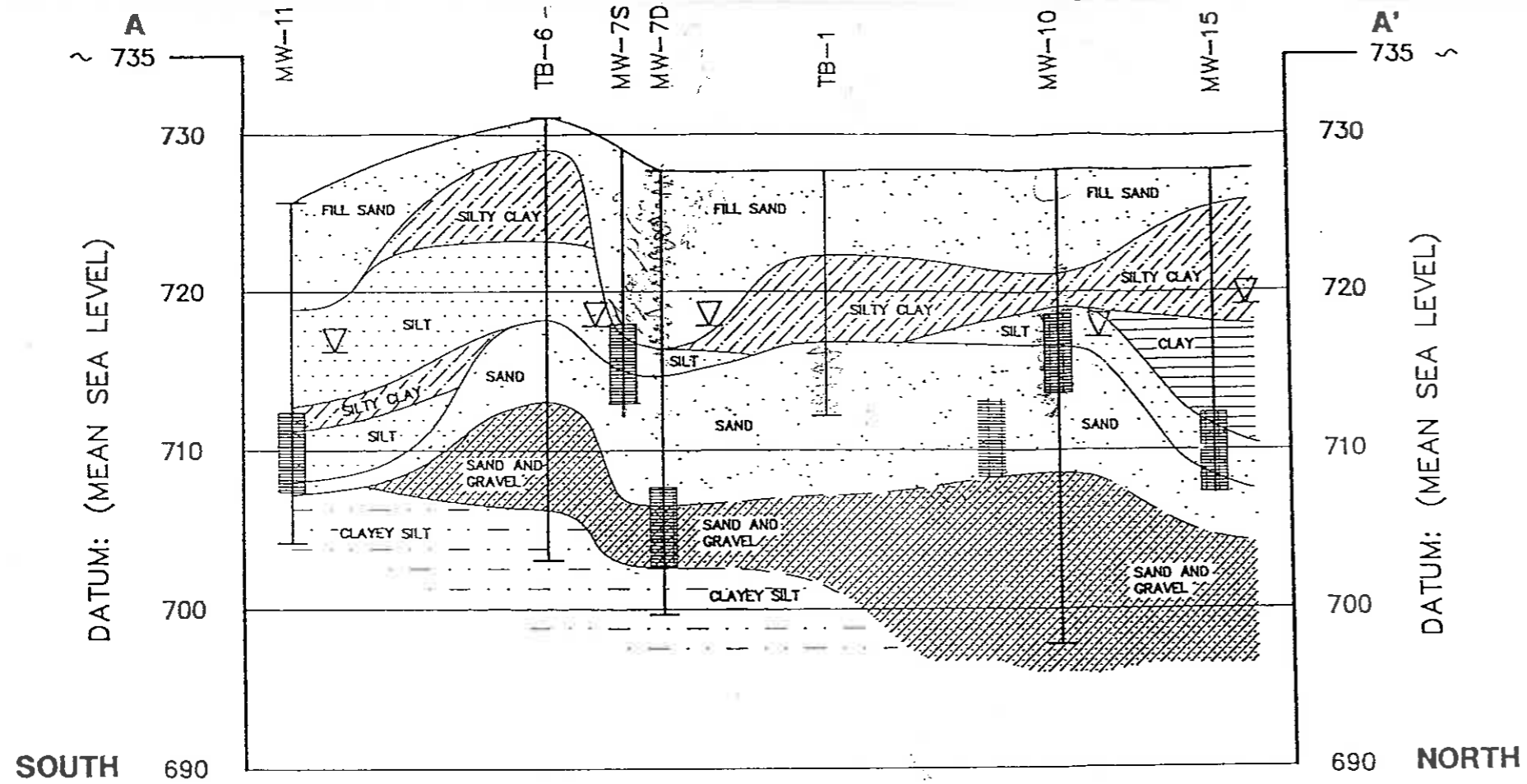
The information contained in this report is based on existing site conditions disclosed or discovered during the current site investigation activities.

Prepared by: 
Constance M. Boris, Ph.D., Sr. Project Engineer

Reviewed by: 
Mark C. Matheny, Sr. Project Manager

Date: February 17, 1994

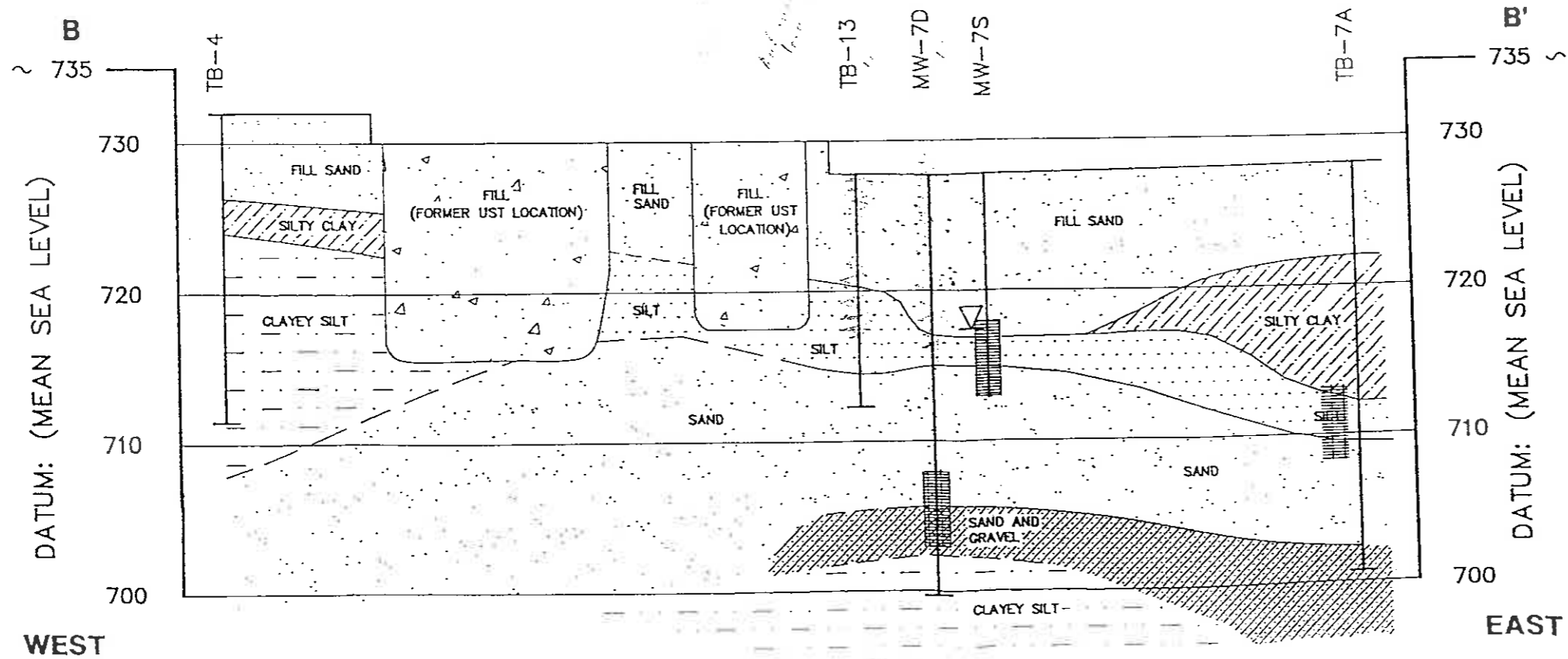
FIGURES



LEGEND:

- = SILT
- = SAND/FILL SAND
- = SILTY CLAY
- = CLAY
- = FILL
- = SAND AND GRAVEL
- = CLAYEY SILT
- = STATIC WATER LEVEL MEASURED BY WWES ON 8-21-92
- = MONITORING WELL SCREEN INTERVAL

HORIZONTAL SCALE = 1:30
VERTICAL SCALE = 1:10



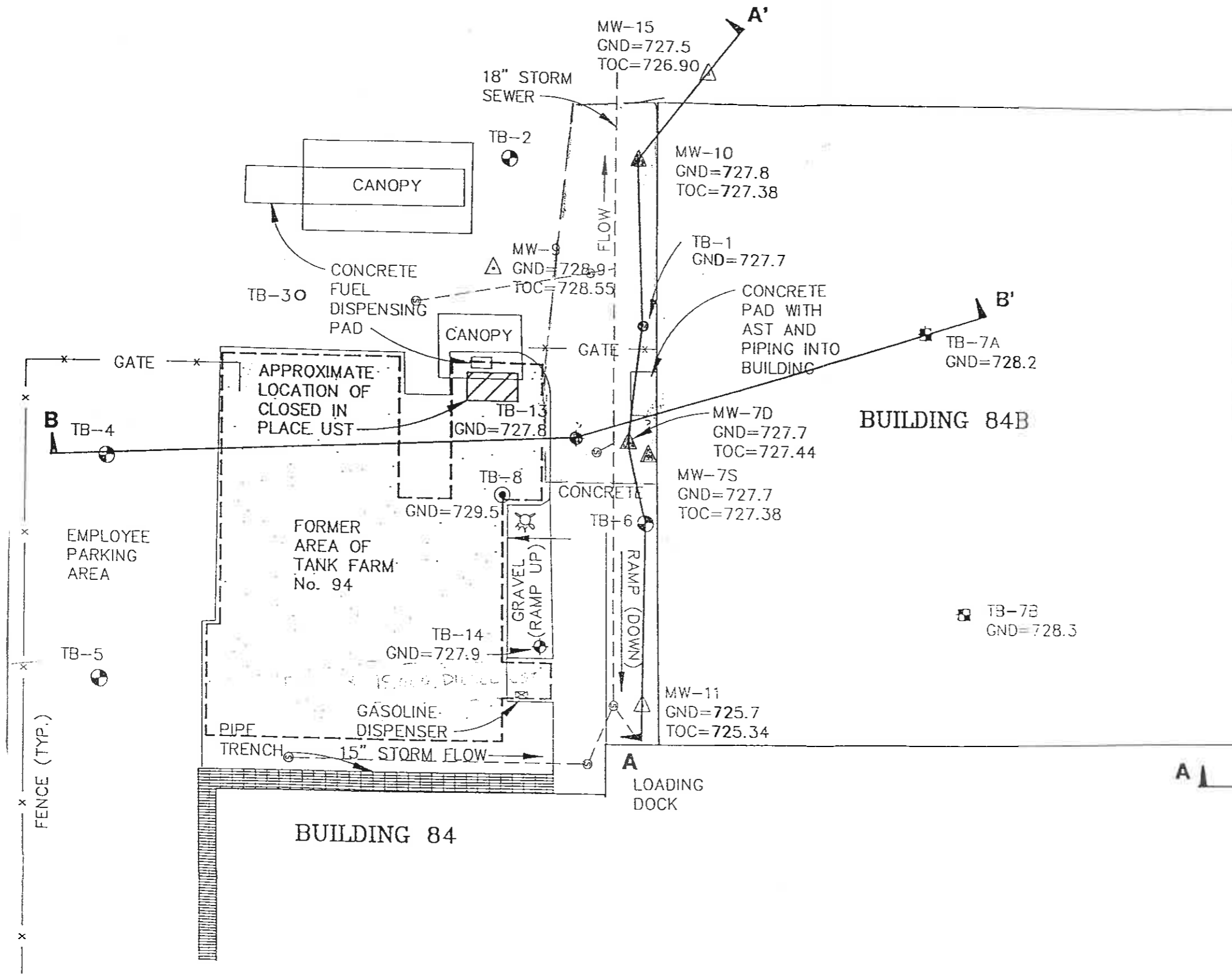
Generalized Subsurface Profiles

Advanced Figure No. 1
Former Tank Farm No. 94
BOC Flint Automotive Division - Flint
Adapted From: WWES report October 1992

NEW TANK FARM AREA

LEGEND:

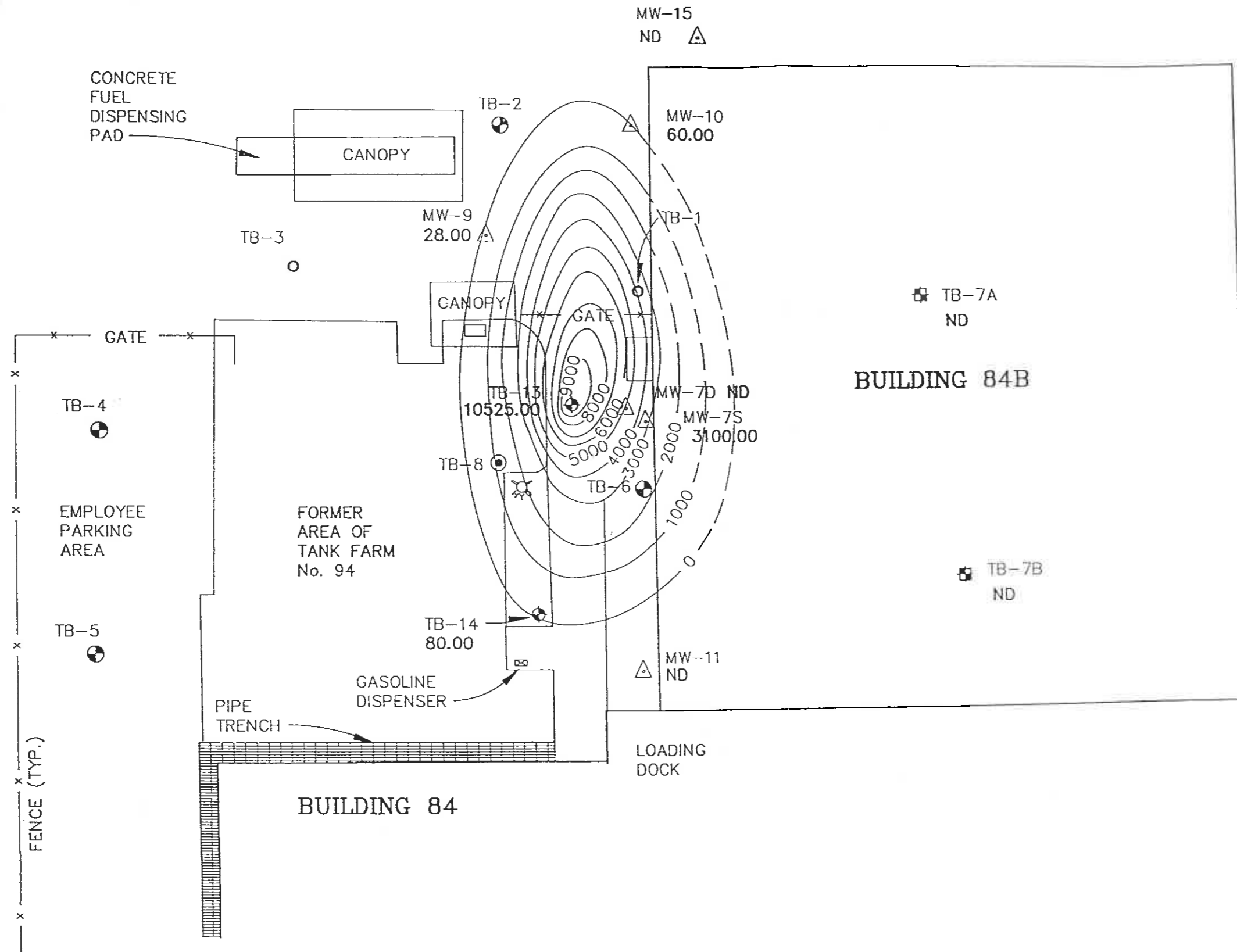
- = SOIL BORING DRILLED ON NOVEMBER 7 THROUGH NOVEMBER 14, 1991 BY STEARNS DRILLING CO. UNDER WWES SUPERVISION
- ⊙ = SOIL BORING WITH TEMPORARY MONITORING WELL INSTALLED ON NOVEMBER 7 THROUGH NOVEMBER 14, 1991 BY STEARNS DRILLING CO. UNDER WWES SUPERVISION
- ⊛ = SOIL BORING WITH TEMPORARY MONITORING WELL INSTALLED ON MAY 5, 1992 BY RAU DRILLING CO. UNDER WWES SUPERVISION
- ⊕ = SOIL BORING DRILLED ON JULY 7 THROUGH JULY 14, 1992 BY STEARNS DRILLING CO. UNDER WWES SUPERVISION
- ⊗ = SOIL BORING WITH TEMPORARY MONITORING WELL INSTALLED ON JULY 7 THROUGH JULY 14, 1992 BY STEARNS DRILLING CO. UNDER WWES SUPERVISION
- △ = MONITORING WELL INSTALLED ON JULY 7 THROUGH JULY 14, 1992 BY STEARNS DRILLING CO. UNDER WWES SUPERVISION
- GND = GROUND SURFACE ELEVATION (IN FEET)
- TOC = TOP OF CASING ELEVATION (IN FEET)
- [---] = APPROXIMATE EXCAVATION LIMITS OF FORMER TANK FARM No. 94 AREA
- A-A' = CROSS-SECTION LOCATION



Test Boring / Monitoring Well Location Map Showing Impacted Soil

Advanced Figure No. 2
 Former Tank Farm No. 94
 BOC Flint Automotive Division - Flint
 Adapted From: WWES report October 1992

NEW TANK FARM AREA



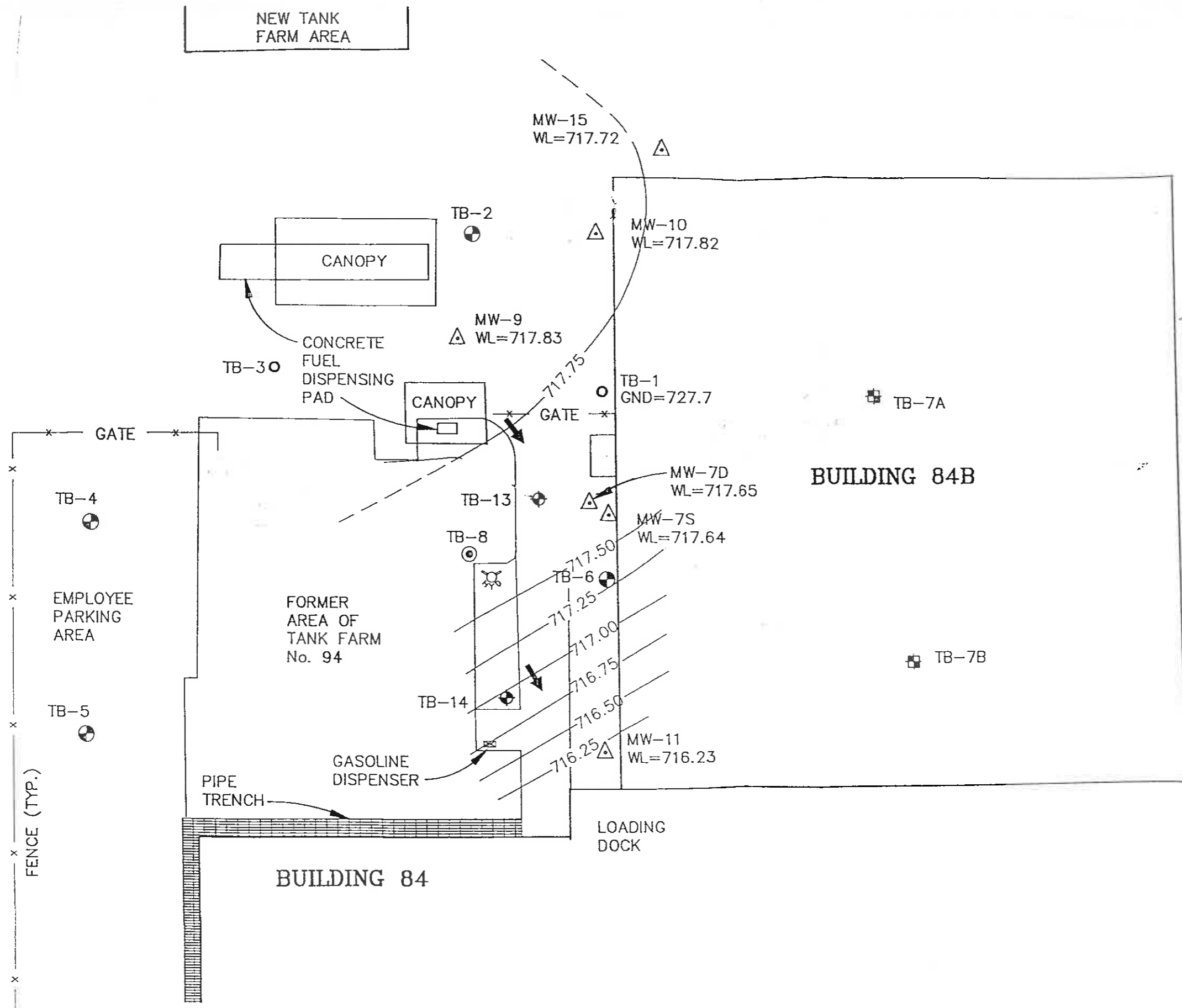
LEGEND:

- MW-10 \triangle = BENZENE CONCENTRATION IN ug/l IN GROUND-WATER SAMPLE COLLECTED FROM MONITORING WELL No. 10
- 60.00
- 3000 — = BENZENE CONTOUR LINE WITH BENZENE CONCENTRATION IN ug/l
- - - = INFERRED CONTOUR LINE
- ND = NON-DETECT

CONTOUR VALUES ARE IN MICROGRAM PER LITER (ug/l)
 CONTOUR INTERVAL = 1000 ug/l

NOTE:
 CONCENTRATIONS OF BENZENE INDICATED ON THIS MAP ARE FOR GROUND-WATER SAMPLES COLLECTED FROM THE UPPER PORTION OF THE WATER-BEARING UNIT.

Benzene Isoconcentration Contour Map
 Advanced Figure No. 3
 Former Tank Farm No. 94
 BOC Flint Automotive Division - Flint
 Adapted From: WWES report October 1992



LEGEND:

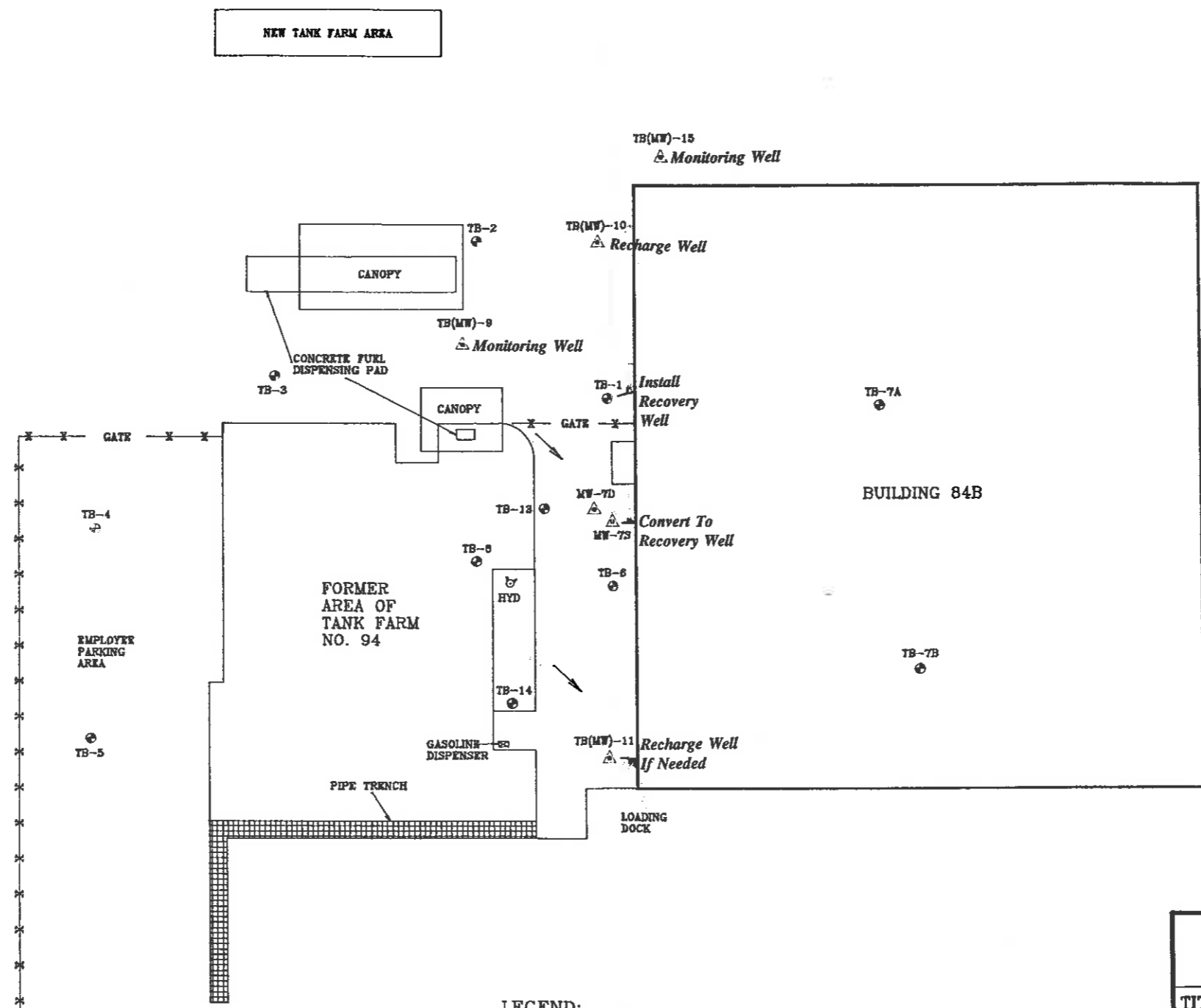
- MW-10 \triangle = GROUND-WATER ELEVATION IN FEET (U.S.G.S. DATUM)
WL=717.82
- 717.50 — = GROUND-WATER CONTOUR LINE
- - - = INFERRED GROUND-WATER CONTOUR LINE
- \rightarrow = DIRECTION OF GROUND-WATER FLOW

CONTOUR INTERVAL = 0.25 FEET


NOTE:
GROUND-WATER CONTOUR MAP
BASED ON DATA COLLECTED
ON JULY 28, 1992.

Static Water Level Contour Map
Showing Benzene Concentrations

Advanced Figure No.4
Former Tank Farm No. 94
BOC Flint Automotive Division - Flint
Adapted From: WWES report October 1992



- LEGEND:**
- Soil Boring Locations
 - ▲ Monitoring Well Locations
 - Direction of Groundwater Flow
 - X-X- Fence (TYP.)

TITLE: SITE DIAGRAM/SOIL BORING/MONITORING WELL FORMER TANK FARM No. 94 FLINT, MICHIGAN	
DATE: 1/25/94	APPROVED BY: B.D.H.
SCALE: 1"=40'	PREPARED BY: C.G.S.
FIGURE NUMBER: 5	PROJECT NUMBER: 3114IE
 ADVANCED ENVIRONMENTAL, INC. ENVIRONMENTAL MANAGEMENT CONSULTANTS	

ATTACHMENT 2
BORING/MONITORING WELL LOGS
TANK FARM 94

Log of Boring

Project No. 83106.00

Client BOC-Flint Automotive Division
 Location Flint, Michigan
 Logged By D. Kanzer
 Contractor Stearns Drilling Company
 Driller R. Christensen

Boring Designation TF-94/TB-1

Start Date 11-07-91 Completed 11-07-91

Ground Surface Elevation: 727.7

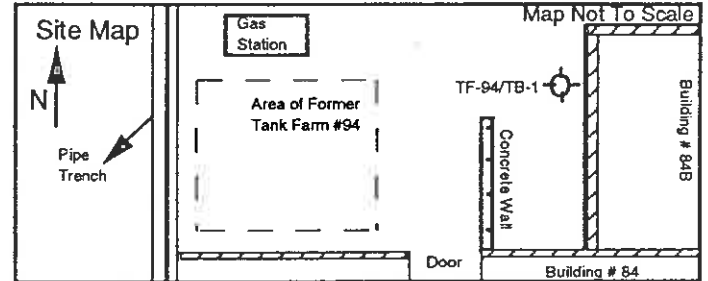
Drilling Method(s) 4 1/2 inch Hollow Stem Auger Depth Range 0.0-15.5 feet

Ground-Water Data
Ground water was encountered during drilling at a depth of 7.5 feet below ground surface.

Sampling Method(s) 2 inch O.D. Split Spoon Sampler Depth Range 2.5 feet intervals

Grouting Material/Method Bentonite/Cement Slurry Depth Range 0.0-15.5 feet
Pressure pumped from bottom of borehole to surface.

General Notes
No monitoring well was installed at this test boring location.



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-inch intervals)	Standard Penetration (N)	OVA - Headspace Reading (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
1							■	0.8	CONCRETE
2				4			●		
3	SS-1	3.0	24	7	14	3.2	●		
4				7			●		
5	SS-2	5.5	24	6	7	4.6	●	5.5	Fill: Medium Compact, Light Brown, Medium to Coarse SAND, some gravel, moist
6				3			●		
7				3			●		
8	SS-3	8.0	24	4	15	45	▼		
9				6			▼		
10	SS-4	10.5	24	9	10	200	|||	10.5	Stiff to Very Stiff, Blue to Gray CLAY, trace of silt and fine sand, wet
11				12			|||		
12				4			●		
13	SS-5	13.0	24	8	16	>1000	●		
14				8			●		
15	SS-6	15.5		7	11	420	●	15.5	Medium Compact, Gray to Black, Fine to Medium SAND, some silt, heavy staining, strong hydrocarbon odor, wet
6				3			●		
7				4			●		
8				4			●		
9				7			●		
0				11			●		
END OF BORING									

Log of Boring

Project No. 83106.00

Client BOC-Flint Automotive Division
 Location Flint, Michigan
 Logged By C. Kingma
 Contractor Stearns Drilling Company
 Driller R. Christensen

Boring Designation TF-94/TB-4

Start Date 11-12-91 Completed 11-12-91

Ground Surface Elevation: 732.0

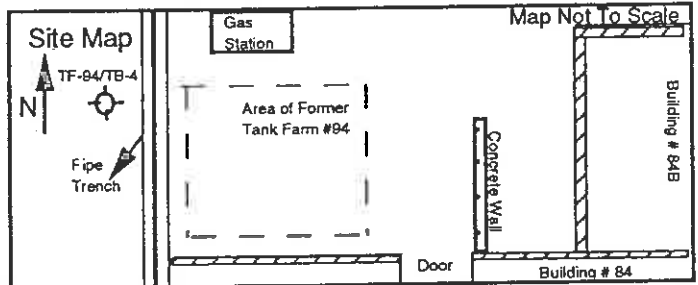
Drilling Method(s) 4 1/2 inch Hollow Stem Auger Depth Range 0.0-20.5 feet

Ground-Water Data
Ground water was encountered during drilling at a depth of 10.5 feet below ground surface.

Sampling Method(s) 2 inch O.D. Split Spoon Sampler Depth Range 2.5 feet intervals

Grouting Material/Method Bentonite/Cement Slurry Depth Range 0.0-20.5 feet
Pressure pumped from bottom of borehole to surface.

General Notes
Temporary monitoring well was installed at this test boring location with well screen tip at a depth of 15.0 below ground surface.



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	OVA - Headspace Reading (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
1							●●●●●●	0.1	ASPHALT
2				6			●●●●●●		
3	SS-1	3.0	24	9 8 9		0.5	●●●●●●		
4				4			●●●●●●		
5	SS-2	5.5	12	3 3 5		1.0	●●●●●●	5.5	Fill: Loose to Medium Compact, Black Stained SAND and GRAVEL, some silt, moist
6				3			//		
7				5			//		
8	SS-3	8.0	24	5 7		ND	//	8.0	Stiff, Light Brown to Gray SILTY CLAY, wet
9				7			//		
10	SS-4	10.5	14	20 25 27		ND	//		
11				12			//		
12				28			//		
13	SS-5	13.0	22	27 31		1.5	//		
14							//		
15	SS-6	15.5	20	15 21 23 26		4	//		
16				17			//		
17				24			//		
18	SS-7	18.0	24	27 28		1	//		
19							//		
20	SS-8	20.5	24	12 29 34 41		1	//	20.5	Very Compact, Gray to Brown CLAY and SILT, some gravel very thin seams of fine silty sand, dry to moist

END OF BORING

Log of Boring

Client BOC-Flint Automotive Division
 Location Flint, Michigan
 Logged By C. Kingma
 Contractor Stearns Drilling Company
 Driller R. Christensen

Boring Designation TF-94/TB-6

Start Date 11-13-91 Completed 11-13-91

Ground Surface Elevation: 731.1

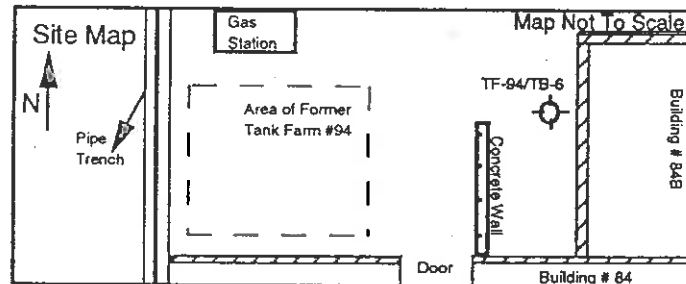
Drilling Method(s) 4 1/2 inch Hollow Stem Auger Depth Range 0.0-28.0 feet

Ground-Water Data
Ground water was encountered during drilling at a depth of 10.5 feet below ground surface.

Sampling Method(s) 2 inch O.D. Split Spoon Sampler Depth Range 2.5 foot intervals

Grouting Material/Method Bentonite/Cement Slurry Depth Range 0.0-28.0 feet
Pressure pumped from bottom of borehole to surface.

General Notes
Temporary monitoring well was installed at this test boring location with well screen tip at a depth of 22.5 feet below ground surface.



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-inch Intervals)	Standard Penetration (N)	OVA - Headspace Reading (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
1				5				0.75	CONCRETE
2				7				2.0	Medium Compact Brown Medium SAND, trace gravel, moist
3	SS-1	3.0	24	8 11		ND			
4				3 4					
5				7 8					
6	SS-2	5.5	18			ND			
7				3					
8	SS-3	8.0	24	5 9 11		ND		7.5	Stiff, Brown SILTY CLAY, trace sand and gravel, moist
9									
10				7					
11	SS-4	10.5	24	8 10 12		ND			
12									
13	SS-5	13.0	24	6 5 8 11		6.5		12.5	Medium Compact, Gray CLAYEY SILT, wet
14				2					
15				3					
16	SS-6	15.5	24	7 12		35			
17				3					
18	SS-7	18.0	19	5 8 11		18		17.5	Medium Compact, Gray, Medium to Coarse SAND, wet
19				4					
20	SS-8		20	12 17 19		8			Medium Compact, Gray SAND and GRAVEL, wet, slight hydrocarbon odor

Client BOC-Flint Automotive Division
 Location Flint, Michigan
 Notes _____

Boring Designation TF-94 / TB-6
 Start Date 11-13-91 Completed 11-13-91
 Ground Surface Elevation: 731.1

Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-inch Intervals)	Standard Penetration (N)	OVA - Headspace Reacting (ppm)	Graphic Log	Depth (feet)	Subsurface Description
21									
22				7					
23	SS-9	23.0	24	10		4			
24				12					
25	SS-10	25.0	20	13		1		24.5	Medium Compact, Gray SAND and GRAVEL wet, slight hydrocarbon odor
26				6					
27				12					
28	SS-11	28.0	24	21		0.5		28.0	Very Compact, Gray SILT and CLAY, trace gravel, wet
29				44					
30				68					
1				65					
2				71					
3				77					
4									
5									
6									
7									
8									
9									
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									
0									
									END OF BORING

Client BOC-Flint Automotive Division/Tank Farm 94
 Location Flint, Michigan
 Logged By J. Judge
 Driller Rau Drilling Company
 Contractor R. Rau

Boring Designation SB-7A

Start Date 5-9-92 Completed 5-9-92

Ground Surface Elevation: 728.2 feet msl

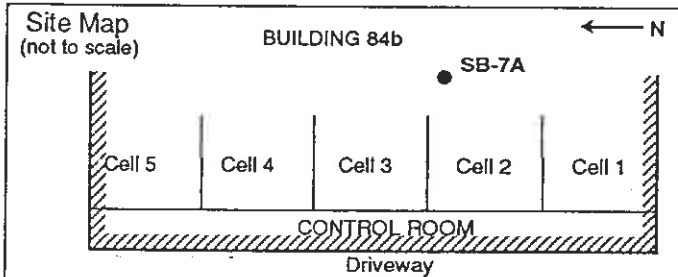
Drilling Method(s) 3.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 26.0 feet

Ground-Water Data
Ground water encountered at 7.0 feet below ground surface during drilling.

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 1.0 - 27.5 feet
2.5 foot intervals

Grouting Material/Method Cement/Bentonite Slurry Depth Range 0.0 - 27.5 feet

General Notes
 Soil Sample SS-6 was submitted for laboratory analysis.
 Temporary monitoring well was installed at this soil boring location with well screen tip at 12.0 feet.



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-inch intervals)	Standard Penetration (N)	PID Readings (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
1				7				0.0	CONCRETE
2	SS-1	2.5	14	11 12	23	0		0.75	FILL: Medium Compact to Compact Light Brown MEDIUM TO FINE SAND, dry
3				15					
4	SS-2	5.0	18	18 19	37	0			(5.0) Increasing silt
5				3					
6				3					
7	SS-3	7.5	17	4	7	0		6.0	Medium to Hard Gray SILTY CLAY, wet (7.0) Wet
8				7					
9	SS-4	10.0	18	13 18	31	0			
10				3					
11				5					
12	SS-5	12.5	18	7	12	0			
13				4					
14				7					
15	SS-6	15.0	17	7	14	0			
16				4					
17	SS-7	17.5	18	5 10	15	0.4		16.0	Stiff Gray SILT, little clay, wet (17.0) Silty clay lens
18				4					
19				6					
20	SS-8	20.0	18	9	15	0		18.5	Medium Compact to Compact Light Brown to Light Gray FINE SAND, wet

Client BOC-Flint Automotive Division/Tank Farm 94
Location Flint, Michigan
Notes _____

Boring Designation SB-7A
Start Date 5-9-92 Completed 5-9-92
Ground Surface Elevation: 728.2 feet msl

Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	PID Readings (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
21				5					Medium Compact to Compact Light Brown to Light Gray FINE TO COARSE SAND, wet (22.5) Silty clay lens
22	SS-9	22.5	18	8	20	0			
23				12					
24	SS-10	24.0	18	14	32	0			
25				18					
26				15					
27	SS-11	27.5	13	18	39	0		26.0	Compact Gray COARSE SAND, some gravel, wet
28				21					END OF BORING AT 27.5 FEET

Figure A1

Client BOC - Flint Automotive Division/Tank Farm 94
 Location Flint, Michigan
 Logged By G. Schmalz
 Driller R. Christensen
 Contractor Stearns Drilling Company

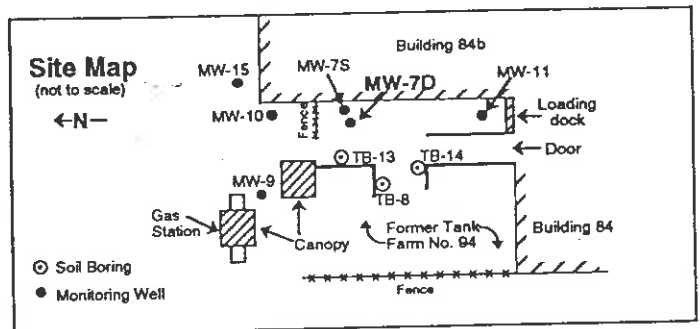
Boring Designation MW-7D
 Start Date 7-8-92 Completed 7-10-92
 Ground Surface Elevation: 727.7 feet msl
 Ground-Water Data
Ground water encountered at 11.0 feet below ground surface during drilling.

Drilling Method(s) 4.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 26.5 feet

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 1.0 - 28.0 feet
2.5 foot intervals

Grouting Material/Method
Monitoring Well MW-7D installed in borehole with well screen tip at 24.8 feet.

General Notes
Soil Samples SS-4 and SS-11 were submitted for laboratory analysis.



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-inch Intervals)	Standard Penetration (N)	HNu (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
0.0							CONCRETE	0.0	
0.8							GRAVEL (sub-base)	0.8	
1.0							FILL: Compact Brown FINE TO MEDIUM SAND, little gravel, moist	1.0	
3.0	SS-1	3.0	22	3 11 12 9	23	0			(3.5) Stained, strong hydrocarbon odor
5.0	SS-2	5.0	15	3 4 7	11	50			(5.0) 7" concrete rubble
8.0	SS-3	8.0	5	50' 6 13 7	20	25			(6.0) Hydrocarbon odor
10.5	SS-4	10.5	20	2 3 11 13	14	1,300			(8.5) Very stained, very strong hydrocarbon odor, wood debris, scrap metal
11.0								11.0	Medium Compact Gray SILT, trace clay, wet
13.0	SS-5	13.0	22	2 7 11 13	18	110			(11.0) Medium Compact Gray FINE TO COARSE SAND, strong hydrocarbon odor, wet
15.5	SS-6	15.5	20	1 4 7 10	11	16			(16.0) Slight hydrocarbon odor
18.0	SS-7	18.0	22	4 5 7 9	12	5			
19.5				8 4					(19.5) No hydrocarbon odor
20.5	SS-8	20.5	20	6 10	10	5			

Log of Boring

Client BOC - Flint
 Location Flint, Michigan
 Notes _____

Boring Designation TB (MW-7D)
 Start Date 7-8-92 Completed 7-10-92
 Ground Surface Elevation (U.S.G.S.): 727.7 feet msl

Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-inch Intervals)	Standard Penetration (N)	PID Readings (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
21				4			.....		Medium Compact Gray MEDIUM TO COARSE SAND, no odor, saturated
22				5			.....	
23	SS-9	23.0	24	7	12	8	.....	22.0	Medium Compact Coarse SAND AND GRAVEL, no odor, saturated
24				11			.....	
25				9			.....	
26	SS-10	25.5	10	11	20	0.0	.....	
27				50/1"			.....	
28	SS-11	28.0	16	5	12	0.0	.....	25.3	Stiff Gray CLAYEY SILT, non-plastic, moist (26.0) Very hard, dry
				69			.....	
				100/4"			.....	
									END OF BORING AT 28.0 FEET

Client BOC - Flint Automotive Division/Tank Farm 94
 Location Flint, Michigan
 Logged By G. Schmalz
 Driller R. Christensen
 Contractor Stearns Drilling Company

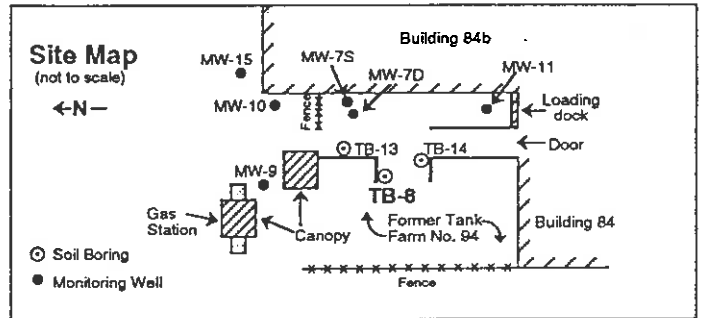
Boring Designation TB-8
 Start Date 7-9-92 Completed 7-9-92
 Ground Surface Elevation: 729.5 feet msl
 Ground-Water Data
Ground water encountered at 10.0 feet below ground surface during drilling.

Drilling Method(s) 4.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 10.0 feet

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 0.0 - 12.0 feet
2.5 foot intervals

Grouting Material/Method Cement/Bentonite slurry Depth Range 0.0 - 12.0 feet

General Notes
Soil Sample SS-5 was submitted for laboratory analysis.
No monitoring well was installed at this soil boring location.



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-inch Intervals)	Standard Penetration (N)	HNu (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
1				3				0.0	GRAVEL (parking lot structure)
2	SS-1	2.0	18	2	5	0		0.3	FILL: Medium Brown SILTY CLAY, trace of sand and gravel, dry
3				2				0.6	FILL: Loose Brown FINE TO MEDIUM SAND, little gravel, moist
4				2				(2.5)	Clay nodules
5	SS-2	4.5	24	2	4	0		(5.5)	Wet
6				1					
7	SS-3	7.0	22	0	1	0			
8				1					
9				1				(9.0)	Moist
10	SS-4	9.5	18	32	3	0		(9.4)	Concrete rubble
11				2				(10.0)	Wet
12	SS-5	12.0	22	6	5	0		10.8	Medium Gray CLAYEY SILT, moist
									END OF BORING AT 12.0 FEET

Client BOC - Flint Automotive Division/Tank Farm 94
 Location Flint, Michigan
 Logged By G. Schmalz
 Driller R. Christensen
 Contractor Stearns Drilling

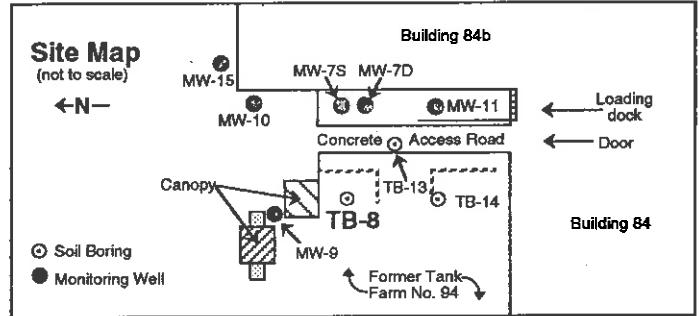
Boring Designation TB (MW-8)
 Start Date 7-9-92 Completed 7-9-92
 Ground Surface Elevation (U.S.G.S.): 729.5 feet msl
 Ground-Water Data
Ground Water encountered at 10.0 feet during drilling.

Drilling Method(s) 4.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 10.0 feet

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 0.0 - 12.0 feet
2.5 foot intervals

Grouting Material/Method Cement/Bentonite slurry Depth Range 0.0 - 12.0 feet

General Notes



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-inch intervals)	Standard Penetration (N)	HNu (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
1				3			●●●●	0.0	GRAVEL (parking lot structure)
				2			||||	0.3	Medium Brown SILTY CLAY, trace c.m.f. sand and gravel, dry
2	SS-1	2.0	18	3	5	0	.....	0.6	Loose Brown FINE TO MEDIUM SAND, little gravel, moist
3				2			.....	(2.5)	Clay nodules
4				2			.....	
5	SS-2	4.5	24	2	4	0	.....	
6				1			.....	(5.5)	Saturated zone
7	SS-3	7.0	22	1	1	0	.....	
8				1			.....	
9				2			.....	(9.0)	Moist
10	SS-4	9.5	18	32	3	0	.....	(9.4)	Weathered concrete
				2			.....	≈(10.0)	Saturated
11				2			.....	
12	SS-5	12.0	22	3	5	0	||||	10.8	Medium Gray CLAYEY SILT, non-plastic, moist
				6			||||		END OF BORING AT 12.0 FEET

Client BOC - Flint
 Location Flint, Michigan
 Logged By G. Schmalz
 Driller R. Christensen
 Contractor Stearns Drilling

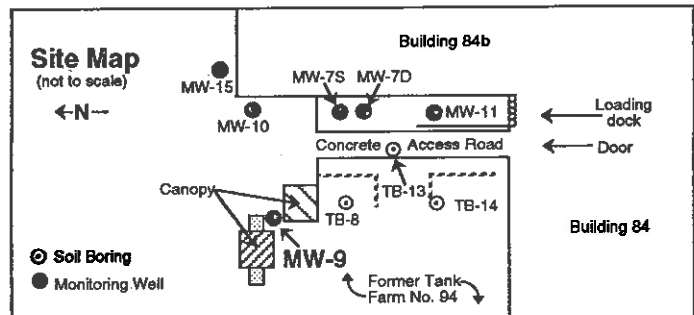
Boring Designation TB (MW-9)
 Start Date 7-7-92 Completed 7-7-92
 Ground Surface Elevation (U.S.G.S.): 728.9 feet msl
 Ground-Water Data
Ground Water encountered at 12.0 feet during drilling.

Drilling Method(s) 4.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 10.0 feet

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 0.0 - 12.0 feet
2.5 foot intervals

Grouting Material/Method Monitoring well MW-9 installed in borehole with well screen tip at 18 feet. Depth Range

General Notes



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-inch Intervals)	Standard Penetration (N)	HNu (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
0.0								0.0	CONCRETE
0.8								0.8	GRAVEL (sub-base)
1.0								1.0	Medium Compact Dark Brown Stained FINE TO MEDIUM SAND, moist, no odor
2.2	SS-1	3.0	24	7	11	0		2.2	Medium Compact Light Brown MEDIUM TO COARSE SAND, dry
3.5				3				3.5	Medium Compact Brown, FINE TO MEDIUM SAND, little gravel, moist
4.5	SS-2	5.5	20	5	10	0		4.5	Stiff Gray SILT, little clay, non-plastic, moist
4.8				3				4.8	Stiff Gray SILTY CLAY, plastic, moist
7.8	SS-3	8.0	22	7	13	0		7.8	Stiff Gray CLAYEY SILT, non-plastic, moist
8.5				8				8.5	Medium Compact Gray SILT, non-cohesive, moist
10.5	SS-4	10.5	24	11	20	0			
12.0				9					
13.0	SS-5	13.0	24	7	16	0			
13.5				10					
13.5				3				13.5	Loose Brown MEDIUM SAND, saturated
15.5	SS-6	15.5	24	4	8	0			
17.0				4					
18.0	SS-7	18.0	24	2	5	0			
				3					
				4					
									END OF BORING AT 18.0 FEET

Client BOC - Flint Automotive Division/Tank Farm 94
 Location Flint, Michigan
 Logged By G. Schmalz
 Driller R. Christensen
 Contractor Stearns Drilling Company

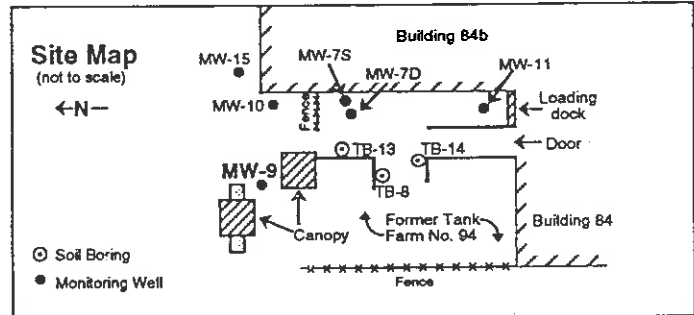
Boring Designation MW-9
 Start Date 7-7-92 Completed 7-7-92
 Ground Surface Elevation: 728.9 feet msl
 Ground-Water Data
Ground Water encountered at 12.0 feet below ground surface during drilling.

Drilling Method(s) 2.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 18.0 feet

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 0.8 - 18.0 feet
2.5 foot intervals

Grouting Material/Method
 Monitoring well MW-9 installed in the borehole with well screen tip at 17.9 feet.

General Notes
 Soil sample SS-5 was submitted for laboratory analysis.



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	HNU (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
0.0							CONCRETE		
0.8							GRAVEL (sub-base)	0.8	
1.0							FILL: Medium Compact Dark Brown Stained FINE TO MEDIUM SAND, moist, no odor	1.0	
2.2					11	0	Medium Compact Light Brown MEDIUM TO COARSE SAND, dry	2.2	
3.5							Medium Compact Brown, FINE TO MEDIUM SAND, little gravel, moist	3.5	
4.5					10	0	Stiff Gray SILT, little clay, moist	4.5	
4.8							Stiff Gray SILTY CLAY, moist	4.8	
7.8					13	0	Stiff Gray CLAYEY SILT, moist	7.8	
8.5							Medium Compact Gray SILT, moist	8.5	
12.0					20	0	(12.0) Wet	12.0	
13.5					16	0	Loose Brown MEDIUM SAND, wet	13.5	
15.5					8	0			
18.0					5	0			
									END OF BORING AT 18.0 FEET

Client BOC - Flint
 Location Flint, Michigan
 Logged By G. Schmalz
 Driller R. Christensen
 Contractor Stearns Drilling

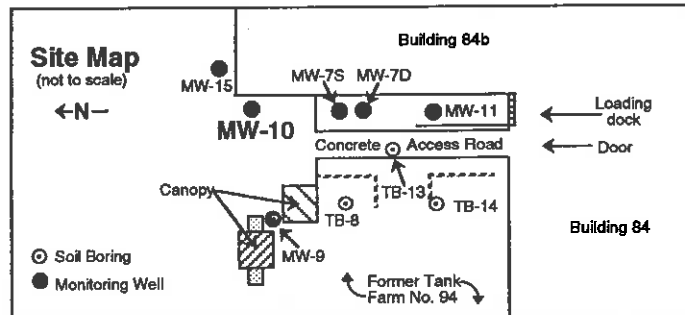
Boring Designation TB (MW-10)
 Start Date 7-9-92 Completed 7-9-92
 Ground Surface Elevation (U.S.G.S.): 727.8 feet msl
 Ground-Water Data
 Product encountered at 8.5 feet below ground surface.
 Ground Water encountered at 11.0 feet during drilling.

Drilling Method(s) 4.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 28.5 feet

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 1.0 - 30.0 feet
2.5 foot intervals

Grouting Material/Method Monitoring well MW-9 installed in borehole with well screen tip at 18 feet. Depth Range

General Notes



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (inches)	Hammer Blows (6-inch intervals)	Standard Penetration (N)	HNu (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
0.0							[Pattern]	0.0	CONCRETE
0.8							[Pattern]	0.8	GRAVEL (sub-base)
1.0							[Pattern]	1.0	Loose Brown FINE TO MEDIUM SAND, little gravel, no odor, moist
3.0	SS-1	3.0	15	4 3 3 2	6	0	[Pattern]		
5.5	SS-2	5.5	18	2 2 3 5	5	5	[Pattern]		(4.5) Stiff Gray SILT, little clay, non-plastic, moist
8.0	SS-3	8.0	20	2 2 3 5	5	60	[Pattern]	6.5	Medium Gray SILTY CLAY, plastic, hydrocarbon odor, moist
10.5	SS-4	10.5	22	4 4 7 8	11	120	[Pattern]	8.5	Medium Compact Gray SILT, very stained from 9.0 to 10.0 feet, strong hydrocarbon odor, saturated
13.0	SS-5	13.0	22	11 18	20	100	[Pattern]	11.0	Medium Compact Gray FINE TO MEDIUM SAND, trace gravel, strong hydrocarbon odor, saturated
15.5	SS-6	15.5	24	5 7 13 16	20	8	[Pattern]		(16.0) No odor
18.0	SS-7	18.0	22	2 3 10 11	13	0	[Pattern]		
20.5	SS-8	20.5	24	8 12 14 13	26	0	[Pattern]	19.0	Medium Compact Fe-stained Coarse SAND AND GRAVEL, no odor, saturated

Client BOC - Flint
Location Flint, Michigan
Notes _____

Boring Designation TB (MW-10)
Start Date 7-9-92 Completed 7-9-92
Ground Surface Elevation (U.S.G.S.): 727.8 feet msl

Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	PID Readings (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
21				7					Medium Compact Fe-stained Coarse SAND AND GRAVEL, no odor, saturated
22				12	17				
23	SS-9	23.0	12	5		0.0		21.0	Medium Compact Fining-upwards Sequence from GRAVEL TO BROWN FINE TO MEDIUM SAND, no odor, saturated
24				8					
25				15	35			23.5	Compact Fining-upwards Sequence from GRAVEL TO BROWN FINE SAND, no odor, saturated
26	SS-10	25.5	18	17		0.0		25.0	Compact Brown CLAYEY SAND AND GRAVEL, saturated
27				18					
28	SS-11	28.0	12	14	28	0.0		26.0	Medium Compact SAND AND GRAVEL, saturated
29				9					
30				13				30.0	Very Compact CLAYEY SAND AND GRAVEL, saturated
31	SS-12	30.5	22	15	60	0.0		30.4	Gray SANDSTONE with secondary recrystallization and quartz
				23					END OF BORING AT 30.5 FEET
				24					
				27					

Client BOC - Flint
 Location Flint, Michigan
 Logged By G. Schmalz
 Driller R. Christensen
 Contractor Stearns Drilling

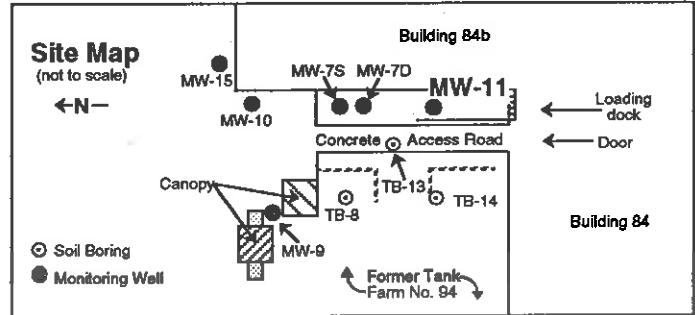
Boring Designation TB (MW) -11
 Start Date 7-9-92 Completed 7-9-92
 Ground Surface Elevation (U.S.G.S.): 727.8 feet msl
 Ground-Water Data
 Product encountered at 8.5 feet below ground surface.
 Ground Water encountered at 11.0 feet during drilling.

Drilling Method(s) 4.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 19.5 feet

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 2.0 - 21.5 feet
 2.5 foot intervals

Grouting Material/Method Monitoring well MW-11 installed in borehole with well screen tip at 18.5 feet. Depth Range

General Notes



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-inch intervals)	Standard Penetration (N)	HNu (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
1								0.0	CONCRETE
2								1.5	GRAVEL (sub-base)
3				2				2.0	Loose BROWN FINE TO MEDIUM SAND, little gravel, moist
4	SS-1	4.0	4	4	7	0		(4.5)	saturated
5				2					
6	SS-2	6.5	4	4	4	0			
7				3				7.0	Medium Compact Gray SILT, moist
8				6				8.8	Stiff Gray CLAYEY SILT, slightly plastic, moist
9	SS-3	9.0	24	11	13	0		9.5	Medium Compact Gray SILT, moist
10				4					
11	SS-4	11.5	24	12	11	0			
12				2					
13				4				13.0	Medium Gray SILTY CLAY WITH SAND AND GRAVEL, plastic, moist Gravel lenses
14	SS-5	14.0	20	9	10	0		14.5	Stiff Gray SILT, little clay, cohesive, non-plastic, moist
15				4					
16	SS-6	16.5	22	18	18	0			
17				2					
18				7				17.8	Medium Compact Brown FINE TO MEDIUM SAND, saturated
19	SS-7	19.0	20	12	14	0		18.3	Very Stiff Gray SILTY CLAY, slightly plastic, moist
20				6					
21	SS-8	21.5	22	31	26	0			

END OF BORING AT 21.5 FEET

Client BOC - Flint Automotive Division
 Location Flint, Michigan
 Logged By G. Schmalz
 Driller D. Decater
 Contractor Stearns Drilling

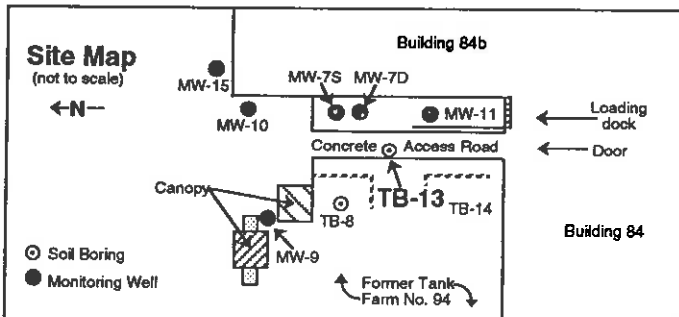
Boring Designation TB -13
 Start Date 7-14-92 Completed 7-14-92
 Ground Surface Elevation (U.S.G.S.): 727.8 feet msl

Drilling Method(s) 4.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 13.0 feet

Ground-Water Data
Product encountered at 8.5 feet below ground surface.
Ground Water encountered at 11.0 feet during drilling.

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 1.0 - 15.5 feet

Grouting Material/Method See monitor well construction diagram. Depth Range



General Notes

Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	HNu (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
1				2				0.0	CONCRETE
2				3				0.8	GRAVEL (sub-base)
3	SS-1	3.0	20	8	11	50		1.0	Medium Compact Brown and Dark Stained FINE TO MEDIUM SAND, little gravel, strong hydrocarbon odor, moist
4				4					
5				2					
6	SS-2	5.5	20	6	8	60			(6.0) Very stained, very strong hydrocarbon odor
7				4					
8	SS-3	8.0	20	6	12	180		7.5	Very Stiff Gray SILT, wood debris, strong hydrocarbon odor, moist
9				7					
10	SS-4	10.0	22	8	20	40			
11				10					
12				10					
13	SS-5	13.0	18	7	15	16		11.0	Stiff Gray CLAYEY SILT, slightly plastic, slight hydrocarbon odor, saturated
14				6					
15	SS-6	15.5	20	7	13	0		13.5	Medium Compact FINE TO MEDIUM SAND, no odor, saturated
16				9					END OF BORING AT 15.5 FEET

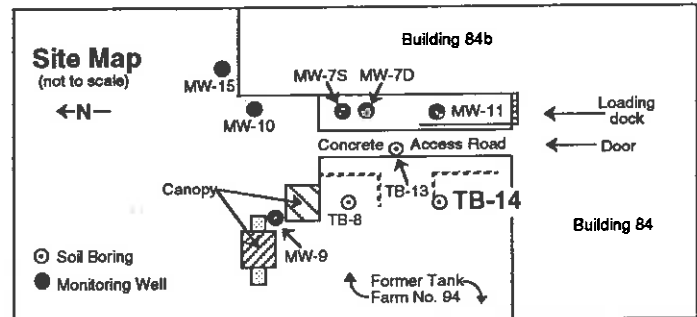
Client BOC - Flint Automotive Division/Tank Farm 94
 Location Flint, Michigan
 Logged By G. Schmalz
 Driller D. Decater
 Contractor Stearns Drilling

Boring Designation TB-14
 Start Date 7-14-92 Completed 7-14-92
 Ground Surface Elevation (U.S.G.S.): 727.8 feet msl
 Ground-Water Data
 Product encountered at 8.5 feet below ground surface.
 Ground Water encountered at 11.0 feet during drilling.

Drilling Method(s) 4.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 6.5 feet

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 1.0 - 8.0 feet

Grouting Material/Method Cement/Bentonite Slurry Depth Range 0.0 - 8.0 feet



General Notes

Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-Inch Intervals)	Standard Penetration (N)	HNu (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
0.0							●●●●●	0.0	GRAVEL (parking lot)
1.0							●●●●●	1.0	Medium Compact Brown FINE TO MEDIUM SAND, little gravel, moist
1.5					11	50	●●●●●	1.5	Concrete
3.0	SS-1	3.0	20	14			●●●●●	3.5	Saturated
5.5	SS-2	5.5	20	6	8	60	●●●●●		
8.0	SS-3	8.0	20	8	12	180	●●●●●	7.5	Very Soft Gray SILTY CLAY, plastic, moist
							###		END OF BORING AT 8.0 FEET

Client BOC - Flint Automotive Division
 Location Flint, Michigan
 Logged By G. Schmalz
 Driller D. Decater
 Contractor Stearns Drilling

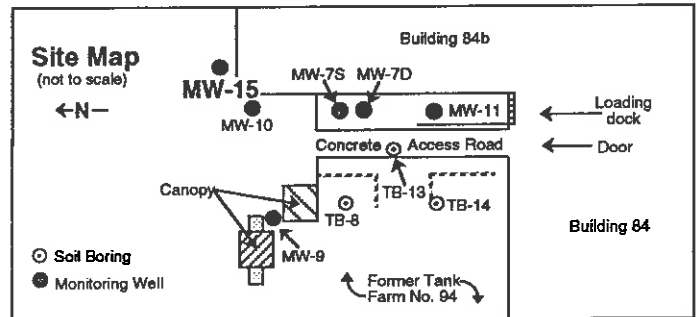
Boring Designation TB (MW) -15
 Start Date 7-14-92 Completed 7-14-92
 Ground Surface Elevation (U.S.G.S.): 727.5 feet msl
 Ground-Water Data
Ground Water encountered at 16.0 feet during drilling.

Drilling Method(s) 4.25 Inch I.D. Hollow Stem Auger Depth Range 0.0 - 18.0 feet

Sampling Method(s) 2.0 Inch O.D. Split Spoon Depth Range 1.0 - 20.5 feet

Grouting Material/Method Monitoring well MW-15 installed in borehole with well screen tip at 20.0 feet. Depth Range

General Notes



Borehole Depth (feet)	Sample Type and Number	Depth of Sample Tip (feet)	Sample Recovered (Inches)	Hammer Blows (6-inch intervals)	Standard Penetration (N)	HNu (ppm)	Graphic Log	Depth Below Ground Surface (feet)	Subsurface Description
0.0								0.0	ASPHALT AND GRAVEL
0.2								0.2	Brown FINE TO MEDIUM SAND, little gravel, no odor, moist
2.0	SS-1	3.0	20	6	11	0		2.0	Stiff Brown/Gray Mottled SILTY CLAY, slightly plastic, no odor, moist
5.5	SS-2	5.5	18	12	19	0		5.5	
8.0	SS-3	8.0	15	13	22	0		8.0	Very Stiff Brown SILTY CLAY, trace gravel, non-plastic, no odor, moist
10.5	SS-4	10.5	22	15	22	0		10.5	
13.0	SS-5	13.0		7	10	0		13.0	
15.5	SS-6	15.5		8	11	0		15.5	(14.5) Lenses of clayey silt, saturated zones
16.0								16.0	Medium Compact Gray SILT, little clay in lenses, non-plastic, no odor, saturated
18.0	SS-7	18.0		5	12	0		18.0	
18.5								18.5	Medium Compact Gray FINE TO MEDIUM SAND, no odor, saturated
19.5								19.5	Medium Compact Gray SILTY CLAYEY FINE SAND, no odor, saturated
20.5	SS-8	20.5		11	18	0		20.5	
END OF BORING AT 20.5.0 FEET									

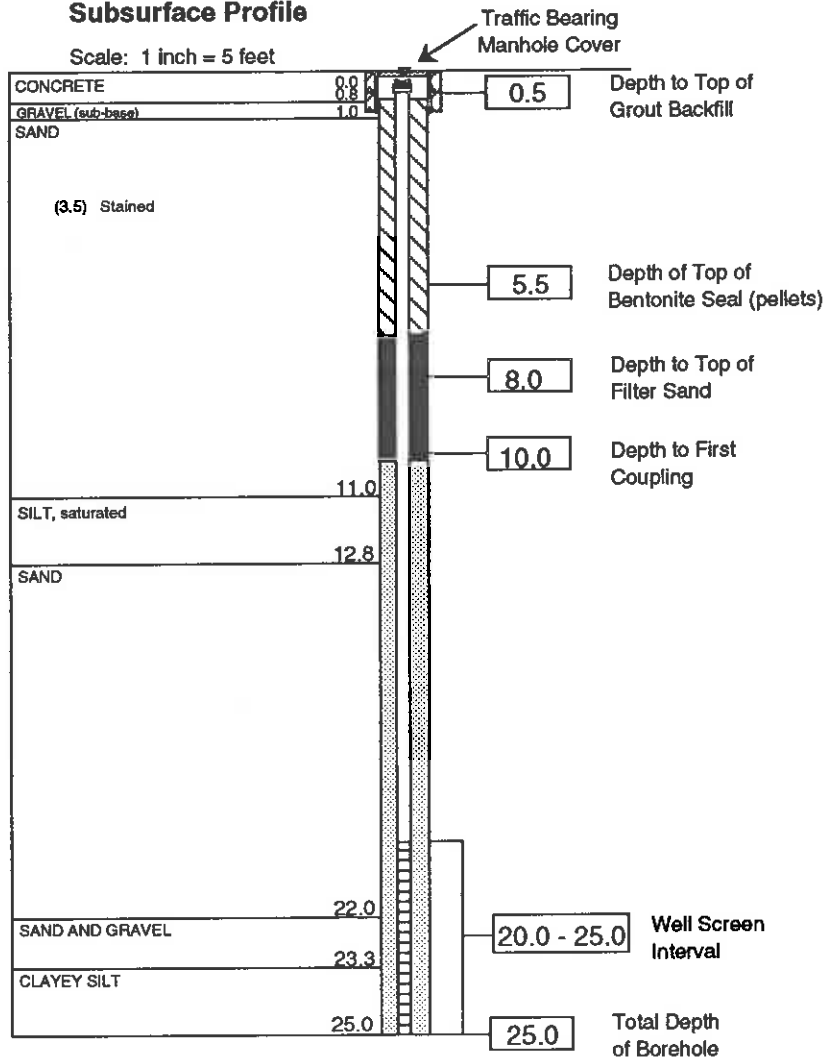
Log of Well Installation

Well Designation: MW-7D

Date(s) of Installation: 7-10-92 To 7-10-92

Generalized Subsurface Profile

Scale: 1 inch = 5 feet



Ground Surface Elevation: 727.7

Top of Casing Elevation: 727.44

Well Screen Tip Elevation: 702.4

Well Casing

Diameter: 2.0 inch O.D.
 Total Length: 19.5 feet
 Material: Schedule 40 PVC
 Cap (Y/N) Locking J-Plug

Well Screen

Diameter: 2.0 inches
 Length: 5.0 feet
 Mesh: 0.010 inch slot
 Material: Schedule 40 PVC
 Screen Plug (Y/N): Collector cup

Protective Well Casing Cover

Material: Steel Flush Cap
 Diameter: 9.0 inches
 Length: 12.0 inches
 Lock (Y/N): 7/8 inch bolt

Inspector: G. Schmalz
 Driller: R. Christensen
 Contractor: Stearns Drilling
 Drilling Equipment: CME 750 - Trailer mount

Well Screen Filter Material: #3 Fine Sand
 Grout Backfill Material: Cement/Bentonite slurry

Other well materials used: Bentonite pellets

Water Level Data

Datum: Top of Well Casing

Date	Water Level Elevation
7-22-92	9.80

General Notes: _____

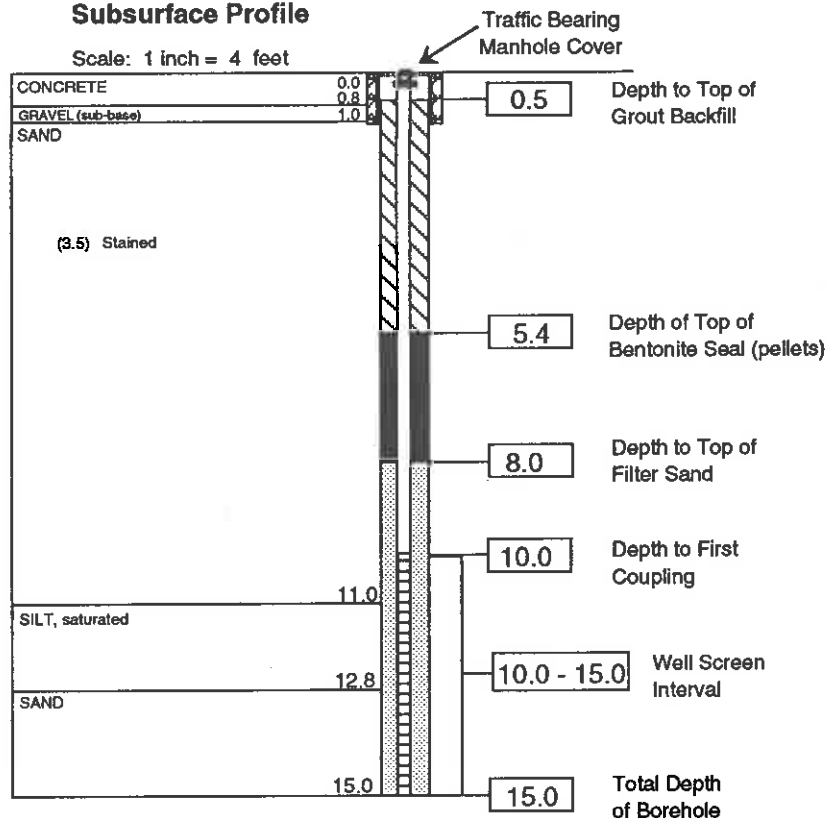
Log of Well Installation

Well Designation: MW-7S

Date(s) of Installation: 7-10-92 To 7-10-92

Generalized Subsurface Profile

Scale: 1 inch = 4 feet



Ground Surface Elevation: 727.7

Top of Casing Elevation: 727.38

Well Screen Tip Elevation: 712.9

Well Casing

Diameter: 2.0 inch O.D.

Total Length: 9.5 feet

Material: Schedule 40 PVC

Cap (Y/N): Locking J-Plug

Well Screen

Diameter: 2.0 inches

Length: 5.0 feet

Mesh: 0.010 inch slot

Material: Schedule 40 PVC

Screen Plug (Y/N): Collector cup

Protective Well Casing Cover

Material: Steel Flush Cap

Diameter: 9.0 inches

Length: 12.0 inches

Lock (Y/N): 7/8 inch bolt

Inspector: G. Schmalz

Driller: R. Christensen

Contractor: Stearns Drilling

Drilling Equipment: CME 750 - Trailer mount

Well Screen Filter Material: #3 Sand

Grout Backfill Material: Cement/Bentonite slurry

Other well materials used: Bentonite pellets

Water Level Data

Datum: Top of Well Casing

Date	Water Level Elevation
7-22-92	10.76

General Notes: _____

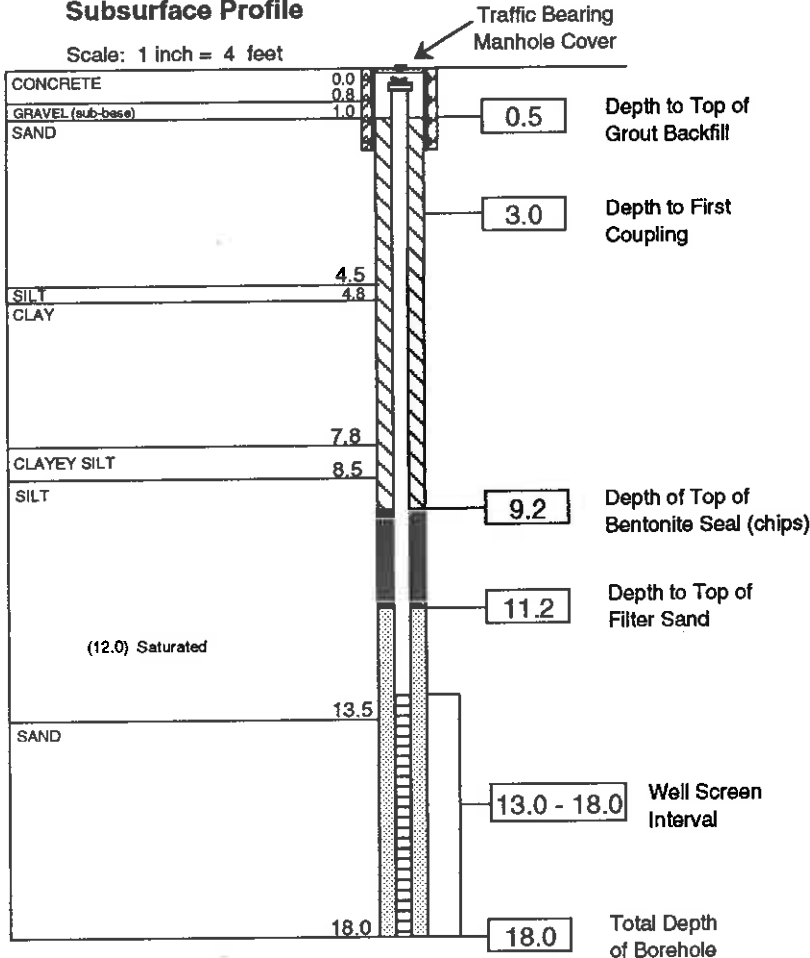
Log of Well Installation

Well Designation: MW-9

Date(s) of Installation: 7-7-92 To 7-7-92

Generalized Subsurface Profile

Scale: 1 inch = 4 feet



Ground Surface Elevation: 728.9

Top of Casing Elevation: 728.55

Well Screen Tip Elevation: 710.6

Well Casing

Diameter: 2.0 inch I.D.
 Total Length: 12.5 feet
 Material: Schedule 40 PVC
 Cap (Y/N): Locking J-Plug

Well Screen

Diameter: 2.0 inches
 Length: 5.0 feet
 Mesh: 0.010 inch slot
 Material: Schedule 40 PVC
 Screen Plug (Y/N): Collector cup

Protective Well Casing Cover

Material: Steel Flush Cap
 Diameter: 9.0 inches
 Length: 12.0 inches
 Lock (Y/N): 7/8 inch bolt

Inspector: G. Schmalz
 Driller: R. Christensen
 Contractor: Stearns Drilling
 Drilling Equipment: CME 750 - Trailer mount

Well Screen Filter Material: #3 Sand
 Grout Backfill Material: Cement/Bentonite slurry
 Other well materials used: Bentonite pellets

Water Level Data

Datum: Top of Well Casing

Date Water Level Elevation

Date	Water Level Elevation
7-22-92	10.76

General Notes: _____

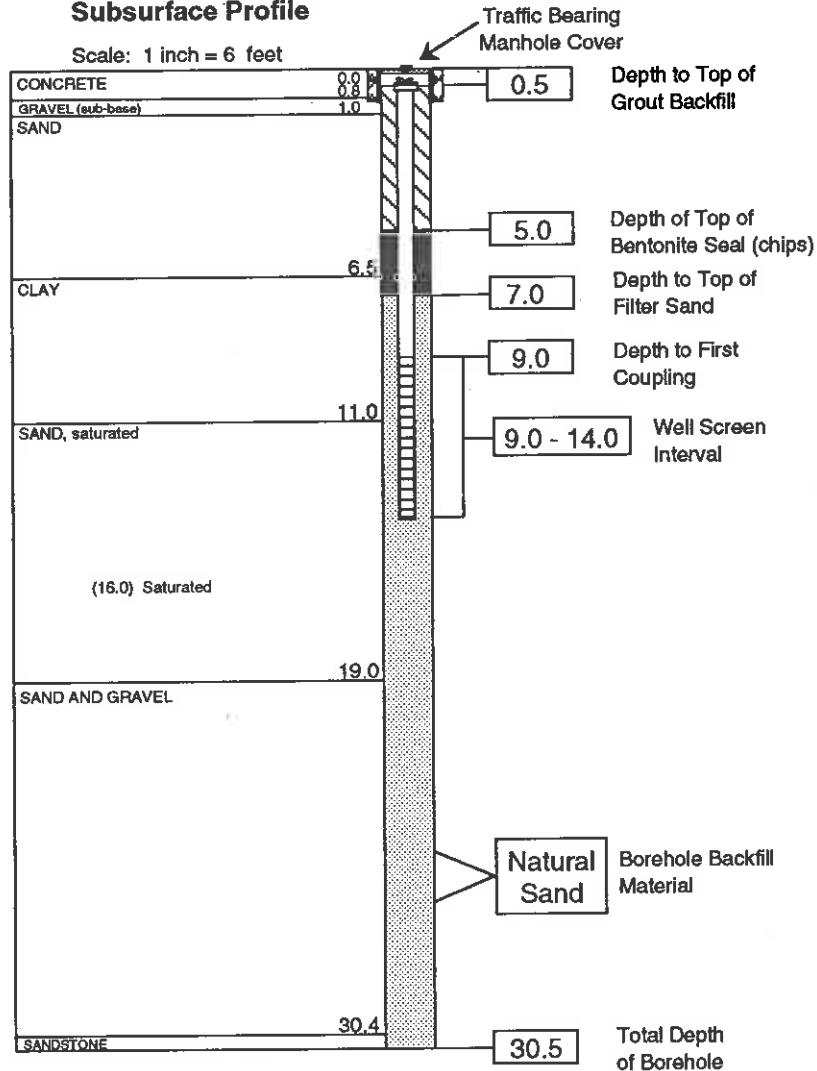
Log of Well Installation

Well Designation: MW-10

Date(s) of Installation: 7-9-92 To 7-9-92

Generalized Subsurface Profile

Scale: 1 inch = 6 feet



Ground Surface Elevation: 727.8

Top of Casing Elevation: 727.38

Well Screen Tip Elevation: 714.4

Well Casing

Diameter: 2.0 inch I.D.
 Total Length: 8.5 feet
 Material: Schedule 40 PVC
 Cap (Y/N): Locking J-Plug

Well Screen

Diameter: 2.0 inches
 Length: 5.0 feet
 Mesh: 0.010 inch slot
 Material: Schedule 40 PVC
 Screen Plug (Y/N): Collector cup

Protective Well Casing Cover

Material: Steel Flush Cap
 Diameter: 9.0 inches
 Length: 12.0 inches
 Lock (Y/N): 7/8 inch bolt

Inspector: G. Schmalz
 Driller: R. Christensen
 Contractor: Stearns Drilling
 Drilling Equipment: CME 750 - Trailer mount

Well Screen Filter Material: #3 Sand
 Grout Backfill Material: Cement/Bentonite slurry
 Other well materials used: Bentonite pellets

Water Level Data

Datum: Top of Well Casing

Date Water Level Elevation

Date	Water Level Elevation
7-22-92	9.58

General Notes: _____

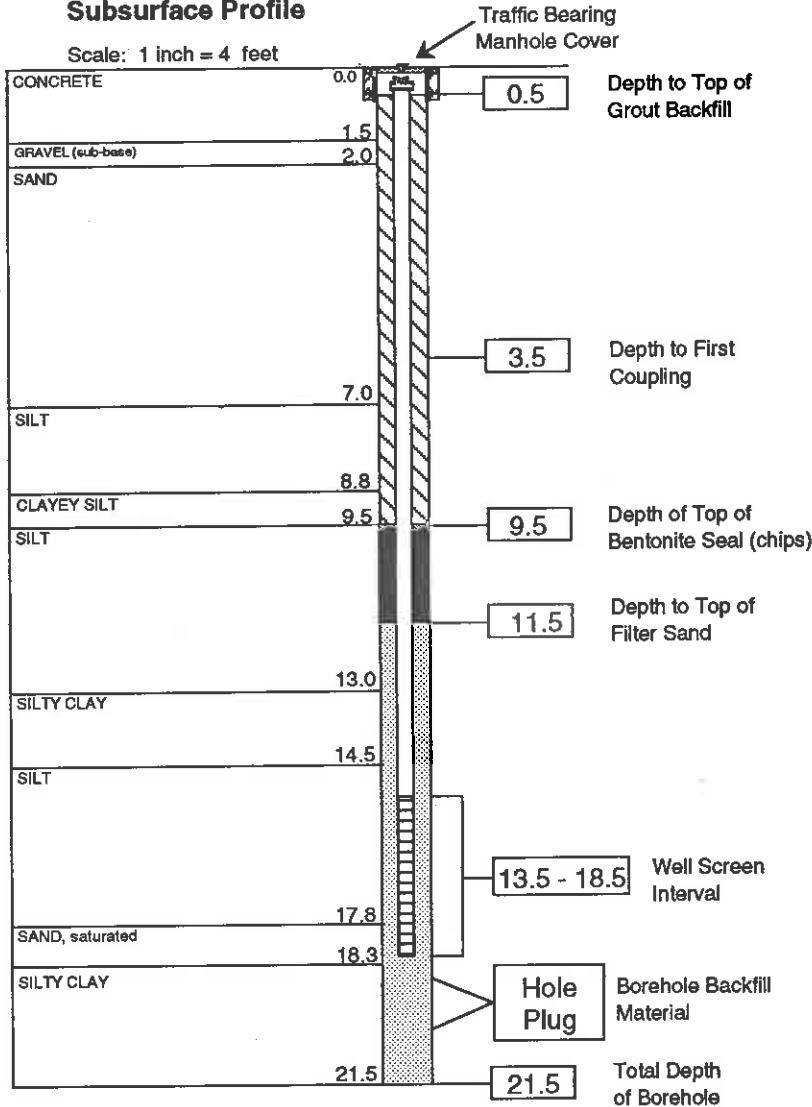
Log of Well Installation

Well Designation: MW-11

Date(s) of Installation: 7-7-92 To 7-7-92

Generalized Subsurface Profile

Scale: 1 inch = 4 feet



Ground Surface Elevation: 725.7

Top of Casing Elevation: 725.39

Well Screen Tip Elevation: 706.89

Well Casing

Diameter: 2.0 inch I.D.

Total Length: 13.0 feet

Material: Schedule 40 PVC

Cap (Y/N) Locking J-Plug

Well Screen

Diameter: 2.0 inches

Length: 5.0 feet

Mesh: 0.010 inch slot

Material: Schedule 40 PVC

Screen Plug (Y/N): Collector cup

Protective Well Casing Cover

Material: Steel Flush Cap

Diameter: 9.0 inches

Length: 12.0 inches

Lock (Y/N): 7/8 inch bolt

Inspector: G. Schmalz
 Driller: R. Christensen
 Contractor: Stearns Drilling
 Drilling Equipment: CME 750 - Trailer mount

Well Screen Filter Material: #3 Sand
 Grout Backfill Material: Cement/Bentonite slurry
 Other well materials used: Bentonite pellets

Water Level Data

Datum: Top of Well Casing

Date	Water Level Elevation
7-22-92	10.26

General Notes: _____

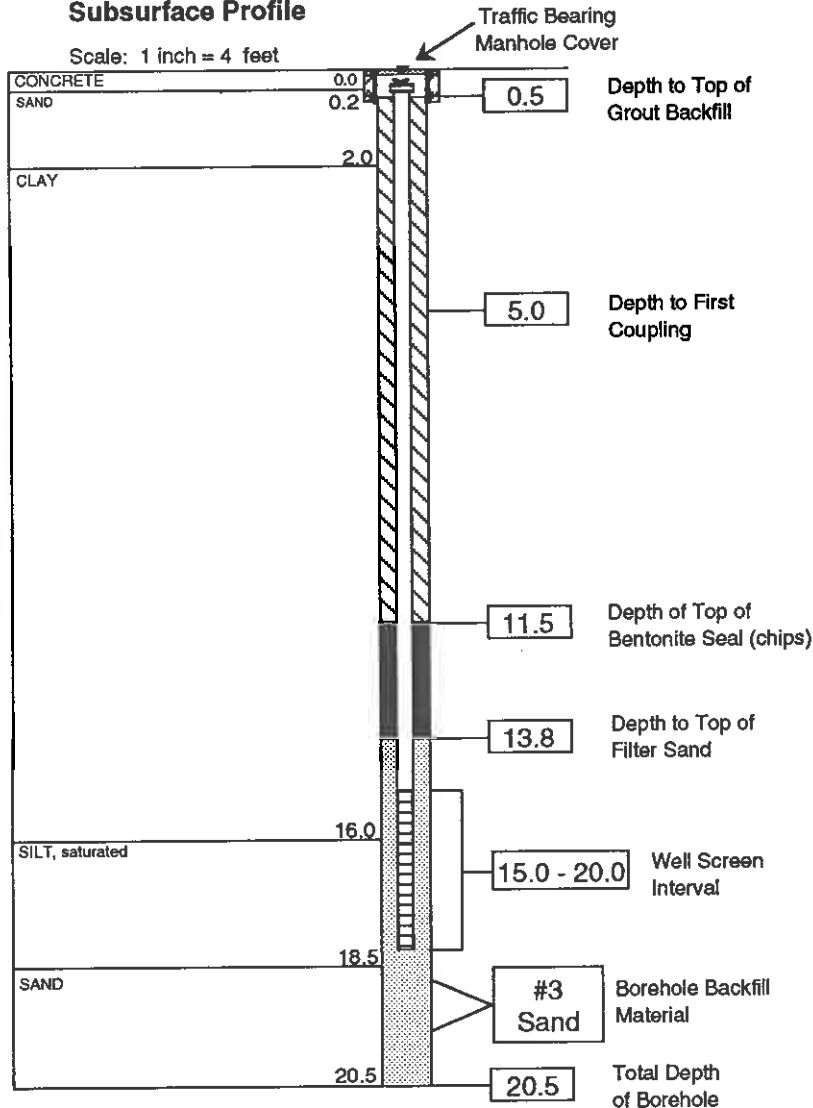
Log of Well Installation

Well Designation: MW-15

Date(s) of Installation: 7-14-92 To 7-14-92

Generalized Subsurface Profile

Scale: 1 inch = 4 feet



Ground Surface Elevation: 727.5

Top of Casing Elevation: 726.90

Well Screen Tip Elevation: 706.9

Well Casing

Diameter: 2.0 inch I.D.
 Total Length: 14.5 feet
 Material: Schedule 40 PVC
 Cap (Y/N): Locking J-Plug

Well Screen

Diameter: 2.0 inches
 Length: 5.0 feet
 Mesh: 0.010 inch slot
 Material: Schedule 40 PVC
 Screen Plug (Y/N): Collector cup

Protective Well Casing Cover

Material: Steel Flush Cap
 Diameter: 9.0 inches
 Length: 12.0 inches
 Lock (Y/N): 7/8 inch bolt

Inspector: G. Schmalz
 Driller: R. Christensen
 Contractor: Stearns Drilling
 Drilling Equipment: CME 750 - Trailer mount

Well Screen Filter Material: #3 Sand
 Grout Backfill Material: Cement/Bentonite slurry
 Other well materials used: Bentonite pellets

Water Level Data

Datum: Top of Well Casing

Date Water Level Elevation

Date	Water Level Elevation
7-22-92	9.06

General Notes: _____

ATTACHMENT 3

ATTACHMENT 3
SOIL AND GROUNDWATER SAMPLING RESULTS
TANK FARM 94

TABLE 1
SOIL AND GROUND-WATER QUALITY

Former Tank Farm No. 94
BOC-Flint Automotive Division
Flint, Michigan

CONTAMINANT: parts per billion (ppb)	SOIL SAMPLE LOCATION AND DEPTH (IN FEET)						GROUND-WATER SAMPLES			
	TYPE B Cleanup Criteria	TB-1 SS-2 (5.5 ft.)	TB-3 SS-2 (5.5 ft.)	TB-3 SS-4 (10.0 ft)	TB-5 SS-2 (5.5 ft.)	TB-5 SS-4 (13.0 ft.)	TYPE B Cleanup Criteria	TB-2 WS-1	TB-4 WS-1	TB-6* WS-1
Benzene	20	<10	<10	<10	<10	<10	1	<1.0	<1.0	38
Toluene	16,000	24	<10	<10	<10	<10	800	<1.0	<1.0	<10
Ethylbenzene	1,400	15	<10	<10	<10	<10	70	<1.0	<1.0	<10
Xylene (Total)	6,000	80	20	<10	<10	<10	300	2.0	<1.0	4
Acetone	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	190
1,2 Dichloroethene (Total)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	3
Methylene Chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1
Vinyl Chloride	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	2

* Sample analyzed for volatile organic compounds - EPA Method 8040

TABLE 2
Summary of Soil Sample Laboratory Analytical Results
Former Tank Farm No. 94
BOC-Flint Automotive Division

(Units as Given)

Sample I.D.	Type A Criteria	Type B Criteria	TB-7A	TB-7B	TB-7B	MW-7D	MW-7D	TB-8B	MW-9
Sample Designation	Criteria	Criteria	SS-6	SS-2	SS-5	SS-4	SS-11	SS-3	SS-6
Sample Date			5/9/92	5/9/92	5/9/92	7/7/92	7/7/92	8/1/92	7/7/92
Sample Depth (In feet)			13.0-15.0	3.0-5.0	10.5-12.5	8.5-10.5	26.0-28.0	5.0-7.0	13.5-15.5
Polynuclear Aromatics (PNA'S)									
Acenaphthene	330	8000	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	330	ID	ND	ND	ND	ND	ND	ND	ND
Anthracene	330	40,000	ND	ND	ND	ND	ND	ND	ND
Benzo (a) anthracene	330	200-D	ND	ND	ND	ND	ND	ND	ND
Benzo (a) pyrene	330	200-D	ND	ND	ND	ND	ND	ND	ND
Benzo (b) fluoranthene	330	200-D	ND	ND	ND	ND	ND	ND	ND
Benzo (ghi) perylene	330	ID	ND	ND	ND	ND	ND	ND	ND
Benzo (k) fluoranthene	330	200-D	ND	ND	ND	ND	ND	ND	ND
Chrysene	330	200-D	ND	ND	ND	ND	ND	ND	ND
Dibenzo (a,h) anthracene	330	200-D	ND	ND	ND	ND	ND	ND	ND
Fluoranthene	330	6000	ND	ND	ND	ND	ND	ND	ND
Fluorene	330	6000	ND	ND	ND	ND	ND	ND	ND
Indeno (1,2,3-cd) pyrene	330	200-D	ND	ND	ND	ND	ND	ND	ND
Naphthalene	330	600	ND	ND	ND	696	ND	ND	ND
Phenanthrene	330	ID	ND	ND	ND	820	ND	ND	ND
Pyrene	330	4000	ND	ND	ND	ND	ND	ND	ND
Volatile Organic Compounds (BTEX)									
Benzene	10	20	ND	ND	ND	MI	ND	ND	ND
Ethylbenzene	10	1,400	ND	ND	ND	95000	ND	ND	ND
Toluene	10	16000	ND	ND	ND	17000	ND	ND	ND
Xylenes (o, m, and p)	30	6000	ND	ND	ND	370000	ND	ND	ND
Methyl tert butylether (MTBE)	100	10,000	ND	ND	ND	ND	ND	ND	ND
Total Lead	1	0.08	7.9	3.9	6.8	36	18.0	4.8	8.7

1 of 2

ug/kg = microgram per kilogram
 mg/kg = milligram per kilogram
 ID = Insufficient data for the MDNR to establish Type B Criteria
 D = Direct human contact values are considered protective of ground water
 ND = Not Detected
 MI = Matrix Interference
 □ = detected above Type B criteria

TABLE 2 (continued)
Summary of Soil Sample Laboratory Analytical Results
Former Tank Farm No. 94
BOC-Flint Automotive Division

		(Units as Given)						
Sample I.D.	Sample Designation	Type A Criteria	Type B Criteria	MW-108 SS-5	MW-11 SS-7	TB-13 SS-3	TB-14B SS-2	MW-15B SS-8
Sample Date	Sample Depth (in feet)		20xGW	8/1/92	7/7/92	7/7/92	8/1/92	8/4/92
Polynuclear Aromatics (PNA'S)		Units		11.0-13.0	17.0-19.0	6.0-8.0	3.5-5.5	18.5-20.5
	Acenaphthene	ug/kg	8000	ND	ND	1400	ND	ND
	Acenaphthylene	ug/kg	ID	ND	ND	1700	ND	ND
	Anthracene	ug/kg	40,000	ND	ND	5700	ND	ND
	Benzo (a) anthracene	ug/kg	200-D	ND	ND	23000	ND	ND
	Benzo (a) pyrene	ug/kg	200-D	ND	ND	18000	ND	ND
	Benzo (b) fluoranthene	ug/kg	200-D	ND	ND	24000	ND	ND
	Benzo (ghi) perylene	ug/kg	ID	ND	ND	4600	ND	ND
	Benzo (k) fluoranthene	ug/kg	200-D	ND	ND	ND	ND	ND
	Chrysene	ug/kg	200-D	ND	ND	27000	ND	ND
	Dibenzo (a,h) anthracene	ug/kg	200-D	ND	ND	3700	ND	ND
	Fluoranthene	ug/kg	6000	ND	ND	31000	ND	ND
	Fluorene	ug/kg	6000	ND	ND	2900	ND	ND
	Indeno (1,2,3-cd) pyrene	ug/kg	200-D	ND	ND	4600	ND	ND
	Naphthalene	ug/kg	600	1700	ND	870	ND	ND
	Phenanthrene	ug/kg	ID	ND	ND	ND	ND	ND
	Pyrene	ug/kg	4000	ND	ND	32000	ND	ND
Volatile Organic Compounds								
Detected		Units						
	Benzene	ug/kg	10	6300	ND	720**	ND	ND
	Ethylbenzene	ug/kg	10	ND	ND	1460**	ND	ND
	Toluene	ug/kg	10	ND	ND	3335**	ND	ND
	Xylenes (o, m, and p)	ug/kg	30	16000	ND	4405**	ND	ND
	Methyl tert butylether (MTBE)	ug/kg	100	ND	ND	NA	ND	ND
	Total Lead	mg/kg	1	6.8	16.0	43.0	4.6	9.4

ug/kg = microgram per kilogram
 mg/kg = milligram per kilogram
 ID = insufficient data for the MDNR to establish Type B Criteria
 ND=Not Detected
 ** = Analytical results for samples analyzed after maximum holding time expired
 D = Direct human contact values are considered protective of ground water
 MI = Matrix interference
 □ = detected above Type B criteria
 NA = Not Analyzed

Summary of Ground-Water Sample Laboratory Analytical Results
 Former Tank Farm No. 94
 BOC-Flint Automotive Division

(Units as Given)

Sample I.D.	Type A Criteria	Type B Criteria	TB-7A 5/9/92 7-12	TB-7B 5/9/92 13.5-18.5	MW-7S 7/28/92 10-15	MW-7D 7/28/92 19.8-24.8	MW-9 7/28/92 12.9-17.9	MW-9 Dup 7/28/92 12.9-17.9
Polynuclear Aromatics (PNA'S)								
Acenaphthene	5	400	ND	ND	ND	ND	ND	ND
Acenaphthylene	5	ID	ND	ND	ND	ND	ND	ND
Anthracene	5	2,000	ND	ND	ND	ND	ND	ND
Benzo (a) anthracene	5	0.006	ND	ND	ND	ND	ND	ND
Benzo (a) pyrene	5	0.006	ND	ND	ND	ND	ND	ND
Benzo (b) fluoranthene	5	0.006	ND	ND	ND	ND	ND	ND
Benzo (ghi) perylene	5	ID	ND	ND	ND	ND	ND	ND
Benzo (k) fluoranthene	5	0.006	ND	ND	ND	ND	ND	ND
Chrysene	5	0.006	ND	ND	ND	ND	ND	ND
Dibenzo (a,h) anthracene	5	0.006	ND	ND	ND	ND	ND	ND
Fluoranthene	5	300	ND	ND	ND	ND	ND	ND
Fluorene	5	300	ND	ND	ND	ND	ND	ND
Indeno (1,2,3-cd) pyrene	5	0.006	ND	ND	ND	ND	ND	ND
Naphthalene	5	30	ND	ND	ND	ND	ND	ND
Phenanthrene	5	ID	ND	ND	ND	ND	ND	ND
Pyrene	5	200	ND	ND	ND	ND	ND	ND
Volatile Organic Compounds								
Detected								
Benzene	1	1	ND	ND	ND	ND	ND	ND
Ethylbenzene	1	70	ND	ND	ND	ND	ND	ND
Toluene	1	800	ND	ND	660	ND	1.7	1.6
Xylenes	3	300	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	1	700	ND	5	ND	ND	ND	ND
1,2-Dichloroethane	1	0.4	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane (total)	1**	70++	2	4	ND	ND	ND	ND
Methylene Chloride	1	5	ND	ND	ND	ND	ND	ND
Vinyl Chloride	1	0.02	ND	ND	ND	ND	ND	ND
Methyl tert-butylether (MTBE)	50	500	ND	ND	ND	ND	ND	ND
Dissolved Lead	3	4*	<1.0+	<1.0+	ND	ND	ND	ND

ug/l = microgram per liter

** = MDL for both cis- and trans isomer of 1,2-dichloroethane

ID = insufficient data for MDNR to establish Type B criteria

++ = Type B criteria is for cis-1,2-dichloroethane (most restrictive of the 2 isomers)

* = Type B criteria for lead is based on total lead

ND = Not Detected

+ = concentration of total lead

83106.12/Pat-G:13BOC/SL/10-13-92/sth/General Motors Corporation

TABLE 3 (Continued)

Summary of Ground-Water Sample Laboratory Analytical Results
Former Tank Farm No. 94
BOC-Flint Automotive Division

(Units as Given)

Sample I.D.	Screen Interval (In feet)	Type A Criteria	Type B Criteria	MW-10 7/28/92 9.0-14.0	MW-11 7/28/92 13.4-18.4	TB-13 7/14/92 10-15	TB-14B 8/1/92 2-7	TB-14B Dup 8/1/92 2-7	MW-15 7/28/92 15.1-20.1
Polynuclear Aromatics (PNA'S)									
Acenaphthene	ug/l	5	400	ND	ND	ND	ND	ND	ND
Acenaphthylene	ug/l	5	ID	ND	ND	ND	ND	ND	ND
Anthracene	ug/l	5	2,000	ND	ND	ND	ND	ND	ND
Benzo (a) anthracene	ug/l	5	0.006	ND	ND	ND	ND	ND	ND
Benzo (a) pyrene	ug/l	5	0.006	ND	ND	ND	ND	ND	ND
Benzo (b) fluoranthene	ug/l	5	ID	ND	ND	ND	ND	ND	ND
Benzo (ghi) perylene	ug/l	5	0.006	ND	ND	ND	ND	ND	ND
Benzo (k) fluoranthene	ug/l	5	0.006	ND	ND	ND	ND	ND	ND
Chrysene	ug/l	5	300	ND	ND	ND	ND	ND	ND
Dibenzo (a,h) anthracene	ug/l	5	0.006	ND	ND	ND	ND	ND	ND
Fluoranthene	ug/l	5	300	ND	ND	ND	ND	ND	ND
Fluorene	ug/l	5	300	ND	ND	ND	ND	ND	ND
Indeno (1,2,3-cd) pyrene	ug/l	5	0.006	ND	ND	ND	ND	ND	ND
Naphthalene	ug/l	5	30	ND	ND	ND	ND	ND	ND
Phenanthrene	ug/l	5	ID	ND	ND	ND	ND	ND	ND
Pyrene	ug/l	5	200	ND	ND	ND	ND	ND	ND
Volatile Organic Compounds									
Detected									
Benzene	ug/l	1	1	60	ND	10525	80	20	ND
Ethylbenzene	ug/l	1	70	1000	ND	2950	2.7	ND	ND
Toluene	ug/l	1	800	58	ND	2350	410	24	ND
Xylenes	ug/l	3	300	600	ND	9475	630	96	ND
1,1-Dichloroethane	ug/l	1	700	ND	ND	NA	ND	ND	ND
1,2-Dichloroethane	ug/l	1	0.4	ND	ND	NA	ND	ND	ND
1,2-Dichloroethene (total)	ug/l	1**	70++	ND	ND	NA	ND	ND	ND
Methylene Chloride	ug/l	1	5	ND	ND	NA	ND	ND	ND
Vinyl Chloride	ug/l	1	0.02	ND	ND	NA	ND	ND	ND
Methyl tert-butylether (MTBE)	ug/l	50	500	ND	51	NA	ND	ND	ND
Dissolved Lead	ug/l	3	4*	ND	ND	166+	1.1	2.3	ND

* = Type B criteria for lead is based on total lead
 ** = MDL for both cis- and trans isomer of 1,2-dichloroethene
 ID = Insufficient data for MDNR to establish Type B criteria
 ++ = Type B criteria is for cis-1,2-dichloroethene (most restrictive of the 2 isomers)
 NA = Not Analyzed
 ND = Not Detected
 + = concentration of total lead
 ** = detected above Type B cleanup criteria
 *** = sample analyzed after maximum holding time expired
 83 106.12/Pat-G:138OC/SL/10-13-92/sh/General Motors Corporation

ATTACHMENT 4

ATTACHMENT 4
DATA NEEDS
TYPE C CLOSURE REQUEST
TANK FARM 94

**DATA NEEDS
TYPE C CLOSURE REQUEST
GM TANK FARM 94**

Pursuant to the Michigan Environmental Response Act rules, a Type C closure request is based on a site-specific risk assessment. It should be noted that the Michigan Department of Natural Resources issued *Operational Memorandum #14* relating to Generic Remedial Action Plans using Industrial Site Risk Assessment Cleanup Criteria. However, for industrial sites where BTEX is present and where the groundwater/surface water interface (GSI) is the controlling variable, the Type C cleanup criteria is the same as the Type B cleanup criteria.

In accordance with the scope of work delineated in the Advanced Environmental, Inc. Proposal dated September 29, 1993, "Advanced will develop a list of data and other information needed ... but not yet collected ... to complete the Type C closure (or, if possible, an Industrial Type C closure)".

The following outlines the data needed to prepare a site-specific Type C closure request based on a selected remedial action plan for the GM Tank Farm 94 site in accordance with MERA Rules 299.5601, 299.5603, 299.5717, 299.5719. These requirements apply whether an Industrial Type C or a Site-Specific Type C closure is proposed.

TYPE C CLOSURE DATA REQUIREMENTS

PHYSICAL SETTING

Site Location

Site Map

Current Uses of the Site including Zoning Classification Documented by either a Map or a Current Property Record Card

Physical Structures

Surrounding Land Use

Reasonably Foreseeable Uses of the Site and Natural Resources

Climate

Geology

Soils

Hydrology

Hydrogeology

ENVIRONMENTAL SITE SETTING

Environmental Media Affected

Background Soil, Groundwater, and Air Quality

Potential Pathways of Hazardous Substance Migration

Potential Exposure of Human and Natural Resource Receptors

CHEMICAL CONCENTRATIONS

Form

Mobility

Persistence

Bioaccumulative Properties

Environmental Fate

Contribution to Food Chain Accumulation

EXTENT OF MIGRATION

Current Extent of Migration

Impact of Future Extent of Migration

DEGREE OF CLEANUP (Rule 299.5601)

MERA Type B and Type C Cleanup Criteria

ARARS (Applicable or Relevant and Appropriate Environmental Laws)

*FEASIBILITY STUDY (EVALUATION OF REMEDIAL ACTION ALTERNATIVES)
[Rule 299.5603]*

Evaluation based on EPA's Nine Criteria including Cost Effectiveness

Uncertainties of the Risk Assessment

Ability to Measure Remedial Performance

DESCRIPTION OF REMEDIAL ACTION PLAN

POST-REMEDATION RISK ASSESSMENT

IF ON-SITE CONTAINMENT, THEN THE FOLLOWING MUST BE MET:

Long-Term Monitoring to Assure Effectiveness

Land Use Restrictions/Restrictive Covenants

Continued Financial Responsibility

Governmental Access to Site to Monitor Effectiveness

Notice to MDNR if Land Conveyance

Prohibit Activities that Interfere with Remedial Action

Prohibit Activities that may result in Unacceptable Human Exposure

Description of Allowable Activities

Installation of a Permanent Marker on all sides of the Site

ATTACHMENT 5

ATTACHMENT 5
OUTLINE
CORRECTIVE ACTION PLAN
TANK FARM 94

OUTLINE
CORRECTIVE ACTION PLAN
TANK FARM 94

1.0 INTRODUCTION

- 1.1 Status of Project
- 1.2 Description of Impacted Soil (Map)
- 1.3 Description of Impacted Groundwater (Map)

2.0 DESCRIPTION OF CORRECTIVE ACTION TO BE IMPLEMENTED

- 2.1 Selection of Cleanup Criteria
- 2.2 Clean-up Standards
- 2.3 Remediation Approach
- 2.4 Selection of Indicator Parameters
- 2.5 Ambient Air Quality Monitoring

3.0 RATIONALE FOR DESIGN

- 3.1 Selection of Corrective Action Methodology
- 3.2 Soil Remediation
- 3.3 Groundwater Remediation
- 3.4 Free Product Recovery

4.0 OPERATION AND MAINTENANCE

- 4.1 Contact Person
- 4.2 Maintenance Schedule
- 4.3 Pictorial Plan and Description
- 4.4 Process Flow Diagram
- 4.5 Design Details and Specifications
- 4.6 Safety Plan
- 4.7 Emergency Plan
- 4.8 Emergency Contact Person
- 4.9 Emergency Response
- 4.10 Local Suppliers

5.0 PERFORMANCE MONITORING PLAN

- 5.1 Evaluation of Effectiveness
- 5.2 Evaluation of Performance
- 5.3 Monitoring Locations
- 5.4 Media to be Monitored
- 5.5 Monitoring Schedule

- 5.6 Monitoring Methodology and Protocol
- 5.7 Parameters to be Monitored
- 5.8 Laboratory Protocol
- 5.9 Data Presentation
- 5.10 Contingency Plan
- 5.11 Maintenance of Monitoring Equipment

6.0 LAND USE RESTRICTIONS

7.0 ALTERNATE WATER SUPPLIES

8.0 SCHEDULE FOR IMPLEMENTATION

9.0 SIGNATURE BLOCK

FIGURES

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APPENDICES

- Appendix 1 Design Details and Specifications
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