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RESPONSE TO COMMENTS
RCRA FACILITY INVESTIGATION (RFI) REPORT

FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

U.S. EPA ID# MIR000020743

Volume II - Attachments F through I

MARCH 2002

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ATTACHMENT F

GWNIAA DETERMINATION REVIEW
(CRA, MARCH 28, 2002)

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MEMORANDUM

TO:	Cheryl Hiatt	REF. NO.:	12636/rcc/37
FROM:	Glenn Turchan	DATE:	March 28, 2002
C.C.:	Marilyn Dedyne Jean Caufield		
RE:	**Groundwater Not In An Aquifer (GWNIAA) Determination Review Former Peregrine (US) Inc. Coldwater Road Facility (Facility) Genesee Township, Michigan**		

1.0 INTRODUCTION

Michigan Act 451, Part 201 requires receptors and exposure scenarios at sites of environmental contamination to be evaluated based upon site-specific geologic/hydrogeologic conditions and exposure scenario characteristics. This memorandum presents a review of the information available through literature, standard engineering and scientific practices, and regulations regarding the basis for classifying a water-bearing unit as an aquifer that is suitable for use as a potable water supply. This memorandum also reviews the investigative programs available to evaluate site-specific geologic/hydrogeologic conditions at the Facility with respect to aquifer classification within shallow water bearing units. This memorandum also reviews the geologic/hydrogeologic conditions present at the Former Peregrine (US) Inc. Coldwater Road Facility, as referenced above, with respect to aquifer and groundwater classification of the shallow water bearing zone.

2.0 MICHIGAN ACT 451, PART 201 AQUIFER DETERMINATION

According to Michigan Public Act 451, Part 201 administrative rules (R299.5101(c)) and the Code of Federal Regulation (CFR, Part 40, Section 149.2) an aquifer is defined as "*... a geological formation, group of formations, or part (portion) of a formation that is capable of yielding a significant amount of groundwater to wells or springs*" (see Attachment A).

Note:

The term "geologic formation" implies that the geologic media within such a unit are native to the region, and as such, a water bearing zone consisting of fill material would not be considered an aquifer. This concept is applicable to many situations, including:

- *sites with engineered permeable backfill;*
- *sites with backfill such as construction rubble and debris;*
- *landfills; and*
- *backfilled excavation (e.g., UST removals/closures/former basements).*

Of particular note in the definition is the concept that there must be a "significant" yield. The term significant is undefined. Webster's Collegiate dictionary defines significant as "having meaning" or "having or likely to have influence or effect: Important", as well as "measurably large amount". The concept of significance in the definition of aquifer requires that "significant" yield be determined on a site-specific basis taking into account the specific circumstances of the locations (eg. municipal water supply available, a significant yield is available at a greater depth, etc.).

MDEQ Guidance also states the following:

- *"The Remedial Action Plan (RAP) should identify whether each saturation zone underlying the site is an aquifer. Any formation which serves or may serve as a drinking water source meets the definition of "aquifer" in R 299.510(c)." (MDEQ-ERD, 1998); and*
- *"Part 201 drinking water criteria are applicable to aquifers that are considered marginal drinking water sources, but serve or may serve as the only viable drinking water source in the area. Consultation with the local health department may assist in resolving the potential use(s) of groundwater to assure application of appropriate groundwater cleanup criteria." (MDEQ-ERD, 2001).*

3.0 REVIEW OF SIGNIFICANT YIELD CONCEPT

Consistent with Section 2.0 above, the concept of "significance" requires a critical review. In general, the concept can be interpreted as follows:

1. to be important; or
2. to be a measurably large amount.

These concepts, although similar, require serious review in order to determine if the groundwater in question can be classified as groundwater in an aquifer.

Factors which need to be reviewed include:

- the availability of municipal water supplies;
- prohibitions against water wells;
- presence of better yields and water quality in other aquifers; and
- presence of a routinely utilized aquifer versus a shallow water bearing zone.

3.1 WATER CONSUMPTION

From a practical standpoint, groundwater wells must have a sustainable yield to be useful as a water supply. The following is a review of available information to determine an objective numerical quantity that could meet this requirement for a typical family of four that uses a groundwater well as the primary source of water.

The United States Geological Survey (USGS) has published an "Estimated Use of Water in the United States in 1995" (USGS, 1998), which provides quantitative information on national water consumption trends.

- *"The average water consumption in the United States is approximately 101 gallons per capita per day for domestic purposes (i.e., drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns) (USGS, 1998)."*

For a family of four this equates to an average daily household consumption of 404 gallons. The majority of water is used over a six-hour period within a household (Tchobanoglous & Schroeder, 1985). This equates to a minimum rate of approximately 1.1 gpm, which does not account for peak flow conditions.

To account for peak flow conditions, the minimum required yield from a groundwater well can be calculated from the following formula developed by the Connecticut Well Drillers Association which considers well storage, well flow (or yield), peak load, and peak load time (Hunt, 1978):

- $Yield \geq \frac{peakload - storage}{peaktime}$

Using this formula for a family of four with two bathrooms and a well storage volume of 100 gallons, the required well flow to sustain a 4-person household would be approximately 4.5 gpm.

3.2 WATER SUPPLY REGULATIONS

3.2.1 WELL YIELD AND CONSTRUCTION

A. Yield

Several states, and many counties or regional health departments within the State of Michigan, have a variety of regulations governing water supply wells which specify minimum yield requirements.

For example, the Michigan Department of Environmental Quality (MDEQ) Drinking Water and Radiological Protection Division (DWRPD) has made recent revisions to the Administrative Rules on the Subdivision of Land, Section R 560.411, which specifies a pumping rate requirement for domestic use (see Attachment B). The new rule is stated as follows:

- *"...shall perform a yield or performance test to demonstrate that water can be withdrawn from an on-site water supply well for drinking and household purposes at a sustained pumping rate which is not less than 10 gpm and which meets or exceeds peak water demand for not less than a 4-hour period of time."*

Another example relating specifically to yield, is the Washtenaw County minimum well construction requirements for single-family residential water supply wells:

- *"Yield: Seven gpm for two hours of continuous pumping without interference with or from neighboring wells. Ten gpm for four hours for wells located in subdivisions..."*

B. Construction

In addition to regional and state requirements for minimum yield, there are also examples of rules which specify well construction requirements such as minimum well depths.

For example, MDEQ-DWRPD Section R 325.1632(3) and Section R 325.10818 (see Attachment C) state that:

- *"A casing shall extend not less than 25 feet below, and terminate not less than 12 inches above, the ground surface."*

Accordingly, any surficial water bearing unit that has an underlying confining unit that is less than 25 feet below land surface cannot be legally used as a water supply in Michigan.

Administrative Rules on the Subdivision of Land, Section R 560.408 state that the following methods of well protection shall be given consideration in order to construct a water supply free of contamination:

- *"a) Penetration of an impervious layer which is of sufficient areal extent, but which is not less than 10 feet thick.*
  b) Maintaining a minimum of 50 feet from static water level to the bottom of the casing or top of the screen in an unconfined aquifer.
  c) An increase in the minimum horizontal isolation distance between the well and a source from which groundwater contamination may occur.
  d) A combination of the methods in subdivisions (a), (b), and (c) of this sub-rule or another method that the department determines will provide adequate protection for the on-site water supply."

3.2.2 GROUNDWATER USE

In addition to well yield requirements, MDEQ-DWRPD has made recent revisions to the Administrative Rules on the Subdivision of Land, Sections R 560.401 to R 560.405, prohibiting the use of shallow wells to obtain water for drinking or household purposes (see Attachment B). The new rule is stated as follows:

- *"...water for drinking or household purposes that is intended to furnish new dwellings located in a subdivision or on a development site less than one acre in size, shall not be obtained from a dug well, crock well, hauled water system, cistern, surface water body, spring, or other similar device."*

This rule is clearly intended to prohibit the use of shallow perched water zones as domestic water supply.

3.3 SUMMARY

Whether the yield from a perched zone can be termed "significant" varies from county to county, but is in the range of 1.1 to 10 gpm. A regional specific definition of the term "significant yield" must be made as discussed below.

An inventory of the domestic wells in close proximity to the site should be completed in order to determine whether or not the area's population utilizes the perched zone for drinking water purposes. The presence of a municipal water supply can render the yield from the perched zone insignificant (even if a sufficient volume of shallow groundwater is available). The presence of a deeper, higher yielding aquifer negates the importance of a shallow low yield zone.

Local drilling companies can provide information on what aquifer is typically utilized. The perched zone may not be used if an aquifer at a lower elevation provides a higher yield and presents the most economically feasible option when drilling a well for domestic use.

Local and/or county governments should also be contacted in order to determine if guidance or ordinances for the construction of drinking water wells in the area prohibit or advise against the use of the perched zone. Local ordinances typically specify minimum depths for water supply wells of a least 25 feet.

4.0 MDEQ-WMD INTERPRETIVE GUIDANCE REVIEW

4.1 WASTE MANAGEMENT DIVISION

The MDEQ Waste Management Division (WMD) has developed an interpretive guidance document, for use by MDEQ-WMD staff, that outlines two guidelines that need to be met to demonstrate that groundwater beneath a site is groundwater not in an aquifer (GWNIAA) thereby eliminating the groundwater pathway in remediation projects.

4.1.1 GUIDELINES

This section summarizes the MDEQ-WMD GWNIAA approach and the suggested conditions to meet the following guidelines:

1. the formation yields an insignificant amount of water below the site; and
2. the groundwater in question is not in hydraulic communication with groundwater in an aquifer.

These guidelines can be met through a combination of regional and site-specific hydrogeologic information and supporting documentation including additional information requirements (if applicable) listed in the MDEQ-WMD GWNIAA Guidance document (e.g., boring and well logs, cross-section drawings, discussion with local health department, etc.). The MDEQ-WMD GWNIAA Guidance document is presented in Attachment D.

4.2 STORAGE TANK DIVISION

The MDEQ Storage Tank Division (STD) has developed Operational Memorandum No. 11 which is a guidance document for use by MDEQ-STD staff to demonstrate that groundwater beneath a site is GWNIAA and outlines four guidelines that must be met to eliminate the potable groundwater pathway.

4.2.1 GUIDELINES

This section summarizes the MDEQ-STD GWNIAA guidelines and the suggested conditions to meet these guidelines:

1. the groundwater formation below the site must yield an insufficient quantity of water considering local and regional hydrogeology;
2. demonstrate that a continuous confining layer exists across the entire site, and that a saturated zone is not in lateral or vertical communication with a lower adjacent aquifer;
3. provide supporting documentation regarding regional and site-specific hydrogeology and groundwater use; and
4. monitoring wells must be properly constructed, and developed in accordance with standard operating practices.

The MDEQ-STD Operational Memorandum No. 11 guidelines can be met through a similar combination of regional and site-specific hydrogeologic information and supporting documentation to that listed in the MDEQ-WMD GWNIAA Guidance document. The MDEQ-STD Guidance document is provided in Attachment E.

5.0 APPLICATION TO FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY

5.1 OVERVIEW OF HYDROGEOLOGY

The stratigraphy encountered at the Facility generally consists of a relatively thin (approximately 0 to 10 feet) silt/silty sand unit. A low permeability clay till unit underlies the surficial silty sand unit.

5.2 APPLICATION OF MDEQ-WMD GWNIAA GUIDANCE

5.2.1 MDEQ-WMD GUIDELINE NO. 1

This guideline can be met through demonstration that the hydraulic conductivity of in situ soils is less than 1.0×10^{-6} cm/s or the formation in question yields less than 0.1 gpm.

5.2.1.1 SUMMARY OF HISTORICAL INVESTIGATIONS

Permeability tests conducted at wells located to the north of the Facility within the perched zone have indicated that this zone contains occasional thin, discontinuous lenses of sand with horizontal permeabilities as high as 4.4×10^{-4} cm/sec (Dames and Moore, 1980). However, most permeabilities for this zone range from 1×10^{-6} to 1×10^{-7} cm/sec as presented in Table 1.

Considering the range in permeability for most of the wells screened within the perched zone (10^{-7} to 10^{-6} cm/sec), it is estimated that a well tapping the perched zone would have a yield ranging from 6 to 60 gallons per day. This range in well yield for the perched zone has been verified by the

permeability tests conducted on the soil samples from the landfill north of the Facility (O'Brien and Gere, 1989).

In addition, vertical permeabilities for the perched zone range from $3.6x10^{-7}$ to $2.1x10^{-8}$ cm/sec as presented in Table 1 (Chester Engineers, 1986). Based on this information, it is evident that the perched zone is not capable of producing usable quantities of water, and therefore is not considered an aquifer.

Recent permeability tests performed as part of the RFI Investigation (CRA, 2000) confirmed that the hydraulic conductivities of the silty sand unit and glacial clay till are on the order of $1.0x10^{-6}$ cm/sec or lower as presented in Tables 2 and 3.

5.2.1.2 ADDITIONAL PROPOSED INVESTIGATION

In order to further confirm the groundwater conditions below the site, an additional investigation program is proposed. This program will determine the hydraulic conductivities from single well response tests and the maximum potential pumping rate from individual wells at the Facility as outlined below.

Boreholes will be completed at five new locations located near PFW-1 (an existing monitoring well completed at a depth of 85 feet at the southeast corner of the Facility boundary). One soil sample from the shallow water bearing zone will be collected for grain size analysis at each location. The boreholes will be completed to a depth of about 2 feet into the top of the confining unit. A 2-inch diameter monitoring well equipped with 1 to 2 feet of screen will be installed to the sand/clay contact at each location, and will be fully developed.

Single well response tests will be conducted at each new monitoring well location, as well as at various existing monitoring well locations at the Facility and at the former waste management area to the north, in order to determine the in situ hydraulic conductivity. These monitoring wells will subsequently be pumped for short durations in order to determine the maximum pumping rate for short-term constant rate testing. The constant rate test pumping program will be conducted at each well at their corresponding maximum practical rate for a duration of about four to six hours.

5.2.2 MDEQ-WMD GUIDELINE NO. 2

This guideline can be met through a pumping test demonstrating that any water bearing seams of concern are isolated and are not in communication with an aquifer or by demonstrating sufficient knowledge of the regional geology.

5.2.2.1 SUMMARY OF HISTORICAL INVESTIGATIONS

During historical investigations conducted at the Facility, a glacial till was identified in all soil borings near surface (within 0 to 10 feet bgs) across the areal limits of the Facility. In addition, previous investigations identified that perched groundwater within the shallow silty sand was generally absent. When present, it was intermittent and discontinuous in nature and is associated with engineered permeable fill placed during the construction of the plant. Static water levels identified during pre-RFI studies at the Facility are presented on Figure 1. The discontinuous

perched water table consists of either a silty sand or engineered fill. The discontinuous perched water table is underlain by a glacial clay till aquitard.

Vertical water movement from the discontinuous perched water table zone is restricted by the underlying glacial till aquitard. Of the 116 boreholes advanced during the RFI Investigation (CRA, 2000), only 22 exhibited any water within the discontinuous perched zone. Eight of the 22 boreholes were completed in the backfilled excavation "footprint" for the waste oil UST removal (AOI 3). The perched water is present as a result of the permeable backfill, which was placed in the completed excavation after the removal of the USTs. As a result, perched groundwater in the shallow native silty sand existed at a frequency of approximately 10 percent.

A water well inventory completed and presented as part of the RFI Report (CRA, 2000) identified 216 wells within a 1.5 mile radius boundary of the Facility (see Figure 2). All of these 216 wells are protected by a confining clay aquitard. A summary of the residential wells identified is presented in Table 4.

Based on the review of the well records in the area and the permeability tests from monitoring wells at the Facility, it can be concluded that the drift aquifer serves as the uppermost aquifer in the close vicinity of the Facility. Although the drift aquifer has a relatively high permeability ranging from 1 to 9 $x10^{-4}$ cm/sec (Chester Engineers, 1986), it is protected from any potential impacts within the discontinuous perched water table zone by the glacial clay till aquitard which exists at a shallow depth immediately beneath the surficial silty sand.

Previous investigations have revealed that there is no hydraulic connection between the perched zone and the drift aquifer at the site. This has been supported by the difference in flow direction, gradients, water levels and natural groundwater quality. The following paragraphs present additional details.

Groundwater elevation data from the waste management area to the north of the Facility reveals that the perched zone and drift aquifer are two distinct flow systems. The discontinuous perched zone has a flow direction and gradient controlled by topography which is generally to the northwest as presented on Figure 9 in Attachment F (Dames and Moore, 1980). The water in the drift aquifer has a direction and gradient independent of the water in the perched zone. The potentiometric surface in the drift aquifer has a gradient of 0.364 in the south-southeast direction as presented on Figure 10 in Attachment F (Dames and Moore, 1980).

Historically, there has been a large difference in groundwater elevations between the wells screened within the perched zone and the wells screened within the drift aquifer. Groundwater levels within the perched zone generally occurred within five feet of the ground surface whereas the groundwater levels within the drift aquifer ranged in depth from 35 to 77 feet, supporting the condition that the two units have distinct groundwater flow systems. A summary of the historical groundwater elevations from the waste management area to the north of the Facility is presented in Table 5.

The vertical permeabilities in the confining clay aquitard underlying the perched zone ranges from $2.2x10^{-8}$ to $1.5x10^{-8}$ cm/sec as presented in Table 1 (Dames and Moore, 1980). These very low permeabilities indicate that there is no hydraulic connection between the upper perched zone and the underlying drift aquifer.

Background groundwater quality data from the waste management area north of the Facility shows that the perched zone contains significantly lower conductivity and concentration of calcium and bicarbonate when compared to the data from the drift aquifer (Dames and Moore, 1980).

The data summarized above verifies that the drift aquifer (ranging in depth from 35 to 77 feet bgs) serves as the uppermost aquifer at the Facility and that there is no hydraulic connection between the drift aquifer and the discontinuous upper perched zone.

Based on information collected from Site well logs, and a knowledge of regional, local, and Site-specific geology, a continuous confining layer exists below the entire Facility, and the saturated zone is not in lateral or vertical communication with any deeper, potentially usable water bearing zones and is incapable of sustaining significant yield.

5.2.2.2 ADDITIONAL PROPOSED INVESTIGATION

In order to further confirm that the groundwater in question is not in hydraulic communication with groundwater in an aquifer, an additional investigation program is proposed as outlined below.

Step-drawdown testing will be carried out at three different rates at PFW-1 (an existing monitoring well completed at a depth of 85 feet at the southeast corner of the Facility boundary) to determine the well's efficiency and the appropriate rate for constant rate test pumping. A constant rate pumping test will then be conducted on PFW-1 at an appropriate pumping rate. The test will be conducted during a dry period about one to two days prior to the test, during testing, and following the test for a minimum duration of about one day. Water levels would be monitored in PFW-1, the newly completed shallow monitoring wells (as discussed above in Section 5.2.1.2), and a few existing wells at the Facility completed within either zone. The results would be evaluated to determine whether a hydraulic response was measured in the surficial water bearing zone solely as a result of pumping of the lower aquifer, considering natural variations.

Step-drawdown testing, as outlined above, will also be performed at monitoring well B23D (completed at a depth of 81 feet) located north of the Facility.

An updated version of this GWNIAA Determination will be submitted when the results of the additional proposed investigations, outlined above in Section 5.2.1.2 and 5.2.2.2, are obtained.

5.2.3 ADDITIONAL INFORMATION

5.2.3.1 CONTACT WITH MDEQ-DWRPD AND GENESEE COUNTY HEALTH DEPARTMENT

The MDEQ-DWRPD was contacted to determine if the Facility was located in or near an approved Local Wellhead Protection Area (LWPA). MDEQ-DWRPD determined that the Facility was not located in a delineated wellhead protection area and that the nearest wellhead protection area is approximately 10 miles east-southeast of the Facility in Davison (see Attachment G).

The Genesee County Health Department was contacted regarding their requirements regarding sufficient water yield for water well construction. In Chapter IV of the Genesee County

Environmental Health Regulations (Water Well Construction, Abandonment, and Groundwater Protection Regulation), "safe and adequate water supply" is defined as follows:

""Safe and adequate water supply" means a water supply which is constructed and located in such a manner as to provide water which will not endanger the health of the user and which provides sufficient water yield and pressure to operate all connected plumbing fixtures."

Please note that the marginal yield of water from the shallow perched zone is not the only viable drinking water source nor is it utilized as the drinking water source in the area of the Facility.

5.2.3.2 GROUNDWATER QUALITY

Groundwater monitoring was initiated at the waste management area to the north of the Facility in 1980. The Chester Engineers began a RCRA detection monitoring program in 1981, following Dames and Moore's initial groundwater assessment in 1980. During 1983, the initial RCRA monitoring system detected statistically significant changes in levels of pH and specific conductivity within the upper perched zone. These changes prompted the initiation of a groundwater assessment program in 1984.

The groundwater quality assessment program involved comprehensive analysis of groundwater from both the upper perched zone and the drift aquifer. The analytical parameters included the RCRA indicator, site specific indicator, and drinking water parameters, as well as volatile organic compounds, cyanide, chromium, copper, lead, nickel, and zinc (Chester Engineers, 1986). The groundwater quality assessment program conducted by Chester Engineers did not indicate the presence of hazardous waste constituents in either the upper perched zone or the drift aquifer, with the exception of detectable levels of chromium and lead in the upper perched zone in the area of the abandoned sludge lakes north of the plant. Consequently, the MDNR approved an alternative semi-annual monitoring program that monitored the water quality in the upper perched zone (Chester Engineers, 1986). This alternative program was initiated in 1987.

As part of the RFI, existing wells within the Facility boundary that had historically identified groundwater exceedances of Part 201, Act 451 generic industrial screening levels were resampled. No exceedances were encountered. A summary of the wells sampled and the static water depth encountered are as follows:

Well ID	*Static Water Depth*
MW-10	6'85"
MW-4	4'12"
MW-3	4'95"
MW-13	20'2"
PFW-9	9'43"

The variable static water depths encountered at these 5 wells indicate the discontinuous nature of the perched zone and do not exhibit a defined water table. In conclusion, based on RFI sampling of these 5 wells, neither the drift aquifer nor the discontinuous perched zone have been impacted by activities at the Facility.

6.0 CONCLUSIONS

In summary, GWNIAA applies to the perched discontinuous water zone due to the following:

- an institutional control prohibits groundwater use for drinking water in areas less than 25 feet below grade;
- perched water is present in an engineered fill material (i.e., not in naturally occurring geologic media);
- groundwater is surficial or unconfined at the top and containing an underlying confining unit at a depth of less than 25 feet below surface grade;
- yield is less than 1 to 5 gpm;
- the first aquifer (drift) is separated from the perched water by an overlying aquitard;
- many wells at the Facility have historically been found to be dry;
- the shallow perched zone is discontinuous and limited in quantity; and
- the shallow perched zone is not the only viable drinking water source nor is it utilized as the drinking water source in the area of the Facility.

Based on regional and Site-specific geologic/hydrogeologic data and local groundwater use information, the groundwater beneath the Site may be considered GWNIAA and the groundwater ingestion exposure pathway may be eliminated in accordance with Michigan Act 451, Part 201.

7.0 REFERENCES

Hunt, J., 1978. Water Well Journal, "How much is enough? – A minimum well formula"

Tchobanoglous & Schroeder, 1985. "Water Quality", Addison-Wesley Publishing Company

USGS, 1998. "Estimated Use of Water in the United States in 1995", U.S. Geological Survey

MOEE, 1996. " Technical Guideline for Private Wells: Water Supply Assessment."

MDEQ-ERD, 1998. "Part 201 Drinking Water Criteria Technical Support Document, August 31, 1998"

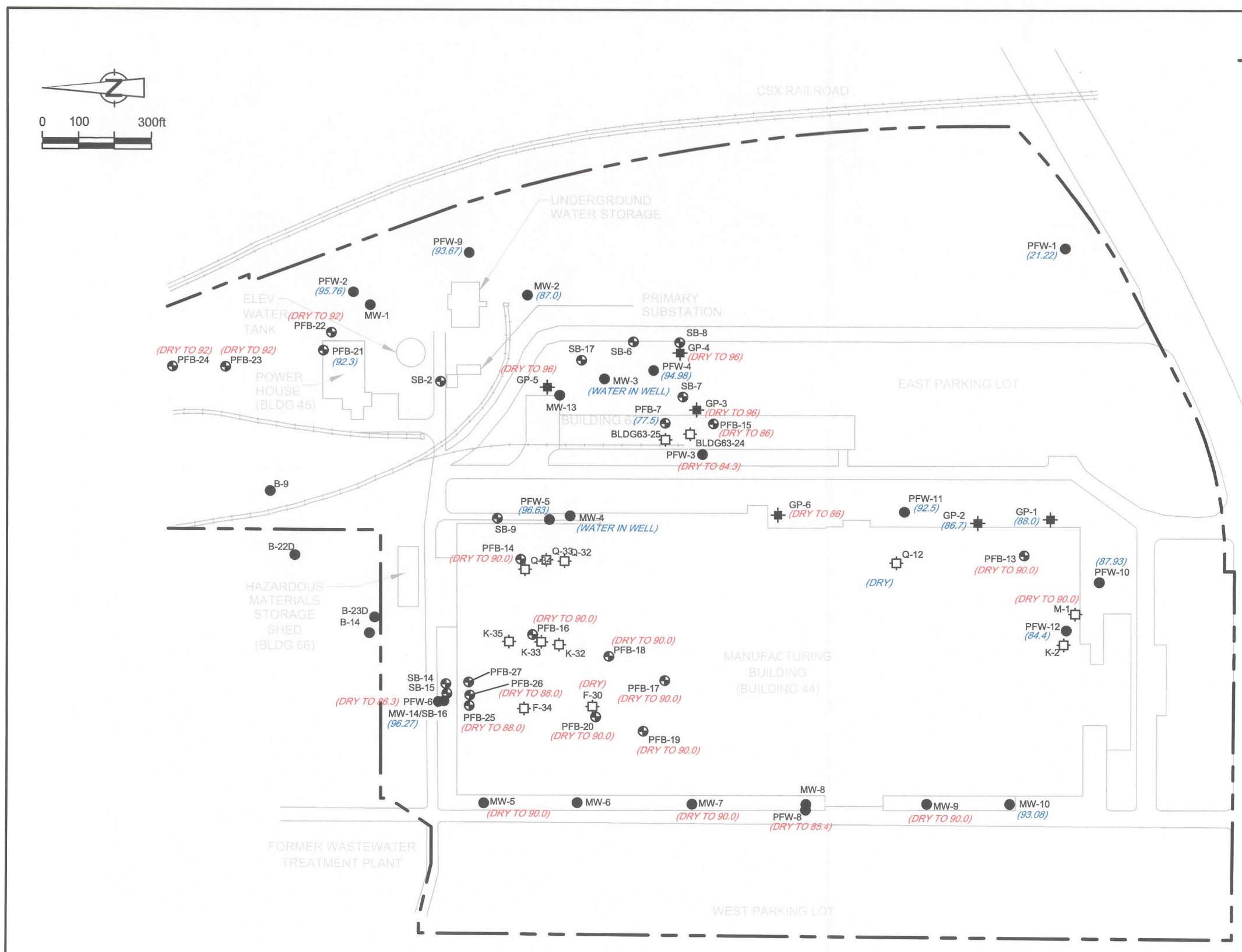
MDEQ-ERD, 2001. "Part 201 Generic Groundwater Contact Criteria Technical Support Document, January 5, 2001"

Dames and Moore, 1980. "Hydrogeological Investigation – Coldwater Road Plant Waste Management Area", prepared for Fisher Body Division, General Motors Corporation, Flint, Michigan

O'Brien and Gere Engineers, Inc., 1989. "Closure Plan", prepared for Michigan Department of Natural Resources, Waste Management Division, Lansing, Michigan

Chester Engineers, 1986. "Final Report on Groundwater Quality Assessment Program", prepared for Fisher Guide Division, General Motors Corporation, Flint, Michigan

Conestoga-Rovers and Associates, 2000. "RCRA Facility Investigation (RFI) Report", prepared for Remediation and Liability Management Company, Detroit, Michigan



LEGEND

- FACILITY BOUNDARY
- MW-7 — STUDY 2 MONITORING WELL LOCATION AND NUMBER
- PFW-12 — STUDY 4 MONITORING WELL LOCATION AND NUMBER
- B-9 — GENERAL MOTORS RCRA UNIT CLOSURE MONITORING WELL LOCATION AND NUMBER
- PFB-17 — STUDY 4 SOIL BORING LOCATION AND NUMBER
- SB-9 — STUDY 2 SOIL BORING LOCATION AND NUMBER
- GP-1 — STUDY 1 GEOPROBE LOCATION AND NUMBER
- Q-34 — STUDY 2 GEOPROBE LOCATION AND NUMBER
- (93.08) — WATER LEVEL

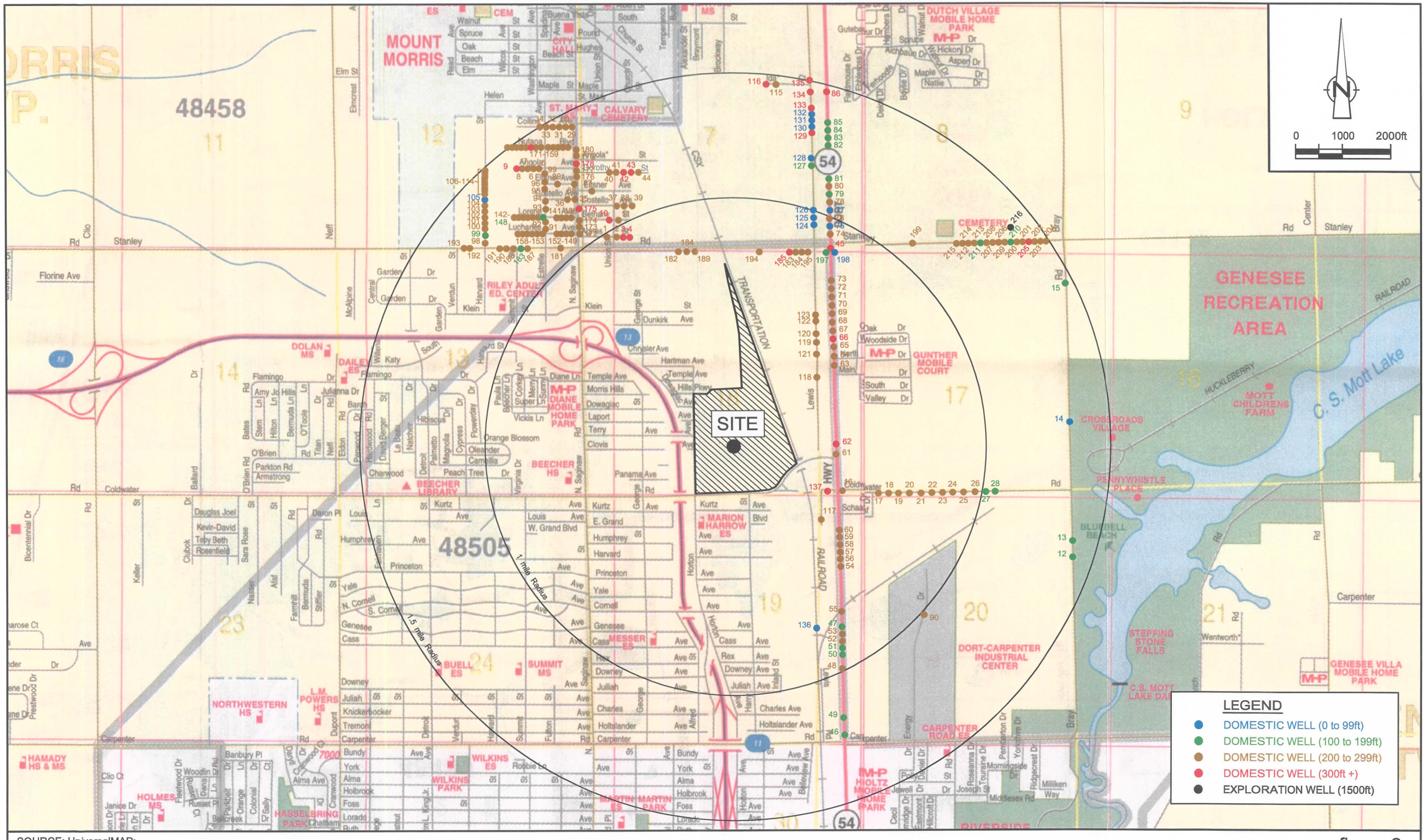
NOTES

1. THIS DRAWING IS FOR REFERENCE ONLY AND IS NEITHER COMPLETE NOR TO EXACTING SCALE.
2. INFERRED WATER TABLE SURFACE IS BASED ON DATA FROM SELECT EXTERIOR WELLS THAT ARE SCREENED ENTIRELY WITHIN THE UPPER 18 FEET OF THE PERCHED AQUIFER. LOCAL VARIATIONS MAY OCCUR IN AREAS NOT SUBJECT TO METEROLOGIC RECHARGE.
3. WATER ELEVATIONS ARE REFERENCED TO AN ON-SITE ARBITRARY DATUM OF 100.00 FEET FOR WELLS MONITORED BY STUDY 4 (JULY, 1997 REPORT)
   ALL OTHER WATER ELEVATIONS TAKEN FROM DRILLING/DEVELOPMENT INFORMATION WITH GROUND SURFACE ASSUMED AT 100.00 FEET.

figure 1

PRE-RFI STATIC WATER ELEVATIONS
FORMER PEREGRINE (US) , INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

CRA



SOURCE: UniversalMAP;
GREATER FLINT & GENESEE COUNTY, MICHIGAN STREETMAP

figure 2

DOMESTIC WATER WELL LOCATIONS (1.5 MILE RADIUS)
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(MEMO037)GN-WA002 MAR 07/2002

TABLE 1

SUMMARY OF GROUNDWATER FLOW CONDITIONS
WASTE MANAGEMENT AREA
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

	Permeability (1)		*Velocity*	
Geologic Unit	*Horizontal cm/sec*	*Vertical cm/sec*	*Horizontal ft/year*	*Vertical ft/year*
Perched Zone	1.3E-07 to 4.4E-04	2.1E-08 to 3.6E-07	0.017 to 57	0.027 to 0.47
Upper Confining Unit	4.9E-07 to 6.7E-05	1.5E-08 to 2.2E-08	0.063 to 8.7	0.019 to 0.028
Drift Aquifer	1.2E-04 to 9.2E-04	--	16 to 120	--
Lower Confining Unit	1.1E-06 to 1.8E-05	3.9E-09	0.14 to 2.3	0.005
Bedrock	1.2E-04	--	--	--

Notes:

(1) Data compiled from the following sources:

1. Dames and Moore, 1980. "Hydrogeological Investigation", prepared for Fisher Body Division, General Motors Corporation, Flint, Michigan.
2. Chester Engineers, 1986. "Final Report on Groundwater Quality Assessment Program", prepared for Fisher Guide Division, General Motors Corporation, Flint, Michigan.

TABLE 2

HYDRAULIC CONDUCTIVITY
DETERMINED BY HAZEN EQUATION
RFI INVESTIGATION
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Well Location	*D_{10} of Soil (mm)* [1]	*Sample Depth (ft. bgs)*	*Hydraulic Conductivity, K (cm/s)* [2]
Silty Sand Unit			
BK-1-00	0.0011	3.0	1.21E-06
BK-2-00	0.00045	4.0	2.02E-07
		Geometric Mean	4.9E-07
Clay Till Unit			
BK-1-00	0.00015	7.0	2.25E-08
BK-2-00	0.0007	10.0	4.9E-07
BK-3-00	0.0007	5.0	4.9E-07
BK-3-00	0.00012	11.0	1.44E-08
BK-4-00	0.00042	5.0	1.76E-07
BK-4-00	0.00011	10.0	1.21E-08
		Geometric Mean	7.41E-08

Notes:

(1) D_{10} grain size was found from extrapolating hydrometer analysis results.
(2) Calculated using the equation $K=CD_{10}^2$, where C = 1.0.

TABLE 3

HYDRAULIC CONDUCTIVITY
MEASURED USING CONSTANT HEAD METHOD
RFI INVESTIGATION
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Well Location	*Depth (feet bgs)*	*Hydraulic Conductivity (cm/s)* [1]
BK-1-00	5 - 7	8.1E-08
BK-2-00	10 - 12	2.9E-08
BK-3-00	5 - 7	5.5E-09
BK-4-00	5 - 7	6.2E-09
	Geometric Mean	1.68E-08

Note:

(1) -Hydraulic conductivity measured using Constant Head Method.

-Samples were tested in a remolded state due to Shelby tube disturbance caused by the presence of cobbles or very dense clay. Dense hard pan clays may have a lower in-situ hydraulic conductivity than the remolded values present. The values presented should be evaluated with an understanding of the fact that they were remolded samples.

DOMESTIC WELL SUMMARY
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Well ID Number	Location	Total Depth (ft)	Overburden Thickness (ft)	Clay Aquitard (1) Thickness (ft)	Static Water Level (ft)	Screened Interval	Screened Unit	Screened Interval Protected/Confined (Y/N)
1	1038 Agnes St	219	148	145	120	149 - 219	sandstone/limestone	Y
2	1049 Agnes St	262	160	35/95	90	170 - 262	shale/sandstone/limestone	Y
3	1067 Agnes St	300	160	100/44	80	170 - 300	slate/sandstone/limestone	Y
4	1068 Agnes St	300	169	169	90	179 - 300	sandstone/limestone	Y
5	1090 Angola Ave	200	135	98/17	70	151 - 200	shale/sandstone	Y
6	1101 Angola Ave	240	128	97/22	84	149 - 240	shale/sandstone	Y
7	1102 Angola Ave	240	135	34/58/28	85	149 - 240	shale/sandstone	Y
8	1110 Angola Ave	220	159	159	84	165 - 220	shale/sandstone/limestone	Y
9	1129 Angola Ave	300	122	97/14	94	153 - 300	shale/sandstone	Y
10	1038 Bethany St	300	140	18/105	106	145 - 300	shale/sandstone/limestone	Y
11	1050 Bethany St	210	148	48/46/38	79	153 - 210	shale/sandstone	Y
12	5373 Bray Road	160	139	25/99	25	144 - 160	sandstone/limestone	Y
13	5385 Bray Road	180	136	17/92/3	35	143 - 180	sandstone/limestone	Y
14	6139 Bray Road	29	29	14	10	26 - 29	gravel	Y
15	6497 Bray Road	182	145	60/60	30	155 - 182	sandstone/limestone	Y
16	Coldwater + Dort Hwy	200	118	95	40	147 - 200	sandstone/limestone	Y
17	2117 E Coldwater Rd	220	156	156	60	163 - 220	shale/sandstone/limestone	Y
18	2126 E Coldwater Rd	222	147	15/92	45	147 - 222	sandstone	Y
19	2127 E Coldwater Rd	223	144	29/103	55	160 - 223	shale/sandstone	Y
20	2134 E Coldwater Rd	220	130	130	65	160 - 220	shale/sandstone	Y
21	2135 E Coldwater Rd	200	154	135	90	162 - 200	sandstone/limestone	Y
22	2153 E Coldwater Rd	202	140	110	50	147 - 202	sandstone/limestone	Y
23	2182 E Coldwater Rd	226	128	128	85	147 - 226	shale/sandstone/limestone	Y
24	2184 E Coldwater Rd	224	104	83	46	117 - 224	shale/sandstone/limestone	Y
25	2264 E Coldwater Rd	200	118	22/91	N/A	117 - 200	sandstone/limestone	Y
26	2343 E Coldwater Rd	200	135	23/102	50	143 - 200	sandstone/limestone	Y
27	2363 E Coldwater Rd	155	146	25/114	30	147 - 155	limestone	Y
28	2369 E Coldwater Rd	180	137	137	73	141 - 180	sandstone/limestone	Y
29	1020 Collins Ave	268	137	26/95	89	147 -268	shale/sandstone	Y
30	1033 Collins Ave	240	130	130	95	155 - 240	shale/sandstone/limestone	Y
31	1037 Collins Ave	220	130	75/30	85	147 - 220	shale/sandstone/limestone	Y
32	1045 Collins Ave	236	136	136	90	160 - 236	slate/shale/sandstone/limestone	Y
33	1055 Collins Ave	240	158	44/96	65	174 - 240	shale/sandstone	Y
34	1071 Collins Ave	233	130	122	68	155 - 233	shale/sandstone	y
35	1023 W Costello Ave	245	157	30/106	N/A	169 - 245	shale/sandstone/limestone	Y
36	1038 W Costello Ave	260	150	105	85	154 - 260	sandstone/limestone	Y
37	1057 E Costello Ave	268	140	34/25/23	100	160 - 268	shale/sandstone/limestone	Y
38	1063 E Costello Ave	260	157	42/85	95	160 - 260	shale/sandstone/limestone	Y
39	1089 E Costello Ave	262	207	70/65	90	207 - 262	sandstone/limestone	Y
40	1071 Dorothy St	230	152	152	85	160 - 230	shale/sandstone	Y
41	1080 Dorothy St	265	158	158	100	179 - 265	shale/sandstone/limestone	Y
42	1092 Dorothy St	300	185	185	106	200 - 300	shale/sandstone/limestone	Y
43	1104 Dorothy St	300	185	65/85	100	192 - 300	shale/sandstone	Y
44	1130 Dorothy St	280	210	175	100	218 - 280	sandstone	Y
45	East Stanley + North Dort Hwy	302	187	42/129	64	238 - 302	shale/sandstone	Y
46	5021 North Dort Hwy	190	90	N/A	32	90 - 190	N/A	Y
47	5150 North Dort Hwy	161	116	15/54	45	117 - 161	shale/sandstone	Y
48	5158 North Dort Hwy	264	108	108	70	152 - 264	slate/sandstone/limestone	Y
49	5172 North Dort Hwy	170	91	78	45	109 - 170	shale/sandstone	Y
50	5182 North Dort Hwy	170	92	25/62	50	109 - 170	shale/sandstone	Y
51	5199 North Dort Hwy	172	97	18/40	50	113 - 172	shale/sandstone	Y
52	5220 North Dort Hwy	200	128	128	60	155 - 200	shale/sandstone	Y
53	5252 North Dort Hwy	200	112	110	80	150 - 200	shale/sandstone	Y
54	5300 North Dort Hwy	222	110	30/65	48	115 - 222	shale/limestone	Y
55	5320 North Dort Hwy	220	118	26/82	50	136 - 220	shale/sandstone/limestone	Y
56	5420 North Dort Hwy	220	138	48/50	50	146 - 220	sandstone/limestone	Y
57	5432 North Dort Hwy	240	139	25/101	78	149 - 240	shale/sandstone/limestone	Y
58	5452 North Dort Hwy	230	140	20/40/55	70	147 - 230	sandstone/limestone	Y
59	5455 North Dort Hwy	200	141	24/97	50	153 - 200	shale/sandstone	Y
60	5469 North Dort Hwy	212	140	140	52	140 - 212	sandstone	Y
61	6129 North Dort Hwy	242	195	35/75/15	80	195 - 242	sandstone/limestone	Y
62	6136 North Dort Hwy	300	180	57/3/100	102	203 - 300	shale/sandstone	Y
63	6190 North Dort Hwy	260	197	55/112	100	203 - 260	shale/sandstone/limestone	Y
64	6203 North Dort Hwy	264	191	191	87	201 - 264	slate/sandstone/limestone	Y
65	6339 North Dort Hwy	260	165	15/142	90	175 - 260	sandstone	Y
66	6368 North Dort Hwy	327	161	161	52	174 - 327	shale/sandstone	Y
67	6369 North Dort Hwy	230	168	53/78	80	175 - 230	sandstone/limestone	Y
68	6406 North Dort Hwy	220	127	30/85	70	174 - 220	quartz/sandstone/limestone	Y
69	6409 North Dort Hwy	265	192	192	90	199 - 265	slate/sandstone/limestone	Y
70	6455 North Dort Hwy	280	168	30/94	95	178 - 280	shale/sandstone	Y
71	6476 North Dort Hwy	268	189	37/121	80	191 - 268	shale/sandstone	Y
72	6500 North Dort Hwy	225	180	30/125	60	187 - 225	sandstone	Y
73	6524 North Dort Hwy	250	190	190	110	222 - 250	shale/sandstone/limestone	Y
74	7025 North Dort Hwy	270	211	80/125	95	213 - 270	sandstone	Y
75	7040 North Dort Hwy	57	57	46	33	53 - 57	sand	Y
76	7073 North Dort Hwy	277	200	45/140	100	220 - 277	shale/sandstone/limestone	Y
77	7074 North Dort Hwy	56	56	3/34	45	52 - 56	sandy gravel	Y
78	7085 North Dort Hwy	292	223	60/133	110	225 - 292	shale/sandstone/limestone	Y
79	7138 North Dort Hwy	320	235	17/140	95	240 - 320	shale/sandstone	Y
80	7141 North Dort Hwy	280	225	38/12/159	90	139 - 280	sandstone/limestone	Y
81	7191 North Dort Hwy	300	240	240	90	251 - 300	sandstone	Y
82	7257 North Dort Hwy	342	190	80/55/20	135	252 - 342	shale/sandstone	Y
83	7260 North Dort Hwy	339	205	95/95	135	255 - 339	shale/sandstone/limestone	Y
84	7293 North Dort Hwy	114	114	8/47/46	42	110 - 114	gravel	Y
85	7351 North Dort Hwy	104	104	70	40	96 - 104	gravel	Y
86	7365 North Dort Hwy	322	270	35/55/145	90	270 - 322	shale/sandstone/limestone	Y
87	1023 Elstner St	224	160	160	87	166 - 224	sandstone/limestone	Y
88	1030 Elstner St	260	140	80/39	101	171 - 260	shale/sandstone	Y

DOMESTIC WELL SUMMARY
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Well ID Number	Location	Total Depth (ft)	Overburden Thickness (ft)	Clay Aquitard (1) Thickness (ft)	Static Water Level (ft)	Screened Interval	Screened Unit	Screened Interval Protected/Confined (Y/N)
89	1104 Elstner St	220	122	45/32	80	135 - 220	sandstone/limestone	Y
90	5315 Energy Dr	260	102	20/43/23	55	140 - 260	shale/sandstone/limestone	Y
91	7051 Estrelle Ave	222	137	42/75	80	140 - 222	sandstone/limestone	Y
92	7065 Estrelle Ave	247	125	38/72	80	140 - 247	shale/sandstone/limestone	Y
93	7103 Estrelle Ave	200	141	18/120	90	144 - 200	sandstone/limestone	Y
94	7117 Estrelle Ave	200	139	35/35/44	82	143 - 200	shale/sandstone	Y
95	7126 Estrelle Ave	220	140	140	85	143 - 220	sandstone/limestone	Y
96	7151 Estrelle Ave	255	117	88/12	92	133 - 255	shale/sandstone	Y
97	7158 Estrelle Ave	240	131	96/20	93	154 - 240	shale/sandstone	Y
98	7041 Harvard St	217	115	42/53	78	120 - 217	shale/sandstone/limestone	Y
99	7060 Harvard St	190	98	30/48	80	125 - 190	shale/sandstone/limestone	Y
100	7061 Harvard St	240	100	25/63	55	157 - 240	shale/sandstone/limestone	Y
101	7078 Harvard St	245	108	108	78	143 - 245	slate/shale/sandstone	Y
102	7070 Harvard St	222	100	45	75	189 - 222	shale/sandstone/limestone	Y
103	7093 Harvard St	244	111	111	75	149 - 244	slate/shale/sandstone/limestone	Y
104	7094 Harvard St	200	92	13/23	80	145-200	shale/sandstone/limestone	Y
105	7098 Harvard St	96	96	18/16	21	90-96	gravel	Y
106	7128 Harvard St	236	119	42/62	82	140 - 236	shale/sandstone/limestone	Y
107	7164 Harvard St	235	137	70/47	80	140 - 235	shale/sandstone/limestone	Y
108	7177 Harvard St	240	120	40/60	80	130 - 240	shale/sandstone/limestone	Y
109	7187 Harvard St	240	120	42/68	90	134 - 240	shale/sandstone/limestone	Y
110	7189 Harvard St	232	118	50/50	83	131 - 232	shale/sandstone/limestone	Y
111	7210 Harvard St	210	175	80/50	40	160-210	clay/shale/sandstone	Y
112	7211 Harvard St	220	120	80	95	156-220	shale/sandstone/limestone	Y
113	7219 Harvard St	247	180	34/64	85	144-247	shale/sand/limestone	Y
114	7244 Harvard St	225	150	119	83	162-225	slate/shale/sandstone	Y
115	1463 Ida Ct	290	254	254	120	254 - 290	sandstone	Y
116	1473 Ida Ct	300	199	69/120	120	254 - 300	shale/sandstone	Y
117	5503 Lewis Rd	220	147	147	90	158 - 220	shale/sandstone	Y
118	6086 Lewis Rd	242	180	60/20/75	95	185 - 242	sandstone/limestone	Y
119	6270 Lewis Rd	265	181	181	108	199 - 265	shale/sandstone/limestone	Y
120	6452 Lewis Rd	260	160	40/113	90	193 - 260	shale/sandstone/limestone	Y
121	6466 Lewis Rd	262	170	40/60	70	196 - 262	shale/sandstone/limestone	Y
122	6472 Lewis Rd	260	180	180	95	190 - 260	sandstone/limestone	Y
123	6480 Lewis Rd	270	183	18/12/24/87	90	203 - 270	shale/sandstone/limestone	Y
124	7049 Lewis Rd	72	72	53	41	67 - 72	gravel	Y
125	7064 Lewis Rd	69	69	58	42	63 - 69	sand	Y
126	7065 Lewis Rd	74	74	56	43	64 - 74	sand	Y
127	7209 Lewis Rd	185	185	68/92	100	180 - 185	gravel	Y
128	7221 Lewis Rd	75	75	62	69	69 - 75	sand and gravel	Y
129	7239 Lewis Rd	340	200	170	88	235 - 340	sandstone	Y
130	7289 Lewis Rd	75	75	15	44	69 - 75	gravel	Y
131	7303 Lewis Rd	75	75	66/2	49	63 - 73	sand	Y
132	7321 Lewis Rd	60	60	47	28	55 - 60	sand and gravel	Y
133	7333 Lewis Rd	322	245	90/130	135	248 - 322	sandstone/limestone	Y
134	7359 Lewis Rd	328	N/A	N/A	125	258 - 328	sandstone/limestone	Y
135	7373 Lewis Rd	300	250	53/78	117	265 - 300	sandstone	Y
136	9468 Lewis Rd	41	41	30	15	38 - 41	sand	Y
137	Lewis Rd + Coldwater Rd	396	177	30/50/57	N/A	N/A	shale/sandstone/limestone	Y
138	1022 Lorene Ave	222	135	20/10/45	95	145 - 222	shale/sandstone/limestone	Y
139	1028 Lorene Ave	220	110	35/55	90	145 - 220	shale/sandstone/limestone	Y
140	1038 Lorene Ave	242	130	130	96	140 - 242	shale/sandstone/limestone	Y
141	1045 Lorene Ave	202	N/A	N/A	82	140 - 202	shale/sandstone/limestone	Y
142	1083 Lorene Ave	205	135	135	85	145 - 205	shale/sandstone/limestone	Y
143	1093 Lorene Ave	200	145	145	90	150 - 200	shale/sandstone	Y
144	1097 Lorene Ave	202	155	40/100	95	155 - 202	sandstone	Y
145	1106 Lorene Ave	202	158	60/88	80	158 - 202	shale/sandstone/limestone	Y
146	1111 Lorene Ave	260	105	105	40	140 - 260	sandstone/limestone	Y
147	1121 Lorene Ave	200	132	132	65	132 - 200	shale/sandstone	Y
148	1127 Lorene Ave	150	132	27/100	70	132 - 150	sandstone	Y
149	1030 Lucharles Ave	223	135	135	78	142 - 223	slate/sandstone/limestone	Y
150	1035 Lucharles Ave	200	133	49/80	82	142 - 200	slate/shale/sandstone	Y
151	1039 Lucharles Ave	218	135	25/95	91	143 - 218	shale/sandstone	Y
152	1040 Lucharles Ave	220	135	20/50/35	50	147 - 220	shale/sandstone/limestone	Y
153	1085 Lucharles Ave	240	130	10/110	60	135 - 240	shale/sandstone/limestone	Y
154	1090 Lucharles Ave	200	135	15/60/40	80	150 - 200	shale/sandstone	Y
155	1094 Lucharles Ave	200	145	67/60	47	150 - 200	sandstone	Y
156	1111 Lucharles Ave	202	121	121	95	131 - 202	shale/sandstone/limestone	Y
157	1116 Lucharles Ave	220	150	150	90	150 - 200	shale/sandstone/limestone	Y
158	1126 Lucharles Ave	200	145	145	76	145 - 200	sandstone	Y
159	Nutana Blvd, 1/4 mi W of Saginaw Rd	240	140	65/10/40	45	168 - 240	shale/sandstone	Y
160	1026 Nutana Blvd	247	147	27/100	94	160 - 247	shale/sandstone/limestone	Y
161	1039 Nutana Blvd	230	150	40/90	40	168 - 230	shale/sandstone	Y
162	1056 Nutana Blvd	227	132	40/55	80	157 - 227	shale/sandstone/limestone	Y
163	1066 Nutana Blvd	260	115	38/45	85	150 - 260	shale/sandstone/limestone	Y
164	1075 Nutana Blvd	247	130	35/20/35	87	145 - 247	shale/sandstone/limestone	Y
165	1076 Nutana Blvd	235	141	141	81	156 - 235	slate/shale/sandstone/limestone	Y
166	1098 Nutana Blvd	300	170	170	88	180 - 300	shale/sandstone	Y
167	1104 Nutana Blvd	260	166	12/60/80	70	180 - 260	shale/sandstone/limestone	Y
168	1117 Nutana Blvd	240	118	35/60	N/A	145 - 240	shale/sandstone/limestone	Y
169	1118 Nutana Blvd	235	143	33/105	70	168 - 235	shale/sandstone	Y
170	1127 Nutana Blvd	230	112	60/39	81	135 - 230	shale/sandstone/limestone	Y
171	1128 Nutana Blvd	260	120	50/40	81	150 - 260	shale/sandstone/limestone	Y
172	7040 N Saginaw Rd	240	148	83/58	85	151 - 240	shale/sandstone	Y
173	7047 N Saginaw Rd	265	146	40/86	80	151 - 265	shale/sandstone/limestone	Y
174	7067 N Saginaw Rd	240	125	65/40	95	150 - 240	shale/sandstone/limestone	Y
175	7101 N Saginaw Rd	305	142	126	60	160 - 305	shale/sandstone	Y
176	7163 N Saginaw Rd	247	150	35/10/60	90	165 - 247	shale/sandstone/limestone	Y

DOMESTIC WELL SUMMARY
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Well ID Number	Location	Total Depth (ft)	Overburden Thickness (ft)	Clay Aquitard (1) Thickness (ft)	Static Water Level (ft)	Screened Interval	Screened Unit	Screened Interval Protected/Confined (Y/N)
177	7166 N Saginaw Rd	247	155	40/90	100	162 - 247	shale/sandstone/limestone	Y
178	7195 N Saginaw Rd	302	180	39/95	80	189 - 302	shale/sandstone/limestone	Y
179	7200 N Saginaw Rd	240	168	80/28	80	168 - 240	sandstone	Y
180	7211 N Saginaw Rd	245	152	8/90/18	60	152 - 245	water rock/limestone	Y
181	1034 W Stanley Rd	215	100	40/40	80	140 - 215	shale/sandstone	Y
182	1097 E Stanley Rd	260	180	30/90	100	195 - 260	sandstone/limestone	Y
183	1128 W Stanley Rd	190	90	15/50/10	71	124 - 190	shale/sandstone	Y
184	1131 E Stanley Rd	290	190	12/100/60	100	212 - 290	shale/sandstone/limestone	Y
185	1290 E Stanley Rd	300	208	208	140	230 - 300	shale/sandstone	Y
186	1297 E Stanley Rd	292	190	6/100/26	95	200 - 292	shale/sandstone/limestone	Y
187	1139 W Stanley Rd	292	215	78/107	102	218 - 292	sandstone/limestone	Y
188	1148 W Stanley Rd	220	114	20/75	60	127 - 220	shale/sandstone/limestone	Y
189	1155 E Stanley Rd	280	230	90/50/78	100	240 - 280	shale/sandstone	Y
190	1166 W Stanley Rd	205	109	109	70	130 - 205	slate/shale/sandstone	Y
191	1180 W Stanley Rd	205	114	27/66	71	133 - 205	shale/sandstone	Y
192	1254 W Stanley Rd	220	89	50/19	50	129 - 220	shale/sandstone/limestone	Y
193	1260 W Stanley Rd	215	85	45/10	60	100 - 215	shale/sandstone	Y
194	1278 E Stanley Rd	295	180	25/20/80	100	231 - 295	shale/sandstone/limestone	Y
195	1302 E Stanley Rd	295	175	140	120	225 - 295	shale/sandstone/limestone	Y
196	1320 E Stanley Rd	245	207	163/27	90	213 - 245	shale/sandstone	Y
197	2008 E Stanley Rd	157	98	26/70	50	112 - 157	shale/sandstone	Y
198	2013 E Stanley Rd	48	48	38	11	44 - 48	sand	Y
199	2056 E Stanley Rd	280	196	196	78	204 - 280	shale/sandstone/limestone	Y
200	2068 E Stanley Rd	252	190	40/125	80	210 - 252	sandstone/limestone	Y
201	2073 E Stanley Rd	205	150	150	50	157 - 205	shale/sandstone/limestone	Y
202	2160 E Stanley Rd	260	164	18/121	102	185 - 260	sandstone/limestone	Y
203	2176 E Stanley Rd	260	160	20/65	36	175 - 260	shale/sandstone/limestone	Y
204	2177 E Stanley Rd	280	201	33/124	N/A	204 - 280	shale/sandstone	Y
205	2240 E Stanley Rd	300	155	130	90	171 - 300	shale/sandstone	Y
206	2382 E Stanley Rd	240	138	120	40	158 - 240	sandstone	Y
207	2389 E Stanley Rd	280	155	120	70	174 - 280	shale/sandstone/limestone	Y
208	2401 E Stanley Rd	198	153	24/56/8	63	153 - 198	shale/sandstone/limestone	Y
209	2434 E Stanley Rd	225	152	152	42	160 - 225	sandstone/limestone	Y
210	2439 E Stanley Rd	185	130	30/90	36	143 - 185	sandstone	Y
211	2454 E Stanley Rd	205	144	144	47	158 - 205	sandstone/limestone	Y
212	2459 E Stanley Rd	220	140	15/108	60	150 - 220	sandstone/limestone	Y
213	2474 E Stanley Rd	205	140	140	45	149 - 205	sandstone/limestone	Y
214	2477 E Stanley Rd	200	143	4/121	60	146 - 200	shale/sandstone	Y
215	2499 E Stanley Rd	202	140	38/80	40	147 - 202	sandstone/limestone	Y
216	Stanley Rd W of Bray Rd	1503	142	8/32	N/A	N/A	shale/sandstone/limestone	Y

Notes: (1) If more than one thickness is present then multiple clay aquitards exist.
(2) Not Available

TABLE 5

HISTORICAL GROUNDWATER ELEVATIONS
WASTE MANAGEMENT AREA
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Date:	01/11/80		01/23/80		02/02/80		04/01/80		04/09/80		05/22/80		07/16/85	
Well Location	Depth (BGS)	Elevation (AMSL)	Depth (BGS)	Elevation (AMSL)	Depth (BGS)	Elevation (AMSL)	Depth (BGS)	Elevation (AMSL)	Depth (BGS)	Elevation (AMSL)	Depth (BGS)	Elevation (AMSL)	Depth (BGS)	Elevation (AMSL)
B-1A	0.96	780.54	1.12	780.38	3.05	778.45	0.51	780.99	0.67	780.83	1.18	780.32	7.19	773.71
B-1B	17.13	764.07	17.19	764.01	19.06	762.14	18.08	763.12	18.08	763.12	18.33	762.87	29.77	751.13
B-1C	34.68	747.02	34.73	746.97	35.23	746.47	35.38	746.32	34.81	746.89	34.62	747.08	35.22	745.68
B-1D	46.99	734.71	47.03	734.67	22.73	758.97	50.26	731.44	50.45	731.25	59.02	722.68	--	--
B-1E	71.20	710.30	71.23	710.27	72.87	708.63	73.45	708.05	73.23	708.27	72.00	709.50	--	--
B-2A	--	--	2.57	803.53	4.65	801.45	6.27	799.83	1.46	804.64	2.52	803.58	10.70	794.90
B-2B	--	--	4.30	801.80	5.86	800.24	3.11	802.99	3.18	802.92	4.35	801.75	12.04	793.56
B-2C	--	--	5.76	800.24	6.92	799.08	4.46	801.54	4.43	801.57	5.41	800.59	--	--
B-2D	--	--	57.88	747.82	58.10	747.60	58.27	747.43	58.09	747.61	57.68	748.02	--	--
B-2E	--	--	60.43	745.27	60.93	744.77	61.40	744.30	61.36	744.34	61.17	744.53	--	--
B-2F	--	--	61.77	743.93	61.91	743.79	62.31	743.39	62.45	743.25	61.99	743.71	--	--
B-2G	--	--	62.90	742.90	62.73	743.07	62.95	742.85	62.81	742.99	62.15	743.65	--	--
B-3A	2.12	812.58	0.67	814.03	2.51	812.19	-0.42	815.12	0.40	814.30	0.87	813.83	2.17	812.53
B-3B	1.84	813.06	5.74	809.16	7.51	807.39	9.20	805.70	9.05	805.85	10.16	804.74	11.25	803.45
B-3C	75.98	738.72	76.76	737.94	77.20	737.50	77.31	737.39	76.97	737.73	76.99	737.71	--	--
B-3D	--	--	78.36	736.94	84.74	730.56	84.96	730.34	84.71	730.59	85.00	730.30	--	--
B-4	--	--	--	--	--	--	--	--	--	--	1.55	779.35	--	--
B-5	--	--	--	--	--	--	--	--	--	--	3.60	790.90	9.19	785.61
B-6	--	--	--	--	--	--	--	--	--	--	14.22	798.78	16.83	795.87
B-7	--	--	--	--	--	--	--	--	--	--	17.92	793.78	17.50	793.90
B-8	--	--	--	--	--	--	--	--	--	--	2.54	809.96	8.71	803.99
B-9	--	--	--	--	--	--	--	--	--	--	4.20	803.90	7.50	800.80
B-10	--	--	--	--	--	--	--	--	--	--	16.61	774.29	26.35	764.15
B-11	--	--	--	--	--	--	--	--	--	--	--	--	15.71	755.79
B-12	--	--	--	--	--	--	--	--	--	--	--	--	16.67	754.83
B-13	--	--	--	--	--	--	--	--	--	--	--	--	6.17	812.32
B-14	--	--	--	--	--	--	--	--	--	--	--	--	9.08	800.37
B-15	--	--	--	--	--	--	--	--	--	--	--	--	23.50	786.51

Notes:

(1) Data compiled from the following sources:

1. Dames and Moore, 1980. "Hydrogeological Investigation", prepared for Fisher Body Division, General Motors Corporation, Flint, Michigan.
2. Chester Engineers, 1986. "Final Report on Groundwater Quality Assessment Program", prepared for Fisher Guide Division, General Motors Corporation, Flint, Michigan.

ATTACHMENT A

ACT 451, PART 201 ADMINISTRATIVE RULES
SECTION R299.5101 (C) AND CFR, PART 40, SECTION 149.2

DEPARTMENT OF NATURAL RESOURCES

NATURAL RESOURCES COMMISSION

ENVIRONMENTAL CONTAMINATION RESPONSE ACTIVITY

Filed with the Secretary of State on June 26, 1990
These rules take effect 15 days after filing with the Secretary of State

(By authority conferred on the department of natural resources and the commission of natural resources by section 5 of Act No. 307 of the Public Acts of 1982, as amended, section 13 of Act No. 328 of the Public Acts of 1988, and section 33 of Act No. 306 of the Public Acts of 1969, as amended, being §§299.605, 299.683, and 24.233 of the Michigan Compiled Laws)

PART 1. GENERAL PROVISIONS

R 299.5101 Definitions; A to I.

Rule 101. As used in these rules:

(a) "Act" means Act No. 307 of the Public Acts of 1982, as amended, being §299.601 et seq. of the Michigan Compiled Laws.

(b) "Ambient air" means that part of the atmosphere outside of buildings to which the general public has access.

(c) "Aquifer" means a geological formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs.

(d) "Department" means the department of natural resources.

(e) "Department of public health" means the Michigan department of public health.

(f) "Direct contact" means exposure to hazardous substances through ingestion or dermal contact.

(g) "Director" means the director of the department.

(h) "Emergency response" means a response activity taken to eliminate or control an immediate public health threat or immediate environmental threat.

(i) "Feasibility study" means a process for developing, evaluating, and selecting an appropriate remedial action.

(j) "Free product" means a hazardous substance or hazardous substances in a liquid phase which are not dissolved in water and which have been released into the environment.

(k) "Fund" or "funds" means the environmental response fund created pursuant to the provisions of section 9 of the act or the environmental protection bond fund created pursuant to the provisions of section 6 of Act No. 328 of the Public Acts of 1988, being §299.676 of the Michigan Compiled Laws, or both.

(l) "Groundwater" means water below the land surface in the zone of saturation.

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§ 149.2 Definitions.

(a) *Aquifer* means a geological formation, group of formations, or part of a formation that is capable of yielding a significant amount of water to a well or spring.

(b) *Recharge* means a process, natural or artificial, by which water is added to the saturated zone of an aquifer.

(c) *Recharge Area* means an area in which water reaches the zone of saturation (ground water) by surface infiltration; in addition, a *major recharge area* is an area where a major part of the recharge to an aquifer occurs.

(d) *Sole or Principal Source Aquifer* (SSA) means an aquifer which is designated as an SSA under section 1424(e) of the SDWA.

[54 FR 6843, Feb. 14, 1989]

e-CFR HOME

ATTACHMENT B

MDEQ-DWRPD SUBDIVISIONS OF LAND RULES
PART 4

DEPARTMENTS OF TRANSPORTATION, CONSUMER AND INDUSTRY SERVICES, AND ENVIRONMENTAL QUALITY
SUBDIVISIONS OF LAND

Filed with the Secretary of State on January 23, 2001.
These rules take effect 15 days after filing with the Secretary of State

(By authority conferred on the director of the department of environmental quality by section 105 of Act No. 288 of the Public Acts of 1967, as amended, being §560.105 and section 2226 of Act No. 368 of the Public Acts of 1978, as amended, being §333.2226 of the Michigan Compiled Laws. Each part of these rules is promulgated separately by the department whose name appears in the designation of that part.)

R 560.401 to R 560.405 of the Michigan Administrative Code are amended, and R 560.406 to R 560.428 are added to the code, as follows:

PART 4. DEPARTMENT OF ENVIRONMENTAL QUALITY ON-SITE WATER SUPPLY AND SEWAGE DISPOSAL FOR LAND DIVISIONS AND SUBDIVISIONS

R 560.401 Definitions.

Rule 401. As used in this part:

(a) "Alternative system" means a treatment and disposal system which is not a conventional system and provides for an equivalent or better degree of protection for public health and the environment than a conventional system.

(b) "Approval for the suitability of an on-site water supply" means a written statement confirming that an adequate quantity and quality of water is available from a protected source in accordance with R 560.404 issued by the department to a property owner or the owner's designated representative.

(c) "Approval for the suitability of on-site sewage disposal" means a written statement or on-site sewage disposal permit in accordance with R 560.416 issued by the department to the property owner or the owner's designated representative.

(d) "Available sanitary sewer facilities" means sanitary sewers determined accessible upon consideration of the following factors:

(i) The distance from the proposed development site to the nearest existing public services or planned public services that are to be installed.

(ii) The capacity of the existing public sanitary sewer system.

(iii) The policy of the local governing body on utility extensions.

(iv) The service areas denoted in the community's comprehensive sewer and water plan, if a plan is available.

(e) "Certified professional geologist" means a professional geologist certified by The American Institute of Professional Geologists, 7278 Vance Drive, Suite 103, Arvada, Colorado 80003.

(f) "Certified professional soil scientist" means a professional soil scientist certified by ARCPACS, 677 South Segoe Road, Madison, Wisconsin 53711.

(g) "Conventional system" means an on-site sewage treatment and disposal system that contains a watertight septic tank with nonuniform distribution of effluent to subsurface soil trenches or an absorption bed on sites meeting the criteria contained in R 560.418 to R 560.422.

(h) "Deep cut excavation" means the excavation of unsuitable soil materials below the bottom of the final disposal system to depths more than 6 feet below natural grade to expose acceptable underlying soils.

(i) "Department" means the department of environmental quality, a city health department, a county health department, or a district health department, whichever has jurisdiction.

(j) "Development site" means any parcel or lot as defined by section 102 of the land division act, Act 288 of the Public Acts of 1967, as amended, being §560.102 of the Michigan Compiled Laws.

(k) "Drains" means man-made excavations, piping, or both, that collect groundwater or surface water, and includes road ditches, county drains, and footing drains.

(l) "Drop-off" means a man-made cut or natural slope where side slope is in excess of 50% and which contains semi-impermeable layers that may cause percolating water to vent to the surface.

(m) "Floodplain" means the area of land adjoining a surface water that will be inundated by a 100-year flood.

(n) "Groundwater" means the water in the ground that is in the zone of saturation.

(o) "High groundwater elevation" means the uppermost part of the soil or underlying material wholly saturated with water. The term includes perched and apparent conditions that are seasonally saturated for a time period in excess of two weeks, or permanently saturated.

(p) "Licensed professional engineer" means a professional civil engineer who is licensed under article 20 of the occupational code, Act 299 of the Public Acts of 1980, being §§399.2001 to 339.2014 of the Michigan Compiled Laws.

(q) "Lot" means a measured portion of a parcel or tract of land as defined by section 102 of the land division act, Act 288 of the Public Acts of 1967, being §560.102 of the Michigan Compiled Laws.

(r) "Peak water demand" means the maximum water use rate in gallons per minute.

(s) "Preliminary plat" means a map as defined by section 102 of the land division act, Act 288 of the Public Acts of 1967, being §560.102 of the Michigan Compiled Laws.

(t) "Primary maximum contaminant level" means the concentration level of a contaminant above which consumption of the water poses a health risk.

(u) "Professional surveyor" means a professional surveyor licensed under article 20 of the occupational code, Act 299 of the Public Acts of 1980, being §§339.2001 to 339.2014 of the Michigan Compiled Laws.

(v) "Public sewer" means a sewerage system as defined in section 4101 of Act No. 451 of the Public Acts of 1994, as amended, being §324.4101 of the Michigan Compiled Laws. Public sewerage systems are generally those that collect and treat sanitary sewage generated by 2 or more dwellings or structures not under the same ownership.

(w) "Public water" means a public water supply as defined in section 2(o) of Act No. 399 of the Public Acts of 1976, as amended, being §325.1002(o) of the Michigan Compiled Laws.

(x) "Registered sanitarian" means a person that is registered under part 184 of Act

No. 368 of the Public Acts of 1978, being §333.18401 of the Michigan Compiled Laws.

(y) "Registered well drilling contractor" means a contractor registered under part 127 of Act No. 368 of the Public Acts of 1978, being §§333.12701 to 333.12715 of the Michigan Compiled Laws.

(z) "Sanitary sewage" means water and contaminants discharged from sanitary conveniences, including bathroom, kitchen, and household laundry fixtures of dwellings, office buildings, industrial plants, commercial buildings, and institutions. Commercial laundry wastes and industrial and commercial processes are not considered sanitary sewage.

(aa) "Secondary maximum contaminant level" means the concentration level of a constituent above which the constituent adversely affects water quality properties, such as taste, odor, corrosivity, or scale production.

(bb) "Soil mottling," also known as redoximorphic features, means spots or blotches of contrasting colors, such as, but not limited to, gray or brown or gray and brown colors in close proximity, that are formed in the soil matrix by the processes of reduction, translocation, and oxidation of iron and manganese compounds in soils that have been periodically saturated.

(cc) "Soil permeability" means the rate at which liquid passes in 1 direction through the soil material under saturated conditions.

(dd) "Soil structure" means the morphological aggregates in which the individual soil particles are arranged.

(ee) "Soil textural class" means the United States department of agriculture (USDA) classification system and refers to the coarseness or fineness of the soil relative to the proportion of sand, silt, and clay.

(ff) "Subsurface" means below the natural or altered ground surface elevation.

(gg) "Suitable absorption area" means the portion of a lot which has acceptable soils that remains for construction of a conventional system after identified limiting surface and subsurface features, applicable setbacks, and isolation distances have been excluded.

(hh) "Suitability" means the presence of site conditions that could warrant the development of an on-site sewage treatment and disposal system or on-site water supply system that is in compliance with these rules.

(ii) "Surface water" means any of the following:

(i) The Great Lakes and their connecting waterways.

(ii) Inland lakes.

(iii) Rivers.

(iv) Streams.

(v) Impoundments.

(vi) Perennial open drains.

(vii) Any other watercourses within the jurisdiction of the state as defined in section 3101 of Act No. 451 of the Public Acts of 1994, as amended, being §324.3101 of the Michigan Compiled Laws.

(jj) "Test well" means a well that is used to obtain information on groundwater quantity, quality, or aquifer characteristics for the purpose of designing or operating a water supply well.

R 560.402 Preliminary plats.

Rule 402. The owner or a designated representative shall submit 3 copies of a preliminary plat drawing to the department for review. A preliminary plat drawing shall include all of the following information:

(a) Existing and proposed 5-foot contour intervals. For waterfront property, or where the high groundwater elevation is within 6 feet of existing or proposed finished ground surface, the preliminary plat shall show existing and proposed 2-foot contour intervals. The department may waive the requirements for contours if a lot in the subdivision is more than 1 acre. If extensive cutting or filling of land is anticipated that will affect building sites and sewage disposal facilities in the areas involved, then the plans shall indicate the cutting or filling. The owner or designated representative shall specify the type of fill material to be used when filling is anticipated.

(b) The location of all of the following, either existing or proposed, within or adjacent to the area to be platted:

(i) Rivers.
(ii) Streams.
(iii) Creeks.
(iv) Lakes.
(v) County drains.
(vi) Other subsurface drains.
(vii) Lagoons.
(viii) Slips.
(ix) Waterways.
(x) Bays.
(xi) Canals.
(xii) Artificial impoundments.

(c) The location of all soil evaluations performed on the site.

(d) Established 100-year floodplain area and elevation and normal high water level in the case of waterfront property. On lakes where a legal level has been established, the plat drawing shall show the legal level.

(e) The location of existing facilities and structures, including, but not limited to, all of the following:

(i) Buildings.
(ii) Sewage systems.
(iii) High-tension towers.
(iv) Utility easements of record or in use.
(v) Excavations.
(vi) Bridges.
(vii) Culverts.
(viii) Injection wells.
(ix) Oil wells.
(x) Gas wells.
(xi) Water wells.
(xii) Underground storage tanks.

(f) Building setback lines from road, waterfront, or lot lines if lines are established or proposed.

(g) The department may require the location of proposed individual wells to be

shown.

R 560.403 Site reports; contents.

Rule 403. For a subdivision, the owner or designated representative shall submit 3 copies of a site report to the department. A site report shall include all of the following information:

(a) The name and location of proposed plat.

(b) The names and addresses of the proprietor of the preliminary plat and the licensed professional engineer or professional surveyor submitting the site report.

(c) A statement of intended use of the proposed plat, such as single-family, 2-family, and multiple residential housing; commercial; industrial; recreational; or agricultural.

(d) A statement of the type of water and sewage system to be provided.

(e) A statement of the existing use of adjacent property and intended use of adjacent undeveloped land, if known, including any adjacent public-owned lands.

(f) The results of all soil profile evaluations performed on the site.

(g) A statement of the site suitability for on-site water supply or on-site sewage disposal according to R 560.404 and R 560.416.

R 560.404 Approval for suitability of on-site water supply.

Rule 404. Before issuing an approval for the suitability of an on-site water supply for a development site that is less than 1 acre in size or a subdivision, the department shall have evidence that a potable, adequate, reliable, and protected on-site water supply has been or can be developed on the parcel as prescribed in these rules.

R 560.405 Water well or test well on parcel.

Rule 405. The completion of a sufficient number of water wells or test wells on the parcel and submittal of water well records for the water wells or test wells under section 12707 of Act No. 368 of the Public Acts of 1978, as amended, being §333.12707 of the Michigan Compiled Laws, and submittal of water sample results or the submittal of other hydrogeological information to the department constitutes evidence for determining the suitability of an on-site water supply.

R 560.406 Water well records and water sample results for well not on parcel.

Rule 406. If a water well or test well has not been completed on the parcel, then water sample results or other hydrogeological information pertaining to existing wells in the vicinity of the parcel which demonstrates that the proposed on-site water supply will likely result in compliance with these rules constitutes evidence of suitability. If well record data, water sample results, and hydrogeological information are not available, or if the data indicate that unsuitable groundwater quantity or quality may exist, then the department shall either reject the development site of less than 1 acre in size or proposed subdivision under R 560.428 or issue a conditional approval with a recorded deed restriction under R 560.426.

R 560.407 On-site water supply construction criteria.

Rule 407. An on-site water supply shall meet the location and construction standards in R 325.1601 to R 325.1676.

R 560.408 Well protection.

Rule 408. The owner shall be responsible for the construction of an on-site water supply that is free from sources of contamination. The following methods shall be given consideration:

(a) Penetration of an impervious layer which is of sufficient areal extent, but which is not less than 10 feet thick.

(b) Maintaining a minimum of 50 feet from the static water level to the bottom of the casing or top of the screen in an unconfined aquifer.

(c) An increase in the minimum horizontal isolation distance between the well and a source from which groundwater contamination may occur.

(d) A combination of the methods in subdivisions (a), (b), and (c) of this subrule or another method that the department determines will provide adequate protection for the on-site water supply.

R 560.409 Prohibited water sources for new dwellings.

Rule 409. The owner or designated representative shall not obtain water for drinking or household purposes that is intended to furnish new dwellings located on a development site that is less than 1 acre in size or a subdivision from any of the following:

(a) A dug well.
(b) A crock well.
(c) A hauled water system.
(d) A cistern.
(e) A surface body of water.
(f) A spring.
(g) Any other similar device.

R 560.410 Deviations to decrease minimum casing depth or isolation distances prohibited.

Rule 410. The department shall not grant deviations to decrease minimum casing depth or to decrease minimum isolation distances under R 325.1613 for development sites less than 1 acre in size or subdivisions.

R 560.411 Yield or performance testing.

Rule 411. A registered water well drilling contractor under the supervision of the owner or the owner's designated representative shall perform a yield or performance test to demonstrate that water can be withdrawn from an on-site water supply well for drinking and household purposes at a sustained pumping rate which is not less than 10 gallons per minute (gpm) and which meets or exceeds peak water demand for not less

than a 4-hour period of time. If an on-site water well cannot sustain a capacity that meets the peak water demand, then the department shall require demonstration of a combination of the known well yield and storage facilities that can furnish water at a delivery rate sufficient to meet the peak water demand.

R 560.412 Collection and analysis of water samples.

Rule 412. (1) The department or a property owner's designated representative shall collect water samples for chemical and bacteriological analyses from each test well or on-site water supply well intended for household purposes.

(2) A state-certified laboratory shall perform all water sample analyses.

(3) The state-certified laboratory shall perform analyses for all of the following parameters:

(a) Chloride.
(b) Fluoride.
(c) Hardness.
(d) Iron.
(e) Nitrate.
(f) Nitrite.
(g) Sodium.
(h) Sulfate.
(i) Coliform bacteria.

(4) The department may require additional sampling or allow a reduction in sampling for specific contaminants based on local site conditions or other pertinent factors.

R 560.413 Adoption of standards by reference.

Rule 413. The department adopts by reference in these rules the publication entitled "Drinking Water Regulations and Health Advisories," EPA-822-B-96-002, October 1996. The publication may be obtained free of charge from the Office of Ground Water and Drinking Water, United States environmental protection agency, 401 M street, SW, Washington, DC 20460-0003. The toll-free telephone number is 800-426-4791. A copy of this publication is available on the internet at http:\\www.epa.gov\OST\tools\dwstds.html. Copies of the adopted matter are available for inspection at the offices of the Drinking Water and Radiological Protection Division, Department of Environmental Quality, 3423 N. Martin L. King Blvd., Lansing, Michigan 48906.

R 560.414 Primary maximum contaminant levels.

Rule 414. (1) The department shall reject proposed development sites that are less than 1 acre in size and subdivisions if the water sample analysis detects contaminants in concentrations that exceed the primary maximum contaminant levels as defined in R 560.401(t).

(2) The department shall reject proposed development sites that are less than 1 acre in size and subdivisions if the water sample analysis detects a contaminant in a concentration that is more than 50% of the maximum contaminant level and the

department has determined that the contaminant is likely to exceed the primary maximum contaminant level in the future after considering the following:

(a) Contaminant transport and modeling.

(b) Land use.

(c) Geology.

(d) Other factors that influence groundwater movement.

(3) If the department requires additional analysis under R 560.412(4), then the department shall use the drinking water regulations and health advisories adopted in R 560.413 to determine primary maximum contaminant levels.

R 560.415 Secondary maximum contaminant levels.

Rule 415. If water sample analyses from a test well or on-site water supply well for a development site less than 1 acre in size or a subdivision detects a contaminant in a concentration that exceeds the secondary maximum contaminant level in Table 1, then the department shall disclose by means of recorded advisories according to R 560.426, the nature of the impact on drinking water quality.

Table 1
Secondary Maximum Contaminant Levels

Contaminant	Secondary Maximum Contaminant Level in Milligrams Per Liter
Chloride	250
Hardness (as calcium carbonate)	250
Iron	0.3
Sodium	250
Sulfate	250
Corrosivity	Noncorrosive

R 560.416 Approval for suitability of conventional on-site sewage treatment and disposal.

Rule 416. Before issuing an approval for the suitability of a conventional on-site sewage treatment and disposal system for a development site less than 1 acre in size or a subdivision, the department shall have evidence that site conditions meet these rules.

R 560.417 Soil absorption area for conventional treatment and disposal systems.

Rule 417. (1) A suitable absorption area for at least 1 original and 1 replacement system shall exist for each development site less than 1 acre in size or each lot where a conventional treatment and disposal system is proposed. Location of each absorption area shall conform to the minimum isolation distances found in Table 2.

Table 2
Minimum Horizontal Isolation Distances

From Absorption Area* To:	Minimum Horizontal Isolation Distance (feet)
Private individual well	50
Surface waters	100
Basement foundation walls	10
Top of drop-off	20
Property lines	10
Footing drains installed in water table without direct connection to surface water	25
Footing drains installed in water table with direct connection to surface water	50
Drains designed to lower the water table	100

*measured from edge of stone

(2) The department shall establish the required minimum area available for a development site less than 1 acre in size or on each lot for initial and replacement systems in accordance with the regulations of the city, county, or district health department having jurisdiction under the authority granted by Act No. 368 of the Public Acts of 1978, as amended, being §325.1101 et seq. of the Michigan Compiled Laws. For lots or development sites less than 1 acre in size proposed to be served by individual wells and on-site sewage disposal systems or lots or development sites less than 1/2 acre in size proposed to be served by a public water supply and on-site sewage disposal systems, the department may require the submission of a detailed development plan by any of the following persons demonstrating competence:

(a) A licensed professional engineer.
(b) A professional surveyor.
(c) A registered sanitarian.
(d) A professional approved by the department.

The professional person shall draw the detailed plan to scale with a maximum 2-foot contour interval, shall show the proposed design for the initial and replacement sewage disposal systems, and shall indicate the location intended for the home and individual water supply well. The professional person shall indicate both existing and proposed contours. The professional person shall ensure that areas defined on the plan for sewage systems and the well are at locations that are readily accessible for future maintenance or replacement, or both.

R 560.418 Slopes.

Rule 418. (1) A development site less than 1 acre in size or a lot shall have sufficient areas of suitable soils in areas that have slopes conducive to the construction of initial and replacement on-site sewage disposal systems.

(2) If a development site less than 1 acre in size or a lot has slopes of more than 12%, then the department may require the submission of a detailed development plan by any of the following persons demonstrating competence:

(a) A licensed professional engineer.
(b) A professional surveyor.
(c) A registered sanitarian.
(d) A professional approved by the department.

The professional person shall draw the detailed plan to scale with a maximum 2-foot contour interval, shall show the proposed design for the initial and replacement sewage disposal systems, and shall indicate the location intended for the home and individual water supply well. The professional person shall indicate both existing and proposed contours. The professional person shall ensure that areas defined on the plan for sewage systems and the well are at locations that are readily accessible for future maintenance or replacement, or both.

(3) If extensive site modifications are required to provide for areas that have a slope amenable to construction of the on-site sewage system, then the department may require necessary site work to be completed before final recording of a subdivision or before approval for on-site sewage disposal of a development site that is less than 1 acre in size.

R 560.419 Floodplains.

Rule 419. (1) The areas for initial and replacement on-site sewage disposal systems shall have natural ground surface elevation above the elevation defining the 100-year floodplain, where a floodplain exists.

(2) The department shall ensure that the soil infiltrative surface of the sewage disposal system is located at an elevation that is above the elevation defining the 100-year floodplain.

R 560.420 Soil profile evaluations for subdivisions and land divisions.

Rule 420. (1) Any of the following persons demonstrating competence shall provide the results of soil profile evaluations to the department for the area designated for initial and reserve on-site sewage disposal systems:

(a) A licensed professional engineer.
(b) A professional surveyor.
(c) A registered sanitarian.
(d) A certified professional geologist.
(e) A certified professional soil scientist.
(f) A professional approved by the department.

Soil profile evaluations shall confirm the existence of suitable soils on each development site that is less than 1 acre in size or proposed lot.

(2) The person conducting soil profile evaluations shall complete them to a minimum depth of 6 feet below the natural ground surface or 6 feet below the elevation that will exist after cutting unless waived by the department. Soil data shall be reported in accord with the United States department of agriculture (USDA) soil classification system. A soil profile evaluation shall identify all of the following:

(a) Soil horizon depths.
(b) Soil texture.
(c) Soil structure.

(d) Soil mottling.
(e) Depth-to-high groundwater elevation or bedrock.
(3) The person providing the results of soil profile evaluations shall complete them using either soil pits or soil borings.

R 560.421 Soil suitability for conventional systems.

Rule 421. (1) The department shall ensure that soil texture and permeability conforms to the types and ranges specified in Table 3.

Table 3
Suitable Soil Texture and Permeabilities

Soil Texture	Permeability* (minutes/inch)
Sand, loamy sand	1 - 15
Sandy loam	16 - 30
Sandy clay loam, light loam	31 - 60
Clay loam, silty clay loam, clay	Above 60 Unsuitable

* soil structure shall also be considered when evaluating permeability.

(2) To provide for adequate soil treatment capability, a minimum of 3 feet of unsaturated soil shall exist between high groundwater elevation or bedrock and the bottom of the infiltrative surface. Greater vertical separation may be required in accordance with the regulations of the city, county, or district health department having jurisdiction under the authority granted by Act No. 368 of the Public Acts of 1978, as amended, being §325.1101 et seq. of the Michigan Compiled Laws. Greater vertical separation may also be required where groundwater mounding underneath the soil absorption system or other factors would limit the treatment to protect on-site water supplies or surface waters. For lots or development sites less than 1 acre, the soil below the infiltrative surface of the absorption system shall meet the texture and permeability requirements of Table 3.
(3) If the required 3 feet of unsaturated soils cannot be provided naturally, then the department will consider proposals for fill. Fill is acceptable only if the depth to high groundwater elevation or bedrock, or both, is a minimum of 2 feet below the natural, unaltered ground surface. Fill is only acceptable over soils specified in Table 3 as suitable by texture and permeability.
(4) Fill materials shall consist of medium to coarse sands in accordance with the USDA classification system without excessive fines. Fill materials may be required to be placed for both the initial and reserve sewage disposal system areas before final recording of the plat or approval for on-site sewage disposal of a development site that is less than 1 acre in size. Any of the following persons demonstrating competence shall provide certification of fill materials and placement to the department:
(a) A licensed professional engineer.
(b) A professional surveyor.
(c) A registered sanitarian.

(d) A certified professional geologist.
(e) A certified professional soil scientist.
(f) A professional approved by the department.

(5) If filling is required, any of the following persons may be required to submit a detailed development plan as the basis for approval:

(a) A licensed professional engineer.
(b) A professional surveyor.
(c) A registered sanitarian.
(d) A professional approved by the department.

The person shall draw the detailed plan to scale showing both existing and proposed contours that have a maximum 2-foot interval and shall indicate the area for the initial and replacement sewage disposal system at locations that will be accessible for maintenance or replacement, or both.

R 560.422 Deep cut excavations.

Rule 422. (1) If suitable soils, as specified in Table 3, are not present within the upper 6 feet of the soil profile and alternative methods of sewage treatment and disposal have been considered under R 560.424, then the department may approve the use of deep cut excavations to expose acceptable underlying soils that exist within 20 feet of the natural grade.

(2) Acceptable underlying soils shall consist of a minimum of 4 feet of soils which have a permeability of greater than 30 minutes per inch and which are not permanently or seasonally saturated as confirmed by soil profile evaluations.

(3) Deep cut excavations are not allowed if the soils that are cut through are seasonally or permanently saturated. Exceptions may be considered where drainage of groundwater from overlying soils would not be expected to adversely impact the function of the sewage disposal system.

(4) Deep cut excavations are not allowed unless hydrogeologic information confirms that the underlying soils being exposed have no direct hydraulic connection to a useable aquifer intended for drinking or household purposes.

(5) For deep cut excavations the department may require alternative methods of sewage treatment. The department may require such excavations to be completed and filled with medium to coarse sands in accord with the USDA classification system before final recording of the plat or approval for on-site sewage disposal of a development site that is less than 1 acre in size. Any of the following persons demonstrating competence shall provide certification of fill materials and placement to the department:

(a) A licensed professional engineer.
(b) A professional surveyor.
(c) A registered sanitarian.
(d) A certified professional geologist.
(e) A certified professional soil scientist.
(f) A professional approved by the department.

(6) The owner or owner's designated representative shall complete deep cut excavations over 100% of the required initial and reserve absorption system area for the upper 6 feet; however, excavations may be reduced to a minimum of 50% of the

required absorption system area between 6 and 20 feet deep.

R 560.423 Proposals to lower high groundwater elevation.

Rule 423. (1) The department may approve the use of a proposal that includes surface and subsurface drainage systems to control high groundwater elevation conditions for a development site that is less than 1 acre in size or subdivision.

(2) Before approval, the owner or his designated representative shall install drainage systems specified in subrule (1) of this rule and shall monitor high groundwater elevations during the normally wettest time period of the year and at least from March 1 to June 1. Any of the following persons shall provide monitoring results to the department:

(a) A licensed professional engineer.
(b) A professional surveyor.
(c) A registered sanitarian.
(d) A certified professional geologist.
(e) A certified professional soil scientist.
(f) A professional approved by the department.

In addition, the designated person shall substantiate that high groundwater elevation has been lowered to meet the requirement of R 560.421.

(3) The designated person shall monitor high groundwater elevations by placing a monitoring well at representative locations approved by the department. The designated person shall make observations on the first day of the monitoring period and at least once every 7 days thereafter until the monitoring period is complete.

(4) The designated person shall provide representative precipitation data for the time period of September 1 to May 31 and shall supply the data as part of the observations required in subrule (3) of this rule. Results of high groundwater elevation monitoring are inconclusive if recorded precipitation totals are less than 90% of normal averages during the time period of September 1 to May 31.

(5) For a proposal to lower high groundwater elevation to be approved by the department, a county drain commissioner or other responsible governmental agency shall have approved the drain design and a responsible governmental agency shall have accepted responsibility for perpetual maintenance of the drain.

R 560.424 Alternative methods of sewage treatment and disposal.

Rule 424. (1) The department may approve an alternative treatment and subsurface disposal system for a development site less than 1 acre in size or a lot deemed suitable or not suitable for a conventional subsurface sewage system.

(2) The department of environmental quality shall provide technical guidance in defining minimum site suitability and design and long-term operation and maintenance requirements considered essential for the proper functioning of specific alternative systems.

(3) The owner may utilize an alternative system if the specific alternative is provided for under the regulations of the city, county, or district health department having jurisdiction and if the department of environmental quality has authorized the alternative system's use.

R 560.425 Industrial and commercial subdivisions.

Rule 425. (1) The department may consider approval for the suitability of development sites less than 1 acre in size or subdivisions intended for industrial or commercial usage if both of the following conditions are met:

(a) The proposed development is strictly limited to those uses that generate and dispose of on-site, sanitary sewage only.

(b) Quantities of sanitary sewage intended to be disposed of are limited to low volumes which have been determined to be compatible with site or lot size and soil conditions.

(2) Where an on-site water supply is proposed, it shall meet the requirements of Act 399 of the Public Acts of 1976 being §§325.1001 to 325.1023 and part 127 of Act 368 of the Public Acts of 1978 being §§333.12701 to 333.12715 of the Michigan Compiled Laws.

(3) The aquifer shall be protected in accordance with R 560.408 and yield an adequate quantity of water for the intended usage.

R 560.426 Recorded deed restrictions and advisories.

Rule 426. (1) The department may require, as a condition of approval of a development site that is less than 1 acre in size or a preliminary plat, that the owner records deed restrictions and advisories. The deed restrictions and advisories may include any of the following:

(a) Minimum well construction features needed to provide an acceptable on-site water supply.

(b) Possible need for water treatment.

(c) An advisory to complete an on-site water supply well before beginning site development.

(d) Other advisory information needed to protect public health or groundwater resources.

(e) Location of the sewage disposal system on the lot in relation to the property lines and structures.

(f) Type of fill material needed.

(g) Type of sewage disposal system or alternative system and requirements related to design, construction, operation, and maintenance.

(h) Isolation above high groundwater elevation.

(2) Before construction of a water well, the department shall advise the owner or designated representative of the existence of any applicable deed restrictions or advisories.

R 560.427 Variances.

Rule 427. (1) A development site that is less than 1 acre in size or a subdivision shall comply with the requirements of these rules; however, the Michigan department of environmental quality may grant a variance. Such variances will be considered by the department of environmental quality when all of the following conditions are met:

(a) The requirements contained within the rules cannot be met.
(b) Other acceptable alternatives are not available.
(c) The requested variance will not create the potential for a health hazard, nuisance condition, or pollution of surface or groundwater.
(d) The requested variance will not violate laws governing water supply, water pollution, or sewage disposal.
(2) The proprietor shall make a request for the variance in writing to the department of environmental quality.
(3) Variances granted apply only to the specific site under consideration.

R 560.428 Plat approval or rejection.

Rule 428. (1) Within 30 days of receipt of the preliminary plat, the department shall issue a written approval or rejection to the proprietor.
(2) Before issuing a rejection for the suitability of an on-site water supply or a sewage disposal system, the department shall have information that site conditions are not suitable for the development of an on-site water supply or a sewage disposal system that complies with these rules.
(3) The department shall reject a development site less than 1 acre in size or a preliminary plat if any of the following provisions apply:
(a) There has been a failure to provide for connection to an available public sanitary sewer required by the municipality for a development site that is less than 1 acre in size or subdivision.
(b) The site conditions are not suitable for on-site sewage or on-site water systems where 1 or both is proposed.
(c) Information submitted is not sufficient to make a determination as to the suitability of conditions for on-site water supply or on-site sewage disposal.
(d) The department determines that submitted information is in error with respect to on-site water supply or sewage disposal in accordance with these rules.

ATTACHMENT C

MDEQ-DWRPD RULES
SECTION R325.1632 (3) AND SECTION R325.10818

(g) The manufacturer's name or trademark.
(h) The manufacturer's code for resin manufacture.
(i) The lot number and date of manufacture.
(j) A certification mark that verifies that the pipe is in compliance with the provisions of ANSI/NSF standard 14.
(3) Casing pipe that is manufactured from thermoplastic materials other than PVC shall be in compliance with the provisions of ASTM specification F 480-90, which is adopted by reference in R 325.1610, and shall be used only with the written prior approval of the director.

History: 1994 MR 4, Eff. Apr. 21, 1994.

R 325.1631c Construction of wells; PVC well casing joints.
Rule 131c. (1) PVC well casing joints shall be deep socket bell ends or couplings that are manufactured in accordance with ASTM specification F 480-90, which is adopted by reference in R 325.1610.
(2) PVC casing fittings shall be legibly marked with all of the following information:
(a) The nominal well casing pipe coupling size.
(b) The type of plastic.
(c) A designation that the fittings are in compliance with the provisions of ASTM specification F 480-90.
(d) The manufacturer's name or trademark.
(e) A certification mark that verifies that the fittings are in compliance with the provisions of ANSI/NSF standard 14.
(3) PVC well casing joints shall be formed utilizing a 2-step solvent cementing process that is consistent with the provisions of ASTM specification F 480-90. The pipe ends shall be free of burrs, dust, or moisture that might interfere with the solvent weld. A primer or welding solvent shall be used before cementing. The primer, welding solvent, and solvent cement shall be compatible with the pipe being coupled and the ambient temperature at the time of use and shall be in compliance with the provisions of R 325.1640.
(4) Screws or similar mechanical fasteners shall not be used for joining PVC well casing.
(5) PVC well casing joints which are not of a bell end configuration or are not made utilizing a 2-step solvent cementing process shall be approved, in writing, by the director before use.

History: 1994 MR 4, Eff. Apr. 21, 1994.

R 325.1631d Construction of wells; examination of pipe.
Rule 131d. Pipe which is intended for water well use and which is sold within the state, regardless of specification designation, shall be subject to random examination by the director. Any lot of pipe that contains defective lengths or lengths which are not in compliance with the specifications required in these rules shall not be used in the construction of a well.

History: 1994 MR 4, Eff. Apr. 21, 1994.

R 325.1632 Construction of wells; casing diameter, depth, termination, and installation procedures.
Rule 132. (1) Steel pipe that is used as permanent casing shall have an inside diameter of not less than 2 inches, except as provided in R 325.1632a.
(2) PVC pipe that is used as permanent casing shall have an inside diameter of not less than 5 inches, except if the pipe is installed as liner pipe. PVC well casing shall be installed only in an oversized borehole without driving.
(3) A casing shall extend not less than 25 feet below, and terminate not less than 12 inches above, the ground surface. A well that has less than 26 feet of casing shall not be used without obtaining written approval from the health officer pursuant to the provisions of R 325.1613.
(4) The top 25 feet of a well casing shall not be used as a suction line unless the well casing is protected by a standard weight or heavier outer casing. The top of both casings shall be finished pursuant to the provisions of R 325.1641 and R 325.1643.
(5) A driven steel permanent casing shall be protected by a drive shoe.
(6) In a paved area, the health officer may approve, in writing, a casing termination of 2 inches or more above the ground surface if the area is not subject to flooding, if the connections and openings are threaded or welded and watertight, and if acceptable casing venting is provided.

public water supplies.

Rule 814. If a modification of the standard isolation area is requested by a supplier of water of a type IIb or type III public water supply, the supplier shall submit to the department and obtain approval for a study of hydrogeological conditions consistent with the capacity of the well and the capacity of the aquifer.

History: 1954 ACS 94, Eff. Jan. 12, 1978; 1979 AC.

R 325.10815 Procedures for department approval of a proposed well for type I and type II public water supplies.

Rule 815. (1) In reviewing the location and acceptability of a proposed well for a type I or type II public water supply, the department shall determine whether the following procedures have been followed by a supplier of water:

(a) Approval has been obtained from the department for each proposed land parcel on which a test well is to be located.

(b) For type I public water supplies, ownership or adequate control as required by R 325.10810 or an option for ownership or adequate control of the required isolation area has been secured.

(c) Where required, a study of hydrogeological conditions has been approved by the department.

(d) Satisfactory yield tests have been completed on the test well or the well capacity has been established to the satisfaction of the department.

(e) Water quality analyses show results meeting the state drinking water standards.

(2) When the department finds that a proposed well, its location, and its construction features meet the requirements of this part, the department shall authorize construction of a production well or conversion of a test well to a production well.

History: 1954 ACS 94, Eff. Jan. 12, 1978; 1979 AC.

R 325.10816 Location of well in area subject to flooding.

Rule 816. (1) A well shall not be located in an area subject to flooding unless the well is protected as approved in writing by the department. The ground surface immediately adjacent to a well casing shall be graded so that surface water is diverted away from the casing. Surface flooding shall not be allowed closer than 25 feet from the well.

(2) The top of a well casing, any other opening into the well casing, well appurtenances, and controls shall be not less than 2 feet above the greater of the following:

(a) One hundred-year flood elevation.

(b) The maximum recorded flood elevation.

History: 1954 ACS 94, Eff. Jan. 12, 1978; 1979 AC.

R 325.10817 Top of well casing; elevation.

Rule 817. The top of a well casing shall terminate not less than 12 inches above the established ground surface, or the floor of a pump room, well room, or well house. In addition, for type IIb and type III public water supplies the top of a well casing may terminate not less than 12 inches above the floor of an approved basement offset.

History: 1954 ACS 94, Eff. Jan. 12, 1978; 1979 AC.

R 325.10818 Minimum well casing depth.

Rule 818. Casings for all wells serving public water supplies shall extend not less than 25 feet below the established ground surface.

History: 1954 ACS 94, Eff. Jan. 12, 1978; 1979 AC.

R 325.10819 Well casing in rock formation.

Rule 819. (1) In an area where a well is to be developed in fractured, jointed, or cavernous rock, the well shall not be approved as a production well unless all of the following conditions exist:

(a) Adequate protective material above the aquifer.

(b) No evidence of aquifer contamination.

(c) No direct flow from surface or near surface sources to the rock aquifer.

(2) The department may also approve a well developed in fractured, jointed, or cavernous rock based on special well construction features and a hydrogeologic study.

ATTACHMENT D

MDEQ - WMD
GWNIAA STAFF GUIDANCE

MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY

INTEROFFICE COMMUNICATION

May 4, 2000

TO: District and Section Supervisors
Waste Management Division

FROM: Jim Sygo, Chief
Waste Management Division

SUBJECT: Groundwater Not In An Aquifer (GWNIAA) Staff Guidance

A Waste Management Division (WMD) technical committee was put together in October of 1999 with the goal of developing a guidance document that would enable WMD staff to cautiously, thoroughly, and consistently apply a decision process for determining whether groundwater at a site is in an aquifer or not. Attached to this memo is the GWNIAA Staff Guidance developed by that committee .

We have received some requests for GWNIAA determinations in the past and will see more of them in the future. The purpose of this guidance is to consistently apply a review approach throughout the Division. This guidance is a decision -making tool. Please make it available to your geological and other technical staff. The use of this guidance is encouraged, but not demanded. Other approaches of review can be considered on a site-specific basis, but then it is also recommended for technical staff to consult with the WMD, Remedial Action Team.

The Guidance is divided into six sections: Introduction, Definitions, Criteria, Information Requirements, Additional Considerations, and Conclusions. The Criteria section outlines two criteria that need to be met and what can be used to demonstrate compliance with those criteria. The Information Requirements section outlines what information should be included as part of the groundwater study (which is needed as part of the GWNIAA demonstration).

If you or any of your staff should have any questions, comments, or concerns about the GWNIAA Staff Guidance, please contact Ron Stone from WMD's Hazardous Waste Section, at 517-373-7141.

Attachment

cc: George Bruchmann, WMD
Frank Ruswick, WMD
De Montgomery, WMD
Ron Stone, WMD
Pat Brennan, WMD-Jackson

WMD Staff Guidance for Determining Groundwater Not In An Aquifer

MDEQ-WMD **May 1, 2000**

INTRODUCTION

This document is guidance for the use of the Waste Management Division (WMD) staff, to consistently apply the requirements for a Groundwater Not In An Aquifer (GWNIAA) designation for siting criteria, pathway analysis, monitoring requirements, discharge authorizations, remediations, and other pertinent determinations under the following parts of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA): Part 31, Water Resources Protection; Part 111, Hazardous Waste Management; and Part 115, Solid Waste Management. This guidance describes the criteria that should be considered when evaluating whether groundwater encountered in a formation is or is not in an aquifer as well as information that should be used in applying those criteria.

The WMD reserves the right to utilize site-specific data in review of all cases, in order to decide the most appropriate determination for each site or formation. If it becomes necessary to remediate any media within the groundwater, hazardous waste, or solid waste programs of WMD, Part 201, Environmental Remediation, of the NREPA, is utilized. Part 201 requires all exposure routes and receptors at sites of environmental contamination to be evaluated based upon site conditions and characteristics. At a remediation site where it is determined that groundwater ingestion is not a relevant exposure pathway, it still will be necessary to evaluate all other transport mechanisms and exposure pathways that might result in unacceptable exposure. Monitoring of a saturated zone that is "GWNIAA" may still be necessary in relation to other pathways such as groundwater-surface water interface criteria (GSI) or indoor air inhalation.

This guidance does not apply to an area that has been determined by the Part 31 Groundwater Discharge Permit program to be a monitoring zone.

DEFINITIONS

- Aquifer: A geological formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs.
- Crock Well: A well traditionally constructed by excavating or boring a large diameter hole and placing vitrified clay tiles, pre-cast concrete pipe, or stone as casing or side walls to keep the excavation from collapsing.
- Driven Well (or Stab/Point Well): Consists of a well point (screen) that is attached to the bottom of the well casing and is pushed into the ground by hand or mechanical methods.
- Formation: a unique lithologic unit that can be mapped, but does not include a unit composed of material that has been physically or chemically altered, transformed, or used during a manufacturing process, such that they would impact the potable quality of the groundwater.
- Groundwater: Water below the land surface in a zone of saturation.
- Monitoring Zone: Area(s) beneath the subsurface where the hydrogeologic environment allows the movement of groundwater and potentially entrained contaminants and is capable of yielding a representative groundwater sample. A monitoring zone may or may not be naturally saturated and may be influenced by regulated surface activities.

- Owner/Operator: The person who owns the facility, or part of the facility, including the titleholder of the land on which the facility is located or the person responsible for the overall operation of the facility.

- Geologist or qualified groundwater scientist: A scientist or engineer who has received a baccalaureate or postgraduate degree in the natural sciences or engineering and who has sufficient training and experience in groundwater hydrology and related fields, as demonstrated by state registration, professional certification(s), or completion of accredited university programs, to make sound professional judgments regarding groundwater monitoring, geological conditions, contaminant fate and transport, and corrective action.

- Staff Geologist: the WMD geologist assigned to the project in question.

- Venting: the discharge of groundwater to surface water or the ground surface.

CRITERIA

It is the responsibility of the owner/operator of a site to demonstrate that the groundwater beneath the site is GWNIAA and that the groundwater ingestion exposure pathway does not apply. Both of the following criteria must be met to make this demonstration:

1. The formation yields an insignificant amount of water below the site (considering local and regional hydrogeology). This criterion can be met by any one or a combination of the following:

   a. All site monitoring wells installed in the formation bail or pump dry (at a maximum pumping rate of 0.1 gpm) and do not recharge to within 80 percent of the original well volumes within twenty-four (24) hours. Monitoring wells must be shown to have been installed properly and are presently in good operational condition and the screens must fully penetrate the saturated zone. The staff geologist, on a case-by-case basis, can approve different pumping and recharge rates.

   b. The *in situ* hydraulic conductivity is to be based on a minimum of five (5) site -specific tests, each of which is less than 1.0×10^{-6} centimeters per second (cm/s). The test results are not to be averaged. Well locations must be approved in advance and cover the formation of concern across the site. The exact number of tests will depend on the size and complexity of the site and will need to be approved by the staff geologist. The staff geologist, on a case-by-case basis, can consider different hydraulic conductivity values for use.

   c. A site pumping test[1], designed appropriately to test the formation in question, yields less than 0.1 gallon per minute.

2. The groundwater in question is not in hydraulic communication with groundwater in an aquifer. This criterion can be met through any one or a combination of the following:

   a. Sufficient knowledge is demonstrated concerning the regional geology supplemented with adequate site-specific information (boring/monitoring well logs, geophysical information, etc.) and is approved by the WMD.

   b. A site pumping test[1] demonstrates that any water bearing seams of concern are isolated and are not in communication with an aquifer.

   c. A demonstration that the groundwater is a totally discharging system and is venting to a surface water body (that is not locally recharging an aquifer) can be used to show that the formation in question does not connect to another aquifer laterally. This demonstration must also show that

all GSI criteria are/will be met or that a mixing zone evaluation by the Surface Water Quality Division has been accepted. This demonstration would only eliminate the horizontal concerns with connection to other aquifers. It would still need to be demonstrated that the unit (or the receiving surface water body) in question does not connect to another aquifer vertically. There are many areas along the larger river systems where shallow saturated units with significant quantities of groundwater discharge directly to the river. It would be difficult to comply with both criteria number 1 and number 2 under these conditions, but it may still be possible to eliminate the drinking water pathway.

INFORMATION REQUIREMENTS

The demonstration that groundwater beneath a site is not in an aquifer, does not need to be monitored and, if applicable, that the groundwater ingestion exposure pathway does not apply, is made in a Groundwater/Hydrogeological Investigation (GI) Report and/or Remedial Action Plan (RAP). In order to make this demonstration the GI or RAP must address all of the applicable components identified below. The GI and/or RAP are subject to review and approval by the staff geologist (or other WMD staff), and additional information may be required to support a finding on the criteria described above.

1. Facility boring and well logs and all private water well logs within a minimum of ½ mile of the facility property boundaries. These should substantiate the continuity of the lower, competent confining layer.

2. At least two (2) scaled cross-sectional drawings, one down the centerline axis of the plume or contaminated area (or parallel to groundwater flow if there is no plume) and one perpendicular to this axis, showing topography, geology, groundwater, and other pertinent features.

3. Scaled isopach maps showing the thickness of the saturated zone and aquiclude/aquitard across the site.

4. A scaled site map showing all buried utility corridors and other subsurface structures, including wells or drainage tiles, that may act as contaminant migration routes or artificially lower the water table due to their depth or proximity to the groundwater. The depths of all such features should be identified and/or included on the cross-sections listed in point 2, above.

5. A summary of the regional geology and topography. Information to support a conclusion that the groundwater ingestion exposure pathway is not relevant should include a well-documented evaluation of site and regional characteristics.

6. A comparison of the formation groundwater elevations with the local aquifer groundwater elevations to sufficiently demonstrate the lack of hydraulic communication. These should also identify the groundwater flow direction at the site and indicate any seasonal variations.

7. Written response from the local health department indicating (1) whether they were contacted to make a determination whether crock wells or driven wells for any private water usage exist in the vicinity of the facility, (2) what that determination was, and (3) any concerns they may have regarding the site and/or the GWNIAA determination.

8. Written response from the Department of Environmental Quality (DEQ), Drinking Water and Radiological Protection Division (DWRPD) indicating whether they were contacted to determine if the facility is located in an approved Local Wellhead Protection Area (LWPA) and what that determination was (see ***www.deq.state.mi.us/dwrl***).

9. Any available groundwater quality analyses, including conditions upgradient, downgradient, and outside any area of on-site contamination.

10. Documentation of any other characteristics of the site that would assist in making this determination.

ADDITIONAL CONSIDERATIONS

1. When conducting this review as part of a site remediation, some programs may use an evaluation of the relative risk with respect to toxicity, concentration, volume, mass, or quantity of the hazardous substance in determining whether the groundwater poses a threat to the environment or the public health and safety. The staff geologist may request this information as part of the review for a GWNIAA determination.

2. With Michigan's highly variable geology, this decision -making process is often a localized consideration. There are some formations around the state in which groundwater availability is limited, but which may still be used as a water source by the use of crock wells or driven wells. Some of these formations may be used as a drinking water source, while others may be used for other purposes (sprinklers, cooling, swimming pools, etc.). If the site is in an area served by crock wells or driven wells or if the area groundwater is used for drinking water or other purposes, the owner/operator must assess whether the water source(s) may be impacted by site activity and whether sampling such water supplies is warranted. The documentation required to support a determination that the groundwater is not in an aquifer at this type of site would also be more extensive. The assigned staff geologist may require additional information to help in the decision making process for areas of the state where crock or driven wells are used.

3. If the groundwater beneath a site is determined to be not in an aquifer, it may be necessary to place a deed notification or restriction on the property to allow the higher degree of contamination (if existing) to remain. The deed notification or restriction should alert any existing or future owner of the condition of the groundwater, that it has been determined to be unusable, and that it will not impact neighboring properties. The staff geologist and/or the WMD must approve the wording of any deed notification or restriction before it is filed. Proof of filing must be supplied to the WMD. On-site soils that are remediated to levels that do not consider the groundwater pathway must not be removed to a different site where groundwater may be vulnerable.

4. The Owner/Operator must contact the DEQ, DWRPD to determine if the site is located in an approved LWPA (see ***www.deq.state.mi.us/dwr/***). If the site is located in such an area, the need for adequate documentation, data collection and assessment is greatly increased, and comments will be required from the DWRPD before a final decision can be made.

5. Monitoring wells used in this evaluation must be properly constructed, developed, and maintained in accordance with WMD approved methods and approved for use by the staff geologist.

6. Site characteristics vary. Therefore, depending on the characteristics of the specific site, additional information could be submitted to, or requested by, the WMD or the staff geologist. The owner/operator should contact the staff geologist concerning site -specific issues.

7. The formation may be naturally saturated, seasonally saturated, or only saturated due to a regulated discharge. These possibilities should be considered by the owner/operator during their evaluation. The staff geologist must determine whether the formation is a monitoring zone before concluding their evaluation.

CONCLUSIONS

This document is intended to assist the WMD staff to foster consistent application of the NREPA, Parts 31, 111, and 115, regarding designations of GWNIAA. This document is not intended to convey any rights to any parties, nor create any duties or responsibilities under law. This document and matters addressed herein are subject to revision.

Responsibility for periodic review and revisions to this document lies with the WMD, Hazardous Waste Program Section, Technical Support Unit.

[1] Pumping tests must be run by an individual qualified to conduct such tests. These tests must be run for sufficient time to determine if boundary conditions (e.g., impermeable boundaries, recharge from leaky confining layers) are encountered. Plotting the drawdown versus time graphs in the field during the pumping test is recommended as a means of determining when the pumping test can be terminated. Wells to be used (or plans for proposed wells) must be approved by the staff geologist, before the test is performed.

ATTACHMENT E

MDEQ - STD
OPERATIONAL MEMORANDUM NO. 11

DEQ UNDERGROUND STORAGE TANK DIVISION

SUBJECT: Criteria to Eliminate the Potable Groundwater Pathway	DATE: August 25, 1997	Operational Memorandum No. 11

Introduction

Part 213, Leaking Underground Storage Tanks (LUST), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, requires all exposure pathways and receptors to be evaluated based upon site conditions and characteristics utilizing the Risk-Based Corrective Action (RBCA) process. This document describes the criteria that must be utilized for evaluating site conditions including the quantity of groundwater present in order to eliminate the potable groundwater pathway at a site. The criteria presented in this operational memorandum has been adapted, as appropriate, for the application in the Underground Storage Tank Division's (USTD) RBCA process. This operational memorandum should be filed as Attachment 15 in your Guidance Document for Risk-Based Corrective Action at Leaking Underground Storage Tanks.

Regulatory Definitions

Groundwater: - Under Part 213 "Groundwater means water below the land surface in the zone of saturation."

Aquifer: - Part 201, Environmental Remediation, of Act 451, defines aquifer to mean, "a geological formation, group of formations, or part of a formation capable of yielding a significant amount of groundwater to wells or springs."

Terminology as used in the Part 213 RBCA Process

Potable Groundwater: - Groundwater that is suitable and in sufficient quantity for human, animal and plant consumption, irrigation, and other uses within the residential, commercial and industrial categories. All potable groundwater must be protected for health based or aesthetic criteria, whichever is more restrictive, unless reliably restricted.

Non-Potable Groundwater: - Groundwater that is deemed unsuitable for the use specified in the potable definition due to naturally occurring elements and/or dissolved salts present in the groundwater. Documentation from the local health department should be provided regarding a determination of non-potability. Non-Potable groundwater may act as a transport mechanism to affect human or other receptors such as surface waters or other environmental areas or species.

Documentation to support the determination of an insufficient quantity of groundwater will require a detailed evaluation and/or documentation of site characteristics by the Qualified Underground Storage Tank Consultant (QC) to verify that the potable groundwater pathway does not exist. Reasonable and adequate subsurface investigations, which may include geophysical activities, must be performed to document that the stated condition exists. A higher degree of

proof will be necessary to support this determination. The results of subsurface investigations and review of published materials should verify a lack of hydraulic communication with another aquifer(s). Conditions may exist in certain areas of the state where the groundwater may be used as a private potable water supply by the use of "crock wells." Such areas include, but are not limited to, parts of the Saginaw Valley and "Thumb" area, Ottawa, Menominee, and Ontonagon counties. The QC should also identify if the site is located within a local wellhead protection program area. Contact should be made with the local health department to identify the areas served by "crock wells", and the Department of Environmental Quality Drinking Water and Radiological Protection Division to determine if sites are located in wellhead protection areas.

Criteria to eliminate the potable groundwater pathway.

In order for the QC to demonstrate that the groundwater present beneath the site is of insufficient quantity to meet the definition of aquifer, the following four (4) criteria must be met:

1. **The groundwater formation below the site must yield an insufficient quantity of water considering local and regional hydrogeology. Any one of the following criteria are acceptable by the Underground Storage Tank Division (USTD) to document that an insufficient quantity of groundwater is present in order to eliminate the potable groundwater pathway.**

   a) All site monitoring wells installed in the native material must bail dry after sustained bailing of less than five (5) gallons (excluding the volume of groundwater initially present in the well casing and filter pack).
   b) The saturated thickness measured in the site monitoring wells must average less than two (2) feet when set at the bottom of the formation. The measurements should account for seasonal groundwater fluctuations.
   c) The average in situ hydraulic conductivity based on at least three (3) site specific slug tests multiplied by 10 must be less than 5.0×10^{-6} centimeters per second, or an aquifer pumping test* that demonstrates a hydraulic conductivity of 5.0×10^{-6}. (Slug tests may underestimate the hydraulic conductivity by an order of magnitude.)
   d) A site aquifer pumping test* demonstrates that the water bearing seams are isolated, and are not in communication with one another.
   e) A site aquifer pumping test* yields less than 0.1 gallons per minute and the contamination will not leave the property above Tier 1 Residential Risk-Based Screening Level (RBSL) unless the off-site property is reliably restricted.
   f) A determination that the well yield (Q) is less than 0.1 gallons per minute based on the use of appropriate hydrogeologic equations that incorporate aquifer condition (confined or unconfined), hydraulic conductivity(k) and saturated thickness (b). These equations must be shown to be applicable to the site hydrogeologic conditions. Estimate of hydraulic conductivity from aquifer slug testing would still need to be multiplied by 10 as a correction factor for use in these equations.
   g) Other site specific Tier 2 evaluations may be proposed for review and approval by the USTD to eliminate the potable groundwater pathway.

*Aquifer pumping tests need to run for sufficient time to determine if boundary conditions (e.g., impermeable boundaries, recharge from leaky confining layers) are encountered. Plotting the drawdown versus time graphs in the field during the aquifer pumping test is recommended as a means of determining when the aquifer pumping test can be terminated.

2. **It must be demonstrated that a continuous confining layer exists across the entire site, and that the saturated zone is not in lateral or vertical communication with a lower adjacent aquifer.**

3. **The QC must provide the following supporting documentation in the Final Assessment Report (FAR) and/or the Closure Report:**

   a) On-site boring logs and area well logs to substantiate the continuity of the lower confining layer, and the absence of communication with an aquifer. Provide a minimum of two (2) scaled cross-sectional drawings, with surface topography, in the FAR or Closure Report; one down the centerline axis of the plume and the other perpendicular to the axis across the plume width.
   b) Documentation that the local health department was contacted to determine if "crock wells" for private potable water supplies exist within 500 ft. of the site and the Department of Environmental Quality Drinking Water and Radiological Protection Division was contacted to determine if the site is located in an approved local wellhead protection area.
   c) Comparison of area surface water elevations with the site groundwater elevations.
   d) Documentation on the local geology and topographical variances.
   e) Document the site relationship to recharge and discharge zones in the area, including a map of paved areas or other surfaces which are impervious to infiltration.
   f) Identify on a site map all buried utility corridors and other subsurface structures that may act as contaminant migration pathways due to their depth or proximity to the groundwater. Identify the depths of all utilities.
   g) Identify if the groundwater elevations across the site can be reasonably predicted, and a groundwater flow direction has been determined. Indicate any seasonal variations in the saturated zone.
   h) A map showing the thickness of the saturated zone across the site.
   i) Identify any subsurface drainage structures that would artificially lower the water table.
   j) Document any other unusual characteristics of the site that would assist in making this determination.

4. **Monitoring wells used in this evaluation must be properly constructed, and developed in accordance with standard operating practices.**

Site characteristics across the state may vary, therefore, additional factors concerning the site should be included or may be requested by the USTD. The QC should contact the USTD project manager or geologist concerning site specific issues not addressed by this memorandum.

NOTE: If the above criteria has been satisfied, the QC will still need to evaluate all other pathways to demonstrate that the groundwater beneath the site will not migrate or act as a transport mechanism to affect other exposure pathways and receptors, such as utilities, surface waters or inhalation.

This memorandum is intended to provide guidance to QCs and USTD staff to foster consistent application of Part 213. This document is not intended to convey any rights to any parties, nor create any duties or responsibilities under law. This document and matters addressed herein are subject to revision.

Questions about this memorandum should be directed to the appropriate USTD District Supervisor.

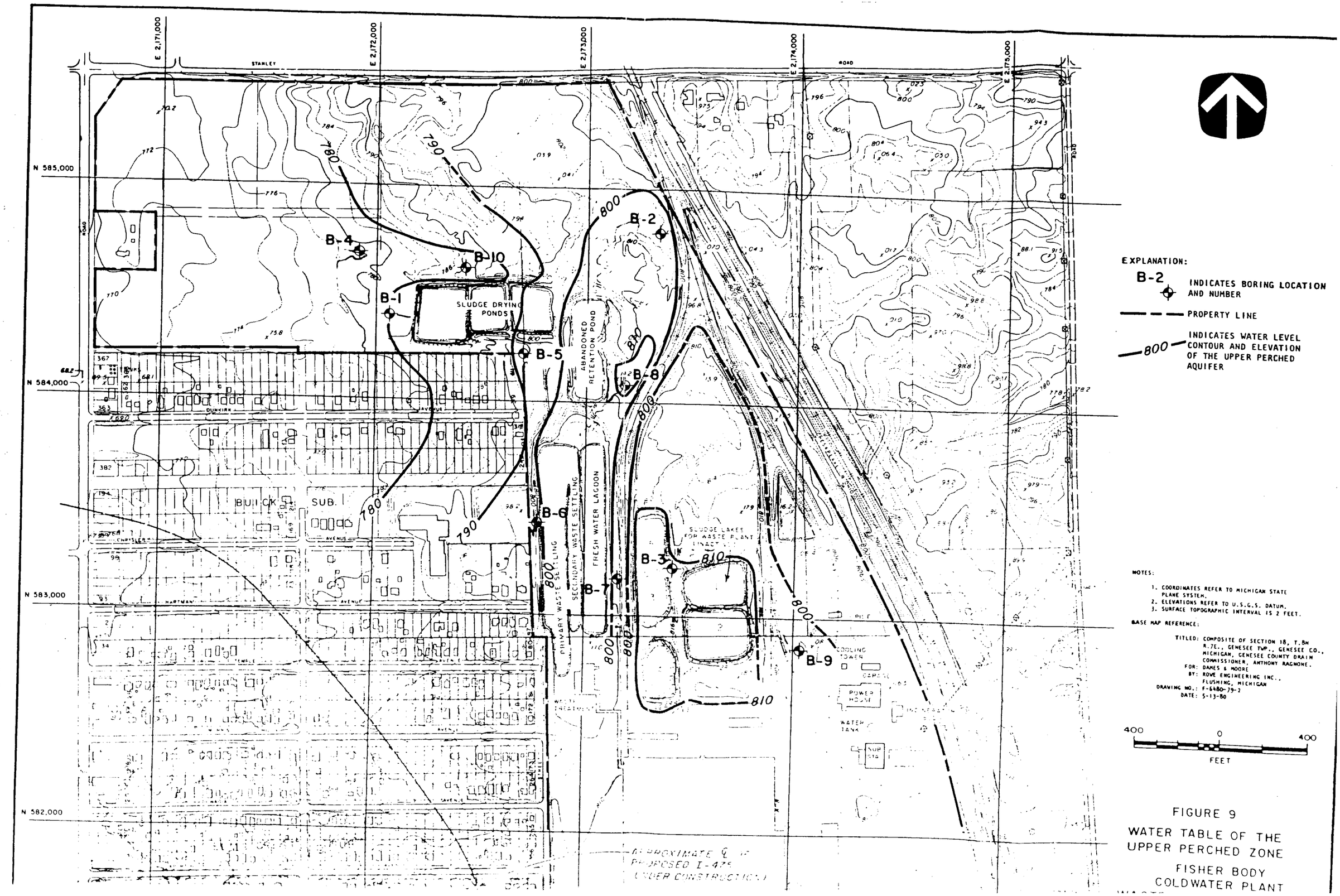
Responsibility for periodic review and revisions to this memorandum lies with the Chief of the Field Operations Section.

Authorization:	Date:

Distribution: Qualified UST Consultants
USTD Mailing List
DEQ Division/Office Chiefs
USTD Supervisors

ATTACHMENT F

FIGURES 9 AND 10 FROM
HYDROGEOLOGICAL INVESTIGATION REPORT
(DAMES & MOORE, 1980)



EXPLANATION:

B-2 — INDICATES BORING LOCATION AND NUMBER

— — — PROPERTY LINE

800 — INDICATES WATER LEVEL CONTOUR AND ELEVATION OF THE UPPER PERCHED AQUIFER

NOTES:

1. COORDINATES REFER TO MICHIGAN STATE PLANE SYSTEM.
2. ELEVATIONS REFER TO U.S.G.S. DATUM.
3. SURFACE TOPOGRAPHIC INTERVAL IS 2 FEET.

BASE MAP REFERENCE:

TITLED: COMPOSITE OF SECTION 18, T.8N R.7E., GENESEE TWP., GENESEE CO., MICHIGAN, GENESEE COUNTY DRAIN COMMISSIONER, ANTHONY RAGHONE.
FOR: DAMES & MOORE
BY: ROWE ENGINEERING INC., FLUSHING, MICHIGAN
DRAWING NO.: F-6480-79-2
DATE: 5-13-80

400 0 400
FEET

FIGURE 9

WATER TABLE OF THE UPPER PERCHED ZONE

FISHER BODY COLDWATER PLANT

00299-052-07

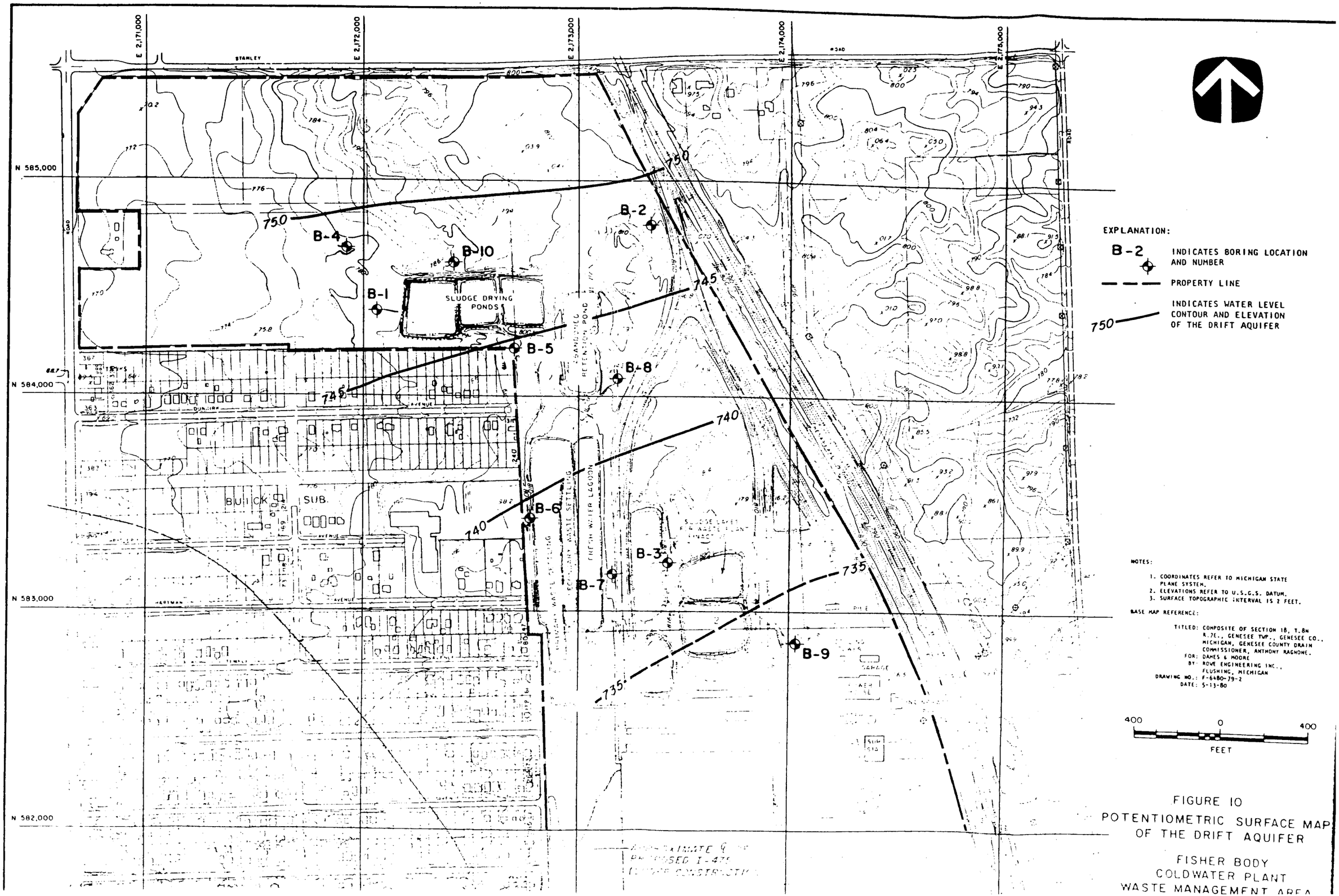


FIGURE 10
POTENTIOMETRIC SURFACE MAP OF THE DRIFT AQUIFER

FISHER BODY
COLDWATER PLANT
WASTE MANAGEMENT AREA

00299-052-07

ATTACHMENT G

LETTER FROM MDEQ - DWRPD
RE: WELLHEAD PROTECTION AREAS

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF ENVIRONMENTAL QUALITY

"Better Service for a Better Environment"

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

INTERNET: www.deq.state.mi.us

RUSSELL J. HARDING, Director

REPLY TO:

DRINKING WATER & RADIOLOGICAL PROTECTION DIVISION
3423 N MARTIN L KING JR BLVD
PO BOX 30630
LANSING, MI 48909-8130

April 05, 2001

Ms. Sara Varty
Conestoga-Rovers & Associates
651 Colby Drive
Waterloo, Ontario N2V 1C2

SUBJECT: Wellhead Protection Areas

Dear Ms. Varty:

In response to your telephone inquiry today, I have checked our database for the existence of delineated wellhead protection areas in the vicinity of the following site:

- G-1245 E. Coldwater Road, Flint, Michigan (Genesee Township)

This site is not within a delineated wellhead protection area. The nearest wellhead protection area is approximately 10 miles east-southeast of your site, in Davison, Michigan.

Please contact me if you have further questions.

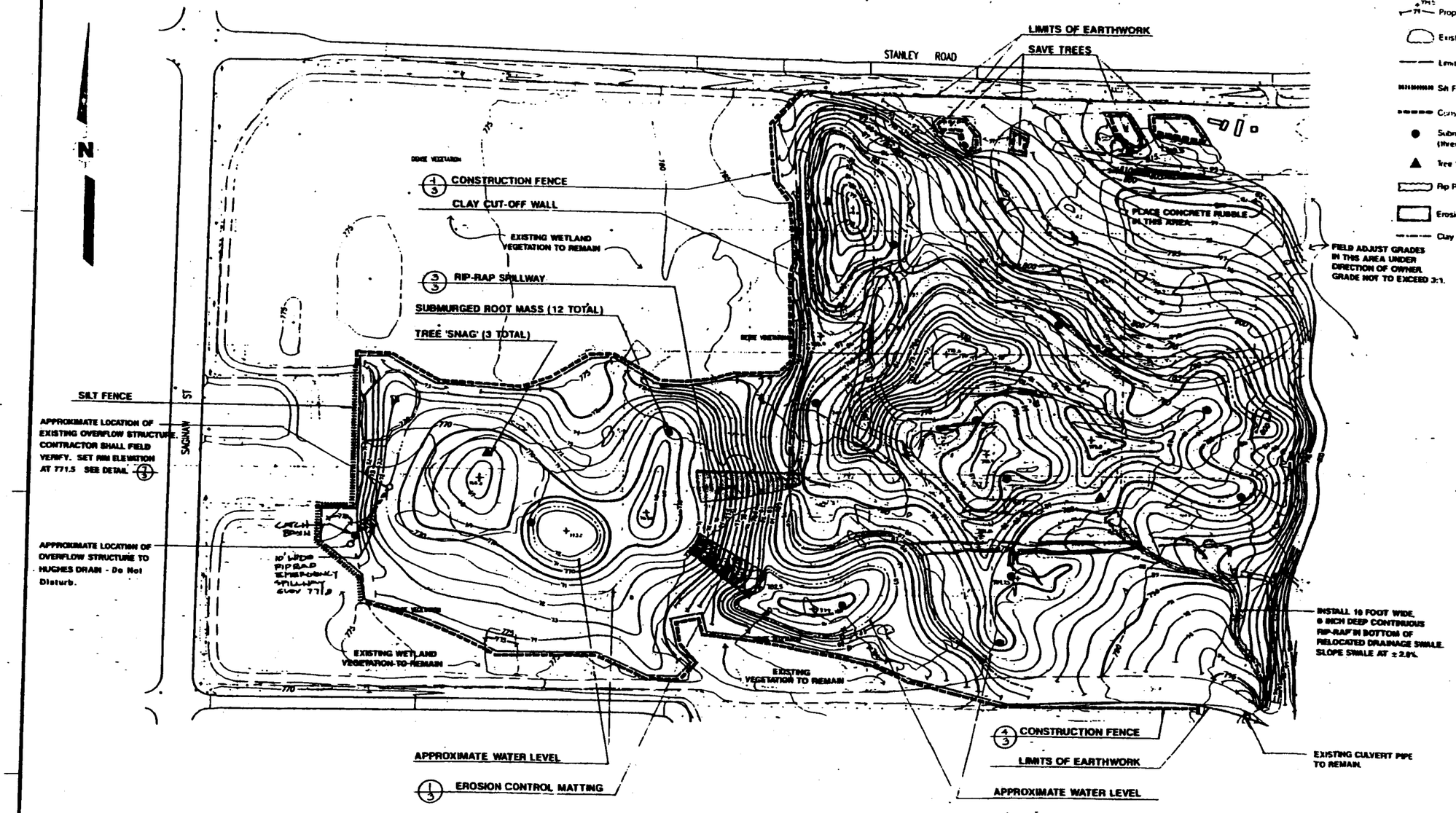
Sincerely,

Wayne W Kukuk

Wayne W. Kukuk, Geologist
Wellhead Protection Unit
Ground Water Supply Section
Drinking Water and Radiological
Protection Division
517-335-8964
kukukw@state.mi.us

ATTACHMENT G

RESPONSE TO COMMENT NO. 10
SECTION 5.3.4 - HYDROLOGY



LEGEND

- Existing Contour — Spot Elevation
- Proposed Contour — Spot Elevation
- Existing Vegetation
- Limits of Earthwork
- Silt Fence
- Construction Fence or Silt Fence
- Submerged Root Mass (three roots each)
- Tree 'Snag' (three trees each)
- Rip Rap
- Erosion Control Matting
- Clay Cut Off Wall

REFERENCES

1. TOPOGRAPHIC MAP PREPARED BY WOOLPERT DAYTON, OHIO DATE OF AERIAL PHOTOGRAPH 9-19-93
2. CONTOURS WITHIN PONDED WATER AREAS WERE

GENERAL NOTES

1. Notify the Owner's Representative of any discrepancies shown on this plan prior to starting construction.
2. No existing underground utilities have been identified within the work limits. Notify Miss Dig 48 hours in advance of starting work to verify the location of all underground utilities (if any).
3. The contractor's surveyor shall utilize the grid-coordinate system shown on this plan for determining the locations of all proposed contours.
4. The contractor shall confine work to areas within contract limit lines and maintain barrier fences in good condition throughout the construction of the project.
5. All grades shown on plan are finish grades.
6. Care shall be taken not to excavate below th ; depths indicated
7. Unless otherwise indicated, grade uniformly between points or between such points and existing grades. The finish surface shall be smooth, reasonably compact, and not more than 0.1 foot above or below the established grade or cross-section.
8. Existing vegetation in the N.W. and S.W. corners of the site supports forested and shrub/scrub wetland vegetation. These stands are considered key landscape features and are to be
9. Construction fence around individual trees shall be installed at the tree dripline.
10. All silt fence and construction fence shall be installed prior to starting earthwork.
11. Clearing and grubbing is limited only to those areas inside limits of earthwork.
12. Some trees will be utilized as 'snags' for wildlife habitat. These trees will be selected from areas to be cleared and grubbed. Prior to seeding, 'snags' will be places by the contractor as the Wetland Consultants direction. Three 'snags' will be required (3 trees each 'snag)
13. Twelve root masses (three roots per mass) shall be placed prior to seeding, by the contractor, at the Wetland Consultants direction. Root masses shall be supplied from existing on site stockpile and supplemented from clearing and grubbing operations.
14. The contractor shall repair all disturbed areas outside work limits to its original condition
15. The existing manhole rim elevation is 771.75.
16. The existing drainage overflow structure rim elevation is 780.78 (Do not disturb).
17. The clay cut-off wall shall be constructed with on-site clay. Install and compact clay over existing

HYDROLOGY NOTES

1. Static water level above rip-rap spillway is anticipated to be at elevation 785.5.
2. Static water level below rip-rap spillway will be controlled from overflow structure at elevation 771.5.

TOPSOIL NOTES

1. Install 6 inch specified topsoil over all disturbed areas.

AS-BUILT NOTE:

1) EARTHWORK WAS CONDUCTED IN ACCORDANCE WITH THIS PLAN NO CHANGES WERE MADE EXCEPT TOPSOIL WAS DELETED ABOVE CONTOUR ELEV. 785.5. AREAS ABOVE THIS ELEVATION ARE UPLANDS.
2) AN EMERGENCY SPILLWAY AND CATCH BASIN WERE INSTALLED BETWEEN THE OVERFLOW STRUCTURE TO HUGHES DRAIN AND EXISTING OVERFLOW STRUCTURE SEE ABOVE

JJR
Johnson Johnson & Roy inc
Planning
Landscape Architecture
Urban Design
Civil Engineering
Environmental Services
100 Miller
Ann Arbor, Michigan 48104
313 665 4457
313 665 7520 FAX

Job No.	12390.00
Designed By	Design Review
Drawn By	Checked By
Project No.	
Project Manager	
Date	

As Built	9-9-94
Issued for Construction	1/25/94
Owner Review	1/21/94
Issued For	Date

GENERAL MOTORS CORPORATION

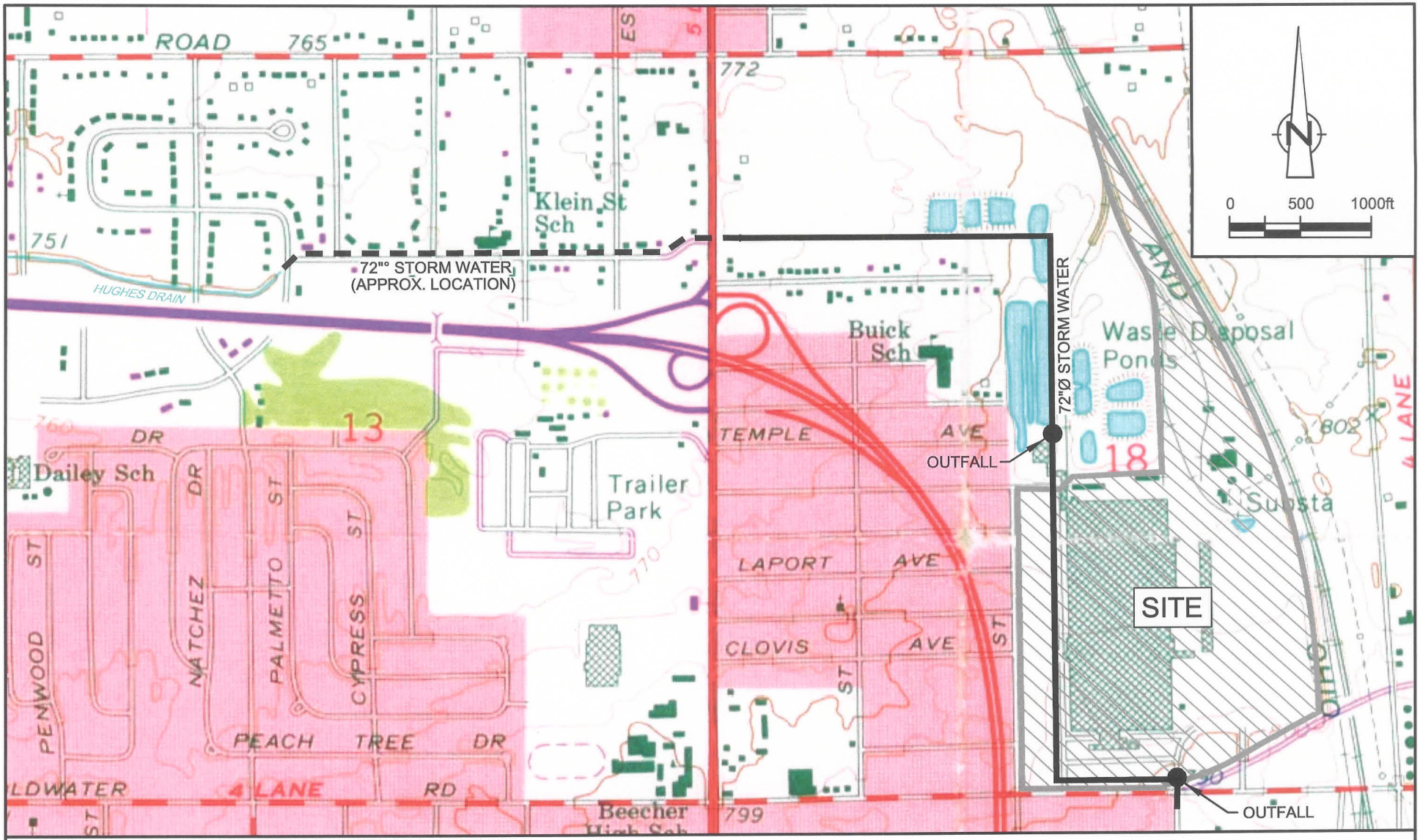
Coldwater Road Plant

Inland Fisher Guide Division
Flint, Michigan

WETLAND RESTORATION

Drawing Title

Grading Plan

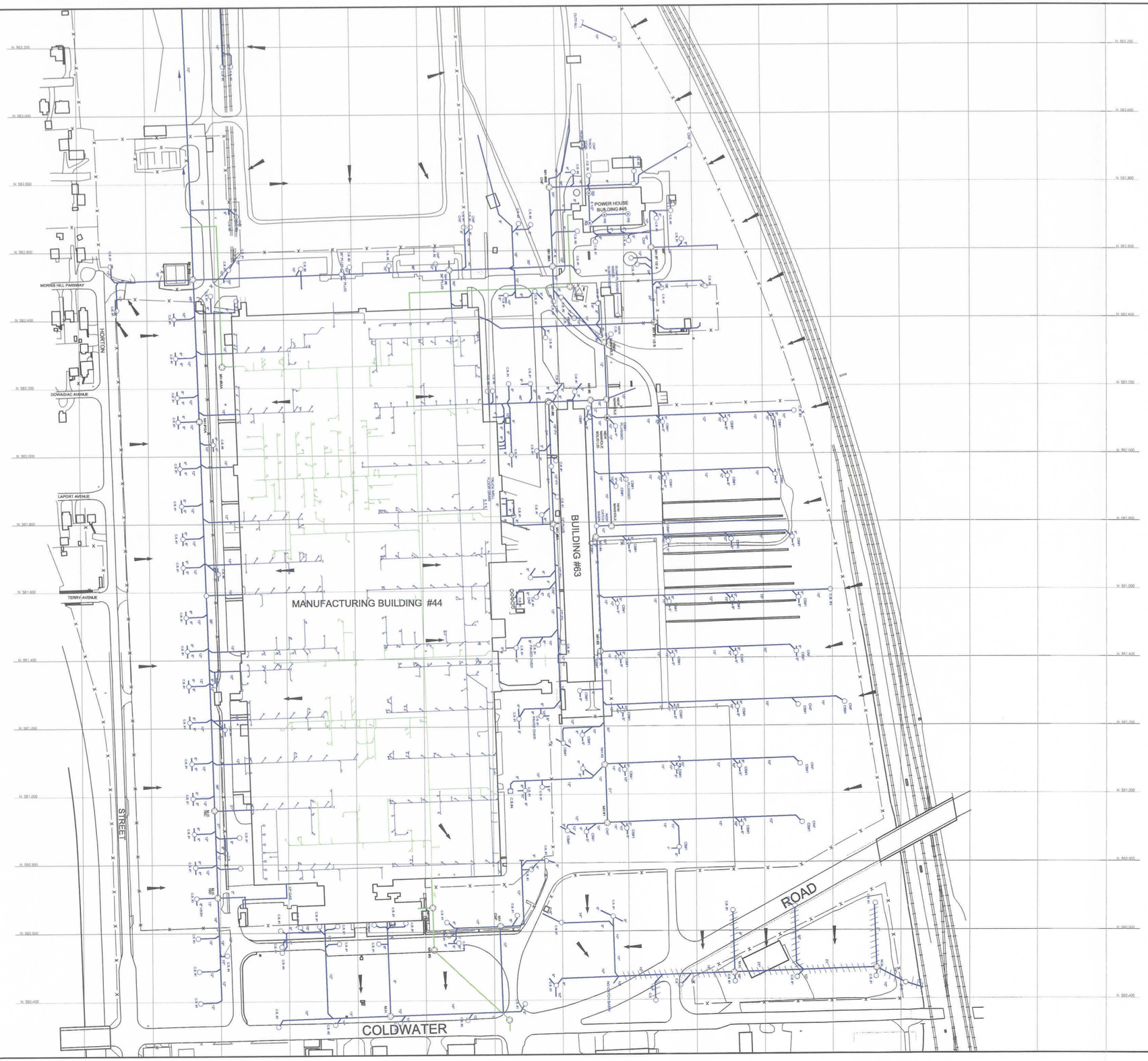


SOURCE: USGS QUADRANGLE MAP;
FLINT NORTH, MICHIGAN
PHOTOREVISED 1975

figure J.1

LOCATION OF STORM SEWER OUTFALL AT HUGHES DRAIN
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(HOLD003)GN-WA008 MAR 07/2002



NO	Revision	Date	Initial

0 50 150ft

LEGEND

- ASPHALT LINE
- BUILDING
- CATCH BASIN
- CURB
- DITCH
- FENCELINE
- FIRE HYDRANT
- GRAVEL LINE
- GUARDRAIL
- RAILROAD
- ROAD
- MANHOLE
- SIDEWALK
- SHORELINE
- TANK
- TRAIL
- MANHOLE
- ESTIMATED SURFACE DRAINAGE DIRECTION
- STORM LINES
- SANITARY LINES

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY

REALM

STORM AND SANITARY SEWER NETWORK PRIOR TO DEMOLITION

CONESTOGA-ROVERS & ASSOCIATES

Source Reference:
NOVA CONSULTANTS, INC. MAY 28, 2000

Project Manager:	Reviewed By:	Date:	
PROJ_MAN	N. BAKER	JULY 2000	
Scale: 1"=150'	Project No: 12636-40	Report No: HOLD003	Drawing No: 1

12636-40(HOLD003)GN-WA006 MAR 07/2002

ATTACHMENT H

RFI WORK PLAN ADDENDUM #2
(CRA, MARCH 2002)

RFI WORK PLAN ADDENDUM #2

FORMER PEREGRINE (US) INC.
COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

MARCH 2002
REF. NO. 12636 (23)
This report is printed on recycled paper.

TABLE OF CONTENTS

LIST OF FIGURES
(Following Text)

LIST OF ATTACHMENTS

1.0 INTRODUCTION

The following RFI Work Plan Addendum #2 (Addendum #2) presents a scope of work for additional soil investigation at AOI 2, AOI 9, and AOI 11 at the Peregrine (US) Inc. Coldwater Road Facility (Facility). This Addendum #2 also outlines additional work proposed to supplement our determination of Groundwater Not In An Aquifer (GWNIAA) for the shallow perched water at the Facility.

1.1 BACKGROUND

The RFI Report (CRA, November 2001) was submitted to MDEQ on November 29, 2000. Comments on the RFI Report were addressed to Ms. Cheryl Hiatt (REALM) from Ms. Kimberly Tyson (MDEQ-WMD) on March 29, 2001. Comment No. 15 addressed the exceedance of the MDEQ Industrial Direct Contact Criteria (IDCC) for lead at BH-9-26-00 (AOI 9) and for arsenic at BH-11-1-00 (AOI 11) and defined them as "hotspots" for lead and arsenic, respectively. MDEQ-WMD further indicated that delineation of the lead and arsenic hotspots is necessary. In addition to the delineation of these two hotspots, this Addendum #2 will address the delineation of 1,1-dichloroethene surrounding BH-9-23-00.

Comment No. 15 also indicated that the area surrounding BH-2-3-00 (AOI 2) should be considered a potential hotspot and recommended that further delineation be performed in this area. The Scope of Work to delineate this area is included in this Addendum #2.

Comment No. 4 identified that no samples were collected immediately adjacent to the location of historical sample K-35 where an exceedance of the IDCC for lead was noted. Investigation to further review this concern is also included in this Addendum #2.

Finally, Comment No. 9 outlined additional information that may be required in order to demonstrate GWNIAA for the shallow perched water at the Facility. Pumping tests to further determine the yield of the perched zone at the Facility as well as tests to demonstrate the lack of hydraulic communication between the perched water zone and the drift aquifer are also outlined in this Addendum #2.

The following sections provide more detail on each of the areas discussed above.

1.2 AOI 2 – FORMER WASTE PILE PAD

The Former Waste Pile Pad (AOI 2) was located east of Building 44 and approximately 100 feet north-northeast of Building 63.

Historically, one soil sample was collected at a location at AOI 2 with no exceedances of Part 201, Act 451 generic industrial criteria. As part of the RFI, four soil samples were collected at four different locations at AOI 2. Of these four samples, one surface sample had a level of arsenic equal to the MDEQ IDCC of 61,000 µg/kg. The location of the RFI and historical sampling locations at AOI 2 are presented on Figure 1. This Addendum #2 addresses the delineation of the area surrounding BH-2-3-00.

1.3 AOI 9 – FORMER PLATING AREAS

The Former Plating Areas were identified as AOI 9 for the RCRA Facility Investigation (RFI) that was implemented during the period from May – August, 2000. The Former Plating Areas comprised three separate areas in Building 44. The zinc barrel plating area was located toward the southeast end of the first floor, the chrome plating area was located toward the north end of the first floor, and the plating solution recycling area was located in the basement.

As part of the RFI, forty-four soil samples were collected from 30 boreholes within AOI 9. Nine of the forty-four samples were collected in the basement of Building 44. Of these nine samples, an exceedance of the MDEQ Industrial Direct Contact Criteria (IDCC) for lead and the MDEQ Particulate Soil Inhalation Criteria (PSIC) for nickel was encountered at BH-9-26-00.

RFI Work Plan Addendum #1 addressed to Ms. Kimberly Tyson on April 27, 2001 outlined the scope of work for the delineation of contamination in the vicinity of BH-9-26-00. A memo summarizing the delineation and subsequent removal of the soil in the area surrounding BH-9-26-00 is presented as Attachment A.

An exceedance of the IDCC for lead was also encountered at historical location K-35 within AOI 9. The location of this exceedance is presented on Figure 1. This Addendum #2 will also address the delineation of the area surrounding K-35.

In the zinc plating areas, the 1,1-dichloroethene concentration (1,000 µg/kg) detected in BH-9-23-00 exceeded the Soil Volatilization to Indoor Air Inhalation Criteria (SVIAIC) of 330 µg/kg. The hexavalent chromium concentration (611,000 µg/kg) detected in

BH-9-24-00 exceeded the Particulate Soil Inhalation Criteria of 240,000 µg/kg. The location of these exceedances is presented on Figure 1. This Addendum #2 will address the delineation of the areas surrounding BH-9-23-00 and BH-9-24-00.

1.4 AOI 11 – FORMER COAL STORAGE AREA

The Former Coal Storage Area was comprised of a relatively large area located to the north of the powerhouse (Building 45). Historically, two soil samples were collected at two different locations at AOI 11 with no exceedances of Part 201, Act 451 generic industrial criteria. As part of the RFI, eight soil samples were collected from five locations within AOI 11. An exceedance of the IDCC for arsenic was encountered at BH-11-1-00. The location of the RFI and historical sampling locations at AOI 11 are presented on Figure 1. This Addendum #2 addresses the delineation of the area surrounding BH-11-1-00.

1.5 GWNIAA DETERMINATION

A review of the MDEQ-WMD guidelines is provided in the CRA memorandum dated November 27, 2001 (see Attachment B). As a result of this review, additional investigative programs will be completed in order to confirm that firstly, the perched water formation below the Facility yields an insufficient quantity of water and secondly, that the perched groundwater in question is not in hydraulic communication with groundwater in an aquifer. This Addendum #2 outlines the Scope of Work for these additional investigative programs.

In order to supplement the GWNIAA determination at the Facility, a formal document following the guidelines recommended in the May 4, 2000 MDEQ-WMD GWNIAA document will be submitted to the MDEQ-WMD. In addition to the information provided in the RFI Report (CRA, 2000), MDEQ recommended that additional information be submitted as listed in Comment No. 9 of the MDEQ's March 29, 2001 comment letter.

2.0 SCOPE OF WORK

Twenty-eight shallow boreholes will be installed for soil sampling in order to delineate the four areas discussed above. Analytical and sampling protocols are presented in the Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP), respectively. The QAPP and FSP are presented in Appendices C and G in the RFI Work Plan (CRA, May 2000), respectively.

2.1 AOI 2 – FORMER WASTE PILE PAD

Soil samples will be collected at eight locations to delineate contamination at RFI borehole location BH-2-3-00. A shallow (0-2 feet bgs) and deep (4-6 feet bgs) sample will be collected at a location 10 feet to the north, south, east, and west of BH-2-3-00, respectively, as shown on Figure 2. The four shallow samples collected will be submitted for analysis of arsenic. The four deep samples will be held for analysis by the laboratory in the case that further vertical delineation is required.

A shallow (0-2 feet bgs) and deep (4-6 feet bgs) sample will also be collected at a location 30 feet to the north, south, east, and west of BH-2-3-00, respectively, as shown on Figure 2, and held for laboratory analysis, if further horizontal delineation is required.

2.2 AOI 9 – FORMER PLATING AREAS

Soil samples will be collected at eight locations to delineate contamination at historical borehole location K-35. A shallow (0-2 feet bgs) and deep (4-6 feet bgs) sample will be collected at a location 10 feet to the north, south, east, and west of K-35, respectively, as shown on Figure 3. The four shallow samples collected will be submitted for analysis of lead. The four deep samples will be held for analysis by the laboratory in the case that further vertical delineation is required.

A shallow (0-2 feet bgs) and deep (4-6 feet bgs) sample will be collected at a location 30 feet to the north, south, east, and west of K-35, respectively, as shown on Figure 3, and held for laboratory analysis, if further horizontal delineation is required.

Soil samples will be collected at four locations to delineate contamination at RFI borehole location BH-9-23-00. A shallow (0-2 feet bgs) and deep (4-6 feet bgs) sample will be collected at locations to the north, south, east, and west of the extent of the former zinc plater in the south end of Building 44 surrounding BH-9-23-00, respectively,

as shown on Figure 4. The four shallow samples collected will be submitted for analysis of 1,1-dichloroethene. The four deep samples will be held for analysis by the laboratory in the case that further vertical delineation is required.

Soil samples will be collected at four locations to delineate contamination at RFI borehole location BH-9-24-00. A shallow (0-2 feet bgs) and deep (4-6 feet bgs) sample will be collected to the north, south, east, and west of the extent of the former zinc plater in the south end of building 44 surrounding BH-9-24-00, respectively, as shown on Figure 5. The four shallow samples collected will be submitted for analysis of hexavalent chromium. The four deep samples will be held for analysis by the laboratory in the case that further vertical delineation is required.

2.3 AOI 11 – FORMER COAL STORAGE AREA

Soil samples will be collected at eight locations to delineate contamination at RFI borehole location BH-11-1-00. A shallow (0-2 feet bgs) and deep (4-6 feet bgs) sample will be collected at a location 10 feet to the north, south, east, and west of BH-11-1-00, respectively, as shown on Figure 6. The four shallow samples collected will be submitted for analysis of arsenic. The four deep samples will be held for analysis by the laboratory in the case that further vertical delineation is required.

A shallow (0-2 feet bgs) and deep (4-6 feet bgs) sample will also be collected at a location 30 feet to the north, south, east, and west of BH-11-1-00, respectively, as shown on Figure 6, and held for laboratory analysis, if further horizontal delineation is required.

2.4 GWNIAA DETERMINATION

2.4.1 YIELD OF SHALLOW WATER BEARING ZONE

An additional investigation program is proposed in order to further confirm the perched water bearing zone below the Facility yields an insufficient quantity of water to meet MDEQ's guidance quantifying "significant yield". This program will determine the hydraulic conductivities from single well response tests and the maximum potential pumping rate from individual wells at the Facility.

PFW-1 is an existing monitoring well with a depth of 85 feet at the southeast corner of the Facility boundary. The location of PFW-1 and the existing monitoring wells at the Facility are presented on Figure 7. The well log for PFW-1 is presented in Attachment C.

Boreholes will be completed at three new locations located near PFW-1 (see Figure 7). One soil sample from the water bearing zone will be collected for grain size analysis at each location. The boreholes will be completed to a depth of about 2 feet into the top of the confining unit. A 2-inch diameter monitoring well equipped with 1 to 2 feet of screen will be installed to the sand/clay contact at each location, and will be fully developed.

In order to determine the in situ hydraulic conductivity, single well response tests will be conducted at each new monitoring well location, as well as at the following existing monitoring well locations: PFW-9, PFB-24, MW-9, MW-5, and PFW-4. The locations of these monitoring wells and their historic static water levels are presented on Figure 7. These monitoring wells will subsequently be pumped for short durations in order to determine the maximum pumping rate for short-term constant rate testing. The constant rate test pumping program will be conducted at each well at their corresponding maximum practical rate for a duration of about four to six hours.

Single well response tests, as outlined above, will also be conducted at five existing monitoring well locations located north of the facility at the former waste management area (B-7, B-9, B-14, B-18A, and B-19A). The locations of these wells are presented on O'Brien & Gere's Monitoring Well Location Plan (Figure 7) in Attachment D.

2.4.2 HYDRAULIC COMMUNICATION

In order to further confirm that the shallow perched water in question is not in hydraulic communication with groundwater in an aquifer, an additional investigation program will be conducted.

Step-drawdown testing will be conducted at three different rates at PFW-1 to determine the well's efficiency and the appropriate rate for constant rate test pumping. A constant rate pumping test will then be conducted on PFW-1 at an appropriate pumping rate. The test will be conducted during a dry period of about one to two days prior to the test, during testing, and following the test for a minimum duration of about one day. Water levels will be monitored in PFW-1, the newly completed shallow monitoring wells and selected existing wells at the Facility (completed within both zones). The results would be evaluated to determine whether a hydraulic response was measured in the perched water bearing zone solely as a result of pumping of the lower aquifer, considering natural variations.

Step-drawdown testing, as outlined above, will also be performed at monitoring well B23D located north of the Facility (see Figure 7 in Attachment D). Water levels will be monitored in B23D and the existing wells at the former waste management area (completed within both zones).

3.0 SCHEDULE

Field activities are expected to be conducted during the second and third calendar quarters in 2002. Reporting activities will be completed approximately 60 days after the completion of the field activities.

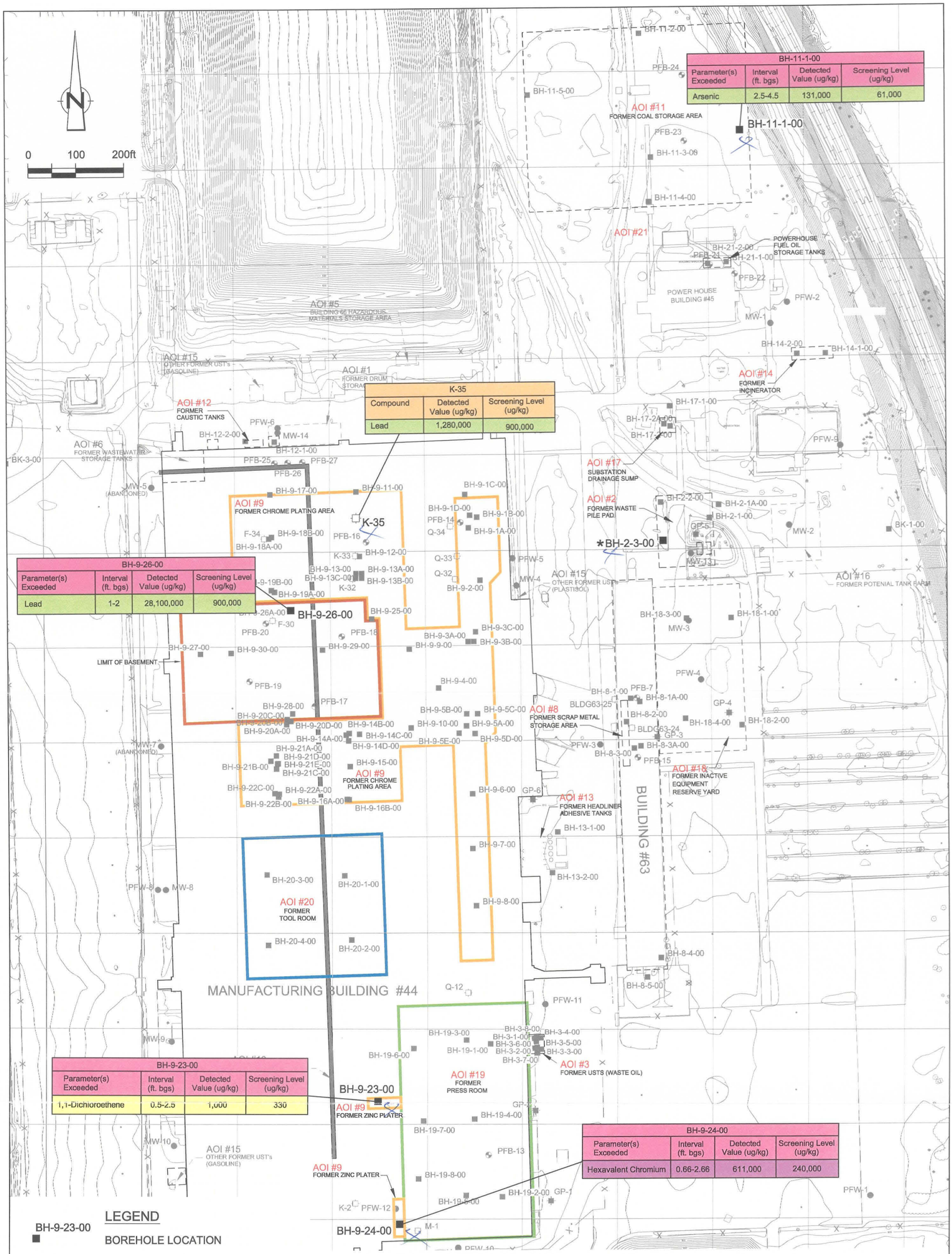


figure 1

HISTORICAL AND RFI EXCEEDANCES OF GENERIC IDCC, SVIAIC, AND PSIC
FORMER PEREGRINE (US) INC., COLDWATER ROAD FACILITY

Genesee Township, Michigan

12636-40(023)GN-WA001 MAR 08/2002

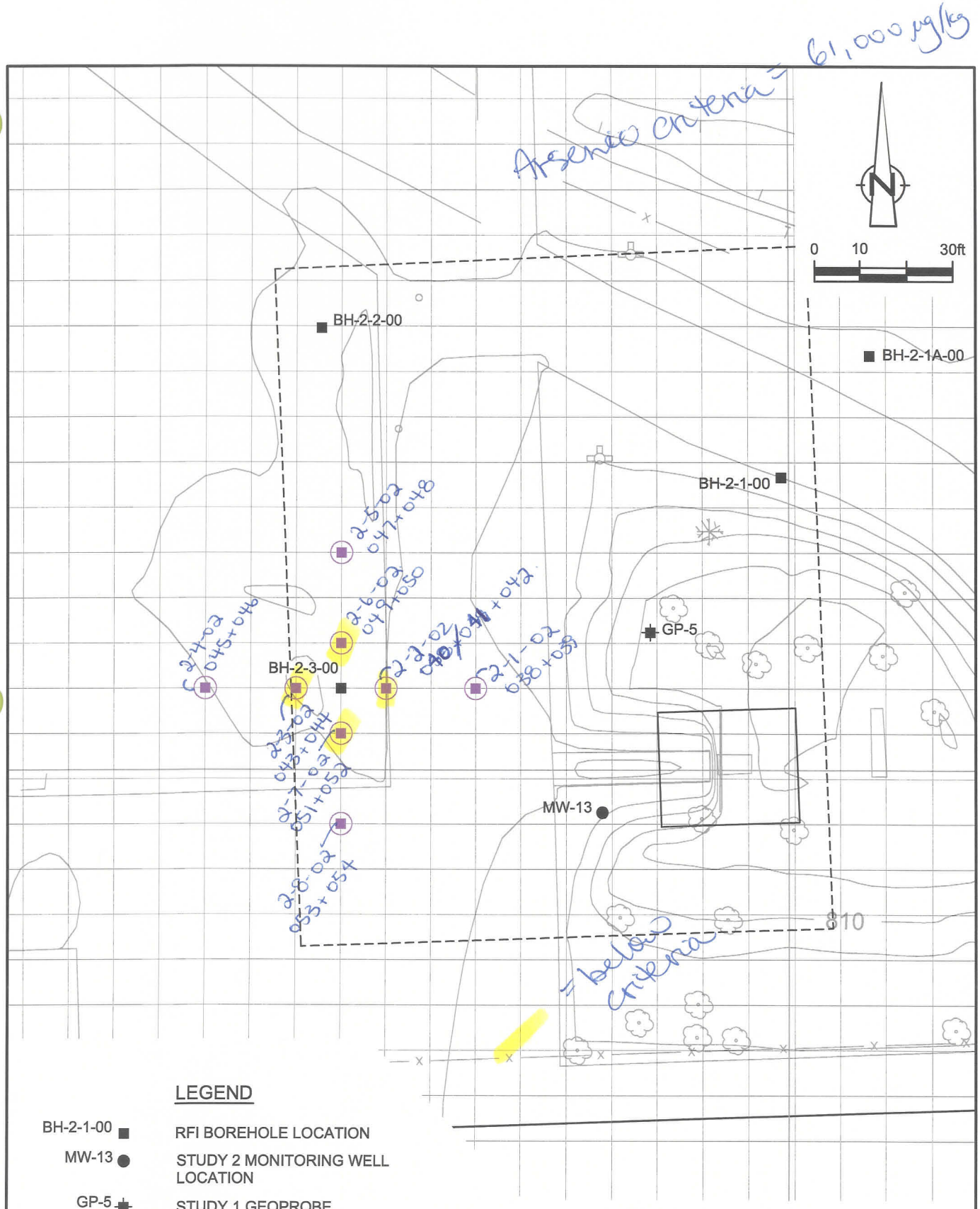


figure 2

DELINEATION OF BH-2-3-00
AOI 2 - FORMER WASTE PILE PAD
FORMER PEREGRINE (US) INC., COLDWATER ROAD FACILITY

Genesee Township, Michigan

CRA

12636-40(023)GN-WA002 MAR 08/2002

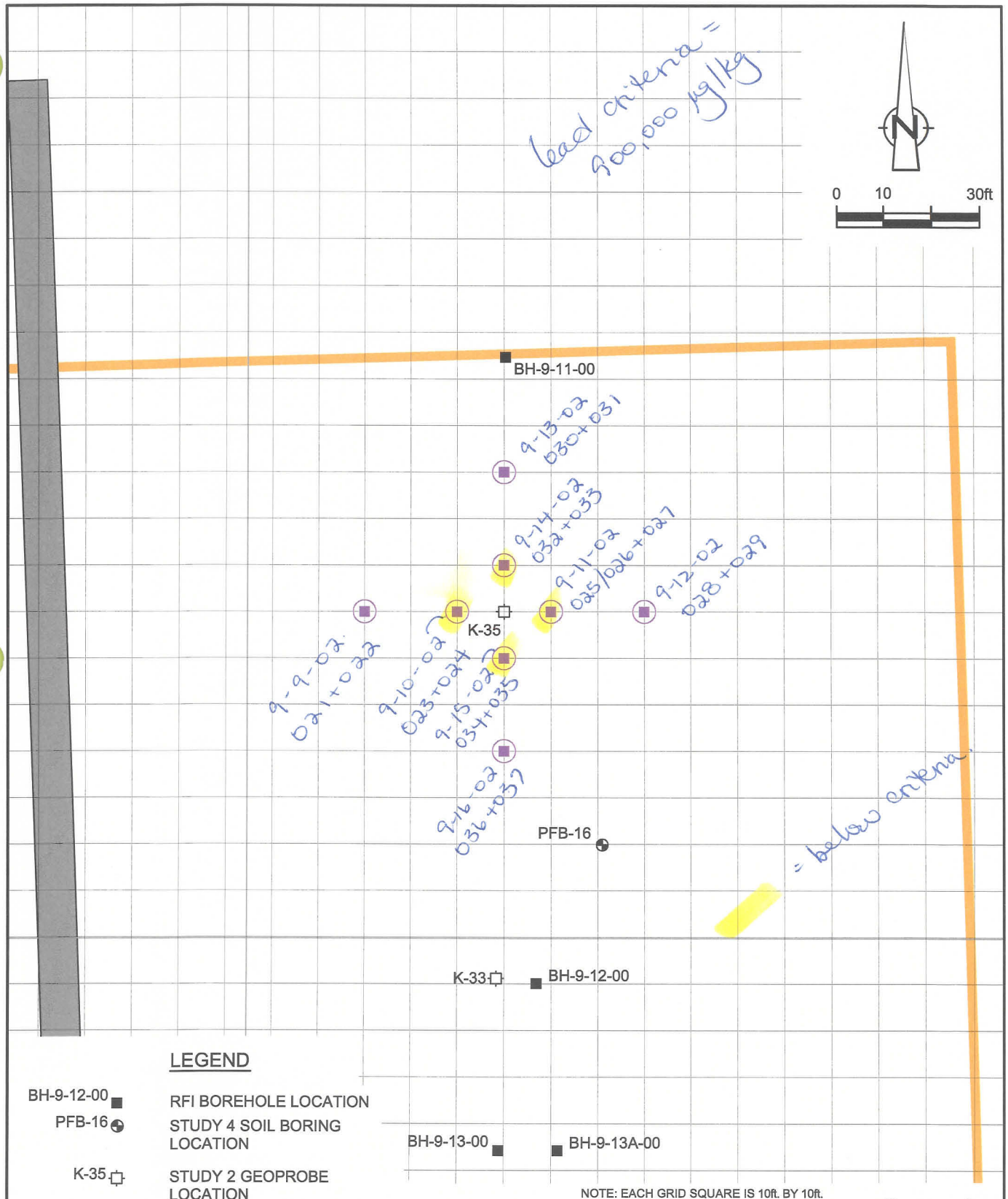


figure 3

DELINEATION OF K-35
AOI 9 - FORMER PLATING AREAS
FORMER PEREGRINE (US) INC., COLDWATER ROAD FACILITY
Genesee Township, Michigan

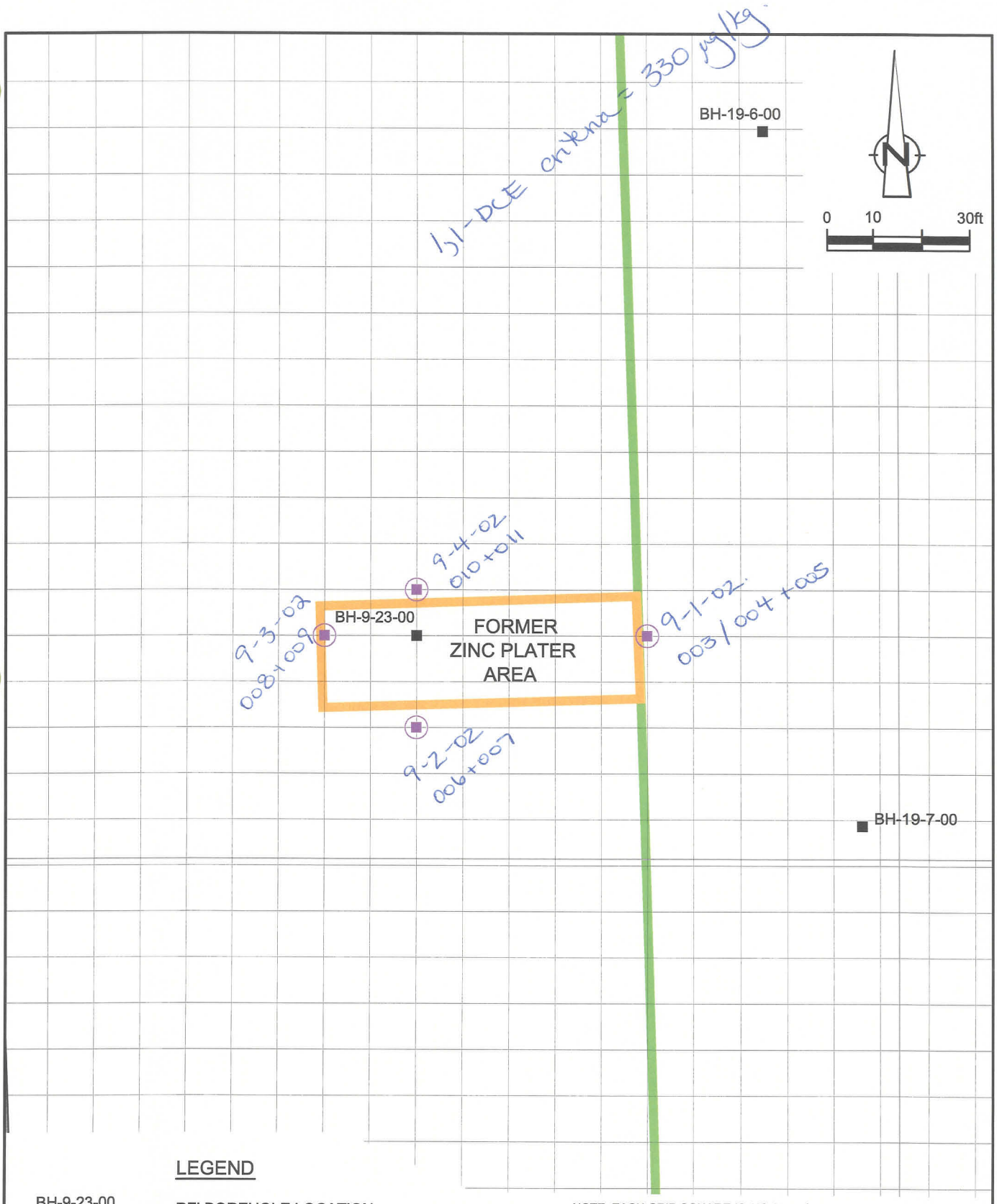


figure 4

DELINEATION OF BH-9-23-00
AOI 9 - FORMER PLATING AREAS
FORMER PEREGRINE (US) INC., COLDWATER ROAD FACILITY
Genesee Township, Michigan

CRA

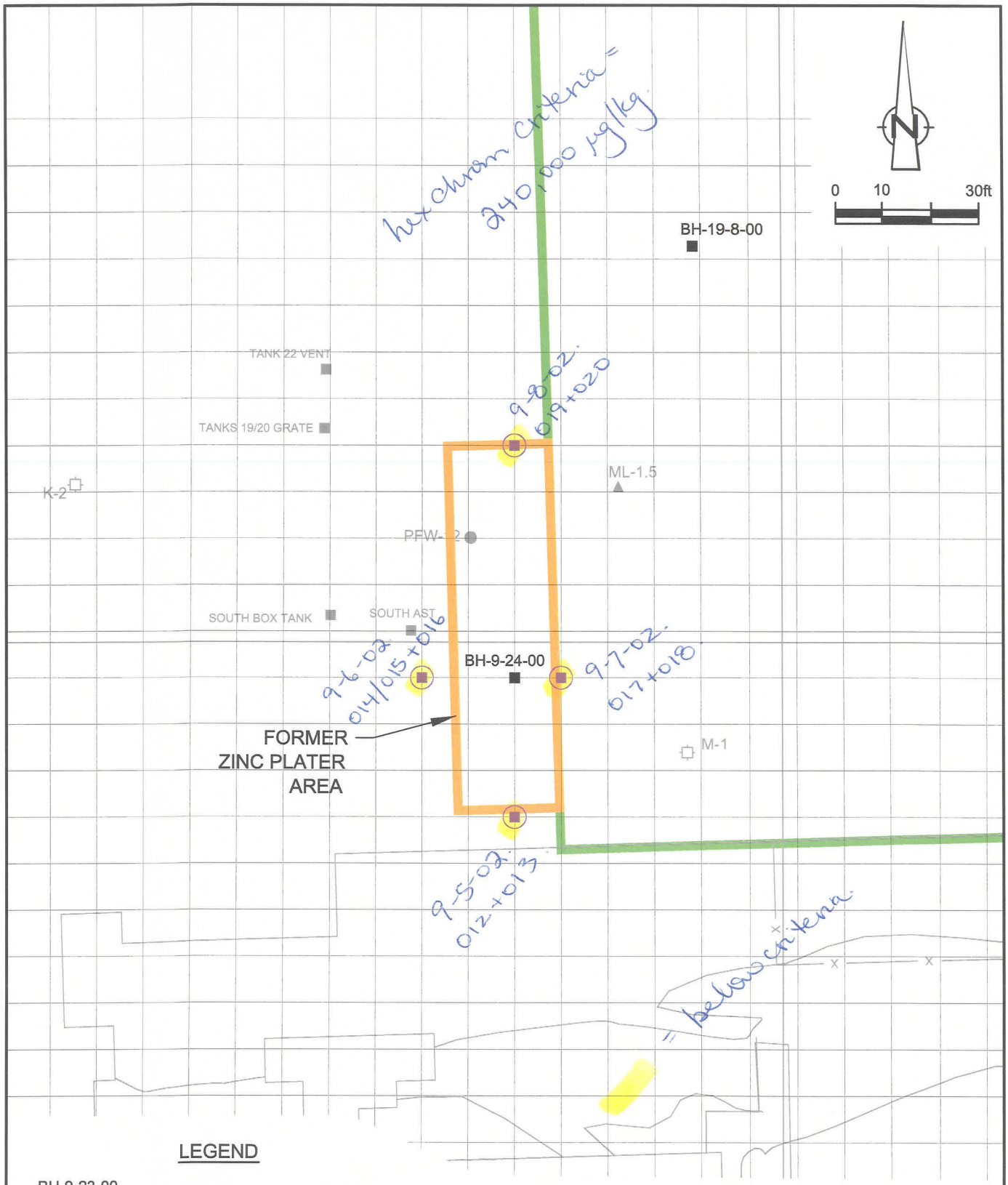


figure 5

DELINEATION OF BH-9-24-00
AOI 9 - FORMER PLATING AREAS
FORMER PEREGRINE (US) INC., COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(023)GN-WA007 MAR 08/2002

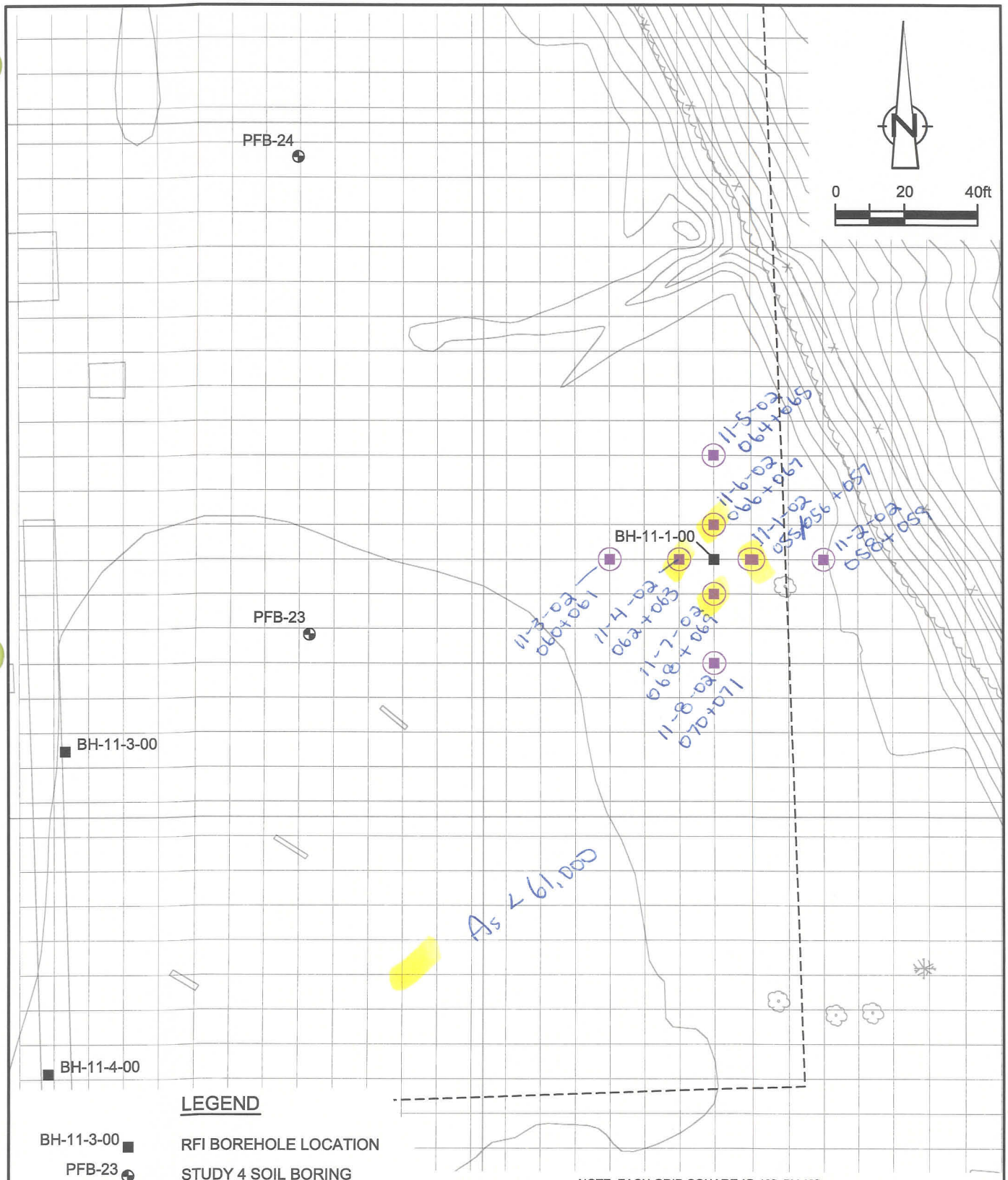
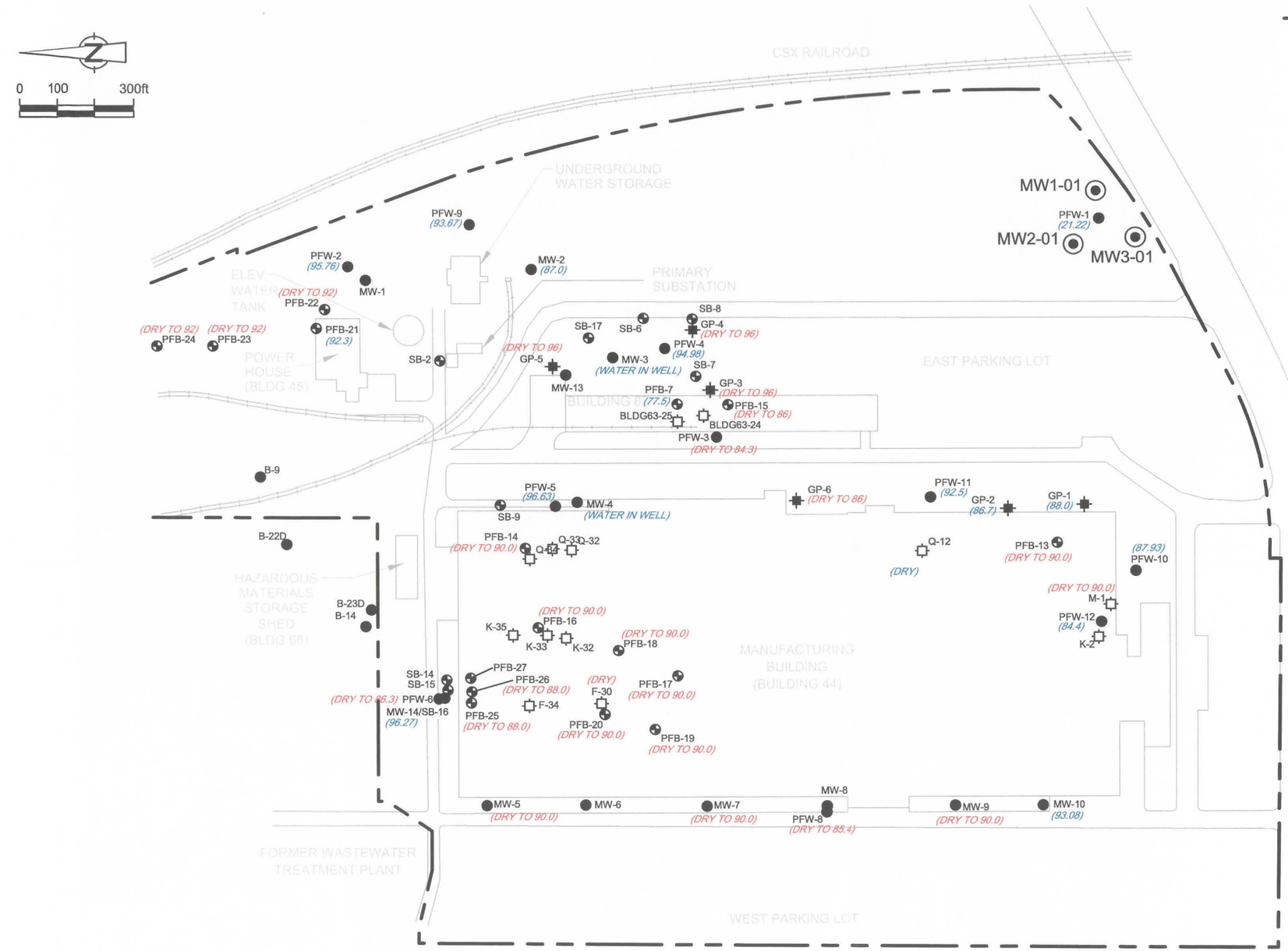


figure 6

DELINEATION OF BH-11-1-00
AOI 11 - FORMER COAL STORAGE AREA
FORMER PEREGRINE (US) INC., COLDWATER ROAD FACILITY

Genesee Township, Michigan

12636-40(023)GN-WA005 MAR 08/2002



LEGEND

- FACILITY BOUNDARY
- MW-7 — STUDY 2 MONITORING WELL LOCATION AND NUMBER
- PFW-12 — STUDY 4 MONITORING WELL LOCATION AND NUMBER
- B-9 — GENERAL MOTORS RCRA UNIT CLOSURE MONITORING WELL LOCATION AND NUMBER
- PFB-17 — STUDY 4 SOIL BORING LOCATION AND NUMBER
- SB-9 — STUDY 2 SOIL BORING LOCATION AND NUMBER
- GP-1 — STUDY 1 GEOPROBE LOCATION AND NUMBER
- Q-34 — STUDY 2 GEOPROBE LOCATION AND NUMBER
- (93.08) — WATER LEVEL
- MW1-01 — PROPOSED MONITORING WELL LOCATION

NOTES

1. THIS DRAWING IS FOR REFERENCE ONLY AND IS NEITHER COMPLETE NOR TO EXACTING SCALE.
2. INFERRED WATER TABLE SURFACE IS BASED ON DATA FROM SELECT EXTERIOR WELLS THAT ARE SCREENED ENTIRELY WITHIN THE UPPER 18 FEET OF THE PERCHED AQUIFER. LOCAL VARIATIONS MAY OCCUR IN AREAS NOT SUBJECT TO METEROLOGIC RECHARGE.
3. WATER ELEVATIONS ARE REFERENCED TO AN ON-SITE ARBITRARY DATUM OF 100.00 FEET FOR WELLS MONITORED BY STUDY 4 (JULY, 1997 REPORT)
   ALL OTHER WATER ELEVATIONS TAKEN FROM DRILLING/DEVELOPMENT INFORMATION WITH GROUND SURFACE ASSUMED AT 100.00 FEET.

figure 7

PRE-RFI STATIC WATER ELEVATIONS
FORMER PEREGRINE (US) , INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

CRA

ATTACHMENT A

MEMO RE: REMEDIATION OF SOIL SURROUNDING
BH-9-26-00 IN BASEMENT (CRA, MARCH 28, 2002)
(supplied as Attachment I in the Response to Comments)

ATTACHMENT B

MEMO RE: GWNIAA DETERMINATION REVIEW (CRA, MARCH 28, 2002)

(supplied as Attachment F in the Response to Comments)

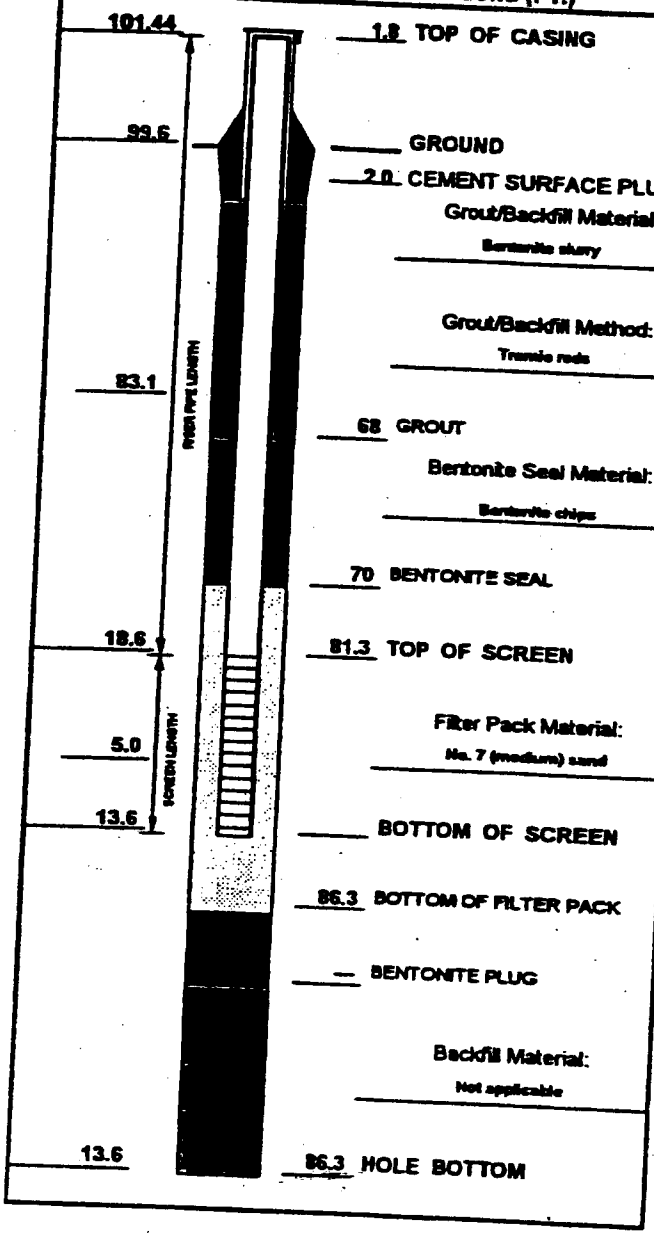
ATTACHMENT C

BORING LOG FOR PFW-1

RMT INC.

WELL CONSTRUCTION DIAGRAM

PROJECT:	Peregrine - Flint					WELL NO.:	PFW-1
PROJ. NO:	4036.05	DATE INSTALLED:	3-13-97	OBSV. BY:	DPR	CHECKED BY:	DPR



1. CASING AND SCREEN DETAILS:

A) Type Of Pipe: 2" PVC — Pipe Schedule: 40

B) Pipe Joints: Flush with O-ring

C) Solvent Used? No

D) Screen Type: 2" with machined slots, flush joint — Screen Slot Size: 0.01"

E) Borehole Diameter: 8 In. From 0 To 86.3 Ft.
___ In. From ___ To ___ Ft.

F) Surf. Casing Diameter: ___ In. From ___ To ___ Ft.
2nd Surface Casing: ___ In. From ___ To ___ Ft.

G) Installed Protective Cover W/ Lock? Yes

2. WELL DEVELOPMENT:

A) Method: Surge/pump with Bremer check valve

B) Time Spent Developing: 2.4 Hours

C) Water Removed: 300 Gallons
Added: 10 Gallons

D) Water Clarity Before/After Development:
Before: Opaque, gray
After: Slightly turbid (approximately 50 NTU)

F) Odor (Descr. if present) None

3. WATER LEVEL SUMMARY:

A) After Developing: ___ Ft. Below Top Of Casing

B) Other Date/Time: 3-31-97/1358 80.52 Ft.

Other Date/Time: ___ Ft.

Notes: Approximately 10 gallons of clean water were added to eliminate a temporary bridge during filter packing.

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	1 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
1	SS	17	16	0.6		Asphalt, broken. Fill: well-graded sand with gravel, little silt, little clay, brown, wet.	
2	SS	15	18	0		SANDY LEAN CLAY (CL), little fine to coarse sand, few fine to coarse gravel, slightly plastic, brown 10YR 4/3 with some mottling to grayish brown and yellowish brown, moist, (hard Pp> 4.5) (Glacial Till).	
3	SS	16	24	0		As above (CL), very stiff from 2 to 2.5 ft.	
					5		
4	SS	15	24	0		As above (CL), fractured, very stiff (Pp=3.4) below 5.7 feet.	
5	SS	22	24	0		As above (CL), becoming mottled brown, dark grayish brown and dark gray 10YR 4/1 - 4/2.	
6	SS	16	24	0	10	As above (CL), wet at sand partings @ 8.5' and 9.1', brown, trace fractures.	

GENERAL NOTES

DATE STARTED	12 MAR 97
DATE COMPLETED	13 MAR 97
RIG	CME 750 ATV
CREW CHIEF	R. BENNETT
LOGGED	DPR CHECKED LPL

WATER LEVEL OBSERVATIONS

WHILE DRILLING ▽	78.0 ft. bgl
AT COMPLETION ▼	
AFTER DRILLING	
CAVE-IN: DATE/TIME	DEPTH
WATER: DATE/TIME	DEPTH

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME: PEREGRINE FLINT
LOCATION: FLINT, MICHIGAN
CONTRACTOR: STEARNS DRILLING CO
DRILLING METHOD: 4.25" HSA

BORING NO.: PFW-1
SHEET NO.: 2 OF 7
PROJECT NO.: 4036.05
INSTALLATION: 3-13-97
SURFACE ELEV.: 99.6
BOREHOLE DIA.: 8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	INTERVAL TYPE	RECOVERY N	RECOVERY IN	PID	DEPTH		
7	SS	15	24			As above (CL), stiff to very stiff, (Pp= 1.6 to 2.7).	
						As above (CL).	
						WELL-GRADED SAND WITH SILT (SW), fine to medium, trace gravel, few clay, brown 10YR 4/3, moist, pieces of clay till.	
					15	SANDY LEAN CLAY (CL), some fine to coarse sand, few fine to coarse gravel, slightly plastic, brown 10YR 4/3, moist, stiff to very stiff (Glacial Till).	
8	SS	15	24	0		As above (CL), hard (Pp > 4).	
					20		
						As above (CL).	
9	SS	19	24	0			
						LEAN CLAY (CL), gradational areas of	

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	3 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	INTERVAL TYPE	RECOVERY N	RECOVERY IN	PID	DEPTH		
					25	clayey silt and sandy silt, slightly plastic, mottled brown, dark yellowish brown, and brownish gray, hard, fractured, friable, (Glacial Till).	
						SILTY SAND (SM), fine, brown, wet.	
10	SS	40	24	0			
					30	LEAN CLAY (CL), slightly plastic, brown with dark yellowish brown and black precipitate along fractures, mostly dark grayish brown below 29.6', moist to wet along silt partings, very hard, faint lamination (Glaciolacustrine).	
					35		

LOG OF TEST BORING

F-203 (R 01-87)

RMT

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	4 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
11	SS	20	0			As above (CL), gray 10YR 5/1 (based on cuttings).	
					40		
12	SS	17	24	0.6		As above (CL), wet along silt partings, very stiff (Pp = 3.2 to 3.7).	
					45	SILT (ML), grading from above clay, nonplastic, gray 10YR 5/1, moist, very stiff.	

LOG OF TEST BORING

F-203 (R 01-87)

RMT

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	5 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	INTERVAL TYPE	RECOVERY N	RECOVERY IN	PID	DEPTH		
					50		
13	SS	14	24	0.3		LEAN CLAY (CL), trace fine gravel, trace fine to coarse sand, medium plastic, gray 10YR 5/1, moist, very stiff (Pp = 2.3 to 2.7), faint lamination (Glaciolacustrine).	
					55		
					60		

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME: PEREGRINE FLINT
LOCATION: FLINT, MICHIGAN
CONTRACTOR: STEARNS DRILLING CO
DRILLING METHOD: 4.25" HSA

BORING NO.: PFW-1
SHEET NO.: 6 OF 7
PROJECT NO.: 4036.05
INSTALLATION: 3-13-97
SURFACE ELEV.: 99.6
BOREHOLE DIA.: 8 IN.

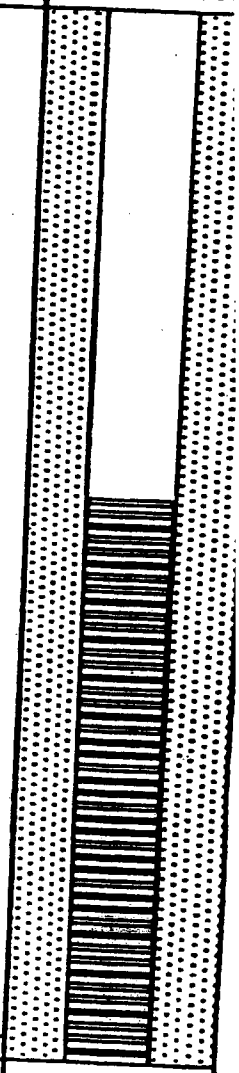
SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT.
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
14	SS	16	24	0.2		As above (CL), abundant silt partings.	
					65		
					70	<— Drillers note change in resistance @ 71 feet.	
15	SS	88	18			POORLY-GRADED SAND (SP), fine, trace silt, light gray 10YR 7/1, moist to dry, faint stratification.	
					75		

LOG OF TEST BORING

F-203 (R 01-87)

PROJECT NAME	PEREGRINE FLINT	BORING NO.	PFW-1
LOCATION	FLINT, MICHIGAN	SHEET NO.	7 OF 7
CONTRACTOR	STEARNS DRILLING CO	PROJECT NO.	4036.05
DRILLING METHOD	4.25" HSA	INSTALLATION	3-13-97
		SURFACE ELEV.	99.6
		BOREHOLE DIA.	8 IN.

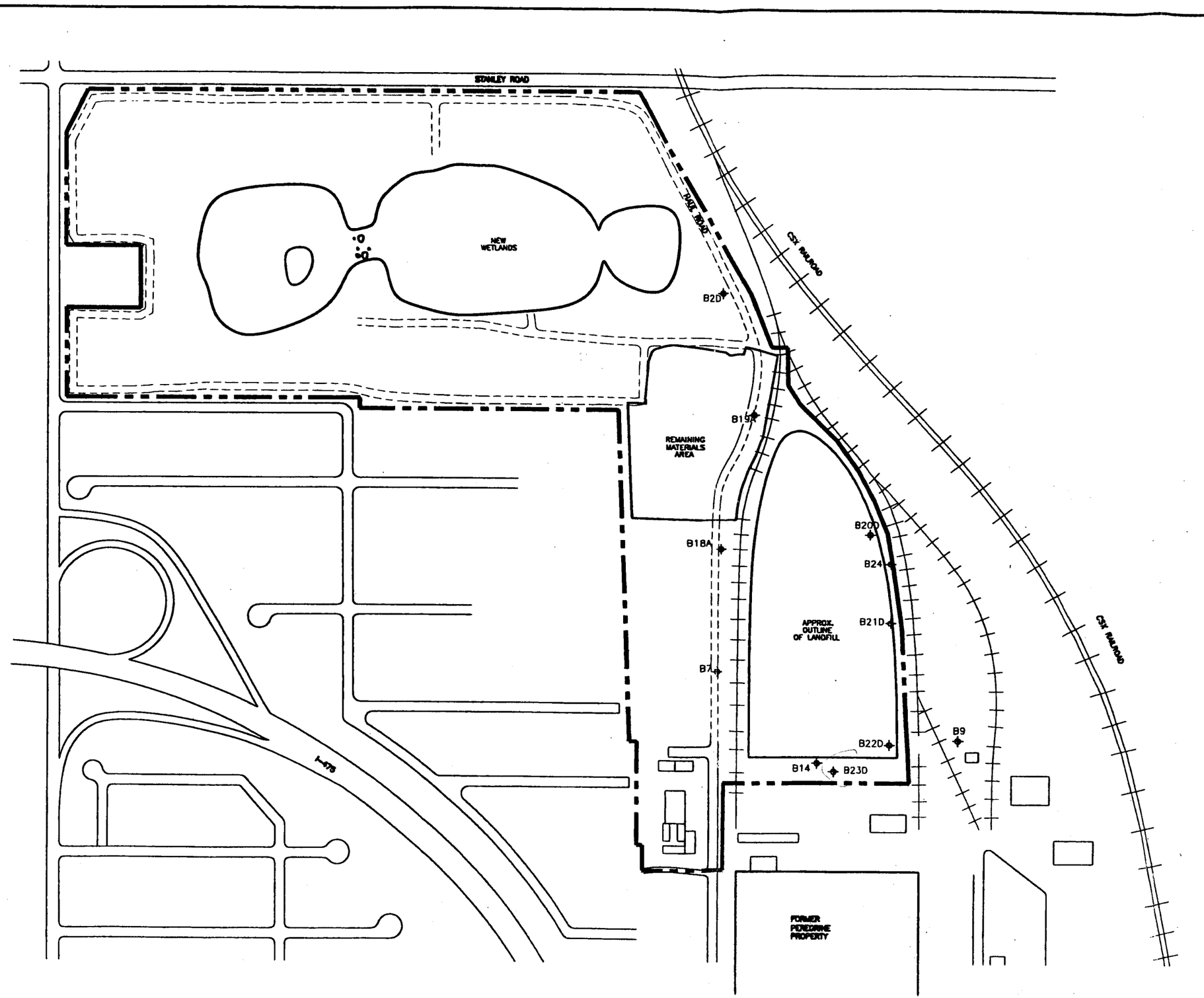
SAMPLING NOTES						VISUAL CLASSIFICATION AND GENERAL OBSERVATIONS	GENERAL WELL CONSTRUCT
INTERVAL NO.	TYPE	RECOVERY N	IN	PID	DEPTH		
16	SS	23	18			As above (SP), some medium sand, gray 10YR 6/1, wet.	
					80		
17	SS	40	24			As above (SP), mostly medium grained.	
					85	LEAN CLAY (CL).	
						End of boring at 85 feet.	



ATTACHMENT D

MONITORING WELL LOCATIONS
NORTH OF THE FACILITY (O'BRIEN & GERE, 1989)

FIGURE 7



LEGEND

B14 — MONITORING WELL LOCATION

PROPERTY LINE

REALM COLDWATER ROAD FACILITY FLINT, MICHIGAN

MONITORING WELL LOCATION PLAN

400 0 400

APPROXIMATE SCALE IN FEET

FILE NO. 4144.007.REALM.040

O'BRIEN & GERE

I:\MDV1\PROJECTS\4144007\DWG\REALM040.DWG

PLOT SCALE: 400

ATTACHMENT I

MEMO RE: REMEDIATION OF SOIL SURROUNDING
BH-9-26-00 IN BASEMENT
(CRA, MARCH 28, 2002)

CONESTOGA-ROVERS & ASSOCIATES

651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

MEMORANDUM

TO: Cheryl Hiatt

REF. NO.: 12636-40/rcc/36

FROM: Glenn Turchan/Noelle Baker

DATE: March 28, 2002

C.C.: Marilyn Dedyne, Jean Caufield

RE: **Remediation of Soil Surrounding BH-9-26-00 in Basement**
Former Peregrine (US) Inc. Coldwater Road Facility
Genesee Township, Michigan

1.0 INTRODUCTION

This memorandum summarizes the delineation and remediation activities related to soil in the area surrounding the "hot spot" identified at BH-9-26-00 in the basement of Building 44 (AOI 9). The activities summarized in this memorandum were implemented to facilitate the backfilling of the basement to grade as part of the demolition/restoration on the Site.

2.0 GENERAL

The Former Plating Areas were investigated during the RCRA Facility Investigation (RFI) that was implemented during the period from May 2000 – August 2000. The basement of Building 44 is within the general area of AOI 9. Historically, five soil samples had been collected as part of earlier property transfer evaluations at five different locations in the basement (PFB-17, PFB-18, PFB-19, PFB-20, and F-30). No exceedances of Act 451, Part 201 Generic Industrial Direct Contact Criteria (IDCC) or the Act 451, Part 201 Generic Industrial Particulate Soil Inhalation Criteria (PSIC) were encountered during the property transfer sampling activities. As part of the RFI, nine additional soil samples were collected at seven different locations in the basement. Of these nine samples, an exceedance of the IDCC for lead and PSIC for nickel was encountered at BH-9-26-00.

RFI Work Plan Addendum #1, dated April 27, 2001, outlined the scope of work for the delineation of IDCC/PSIC exceedances in the vicinity of BH-9-26-00 (see Attachment A). On May 3, 2001, CRA supervised the installation of four boreholes (BH-26A-01, BH-26B-01, BH-26C-01, and BH-26D-01) surrounding the location of BH-9-26-00. Soil samples were analyzed for benzene, ethylbenzene, methylene chloride, xylene, barium, cadmium, lead, mercury, nickel, selenium, zinc, and cyanide. No exceedances of the Act 451, Part 201 Generic IDCC or PSIC were encountered at these four boreholes (see Attachment B).

Contingency samples had been collected at four additional locations surrounding RFI borehole BH-9-25-00 and at twenty-one random locations in the basement as presented on Figure 1. A summary of the field activities and results is presented in the CRA memorandum dated May 15, 2001 (see Attachment B).

lay was encountered at shallow depths (generally two to three feet below the basement floor) at each of the twenty-nine boreholes completed in the basement during the implementation of RFI Work Plan Addendum No. 1. Borehole logs from each of these locations are presented in Attachment C.

Based on the above obtained information, the area directly surrounding borehole location BH-9-26-00 was considered a "hot spot" and was removed for off-Site disposal as outlined in the scope of work included in the CRA memorandum dated June 7, 2001 (see Attachment D).

3.0 REMEDIATION OF HOTSPOT AT BH-9-26-00

The location of the remediation is presented on Figure 1. The extent of the excavation is presented on Figure 2. The dimensions of the excavation were 21 feet by 19 feet horizontally. The excavation was completed to a depth of 6 feet below the concrete slab. Photographs of the excavation are presented in Attachment E.

Approximately 90 cubic yards of soil was excavated and placed in roll-off boxes pending characterization. A composite soil sample from the roll-off boxes was collected and submitted for TCLP VOCs, TCLP sVOCs, TCLP metals, and TCL PCBs.

The samples collected as part of RFI Work Plan Addendum #1, as described above, were used as the four sidewall verification samples in accordance with the MDNR Verification of Soil Remediation Guidance ocument (April, 1994). In addition, two verification samples were collected from the base of the excavation and submitted for analysis for the constituents of concern (COCs) which included the following: benzene; ethylbenzene; methylene chloride; xylene; barium; cadmium; lead mercury; nickel; selenium; and zinc.

A summary of the analytical data for the constituents of concern (benzene, ethylbenzene, methylene chloride, xylene, barium, cadmium, lead, mercury, nickel, selenium and zinc) for the verification samples is presented in Table 1. There were no exceedances of the IDCC, SVIAIC, or PSIC. Complete analytical data for VOCs and metals and the corresponding data quality assessment and validation are presented in Attachment F.

The TCLP characterization data report for the excavated soil is presented in Attachment G. The soil did not exceed any of the TCLP regulatory limits and was characterized as non-hazardous.

The soil was transported to and disposed at the Brent Run Landfill. Manifests are presented in Attachment H.

4.0 SUMMARY

A small area [21 ft. x 19 ft. x 6 ft. (deep)] in the vicinity of BH-9-26-00 was identified and remediated as a "hot spot" to facilitate backfilling of the basement as part of the facility demolition/restoration. A total of 90 cubic yards was excavated, characterized as non-hazardous and disposed at the Brent Run Landfill. our sidewall and two base verification samples were below IDCC and PSIC criteria. As a result, no further activity is required in the vicinity of BH-9-26-00.

ANALYTICAL DATA FOR CONSTITUENTS OF CONCERN FOR VERIFICATION SOIL SAMPLES FROM EXCAVATION IN BASEMENT
FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	Site-Specific Background Levels	Industrial Drinking Water Protection Criteria	Industrial Direct Contact Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Volatile Soil Inhalation Criteria	Particulate Soil Inhalation Criteria	Sides of Excavation				
							BH-26B-01 S-12636-030501-DRD-007 AOI 9 5/3/00 0-2' bgs	BH-26C-01 S-12636-030501-DRD-008 AOI 9 5/3/00 4-6' bgs	BH-26A-01 S-12636-030501-DRD-009 AOI 9 5/3/00 4-6' bgs	BH-26D-02 S-12636-030501-DRD-010 AOI 9 5/3/00 0-2' bgs	BH-26D-01 S-12636-030501-DRD-011 AOI 9 5/3/00 0-2' bgs
Volatiles (ug/kg)											
Benzene	-	100	400,000	8,400	45,000	470,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ	ND(4.2)
Ethylbenzene	-	1,500	140,000	140,000	11,000,000	29,000,000,000	ND(5.6)	ND(4.6)	ND(5.5) UJ	ND(4.5) UJ	ND(4.2)
Xylene (total)	-	5,600	150,000	150,000	54,000,000	130,000,000,000	ND(11)	ND(9.3)	3.1 J	ND(9.0) UJ	ND(8.4)
Metals (ug/kg)											
Barium	118,000	1,300,000	250,000,000	-	-	150,000,000	**9,910**	**51,500**	**47,300**	**142,000**	**43,700**
Lead	21,000	700,000	900,000	-	-	44,000,000	**3,590**	**9,610**	**136,000**	**10,300**	**7,260**
Mercury	130	1,700	1,100,000	-	-	-	**4.0 B**	**8.9 B**	**30.6 B**	**18.5 B**	**7.9 B**
Nickel	26,000	100,000	270,000,000	-	-	16,000,000	**4,760**	**32,100**	**222,000**	**23,600**	**15,000**
Selenium	440	4,000	18,000,000	-	-	59,000,000	ND(578)	ND(595)	ND(1,160)	ND(597)	ND(577)
Zinc	70,000	5,000,000	1,000,000,000	-	-	-	**19,600**	**49,500**	**216,000**	**41,700**	**30,300**
General Chemistry											
Total Cyanide (ug/kg)	390	4,000	250,000	-	-	250000	ND(578)	ND(595)	**807**	ND(597)	ND(577)
Percent Solids (%)	100	-	-	-	-	-	86.4	84.1	86.4	83.8	86.7

Notes

ND ( ) - Not detected at the quantitation limit stated in parentheses
ND ( ) U - The analyte was analyzed for but was not detected above the reported sample quantitation limit in parentheses
J - The associated numerical value is an estimated quantity
UJ - The compound was analyzed for but was not detected. The sample quantitation limit is an estimated value (for non-detected parameters)
B - Method blank contamination. The associated method blank contains the target analyte at a reportable level
[ ] - Exceeds Industrial Direct Contact Criteria
——— - Exceeds Industrial Drinking Water Protection Criteria and Site-Specific Background Level
- Exceeds Particulate Soil Inhalation Criteria
═══ - Exceeds Soil Volatilization to Indoor Air Inhalation Criteria

ANALYTICAL DATA FOR CONSTITUENTS OF CONCERN FOR VERIFICATION SOIL SAMPLES FROM EXCAVATION IN BASEMENT
FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	Site-Specific Background Levels	Industrial Drinking Water Protection Criteria	Industrial Direct Contact Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Volatile Soil Inhalation Criteria	Particulate Soil Inhalation Criteria	Base of Excavation: BASE 1 5-12636-061401-NB-002 AOI 9 6/14/01 5-7' bgs	Base of Excavation: BASE 2 5-12636-061401-NB-003 AOI 9 6/14/01 5-7' bgs
Volatiles (ug/kg)								
Benzene	-	100	400,000	8,400	45,000	470,000,000	ND (6 6)	ND (5 9) UJ
Ethylbenzene	-	1,500	140,000	140,000	11,000,000	29,000,000,000	ND (6 6)	ND (5 9) UJ
Xylene (total)	-	5,600	150,000	150,000	54,000,000	130,000,000,000	ND (12)	ND (12) UJ
Metals (ug/kg)								
Barium	118,000	1,300,000	250,000,000	-	-	150,000,000	**62,700**	**59,300**
Lead	21,000	700,000	900,000	-	-	44,000,000	**13,000**	**10200 J**
Mercury	130	1,700	1,100,000	-	-	-	**11.3 B**	**14.1 B**
Nickel	26,000	100,000	270,000,000	-	-	16,000,000	**150,000**	**59,400**
Selenium	440	4,000	18,000,000	-	-	59,000,000	ND (599)	ND (582) UJ
Zinc	70,000	5,000,000	1,000,000,000	-	-	-	**145,000**	**92,400**
General Chemistry								
Total Cyanide (ug/kg)	390	4,000	250,000	-	-	250000	--	--
Percent Solids (%)	100	-	-	-	-	-	83 5	85 9

Notes

ND ( ) - Not detected at the quantitation limit stated in parentheses
ND ( ) U - The analyte was analyzed for but was not detected above the reported sample quantitation limit in parentheses
J - The associated numerical value is an estimated quantity
UJ - The compound was analyzed for but was not detected The sample quantitation limit is an estimated value (for non-detected parameters)
B - Method blank contamination The associated method blank contains the target analyte at a reportable level
bold - Exceeds Industrial Direct Contact Criteria
bold - Exceeds Industrial Drinking Water Protection Criteria and Site-Specific Background Level
bold - Exceeds Particulate Soil Inhalation Criteria
bold - Exceeds Soil Volatilization to Indoor Air Inhalation Criteria

ATTACHMENT A

RFI WORK PLAN ADDENDUM #1
(REALM, APRIL 27, 2001)

REALM
Remediation and Liability Management Company, Inc.
485 West Milwaukee
Detroit, Michigan 48202
(313) 556-6454

April 27, 2001

Reference No. 12636

Ms. Kimberly Tyson
Michigan Department of Environmental Quality
Waste Management Division
P.O. Box 30241
Lansing, MI 48909-7741

Dear Ms. Tyson:

Re: RFI Work Plan Addendum #1 – Basement (AOI 9) Delineation
Former Peregrine (US) Inc. Coldwater Road Facility
Genesee Township, Michigan

This letter presents RFI Work Plan Addendum #1 for additional soil investigation in the basement (portion of AOI 9) of former Building 44 at the Peregrine (US) Inc. Coldwater Road Facility (Facility).

1.0 BACKGROUND

The Former Plating Areas were identified as AOI 9 for the RCRA Facility Investigation (RFI) that was implemented during the period from May – August, 2000. One of these areas (chrome plating) encompassed the basement of Building 44. Historically, five soil samples had been collected as part of earlier property transfer evaluations at five different locations in the basement (PFB-17, PFB-18, PFB-19, PFB-20, and F-30). No exceedances of MDEQ IDCC or PSIC were encountered historically. As part of the RFI, nine additional soil samples were collected at seven different locations in the basement. Of these nine samples, an exceedance of the MDEQ Industrial Direct Contact Criteria (IDCC) for lead and the MDEQ Particulate Soil Inhalation Criteria (PSIC) for nickel was encountered at BH-9-26-00. The RFI and historical soil sampling locations are presented on Figure 1.

Historically, an exceedance of IDWPC for cyanide was encountered at F-30. Cyanide was not detected in any of the soil samples collected in the basement as part of the RFI. In addition, exceedances of the MDEQ Industrial Drinking Water Protection Criteria (IDWPC) were encountered at two RFI borehole locations in the basement. The benzene, ethylbenzene, methylene chloride, xylene, barium, cadmium, lead, mercury, nickel, selenium, and zinc concentrations detected at BH-9-26-00 and the magnesium and nickel concentrations detected at BH-9-25-00 exceeded their respective IDWPC.

The RFI Report was submitted to MDEQ on November 30, 2000. Comments on the RFI Report were addressed to Ms. Cheryl Hiatt (REALM) from Ms. Kimberly Tyson (MDEQ-WMD) on

March 29, 2001. Comment 15 addressed the exceedance of the IDCC for lead at BH-9-26-00 and defined it as a hot spot for lead. MDEQ-WMD further indicated that delineation of the lead hot spot is necessary. This RFI Work Plan Addendum #1 addresses the delineation of lead contamination at BH-9-26-00.

In addition, due to the inaccessibility of the basement floor once backfilling at the Facility has occurred, additional contingency samples will be collected at the locations with exceedances of the MDEQ generic industrial screening levels discussed above, in order to remain conservative and flexible with any further actions in the basement. These samples will be held by the laboratory for later analysis, if deemed necessary. Additional samples may also be collected to more fully characterize the basement depending on the results of the initial analysis.

2.0 SCOPE OF WORK

The extent of the basement and the proposed borehole locations are shown on Figure 2. Analytical and sampling protocols are presented in the Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP), respectively. The QAPP and FSP are presented in Appendix C and G in the RFI Work Plan (CRA, May 2000), respectively.

The initial samples collected will delineate contamination at RFI borehole location BH-9-26-00. A shallow (0-2 feet bgs) and deep (4-6 feet bgs) sample will be collected at locations 10 feet to the north, south, east, and west of BH-9-26-00, respectively, as shown on Figure 2. The four shallow samples collected will be submitted for analysis of benzene, ethylbenzene, methylene chloride, xylene, barium, cadmium, lead, mercury, nickel, selenium, zinc, and cyanide. The four deep samples will be held by the laboratory in the case that further vertical delineation is required.

A shallow (0-2 feet bgs) and deep (4-6 feet bgs) contingency sample will be collected at four locations surrounding BH-9-25-00 as shown on Figure 2, and held for laboratory analysis pending the results of the initial sampling.

Additional shallow (0-2 feet bgs) and deep (4-6 feet bgs) contingency samples will be collected as shown on Figure 2, and held for laboratory analysis, if required.

3.0 SCHEDULE

Subject to weather conditions and removal of existing rain water from the basement, this sampling event and associated field work should be completed in one to two days. A minimum of 24 hours notice of the scheduled start date will be provided.

Yours truly,

REMEDIATION AND LIABILITY MANAGEMENT COMPANY, INC.

original sent to MDEQ.

Cheryl Hiatt
Project Manager

NB/ja/4
Encl.

c.c.: MDEQ-WMD (4 additional copies)
Marilyn Dedyne (REALM)
Jean Caufield (REALM)
Glenn Turchan (CRA)

REALM Detroit Office • 485 West Milwaukee • Detroit, Michigan 48202 • Phone 313-556-9032
Fax 313-556-0803 Email: cheryl.r.hiatt@gm.com

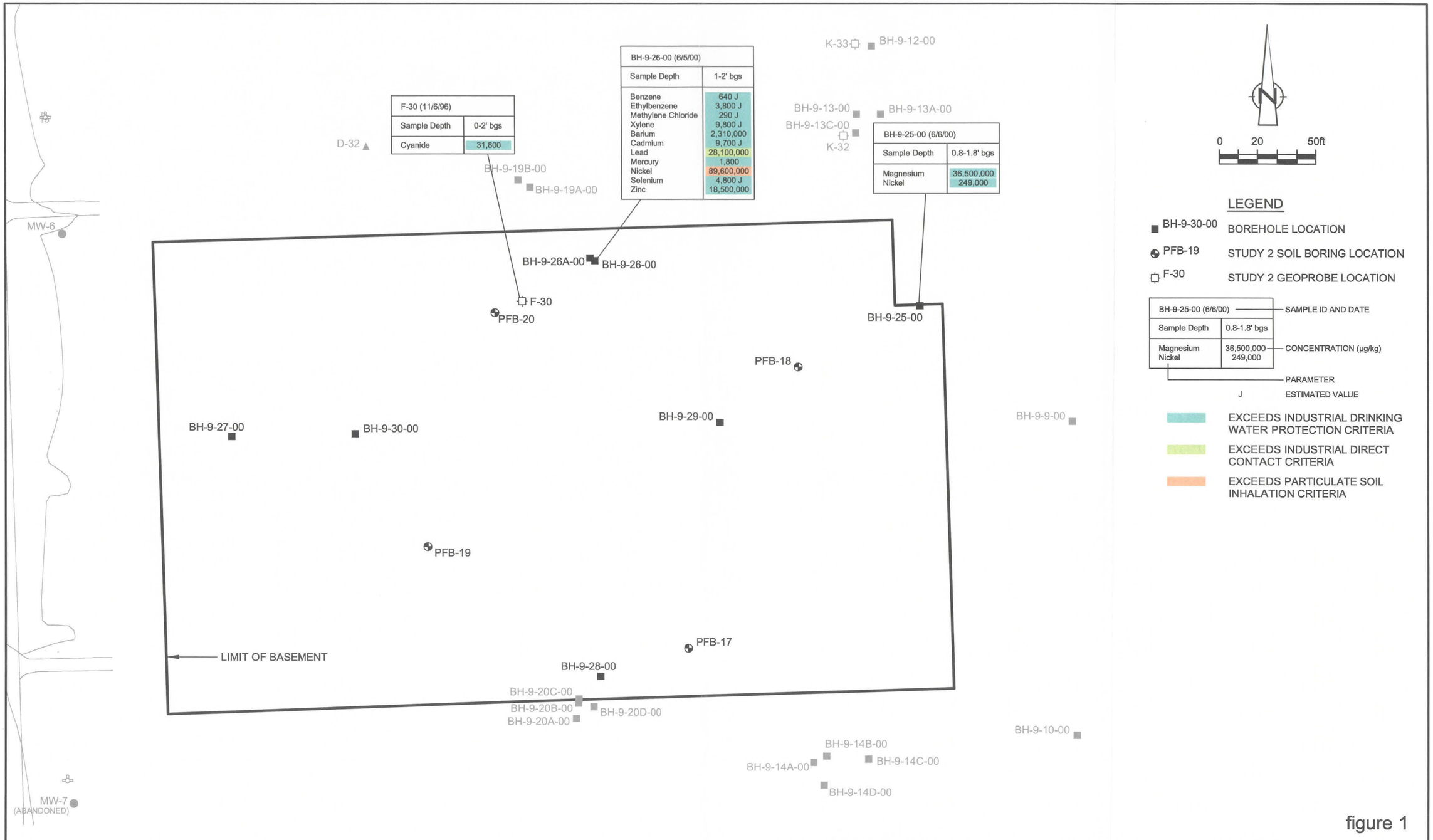


figure 1

EXCEEDANCES OF MDEQ GENERIC INDUSTRIAL SCREENING LEVELS
IN BASEMENT OF BUILDING 44
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(TYSO004)GN-WA002 JUL 13/2001

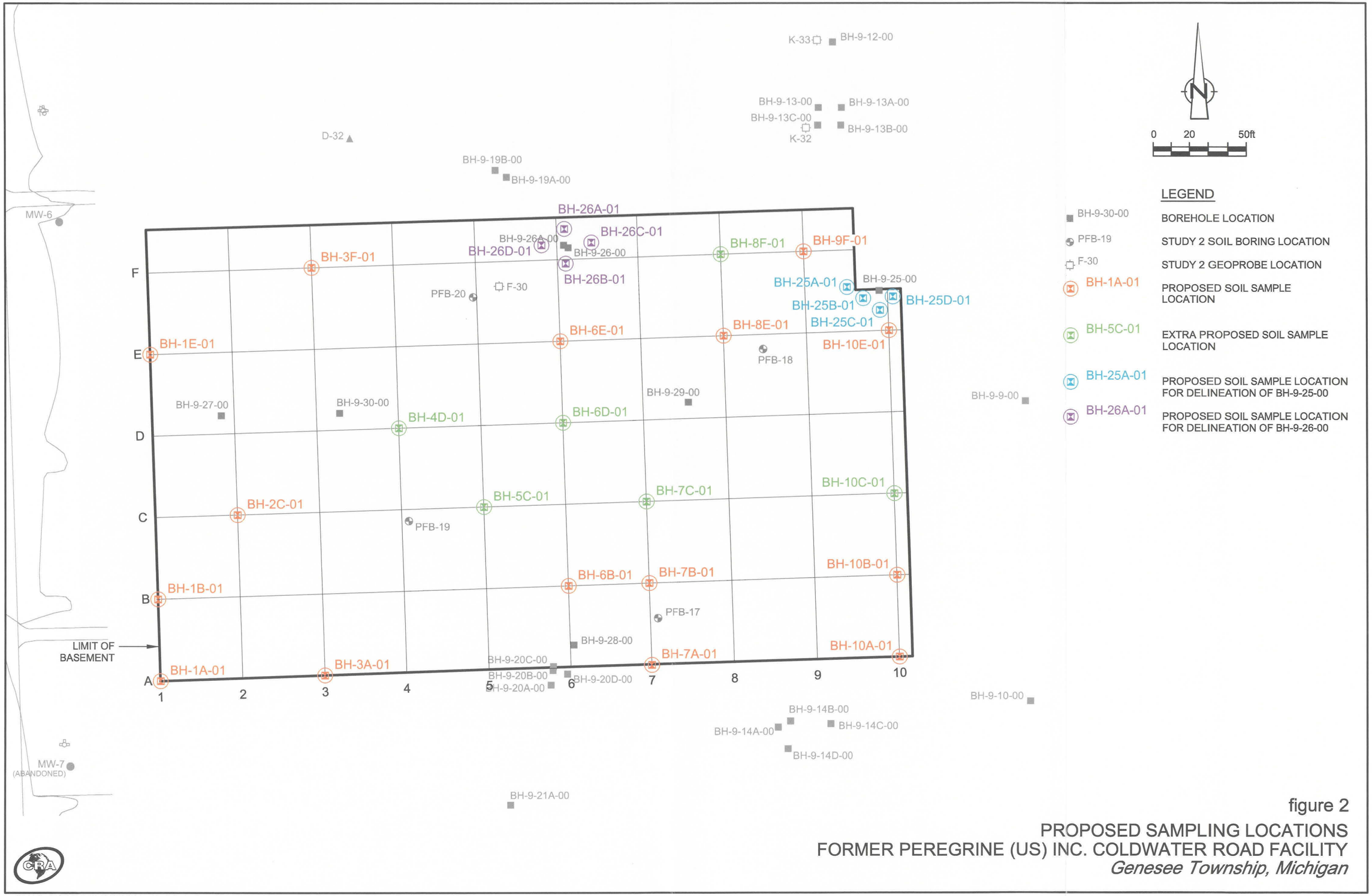


figure 2

PROPOSED SAMPLING LOCATIONS
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(TYSO004)GN-WA001 JUL 13/2001

ATTACHMENT B

MEMO RE: PRELIMINARY SOIL ANALYTICAL DATA
(CRA, MAY 15, 2001)

CONESTOGA-ROVERS & ASSOCIATES

651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

MEMORANDUM

TO:	Cheryl Hiatt	REF. NO.:	12636-40/nb/34
FROM:	Glenn Turchan/ Noelle Baker	DATE:	May 15, 2001
C.C.:	Marilyn Dedyne Jean Caufield		
RE:	**Preliminary Soil Analytical Data RFI Work Plan Addendum #1 – Basement Delineation Former Peregrine (US) Inc. Coldwater Road Facility Genesee Township, Michigan**		

This memorandum summarizes the preliminary soil analytical data for the investigation activities outlined in the RFI Work Plan Addendum #1 for additional soil investigation in the basement (portion of AOI 9) of former Building 44 at the Former Peregrine (US) Inc. Coldwater Road Facility (Facility).

SCOPE OF WORK

The purpose of the investigation was to further delineate contamination at RFI borehole BH-9-26-00. Contingency samples were also collected at four locations surrounding RFI borehole BH-9-25-00 and at twenty-one random locations in the basement.

Sampling locations are presented on Figure 1. A summary of the soil sampling is presented in Table 1.

2.0 SUMMARY OF FIELD ACTIVITIES

On April 23, 2001, an attempt was made to begin borehole installation at the following locations: BH-4D-01; BH-5C-01; BH 6D-01; BH-6E-01; and BH-26B-01. Refusal was encountered at depths of 1.7 to 2.3 feet below ground surface (bgs) at each of these locations. Existing rain water in the basement made it unfavorable to attempt any additional locations (at that time).

Following favorable weather conditions, 3' by 3' sections of concrete were excavated from all borehole locations to allow for advancement of boreholes. The soil underlying the concrete was typically saturated sand overlying clay till. All excavated areas contained water from the saturated sand prior to borehole installation.

Boreholes were installed to the north, south, west and east of the former sump area (BH-9-26-00) as shown on Figure 1. At BH-26B-00, a second layer of concrete was encountered at 2.3 bgs. Further advancement in this area was not possible at the time. A split sample was taken with MDEQ-WMD from 0 to 1 feet bgs at this location.

At BH-26A-00 and BH-26C-00, four feet of saturated sand overlies clay till. Samples were not collected from the 0 to 2 feet bgs interval in these two locations due to lack of soil recovery from the 4 foot soil sampler. Split samples were collected with MDEQ-WMD from 4' to 6' bgs at these locations.

BH-26D-00 was located adjacent to a metal structure which extended two feet bgs. Gravel fill was encountered from 0 feet to 7.6 feet bgs at which point refusal was encountered. A sample was collected from 0 to 2 feet bgs. Due to the nature of the material, two 4-ounce jars were collected as opposed to EnCores. Only three inches of material was recovered from the second probe (4 to 8 feet bgs) which was comprised of "sluff". MDEQ-WMD took this material as a sample.

All remaining boreholes were installed to a depth of 8 feet bgs with sample intervals from 0 to 2 feet bgs and 4 to 6 feet bgs, with the exception of BH-10A-01 and BH-7A-01. At BH-10A-01, 4" of sample was recovered from 4 to 8 feet bgs, and comprised of sluff. An additional probe was driven to have enough volume to collect a sample. BH-7A was located adjacent to a footing. The area was excavated to a depth of 6.5 feet bgs (bottom of the footing) prior to drilling. Samples were obtained at intervals of 6.5 to 8.5 feet bgs and 10.5 to 13 feet bgs.

3.0 PRELIMINARY ANALYTICAL DATA

Samples collected from the borehole locations delineating contamination at BH-9-26-00 (BH-26A-01, BH-26B-01, BH-26C-01, and BH-26D-01) and borehole location BH-6E-01 were submitted for analysis of VOCs, barium, cadmium, mercury, nickel, selenium, lead, zinc, and cyanide. Each of these samples was also collected by MDEQ-WMD for analysis. All remaining samples were submitted to the laboratory and held for analysis.

Preliminary analytical data for BH-6E-01, BH-26A-01, BH-26B-01, BH-26C-01, and BH-26D-01 is presented in Table 2.

A. VOCS

The soil sample collected at BH-9-26-00 (1 to 2 feet bgs) during the RFI exceeded the MDEQ Industrial Drinking Water Protection Criteria (IDWPC) for four VOCs (benzene, ethylbenzene, methylene chloride, and total xylenes) as shown on Figure 2. Historically, there have been no other exceedances of the MDEQ generic industrial screening levels for VOCs in soil samples collected in the basement.

No VOCs were detected in the soil samples collected at BH-6E-01, BH-26B-01, BH-26C-01, and BH-26D-01 as part of this investigation. Four VOCs (2-butanone, acetone, methylene chloride, and total xylenes) were detected in the soil sample collected at BH-26A-01 (4 to 6 feet bgs). There were no exceedances of the MDEQ generic industrial screening levels for VOCs in the samples collected at BH-6E-01, BH-26A-01, BH-26B-01, BH-26C-01, and BH-26D-01.

B. METALS

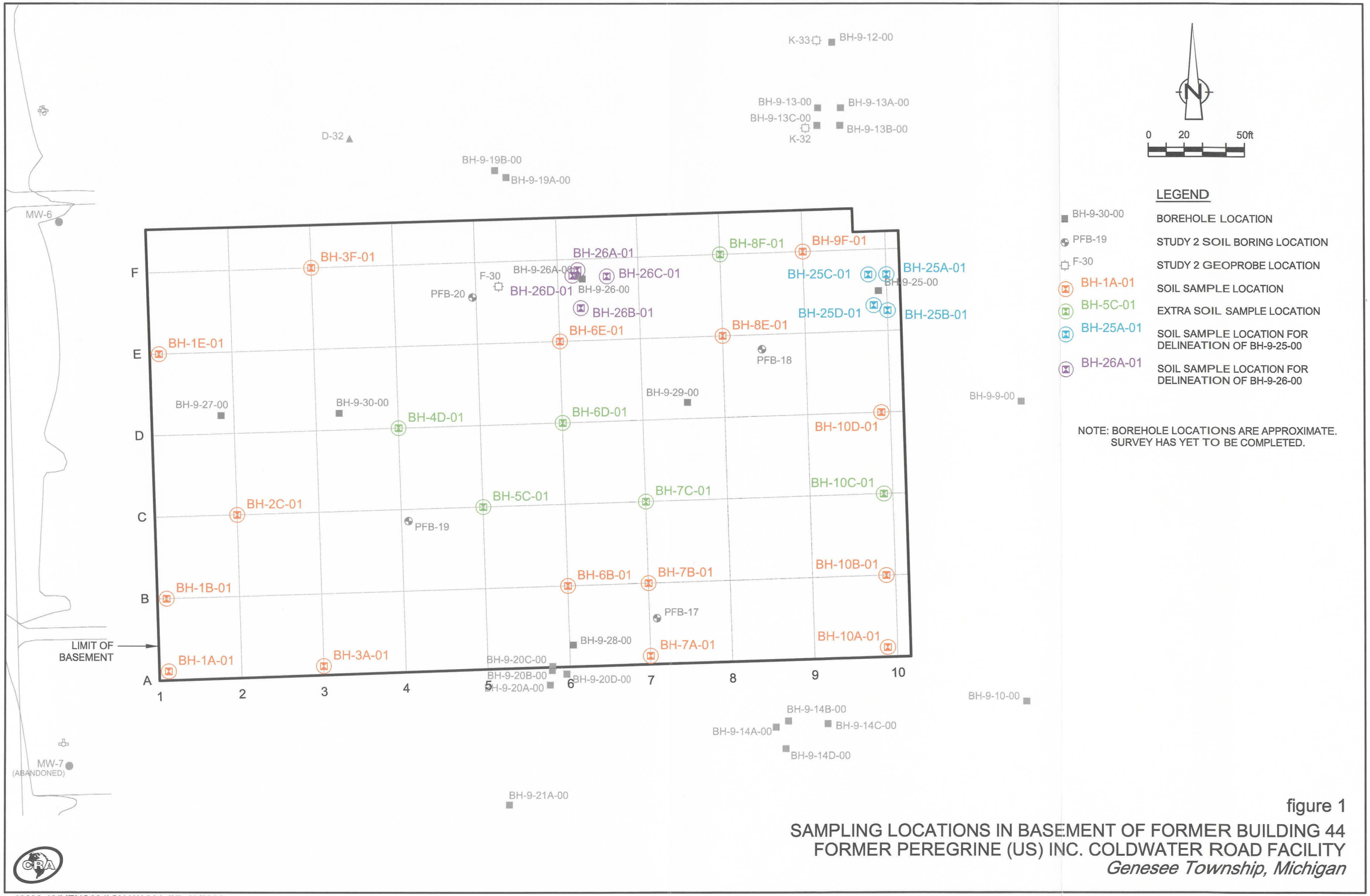
The soil sample collected at BH-9-25-00 (0.8 to 1.8 feet bgs) during the RFI exceeded the MDEQ IDWPC for magnesium and nickel as shown on Figure 2. The soil sample collected at BH-9-26-00 (1 to 2 feet bgs) during the RFI exceeded the MDEQ IDWPC for seven metals (barium, cadmium, lead, mercury, nickel, selenium, and zinc) as shown on Figure 2. The soil sample collected at BH-9-26-00 (1 to 2 feet bgs) during the RFI also exceeded the MDEQ Industrial Direct Contact Criteria (IDCC) for lead and MDEQ Industrial Particulate Soil Inhalation Criteria (PSIC) for nickel as shown on Figure 2. Historically, there have been no other exceedances of the MDEQ generic industrial screening levels for metals in soil samples collected in the basement.

There was one exceedance of IDWPC for metals in the soil samples collected in the basement as part of this investigation. The soil sample collected at BH-26A-01 (4 to 6 feet bgs) exceeded the IDWPC for nickel as shown on Figure 2. There were no other exceedances of MDEQ generic screening levels for metals in the samples collected at BH-6E-01, BH-26A-01, BH-26B-01, BH-26C-01, and BH-26D-01.

C. CYANIDE

Historically, an exceedance of IDWPC for cyanide was encountered at F-30 (0 to 2 feet bgs) as shown on Figure 2. Cyanide was not detected in any of the soil samples collected in the basement as part of the RFI.

Cyanide was only detected in the sample collected at BH-26A-01 (4 to 6 feet bgs). There were no exceedances of the MDEQ generic industrial screening levels for cyanide in the samples collected at BH-6E-01, BH-26A-01, BH-26B-01, BH-26C-01, and BH-26D-01.



NOTE: BOREHOLE LOCATIONS ARE APPROXIMATE. SURVEY HAS YET TO BE COMPLETED.

figure 1

SAMPLING LOCATIONS IN BASEMENT OF FORMER BUILDING 44
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(MEMO034)GN-WA001 JUL 13/2001

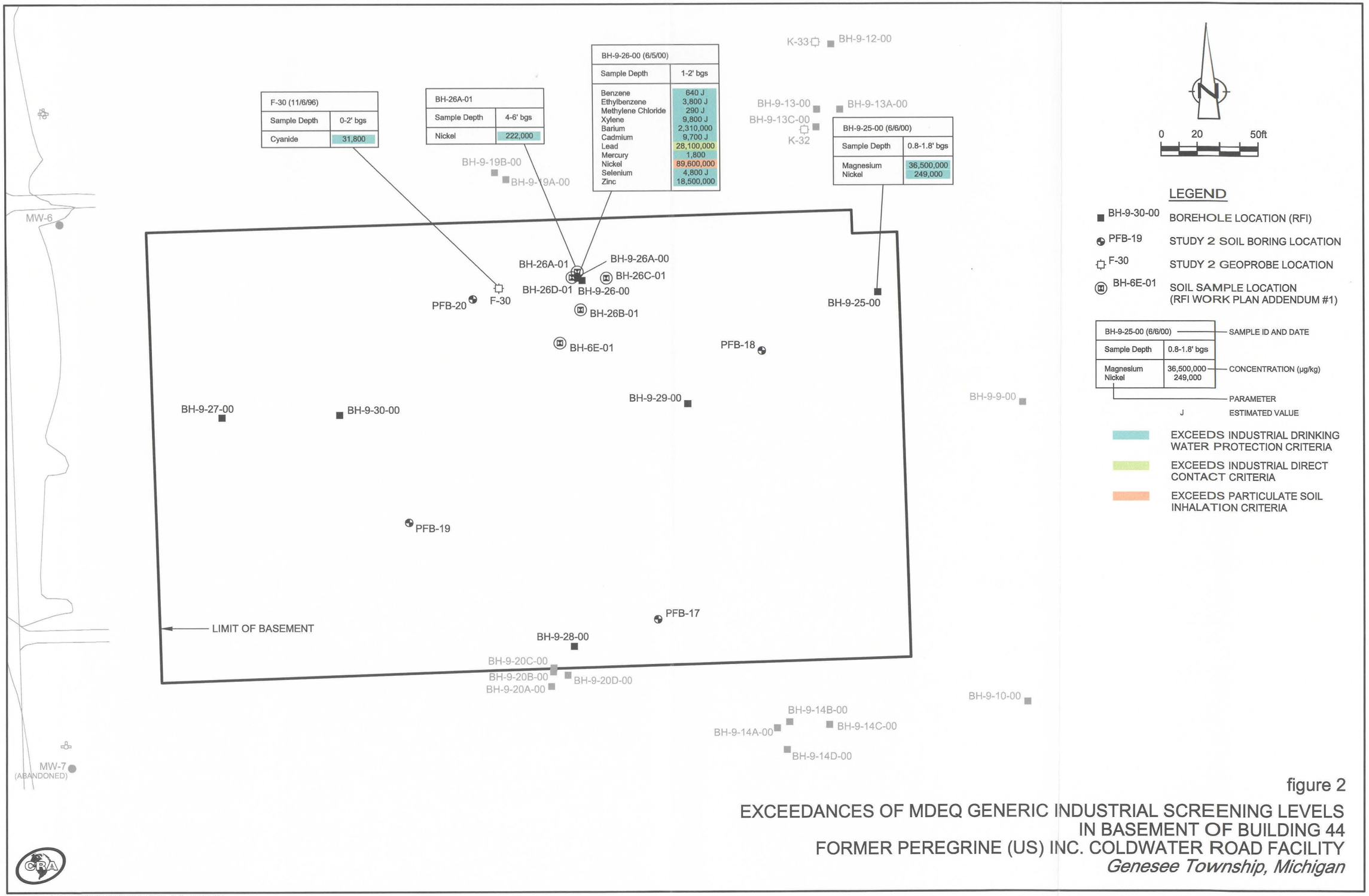


figure 2

EXCEEDANCES OF MDEQ GENERIC INDUSTRIAL SCREENING LEVELS
IN BASEMENT OF BUILDING 44
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(MEMO034)GN-WA002 JUL 13/2001

Table 1
Soil Sample Summary
Delineation of Basement of Bldg. 44
Former Peregrine (US) Inc. Coldwater Road Facility
Genesee Township, Michigan

Sample ID #	*Location*	*Sample Depth (feet bgs)*	*To Be Analyzed (1) (1 week TAT)*	*Prepare for Holding*	*PID Reading (ppm)*	*Staining Present (Y/N)*	*Odors Present (Y/N)*	*Comments*
S-12636-020501-DRD-001	BH-6E-01	0' to 2'	X		0.0	N	N	MDEQ-WMD split sample (2)
S-12636-020501-DRD-002	BH-6E-01	4' to 6'		X	0.0	N	N	
S-12636-020501-DRD-003	BH-6D-01	0' to 2'		X	0.0	N	N	
S-12636-020501-DRD-004	BH-6D-01	6' to 8'		X	0.0	N	N	no recovery 4' to 6'
S-12636-020501-DRD-005	BH-5C-01	0' to 2'		X	0.0	N	N	
S-12636-020501-DRD-006	BH-5C-01	4' to 6'		X	0.0	N	N	
S-12636-030501-DRD-007	BH-26B-01	0' to 1'	X		0.0	N	N	MDEQ-WMD split sample
S-12636-030501-DRD-008	BH-26C-01	4' to 6'	X		0.0	N	N	MDEQ-WMD split sample
S-12636-030501-DRD-009	BH-26A-01	4' to 6'	X		0.0	N	N	MDEQ-WMD split sample
S-12636-030501-DRD-010	BH-26D-01	0' to 2'	X		0.0	N	N	MDEQ-WMD split sample
S-12636-030501-DRD-011	BH-26D-01	0' to 2'	X		0.0	N	N	dup of # 010
S-12636-030501-DRD-012	BH-25A-01	0' to 2'		X	0.0	N	N	
S-12636-030501-DRD-013	BH-25A-01	4' to 6'		X	0.0	N	N	
S-12636-030501-DRD-014	BH-25C-01	0' to 2'		X	0.0	N	N	MS/MSD collected
S-12636-030501-DRD-015	BH-25C-01	4' to 6'		X	0.0	N	N	
S-12636-030501-DRD-016	BH-9F-01	0' to 2'		X	0.0	N	N	
S-12636-030501-DRD-017	BH-9F-01	4' to 6'		X	0.0	N	N	
S-12636-030501-DRD-018	BH-25D-01	0' to 2'		X	0.0	N	N	
S-12636-030501-DRD-019	BH-25D-01	4' to 6'		X	0.0	N	N	
S-12636-030501-DRD-020	BH-25D-01	4' to 6'		X	0.0	N	N	dup of # 019
S-12636-030501-DRD-021	BH-25B-01	0' to 2'		X	0.0	N	N	
S-12636-030501-DRD-022	BH-25B-01	4' to 6'		X	0.0	N	N	
S-12636-030501-DRD-023	BH-8E-01	0' to 2'		X	0.0	N	N	
S-12636-030501-DRD-024	BH-8E-01	4' to 6'		X	0.0	N	N	
S-12636-030501-DRD-025	BH-8F-01	0' to 2'		X	0.0	N	N	
S-12636-030501-DRD-026	BH-8F-01	4' to 6'		X	0.0	N	N	
S-12636-030501-DRD-027	BH-8F-01	4' to 6'		X	0.0	N	N	dup of # 026
S-12636-030501-DRD-028	BH-10-D-01	0' to 2'		X	0.0	N	N	
S-12636-030501-DRD-029	BH-10-D-01	4' to 6'		X	0.0	N	N	
S-12636-040501-DRD-030	BH-10-C-01	0' to 2'		X	0.0	N	N	MS/MSD collected
S-12636-040501-DRD-031	BH-10-C-01	0' to 2'		X	0.0	N	N	dup of # 030
S-12636-040501-DRD-032	BH-10-C-01	4' to 6'		X	0.0	N	N	
S-12636-040501-DRD-033	BH-10B-01	0' to 2'		X	0.0	N	N	
S-12636-040501-DRD-034	BH-10B-01	4' to 6'		X	0.0	N	N	
S-12636-040501-DRD-035	BH-10A-01	0' to 2'		X	0.0	N	N	
S-12636-040501-DRD-036	BH-10A-01	8' to 10'		X	0.0	N	N	
S-12636-040501-DRD-037	BH-7A-01	6.5' to 8.5'		X	0.0	N	N	
S-12636-040501-DRD-038	BH-7A-01	10.5' to 13'		X	0.0	N	N	
S-12636-040501-DRD-039	BH-7B-01	0' to 2'		X	0.0	N	N	
S-12636-040501-DRD-040	BH-7B-01	4' to 6'		X	0.0	N	N	
S-12636-040501-DRD-041	BH-7C-01	0' to 2'		X	0.0	N	N	
S-12636-040501-DRD-042	BH-7C-01	4' to 6'		X	0.0	N	N	
S-12636-040501-DRD-043	BH-7C-01	4' to 6'		X	0.0	N	N	dup of # 042
S-12636-040501-DRD-044	BH-6B-01	0' to 2'		X	0.0	N	N	
S-12636-040501-DRD-045	BH-6B-01	4' to 6'		X	0.0	N	N	
S-12636-040501-DRD-046	BH-4D-01	0' to 2'		X	0.0	N	N	
S-12636-040501-DRD-047	BH-4D-01	4' to 6'		X	0.0	N	N	
S-12636-040501-DRD-048	BH-3F-01	0' to 2'		X	0.0	N	N	
S-12636-040501-DRD-049	BH-3F-01	4' to 6'		X	0.0	N	N	
S-12636-070501-DRD-050	BH-3A-01	0' to 2'		X	0.0	N	N	
S-12636-070501-DRD-051	BH-3A-01	4' to 6'		X	0.0	N	N	
S-12636-070501-DRD-052	BH-3A-01	4' to 6'		X	0.0	N	N	dup of # 051
S-12636-070501-DRD-053	BH-2C-01	0' to 2'		X	0.0	N	N	
S-12636-070501-DRD-054	BH-2C-01	4' to 6'		X	0.0	N	N	
S-12636-070501-DRD-055	BH-1A-01	0' to 2'		X	0.0	Y	Y	1" stain, slight odor at 20" bgs
S-12636-070501-DRD-056	BH-1A-01	4' to 6'		X	0.0	N	N	
S-12636-070501-DRD-057	BH-1B-01	0' to 2'		X	0.0	N	N	
S-12636-070501-DRD-058	BH-1B-01	4' to 6'		X	0.0	N	N	
S-12636-070501-DRD-059	BH-1E-01	0' to 2'		X	0.0	N	N	
S-12636-070501-DRD-060	BH-1E-01	4' to 6'		X	0.0	N	N	MS/MSD collected

Notes:
(1) Analysis for VOCs, nickel, barium, cadmium, mercury, selenium, lead, zinc, and cyanide
(2) Not enough sample volume for split sample, MDEQ grabbed sample from side of excavation, this area had slight green staining from concrete slab

TABLE 2

PRELIMINARY DATA FOR SOIL SAMPLES FROM BASEMENT OF BLDG. 44
FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	*Site-Specific Background Levels*	*Industrial Drinking Water Protection Criteria*	*Industrial Direct Contact Criteria*	*Soil Volatilization to Indoor Air Inhalation Criteria*	*Volatile Soil Inhalation Criteria*	*Particulate Soil Inhalation Criteria*	*BH-6E-01 S-12636-020501-DRD-001 AOI 9 5/2/2001 0-2' bgs*	*BH-26B-01 S-12636-030501-DRD-007 AOI 9 5/3/2000 0-1' bgs*	*BH-26C-01 S-12636-030501-DRD-008 AOI 9 5/3/2000 4-6' bgs*	*BH-26A-01 S-12636-030501-DRD-009 AOI 9 5/3/2000 4-6' bgs*	*BH-26D-01 S-12636-030501-DRD-010 AOI 9 5/3/2000 0-2' bgs*	*BH-26D-01 S-12636-030501-DRD-011 AOI 9 5/3/2000 0-2' bgs*
Volatiles (ug/kg)							-	-	-	-	-	-
1,1,1,2-Tetrachloroethane		6,400	440,000	33,000	120,000	530,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,1,1-Trichloroethane	-	4,000	460,000	460,000	4,500,000	29,000,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,1,2,2-Tetrachloroethane		700	370,000	23,000	34,000	68,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,1,2-Trichloroethane		100	920,000	24,000	57,000	250,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,1-Dichloroethane	-	50,000	890,000	430,000	2,500,000	15,000,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,1-Dichloroethene	-	140	570,000	330	3,700	78,000,000	ND(4.6)	-	-	-	-	-
1,2,3-Trichloropropane	-	2,400	830,000	-	-	-	-	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,2,4-Trichlorobenzene	-	4,200	1,100,000	1,100,000	34,000,000	11,000,000,000	ND(4.6)	ND(11)	ND(9.3)	ND(12)	ND(9.0)	ND(8.4)
1,2-Dibromo-3-chloropropane (DBCP)	-	4	1,200	1,200	15,000	5,900,000	ND(9.1)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,2-Dibromoethane (EDB)	-	10	660	3,600	5,800	18,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,2-Dichlorobenzene	-	14,000	210,000	210,000	46,000,000	44,000,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,2-Dichloroethane	-	100	640,000	11,000	21,000	150,000,000	-	-	-	-	-	-
1,2-Dichloroethene (total)	-	-	-	-	-	-	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,2-Dichloropropane	-	100	550,000	7,400	30,000	120,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,3-Dichlorobenzene	-	480	170,000	-	-	-	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
1,4-Dichlorobenzene	-	1,700	2,900,000	100,000	260,000	570,000,000	-	-	-	-	-	-
1,4-Dioxane	-	7,000	3,700,000	-	-	710,000,000	ND(18)	ND(22)	ND(19)	**13 J**	ND(18)	ND(17)
2-Butanone	-	760,000	27,000,000	27,000,000	35,000,000	29,000,000,000	ND(18)	ND(22)	ND(19)	ND(23)	ND(18)	ND(17)
2-Hexanone	-	58,000	2,500,000	1,800,000	1,300,000	1,200,000,000	-	-	-	-	-	-
2-Methyl-1-propanol	-	130,000	8,900,000	8,900,000	95,000,000	44,000,000,000	ND(18)	ND(22)	ND(19)	ND(23)	ND(18)	ND(17)
4-Methyl-2-pentanone	-	100,000	2,700,000	2,700,000	53,000,000	60,000,000,000	ND(18)	ND(22)	ND(19)	**51**	ND(18)	ND(17)
Acetone	-	42,000	110,000,000	110,000,000	160,000,000	170,000,000,000	-	-	-	-	-	-
Acetonitrile	-	8,000	21,000,000	8,800,000	1,900,000	1,800,000,000	-	-	-	-	-	-
Acrolein	-	6,600	18,000,000	760	370	590,000	-	-	-	-	-	-
Acrylonitrile	-	220	110,000	35,000	17,000	58,000,000	-	-	-	-	-	-
Allyl chloride	-	-	-	-	-	-	-	-	-	-	-	-
Benzene, isopropyl	-	260,000	390,000	390,000	2,000,000	2,600,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Benzene	-	100	400,000	8,400	45,000	470,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Bromodichloromethane	-	2,000	750,000	6,400	31,000	110,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Bromoform	-	2,000	870,000	770,000	3,100,000	3,600,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Bromomethane	-	580	1,600,000	1,600	13,000	150,000,000	ND(9.1)	ND(11)	ND(9.3)	ND(12)	ND(9.0)	ND(8.4)
Carbon disulfide	-	46,000	280,000	140,000	1,600,000	21,000,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Carbon tetrachloride	-	100	390,000	990	12,000	170,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Chlorobenzene	-	2,000	260,000	220,000	920,000	2,100,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Chloroethane	-	34,000	950,000	950,000	36,000,000	290,000,000,000	ND(9.1)	ND(11)	ND(9.3)	ND(12)	ND(9.0)	ND(8.4)
Chloroform	-	2,000	1,500,000	38,000	150,000	1,600,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Chloromethane	-	22,000	1,100,000	12,000	140,000	6,100,000,000	ND(9.1)	ND(11)	ND(9.3)	ND(12)	ND(9.0)	ND(8.4)
Chloroprene	-	-	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	1,400	640,000	42,000	210,000	1,000,000,000	ND(2.3)	ND(2.8)	ND(2.3)	ND(2.9)	ND(2.2)	ND(2.1)
cis-1,3-Dichloropropene	-	-	-	-	-	-	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Cyclohexane	-	-	-	-	-	-	ND(9.1)	ND(11)	ND(9.3)	ND(12)	ND(9.0)	ND(8.4)
Dibromochloromethane	-	2,000	610,000	21,000	80,000	160,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Dibromomethane	-	4,600	2,000,000	-	-	-	-	-	-	-	-	-
Dichlorodifluoromethane (CFC-12)	-	270,000	1,000,000	1,000,000	63,000,000	1,500,000,000,000	ND(9.1)	ND(11)	ND(9.3)	ND(12)	ND(9.0)	ND(8.4)
Ethyl methacrylate	-	-	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	-	1,500	140,000	140,000	11,000,000	29,000,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Iodomethane	-	-	-	-	-	-	-	-	-	-	-	-
Methyl acetate	-	-	-	-	-	-	ND(9.1)	ND(11)	ND(9.3)	ND(12)	ND(9.0)	ND(8.4)
Methyl acrylonitrile	-	-	-	-	-	-	-	-	-	-	-	-
Methyl cyclohexane	-	-	-	-	-	-	ND(9.1)	ND(11)	ND(9.3)	ND(12)	ND(9.0)	ND(8.4)
Methyl methacrylate	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Tert Butyl Ether	-	800	5,900,000	5,900,000	30,000,000	88,000,000,000	ND(18)	ND(22)	ND(19)	ND(23)	ND(18)	ND(17)
Methylene chloride	-	100	2,300,000	240,000	700,000	8,300,000,000	ND(4.6)	ND(5.6)	ND(4.6)	**10**	ND(4.5)	ND(4.2)
Propionitrile (Ethyl cyanide)	-	-	-	-	-	-	-	-	-	-	-	-
Styrene	-	2,700	520,000	520,000	3,300,000	6,900,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Tetrachloroethene	-	100	88,000	60,000	600,000	6,800,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Toluene	-	16,000	250,000	250,000	3,300,000	12,000,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
trans-1,2-Dichloroethene		2,000	1,400,000	43,000	330,000	2,100,000,000	ND(2.3)	ND(2.8)	ND(2.3)	ND(2.9)	ND(2.2)	ND(2.1)
trans-1,3-Dichloropropene	-	-	-	-	-	-	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
trans-1,4-Dichloro-2-butene	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene	-	100	500,000	37,000	260,000	2,300,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Trichlorofluoromethane (CFC-11)	-	150,000	560,000	560,000	110,000,000	1,700,000,000,000	ND(9.1)	ND(11)	ND(9.3)	ND(12)	ND(9.0)	ND(8.4)
Trifluorotrichloroethane (Freon 113)	-	550,000	550,000	550,000	210,000,000	2,300,000,000,000	ND(4.6)	ND(5.6)	ND(4.6)	ND(5.8)	ND(4.5)	ND(4.2)
Vinyl acetate	-	36,000	2,400,000	1,500,000	2,000,000	5,900,000,000	-	-	-	-	-	-
Vinyl chloride	-	40	29,000	150	1,500	47,000,000	ND(9.1)	ND(11)	ND(9.3)	ND(12)	ND(9.0)	ND(8.4)
Xylene (total)	-	5,600	150,000	150,000	54,000,000	130,000,000,000	ND(9.1)	ND(11)	ND(9.3)	**3.1 J**	ND(9.0)	ND(8.4)

TABLE 2

PRELIMINARY DATA FOR SOIL SAMPLES FROM BASEMENT OF BLDG. 44
FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	*Site-Specific Background Levels*	*Industrial Drinking Water Protection Criteria*	*Industrial Direct Contact Criteria*	*Soil Volatilization to Indoor Air Inhalation Criteria*	*Volatile Soil Inhalation Criteria*	*Particulate Soil Inhalation Criteria*	*BH-6I-01 S-12636-020501-DRD-001 AOI 9 5/2/2001 0-2' bgs*	*BH-26B-01 S-12636-030501-DRD-007 AOI 9 5/3/2000 0-1' bgs*	*BH-26C-01 S-12636-030501-DRD-008 AOI 9 5/3/2000 4-6' bgs*	*BH-26A-01 S-12636-030501-DRD-009 AOI 9 5/3/2000 4-6' bgs*	*BH-26D-01 S-12636-030501-DRD-010 AOI 9 5/3/2000 0-2' bgs*	*BH-26D-01 S-12636-030501-DRD-011 AOI 9 5/3/2000 0-2' bgs*
Metals (ug/kg)												
Aluminum	16,500,000	1,000	660,000,000	-	-	-	**5,060,000**	2,080,000	9,880,000	5,290,000	11,800,000	8,370,000
Antimony	120	4,300	1,200,000	-	-	5,900,000	**38.8 B**	ND(231)	ND(238)	**239 B**	ND(239)	ND(231)
Arsenic	13,500	23,000	61,000	-	-	910,000	**4,520**	**2,780**	**5,740**	**4,290**	**6,550**	**5,330**
Barium	118,000	1,300,000	250,000,000	-	-	150,000,000	**30,100**	**9,910**	**51,500**	**47,300**	**142,000**	**45,700**
Beryllium	800	51,000	3,100,000	-	-	590,000	**291**	**114 B**	**5.1 B**	ND(116)	**6.0 B**	**4.1 B**
Cadmium	1,200	6,000	4,100,000	-	-	2,200,000	**133**	**86.1 B**	**137**	**1,260**	**135**	**115**
Calcium	88,000,000	-	-	-	-	-	**38,800,000**	**26,300,000**	**50,000,000**	**98,500,000**	**67,900,000**	**44,600,000**
Chromium	19,000	1,000,000,000	1,000,000,000	-	-	150,000,000	**11,900**	**7,030**	**45,600**	**120,000**	**19,400**	**13,200**
Cobalt	11,500	2,000	18,000,000	-	-	5,900,000	**4,320**	**2,010**	**7,040**	**6,270**	**8,610**	**5,960**
Copper	32,000	5,800,000	140,000,000	-	-	59,000,000	**9,330**	**4,530**	**11,000**	**60,000**	**12,300**	**9,180**
Iron	29,800,000	6,000	1,000,000,000	-	-	-	**10,300,000**	**5,680,000**	**16,200,000**	**18,100,000**	**19,200,000**	**15,100,000**
Lead	21,000	700,000	900,000	-	-	44,000,000	**7,960**	**3,590**	**9,610**	**136,000**	**10,300**	**7,260**
Magnesium	35,000,000	22,000,000	1,000,000,000	-	-	2,900,000,000	**13,500,000**	**8,070,000**	**19,500,000**	**13,500,000**	**23,200,000**	**18,100,000**
Manganese	513,000	1,000	170,000,000	-	-	1,500,000	**231,000**	**149,000**	**291,000**	**241,000**	**374,000**	**295,000**
Mercury	130	1,700	1,100,000	-	-	-	**8.5 B**	**4.0 B**	**8.9 B**	**30.6 B**	**10.5 B**	**7.9 B**
Nickel	26,000	100,000	270,000,000	-	-	16,000,000	**10,600**	**4,740**	**32,100**	**222,000**	**21,400**	**15,000**
Potassium	2,300,000	-	-	-	-	-	**1,120,000**	**308,000 B**	**2,370,000**	**1,070,000**	**2,820,000**	**2,010,000**
Selenium	440	4,000	18,000,000	-	-	59,000,000	**57.1 B**	ND(578)	ND(595)	ND(1,160)	ND(597)	ND(577)
Silver	1,000	13,000	17,000,000	-	-	2,900,000	**61.2 B**	**22.0 B**	**65.7 B**	**6,650**	**76.0 B**	**54.8 B**
Sodium	660,000	7,000,000	1,000,000,000	-	-	-	ND(601,000)	ND(578,000)	ND(595,000)	**146,000 B**	ND(597,000)	ND(577,000)
Thallium	190	2,300	240,000	-	-	-	**113 B**	**54.3 B**	**236**	**42.1 B**	**255**	**177**
Tin	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	42,000	990,000	10,000,000	-	-	-	**15,500**	**8,880**	**25,900**	**12,200**	**30,600**	**23,300**
Zinc	70,000	5,000,000	1,000,000,000	-	-	-	**35,000**	**19,400**	**49,500**	**216,000**	**41,700**	**30,300**
General Chemistry												
Total Cyanide (ug/kg)	390	4,000	250,000	-	-	250000	ND(601)	ND(578)	ND(595)	**807**	ND(597)	ND(577)
Percent Solids (%)	100	-	-	-	-	-	83.3	86.4	84.1	86.4	83.8	86.7

Notes

ND ( ) - Not detected at the quantitation limit stated in parentheses.
ND ( ) U - The analyte was analyzed for but was not detected above the reported sample quantitation limit in parentheses.
J - The associated numerical value is an estimated quantity.
UJ - The compound was analyzed for but was not detected. The sample quantitation limit is an estimated value (for non-detected parameters).
B - Method blank contamination. The associated method blank contains the target analyte at a reportable level.
☐ - Exceeds Industrial Direct Contact Criteria.
— - Exceeds Industrial Drinking Water Protection Criteria and Site-Specific Background Level.
- Exceeds Particulate Soil Inhalation Criteria.
═ - Exceeds Soil Volatilization to Indoor Air Inhalation Criteria.

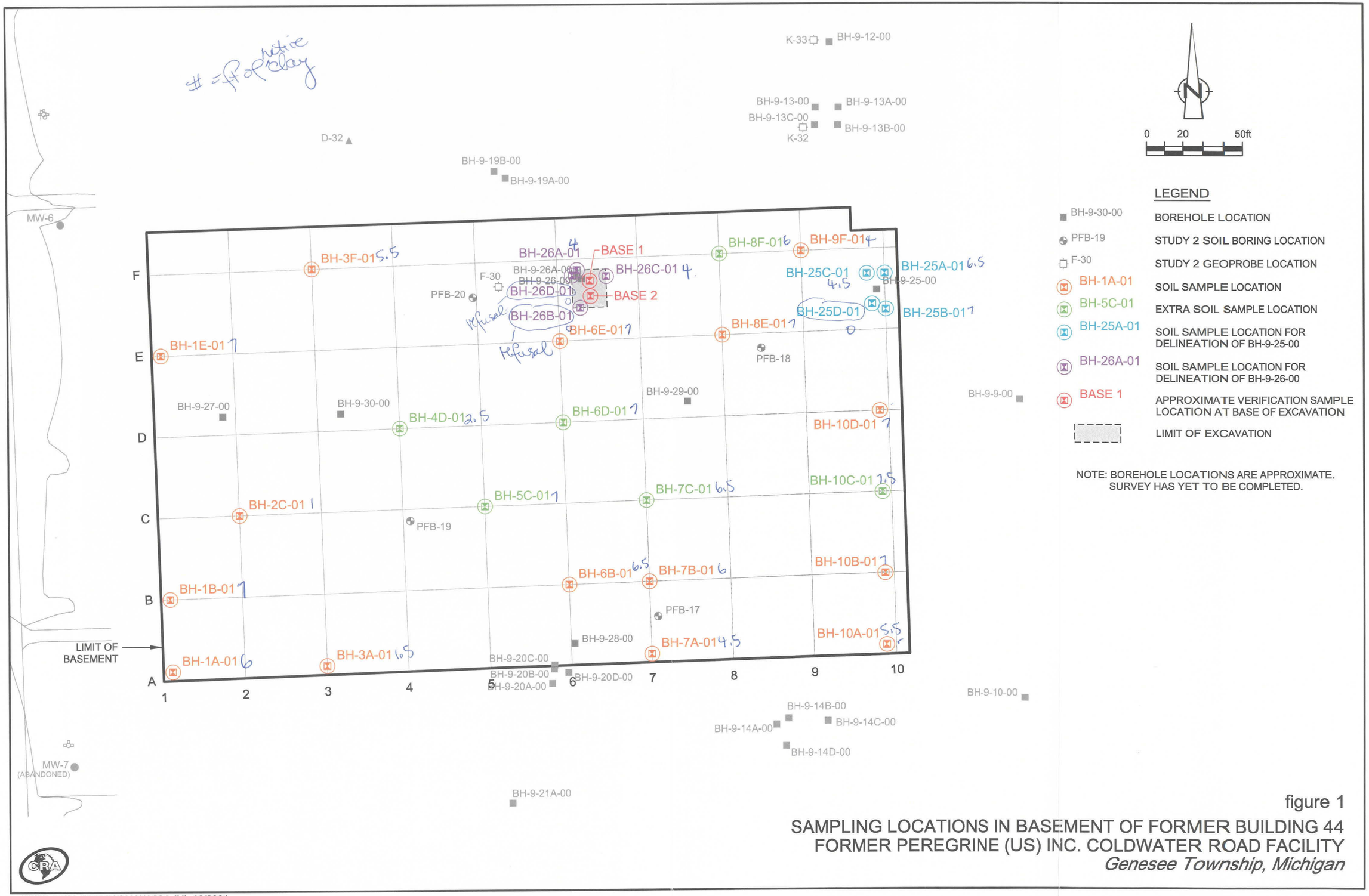


figure 1

SAMPLING LOCATIONS IN BASEMENT OF FORMER BUILDING 44
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(MEMO036)GN-WA001 JUL 16/2001

ATTACHMENT C

SOIL BORING LOGS

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-117)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-1A-01
DATE COMPLETED: MAY 7, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
	SP-SAND, trace silt, compact, fine to medium grained, poorly graded, brown, moist	-1.5					
2.5	GP-GRAVEL, with sand, compact, coarse grained, poorly graded, gray, moist - black stain (25mm)	-2.5	NATIVE CAVE	1GP			0.0
5.0	CI-CLAY, trace silt, firm, medium plasticity, gray, moist, slight odor		2" Ø BOREHOLE	2GP			0.0
7.5							
	END OF HOLE @ 8.7ft BGS	-8.7					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-118)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-1B-01
DATE COMPLETED: MAY 7, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
	SP-SAND, trace silt, compact, fine to medium grained, poorly graded, brown, wet	-1.7					
2.5	CI-CLAY, trace silt, trace fine rounded gravel, firm, medium plasticity, gray, moist		NATIVE CAVE	1GP			0.0
5.0			2" Ø BOREHOLE	2GP			0.0
7.5		-8.7					
	END OF HOLE @ 8.7ft BGS						
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-119)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-1E-01
DATE COMPLETED: MAY 7, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
	SP-SAND, trace silt, trace medium angular gravel, compact, fine grained, poorly graded, brown, wet	-1.7	NATIVE CAVE	1GP			0.0
2.5	CI-CLAY, trace silt, firm, medium plasticity, gray, moist						
	- trace coarse subrounded gravel						
5.0	- trace fine subrounded gravel		2" Ø BOREHOLE	2GP			0.0
7.5							
	END OF HOLE @ 8.7ft BGS	-8.7					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-120)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-2C-01
DATE COMPLETED: MAY 7, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
-2.5	SP-SAND, trace silt, trace medium angular gravel, compact, fine grained, poorly graded, brown, moist		NATIVE CAVE	1GP			0.0
-5.0			2" Ø BOREHOLE	2GP			0.0
-7.5		-7.7					
	CI-CLAY, trace silt, firm, medium plasticity, gray, moist	-8.7					
-10.0	END OF HOLE @ 8.7ft BGS						
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-3A-01
DATE COMPLETED: MAY 7, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.8					
2.5	SP-SAND, trace silt, trace medium angular gravel, compact, fine grained, poorly graded, brown, wet	-3.5	NATIVE CAVE	1GP			0.0
	CI-CLAY (FILL), trace silt, firm, medium plasticity, gray, moist	-4.0					
5.0	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet		2" Ø BOREHOLE	2GP			0.0
7.5	CI-CLAY, trace silt, firm, medium plasticity, gray, moist	-7.2					
	END OF HOLE @ 8.8ft BGS	-8.8					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-3F-01
DATE COMPLETED: MAY 4, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.8					
2.5	SP-SAND, trace silt, trace fine gravel, compact, fine grained, poorly graded, brown, moist	-3.2	NATIVE CAVE	1GP			0.0
5.0	CI-CLAY, trace silt, trace fine rounded gravel, firm, medium plasticity, gray, moist		2" Ø BOREHOLE	2GP			0.0
7.5							
	END OF HOLE @ 8.8ft BGS	-8.8					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-4D-01
DATE COMPLETED: MAY 4, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
2.5	SP-SAND, trace silt, trace gravel, compact, fine grained, poorly graded, brown, moist		NATIVE CAVE	1GP			0.0
5.0							
	CI-CLAY, trace silt, trace medium rounded gravel, firm, medium plasticity, gray, moist	-6.1	2" Ø BOREHOLE	2GP			0.0
7.5							
	END OF HOLE @ 8.7ft BGS	-8.7					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-124)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-4D-01
DATE COMPLETED: APRIL 23, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE	-1.2	BENTONITE HOLEPLUG	1GP			N/A
-2.5	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, moist	-1.7	2" Ø BOREHOLE				
	- refusal (concrete)						
	END OF HOLE @ 1.7ft BGS						
-5.0							
-7.5							
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-125)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-5C-01
DATE COMPLETED: MAY 2, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-1.3		1GP			0.0
2.5	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet	-2.3	BENTONITE CHIPS	2GP			0.0
	CI-CLAY, trace silt, firm, medium plasticity, gray, moist						
5.0				3GP			0.0
7.5			2" Ø BOREHOLE	4GP			0.0
	END OF HOLE @ 9.3ft BGS	-9.3					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-126)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-5C-01
DATE COMPLETED: APRIL 23, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE	-1.3	BENTONITE HOLEPLUG	1GP			-
-2.5	SP-SAND, trace silt, compact, fine grained, poorly graded, light brown, very moist	-2.3	2" Ø BOREHOLE				
	- refusal (concrete)						
	END OF HOLE @ 2.3ft BGS						
-5.0							
-7.5							
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

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Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-6E-01
DATE COMPLETED: APRIL 23, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE	-1.3	BENTONITE HOLEPLUG	IGP	X		-
2.5	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, moist	-1.9	2" Ø BOREHOLE				
	- refusal						
	END OF HOLE @ 1.9ft BGS						
5.0							
7.5							
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-128)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-6B-01
DATE COMPLETED: MAY 4, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.5					
-2.5	SP-SAND, trace silt, trace coarse angular gravel, compact, fine grained, poorly graded, brown, moist	-2.0	NATIVE CAVE	1GP			0.0
-5.0	CI-CLAY, with trace silt, trace fine rounded gravel, stiff, low plasticity, gray, moist - trace silt, trace fine gravel, firm		2" Ø BOREHOLE	2GP			0.0
-7.5							
	END OF HOLE @ 8.5ft BGS	-8.5					
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-6D-01
DATE COMPLETED: MAY 2, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-1.0					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet	-2.0	BENTONITE CHIPS	1GP			0.0
2.5	CI-CLAY, trace silt, firm, medium plasticity, gray, moist			2GP			0.0
5.0				3GP			0.0
			2" Ø BOREHOLE	4GP			0.0
7.5							
	END OF HOLE @ 9.0ft BGS	-9.0					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-130)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-6D-01
DATE COMPLETED: APRIL 23, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE	-1.2	BENTONITE HOLEPLUG	1GP			-
2.5	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, moist to very moist	-1.8	2" Ø BOREHOLE				
	- refusal (concrete)						
	END OF HOLE @ 1.8ft BGS						
5.0							
7.5							
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-131)
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PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-6E-01
DATE COMPLETED: MAY 2, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-1.3					
2.5	SP-SAND, trace silt, compact, fine grained, poorly graded, light brown, moist	-2.3	BENTONITE CHIPS	1GP			0.0
	CI-CLAY, with silt, firm, medium plasticity, gray, moist			2GP			0.0
5.0				3GP			0.0
7.5			2" Ø BOREHOLE	4GP			0.0
	END OF HOLE @ 9.3ft BGS	-9.3					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-132)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-7A-01
DATE COMPLETED: MAY 4, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.5					
-2.5	SP-SAND, trace silt, trace fine angular gravel, compact, fine grained, poorly graded, brown, moist		NATIVE CAVE				
-5.0							
		-6.5					
	CONCRETE FOOTING	-7.0					
-7.5	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet		2" Ø BOREHOLE	1GP			0.0
		-9.0					
-10.0	CI-CLAY, trace silt, trace coarse rounded gravel, firm, medium plasticity, gray, moist			2GP			0.0
-12.5							
		-13.5					
	END OF HOLE @ 13.5ft BGS						
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-133)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-7B-01
DATE COMPLETED: MAY 4, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.5					
	SP-SAND, trace silt, trace coarse angular gravel, compact, fine grained, poorly graded, brown, wet		NATIVE CAVE	1GP			0.0
-2.5		-2.5					
	CI-CLAY, trace silt, trace fine rounded gravel, firm, medium plasticity, gray, moist						
-5.0			2" Ø BOREHOLE	2GP			0.0
-7.5							
	END OF HOLE @ 8.5ft BGS	-8.5					
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-134)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-7C-01
DATE COMPLETED: MAY 4, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, moist	-2.2	NATIVE CAVE	1GP			0.0
2.5	CI-CLAY, trace sand, trace fine rounded gravel, firm, medium plasticity, gray, moist						
5.0			2" Ø BOREHOLE	2GP			0.0
7.5		-8.7					
	END OF HOLE @ 8.7ft BGS						
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-135)
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PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-8E-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.8					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet	-1.8	NATIVE CAVE	1GP			0.0
2.5	CI-CLAY, trace silt, firm, medium plasticity, gray, moist						
5.0			2" Ø BOREHOLE	2GP			0.0
7.5		-8.8					
	END OF HOLE @ 8.8ft BGS						
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

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PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-8F-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.8					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet		NATIVE CAVE	1GP			0.0
2.5		-2.8					
	CI-CLAY, trace silt, firm, medium plasticity, gray, moist		2" Ø BOREHOLE	2GP			0.0
5.0							
7.5							
	END OF HOLE @ 8.8ft BGS	-8.8					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-9F-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet		NATIVE CAVE	1GP			0.0
2.5							
		-4.4					
5.0	CI-CLAY, trace silt, firm, medium plasticity, gray, moist		2" Ø BOREHOLE	2GP			0.0
7.5							
	END OF HOLE @ 8.4ft BGS	-8.4					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-138)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-10A-01
DATE COMPLETED: MAY 4, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.5					
2.5	SP-SAND, trace silt, trace gravel, compact, fine grained, poorly graded, brown, wet	-3.0	NATIVE CAVE	1GP			0.0
5.0	CI-CLAY, trace silt, trace fine gravel, firm, medium plasticity, gray, moist - soft		2" Ø BOREHOLE	2GP			0.0
7.5		-8.5					
	END OF HOLE @ 8.5ft BGS						
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-139)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-10B-01
DATE COMPLETED: MAY 4, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.6					
	SP-SAND, trace silt, trace medium angular gravel, compact, fine grained, poorly graded, brown, wet	-1.6	NATIVE CAVE	1GP			0.0
2.5	CI-CLAY, trace silt, trace fine gravel, firm, medium plasticity, gray, moist						
5.0	- soft		2" Ø BOREHOLE	2GP			0.0
7.5							
	END OF HOLE @ 8.6ft BGS	-8.6					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-140)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-10C-01
DATE COMPLETED: MAY 4, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
	SP-SAND, trace silt, trace medium angular gravel, compact, fine grained, poorly graded, brown, moist	-1.2	NATIVE CAVE	1GP			0.0
-2.5	CI-CLAY, trace silt, trace fine rounded gravel, firm, medium plasticity, gray, moist						
-5.0	- soft		2" Ø BOREHOLE	2GP			0.0
-7.5							
	END OF HOLE @ 8.7ft BGS	-8.7					
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-10D-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.6					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet	-1.3					
-2.5	CI-CLAY, trace silt, trace fine rounded gravel, firm, medium plasticity, gray, moist		NATIVE CAVE	1GP			0.0
-5.0							
-7.5			2" Ø BOREHOLE	2GP			0.0
	END OF HOLE @ 8.6ft BGS	-8.6					
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-142)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-25A-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, very moist to wet	-2.2	BENTONITE CHIPS	1GP			0.0
2.5	CI-CLAY, trace silt, firm, medium plasticity, gray, moist						
5.0			2" Ø BOREHOLE	2GP			0.0
7.5							
	END OF HOLE @ 8.7ft BGS	-8.7					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-25B-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet	-1.7					
2.5	CI-CLAY, trace silt, trace gravel, firm, medium plasticity, gray, moist		NATIVE CAVE	1GP			0.0
5.0							
7.5			2" Ø BOREHOLE	2GP			0.0
	END OF HOLE @ 8.7ft BGS	-8.7					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-25C-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet		NATIVE CAVE	1GP			0.0
2.5							
		-4.2					
5.0	CI-CLAY (TILL), trace silt, trace fine rounded gravel, firm, medium plasticity, gray, moist		2" Ø BOREHOLE	2GP			0.0
7.5							
	END OF HOLE @ 8.7ft BGS	-8.7					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-145)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-25D-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7					
2.5	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, wet		NATIVE CAVE	1GP			0.0
		-3.9					
5.0	CI-CLAY (FILL), with silt, trace gravel, firm, medium plasticity, gray, moist	-4.2					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, moist		2" Ø BOREHOLE	2GP			0.0
7.5	- trace coarse angular gravel						
	END OF HOLE @ 8.7ft BGS	-8.7					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-146)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-26A-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB						
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, saturated	-.8	BENTONITE CHIPS	1GP			-
2.5							
5.0	CI-CLAY, with silt, trace fine gravel, firm, medium plasticity, gray, moist	-4.8	2" Ø BOREHOLE	2GP			0.0
7.5							
	END OF HOLE @ 8.8ft BGS	-8.8					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-147)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-26B-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB		BENTONITE HOLEPLUG	1GP			0.0
		-1.1					
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, very moist						
2.5							
	- refusal on concrete (footing?)	-3.4	2" Ø BOREHOLE				
	END OF HOLE @ 3.4ft BGS						
5.0							
7.5							
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-148)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-26B-01
DATE COMPLETED: MAY 23, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE	-1.3	BENTONITE HOLEPLUG	1GP	X	-	-
2.5	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, moist	-2.0	2" Ø BOREHOLE				
	- refusal (concrete)						
	END OF HOLE @ 2.0ft BGS						
5.0							
7.5							
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG
(OVERBURDEN)

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-26C-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-.7	BENTONITE CHIPS				
	SP-SAND, trace silt, compact, fine grained, poorly graded, brown, saturated			IGP			-
-2.5							
		-4.0					
-5.0	CI-CLAY, with silt, firm, medium plasticity, gray, moist		2" Ø BOREHOLE	2GP			0.0
-7.5							
	END OF HOLE @ 8.0ft BGS	-8.0					
-10.0							
-12.5							
-15.0							
-17.5							
-20.0							
-22.5							
-25.0							
-27.5							
-30.0							
-32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

STRATIGRAPHIC AND INSTRUMENTATION LOG (OVERBURDEN)

(WL-150)
Page 1 of 1

PROJECT NAME: FORMER PEREGRINE FACILITY
PROJECT NUMBER: 12636
CLIENT: REALM
LOCATION: FLINT, MICHIGAN

HOLE DESIGNATION: BH-26D-01
DATE COMPLETED: MAY 3, 2001
DRILLING METHOD: GEOPROBE
CRA SUPERVISOR: D. DEITNER

DEPTH ft. BGS	STRATIGRAPHIC DESCRIPTION & REMARKS	ELEV. ft.	MONITOR INSTALLATION	SAMPLE NUMBER	SAMPLE STATE	SAMPLE 'N' VALUE	SAMPLE PID (ppm)
	GROUND SURFACE	0.0					
	CONCRETE SLAB	-1.2	BENTONITE HOLEPLUG				
2.5	GP-GRAVEL, trace to with sand, coarse rounded gravel, fine grained sand, poorly graded, gray, saturated			1GP			0.0
5.0				2GP			0.0
7.5	- refusal (concrete footing)		2" Ø BOREHOLE				
	END OF HOLE @ 8.8ft BGS	-8.8					
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							
32.5							

NOTES: MEASURING POINT ELEVATIONS MAY CHANGE; REFER TO CURRENT ELEVATION TABLE
WATER FOUND ▽ STATIC WATER LEVEL ▼
CHEMICAL ANALYSIS ⬭

ATTACHMENT D

MEMO RE: EXCAVATION OF AREA SURROUNDING BH-9-26-00 IN BASEMENT
(CRA, JUNE 7, 2001)

CONESTOGA-ROVERS & ASSOCIATES

651 Colby Drive, Waterloo, Ontario, Canada N2V 1C2
Telephone: (519) 884-0510 Fax: (519) 884-0525
www.CRAworld.com

MEMORANDUM

TO:	Cheryl Hiatt	REF. NO.:	12636-40/nb/35
FROM:	Noelle Baker	DATE:	June 7, 2001
C.C.:	Marilyn Dedyne, Jean Caufield		
RE:	**Excavation of Area Surrounding BH-9-26-00 in Basement Former Peregrine (US) Inc. Coldwater Road Facility Genesee Township, Michigan**		

This memorandum outlines the scope of work, schedule, and budget for the excavation of the soil in the area surrounding BH-9-26-00 in the basement of Building 44 (AOI 9).

1.0 INTRODUCTION

The Former Plating Areas were identified as AOI 9 for the RCRA Facility Investigation (RFI) that was implemented during the period from May – August, 2000. One of these chrome plating areas was in the basement of Building 44. Historically, five soil samples had been collected as part of earlier property transfer evaluations at five different locations in the basement (PFB-17, PFB-18, PFB-19, PFB-20, and F-30). No exceedances of MDEQ IDCC or PSIC were encountered historically. As part of the RFI, nine additional soil samples were collected at seven different locations in the basement. Of these nine samples, an exceedance of the Act 451, Part 201 Generic Industrial Direct Contact Criteria (IDCC) for lead and the Act 451, Part 201 Generic Industrial Particulate Soil Inhalation Criteria (PSIC) for nickel was encountered at BH-9-26-00.

RFI Work Plan Addendum #1, dated April 27, 2001, outlined the scope of work for the delineation of contamination in the vicinity of BH-9-26-00. On May 3, 2001, CRA supervised the installation of four boreholes (BH-26A-01, BH-26B-01, BH-26C-01, and BH-26D-01) surrounding the location of BH-9-26-00. No exceedances of the Act 451, Part 201 Generic IDCC or PSIC were encountered at these four boreholes.

Based on this information, the area surrounding borehole location BH-9-26-00 is considered a hot spot and will be removed for disposal.

2.0 SCOPE OF WORK

The extent of the proposed excavation is presented on Figure 1. The dimensions of the proposed excavation are 21 feet by 19 feet. The depth of the excavation will extend two feet into the clay layer that underlies the sand layer beneath the concrete floor (approximately 6 feet below the concrete floor). Approximately, 1) cubic yards of soil will excavated.

he samples collected as part of RFI Work Plan Addendum #1 will be used as the four sidewall verification samples in accordance with the MDNR Verification of Soil Remediation Guidance Document (April, 1994). Two verification samples will be collected from the base of the excavation.

The excavated soil will be placed in roll-off boxes until characterization is complete. The characterization samples will be analyzed for TCLP lead and TCLP barium. This is based on the comparison of the 20X TCLP limits and the total VOC and metal concentrations encountered in the sample collected during the RFI from BH-9-26-00.

3.0 SCHEDULE

Adamo Demolition Company (Adamo) is currently pumping rainwater out of the basement. Adamo will then proceed on June 11, 2001 with building a ramp into the basement to aid in the eventual backfilling of the basement. The excavation of the area surrounding borehole location BH-9-26-00 will follow. Subject to weather conditions, the excavation should be completed in one day.

4.0 BUDGET

The following is the estimated budget for the scope of work described above.

umping of Water from Basement (Adamo)	$ 2000
Excavation of Soil (Adamo)	$ 2000
Rental of Roll-Off Boxes (Adamo)	$ 1000
Transportation to Brent Run	$ 1000
Disposal at Brent Run	$ 1000
Lab Costs (Verification and Characterization Samples)	$ 1000
Total Cost	$ 8000

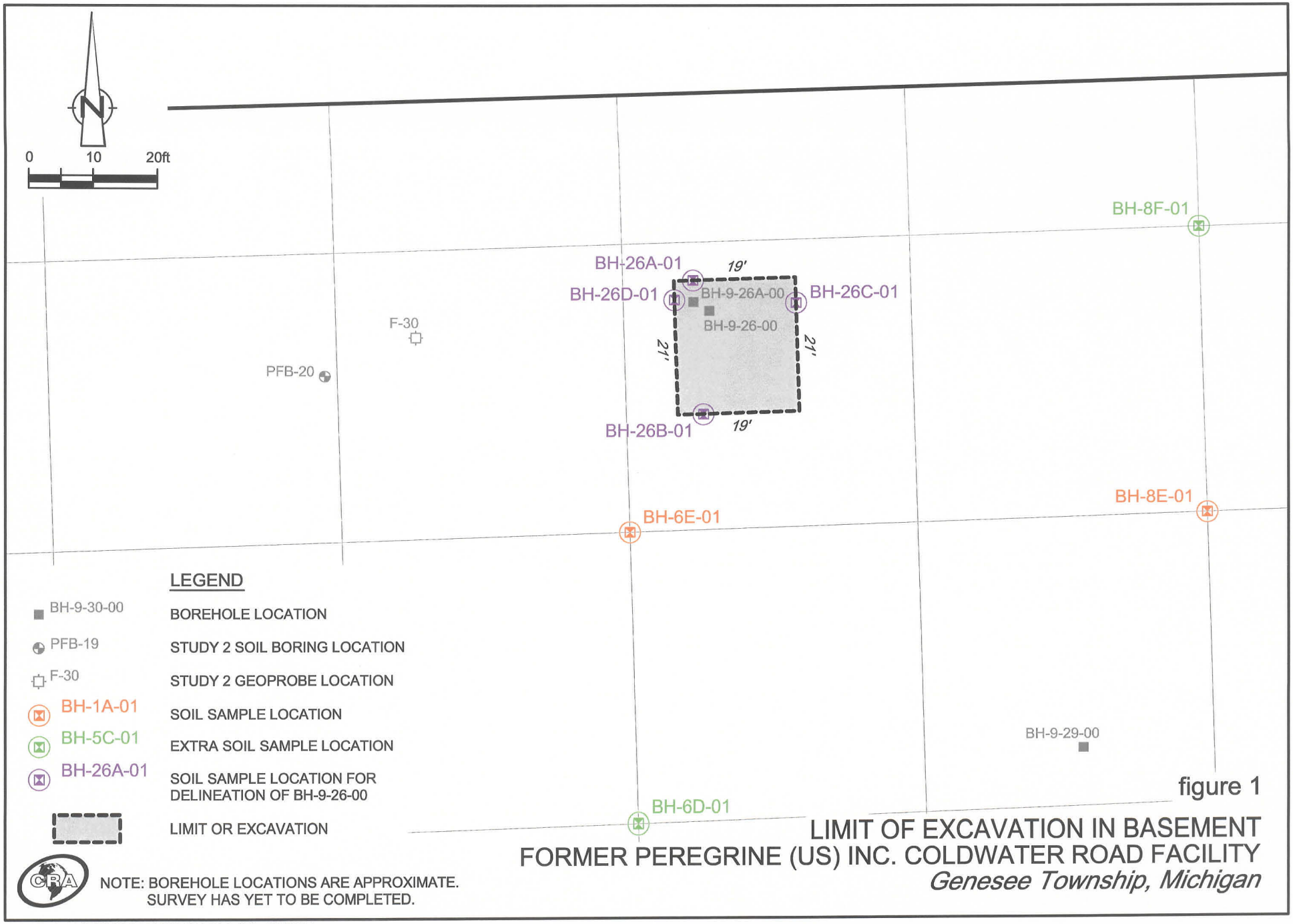

figure 1

LIMIT OF EXCAVATION IN BASEMENT
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(MEMO035)GN-WA001 JUL 13/2001

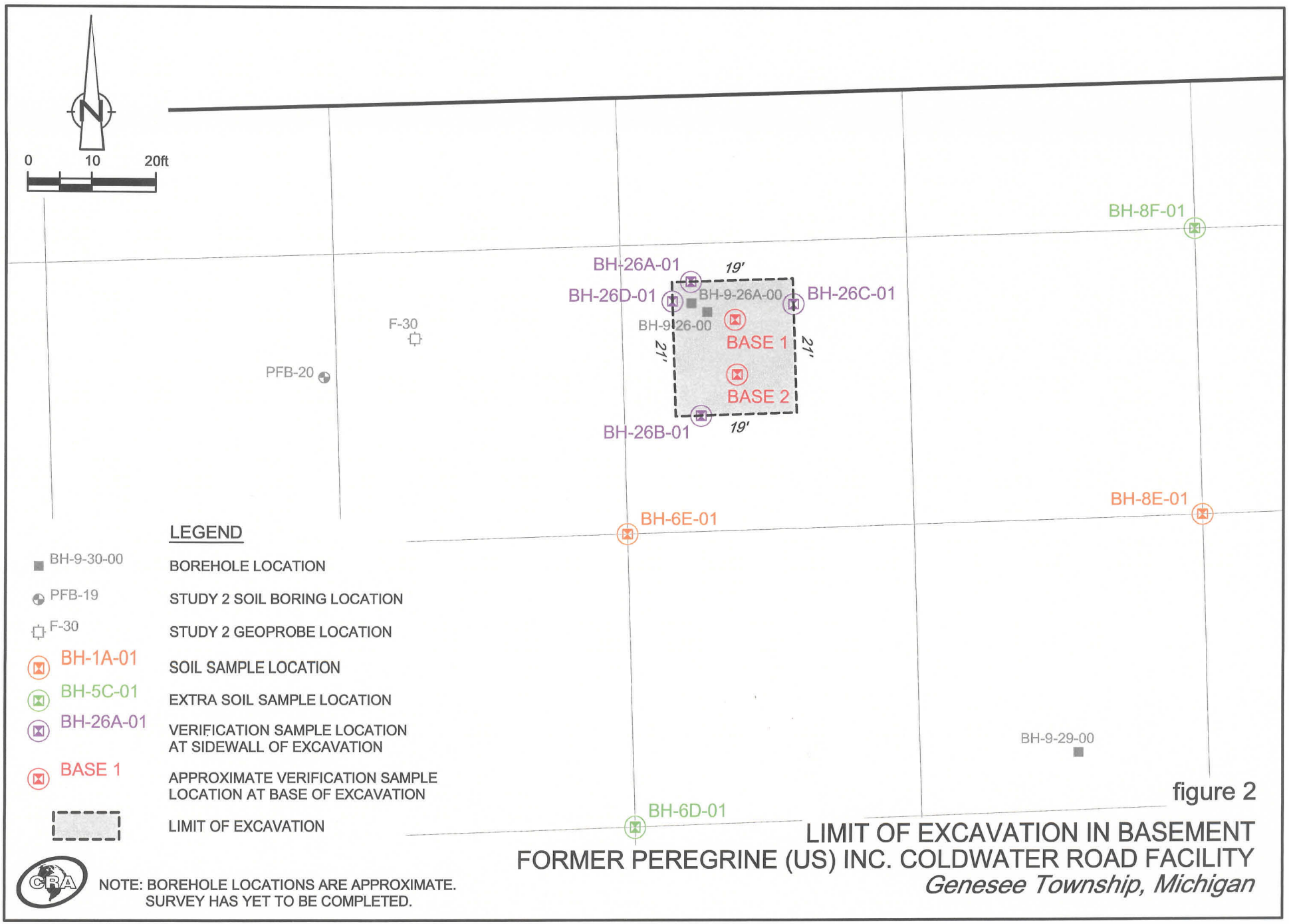

figure 2

LIMIT OF EXCAVATION IN BASEMENT
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

12636-40(MEMO036)GN-WA002 JUL 16/2001

ATTACHMENT E

PHOTOGRAPHS OF EXCAVATION

PHOTO 1 - JUNE 13, 2001
EXCAVATION OF HOT SPOT AT BH-9-26-00 LOOKING SOUTHEAST

PHOTO 2 - JUNE 13, 2001
EXCAVATION OF HOT SPOT AT BH-9-26-00 LOOKING EAST

figure E.1

PHOTOGRAPHIC LOG
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

PHOTO 3 - JUNE 13, 2001
EXCAVATION OF HOTSPOT AT BH-9-26-00

figure E.2

PHOTOGRAPHIC LOG
FORMER PEREGRINE (US) INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

ATTACHMENT F

ANALYTICAL DATA & VALIDATION FOR VERIFICATION SAMPLES

ANALYTICAL DATA FOR VERIFICATION SOIL SAMPLES FROM EXCAVATION IN BASEMENT OF BLDG. 44
FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	Site-Specific Background Levels	Industrial Drinking Water Protection Criteria	Industrial Direct Contact Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Volatile Soil Inhalation Criteria	Particulate Soil Inhalation Criteria	Sides of Excavation			
							BH-26B-01 S-12636-030501-DRD-007 AOI 9 5/3/00 0-1' bgs	BH-26C-01 S-12636-030501-DRD-008 AOI 9 5/3/00 4-6' bgs	BH-26A-01 S-12636-030501-DRD-009 AOI 9 5/3/00 4-6' bgs	BH-26D-01 S-12636-030501-DRD-010 AOI 9 5/3/00 0-2' bgs
Volatiles (ug/kg)										
1,1,1,2-Tetrachloroethane		6,400	440,000	33,000	120,000	530,000,000	-	-	-	-
1,1,1-Trichloroethane	-	4,000	460,000	460,000	4,500,000	29,000,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,1,2,2-Tetrachloroethane		700	370,000	23,000	34,000	68,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,1,2-Trichloroethane		100	920,000	24,000	57,000	250,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,1-Dichloroethane	-	50,000	890,000	430,000	2,500,000	15,000,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,1-Dichloroethene	-	140	570,000	330	3,700	78,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,2,3-Trichloropropane	-	2,400	830,000	-	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	4,200	1,100,000	1,100,000	34,000,000	11,000,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,2-Dibromo-3-chloropropane (DBCP)	-	4	1,200	1,200	15,000	5,900,000	ND(11)	ND(9.3)	ND(12) UJ	ND(9.0) UJ
1,2-Dibromoethane (EDB)	-	10	660	3,600	5,800	18,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,2-Dichlorobenzene	-	14,000	210,000	210,000	46,000,000	44,000,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,2-Dichloroethane	-	100	640,000	11,000	21,000	150,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,2-Dichloroethene (total)	-	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	-	100	550,000	7,400	30,000	120,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,3-Dichlorobenzene	-	480	170,000	-	-	-	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,4-Dichlorobenzene	-	1,700	2,900,000	100,000	260,000	570,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
1,4-Dioxane	-	7,000	3,700,000	-	-	710,000,000	-	-	-	-
2-Butanone	-	760,000	27,000,000	27,000,000	35,000,000	29,000,000,000	ND(22)	ND(19)	**13 J**	ND(18) UJ
2-Hexanone	-	58,000	2,500,000	1,800,000	1,300,000	1,200,000,000	ND(22)	ND(19)	ND(23) UJ	ND(18) UJ
2-Methyl-1-propanol	-	130,000	8,900,000	8,900,000	95,000,000	44,000,000,000	-	-	-	-
4-Methyl-2-pentanone	-	100,000	2,700,000	2,700,000	53,000,000	60,000,000,000	ND(22)	ND(19)	ND(23) UJ	ND(18) UJ
Acetone	-	42,000	110,000,000	110,000,000	160,000,000	170,000,000,000	ND(22)	ND(19)	**51 J**	ND(18) UJ
Acetonitrile	-	8,000	21,000,000	8,800,000	1,900,000	1,800,000,000	-	-	-	-
Acrolein	-	6,600	18,000,000	760	370	590,000	-	-	-	-
Acrylonitrile	-	220	110,000	35,000	17,000	58,000,000	-	-	-	-
Allyl chloride	-	-	-	-	-	-	-	-	-	-
Benzene, isopropyl	-	260,000	390,000	390,000	2,000,000	2,600,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Benzene	-	100	400,000	8,400	45,000	470,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Bromodichloromethane	-	2,000	750,000	6,400	31,000	110,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Bromoform	-	2,000	870,000	770,000	3,100,000	3,600,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Bromomethane	-	580	1,600,000	1,600	13,000	150,000,000	ND(11)	ND(9.3)	ND(12) UJ	ND(9.0) UJ
Carbon disulfide	-	46,000	280,000	140,000	1,600,000	21,000,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Carbon tetrachloride	-	100	390,000	990	12,000	170,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Chlorobenzene	-	2,000	260,000	220,000	920,000	2,100,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Chloroethane	-	34,000	950,000	950,000	36,000,000	290,000,000,000	ND(11)	ND(9.3)	ND(12) UJ	ND(9.0) UJ
Chloroform	-	2,000	1,500,000	38,000	150,000	1,600,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Chloromethane	-	22,000	1,100,000	12,000	140,000	6,100,000,000	ND(11)	ND(9.3)	ND(12) UJ	ND(9.0) UJ
Chloroprene	-	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	1,400	640,000	42,000	210,000	1,000,000,000	ND(2.8)	ND(2.3)	ND(2.9) UJ	ND(2.2) UJ
cis-1,3-Dichloropropene	-	-	-	-	-	-	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Cyclohexane	-	-	-	-	-	-	ND(11)	ND(9.3)	ND(12) UJ	ND(9.0) UJ
Dibromochloromethane	-	2,000	610,000	21,000	80,000	160,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Dibromomethane	-	4,600	2,000,000	-	-	-	-	-	-	-
Dichlorodifluoromethane (CFC-12)	-	270,000	1,000,000	1,000,000	63,000,000	1,500,000,000,000	ND(11)	ND(9.3)	ND(12) UJ	ND(9.0) UJ
Ethyl methacrylate	-	-	-	-	-	-	-	-	-	-
Ethylbenzene	-	1,500	140,000	140,000	11,000,000	29,000,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Iodomethane	-	-	-	-	-	-	-	-	-	-
Methyl acetate	-	-	-	-	-	-	ND(11)	ND(9.3)	ND(12) UJ	ND(9.0) UJ
Methyl acrylonitrile	-	-	-	-	-	-	-	-	-	-
Methyl cylohexane	-	-	-	-	-	-	ND(11)	ND(9.3)	ND(12) UJ	ND(9.0) UJ

ANALYTICAL DATA FOR VERIFICATION SOIL SAMPLES FROM EXCAVATION IN BASEMENT OF BLDG. 44
FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

							Sides of Excavation			
							BH-26B-01	BH-26C-01	BH-26A-01	BH-26D-01
							S-12636-030501-DRD-007	S-12636-030501-DRD-008	S-12636-030501-DRD-009	S-12636-030501-DRD-010
							AOI 9	AOI 9	AOI 9	AOI 9
							5/3/00	5/3/00	5/3/00	5/3/00
Parameter	*Site-Specific Background Levels*	*Industrial Drinking Water Protection Criteria*	*Industrial Direct Contact Criteria*	*Soil Volatilization to Indoor Air Inhalation Criteria*	*Volatile Soil Inhalation Criteria*	*Particulate Soil Inhalation Criteria*	0-1' bgs	4-6' bgs	4-6' bgs	0-2' bgs
Methyl methacrylate	-	-	-	-	-	-	-	-	-	-
Methyl Tert Butyl Ether	-	800	5,900,000	5,900,000	30,000,000	88,000,000,000	ND(22)	ND(19)	ND(23) UJ	ND(18) UJ
Methylene chloride	-	100	2,300,000	240,000	700,000	8,300,000,000	ND(5.6)	ND(4.6)	**10 J**	ND(4.5) UJ
Propionitrile (Ethyl cyanide)	-	-	-	-	-	-	-	-	-	-
Styrene	-	2,700	520,000	520,000	3,300,000	6,900,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Tetrachloroethene	-	100	88,000	60,000	600,000	6,800,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Toluene	-	16,000	250,000	250,000	3,300,000	12,000,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
trans-1,2-Dichloroethene		2,000	1,400,000	43,000	330,000	2,100,000,000	ND(2.8)	ND(2.3)	ND(2.9) UJ	ND(2.2) UJ
trans-1,3-Dichloropropene	-	-	-	-	-	-	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
trans-1,4-Dichloro-2-butene	-	-	-	-	-	-	-	-	-	-
Trichloroethene	-	100	500,000	37,000	260,000	2,300,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Trichlorofluoromethane (CFC-11)	-	150,000	560,000	560,000	110,000,000	1,700,000,000,000	ND(11)	ND(9.3)	ND(12) UJ	ND(9.0) UJ
Trifluorotrichloroethane (Freon 113)	-	550,000	550,000	550,000	210,000,000	2,300,000,000,000	ND(5.6)	ND(4.6)	ND(5.8) UJ	ND(4.5) UJ
Vinyl acetate	-	36,000	2,400,000	1,500,000	2,000,000	5,900,000,000	-	-	-	-
Vinyl chloride	-	40	29,000	150	1,500	47,000,000	ND(11)	ND(9.3)	ND(12) UJ	ND(9.0) UJ
Xylene (total)	-	5,600	150,000	150,000	54,000,000	130,000,000,000	ND(11)	ND(9.3)	**3.1 J**	ND(9.0) UJ

ANALYTICAL DATA FOR VERIFICATION SOIL SAMPLES FROM EXCAVATION IN BASEMENT OF BLDG. 44
FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	Site-Specific Background Levels	Industrial Drinking Water Protection Criteria	Industrial Direct Contact Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Volatile Soil Inhalation Criteria	Particulate Soil Inhalation Criteria	Sides of Excavation: BH-26B-01 S-12636-030501-DRD-007 AOI 9 5/3/00 0-1' bgs	BH-26C-01 S-12636-030501-DRD-008 AOI 9 5/3/00 4-6' bgs	BH-26A-01 S-12636-030501-DRD-009 AOI 9 5/3/00 4-6' bgs	BH-26D-01 S-12636-030501-DRD-010 AOI 9 5/3/00 0-2' bgs
Metals (ug/kg)										
Aluminum	16,500,000	1,000	660,000,000	-	-	-	**2,080,000**	**9,880,000**	**5,290,000**	**11,800,000**
Antimony	120	4,300	1,200,000	-	-	5,900,000	ND(231) UJ	ND(238) UJ	**239 B**	ND(239)
Arsenic	13,500	23,000	61,000	-	-	910,000	**2,780**	**5,740**	**4,290**	**6,550**
Barium	118,000	1,300,000	250,000,000	-	-	150,000,000	**9,910**	**51,500**	**47,300**	**142,000**
Beryllium	800	51,000	3,100,000	-	-	590,000	**114 B**	**5.1 B**	ND(116)	**6.0 B**
Cadmium	1,200	6,000	4,100,000	-	-	2,200,000	**86.1 B**	**137**	**1,260**	**135**
Calcium	88,000,000	-	-	-	-	-	**26,300,000**	**50,000,000**	**98,500,000**	**67,900,000**
Chromium	19,000	30,000	17,000,000	-	-	240,000	**7,030**	**45,600**	**120,000**	**19,400**
Cobalt	11,500	2,000	18,000,000	-	-	5,900,000	**2,010**	**7,040**	**6,270**	**8,610**
Copper	32,000	5,800,000	140,000,000	-	-	59,000,000	**4,530**	**11000 J**	**60000 J**	**12300 J**
Iron	29,800,000	6,000	1,000,000,000	-	-	-	**5,680,000**	**16,200,000**	**18,100,000**	**19,200,000**
Lead	21,000	700,000	900,000	-	-	44,000,000	**3,590**	**9,610**	**136,000**	**10,300**
Magnesium	35,000,000	22,000,000	1,000,000,000	-	-	2,900,000,000	**8,070,000**	**19,500,000**	**13,500,000**	**23,200,000**
Manganese	513,000	1,000	170,000,000	-	-	1,500,000	**149,000**	**291,000**	**241,000**	**374,000**
Mercury	130	1,700	1,100,000	-	-	-	**4.0 B**	**8.9 B**	**30.6 B**	**10.5 B**
Nickel	26,000	100,000	270,000,000	-	-	16,000,000	**4,740**	**32,100**	**222,000**	**21,400**
Potassium	2,300,000	-	-	-	-	-	**308,000 B**	**2,370,000**	**1,070,000**	**2,820,000**
Selenium	440	4,000	18,000,000	-	-	59,000,000	ND(578)	ND(595)	ND(1,160)	ND(597)
Silver	1,000	13,000	17,000,000	-	-	2,900,000	**22.0 B**	**65.7 B**	**6,650**	**76.0 B**
Sodium	660,000	7,000,000	1,000,000,000	-	-	-	ND(578,000)	ND(595,000)	**146,000 B**	ND(597,000)
Thallium	190	2,300	240,000	-	-	-	**54.3 B**	**236**	**42.1 B**	**255**
Tin	-	-	-	-	-	-	-	-	-	-
Vanadium	42,000	990,000	10,000,000	-	-	-	**8880 J**	**25,900**	**12,200**	**30,600**
Zinc	70,000	5,000,000	1,000,000,000	-	-	-	**19,400**	**49,500**	**216,000**	**41,700**
General Chemistry										
Total Cyanide (ug/kg)	390	4,000	250,000	-	-	250000	ND(578)	ND(595)	**807**	ND(597)
Percent Solids (%)	100	-	-	-	-	-	86.4	84.1	86.4	83.8

Notes

ND ( ) - Not detected at the quantitation limit stated in parentheses.
ND ( ) U - The analyte was analyzed for but was not detected above the reported sample quantitation limit in parentheses.
J - The associated numerical value is an estimated quantity.
UJ - The compound was analyzed for but was not detected. The sample quantitation limit is an estimated value (for non-detected parameters).
B - Method blank contamination. The associated method blank contains the target analyte at a reportable level.
☐ - Exceeds Industrial Direct Contact Criteria.
— - Exceeds Industrial Drinking Water Protection Criteria and Site-Specific Background Level.
- Exceeds Particulate Soil Inhalation Criteria.
= - Exceeds Soil Volatilization to Indoor Air Inhalation Criteria.

ANALYTICAL DATA FOR VERIFICATION SOIL SAMPLES FROM EXCAVATION IN BASEMENT OF BLDG. 44
FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	Site-Specific Background Levels	Industrial Drinking Water Protection Criteria	Industrial Direct Contact Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Volatile Soil Inhalation Criteria	Particulate Soil Inhalation Criteria	BH-26D-01 S-12636-030501-DRD-011 AOI 9 5/3/00 0-2' bgs	base of excavation BASE 1 S-12636-061401-NB-002 AOI 9 6/14/01 5-7' bgs	base of excavation BASE 2 S-12636-061401-NB-003 AOI 9 6/14/01 5-7' bgs
Volatiles (ug/kg)									
1,1,1,2-Tetrachloroethane		6,400	440,000	33,000	120,000	530,000,000	-	-	-
1,1,1-Trichloroethane	-	4,000	460,000	460,000	4,500,000	29,000,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,1,2,2-Tetrachloroethane		700	370,000	23,000	34,000	68,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,1,2-Trichloroethane		100	920,000	24,000	57,000	250,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,1-Dichloroethane	-	50,000	890,000	430,000	2,500,000	15,000,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,1-Dichloroethene	-	140	570,000	330	3,700	78,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,2,3-Trichloropropane	-	2,400	830,000	-	-	-	-	-	-
1,2,4-Trichlorobenzene	-	4,200	1,100,000	1,100,000	34,000,000	11,000,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,2-Dibromo-3-chloropropane (DBCP)	-	4	1,200	1,200	15,000	5,900,000	ND(8.4)	-	-
1,2-Dibromoethane (EDB)	-	10	660	3,600	5,800	18,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,2-Dichlorobenzene	-	14,000	210,000	210,000	46,000,000	44,000,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,2-Dichloroethane	-	100	640,000	11,000	21,000	150,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,2-Dichloroethene (total)	-	-	-	-	-	-	-	-	-
1,2-Dichloropropane	-	100	550,000	7,400	30,000	120,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,3-Dichlorobenzene	-	480	170,000	-	-	-	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,4-Dichlorobenzene	-	1,700	2,900,000	100,000	260,000	570,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
1,4-Dioxane	-	7,000	3,700,000	-	-	710,000,000	-	-	-
2-Butanone	-	760,000	27,000,000	27,000,000	35,000,000	29,000,000,000	ND(17)	ND (24)	ND (24) UJ
2-Hexanone	-	58,000	2,500,000	1,800,000	1,300,000	1,200,000,000	ND(17)	ND (24)	ND (24) UJ
2-Methyl-1-propanol	-	130,000	8,900,000	8,900,000	95,000,000	44,000,000,000	-	-	-
4-Methyl-2-pentanone	-	100,000	2,700,000	2,700,000	53,000,000	60,000,000,000	ND(17)	ND (24)	ND (24) UJ
Acetone	-	42,000	110,000,000	110,000,000	160,000,000	170,000,000,000	ND(17)	ND (24)	ND (24) UJ
Acetonitrile	-	8,000	21,000,000	8,800,000	1,900,000	1,800,000,000	-	-	-
Acrolein	-	6,600	18,000,000	760	370	590,000	-	-	-
Acrylonitrile	-	220	110,000	35,000	17,000	58,000,000	-	-	-
Allyl chloride	-	-	-	-	-	-	-	-	-
Benzene, isopropyl	-	260,000	390,000	390,000	2,000,000	2,600,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Benzene	-	100	400,000	8,400	45,000	470,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Bromodichloromethane	-	2,000	750,000	6,400	31,000	110,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Bromoform	-	2,000	870,000	770,000	3,100,000	3,600,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Bromomethane	-	580	1,600,000	1,600	13,000	150,000,000	ND(8.4)	ND (12)	ND (12) UJ
Carbon disulfide	-	46,000	280,000	140,000	1,600,000	21,000,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Carbon tetrachloride	-	100	390,000	990	12,000	170,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Chlorobenzene	-	2,000	260,000	220,000	920,000	2,100,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Chloroethane	-	34,000	950,000	950,000	36,000,000	290,000,000,000	ND(8.4)	ND (12)	ND (12) UJ
Chloroform	-	2,000	1,500,000	38,000	150,000	1,600,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Chloromethane	-	22,000	1,100,000	12,000	140,000	6,100,000,000	ND(8.4)	ND (12)	ND (12) UJ
Chloroprene	-	-	-	-	-	-	-	-	-
cis-1,2-Dichloroethene	-	1,400	640,000	42,000	210,000	1,000,000,000	ND(2.1)	ND (3.0)	**3.2 J**
cis-1,3-Dichloropropene	-	-	-	-	-	-	ND(4.2)	ND (6.0)	ND (5.9) UJ
Cyclohexane	-	-	-	-	-	-	ND(8.4)	ND (12)	ND (12) UJ
Dibromochloromethane	-	2,000	610,000	21,000	80,000	160,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Dibromomethane	-	4,600	2,000,000	-	-	-	-	-	-
Dichlorodifluoromethane (CFC-12)	-	270,000	1,000,000	1,000,000	63,000,000	1,500,000,000,000	ND(8.4)	ND (12)	ND (12) UJ
Ethyl methacrylate	-	-	-	-	-	-	-	-	-
Ethylbenzene	-	1,500	140,000	140,000	11,000,000	29,000,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Iodomethane	-	-	-	-	-	-	-	-	-
Methyl acetate	-	-	-	-	-	-	ND(8.4)	ND (12)	ND (12) UJ
Methyl acrylonitrile	-	-	-	-	-	-	-	-	-
Methyl cylohexane	-	-	-	-	-	-	ND(8.4)	ND (12)	ND (12) UJ

ANALYTICAL DATA FOR VERIFICATION SOIL SAMPLES FROM EXCAVATION IN BASEMENT OF BLDG. 44
FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	Site-Specific Background Levels	Industrial Drinking Water Protection Criteria	Industrial Direct Contact Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Volatile Soil Inhalation Criteria	Particulate Soil Inhalation Criteria	BH-26D-01 S-12636-030501-DRD-011 AOI 9 5/3/00 0-2' bgs	base of excavation: BASE 1 S-12636-061401-NB-002 AOI 9 6/14/01 5-7' bgs	base of excavation: BASE 2 S-12636-061401-NB-003 AOI 9 6/14/01 5-7' bgs
Methyl methacrylate	-	-	-	-	-	-	-	-	-
Methyl Tert Butyl Ether	-	800	5,900,000	5,900,000	30,000,000	88,000,000,000	ND(17)	ND (24)	ND (24) UJ
Methylene chloride	-	100	2,300,000	240,000	700,000	8,300,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Propionitrile (Ethyl cyanide)	-	-	-	-	-	-	-	-	-
Styrene	-	2,700	520,000	520,000	3,300,000	6,900,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Tetrachloroethene	-	100	88,000	60,000	600,000	6,800,000,000	ND(4.2)	ND (6.0)	ND (5.4) UJ
Toluene	-	16,000	250,000	250,000	3,300,000	12,000,000,000	ND(4.2)	ND (6.0)	**0.88 J**
trans-1,2-Dichloroethene		2,000	1,400,000	43,000	330,000	2,100,000,000	ND(2.1)	ND (3.0)	ND (3.0) UJ
trans-1,3-Dichloropropene	-	-	-	-	-	-	ND(4.2)	ND (6.0)	ND (5.9) UJ
trans-1,4-Dichloro-2-butene	-	-	-	-	-	-	-	-	-
Trichloroethene	-	100	500,000	37,000	260,000	2,300,000,000	ND(4.2)	ND (6.0)	**3.2 J**
Trichlorofluoromethane (CFC-11)	-	150,000	560,000	560,000	110,000,000	1,700,000,000,000	ND(8.4)	ND (12)	ND (12) UJ
Trifluorotrichloroethane (Freon 113)	-	550,000	550,000	550,000	210,000,000	2,300,000,000,000	ND(4.2)	ND (6.0)	ND (5.9) UJ
Vinyl acetate	-	36,000	2,400,000	1,500,000	2,000,000	5,900,000,000	-	-	-
Vinyl chloride	-	40	29,000	150	1,500	47,000,000	ND(8.4)	ND (12)	ND (12) UJ
Xylene (total)	-	5,600	150,000	150,000	54,000,000	130,000,000,000	ND(8.4)	ND (12)	ND (12) UJ
Metals (ug/kg)									
Aluminum	16,500,000	1,000	660,000,000	-	-	-	**8,370,000**	**11,100,000**	**10,700,000**
Antimony	120	4,300	1,200,000	-	-	5,900,000	ND(231)	ND (239)	ND (233) UJ
Arsenic	13,500	23,000	61,000	-	-	910,000	**5,330**	**4,760**	**6060 J**
Barium	118,000	1,300,000	250,000,000	-	-	150,000,000	**45,700**	**62,700**	**59,300**
Beryllium	800	51,000	3,100,000	-	-	590,000	**4.1 B**	**338**	**572**
Cadmium	1,200	6,000	4,100,000	-	-	2,200,000	**115**	**416**	**133**
Calcium	88,000,000	-	-	-	-	-	**44,600,000**	**50,200,000**	**50,000,000**
Chromium	19,000	30,000	17,000,000	-	-	240,000	**13,200**	**96,400**	**38,300**
Cobalt	11,500	2,000	18,000,000	-	-	5,900,000	**5,960**	**4,830**	**7540 J**
Copper	32,000	5,800,000	140,000,000	-	-	59,000,000	**9180 J**	**12,400**	**11800 J**
Iron	29,800,000	6,000	1,000,000,000	-	-	-	**15,100,000**	**18,000,000**	**17,800,000**
Lead	21,000	700,000	900,000	-	-	44,000,000	**7,260**	**13,800**	**10200 J**
Magnesium	35,000,000	22,000,000	1,000,000,000	-	-	2,900,000,000	**18,100,000**	**21000000 J**	**22,300,000**
Manganese	513,000	1,000	170,000,000	-	-	1,500,000	**295,000**	**376,000**	**330,000**
Mercury	130	1,700	1,100,000	-	-	-	**7.9 B**	**11.3 B**	**14.5 B**
Nickel	26,000	100,000	270,000,000	-	-	16,000,000	**15,000**	**158,000**	**59,600**
Potassium	2,300,000	-	-	-	-	-	**2,010,000**	**3,020,000**	**2720000 J**
Selenium	440	4,000	18,000,000	-	-	59,000,000	ND(577)	ND (599)	ND (582) UJ
Silver	1,000	13,000	17,000,000	-	-	2,900,000	**54.8 B**	**97.0 B**	**80.9 B**
Sodium	660,000	7,000,000	1,000,000,000	-	-	-	ND(577,000)	ND (599,000)	ND (582,000)
Thallium	190	2,300	240,000	-	-	-	**177**	**134**	**220**
Tin	-	-	-	-	-	-	-		
Vanadium	42,000	990,000	10,000,000	-	-	-	**23,300**	**29,600**	**28700 J**
Zinc	70,000	5,000,000	1,000,000,000	-	-	-	**30,300**	**145,000**	**92,400**
General Chemistry									
Total Cyanide (ug/kg)	390	4,000	250,000	-	-	250000	ND(577)	--	--
Percent Solids (%)	100	-	-	-	-	-	86.7	83.5	85.9

Notes

ANALYTICAL DATA FOR VERIFICATION SOIL SAMPLES FROM EXCAVATION IN BASEMENT OF BLDG. 44
FORMER PEREGRINE (US), INC., COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	Site-Specific Background Levels	Industrial Drinking Water Protection Criteria	Industrial Direct Contact Criteria	Soil Volatilization to Indoor Air Inhalation Criteria	Volatile Soil Inhalation Criteria	Particulate Soil Inhalation Criteria	base of excavation		
							BH-26D-01 S-12636-030501-DRD-011 AOI 9 5/3/00 0-2' bgs	BASE 1 S-12636-061401-NB-002 AOI 9 6/14/01 5-7' bgs	BASE 2 S-12636-061401-NB-003 AOI 9 6/14/01 5-7' bgs

ND ( ) - Not detected at the quantitation limit stated in parentheses.
ND ( ) U - The analyte was analyzed for but was not detected above the reported sample quantitation limit in parentheses.
J - The associated numerical value is an estimated quantity.
UJ - The compound was analyzed for but was not detected. The sample quantitation limit is an estimated value (for non-detected parameters).
B - Method blank contamination. The associated method blank contains the target analyte at a reportable level.
☐ - Exceeds Industrial Direct Contact Criteria.
— - Exceeds Industrial Drinking Water Protection Criteria and Site-Specific Background Level.
- Exceeds Particulate Soil Inhalation Criteria.
═ - Exceeds Soil Volatilization to Indoor Air Inhalation Criteria.

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MEMORANDUM

TO: Glenn Turchan

REF. NO.: 12636

FROM: Mary Cameron/soh/135/Det. MBC

DATE: August 2, 2001

RE: Data Quality Assessment and Validation – Expanded Deliverables
Former Peregrine (US) Inc. Coldwater Road Facility
Genesee Township, Michigan

The following details a quality assessment and validation of the analytical data resulting from the March 5 and June 14, 2001 collection of six (6) soil and one (1) quality control sample from the Former Peregrine (U.S.) Inc. Coldwater Road Facility in Genesee Township, Michigan. The sample summary detailing sample identification, sample location, quality control samples and analytical parameters is presented in Table 1. Sample analysis was completed at Severn Trent Laboratory (STL) in Canton, Ohio with the exception of several metal analyses which were completed at STL's Denver, Colorado facility in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).[1]

Sample Quantitation

In an effort to achieve the Michigan Department of Environmental Quality (MDEQ) Environmental Response Divisions (ERD) target method detection limits the laboratory provided reporting to their method detection limits.

The laboratory flagged concentrations of organic analytes below the laboratories sample specific reporting limit (RL) but above the laboratories sample specific method detection limit (MDL) with a "J" flag, these results should be qualified as estimated values unless otherwise qualified in this memorandum.

The laboratory flagged concentrations of metal analysis below the laboratories RL but above the laboratories MDL with a "B" flag, these results should be qualified as estimated (J) concentrations unless otherwise qualified in this memorandum. The "B" flag may be disregarded.

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. The samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by STL, were prepared and analyzed within the required holding time periods.

[1] Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check)

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each gas chromatography/mass spectrometer (GC/MS) instrument used for volatile organic compounds (VOC) analyses was checked at the beginning of each 12-hour period using bromofluorobenzene (BFB). The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration – Organic Analyses

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for organic analyses required that all compounds meet a method-specific minimum mean relative response factor (RRF) for GC/MS analyses only and a maximum percent relative standard deviation (RSD). The initial calibration data for organic analyses analyses were within the acceptance criteria indicating the instruments were capable of acceptable performance prior to analysis.

Initial Calibration – Inorganic Analyses

The initial calibration criteria for inorganic analysis requires an initial calibration verification standard be analyzed within a method-specific percent recovery of the accepted or true value. The initial calibration data for the inorganic analyses were within the acceptance criteria indicating the instruments were capable acceptable performance prior or analysis.

Continuing Calibration

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for organic analyses required that compounds meet a method-specific minimum RRF (GC/MS analyses only) and maximum percent difference (D) between the initial calibration mean RRF and the continuing calibration RRF. The continuing calibration verification data were within the acceptance criteria.

Continuing calibration criteria for inorganic analyses were the same criteria as used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. The samples presented in Table 4 should be qualified due to laboratory contamination. The samples were flagged by the laboratory with a "B" flag which may be disregarded. The remaining method blank samples were reported to be free from detectable levels of target analytes, indicating no laboratory-attributable contamination occurred.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The sample analyses that violated surrogate acceptance criteria are identified and qualified in Table 5. The surrogate recovery acceptance criteria was met for the remaining samples.

Inductively Coupled Plasma Interference Check Sample Analysis

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored. The data were within the acceptance criteria.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses serve as a monitor of the overall performance in all steps of the sample analysis. The LCS percent recoveries were within the laboratory control limits, indicating that an acceptable level of overall performance was achieved.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Organic Analyses

To assess the long term accuracy and precision of the analytical methods on various matrices, matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the relative percent difference (RPD) of the concentrations were determined. The MS/MSD percent recoveries and associate RPDs acceptance criteria were met for all analyses.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Inorganic Analyses

Matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the RPD of the concentrations were monitored to determine the effects of sample matrix on the laboratories digestion and measurement methods. Table 6 presents outlying MS/MSD results and the associated samples that should be qualified. The remaining samples analytes MS/MSD percent recoveries and associated RPDs were within the acceptance criteria.

Serial Dilution – Inorganic Analyses

The percent difference (D) between serial dilutions of a sample for various matrices were monitored to determine physical or chemical interference. The samples that should be qualified due to violation of serial dilution are identified in Table 7. The remaining percent D acceptance criteria was met.

Internal Standard Summaries

Overall instrument stability and performance for the VOC analyses was monitored using internal standard peak area and retention time (RT) data. Internal standard peak areas of the samples were required to fall within method-specific percent recovery of their respective internal standard areas in the continuing calibration standard. The RT for each internal standard in the samples were required to be within method-specific time intervals of their respective internal standard RT in the continuing calibration standard. The

Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to identification criteria established by the methods. The organics reported adhered to the specified identification criteria.

Compound Quantitation

The reported quantitation results and detection limits were checked to ensure results reported were accurate. No discrepancies were found between the raw data and the sample results reported by the laboratory.

Field Quality Assurance/Quality Control

The field quality assurance/quality control consisted of one (1) field duplicate sample set. Overall precision for the sampling event and laboratory procedures was monitored using the results of the field duplicate sample sets. Table 9 summarizes the results of the detected analytes in the field duplicate sample sets. The data indicate that an adequate level of precision was achieved for the sampling event.

System Performance

System performance between various quality control checks was evaluated to monitor for changes that may have caused the degradation of data quality. No technical problems or chromatographic anomalies were observed which require qualification of the data.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

TABLE 1

SAMPLE SUMMARY
FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Sample Identification	*Sample Location*	*Depth*	*Matrix*	*QC Sample*	*Parameters*
S-12636-030501-DRD-007	BH-26B-01	0' to 1'	Soil	---	Metals, VOC, Cyanide
S-12636-030501-DRD-008	BH-26C-01	4' to 6'	Soil	---	Metals, VOC, Cyanide
S-12636-030501-DRD-009	BH-26A-01	0' to 2'	Soil	---	Metals, VOC, Cyanide
S-12636-030501-DRD-010	BH-26D-01	4' to 6'	Soil	---	Metals, VOC, Cyanide
S-12636-030501-DRD-011	BH-26D-01	4' to 6'	Soil	Duplicate of 010	Metals, VOC, Cyanide
S-12636-061401-NB-002	Base 1	---	Soil	---	Metals, VOC
S-12636-061401-NB-003	Base 2	---	Soil	---	Metals, VOC

VOC - Target Compound List (TCL) Volatile Organic Compounds

QC - Quality Control

TABLE 2

SUMMARY OF ANALYTICAL METHODS
FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	*Method*
TCL VOC	SW-846 8260B[1]
TAL Metals	
Aluminum	SW-846 6010B
Antimony	SW-846 6020
Arsenic	SW-846 6020
Barium	SW-846 6010B
Beryllium	SW-846 6020B
Cadmium	SW-846 6020
Calcium	SW-846 6010B
Chromium	SW-846 6020
Cobalt	SW-846 6020
Copper	SW-846 6020
Iron	SW-846 6010B
Lead	SW-846 6020
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7471A
Nickel	SW-846 6020
Potassium	SW-846 6010B
Selenium	SW-846 6020
Silver	SW-846 6020
Sodium	SW-846 6010B
Thallium	SW-846 6020
Total Cyanide	SW-846 9012
Vanadium	SW-846 6010B
Zinc	SW-846 6020B

[1] SW-846 – "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods", SW-846, 3rd Edition, and Promulgated updates, November 1986.

TABLE 3

HOLDING TIME PERIODS
FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Analysis	*Holding Time Period*
TCL VOC	- 14 days from sample collection to completion of analysis
TAL Metals -	
Metals (except Mercury)	- 180 days from sample collection to completion of analysis
Mercury	- 28 days from sample collection to completion of analysis
Cyanide	- 14 days from sample collection to completion of Analysis

TABLE 4

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO METHOD BLANK CONTAMINATION FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY GENESEE TOWNSHIP, MICHIGAN

Analyte	*Associated Samples*	*Qualified[1] Sample Result*
TAL Metals		
Antimony	S-12636-030501-DRD-007	ND (231) U
	S-12636-030501-DRD-008	ND (238) U

[1] The analyte should be qualified for the listed samples as:

ND ( ) U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit in parenthesis.

TABLE 5

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO VIOLATION OF SURROGATE PERCENT RECOVERY CRITERIA FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY GENESEE TOWNSHIP, MICHIGAN

Analysis	*Associated Sample*	*Qualifier*[1]
TCL VOC	S-12636-030501-DRD-009	J/UJ

---

[1] The analysis parameter results should be qualified for the associated samples as:

J - The analyte was positively identified; the associated numerical value is the estimated concentration of the analyte in the sample (for detected parameters).

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is estimated and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample (for non-detected parameters).

TABLE 6

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO OUTLYING INORGANIC MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY GENESEE TOWNSHIP, MICHIGAN

Analysis	*Parameter*	*Associated Samples*	*Qualifier* [1]
TAL Metals	Antimony,	S-12636-030501-DRD-007	J/UJ
	Copper	S-12636-030501-DRD-008	J
		S-12636-030501-DRD-009	
		S-12636-030501-DRD-010	
		S-12636-030501-DRD-011	
TAL Metals	Magnesium,	S-12636-061401-NB-002	J
	Potassium,	S-12636-061401-NB-003	J
	Vanadium,		J
	Antimony,		UJ
	Arsenic,		J
	Cobalt,		J
	Copper,		J
	Lead,		J
	Selenium		UJ

[1] The samples should be qualified for each associated parameter as:

J - The associated numerical value is an estimated quantity (for detected parameters).

UJ - The compound was analyzed for but was not detected. The sample quantitation limit is an estimated value (for non-detected parameters).

TABLE 7

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO OUTLYING SERIAL DILUTION PERCENT DIFFERENCE FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY GENESEE TOWNSHIP, MICHIGAN

Analysis	*Parameter*	*Associated Sample*	*Qualifier*[1]
TAL Metals	Vanadium	S-12636-030501-DRD-007	J

[1] The parameter results should be qualified for the listed samples as:

J - The associated value is an estimated quantity (for detected parameters).

TABLE 8

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO OUTLYING INTERNAL STANDARD PERCENT RECOVERY DATA FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY GENESEE TOWNSHIP, MICHIGAN

Analysis	*Associated Samples*	*Qualifier*[1]
TCL VOC	S-12636-030501-DRD-010	UJ
	S-12636-061401-NB-003	J/UJ

[1] The parameter results should be qualified for the listed samples as:

J - The associated value is an estimated quantity (for detected parameters).

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is estimated and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample (for non-detected parameters).

TABLE 9

SUMMARY OF DETECTED ANALYTES IN FIELD DUPLICATE SAMPLE SET
FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	*Investigative Sample*	*Duplicate Sample*	*RPD* [1]
	S-12636-030501-DRD-010	S-12636-030501-DRD-011	
TAL Metals (µg/kg)			
Aluminum	11,800,000	8,370,000	34
Arsenic	6,800	5,380	23
Barium	142,000	45,700	100
Beryllium	598	409	38
Cadmium	130	111	16
Calcium	67,900,000	44,600,000	41
Chromium	19,000	13,000	38
Cobalt	8,610	5,960	36
Copper	12,300 J [2]	9,180 J	29
Iron	19,200,000	15,100,000	24
Lead	9,020	6,480	33
Magnesium	23,200,000	18,100,000	25
Manganese	374,000	295,000	24
Mercury	10.5 J	7.8 J	30
Nickel	21,400	15,000	35
Potassium	2,820,000	2,010,000	34
Silver	82.3 J	60.4 J	31
Thallium	223	154	37
Vanadium	30,600	23,300	27
Zinc	42,300	30,600	32

RPD - Relative Percent Difference

J - The associated numerical value is an estimated quantity.

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MEMORANDUM

TO:	Glenn Turchan	REF. NO.:	12636
FROM:	Mary Cameron/mw/136/Det. MW	DATE:	August 14, 2001
RE:	Data Quality Assessment and Validation – Expanded Deliverables Former Peregrine (US) Inc. Coldwater Road Facility Genesee Township, Michigan		

The following details a quality assessment and validation of the analytical data resulting from the May 2, 2001 collection of one (1) soil sample from the Former Peregrine (U.S.) Inc. Coldwater Road Facility in Genesee Township, Michigan. The sample summary detailing sample identification, sample location, and analytical parameters is presented in Table 1. Sample analysis was completed at Severn Trent Laboratories (STL) in North Canton, Ohio with the exception of several metal analyses which were completed at STL's Denver, Colorado facility in accordance with the methodologies presented in Table 2. The quality control criteria used to assess the data were established by the methods and the quality assurance project plan (QAPP).[1]

Sample Quantitation

In an effort to achieve the Michigan Department of Environmental Quality (MDEQ) Environmental Response Divisions (ERD) target method detection limits the laboratory reported all analyses to their method detection limits.

The laboratory flagged concentrations of metal analysis below the laboratories report limit (RL) but above the laboratories method detection limit (MDL) with a "B" flag, these results should be qualified as estimated (J) concentrations unless otherwise qualified in this memorandum. The "B" flag may be disregarded.

Holding Time Period and Sample Analysis

The holding time periods are presented in Table 3. The samples, as indicated by the sample collection, extraction and analysis dates on the chain-of-custody forms and analytical reports provided by STL, were prepared and analyzed within the required holding time periods.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check)

To ensure adequate mass resolution, identification, and to some degree, sensitivity; the performance of each gas chromatography/mass spectrometer (GC/MS) instrument used for volatile organic compounds (VOC)

[1] Application of quality assurance criteria was consistent with "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review", EPA-540/R-94/012, February 1994 and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Review", EPA-540/R-94/013, February 1994.

Gas Chromatography/Mass Spectrometer Mass Calibration (Instrument Performance Check) (Cont'd)

analyses was checked at the beginning of each 12-hour period using bromofluorobenzene (BFB). The results of all instrument performance checks were within the acceptance criteria, indicating acceptable instrument performance.

Initial Calibration – Organic Analyses

Initial calibration data were used to demonstrate that each instrument was capable of generating acceptable quantitative data. Initial calibration criteria for organic analyses required that all compounds meet a method-specific minimum mean relative response factor (RRF) and a maximum percent relative standard deviation (RSD). The initial calibration data for organic analyses analyses were within the acceptance criteria indicating the instruments were capable of acceptable performance prior to analysis.

Initial Calibration – Inorganic Analyses

The initial calibration criteria for inorganic analysis requires an initial calibration verification standard be analyzed within a method-specific percent recovery of the accepted or true value. The initial calibration data for the inorganic analyses were within the acceptance criteria indicating the instruments were capable of acceptable performance prior or analysis.

Continuing Calibration

To ensure that each instrument was capable of producing acceptable quantitative data over the analysis period, routine checks upon the instrument calibrations were performed. Continuing calibration acceptance criteria for organic analyses required that compounds meet a method-specific minimum RRF and maximum percent difference (D) between the initial calibration mean RRF and the continuing calibration RRF. The continuing calibration verification data were within the acceptance criteria.

Continuing calibration criteria for inorganic analyses were the same criteria as used for assessing the initial calibration data. The continuing calibration verification data were within the acceptance criteria.

Method Blank Samples

Contamination of samples contributed by laboratory conditions or procedures was monitored by concurrent preparation and analysis of method blank samples. The method blank samples were reported to be free from detectable levels of target analytes, indicating no laboratory-attributable contamination occurred.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for the organic analyses was monitored by assessing the results of surrogate compound percent recoveries. The surrogate recovery acceptance criteria was met for all of the samples.

Inductively Coupled Plasma Interference Check Sample Analysis

To verify that proper inter-element and background correction factors had been established by the laboratory for metals analyses, the inductively coupled plasma interference check sample data was monitored. The data were within the acceptance criteria.

Laboratory Control Sample Analysis

The laboratory control sample (LCS) analyses serve as a monitor of the overall performance in all steps of the sample analysis. The LCS percent recoveries were within the laboratory control limits, indicating that an acceptable level of overall performance was achieved.

Matrix Spike/Matrix Spike Duplicate Percent Recoveries - Inorganic Analyses

Matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the relative percent difference (RPD) of the concentrations were monitored to determine the effects of sample matrix on the laboratories digestion and measurement methods. Table 4 presents outlying MS/MSD results and the associated samples that should be qualified. The remaining samples analytes MS/MSD percent recoveries and associated RPDs were within the acceptance criteria.

Serial Dilution – Inorganic Analyses

The percent difference (D) between serial dilutions of a sample for various matrices were monitored to determine physical or chemical interference. The percent D acceptance criteria was met.

Internal Standard Summaries

Overall instrument stability and performance for the VOC analyses was monitored using internal standard peak area and retention time (RT) data. Internal standard peak areas of the samples were required to fall within method-specific percent recovery of their respective internal standard areas in the continuing calibration standard. The RT for each internal standard in the samples were required to be within method-specific time intervals of their respective internal standard RT in the continuing calibration standard. The samples that should be qualified due to violation of the percent internal standard area are summarized in Table 5. The remaining samples internal standard data were within the acceptance criteria.

Target Compound Identification

To minimize erroneous compound identification during organic analyses, qualitative criteria including compound retention time and mass spectra (if applicable) were evaluated according to identification criteria established by the methods. The organics reported adhered to the specified identification criteria.

Compound Quantitation

The reported quantitation results and detection limits were checked to ensure results reported were accurate. No discrepancies were found between the raw data and the sample results reported by the laboratory.

System Performance

System performance between various quality control checks was evaluated to monitor for changes that may have caused the degradation of data quality. No technical problems or chromatographic anomalies were observed which require qualification of the data.

Overall Assessment

The data were found to exhibit acceptable levels of accuracy and precision, based on the provided information, and may be used with the qualifications noted.

TABLE 1

SAMPLE SUMMARY
FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Sample Identification	*Sample Location*	*Depth (feet bgs)*	*Matrix*	*Parameters*
S-12636-020501-DRD-001	BH-6E-01	0' to 2'	Soil	Inorganics, VOC, Cyanide

VOC - Target Compound List (TCL) Volatile Organic Compounds

Inorganics - Target Analyte List (TAL) Inorganics

Feet bgs - Feet below ground surface

TABLE 2

SUMMARY OF ANALYTICAL METHODS
FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Parameter	*Method*
TCL VOC	SW-846 8260B[1]
TAL Inorganics	
Aluminum	SW-846 6010B
Antimony	SW-846 6020
Arsenic	SW-846 6020
Barium	SW-846 6010B
Beryllium	SW-846 6020
Cadmium	SW-846 6020
Calcium	SW-846 6010B
Chromium	SW-846 6020
Cobalt	SW-846 6020
Copper	SW-846 6020
Iron	SW-846 6010B
Lead	SW-846 6020
Magnesium	SW-846 6010B
Manganese	SW-846 6010B
Mercury	SW-846 7471A
Nickel	SW-846 6020
Potassium	SW-846 6010B
Selenium	SW-846 6020
Silver	SW-846 6020
Sodium	SW-846 6010B
Thallium	SW-846 6020
Total Cyanide	SW-846 9012
Vanadium	SW-846 6010B
Zinc	SW-846 6020

[1] SW-846 - "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," SW-846, 3rd Edition, and Promulgated updates, November 1986.

TABLE 3

HOLDING TIME PERIODS
FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY
GENESEE TOWNSHIP, MICHIGAN

Analysis	*Holding Time Period*
TCL VOC	- 14 days from sample collection to completion of analysis
TAL Inorganics -	
Metals (except Mercury)	- 180 days from sample collection to completion of analysis
Mercury	- 28 days from sample collection to completion of analysis
Cyanide	- 14 days from sample collection to completion of Analysis

TABLE 4

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO OUTLYING INORGANIC MATRIX SPIKE/MATRIX SPIKE DUPLICATE RESULTS FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY GENESEE TOWNSHIP, MICHIGAN

Analysis	*Parameter*	*Associated Samples*	*Qualifier* [1]
TAL Inorganics	Sodium,	S-12636-020501-DRD-001	UJ
	Manganese,		J
	Vanadium,		J
	Chromium,		J
	Copper,		J
	Nickel		J

[1] The samples should be qualified for each associated parameter as:

J - The associated numerical value is an estimated quantity (for detected parameters).

UJ - The compound was analyzed for but was not detected. The sample quantitation limit is an estimated value (for non-detected parameters).

TABLE 5

SUMMARY OF QUALIFIED SAMPLE DATA DUE TO OUTLYING INTERNAL STANDARD PERCENT RECOVERY DATA FORMER PEREGRINE (U.S.) INC. COLDWATER ROAD FACILITY GENESEE TOWNSHIP, MICHIGAN

Analysis	*Associated Samples*	*Qualifier*[1]
TCL VOC	S-12636-020501-DRD-001	UJ

[1] The parameter results should be qualified for the listed samples as:

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is estimated and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample (for non-detected parameters).

ATTACHMENT G

TCLP CHARACTERIZATION DATA REPORT

CT&E Environmental Services Inc.
Michigan Division

Laboratory Report

Project:	**Former Peregrine (Coldwater Rd) #12636**
CT&E Work Order:	**3012650** **12636 Soil TCLP 6/13/01**
Client:	**Conestoga-Rovers & Associates** **11100 Metro Airport Center Dr.** **Suite 160** **Romulus, MI 48174**
Attention:	**Paul Wiseman**

Certification:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, other than the conditions noted on the sample data sheet(s) and/or the case narrative. This certification applies only to the tested parameters and the specific sample(s) received at the laboratory.

Respectfully submitted,

Lidya Gulizia

Lidya Gulizia, Project Manager
CT&E Environmental Services Inc.
Michigan Division
1200 Conrad Industrial Drive
Ludington, MI 49431
Phone: 231.843.1877
Fax: 231.845.9942
E-mail: lgulizia@cteesi.com

6/22/2001
Date

This report contains 40 **pages**

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/22/2001

ORIGINAL ANALYTICAL REPORT

Project#: 12636 **Lab#:** 3012650
Name: Coldwater Rd
Description
Event: BDA
Samples: 1 Soil (6/12/01)
Analysis: TCLP - VOC - SVOC - MTL, PCB
TAT: 3 day Not Met
Lab: CT&E
Checked Against Preliminary Data:
Date: 7/10/01 **Init.:**
Date of Validation Memo: 12/19/01
Invoice Approval Date:
Comments:

Report Order

Report Legend
Laboratory Report
Chain-of-Custody Record
Log-In Check List
Preservation Check List
Report Addenda

Laboratory Report Legend

The laboratory holds the following certifications:

American Association of Laboratory Accreditation (A2LA), Certificate No. 1628.01
National Environmental Laboratory Accreditation Program (NELAP), Accreditation No. 100433 (State of Illinois)
State of Alaska UST, Approval No. UST-048
State of Indiana, Certification No. C-MI-01
State of Maryland, Certification No. 266
State of Michigan, Certification No. 0021
State of Wisconsin, Certification No. 999959180
United States Army Corps of Engineers

Container Identification (ID)

The unique container ID is comprised of the CT&E Sample ID plus a "-" and the number found in the Cont. ID column.

Qualifiers (located next to the Result column)

ND	Not detected
B	Blank contaminant
D	Dilution
J	Estimated result
M	Matrix interference
N	Presumptive evidence by GC/MS library search
E	Concentration exceeds calibration range

Footnotes

(1) Parameter analyzed according to method; this combination of method and / or parameter has not been evaluated by NELAP

LABORATORY NARRATIVE

CT&E Environmental Services Inc.
PROJECT SUMMARY / QUALITY CONTROL NARRATIVE

CRA Project Name: Former Peregrine (Coldwater Rd.)
CRA Project Reference Number: 12636
CT&E Work Order: 3012650

Sample Collection and Receipt:

One soil sample was collected by the client on June 13, 2001 and was relinquished to a laboratory courier for shipping to CT&E Environmental Services, Inc. (CT&E) on June 14, 2001. The sample was received at CT&E on June 15, 2001. All containers arrived at the laboratory in good condition and at a temperature of 6 °C. Following log-in, the samples were stored at 4°C until extraction.

Following receipt of the sample, a sample confirmation summary was sent and telephone call made to Mr. Paul Wiseman on June 15, 2001 requesting clarification of the PCB and turnaround requirements. On June 18, 2001, Mr. Steven Carter revised the sample requirements for total PCB analysis and requested 3-day rush turnaround analysis.

The project sample was logged for analysis on a 3-day turnaround basis, however, sample analysis could not be completed within the requested turnaround time and preliminary data was provided on a 1-week turnaround basis.

Sample Analysis:

The sample was extracted by the Toxicity Characteristic Leaching Procedure (TCLP) using SW-846 Method 1311 and the leachate analyzed for the following parameters for TCLP constituents: volatile organic compounds (VOC); semivolatile organic compounds (SVOC); and RCRA metals. Additionally, the sample was extracted and analyzed for total PCBs in accordance with SW-846 Method 8082.

All preparations were performed within the required holding times and proceeded without incident. Method blanks, duplicate laboratory control samples (LCS) and/or matrix spike (MS) samples were analyzed with each analytical batch.

All of the quality control data were acceptable and within the required acceptance limits except for the following.

PCB Analyses

The control limits for the relative percent difference (RPD) of the LCS and MS duplicate sample recoveries were exceeded for Aroclor 1260 in Preparation Batch XXX 3273. There was no corrective action initiated on the basis of the RPD results.

CT&E Environmental Services Inc.
PROJECT SUMMARY / QUALITY CONTROL NARRATIVE

CRA Project Name: Former Peregrine (Coldwater Rd.)
CRA Project Reference Number: 12636
CT&E Work Order: 3012650

Reporting:

The percent solids of the sample were determined and PCB results corrected to a dry-weight reporting basis.

There were no qualifications to any sample data due to quality control or sample-related issues other than those stated above.

Lidya Gulizia 7/3/01
Lidya Gulizia Date
Project Manager, CT&E Environmental Services, Inc.

SUPPORTING DOCUMENTATION

CRA Project Name: Former Peregrine (Coldwater Rd.)
CRA Project Reference Number: 12636
CT&E Work Order: 3011920

I. Analytical Methods:

TCLP Extraction	SW-846 1311[1]
PCBs	SW-846 8082[1]
RCRA Metals (excluding Mercury)	SW-846 6020[1]
Mercury	SW/846 7470[1]
Volatiles	SW-846 8260[1]
Semivolatiles	SW-846 8270[1]
Total Solids	SM 2540G[2]

[1] Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 3rd Edition and Promulgated Updates, November 1986
[2] Standard Methods for the Examination of Water & Wastewater. 19th Edition.

II. Sample Summary:

CRA Sample Number	CT&E Sample Number
S-12636-061301-NB-001	3012650001

Explanation of Terms and Data Qualifiers

(Non-Wisconsin Sites)

Term/Qualifier	Description
Result	The value calculated from the analytical test reported to two significant figures.
Reporting Detection Limit	The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. Reporting Detection Limits are often based on cleanup requirements, drinking water MCLs or permits and are always greater than the MDL.
MDL - Method Detection Limit.	The minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte. This value is determined using 40 CFR Part 136 Appendix B.
Surrogates	Organic compounds that are added to the sample prior to analysis to monitor the efficiency of the sample preparation and potential matrix interference.
Qualifiers	Data flags used to indicate problems or issues that could affect the result.
ND	Indicates compound was analyzed for but not detected at or above the Reporting Detection Limit.
J	Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the data indicates the presence of a compound that meets the identification criteria but the result is less than the limit of quantitation but greater than the method detection limit.
N	Indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds, where the identification is based on a mass spectral library search. It is applied to all TIC results.
B	This flag is used when the analyte is found in the associated blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. This flag must be used for a TIC as well as for a positively identified target compound.
E	This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.
M	This flag identifies compounds where a matrix interference is suspected. The interference may be positive (enhance the signal or compound concentration) or negative (suppress the signal or compound concentration).
D	This flag identifies all compounds identified in an analysis at a secondary dilution factor.
X	The data should be considered suspect because some aspect of the test did not meet method requirements. This flag must always be accompanied by a explanation.

CHAIN-OF-CUSTODY/LOG-IN RECORDS

3012650

CT&E Environmental Services Inc.

CHAIN OF CUSTODY RECOI

131620 COC Serial

CRA
CONESTOGA-ROVERS & ASSOCIATES
651 Colby Drive
Waterloo, Ont. N2V 1C2 (519)884-0510

SHIPPED TO (Laboratory Name): CT&E

12636

SAMPLER'S SIGNATURE: Noelle Baker PRINTED NAME: Noelle Baker

SEQ. No.	DATE	TIME	SAMPLE No.	SAMPLE TYPE	No. OF CONTAINERS	PARAMETERS: 32oz	TCLP Metals	TCLP PCBs	TCLP SVOCs	TCLP VOCs	REMARKS
001	6-13-01		S-12636-061301-NB-001	Soil	2	402	X	X	X	X	

TOTAL NUMBER OF CONTAINERS: 2 HEALTH/CHEMICAL HAZARDS

RELINQUISHED BY: ① Noelle Baker	DATE: 6-14-01 TIME: 10:40	RECEIVED BY: ②	DATE: 6/14/01 TIME: 10:40
RELINQUISHED BY: ②	DATE: 6/14/01 TIME: 10:40	RECEIVED BY: ③	DATE: TIME:
RELINQUISHED BY: ③	DATE: TIME:	RECEIVED BY: ④ Reagan Appleton	DATE 6/15/01 TIME: 9:00

METHOD OF SHIPMENT: WAY BILL No.

White -Fully Executed Copy
Yellow -Receiving Laboratory Copy
Pink -Shipper Copy
Goldenrod -Sampler Copy

SAMPLE TEAM: NB

RECEIVED FOR LABORATORY BY: Reagan Appleton
DATE: 6/15/01 TIME: 9:00

№ 16351

1001 JULY 19/93 REV.0 (F-42)

02-28-02 14:30 From- T-983 P.05 F-316

Attach to the COC and include with the final report.

CT&E Environmental Services
Michigan Division
Login checklist

Project Number: 30126SD Date Logged In: 6/15/01 Login Person Initials: SF

This section to be completed when corrective action is required:

Client: CRA – Romulus Project Name: Former Peregrine
Client Contact: P. Wiseman Phone Number:

	YES	NO
1. Were custody seals/original packing tape intact? *If no, notify the project manager and project manager documents client response below.*	✓	
2. Are the samples in good condition, i.e. not broken or leaking? *If no, notify the project manager and project manager documents client response below.*	✓	
3. Are samples within holding times? *If no, notify the project manager and project manager documents client response below.*	✓	
4. Were the samples received on ice (ice in direct contact with the samples)? *If yes, and Wisconsin samples, do not record the sample temperature.*	✓	
5. Is the temperature of the samples between 2-6°C? *If no and samples are not on ice, notify the project manager and project manager documents client response below NOTE: Samples not between 2-6°C that are received at the laboratory on the day of sample collections do not require client notification.*	✓	
6. Do the samples match the COC? *If no, notify the project manager and project manager documents client response below.*	✓	
7. Were the proper containers used? *If no, notify the project manager and project manager documents client response below.*	✓	
8 Were the samples collected in CT&E Environmental Services containers? *No corrective action required.*	✓	
9. Is there adequate sample volume for requested analyses and QC? *If no, notify the project manager and project manager documents client response below.*	✓	
10. Do water VOC samples contain headspace less than the size of a pea? *If no, notify the project manager and project manager documents client response below.*	N/A	
11. Are samples preserved to the proper pH? *If no, identify sample, bottle and preservative, adjust to the proper pH, generate CAR and note below.*	N/A	
12. Is the chain of custody signed? *If no, notify the project manager and project manager documents client response below.*	✓	
13. Is sub-sampling required? *If yes, sub-sample per SOP and document which samples(s) below.*		✓
14. Were proper sample weights met for Wisconsin soil samples? *If no, notify the project manager and project manager documents client response below.*	N/A	

COMMENTS/CORRECTIVE ACTION

> No corrective action required regarding sample receipt, preservation (12)

6/15/01 Requested clarification of PCBs on TCLP leachate basis (13)

CLIENT RESPONSE (Provide date/time of contact, client response and project manager initials)

6/18/01 PCBs to be performed on total sample basis per Steve Carter/CRA (12) Log-in revised by BDC.

G:\guest\shipping\login checklist.doc

LABORATORY REPORT

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/22/2001

CT&E Sample ID:	3012650001	**Matrix:**	Solid
Client Sample ID:	S-12636-061301-NB-001	**Location:**	
Collected:	06/13/2001 00:00	**Project:**	Former Peregrine (Coldwater Rd) #12636
Received:	06/15/2001 09:00	**Sampled By:**	NB

Comments: Results reported on Dry Weight basis.
PCB: Multiple cleanups performed for hydrocarbons (SW-846 Method 3620 Florisil Column and SW-846 Method 3665 Sulfuric Acid).

Test Description	Result	Allowable Limit	Unit	Reporting Detection Limit	Method Analysis / Preparation	Prepared Date / Time	Analyzed Date / Time	Analyst	Cont. ID
PHYSICAL PROPERTY ANALYSIS									
Total Solids	86.7		%	0.10	SM19 2540G¹		06/18/01 16:29	DLM	
GC SEMIVOLATILE ORGANIC ANALYSIS									
Aroclor-1016	ND		ug/kg	38	SW-846 8082 / SW-846 3550B	06/19/01 15:27	06/19/01 17:34	JL	
Aroclor-1221	ND		ug/kg	38	SW-846 8082 / SW-846 3550B	06/19/01 15:27	06/19/01 17:34	JL	
Aroclor-1232	ND		ug/kg	38	SW-846 8082 / SW-846 3550B	06/19/01 15:27	06/19/01 17:34	JL	
Aroclor-1242	ND		ug/kg	38	SW-846 8082 / SW-846 3550B	06/19/01 15:27	06/19/01 17:34	JL	
Aroclor-1248	ND		ug/kg	38	SW-846 8082 / SW-846 3550B	06/19/01 15:27	06/19/01 17:34	JL	
Aroclor-1254	ND		ug/kg	38	SW-846 8082 / SW-846 3550B	06/19/01 15:27	06/19/01 17:34	JL	
Aroclor-1260	ND		ug/kg	38	SW-846 8082 / SW-846 3550B	06/19/01 15:27	06/19/01 17:34	JL	
TCLP METAL ANALYSIS SW-846 Method 1311									
Arsenic	ND	5	mg/L	0.010	SW-846 6020 / SW-846 3010A	06/19/01 07:03	06/21/01 22:53	KAA	1
Barium	0.52	100	mg/L	0.020	SW-846 6020 / SW-846 3010A	06/19/01 07:03	06/21/01 22:53	KAA	1
Cadmium	0.0035	1	mg/L	0.0020	SW-846 6020 / SW-846 3010A	06/19/01 07:03	06/21/01 22:53	KAA	1
Chromium	0.059	5	mg/L	0.020	SW-846 6020 / SW-846 3010A	06/19/01 07:03	06/21/01 22:53	KAA	1
Lead	0.030	5	mg/L	0.020	SW-846 6020 / SW-846 3010A	06/19/01 07:03	06/21/01 22:53	KAA	1
Mercury	ND	0.2	mg/L	0.0002	SW-846 7470A	06/19/01 08:35	06/19/01 09:06	SPE	1
Selenium	ND	1	mg/L	0.040	SW-846 6020 / SW-846 3010A	06/19/01 07:03	06/21/01 22:53	KAA	1
Silver	ND	5	mg/L	0.0040	SW-846 6020 / SW-846 3010A	06/19/01 07:03	06/21/01 22:53	KAA	1
TCLP VOLATILES SW-846 Method 1311									
1,1-Dichloroethylene	ND	0.7	mg/L	0.010	SW-846 8260B TCLP		06/19/01 12:54	HNL	1
1,2-Dichloroethane	ND	0.5	mg/L	0.010	SW-846 8260B TCLP		06/19/01 12:54	HNL	1
1,4-Dichlorobenzene	ND	7.5	mg/L	0.010	SW-846 8260B TCLP		06/19/01 12:54	HNL	1
2-Butanone (M E K)	ND	200	mg/L	0.10	SW-846 8260B TCLP		06/19/01 12:54	HNL	1
Benzene	ND	0.5	mg/L	0.010	SW-846 8260B TCLP		06/19/01 12:54	HNL	1
Carbon tetrachloride	ND	0.5	mg/L	0.010	SW-846 8260B TCLP		06/19/01 12:54	HNL	1
Chlorobenzene	ND	100	mg/L	0.010	SW-846 8260B TCLP		06/19/01 12:54	HNL	1

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/22/2001

CT&E Sample ID:	3012650001	**Matrix:**	Solid
Client Sample ID:	S-12636-061301-NB-001	**Location:**	
Collected:	06/13/2001 00:00	**Project:**	Former Peregrine (Coldwater Rd) #12636
Received:	06/15/2001 09:00	**Sampled By:**	NB

Test Description	Result	Allowable Limit	Unit	Reporting Detection Limit	Method Analysis / Preparation	Prepared Date / Time	Analyzed Date / Time	Analyst	Cont. ID
TCLP VOLATILES SW-846 Method 1311									
Chloroform	ND	6	mg/L	0.010	SW-846 8260B TCLP		06/19/01 12:54	HNL	1
Tetrachloroethene	ND	0.7	mg/L	0.010	SW-846 8260B TCLP		06/19/01 12:54	HNL	1
Trichloroethene	ND	0.5	mg/L	0.010	SW-846 8260B TCLP		06/19/01 12:54	HNL	1
Vinyl chloride	ND	0.2	mg/L	0.010	SW-846 8260B TCLP		06/19/01 12:54	HNL	1
TCLP SEMI-VOLATILES SW1311									
2,4,5-Trichlorophenol	ND	400	mg/L	0.010	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1
2,4,6-Trichlorophenol	ND	2	mg/L	0.010	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1
2,4-Dinitrotoluene	ND	0.13	mg/L	0.010	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1
2-Methylphenol (o-Cresol)	ND	200	mg/L	0.010	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1
3&4-Methylphenol (p&m-Cresol)	ND	200	mg/L	0.020	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1
Hexachlorobenzene	ND	0.13	mg/L	0.010	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1
Hexachlorobutadiene	ND	0.5	mg/L	0.010	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1
Hexachloroethane	ND	3	mg/L	0.010	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1
Nitrobenzene	ND	2	mg/L	0.010	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1
Pentachlorophenol	ND	100	mg/L	0.010	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1
Pyridine	ND	5	mg/L	0.020	SW-846 8270C / SW-846 3510C	06/19/01 15:59	06/19/01 20:34	JLS	1

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/22/2001

REPORT ADDENDA

- [ ] Case Narrative
- [x] Quality Control Data
- [ ] Field Notes
- [ ] Well Inspection Reports/Statics
- [ ] Subcontractor Report
- [ ] Data Summary Report
- [ ] Other _____
- [ ] None

CT&E Environmental Services Inc.

VOLATILE ORGANIC COMPOUNDS (VOC)

QUALITY CONTROL DATA

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

SURROGATE SUMMARY

TCLP VOLATILES SW-846 Method 1311

Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636
Matrix Solid

Analysis
Batch VMS 2487
Method SW-846 8260B TCLP
Date 06/19/2001
By HNL

Sample ID(s)		Surrogate Recovery %			
		BFB	DCE	DFM	TOL
3012650001	PS	97.8	102	99.1	98.3

BFB = **4-Bromofluorobenzene <Surr>** **(87.1-110)**
DCE = **1,2-Dichloroethane-D4 <Surr>** **(84.5-117)**
DFM = **Dibromofluoromethane <Surr>** **(85.6-114)**
TOL = **Toluene-d8 <Surr>** **(93.5-106)**

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

SURROGATE SUMMARY

TCLP VOLATILES SW-846 Method 1311

Client	Conestoga-Rovers & Associates	**Analysis**	
Project	Former Peregrine (Coldwater Rd) #12636	**Batch**	VMS 2487
		Method	SW-846 8260B TCLP
Matrix	Aqueous	**Date**	06/19/2001
		By	HNL

Sample ID(s)	Surrogate Recovery %			
	BFB	DCE	DFM	TOL
107487 MB	98	103	100	98.1

BFB	=	**4-Bromofluorobenzene <Surr>**	**(89.3-107.7)**
DCE	=	**1,2-Dichloroethane-D4 <Surr>**	**(77.7-122.3)**
DFM	=	**Dibromofluoromethane <Surr>**	**(84.6-117.9)**
TOL	=	**Toluene-d8 <Surr>**	**(90.9-107.1)**

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

Lab Control Spike / Lab Control Spike Duplicate Summary

TCLP VOLATILES SW-846 Method 1311

Sample ID 107488 Lab Control Spike

Prep Batch
Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636
File Q0619_03.D

Analysis
Batch VMS 2487
Method SW-846 8260B TCLP

Date 06/19/2001
By HNL

QC results affect the following production samples:
3012650001

Analyte	LCS,LCSD Spike Added mg/L	LCS Concentration mg/L	LCS Recovery %	LCSD Concentration	LCSD Recovery %	LCS/LCSD Limits	RPD	RPD Limits
1,1-Dichloroethylene	0.5	0.47	94			(81.4-122.2)		
1,2-Dichloroethane	0.5	0.46	91			(70.4-121.5)		
1,4-Dichlorobenzene	0.5	0.55	110			(70.9-111.2)		
2-Butanone (M E K)	0.5	0.54	108			(54.5-147.3)		
Benzene	0.5	0.50	100			(89.2-111.3)		
Carbon tetrachloride	0.5	0.54	108			(82.5-131.7)		
Chlorobenzene	0.5	0.51	102			(87.5-120.9)		
Chloroform	0.5	0.49	98			(84-124.1)		
Tetrachloroethene	0.5	0.32	65			(39.4-158.4)		
Trichloroethene	0.5	0.47	95			(87.7-123.6)		
Vinyl chloride	0.5	0.57	114			(59.1-135.9)		

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

Matrix Spike / Matrix Spike Duplicate Summary

TCLP VOLATILES SW-846 Method 1311

Sample ID 107484 Matrix Spike

Prep Batch
Original 3012650001
Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636
File Q0619_18.D

Analysis
Batch VMS 2487
Method SW-846 8260B TCLP
Date 06/19/2001
By HNL

QC results affect the following production samples:
3012650001

Analyte	MS, MSD Spike Added mg/L	Sample Conc. mg/L	MS Concentration mg/L	MS Recovery %	MSD Concentration	MSD Recovery %	MS/MSD Limits	RPD	RPD Limits
1,1-Dichloroethylene	0.5	ND	0.45	91			(66.2-125.6)		
1,2-Dichloroethane	0.5	ND	0.45	90			(69.8-120)		
1,4-Dichlorobenzene	0.5	ND	0.53	105			(77.9-123.3)		
2-Butanone (M E K)	0.5	ND	0.50	96			(53.1-154)		
Benzene	0.5	ND	0.48	97			(84.4-120)		
Carbon tetrachloride	0.5	ND	0.53	105			(88.6-122.5)		
Chlorobenzene	0.5	ND	0.48	96			(85-120)		
Chloroform	0.5	ND	0.47	94			(79-120.9)		
Tetrachloroethene	0.5	ND	0.30	60			(60-134.3)		
Trichloroethene	0.5	ND	0.45	91			(76.9-120)		
Vinyl chloride	0.5	ND	0.51	103			(64.6-122.4)		

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

METHOD BLANK SUMMARY

TCLP VOLATILES SW-846 Method 1311

Sample ID	107487	Method Blank		
Prep Batch			**Analysis**	
Client	Conestoga-Rovers & Associates		**Batch**	VMS 2487
Project	Former Peregrine (Coldwater Rd) #12636		**Method**	SW-846 8260B TCLP
File	Q0619_06.D			
			Date	06/19/2001
			By	HNL

QC results affect the following production samples:

3012650001

Analyte	Concentration mg/L	Detection Limit mg/L
1,1-Dichloroethylene	ND	0.010
1,2-Dichloroethane	ND	0.010
1,4-Dichlorobenzene	ND	0.010
2-Butanone (M E K)	ND	0.10
Benzene	ND	0.010
Carbon tetrachloride	ND	0.010
Chlorobenzene	ND	0.010
Chloroform	ND	0.010
Tetrachloroethene	ND	0.010
Trichloroethene	ND	0.010
Vinyl chloride	ND	0.010

CT&E Environmental Services Inc.

SEMIVOLATILE ORGANIC COMPOUNDS (SVOC)

QUALITY CONTROL DATA

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

SURROGATE SUMMARY

TCLP SEMI-VOLATILES SW1311

Client	Conestoga-Rovers & Associates	**Analysis**	
Project	Former Peregrine (Coldwater Rd) #12636	**Batch**	XMS 1825
		Method	SW-846 8270C
Matrix	Solid	**Date**	06/19/2001
		By	JLS

Sample ID(s)		Surrogate Recovery %					
		2FP	FBP	NB2	PHL	TBP	TPH
3012650001	PS	**30.5**	**55.9**	**57.5**	**24.9**	**55.7**	**78.3**

2FP	=	**2-Fluorophenol <Surr>**	**(10-110.5)**
FBP	=	**2-Fluorobiphenyl <Surr>**	**(22.4-113.6)**
NB2	=	**Nitrobenzene-d5 <Surr>**	**(18.6-112.6)**
PHL	=	**Phenol-d5 <Surr>**	**(10-121.3)**
TBP	=	**2,4,6-Tribromophenol <Surr>**	**(28-129.1)**
TPH	=	**Terphenyl-d14 <Surr>**	**(29.7-131.9)**

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 7/5/2001

SURROGATE SUMMARY

TCLP SEMI-VOLATILES SW1311

Client	Conestoga-Rovers & Associates	**Analysis**	
Project	Former Peregrine (Coldwater Rd) #12636	**Batch**	XMS 1825
		Method	SW-846 8270C
Matrix	Aqueous	**Date**	06/19/2001
		By	JLS

Sample ID(s)	Surrogate Recovery %					
	2FP	FBP	NB2	PHL	TBP	TPH
107293 MB	**34.7**	**52.2**	**51.2**	**26.1**	**55.5**	**78.2**

2FP	=	**2-Fluorophenol <Surr>**	**(10-78.5)**
FBP	=	**2-Fluorobiphenyl <Surr>**	**(10-112.3)**
NB2	=	**Nitrobenzene-d5 <Surr>**	**(10.6-107.1)**
PHL	=	**Phenol-d5 <Surr>**	**(10-56.4)**
TBP	=	**2,4,6-Tribromophenol <Surr>**	**(20.4-126.7)**
TPH	=	**Terphenyl-d14 <Surr>**	**(20.7-138.1)**

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

Lab Control Spike / Lab Control Spike Duplicate Summary

TCLP SEMI-VOLATILES SW1311

Sample ID	107294	Lab Control Spike	**Analysis**		
	107295	Lab Control Spike Dup	**Batch**	XMS	1825
Prep Batch	XXX	3276	**Method**	SW-846 8270C	
Client	Conestoga-Rovers & Associates				
Project	Former Peregrine (Coldwater Rd) #12636		**Date**	06/19/2001	
File	F0619_12.D		**By**	JLS	
	F0619_13.D				

QC results affect the following production samples:

3012650001

Analyte	LCS,LCSD Spike Added mg/L	LCS Concentration mg/L	LCS Recovery %	LCSD Concentration mg/L	LCSD Recovery %	LCS/LCSD Limits	RPD	RPD Limits
2,4,5-Trichlorophenol	0.2, 0.2	0.12	59	0.10	51	(27.4-135.5)	14	(< 27)
2,4,6-Trichlorophenol	0.2, 0.2	0.11	55	0.097	48	(26.6-127.9)	13	(< 27)
2,4-Dinitrotoluene	0.05, 0.05	0.035	69	0.034	69	(16.4-136.4)	1	(< 30)
2-Methylphenol (o-Cresol)	0.2, 0.2	0.090	45	0.085	42	(26.6-104.8)	7	(< 33)
3&4-Methylphenol (p&m-Cresol)	0.25, 0.25	0.12	46	0.11	43	(23.8-100)	7	(< 33)
Hexachlorobenzene	0.05, 0.05	0.032	64	0.030	61	(20.6-130.2)	5	(< 16)
Hexachlorobutadiene	0.05, 0.05	0.025	49	0.022	44	(10-119.8)	12	(< 26)
Hexachloroethane	0.05, 0.05	0.020	41	0.019	37	(10-105)	9	(< 24)
Nitrobenzene	0.05, 0.05	0.026	52	0.025	51	(26.3-104.9)	3	(< 24)
Pentachlorophenol	0.2, 0.2	0.16	81	0.16	81	(30.2-154.3)	1	(< 17)
Pyridine	0.05, 0.05	0.014	28	0.012	25	(10-55.4)	14	(< 20)

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 | Conestoga-Rovers & Associates | Reported: 6/23/2001

Matrix Spike / Matrix Spike Duplicate Summary

TCLP SEMI-VOLATILES SW1311

Sample ID	107296 Matrix Spike		
		Analysis	
Prep Batch	XXX 3276	**Batch**	XMS 1825
Original	3012650001	**Method**	SW-846 8270C
Client	Conestoga-Rovers & Associates		
Project	Former Peregrine (Coldwater Rd) #12636	**Date**	06/19/2001
File	F0619_15.D	**By**	JLS

QC results affect the following production samples:
3012650001

Analyte	MS, MSD Spike Added mg/L	Sample Conc. mg/L	MS Concentration mg/L	MS Recovery %	MSD Concentration	MSD Recovery %	MS/MSD Limits	RPD	RPD Limits
2,4,5-Trichlorophenol	0.2	ND	0.11	57			(20.5-126.1)		
2,4,6-Trichlorophenol	0.2	ND	0.11	54			(17.9-121.8)		
2,4-Dinitrotoluene	0.05	ND	0.033	65			(10-144.3)		
2-Methylphenol (o-Cresol)	0.2	ND	0.092	46			(10.5-104.3)		
3&4-Methylphenol (p&m-Cresol)	0.25	ND	0.11	46			(10-103.2)		
Hexachlorobenzene	0.05	ND	0.031	62			(10-126.3)		
Hexachlorobutadiene	0.05	ND	0.023	46			(10-109.7)		
Hexachloroethane	0.05	ND	0.019	39			(10-94.9)		
Nitrobenzene	0.05	ND	0.027	54			(10-114.1)		
Pentachlorophenol	0.2	ND	0.15	77			(10-141.4)		
Pyridine	0.05	ND	0.016	31			(10-59.5)		

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

METHOD BLANK SUMMARY

TCLP SEMI-VOLATILES SW1311

Sample ID	107293 Method Blank	**Analysis**	
Prep Batch	XXX 3276	**Batch**	XMS 1825
Client	Conestoga-Rovers & Associates	**Method**	SW-846 8270C
Project	Former Peregrine (Coldwater Rd) #12636		
File	F0619_11.D	**Date**	06/19/2001
		By	JLS

QC results affect the following production samples:

3012650001

Analyte	Concentration mg/L	Detection Limit mg/L
2,4,5-Trichlorophenol	ND	0.010
2,4,6-Trichlorophenol	ND	0.010
2,4-Dinitrotoluene	ND	0.010
2-Methylphenol (o-Cresol)	ND	0.010
3&4-Methylphenol (p&m-Cresol)	ND	0.020
Hexachlorobenzene	ND	0.010
Hexachlorobutadiene	ND	0.010
Hexachloroethane	ND	0.010
Nitrobenzene	ND	0.010
Pentachlorophenol	ND	0.010
Pyridine	ND	0.020

CT&E Environmental Services Inc.

Polychlorinated Biphenyls (PCB)

Quality Control Data

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

SURROGATE SUMMARY

GC SEMIVOLATILE ORGANIC ANALYSIS

Client	Conestoga-Rovers & Associates	**Analysis**	
Project	Former Peregrine (Coldwater Rd) #12636	**Batch**	XGC 2377
		Method	SW-846 8082
Matrix	Solid	**Instrument**	Varian 3400 ECD INST-D
		Date	06/19/2001
		By	JL

Sample ID(s)	Surrogate Recovery %	
	DCB	TMX
107271 MB	72.3	61.9
3012650001 PS	55.6	81.8

DCB	=	**Decachlorobiphenyl <Surr>**	**(10-175.7)**
TMX	=	**Tetrachloro-m-xylene <Surr>**	**(10-124.9)**

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

Lab Control Spike / Lab Control Spike Duplicate Summary

GC SEMIVOLATILE ORGANIC ANALYSIS

Sample ID 107272 Lab Control Spike

Prep Batch XXX 3273
Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636

Analysis
Batch XGC 2377
Method SW-846 8082
Instrument Varian 3400 ECD INST-D
Date 06/19/2001
By JL

QC results affect the following production samples:
3012650001

Analyte	LCS,LCSD Spike Added ug/kg	LCS Concentration ug/kg	LCS Recovery %	LCSD Concentration ug/kg	LCSD Recovery %	LCS/LCSD Limits	RPD	RPD Limits
Aroclor-1248	330, 330	170	52	200	61	(51.2-136.5)	16	(< 20)
Aroclor-1260	330, 330	230	70	290	86	(57.6-145)	21	(< 20)

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

Matrix Spike / Matrix Spike Duplicate Summary

GC SEMIVOLATILE ORGANIC ANALYSIS

Sample ID 107274 Matrix Spike

Prep Batch XXX 3273
Original 3012650001
Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636

Analysis
Batch XGC 2377
Method SW-846 8082
Instrument Varian 3400 ECD INST-D
Date 06/19/2001
By JL

QC results affect the following production samples:

3012650001

Analyte	MS, MSD Spike Added ug/kg	Sample Conc. ug/kg	MS Concentration ug/kg	MS Recovery %	MSD Concentration ug/kg	MSD Recovery %	MS/MSD Limits	RPD	RPD Limits
Aroclor-1248	380, 380	ND	260	68	260	67	(15.5-158.9)	1	(< 20)
Aroclor-1260	380, 380	ND	280	72	160	43	(10-167.3)	51	(< 20)

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

METHOD BLANK SUMMARY

GC SEMIVOLATILE ORGANIC ANALYSIS

Sample ID	107271 Method Blank	**Analysis**	
Prep Batch	XXX 3273	**Batch**	XGC 2377
Client	Conestoga-Rovers & Associates	**Method**	SW-846 8082
Project	Former Peregrine (Coldwater Rd) #12636	**Instrument**	Varian 3400 ECD INST-D
		Date	06/19/2001
		By	JL

QC results affect the following production samples:

3012650001

Analyte	Concentration ug/kg	Detection Limit ug/kg
Aroclor-1016	ND	33
Aroclor-1221	ND	33
Aroclor-1232	ND	33
Aroclor-1242	ND	33
Aroclor-1248	ND	33
Aroclor-1254	ND	33
Aroclor-1260	ND	33
Aroclor-1262	ND	33
Aroclor-1268	ND	33

CT&E Environmental Services Inc.

METALS QUALITY CONTROL DATA

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

Lab Control Spike / Lab Control Spike Duplicate Summary

TOTAL METALS ANALYSIS

Sample ID 107360 Lab Control Spike TCLP

Prep Batch MXX 6713
Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636
File D:\EXPTOLIMS\062101.

Analysis
Batch MIM 2619
Method SW-846 6020
Instrument SCIEX ELAN 6100 ICP/MS
Date 06/21/2001
By KAA

QC results affect the following production samples:

3012650001

Analyte	LCS,LCSD Spike Added mg/L	LCS Concentration mg/L	LCS Recovery %	LCSD Concentration	LCSD Recovery %	LCS/LCSD Limits	RPD	RPD Limits
Aluminum	1	0.87	87			(50-150)		
Arsenic	1	1.1	106			(50-150)		
Barium	1	0.99	99			(50-150)		
Beryllium	1	1.0	103			(50-150)		
Cadmium	1	1.0	101			(50-150)		
Chromium	1	0.99	99			(50-150)		
Cobalt	1	1.0	105			(50-150)		
Copper	1	1.0	104			(50-150)		
Iron	1	0.93	93			(50-150)		
Lead	1	1.0	102			(50-150)		
Lithium	1	1.0	100			(50-150)		
Magnesium	1	0.85	85			(50-150)		
Manganese	1	1.0	103			(50-150)		
Nickel	1	1.0	105			(50-150)		
Potassium	1	0.88	88			(50-150)		
Selenium	1	1.0	104			(50-150)		
Silver	1	1.0	105			(50-150)		
Thallium	1	1.1	105			(50-150)		
Zinc	1	1.0	101			(50-150)		

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

Matrix Spike / Matrix Spike Duplicate Summary

TOTAL METALS ANALYSIS

Sample ID 107365 Matrix Spike TCLP

Prep Batch MXX 6713
Original 3012650001
Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636
File D:\EXPTOLIMS\062101.

Analysis
Batch MIM 2619
Method SW-846 6020
Instrument SCIEX ELAN 6100 ICP/MS
Date 06/21/2001
By KAA

QC results affect the following production samples:

3012650001

Analyte	MS, MSD Spike Added mg/L	Sample Conc. mg/L	MS Concentration mg/L	MS Recovery %	MSD Concentration	MSD Recovery %	MS/MSD Limits	RPD	RPD Limits
Aluminum	1.2		ND	84			(50-150)		
Arsenic	1.2	ND	1.3	109			(50-150)		
Barium	1.2	0.52	1.8	106			(50-150)		
Beryllium	1.2		1.1	98			(50-150)		
Cadmium	1.2	0.0035	1.2	99			(50-150)		
Chromium	1.2	0.059	1.2	97			(50-150)		
Cobalt	1.2		1.2	104			(50-150)		
Copper	1.2		1.2	100			(50-150)		
Iron	1.2		ND	89			(50-150)		
Lead	1.2	0.030	1.1	95			(50-150)		
Magnesium	1.2		25	265			(50-150)		
Manganese	1.2		6.9	213			(50-150)		
Nickel	1.2		2.2	111			(50-150)		
Potassium	1.2		ND	167			(50-150)		
Selenium	1.2	ND	ND	103			(50-150)		
Silver	1.2	ND	1.1	95			(50-150)		
Thallium	1.2		1.1	98			(50-150)		
Zinc	1.2		ND	141			(50-150)		

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

METHOD BLANK SUMMARY

TOTAL METALS ANALYSIS

Sample ID 107364 Method Blank
Prep Batch MXX 6713
Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636
File D:\EXPTOLIMS\062101.

Analysis
Batch MIM 2619
Method SW-846 6020
Instrument SCIEX ELAN 6100 ICP/MS
Date 06/21/2001
By KAA

QC results affect the following production samples:
3012650001

Analyte	Concentration mg/L	Detection Limit mg/L
Aluminum	ND	0.20
Antimony	0.030	0.012
Arsenic	ND	0.010
Barium	ND	0.0040
Beryllium	ND	0.0040
Boron	0.034	
Cadmium	ND	0.0020
Calcium	ND	0.44
Chromium	ND	0.0060
Cobalt	ND	0.0020
Copper	ND	0.0060
Iron	ND	0.64
Lead	ND	0.0040
Lithium	ND	0.010
Magnesium	ND	0.080
Manganese	ND	0.0040
Molybdenum	0.022	0.0040
Nickel	ND	0.0040
Potassium	ND	0.80
Selenium	ND	0.014
Silver	ND	0.0040
Sodium	ND	1.0
Strontium	ND	0.0020
Thallium	0.0043	0.0020
Tin	0.019	0.012
Titanium	0.0050	
Vanadium	ND	0.0080
Zinc	ND	0.060

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

Lab Control Spike / Lab Control Spike Duplicate Summary

TOTAL METALS ANALYSIS

Sample ID 107400 Lab Control Spike

Prep Batch MXX 6715
Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636

Analysis
Batch MCV 1472
Method SW-846 7470A
Instrument Varian Spectr AA-20
Date 06/19/2001
By SPE

QC results affect the following production samples:

3012650001

Analyte	LCS,LCSD Spike Added mg/L	LCS Concentration mg/L	LCS Recovery %	LCSD Concentration	LCSD Recovery %	LCS/LCSD Limits	RPD	RPD Limits
Mercury	0.002	0.00211	105			(82.5-118.3)		

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 | Conestoga-Rovers & Associates | Reported: 6/23/2001

Matrix Spike / Matrix Spike Duplicate Summary

Sample ID	107405 Matrix Spike TCLP	**Analysis**	
	107406 Matrix Spike Duplicate TCLP	**Batch**	MCV 1472
Prep Batch	MXX 6715	**Method**	SW-846 7470A
Original	3012650001	**Instrument**	Varian Spectr AA-20
Client	Conestoga-Rovers & Associates	**Date**	06/19/2001
Project	Former Peregrine (Coldwater Rd) #12636	**By**	SPE

QC results affect the following production samples:
3012650001

Analyte	MS, MSD Spike Added mg/L	Sample Conc. mg/L	MS Concentration mg/L	MS Recovery %	MSD Concentration mg/L	MSD Recovery %	MS/MSD Limits	RPD	RPD Limits
Mercury	0.002, 0.002	ND	0.00209	105	0.00199	100	(50-150)	5	(< 20)

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 | Conestoga-Rovers & Associates | Reported: 6/23/2001

Matrix Spike / Matrix Spike Duplicate Summary

Sample ID 107422 Analytical Spike

Prep Batch
Original 3012650001
Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636

Analysis
Batch MCV 1472
Method SW-846 7470A
Instrument Varian Spectr AA-20
Date 06/19/2001
By SPE

QC results affect the following production samples:

3012650001

Analyte	MS, MSD Spike Added mg/L	Sample Conc. mg/L	MS Concentration mg/L	MS Recovery %	MSD Concentration	MSD Recovery %	MS/MSD Limits	RPD	RPD Limits
Mercury	0.004	ND	0.00403	101			(85-115)		

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012650 Conestoga-Rovers & Associates Reported: 6/23/2001

METHOD BLANK SUMMARY

TOTAL METALS ANALYSIS

Sample ID 107401 Method Blank
Prep Batch MXX 6715
Client Conestoga-Rovers & Associates
Project Former Peregrine (Coldwater Rd) #12636

Analysis
Batch MCV 1472
Method SW-846 7470A
Instrument Varian Spectr AA-20
Date 06/19/2001
By SPE

QC results affect the following production samples:
3012660001

Analyte	Concentration mg/L	Detection Limit mg/L
Mercury	ND	0.0002

CT&E Environmental Services Inc.
Michigan Division

Workorder: 3012652 | Conestoga-Rovers & Associates | Reported: 7/5/2001

Matrix Spike / Matrix Spike Duplicate Summary

GENERAL CHEMISTRY ANALYSIS

Sample ID	108669	Matrix Spike	**Analysis**	
	108670	Matrix Spike Duplicate	**Batch**	WSP 2261
Prep Batch			**Method**	EPA 325.2
Original	3012647002		**Instrument**	Quick Chem 8000
Client	Conestoga-Rovers & Associates		**Date**	06/26/2001
Project	Cargill Salt Site #17774		**By**	MAH
File	CL06261A.FDT			
	CL06261A.FDT			

QC results affect the following production samples:

3012652001, 3012652002, 3012652003, 3012652004, 3012652005, 3012652006

Analyte	MS, MSD Spike Added mg/L	Sample Conc. mg/L	MS Concentration mg/L	MS Recovery %	MSD Concentration mg/L	MSD Recovery %	MS/MSD Limits	RPD	RPD Limits
Chloride	20, 20	1.4	19	88	20	92	(73.5-120.2)	4	(< 9.6)

ATTACHMENT H

WASTE MANIFESTS

REPUBLIC SERVICES
OF MICHIGAN I, LLC

Manifest Number: **№ 09706**

NON-HAZARDOUS WASTE MANIFEST

DELIVER TO: ☐ Carleton Farms (New Boston, MI) ☑ Brent Run (Montrose, MI) ☐ Whitefeather (Pinconning, MI)

GENERATOR:

Generator Name Realm Inc. US EPA ID #

Billing Address 485 W. Milwaukee Detroit MI

Site Address 1245 E. Coldwater Rd Flint

County of Origin Phone

Description of Waste	Approval Number	Total Quantity	Unit of Measure	Container Type
Sand	16093	15	Cubic yard	

Special Handling Instructions:

I hereby certify that the above described materials are non-hazardous wastes as defined by 40 CFR 261 or any applicable state law. Further, that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

GLENN TURCHAN — Generator Authorized Agent Name

Brad Cook for G.T. — Signature

7-26-01 — Date Shipped

TRANSPORTER:

Transporter Name AVERILL ROADS DOT #.

Address 220 S. AVERILL Truck Number 98

BERNARD LOSING JR — Driver's Name

Signature

7-26-01 — Date Delivered

DISPOSAL FACILITY:

Site Name Brent Run Landfill Phone Number 810-639-3077

Address 6335 Vienna Rd Montrose Mi 48457

I hereby acknowledge receipt of the above described materials.

K. Gilstrap — Name of Authorized Agent

K Gilstrap — Signature

7-26-01 — Date Received

White: Generator Canary: Transporter Pink: Disposal Facility Gold: Generator

Aug. 2. 2001 9:16AM CARLTON FARMS ADMIN AUG 01'01 No.1598 P. 3/7 P.03

REPUBLIC SERVICES
OF MICHIGAN I, LLC

Manifest Number: № 09707

NON-HAZARDOUS WASTE MANIFEST

DELIVER TO: ☐ Carleton Farms (New Boston, MI) ☒ Brent Run (Montrose, MI)
☐ Whitefeather (Pinconning, MI)

GENERATOR:

Generator Name Realm Inc US EPA ID #

Billing Address 485 W. Milwaukee Detroit MI

Site Address 1245 E. Coldwater Rd Flint

County of Origin Phone

Description of Waste	Approval Number	Total Quantity	Unit of Measure	Container Type
c-soil	10601.3	15	cubic yards	

Special Handling Instructions:

I hereby certify that the above described materials are non-hazardous wastes as defined by 40 CFR 261 or any applicable state law. Further, that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Generator Authorized Agent Name: [illegible] Signature: [illegible] Date Shipped: 7/27/01

TRANSPORTER:

Transporter Name Averill DOT #

Address 220 S Averill [illegible] Truck Number 2000

Driver's Name Bob Woodman Signature: Bob Woodman Date Delivered 7/27/01

DISPOSAL FACILITY:

Site Name Brent Run Landfill Phone Number 810-639-3077

Address 8335 Vienna Rd Montrose MI 48457

I hereby acknowledge receipt of the above described materials.

Name of Authorized Agent K Gallagher Signature K Gallagher Date Received 7-27-01

White: Generator Canary: Transporter Pink: Disposal Facility Gold: Generator

REPUBLIC SERVICES OF MICHIGAN I, LLC

Manifest Number: **Nº 09708**

NON-HAZARDOUS WASTE MANIFEST

DELIVER TO: ☐ Carleton Farms (New Boston, MI) ☒ Brent Run (Montrose, MI) ☐ Whitefeather (Pinconning, MI)

GENERATOR:

Generator Name Realm Inc US EPA ID #

Billing Address 488 W. Milwaukee Detroit MI

Site Address 1243 E. Coldwater Rd Flint

County of Origin Phone

Description of Waste	Approval Number	Total Quantity	Unit of Measure	Container Type
C-soil	106093	15	cubic yard	

Special Handling Instructions:

I hereby certify that the above described materials are non-hazardous wastes as defined by 40 CFR 261 or any applicable state law. Further, that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

GLENN TURCHAN — Generator Authorized Agent Name
[signature] for G.T. — Signature
7-27-01 — Date Shipped

TRANSPORTER:

Transporter Name Averill DOT #

Address 220 S. Averill Rd Truck Number

Driver's Name ~~Bob Woodman~~ BOB Signature [signature] Date Delivered 7-27-01

DISPOSAL FACILITY:

Site Name Brent Run Landfill Phone Number 810 639 3077

Address 8335 Vienna Rd Montrose MI 48457

I hereby acknowledge receipt of the above described materials.

K Giltrop — Name of Authorized Agent
[signature] — Signature
7-27-2001 — Date Received

White: Generator Canary: Transporter Pink: Disposal Facility Gold: Generator

REPUBLIC SERVICES
OF MICHIGAN I, LLC

Manifest Number: № 09709

NON-HAZARDOUS WASTE MANIFEST

DELIVER TO: ☐ Carleton Farms (New Boston, MI) ☒ Brent Run (Montrose, MI)
☐ Whitefeather (Pinconning, MI)

GENERATOR:

Generator Name: Realm Inc US EPA ID #

Billing Address: 485 W. Milwaukee Detroit

Site Address: 1242 Coldwater Flint MI

County of Origin Phone

Description of Waste	Approval Number	Total Quantity	Unit of Measure	Container Type
soil	106093	5	cu yard	

Special Handling Instructions:

I hereby certify that the above described materials are non-hazardous wastes as defined by 40 CFR 261 or any applicable state law. Further, that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Generator Authorized Agent Name: GLENN TURCHAN Signature: Brad Garrett for G.T. Date Shipped

TRANSPORTER:

Transporter Name: AVERILL REFUSE DOT #

Address: 820 S. AVERILL Truck Number: 98

Driver's Name: BRUCE LASSILA Signature Date Delivered: 7-27-01

DISPOSAL FACILITY:

Site Name: BRENT RUN LAND FILL Phone Number: 810 639 3077

Address: 8335 VIENNA RD MONTROSE MI 48457

I hereby acknowledge receipt of the above described materials.

Name of Authorized Agent: K Gillespie Signature: K Gillespie Date Received: 7-27-01

White: Generator Canary: Transporter Pink: Disposal Facility Gold: Generator

REPUBLIC SERVICES
OF MICHIGAN I, LLC

Manifest Number: **№ 09710**

NON-HAZARDOUS WASTE MANIFEST

DELIVER TO: ☐ Carleton Farms (New Boston, MI) ☒ Brent Run (Montrose, MI) ☐ Whitefeather (Pinconning, MI)

GENERATOR:

Generator Name Ruan Inc US EPA ID #

Billing Address 400 W. Milwaukee Detroit

Site Address 124 x Goldwater Flint mg

County of Origin Phone

Description of Waste	Approval Number	Total Quantity	Unit of Measure	Container Type
Gasoil	10693	15	cubic yard	

Special Handling Instructions:

I hereby certify that the above described materials are non-hazardous wastes as defined by 40 CFR 261 or any applicable state law. Further, that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Generator Authorized Agent Name GLENN TURCHAN Signature Brad Enoch Haz Cr. Date Shipped 7/27/01

TRANSPORTER:

Transporter Name Averill Disposal DOT #

Address 220 S. Averill Flint, MI 48506 Truck Number 49-16

Driver's Name Mike C. Sullivan Signature Date Delivered 7-27-01

DISPOSAL FACILITY:

Site Name Brent Run Landfill Phone Number 810 639 3570

Address 8335 Vienna Rd Montrose MI 48457

I hereby acknowledge receipt of the above described materials.

Name of Authorized Agent C. Kurtz Signature Date Received 7/27/01

White: Generator Canary: Transporter Pink: Disposal Facility Gold: Generator

REPUBLIC SERVICES
OF MICHIGAN I, LLC

Manifest Number: № 09711

NON-HAZARDOUS WASTE MANIFEST

DELIVER TO: [ ] Carleton Farms (New Boston, MI) [X] Brent Run (Montrose, MI)
[ ] Whitefeather (Pinconning, MI)

GENERATOR:

Generator Name: Realm Inc.

Billing Address: 4825 W. Milwaukee Detroit

US EPA ID #:

Site Address: 1245 Coldwater Flint MI

County of Origin:

Phone:

Description of Waste	Approval Number	Total Quantity	Unit of Measure	Container Type
[illegible]	106693	15	cubic yard	

Special Handling Instructions:

I hereby certify that the above described materials are non-hazardous wastes as defined by 40 CFR 261 or any applicable state law. Further, that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Generator Authorized Agent Name: GLENN TURCHANI
Signature: Brad Gabba FOR G.T.
Date Shipped:

TRANSPORTER:

Transporter Name: AVERILL REFUSE

Address: 220 S. AVERILL

DOT #:

Driver's Name: BERNIE COSSING

Truck Number: 98

Signature: [signature]

Date Delivered: 7-27-01

DISPOSAL FACILITY:

Site Name: Brent Run LANDFILL

Address: 8335 Vienna Rd Montrose MI 48457

Phone Number: 810-639-3077

I hereby acknowledge receipt of the above described materials.

Name of Authorized Agent: E. Kretz
Signature: E. Kretz
Date Received: 7/27/01

White: Generator Canary: Transporter Pink: Disposal Facility Gold: Generator

REPUBLIC SERVICES
OF MICHIGAN, LLC

Manifest Number: № 08965

NON-HAZARDOUS WASTE MANIFEST

DELIVER TO: ☐ Carleton Farms (New Boston, MI) ☒ Brent Run (Montrose, MI)
☐ Whitefeather (Pinconning, MI)

GENERATOR:

Generator Name: Realm US EPA ID #:

Billing Address: 485 W Milwaukee Detroit MI 48202

Site Address: 245 Coldwater Flint MI

County of Origin: Phone: (313) 884-6570

Description of Waste	Approval Number	Total Quantity	Unit of Measure	Container Type
Soil	106093	15 yds	cubic yard	

Special Handling Instructions:

I hereby certify that the above described materials are non-hazardous wastes as defined by 40 CFR 261 or any applicable state law. Further, that the above named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation.

Generator Authorized Agent Name: Glenn Turchan Signature: [signature] Date Shipped: 8/2/01

TRANSPORTER:

Transporter Name: Averill Refuse DOT #:

Address: 220 S. Averill Truck Number: 2002

Driver's Name: Rob Hickmott Signature: [signature] Date Delivered: 8/2/01

DISPOSAL FACILITY:

Site Name: Brent Run Landfill Phone Number: 810-639-3077

Address: 6335 W. Vienna Montrose, MI 48457

I hereby acknowledge receipt of the above described materials.

Name of Authorized Agent: K. Giltrop Signature: [signature] Date Received: 8/2/01

White: Generator Canary: Transporter Pink: Disposal Facility Gold: Generator