COVER SHEET

Name of Site: Behr Dayton Thermal System VOC (Volatile Organic Compound) Plume

EPA ID No.: OHN000510164

Contact Person

Site Investigation and Documentation Record	Laura Ripley United States Environmental Protection Agency (EPA), Region V 77 West Jackson Boulevard, Mail Code: SR-6J Chicago, Illinois 60604 312-886-6040

Pathways, Components or Threat Not Scored

Surface Water Migration Pathway: At this time, there are insufficient data to satisfy the Hazard Ranking System (HRS) requirements for establishing the threat of release to surface water at the Behr Dayton Thermal System VOC Plume. The surface water pathway has not been scored because a release to this media does not significantly affect the overall site score and because the ground water pathway produces an overall site score well above the minimum required for the site to quality for inclusion on the National Priorities List (NPL). The surface water migration pathway may be of concern to EPA and may be evaluated during future investigations.

Soil Exposure Pathway: At this time, there are insufficient data to satisfy the HRS requirements for establishing the threat of soil exposure at the Behr Dayton Thermal System VOC Plume. The soil exposure pathway has not been scored because a release to this media does not significantly affect the overall site score and because the ground water pathway produces an overall site score well above the minimum required for the site to quality for inclusion on the NPL.

Daimler Chrysler Corporation had a contractor design, install, and operate two systems for the remediation of soil and ground water contamination under the Behr Dayton facility. A soil vapor extraction system for soil remediation began operation in October 2003 through December 2005. Based on the extracted air concentrations, the system removed a total of 900 pounds of VOCs (Ref. 5, p. 8).

EPA documented eight residences which exceeded the Agency for Toxic Substances and Disease Registry (ATSDR) Trichloroethene (TCE) sub-slab screening of 4 parts per billion by volume (ppbv) and four residences which exceeded the ATSDR TCE sub-slab immediate action level of 1,000 ppbv. In addition EPA has documented eight residences which exceed the ATSDR indoor air screening level of 0.4 ppbv and three residences exceed the ATSDR TCE indoor air immediate action level of 100 ppbv. The soil exposure pathway may be a pathway of concern to EPA and may be evaluated during future investigations (Ref. 5, pp. 11, 12).

Air Migration Pathway: At this time, there are insufficient data to satisfy the HRS requirements for establishing the threat of release to air at the Behr Dayton Thermal System VOC Plume. The air pathway has not been scored because a release to this media does not significantly affect the overall site score and because the ground water pathway produces an overall site score well above the minimum required for the site to quality for inclusion on the NPL. The air migration pathway may be of concern to EPA and may be evaluated during future investigations.

NOTES TO READER

The following rules were used when citing references in the HRS Documentation Record:

1. If the reference cited had an original page number, that page number is cited.

2. If the reference cited had no original page number, then a designated tracking number is cited. These references have been marked with a designated page number (example: Ref. 2, p. 011).

3. If the reference cited had an original (or native) page number and a repaginated number, then the repaginated is cited (example: Ref. 8, p. 1 is a native page, Ref. 8, p. 8 is the repaginated).

4. Abbreviations/Conventions used to identify references and citations:

Reference	Ref.
Section	Sec.
Single Page	p.
Multiple pages	pp.
[];[]	Next Reference
()	selected Acronyms
Figure	Fig.

HRS DOCUMENTATION RECORD

Name of Site:	Behr Dayton Thermal System VOC Plume
Date Prepared:	September 2008
Date Revised:	April 2009
EPA Region:	V
Street Address*:	1600 Webster Street*
City, County, State, Zip Code:	Dayton, Montgomery, Ohio, 45404 (Figure 1) (Ref. 3, p. 4)
General Location in State:	The Behr Dayton Thermal System VOC Plume is located in southwest Ohio.
Topographic Map:	The location of the Behr VOC Plume site is depicted on the Dayton North, Ohio, Quadrangle, U.S. Geological Survey (USGS) 7.5-Minute Series Topographic Map (Ref. 3, p. 4).
Latitude:	39º 47' 04" North (Ref. 3, pp. 1 through 4)
Longitude:	84º 10' 46" West (Ref. 3, pp. 1 through 4)

The latitude and longitude listed above mark the approximate location of the center of the 1600 Webster Street property (Ref. 3, p. 4).

* The street address, coordinates, and contaminant locations presented in this HRS documentation record identify the general area in which the site is located. They represent one or more locations the EPA considers to be part of the site based on the screening information EPA used to evaluate the site for NPL listing. EPA lists national priorities among the known "releases or threatened releases" of hazardous substances; thus, the focus is on the release, not delineated boundaries. A site is defined as where a hazardous substance has been "deposited, stored, placed, or otherwise come to be located." Generally, HRS scoring and the subsequent listing of a release merely represent the initial determination that a certain area may need to be addressed under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Accordingly, EPA contemplates that the preliminary description of facility boundaries at the time of scoring will be refined as more information is developed as to where the contamination has come to be located.

Scores

Ground Water Migration Pathway	-	100.00
Surface Water Migration Pathway	-	Not Scored
Soil Exposure Pathway	-	Not Scored
Air Pathway	-	Not Scored
HRS SITE SCORE		**50.00**

WORKSHEET FOR COMPUTING HRS SITE SCORE

		S	S^2
1.	Ground Water Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	100	10,000
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	NS	
2b	Ground Water to Surface Water Migration Component (from Table 4-25, line 28)	NS	
2c.	Surface Water Migration Pathway Score (S_{sw}) (enter the larger of lines 2a and 2b as the pathway score)	NS	
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	NS	
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10,000
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root.	**50.00**	

Note:

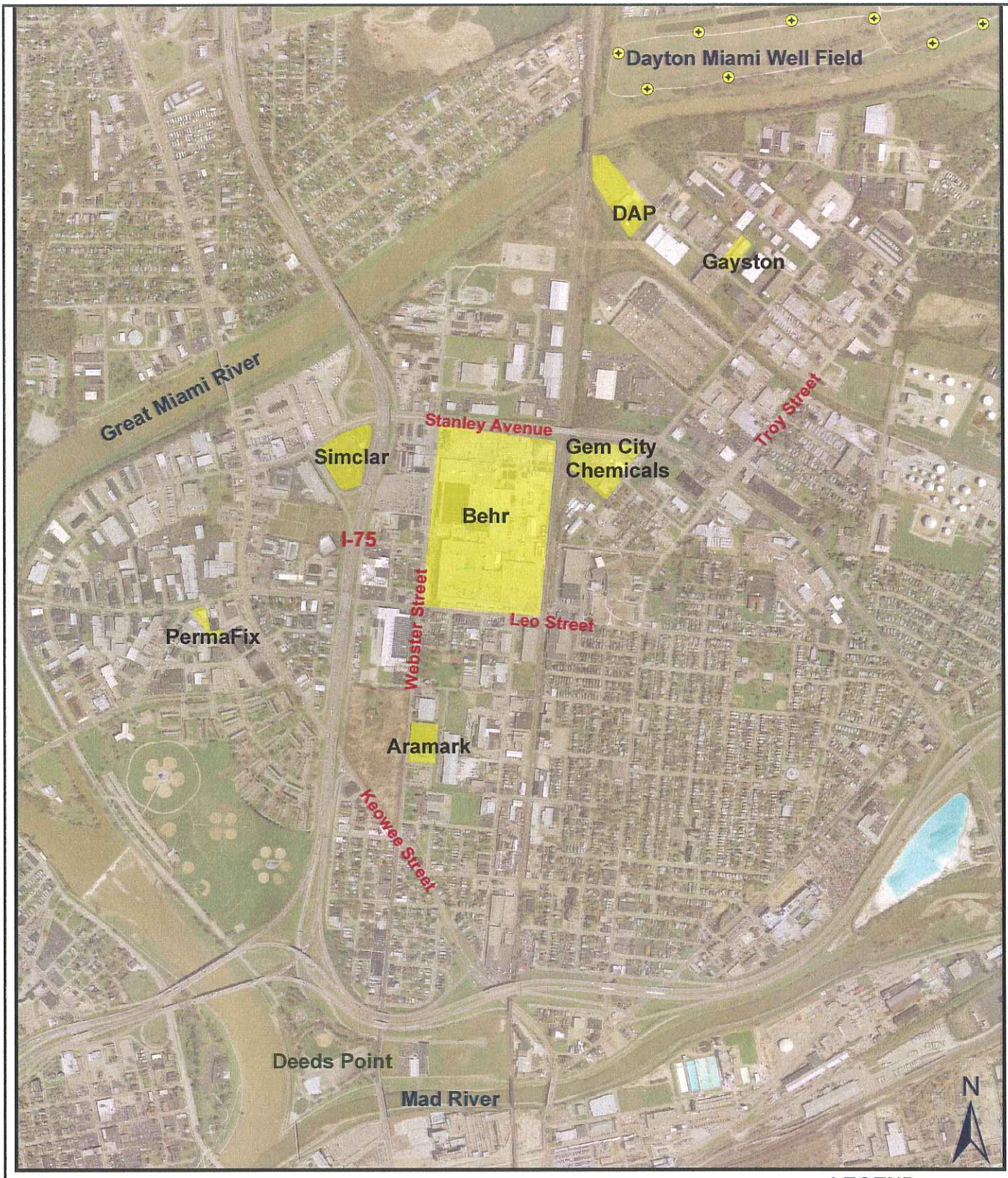
NS – Not scored

HRS Table 3-1 – Ground Water Migration Pathway Scoresheet
Behr Dayton Thermal System VOC Plume Site

Factor Categories and Factors	Maximum Value	Value Assigned
Likelihood of Release to an Aquifer:		
1. Observed Release	550	550
2. Potential to Release:		
2a. Containment	10	NS
2b. Net Precipitation	10	NS
2c. Depth to Aquifer	5	NS
2d. Travel Time	35	NS
2e. Potential to Release (lines 2a x (2b+ 2c+2d))	500	NS
3. Likelihood to Release (higher of lines 1 and 2e)	550	550
Waste Characteristics		
4. Toxicity/Mobility	(a)	10,000
5. Hazardous Waste Quantity	(a)	10
6. Waste Characteristics	100	18
Targets:		
7. Nearest Well	50	9
8. Population:		
8a. Level I Concentrations	(b)	0
8b. Level II Concentrations	(b)	0
8c. Potential Contamination	(b)	5,445
8d. Population (lines 8a+8b+8c)	(b)	5,445
9. Resources	5	0
10. Wellhead Protection Area	20	5
11. Targets (lines 7+8d+9+10)	(b)	5,459
Ground Water Migration Score for the Aquifer		
12. Aquifer Score [(lines 3 x6x11)/82,500][c]	100	100
Ground Water Migration Pathway Score		
13. Pathway Score (Sgw) (highest value from line 12 for all aquifers evaluated)[c]	100	100

Notes:

a. Maximum value applies to waste characteristics category
b. Maximum value not applicable
c. Do not round to highest integer
NS - Not scored



OhioEPA

December 27, 2007
JRW

SOURCE: REF. 18, P. 40

0 500 1,000 2,000
Feet

LEGEND

Known and Suspected Sources

Dayton Public Wells

FIGURE 1

Prepared for:
U.S. EPA. REGION V
Contract No: EP-S5-06-04
TDD NO: S05-0008-0610-011
DCN: 087-2A-

WESTON SOLUTIONS. Prepared by:
WESTON SOLUTIONS, INC.
750 East Bunker Court
Vernon Hills, IL

Site Location Map
Behr VOC Plume Site
Dayton, Miami County, Ohio
July 23, 2008

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http://www.epa.gov/superfund/sites/npl/hrsres/rule/part4a.pdf
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http://www.epa.gov/superfund/sites/npl/hrsres/rule/part5.pdf
http://www.epa.gov/superfund/sites/npl/hrsres/rule/toc_sec1.pdf
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2.0 SITE SUMMARY

2.0.1 SITE DESCRIPTION

The Behr Dayton Thermal System VOC Plume (Behr) site (EPA ID No. OHN000510164) lies approximately 2 miles northeast of Dayton, Ohio (Ref. 4, pp. 3, 9). The Behr site consists of a contaminated ground water plume and one source, contaminated soil, associated with the use of industrial solvent cleaners. This HRS package evaluates the ground water pathway associated with the contaminated soil source located on the Behr facility. The facility location is shown in Figure 1 of this HRS documentation record.

The Behr facility contains approximately 60 acres of buildings, parking areas, and outdoor storage areas that are located in a high-density, mixed-use area (Refs. 4, pp. 8, 9; 7, p. 9). The site area is relatively flat and is located between the Great Miami River, which is located west, north, and northeast of the site, and the Mad River, which is located south of the site (Refs. 3, p. 4; 4, p. 9; Figure 1 of this HRS documentation record).

In 1907, the Maxwell Car Company (Maxwell) first developed the south part of the Behr facility into an automobile manufacturing facility (Ref. 6, p. 2). In 1936, the Chrysler Corporation (Chrysler) purchased the Behr facility to assemble heating and air conditioning units (Refs. 6, p. 2; 7, p. 9). During World War II, the facility was used to manufacture furnaces, gun parts, and bomb shackles (Ref. 6, p. 2). In 1951, the north portion of the facility was acquired from White Villa Grocers, Incorporated (Ref. 6, p.- 2). In 2002, Chrysler sold the Behr facility to Behr America who currently uses the facility in a similar manner to Chrysler's past use (Ref. 6, p.- 2).

Manufacturing processes at Behr facility have relied on industrial solvent cleaners including tetrachloroethene (PCE), trichloroethene (TCE), 1,1,1-trichloroethane (TCA) and sulfuric acid (Ref. 6, p. 3). A soil investigation conducted at the Behr facility identified TCE and PCE soil contamination (Refs. 4, pp. 9, 10; 8, pp. 105, 106). TCE and other VOC constituents have been detected in ground water in areas located south, west, north and northeast of the Behr facility (Ref. 5, p. 8).

In situ bioremediation and ground water containment are being used to remediate the constituents at the Behr facility and to prevent further off-property migration (Refs. 4, p. 9; 5, p. 8; 7, p. 10; 61, p. 1; 62, p. 1). The remediation process underway at the Behr facility includes a ground water remediation project under Ohio EPA's VAP (Voluntary Action Program) and a soil vapor extraction (SVE) system for the

contaminant source area (Refs. 61, p. 1; 62, p. 2). In addition there are other facilities in the area that potentially used or discharged VOCs in their processes (Ref. 4, p. 9).

2.0.2 SITE HISTORY

The north and south portions of the Behr property are undeveloped (Ref. 6, p. 2). The south part of the Behr property was first developed by the Maxwell Car Company (Maxwell) in 1907 as an automobile manufacturing facility (Ref. 6, p. 2). The Maxwell facility was demolished in 1990 except for part of building (Ref. 6, p. 2). Chrysler Corporation purchased the property in 1936 and used the remaining building to assemble heating and air conditioning units (Refs. 4, p. 8; 6, p. 2; 7, p. 9). The current buildings at the Behr facility were constructed in 1920, 1969, and 1992 (Ref. 6, p. 2). During World War II, the plant was used to manufacture furnaces, gun parts, and bomb shackles (Ref. 6, p.- 2). In 1951, the north portion of the plant was acquired from White Villa Grocers, Incorporated (Ref. 6, p.– 2). White Villa Grocers, Incorporated, operated a single on-site building used as a warehouse (Ref. 6, p. 2).

The Dayton Thermal Product Plant has also been known as Temperature Corporation; AirTemp Corporation; AirTemp Incorporated, a subsidiary of Chrysler Corporation; AirTemp, a Division of Chrysler Corporation; Dayton Thermal Product; DCC; and now Behr (Ref. 6, p. 2). Daimler Chrysler sold the Dayton Thermal Product Plant to Behr America on May 1, 2002 (Refs. 4, p. 8; 6, p. 2).

Behr currently uses the plant in much the same manner as Daimler Chrysler to manufacture parts and sub-assemblies of heating, ventilation, and air conditioning (HVAC) equipment for Daimler Chrysler and other car and truck manufacturers (Refs. 4, pp. 8, 9; 5, p. 7; 7, p. 9; 45, p. 1). The types of vehicle parts produced include automobile heater cores and air conditioner coils, radiators, and gasoline vapor canisters (Ref. 4, p. 9). The Standard Industrial Classification (SIC) Code for the plant is 3069 (Ref. 4, p.9). The plant employs approximately 2,500 employees working three shifts (Refs. 4, p. 9; 7, p. 9).

Industrial solvent cleaners used in the facility manufacturing processes included tetrachloroethene (PCE), trichloroethene (TCE); 1,1,1-trichloroethane (TCA) and sulfuric acid (Refs. 5, p. 7; 6, p. 4; 33, p. 2; 34, p. 41). PCE, TCE and 1,1,1-TCA are listed hazardous wastes (Ref. 34, p. 41). Waste materials produced by the Dayton Thermal Product Plant included scrap metals, general refuse, spent solvents, wastewater treatment plant (WWTP) sludge, and used oil (Ref. 6, p. 4).

Waste materials were stored on the facility in various waste accumulation areas (Ref. 6, p. 4). Accumulation areas consisted of roll-off boxes, drum storage areas, and waste storage tanks (Ref. 6, p. 4).

Accumulation areas changed throughout the site history based on production and construction changes (Ref. 6, p. 4).

The Behr facility is currently a conditionally exempt small quantity generator under the Resource Conservation Recovery Act (RCRA) (Ref. 44, p. 3). The facility has a National Pollutant Discharge Elimination System (NPDES) permit for wastewater discharges to the Dayton sanitary sewer system (Ref. 4, p. 9; 61, p. 1). These discharges include wastewater generated by the ground water remediation system currently in use (Ref. 4, p. 9). Permits are also in place for airborne emissions from the facility (Ref. 4, p. 9).

Dissolved chlorinated VOC constituents, including TCE, have been detected in ground water south, west, north, and northeast of the Behr facility (Refs. 4, p. 9; 5, pp. 7, 8; 7, p. 10). In addition to the Behr facility; there are other facilities in the area which potentially used or discharged VOCs in their processes: Gem City Chemicals, Inc. (Gem City Chemicals), located at 1287 Air City Avenue; DAP, Inc. (DAP), located at 220 Janney Road; the Gayston Corporation (Gayston) located at 55 Janney Road; Aramark Uniform Services (Aramark) located at 1200 Webster Street; and the former PermaFix facility (current Environmental Processing facility) located at 416 Leo Street. It is likely that other unknown sources of VOCs are present in the industrialized area surrounding the Behr facility (Refs. 4, p. 9; 7, pp. 35 through 46, 48, 49; 18, p. 40; 38, pp. 1, 2, 3, 4; 39, p. 1; 40, pp. 1, 2, 3, 4, 5).

In situ bioremediation and ground water containment are being used to remediate the constituents beneath the Behr facility and to prevent further off-property migration (Refs. 4, p. 9; 7, p. 10; 45, p. 1). Gem City Chemicals, DAP, and Gayston are under orders with the Ohio Environmental Protection Agency (OEPA) to control or remediate sources of VOC ground water contamination (Ref. 4, p. 9). Aramark conducted remedial activities at its facility without input from OEPA (Ref. 4, p. 9).

Concentrations of VOCs in ground water continue to exceed the maximum contaminant levels (MCL) in wells south and north of the Behr facility (Refs. 4, p. 9).

In 2003 and 2006, Daimler Chrysler documented elevated levels of VOCs south of the Behr facility (Ref. 4, p. 9). In 2006, TCE concentrations as high as 3,900 parts per billion (ppb) were reported (Refs. 4, p. 9; 5, p. 9). In response to the VOC concentrations detected in shallow ground water and increased awareness of the threat posed by vapor intrusion, OEPA conducted a soil gas investigation on Daniel Street, Lamar Street, and Milburn Avenue in October 2006 (Ref. 4, pp. 9, 10). OEPA documented

elevated levels of TCE in soil gas as high as 160,000 parts per billion by volume (ppbv) (Refs. 4, pp. 9, 10; 5, p. 10; 43, p. 1).

In late October and in November 2006, EPA tasked WESTON START to collect sub-slab air samples from eight residences located south of the Behr facility along Milburn Avenue (Refs. 4, p. 10; 43, p. 1; 45, p. 2).

In the Daniel Street and Leo Street area, OEPA documented elevated soil gas VOC concentrations. TCE concentrations as high as 62,000 ppb were detected in the sub-slab samples (Refs. 4, p. 10; 5, p. 12). The Agency for Toxic Substances and Disease Registry (ATSDR) and the Ohio Department of Health (ODH) established TCE screening and action levels for residential and commercial sub-slab and indoor air (Refs. 4, p. 10; 5, p. 8). The ATSDR residential indoor air screening level is 0.4 ppb, and the action level is 100 ppb. The ATSDR residential sub-slab screening level is 4 ppbv. Samples from all eight residences exceeded the ATSDR residential TCE sub-slab screening level of 4 ppbv (Refs. 4, p. 10; 43, p. 1; 45, p. 2).

Based on ATSDR and ODH recommendations, EPA followed sub-slab air sampling with indoor air sampling at the eight residences in November 2006. TCE residential indoor air concentrations were detected at a range of 0.4 to 260 ppb. Results indicated that TCE concentrations in all eight samples were equal to or exceeded the ATSDR residential TCE indoor air screening level of 0.4 ppb. TCE concentrations in three samples exceeded the ATSDR residential TCE indoor air immediate action level of 100 ppb (Refs. 4, p. 10; 5, pp. 7, 9, 10; 43, p. 1; 45, p. 2).

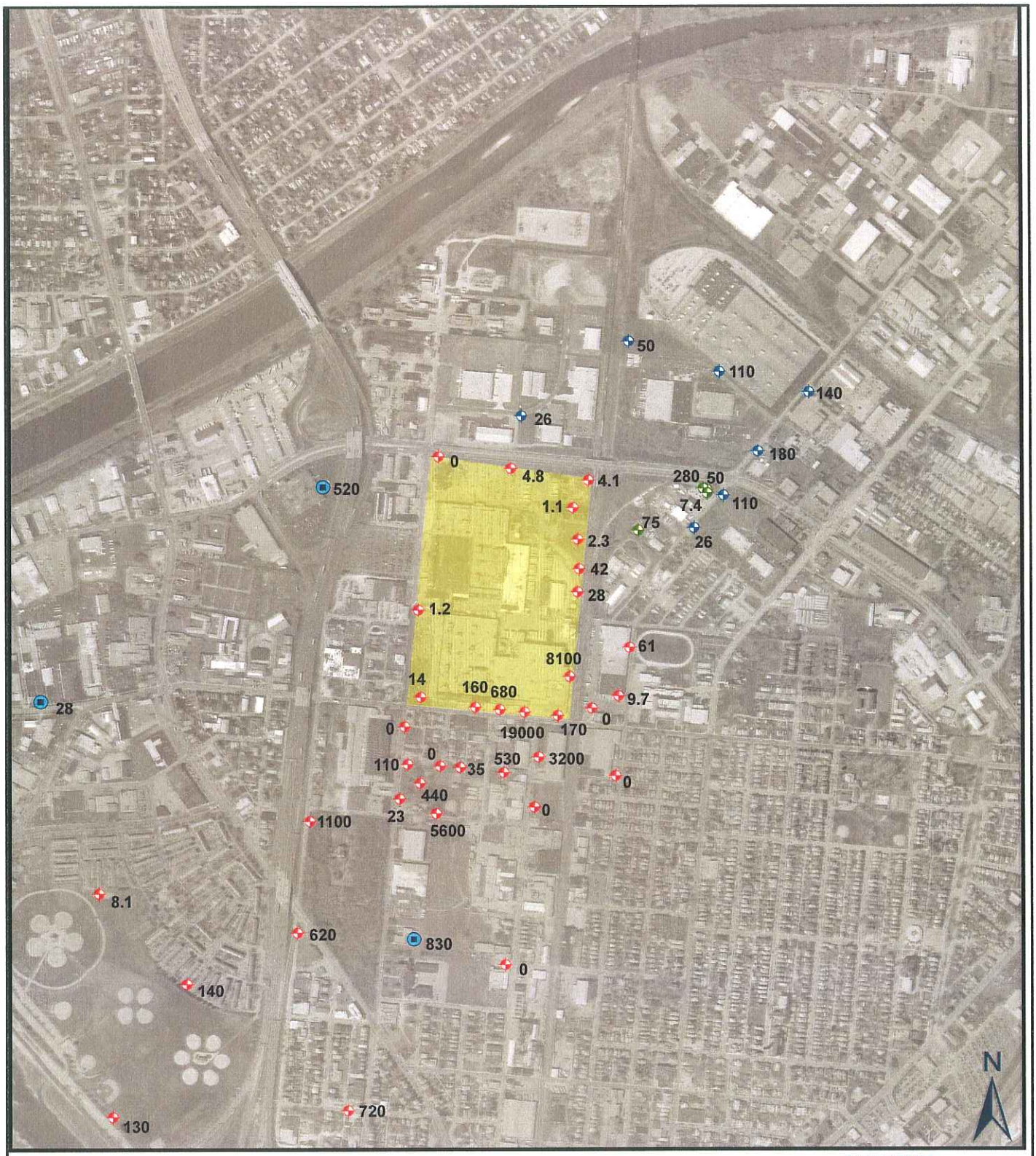
On December 19, 2006, EPA and Daimler Chrysler (former owner of the Behr facility) signed an Administrative Order by Consent to conduct vapor intrusion investigation and mitigation (Ref. 43, p. 1; 45, p. 2). On December 21, 2006, EPA approved the Daimler Chrysler Phase 1 work plan for sampling and for installing residential TCE vapor abatement systems in up to 21 residences along Leo Street, Daniel Street, and Milburn Avenue (Refs. 4, p. 10; 43, p. 1).

From January through December 2007, Chrysler has sampled over 80 residential and commercial locations to determine if indoor air concentrations exceed the ATSDR residential TCE indoor air immediate action level (Refs. 45, p. 2). The January 11, 2008 update indicated that Chrysler has installed and/or will be installing 35 vapor abatement mitigation systems in residential and commercial businesses in the area (Ref. 43, p. 2). On March 4, 2008, EPA approved the Chrysler Phase II Work Plan Addendum Soil Vapor Extraction System Design (Refs. 43, p. 2). The soil vapor extraction system will enhance the

TCE vapor mitigation as part of the indoor air removal action within the residential area between Leo Street, Milburn Avenue, Daniel Street, and Lamar Street (Ref. 43, p. 2).

In August 2007, EPA issued a letter to Chrysler requesting Chrysler to conduct vapor intrusion sampling in an area of the McCook Field Neighborhood bordered to the north by Protzman Street, to the east by Kiser Street and to the south by State Route 4 (Ref. 45, p. 2). The 2007 ground water and soil gas data indicated the potential for vapor intrusion in the area where additional removal work was required (Ref. 45, p. 2). In October 2007, Chrysler issued a letter to EPA formally stating that they do not intend to conduct vapor intrusion sampling in the area EPA requested in August 2007 (Ref. 45, pp. 2, 3). Following a dispute resolution, on November 8, 2007, EPA submitted a letter to Chrysler indicating that EPA would be initiating a fund-lead removal action within the McCook Field Neighborhood including residential sampling and mitigation (Ref. 45, p. 3). As of February 6, 2008, EPA collected indoor air samples from 169 residential locations within the McCook Field Neighborhood. EPA received analytical data showing that 71 residences require a vapor abatement system, 20 residences to be placed on a quarterly monitoring program and 44 residences require "No Further Action" within McCook Field Neighborhood (Ref. 45, p. 3).

Under the Administrative Order on Consent as well as with EPA funds, Chrysler and EPA continue to investigate the extent of vapor intrusion from a VOC ground water plume from the Behr facility. Structures impacted by vapors containing concentrations above action levels are being mitigated through the installation of active venting systems and a soil vapor extraction system as approved by EPA is currently being installed in the area bounded by Leo Street to the North, Milburn Avenue to the East, Daniel Street to the West, and Lamar Street to the South (Refs. 43, pp. 1, 2, 3; 45, pp. 1, 2, 3).



OhioEPA

December 18, 2007
JRW

0 500 1,000 2,000
Feet

LEGEND

- Behr Dayton Thermal Products LLC Property Boundary
- Dayton Public Wells
- Chrysler Monitoring Wells
- Dayton Monitoring Wells
- Gem City Chemicals Monitoring Wells
- Miscellaneous Sample Locations

NOTE:
CONCENTRATIONS ARE IN ug/L.

SOURCE: REF. 18, P. 44

FIGURE 2

Prepared for:
U.S. EPA. REGION V
Contract No: EP-S5-06-04
TDD NO: S05-0008-0610-011
DCN: 087-2A-

WESTON SOLUTIONS. Prepared by:
WESTON SOLUTIONS, INC.
750 East Bunker Court
Vernon Hills, IL

TCE Groundwater Results
Behr VOC Plume Site
Dayton, Miami County, Ohio
July 23, 2008

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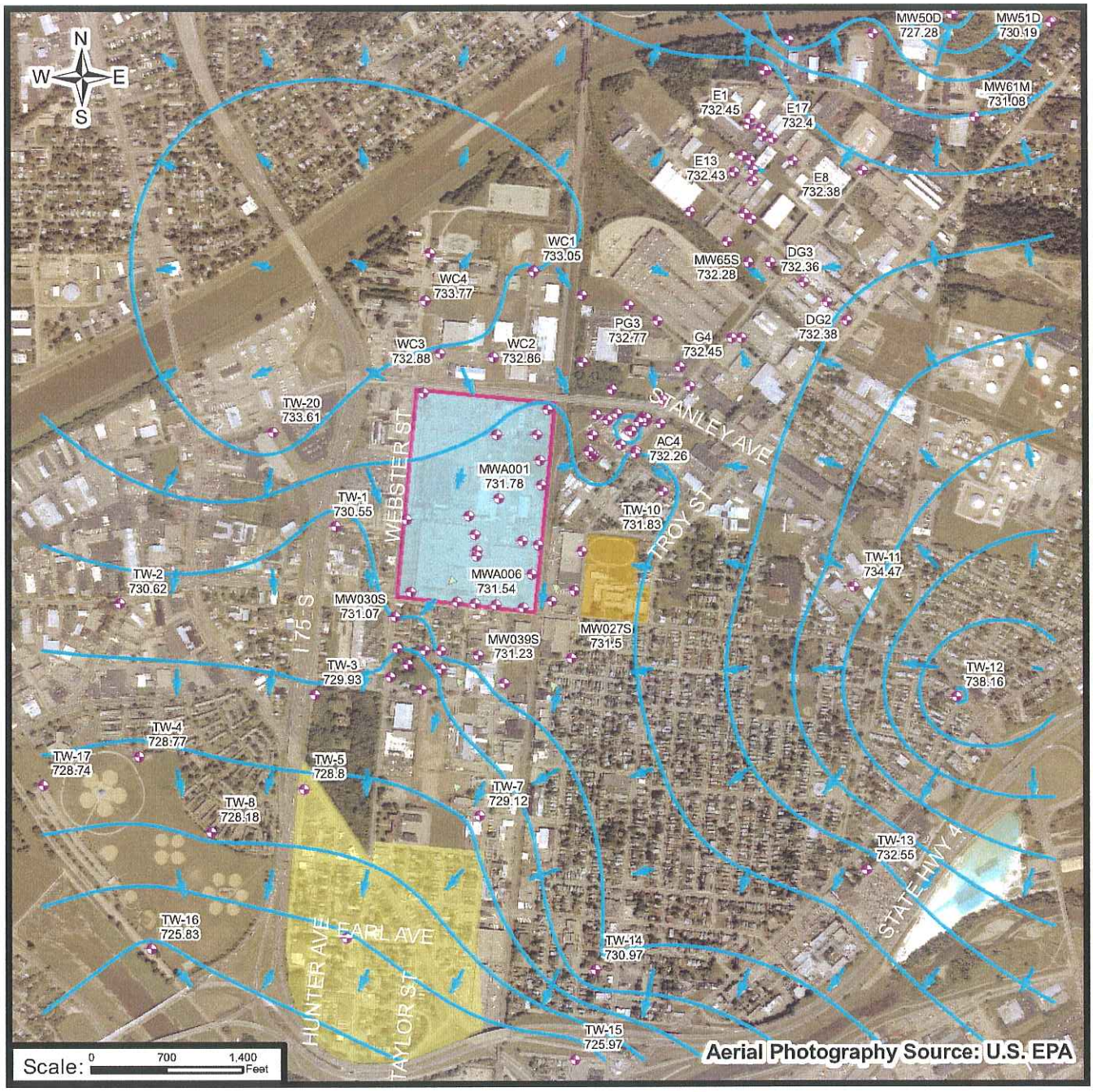


Notes:
Contours Generated using Surfer 8.05

- Monitoring Well Location
- Groundwater Flow Direction
- Groundwater Elevation Contour
- Additional Phase II Sample Area (Kiser Elementary School)
- Additional Phase II Sample Area (McCook Field Neighborhood)

Attachment 1

U.S. EPA

NOTE:
UNITS ARE IN MEAN SEA LEVEL - FEET.

SOURCE: REF. 18, P. 46

JULY 2007 GROUNDWATER CONTOUR MAP
BEHR VOC PLUME SITE
DAYTON, MIAMI COUNTY, OHIO
OCTOBER 4, 2007

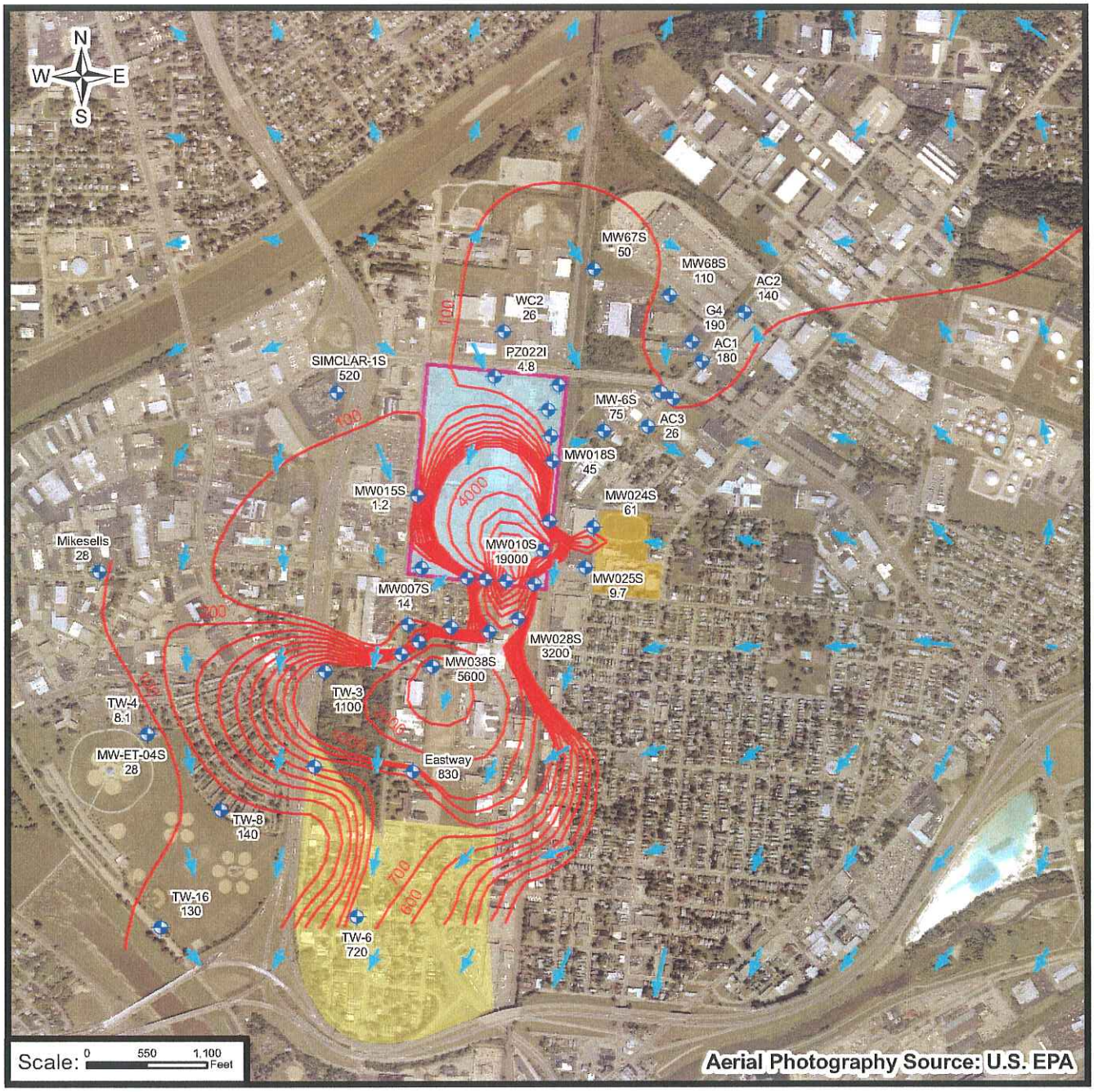
FIGURE 3

Prepared for:
U.S. EPA. REGION V
Contract No: EP-S5-06-04
TDD NO: S05-0008-0610-011
DCN: 087-2A-

WESTON SOLUTIONS. Prepared by:
WESTON SOLUTIONS, INC.
750 East Bunker Court
Vernon Hills, IL

July 2007 Groundwater Contour Map
Behr VOC Plume Site
Dayton, Miami County, Ohio
July 23, 2008

I:\CAD93-000\01108.dwg, 7/23/2008 10:15:28 AM



Behr VOC Plume Site
Dayton, Montgomery County, Ohio

Notes:
Concentration Contour Intervals are
100 ug/L between 100 and 1,000 ug/L
2,000 ug/L between 2,000 and 18,000 ug/L
Contours Generated using Surfer 8.05

- Groundwater Flow Direction
- Sample Location & TCE ug/L
- TCE Plume Contour (ug/L)
- Additional Phase II Sample Area (Kiser Elementary School)
- Additional Phase II Sample Area (McCook Field Neighborhood)

Attachment 2

U.S. EPA

SOURCE: REF. 18, P. 47

JULY 2007 TCE PLUME MAP
BEHR VOC PLUME SITE
DAYTON, MIAMI COUNTY, OHIO
OCTOBER 4, 2007

FIGURE 4

Prepared for:
U.S. EPA. REGION V
Contract No: EP-S5-06-04
TDD NO: S05-0008-0610-011
DCN: 087-2A-

Prepared by:
WESTON SOLUTIONS, INC.
750 East Bunker Court
Vernon Hills, IL

July 2007 TCE Plume Map
Behr VOC Plume Site
Dayton, Miami County, Ohio
July 23, 2008

2.2 SOURCE CHARACTERIZATION

Clean Tech completed a site investigation report at Chrysler Corporation's Dayton Thermal Products Plant (Ref. 8, pp. 1, 2, 6). The objectives of this site investigation were to characterize the type and extent of contaminants in the unsaturated and saturated soil zones; characterize the extent of dissolved phase contamination in the ground water; assess the source of contaminants; evaluate the potential migration of contaminants off the property; obtain site data useful for evaluating remediation technologies; evaluate the potential for contamination due to dense non-aqueous phase liquids (Ref. 8, p. 6). Waste materials were stored on the property in various waste accumulation areas (Ref. 6, p. 4). Accumulation areas consisted of roll-offs, drum storage areas, and waste storage tanks (Ref. 6, p. 4). Accumulation areas changed throughout the site history based on changes in production and construction changes at the site (Ref. 6, p. 4). The facility reported releases from a leaking underground storage tank; 1990 process wastewater discharge; a polychlorinated biphenyl (PCB) release and cleanup; 1996 oil/water mixture release; 1990 zinc discharge due to process malfunction; 1991 process overfill; 1991 process overflow; 1996 hydrogen peroxide release; 1996 waste oil release; 1996 stamping oil overflow; 1996 oil/water mixture release; 1997 wastewater discharge; and two 1997 non-contact cooling water releases (Ref 6, p. 6). Industrial solvent cleaners used in the manufacturing process included PCE; TCE; 1,1,1-TCA; and sulfuric acid (Refs. 6, p. 3; 33, p. 2; 34, p. 41).

Ground water sample analysis and ground water flow patterns establish a contamination pattern that relates vadose soil and ground water contaminants in the unconfined aquifer across the property. The levels of PCE in the unconfined aquifer were greatest in the central portion of the facility, and a similar pattern is seen for the soil contamination. The levels of TCE in the unconfined aquifer were greatest along the southern portion of the property, and a similar pattern is seen for the soil contamination (Ref. 8, pp. 100 through 103).

Soil samples collected from the site confirm soil contamination within the property. The levels of PCE in soil were greatest in the central portion of the facility, and the levels of TCE in soil were greatest along the southern portion of the facility (Ref. 8, pp. 61 through 63).

2.2.1 SOURCE IDENTIFICATION

Source Number: 1

Source Type: Contaminated Soil

Description and Location of Source (with reference to a map of the site):

Soil and ground water investigations conducted at the facility have identified TCE and PCE contamination in both soil and ground water (Ref. 10, pp. 7, 13, 16, 20, 23, 29, 32, 35, 37, 38, 46, 49, 52, 55, 58, 63, 65, 66, 67, 68, 73, 75, 80, 84, 89, 90, 92). Waste materials were stored on the facility in various waste accumulation areas (Ref. 6, p. 4). Accumulation areas consisted of roll-off boxes, drum storage areas, and waste storage tanks (Ref. 6, p. 4). Accumulation areas changed throughout the site history based on changes in production and construction changes at the site (Ref. 6, p. 4). A soil vapor extraction (SVE) system was designed and installed at the site and operated from October 2003 through December 2005 (Ref. 5, p. 8). Based on extracted air concentrations, the SVE system removed 900 pounds of VOCs (Ref. 5, p. 8). A ground water remediation system was designed and installed at the site and operated from June 2004 through December 2005 (Ref. 5, p. 8). The ground water system removed a total of 1,031 pounds of VOCs (Ref. 5, p. 8).

In 1994, soil samples were collected from soil borings and during the installation of monitoring wells. The samples were analyzed by the Canton Analytical Laboratory of Michigan for Target Compound List (TCL) VOCs and Target Analyze List (TAL) metals (Refs. 8, pp. 24 through 27; 9, pp. 45; 10, pp. 5 through 36, 44 through 88). Samples were analyzed by EPA method 8260 (Ref. 8, pp. 26, 41 through 42).

The soil sampling and quality control procedures for the soil borings and monitoring well installation are provided in Reference 9, pages 28, 29, 31 and 32.

Based on the ground water sampling performed by OEPA, significant TCE concentration was detected in the southeast portion of the Behr property (Ref. 18, pp. 43, 44). Based on the ground water flow direction (north to south and northeast to south), the ground water contamination detected in the southeast portion of the property (TCE at 19,000 μg/L) is most likely from an upgradient location on the Behr property (Ref. 18, pp. 43, 44, 45).

Based on soil sampling results provided in the site investigation report, the approximate area of soil contamination may extend beyond the facility boundary; however, the contamination appears to be primarily located in the area within the following monitoring wells and borings: MWC-2, MWA-4, MWA-5, MWB-2, MWB-3, MWB-5, SB-1, SB-4, SB-9 and SB-10 (Refs. 8, pp. 19, 20, 34, 35; 9, pp. 34, 37, 42, 43, 55, 56, 63, 66, 71, 78, 114 through 117; 10, pp. 46, 49, 52, 55, 58, 63, 65, 66, 67, 68, 73, 75,

80, 84, 89, 90, 92). There are no records indicating that the soil samples were obtained under the buildings, therefore, the soil under the building within the bounded area is considered to be not impacted soil. Chlorinated solvents (TCE and/or PCE) were detected at SB1-9, SB3-14, SB5-29, SB6-14, SB9-19, SB10-29, MWA1-24, MWA2-19, MWA3-24, MWA4-24, MWA5-24, MWA6-24, MWB2-24, MWB3-24, MWB5-24, MWB6-24, SB4-14, SB8-24 (Refs. 9, pp. 114 through 117; 10, pp. 7, 13, 16, 20, 23, 29, 32, 35, 37, 38, 46, 49, 52, 55, 58, 63, 65, 66, 67, 68, 73, 75, 80, 84, 89, 90, 92).

The soil sample results for the area bounded MWC-2, MWA-4, MWA-5, MWB-2, MWB-3, MWB-5, SB-1, SB-4, SB-9, and SB-10 is summarized in the table under the Hazardous Substance Associated With Source section (Ref. 9, pp. 108 through 111, 114 through 117).

The extent of soil contamination is provided in Figure provided in Reference 11. The TCE ground water plume associated with the source area is shown in Reference 18, Page 41.

Based on the contamination detected in the soil samples collected in 1994, an approximate contaminated soil source area was identified (Refs. 9, pp. 34, 36, 38, 39, 42, 43, 48, 50, 52, 54, 56, 65, 71, 74, 115, 117; 10, pp. 7, 13, 16, 20, 23, 29, 32, 35, 37, 38, 46, 49, 52, 55, 58, 63, 65, 66, 67, 68, 73, 75, 80, 84, 89, 90, 92; Section 2.2.2 of this HRS documentation record). However, since extent of contamination under the buildings in not known the estimated area of on-site soil contamination is greater than 0.

HAZARDOUS SUBSTANCE ASSOCIATED WITH THE SOURCE

Background Level: A site-specific background sample was not designated during the sampling event. In order to characterize Source 1 through chemical analysis, samples SB-2-19 and MWB4-19 were collected from two borings to represent background contaminant levels (Refs. 9, pp. 35, 68; 10, pp. 10, 37, 77, 89). Soil boring SB-2 is located at the eastern/central corner of the property, and soil boring MWB4 is located at the northeastern border of the property (Ref. 9, pp. 108 through 111). These locations appear to be outside the influence of soil contamination (Ref. 9, pp. 112 through 117). The two boring locations were selected because the primary contaminants of concern (TCE; PCE; and 1,1,1-TCA) were not detected in soil samples obtained from these locations and the samples were collected at similar depths to the contaminated samples. Therefore, soil borings SB-2 and MWB4 are considered to be outside the influence of the soil contamination (Refs. 9, p. 35, 68; 10, pp. 10, 37, 77, 89).

- Background Soil Samples at Source 1 – Contaminated Soil Source Area

Background soil samples-SB-2-19 and MWB4-19 were collected from a depth of 19 to 21 feet below ground surface (bgs) (Ref. 8, pp. 27, 42).

Sampling Location	Type and USCS Description	Depth (ft bgs)	Sample ID	Date	Hazardous Substance	RL µg/kg	Hazardous Substance Concentration µg/kg	References
SB-2	Soil; GP-GM	19-21	SB-2-19	10/18/94	PCE TCE 1,1,1-TCA	10.0 10.0 10.0	ND ND ND	Refs. 9, p. 35; 10, pp. 10, 37
MWB4	Soil; SW-SM	19-21	MWB4-19	11/1/94	PCE TCE 1,1,1-TCA	10.0 10.0 10.0	ND ND ND	Refs. 9, p. 68; 10, pp. 77, 89

Notes:
µg/kg – Microgram per kilogram
bgs – Below ground surface
ft – Feet
GM– Silty gravel
GP – Poorly graded gravel
ID–Identification
NA – Not available
ND – Non-detect
PCE – Tetrachloroethene
RL – Reporting limit, this is a sample detection limit and it was derived from review of all sample results which were reported as less than particular value for non-detects
SM – Silty sand
SW – Well-graded fine to coarse sand
TCA – Trichloroethane
TCE – Trichloroethene
USCS – Unified Soil Classification System

- Contaminated Soil Samples at Source 1 – Contaminated Soil Source Area

During installation of soil borings, 10 soil samples were collected and analyzed for TCL VOCs and TAL metals (Ref. 8, pp. 19, 20; 10, pp. 5 through 36). During installation of monitoring wells, 12 soil samples were collected and analyzed for TCL VOCs and TAL metals (Ref. 8, pp. 34, 35; 10, pp. 44 through 88). Chlorinated solvent compounds were detected extensively in the soil samples, most notably PCE; TCE; and 1,1,1 TCA (Ref. 8, pp. 66, 67).

Sampling Location	Type and USCS Description	Depth (ft bgs)	Date	Hazardous Substance	RL µg/kg	Hazardous Substance Concentration µg/kg	References
SB-1-9	Soil; GP	9-11	10/17/94	TCE	10	16	Refs. 9, p. 34; 10, pp. 7, 37

Sampling Location	Type and USCS Description	Depth (ft bgs)	Date	Hazardous Substance	RL µg/kg	Hazardous Substance Concentration µg/kg	References
SB-3-14	Soil; SP-SM	14-16	10/19/94		10	75	Refs. 9, p. 36; 10, pp 13, 37
SB-5-29	Soil; GW	29-31	10/19/94		10	47	Refs. 9, p. 38; 10, pp. 20, 37
SB-6-14	Soil; GW-GM	14-16	10/20/94		10	54	Refs. 9, p. 39; 10, pp. 23, 38
SB-9-19	Soil; SP	19-21	10/21/94		10	2,600	Refs. 9, p. 42; 10, pp. 32, 38
SB-10-29	Soil; GW-GC	29-31	10/21/94		10	3,100	Refs. 9, p. 43; 10, pp. 35, 38
MWA1-24	Soil; SW	24-26	11/14/94		10	91	Refs. 9, p. 48; 10, pp. 46, 67
MWA2-19	Soil; SW-SM	19-21	10/28/94		10	200	Refs. 9, p. 50; 10, pp. 49, 89
MWA3-24	Soil; SW	24-26	11/11/94		10	52	Refs. 9, p. 52; 10, pp. 52, 90
MWA4-24	Soil; SW	24-26	10/24/94		10	1,300	Refs. 9, p. 54; 10, pp. 55, 65, 66
MWA5-24	Soil; GW-GC	24-26	11/15/94		10	64	Refs. 9, p. 56; 10, pp. 58, 68
MWA6-24	Soil; SW	24-26	10/25/94		10	90	Refs. 9, p. 58; 10, pp. 63, 65, 66
MWB3-24	Soil; GW	24-26	11/3/94		10	1,200	Refs. 9, p. 66; 10, pp. 75, 92
MWB5-24	Soil; SW	24-26	11/7/94		10	470	Refs. 9, p. 71; 10, pp. 80, 92
MWB6-24	Soil; SW	24-26	11/9/94		10	400	Refs. 9, p. 74; 10, pp. 84, 90
SB-1-9	Soil; GP	9-11	10/17/94	PCE	10	45	Refs. 9, p. 34; 10, pp. 7, 37
SB-3-14	Soil; SP-SM	14-16	10/19/94		10	490	Refs. 9, p. 36; 10, pp.13, 37
SB-4-14	Soil; GW-GC	14-16	10/31/94		10	14	Ref. 9, p. 37; 10, pp. 16, 89
SB-5-29	Soil; GW	29-31	10/19/94		10	860	Refs. 9, p. 38; 10, pp. 20, 37
SB-6-14	Soil; GW-GM	14-16	10/20/94		10	38	Refs. 9, p. 39; 10, pp. 23, 38
SB-8-24	Soil; SP	24-26	10/19/94		10	480	Refs. 9, p. 41; 10, pp. 29, 37
SB-9-19	Soil; SP	19-21	10/21/94		10	390	Ref. 9, p. 42; 10, pp. 32, 38
MWA1-24	Soil; SW	24-26	11/14/94		10	5,300	Refs. 9, p.48; 10, pp. 46, 67
MWA2-19	Soil; SW-SM	19-21	10/28/94		10	1,800	Refs. 9, p. 50; 10, pp. 49, 89
MWA3-24	Soil; SW	24-26	11/11/94		10	260	Refs. 9, p. 52; 10, pp. 52, 90
MWA4-24	Soil; SW	24-26	10/24/94		10	150	Refs. 9, p. 54; 10, pp. 55, 65
MWA5-24	Soil; GW-GC	24-26	11/15/94		10	300	Refs. 9, p. 56; 10, pp. 58, 68

Sampling Location	Type and USCS Description	Depth (ft bgs)	Date	Hazardous Substance	RL µg/kg	Hazardous Substance Concentration µg/kg	References
MWB2-24	Soil; SP	24-26	11/16/94		10	4,000	Refs. 9, p. 63; 10, pp. 73, 67
MWA1-24	Soil; SW	24-26	11/14/94	1,1,1-TCA	10	25	Refs. 9, p. 48; 10, pp. 46, 67
MWA2-19	Soil; SW-SM	19-21	10/28/94		10	640	Refs. 9, p. 50; 10, pp.49, 89
MWA3-24	Soil; SW	24-26	11/11/94		10	160	Refs. 9, p. 52; 10, pp. 52, 90
MWA5-24	Soil; GW-GC	24-26	11/15/94		10	39	Refs. 9, p. 56; 10, pp. 58, 68
MWB5-24	Soil; SW	24-26	11/7/94		10	14	Refs. 9, p. 71; 10, pp. 80, 92
MWB6-24	Soil; SW	24-26	11/9/94		10	420	Refs. 9, p. 74; 10, pp. 84, 90

Notes:
µg/kg – Microgram per kilogram
bgs – Below ground surface
ft – Feet
GC– Clayey gravel, gravel-sand-clay mixtures
GM– Silty gravel, gravel-sand-silt mixtures
GP – Poorly graded gravel, gravel-sand mixtures, little or no fines
GW– Well-graded gravel, fine to coarse gravel, gravel-sand mixtures
NA – Not available
PCE – Tetrachloroethene
RL – Reporting limit, this is a sample detection limit and it was derived from review of all sample results which were reported as less than particular value for non-detects
SM – Silty sand, sand-silt mixture
SP – Poorly graded sands, gravelly sands, little or no fines
SW – Well-graded fine to coarse sand
TCA – Trichloroethane
TCE – Trichloroethene
USCS – Unified Soil Classification System

Hazardous Substance Associated With the Source – Sample Similarity

The background soil samples collected at SB-2 and MWB-4 can be characterized as predominantly coarse grained soils with mostly gravels and sand. Poorly graded soils usually contain diversified grain sizes and well graded soils tend to contain uniform grain sizes. The poorly graded gravels found at SB-2 contain mixtures of sand and silt while the soil at MWB-4 contain mostly well graded sands and silty-sand mixtures (See Background Soil Samples at Source 1).

The contaminated soil samples collected at SB-1, SB-3, SB-4, SB-5, SB-6, SB-8, SB-9, MWA1-24, MWA2-19, MWA3-24, MWA4-24, MWA5-24, MWB2-24, MWB5-24, and MWB6-24 are predominantly coarse grained soils ranging from well to poorly graded gravels and sand to silty-sand mixtures. The range of grading found for the gravels and sands indicate multiple grain sizes and mixtures of gravel, sand and silt. The contaminated soil samples can be characterized as coarse grained soils largely defined by gravels and sands similar to the soil type of the background samples (See Background and Contaminated Soil Samples at Source 1).

2.2.2 HAZARDOUS SUBSTANCES AVAILABLE TO A PATHWAY

The soil borings installed at the site have shown that the contaminated soil source has no liner, functioning and maintained run-on control system, runoff management system, or functioning leachate collection and removal system. Therefore, the Containment Factor Value (CFV) for Source 1 was assigned a maximum value of 10 (Refs. 1, Section 3.1.2.1, Table 3-2; 9, pp. 12, 13, 33 through 43, 48 through 82, 136 through 141; 10, pp. 7, 11, 20, 23, 32, 35, 37, 38, 46, 49, 52, 55, 58, 65, 68, 75, 76, 84, 89, 90, 92). The maximum CFV reflects the minimum level of containment. Sources are assigned a maximum CFV if there is evidence that hazardous substances have migrated from the source area or that there is no liner, functioning leachate collection and removal system, or functioning and maintained run-on control system or runoff management system (Ref. 1, Section 3.1.2.1, Table 3-2).

Source 1 is contaminated soil. As discussed above, an observed release to the soil has occurred. Because the CFV for Source 1 source is greater than zero, the following substances associated with the source area are available to migrate via the ground water pathway: TCE, PCE, and 1,1,1- TCA.

Containment Description	Containment Factor Value	Reference
Gas Release to Air	Not Scored	Not Applicable
Particulate Release to Air	Not Scored	Not Applicable
Release to Ground Water	10	Refs. 1, Section 3.1.2.1, Table 3-2; 9, pp. 12, 13, 33 through 43, 48 through 82, 136 through 141; 10, pp. 7, 13, 16, 20, 23, 29, 32, 35, 37, 38, 46, 49, 52, 55, 58, 63, 65, 66, 67, 68, 73, 75, 80, 84, 89, 90, 92
Release through Overland Migration or Flood	Not Scored	Not Applicable

HAZARDOUS WASTE QUANTITY

2.4.2.1 Source Hazardous Waste Quantity

2.4.2.1.1 Hazardous Constituent Quantity (Tier A)

The information available is not sufficient to adequately determine Tier A as required in Section 2.4.2.1.1 of the HRS Rule. As a result, the evaluation of Source Hazardous Waste Quantity proceeds to the evaluation of Tier B, hazardous waste stream quantity (Ref. 1, Section 2.4.2.1.1).

2.4.2.1.2 Hazardous Wastestream Quantity (Tier B)

The information available is not sufficient to adequately determine Tier B as required in Section 2.4.2.1.2 of the HRS Rule. As a result, the evaluation of Source Hazardous Waste Quantity proceeds to the evaluation of Tier C, volume (Ref. 1, Section 2.4.2.1.2).

2.4.2.1.3 Volume (Tier C)

The information available is not sufficient to adequately determine Tier C as required in Section 2.4.2.1.3 of the HRS Rule. As a result, a value of 0 is assigned for volume, and the evaluation of Source Hazardous Waste Quantity proceeds to the evaluation of Tier D, area (Ref. 1, Section 2.4.2.1.3).

2.4.2.1.4 Area (Tier D)

The soil sampling results indicate the presence of TCE, PCE and 1,1,1 TCA levels significantly above background as defined in the HRS Table 2-3. At this time, the extent of soil contamination cannot be completely defined because it is not known if soil contamination exists under the buildings.

Therefore, the Source 1 Hazardous Waste Quantity Value is > 0, but amount is unknown (Ref. 1, Section 2.4.2.2).

2.4.2.1.5 Calculation of Source Hazardous Waste Quantity Value

As described in the HRS, the highest value assigned to a source from among the four tiers of hazardous waste quantity - constituent quantity (Tier A), wastestream quantity (Tier B), volume (Tier C), or area (Tier D) - shall be selected as the source hazardous waste quantity value (Ref. 1, Section 2.4.2.1.5). Source 1 has a Source Hazardous Waste Quantity Value of >0, but amount is unknown.

HAZARDOUS WASTE QUANTITY VALUE

Source 1 Hazardous Waste Quantity	
Tier Measure	**Source Value**
Tier A, Hazardous Constituent Quantity	Not Scored
Tier B, Hazardous Wastestream Quantity	Not Scored
Tier C, Volume	0
Tier D, Area	>0

SUMMARY OF SOURCE DESCRIPTIONS

Source Number	Source Hazardous Waste Quantity Value	Source Hazardous Constituent Quantity Complete (Y/N)	Containment Factor Value by Pathway				
			GW	SW		Air	
			(Table 3-2)	Overland/ Flood (Table 4-2)	GW to SW (Table 3-2)	Gas (Table 6-3)	Particulate (Table 6-9)
1	10	N	10	NS	NS	NS	NS

Notes:
GW – Ground water
NS – Not scored
SW – Surface water

Other Potential Sources On-Site

Clean Tech completed a site investigation report at Chrysler Corporation's Dayton Thermal Products Plant (Ref. 8, pp. 1, 2, 6). The objectives of this site investigation were to characterize the type and extent of contaminants in the unsaturated and saturated soil zones; characterize the extent of dissolved phase contamination in the ground water; assess the source of contaminants; evaluate the potential migration of contaminants off the property; obtain site data useful for evaluating remediation technologies; evaluate the potential for contamination due to dense non-aqueous phase liquids (Ref. 8, p. 6). Waste materials were stored on the property in various waste accumulation areas (Ref. 6, p. 4). Accumulation areas consisted of roll-offs, drum storage areas, and waste storage tanks (Ref. 6, p. 4). Accumulation areas changed throughout the site history based on changes in production and construction changes at the site (Ref. 6, p. 4). The facility reported releases from a leaking underground storage tank; 1990 process wastewater discharge; a polychlorinated biphenyl (PCB) release and cleanup; 1996 oil/water mixture release; 1990 zinc discharge due to process malfunction; 1991 process overfill; 1991 process overflow; 1996 hydrogen peroxide release; 1996 waste oil release; 1996 stamping oil overflow; 1996 oil/water mixture release; 1997 wastewater discharge; and two 1997 non-contact cooling water releases (Ref 6, p. 6). Industrial solvent cleaners used in the manufacturing process included PCE; TCE; 1,1,1-TCA; and sulfuric acid (Refs. 6, p. 3; 33, p. 2; 34, p. 41).

3.0 GROUND WATER MIGRATION PATHWAY

3.0.1 GENERAL CONSIDERATIONS

Regional Geology

The regional geology of the Dayton, Ohio, area has been examined and discussed by several authors. The original geology of the area is summarized here based on these information sources which pulled from other information sources (Refs. 7, p. 20 through 29; 8, pp. 48 through 58; 51, pp. 22 through 25; 58, pp. 10, 11, 12). The regional geologic setting of the Dayton, Ohio, area consists of glacial and glacial-fluvial (outwash stream) sediments deposited over an irregular bedrock surface (Refs. 7, pp. 20 through 23; 8, pp. 48 through 50, 53; 51 pp. 23, 24, 41 through 44). The outwash sediments made up of sands and gravel fill pre-glacial or glacial valleys eroded into the underlying bedrock. These permeable glacial deposits are outwash sediments originating from retreating glaciers (Refs. 7, pp. 20 through 23; 8, pp.48 through 50, 53; 51 pp. 23, 24, 41 through 44). The permeable deposits have formed shallow and deeper aquifers separated by low-permeability confining layers (Refs. 7, pp. 20 through 23; 8, pp.48 through 50, 53; 51 pp. 23, 24, 41 through 44). The confining layers are till layers composed primarily of clay with mixtures of gravel, sand, and silt (Refs. 7, pp. 20 through 23; 8, pp. 48 through 50, 53; 51, pp. 23, 24, 41 through 44; 52, pp. 1, 2; 58, pp. 10, 11, 12).

The bedrock underlying the glacial sediments is believed to consist of relatively impermeable material (Ref. 51, pp. 22, 23). It is mapped as the Ordovician Richmond Group and is thought to be composed of soft, light-gray, calcareous shale with interbedded layers of limestone (Ref. 51, pp. 22, 23). Few wells in the region have reached the bedrock surface, which is estimated to be at 250 to 300 feet bgs in most areas (Refs. 8, p. 49, 51, p. 34). The bedrock yields little to no water, provides little recharge to the overlying aquifers, and acts as an impervious lower and lateral boundary to the overlying aquifers (Refs. 8, pp. 48, 49; 51, pp. 22, 23).

Regional studies of the glacial and glacial-fluvial deposits have shown that the uppermost recognizable geologic unit is a sand and gravel outwash approximately 80 feet thick. This unit is typically recognized as the unconfined aquifer. Discontinuous till layers have been encountered within this unit at depths of 40 to 50 feet bgs (Refs. 8, pp. 49, 53; 51, pp. 1, 42, 54, 59; 58, pp. 10, 11, 12).

The unconfined aquifer is generally underlain by a till layer present at approximately 80 feet bgs. This till layer appears to be laterally persistent but may be absent from some locations in the region either because

of non-deposition or erosion (Ref. 51, p. 59). Till layers have been reported as massive clay units or as zones of alternating clay with stratified sand and gravel. Till layers act as confining layers that control aquifer recharge and regional ground water flow (Refs. 7, pp. 21, 24; 8, pp. 49, 53; 51, p. 42; 58, pp. 10, 11, 12).

Regional studies indicate that a second recognizable sand and gravel outwash deposit underlies the till layer found at approximately 80 feet bgs (Refs. 7, p. 23; 8, pp. 49, 50, 51, 57, 58; 51, p. 52). This lower aquifer behaves as a confined or semi-confined aquifer. However, if the till layer is thin or absent, the hydraulically connected sand and gravel units act as a single unconfined aquifer (Ref. 8, pp. 49, 50, 51, 57, 58).

Deep wells in the region suggest that discontinuous till layers may exist within the second glacial outwash unit (the semi-confined aquifer) and that additional semi-confined or confined aquifers exist at greater depths. These deeper aquifers are believed to be separated by till layers in much the same way as the shallower geological units. Deeper aquifers were not examined in this investigation (Ref. 8, p. 50).

Regional Hydrogeology

The regional geologic setting of the Dayton, Ohio, area consists of highly permeable calcareous sands and gravel deposited in pre-glacial or glacial valleys eroded into the underlying bedrock. These glacial deposits for shallow and deeper aquifers are separated by low-permeability confining layers (glacial till) composed primarily of clay with mixtures of gravel, sand, and silt. The bedrock materials are of low permeability and act to form lateral and lower boundaries to the flow of ground water through the permeable materials (Refs. 7, pp. 20 through 23; 8, pp. 48 through 50, 53; 12, p. 23; 52).

Regional studies of the permeable deposits have shown that the uppermost recognizable hydrogeologic unit is a sand and gravel deposit approximately 80 feet thick that is recognized as the unconfined aquifer. Discontinuous till layers have been encountered within this unit which act as local confining layers (Ref. 8, pp. 49, 53; 51, p. 1; 52; 58, pp. 10, 11, 12).

The unconfined aquifer is widely used as a water source throughout the region. The main source of ground water recharge to the unconfined aquifer is infiltration from local rivers. Direct recharge by precipitation and recharge by subsurface flow from the edges of buried valleys provide lesser amounts of recharge to the aquifer. Available annual precipitation is highest during March through June in the Dayton region (Ref. 8, p. 56).

Wells constructed in portions of the aquifer having a substantial saturated thickness may yield up to 1,000 gallons per minute (gpm) for a short period of time, although yields of 100 to 500 gpm are more common. The presence of thick layers of till within the aquifer has been shown to decrease these short-term yields by up to 50 percent. Areas having thin deposits of sand and gravel, such as locations near the edges of the buried valleys, have been shown to yield substantially less water (Ref. 8, pp. 56, 57).

The unconfined aquifer is generally underlain by a till layer present at approximately 80 feet bgs. This layer appears to be laterally persistent across areas on the order of a mile, but evidence suggests that it may be discontinuous on a larger regional scale across the entire buried valley in the Dayton region. The till has been found to be absent from some locations in the region either because of non-deposition or erosion (Refs. 7, pp. 22, 24; 8, pp. 49, 57; 51, pp. 24, 42, 43; 52; 58, pp. 10, 11, 12).

Till layers generally act as confining layers, controlling aquifer recharge and creating barriers to ground water flow. Norris examined recharge to the aquifer underlying a regional till layer and found that leakage through the confining layer was responsible for most of the ground water recharge to the lower aquifer. This leakage was not assumed to represent a breach in the till layer but rather uniform transmission of water through the till under a hydraulic gradient. A leakage coefficient was computed for the till of 0.003 gallon per day per cubic foot (Ref. 8, p. 57).

Regional studies indicate that a second recognizable sand and gravel outwash deposit underlies the till layer found at approximately 80 feet bgs. This lower aquifer behaves as a confined or semi-confined aquifer. However, if the till layer is thin or absent, the hydraulically connected sand and gravel units act as a single unconfined aquifer. This second recognizable sand and gravel deposit is the semi-confined aquifer examined during this investigation (Refs. 8, pp. 57, 58).

The semi-confined aquifer is used as a major municipal water supply source throughout the region. The main source of ground water recharge to the semi-confined aquifer is the overlying unconfined aquifer (Ref. 8, p. 58).

Site-Specific Geology

The site geology consists primarily of sand and gravel with minor amounts of silt and clay. These are the glacial and glacial-fluvial sediments typical of the region. The sand and gravel are interbedded with till and clay layers composed of massive clay units or zones of clay with sand and gravel. The uppermost 2

to 4 feet typically consist of a disturbed, clay-bearing material that is absent in many places, probably because of site development activities. None of the borings or wells reached the bedrock surface (Refs. 8, pp. 50 through 52; 9, pp. 12, 13, 33 through 43, 48 through 82).

The uppermost geologic unit at the site is a sand and gravel outwash deposit approximately 75 to 90 feet thick. This unit is the unconfined aquifer. Clay units and units composed of clay, sand, and gravel mixtures were encountered within the unconfined aquifer. Several of these units are laterally persistent, suggesting that they may exert some local control over potential contaminant migration pathways. Additional clay-bearing units were noted in the unconfined aquifer but were restricted to certain small areas of the site (Refs. 8, p. 51; 9, pp. 12, 13, 33 through 43, 48 through 82).

A persistent till layer is present, forming the confining layer between the unconfined aquifer (Ref. 8, p. 44).

The semi-confined aquifer was encountered below the till layer in wells MWC-1 and MWC-2 and consists of sand and gravel with minor amounts of fine-grained material, much like the unconfined aquifer. These materials are glacial and glacial-fluvial sediments typical of the region. No clay-bearing units were noted in the portion of the semi-confined aquifer examined (Refs. 8, p. 52; 9, pp. 76 through 80).

Geologic cross sections developed using available well logs by Weston Solutions Inc. suggest that the till is discontinuous south of the Behr facility (Refs. 54, p. 1; 55 p. 1; 56, p. 1; 57, p. 1).

Aquifer Interconnection: Till layers generally act as confining layers, controlling aquifer recharge and creating barriers to ground water flow (Refs. 8, p. 57; 51, p. 24). Norris examined recharge to the aquifer underlying a regional till layer and found that leakage through the confining layer was responsible for most of the ground water recharge to the lower aquifer (Refs. 8, p. 57; 51, pp. 59, 60). This leakage was not assumed to represent a breach in the till layer but rather uniform transmission of water through the till under a hydraulic gradient. A leakage coefficient was computed for the till of 0.003 gallon per day per cubic foot (Ref. 8, p. 57).

In small areas, notably in the Mad River valley immediately below Eastwood Park, the till either is absent from the sand and gravel deposits or consists only of few scattered lenses (Ref. 51, pp. 42). Elsewhere, there are small openings in otherwise extensive till sheets; these probably represent stream channels cut through the till when it was exposed at the surface (Ref. 51, pp. 42, 43, 173). The cross-section that

passes south of the site and through 2-mile radius target distance limit (TDL) suggests several openings in the till sheet with in 2-mile TDL (Refs. 51, p. 173; 52, p. 1). Cross-sections A-A' (North-South), B-B' (East-West), C-C' (East-West) and D-D' (East West) developed by Weston Solutions Inc. suggests several discontinuous till layers within the 2-mile TDL (Ref. 56, p. 1; 57, p. 1;58 p. 1). The till-rich zone is relatively ineffective as a confining bed in the Mad River Valley in the Findlay Street-Eastwoood Park area, where interbedded till deposits are generally thin or absent (Ref. 51, p. 110).

At the nearby Gayston facility, the clay till unit is absent and the entire aquifer thickness is considered to be unconfined. A regional cross-section shows that the clay till is not continuous (Ref. 12, p. 120).

The hydraulic interconnection between the upper and lower aquifers, therefore, is well established, and the lower and upper aquifer system is referred to as the unconsolidated aquifer.

Aquifer Discontinuity: Recharge to the valley-fill deposits has its origin principally in that portion of the precipitation which runs off or seeps into the streams above Dayton and enters the aquifers in the Dayton area by infiltration through streambeds (Ref. 51, p. 81). The water enters the ground where the water table in the deposits underlying the stream has been sufficiently lowered by pumping to reverse its natural slope (Ref. 51, p. 81). This is the process called induced infiltration, by which all large ground-water developments in the Dayton area are chiefly replenished (Ref. 51, p. 81). In a sense, the valley-fill deposits function as vast natural filter beds into which water is drawn from the streams and purified before use (Ref. 51, p. 81).

A thermometric study was conducted along Great Miami River, near downtown Dayton, Ohio, to investigate the interrelationship of surface water and ground water in the metropolitan area (Ref. 58, p. 4). The cross-sections developed during the thermometric study suggest that the Miami River does not completely intersect the aquifer (Ref. 58, pp.10, 11, 12, 34 through 43). The Miami River in the area of study is shallow and has a depth of less than 5-feet (Ref. 58, pp. 11, 12, 34 through 43). Therefore, the Great Miami River in the area of the study does not completely transect the aquifer which is 75 to 80 feet thick (Ref. 8 p. 51). The thermometric study results suggested that within the western portion of the study area the river was a gaining stream for the most of the year (Ref. 58, p.31). However, within the eastern portion of the study area the river was a losing stream during late summer/fall season when a large ground water depression, caused by ground water pumping for cooling of buildings in Dayton proper, was most pronounced in the shallow aquifer (Ref. 58, p.31).

The maximum depth of Mad River measured 100-meters upstream of Huffman Dam at Gage ID HU070413 is 5.75 feet (Ref. 59, pp. 1, 24). Therefore, Mad River is shallow in the area of Huffman Dam and does not completely transect the aquifer which is 75 to 80 feet thick (Ref. 8, p.51).

SUMMARY OF AQUIFER BEING EVALUATED

Aquifer Number	Aquifer Name	Is Aquifer Continuous Within-4-Mile Target Distance Limit?	Is Aquifer Karst?
1	Unconsolidated Aquifer	Yes	No

3.1 LIKELIHOOD OF RELEASE

3.1.1 OBSERVED RELEASE

Aquifer Being Evaluated: Unconsolidated Aquifer (combined unconfined and semi-confined aquifer)

Direct Observation: Behr property (Source 1)

An observed release to the ground water migration pathway in the unconsolidated aquifer has been established at the Behr property through direct observation. The observed release is based on the detection of chlorinated solvents (primarily TCE; PCE; and 1,1,1-TCA) in soil samples collected from 9 to 31 feet below ground surface on the Behr property with the ground water table at approximately 25 to 27 feet below ground surface (Table listed under Section 2.2.1 of this HRS documentation record; Ref. 9, pp. 38, 39, 43, 54, 74). Soil samples were analyzed using SW-846-8260B (Ref. 8, pp. 19, 20, 34, 35). Therefore contamination has been observed migrating in the soil at the Behr facility downward into groundwater.

The contamination in the soil is considered to have come from Behr operations. Waste materials were stored on the Behr property in various waste accumulation areas (Ref. 6, p. 4). Accumulation areas consisted of roll-offs, drum storage areas, and waste storage tanks (Ref. 6, p. 4). Accumulation areas changed throughout the site history based on changes in production and construction changes at the site (Ref. 6, p. 4). The facility reported releases from a leaking underground storage tank; 1990 process wastewater discharge; a polychlorinated biphenyl (PCB) release and cleanup; 1996 oil/water mixture release; 1990 zinc discharge due to process malfunction; 1991 process overfill; 1991 process overflow;

1996 hydrogen peroxide release; 1996 waste oil release; 1996 stamping oil overflow; 1996 oil/water mixture release; 1997 wastewater discharge; and two 1997 non-contact cooling water releases (Ref 6, p. 6). Industrial solvent cleaners used in the manufacturing process included PCE; TCE; 1,1,1-TCA; and sulfuric acid (Refs. 6, p. 3; 33, p. 2; 34, p. 41).

In 1994, soil samples were collected from soil borings and during the installation of monitoring wells. The samples were analyzed by the Canton Analytical Laboratory of Michigan for Target Compound List (TCL) VOCs and Target Analyze List (TAL) metals (Refs. 8, pp. 24 through 27; 9, pp. 45; 10, pp. 5 through 36, 44 through 88). The samples were analyzed using EPA method 8260 (Ref. 8, pp. 26, 41 through 42). The soil sampling and quality control procedures for the soil borings and monitoring well installation are provided in Reference 9, pages 28, 29, 31 and 32.

Based on soil sampling results provided in the Site Investigation report, the approximate area of soil contamination may extend beyond the facility boundary; however, the contamination appears to be primarily located on the Behr property in the area within the following monitoring wells and borings: MWC-2, MWA-4, MWA-5, MWB-2, MWB-3, MWB-5, SB-1, SB-4, SB-9, and SB-10 (Refs. 8, pp. 19, 20, 34, 35; 9, pp. 34, 37, 42, 43, 55, 56, 63, 66, 71, 78, 108 through 111, 114 through 117; 10, pp. 46, 49, 52, 55, 58, 63, 65, 66, 67, 68, 73, 75, 80, 84, 89, 90, 92). Chlorinated solvents (TCE and/or PCE) were detected at SB1-9, SB3-14, SB5-29, SB6-14, SB9-19, SB10-29, MWA1-24, MWA2-19, MWA3-24, MWA4-24, MWA5-24, MWA6-24, MWB2-24, MWB3-24, MWB5-24, MWB6-24, SB4-14, SB8-24 (Refs. 9, pp. 114 through 117; 10, pp. 7, 13, 16, 20, 23, 29, 32, 35, 37, 38, 46, 49, 52, 55, 58, 63, 65, 66, 67, 68, 73, 75, 80, 84, 89, 90, 92).

The soil sample results for the area bounded by MWC-2, MWA-4, MWA-5, MWB-2, MWB-3, MWB-5, SB-1, SB-4, SB-9, and SB-10 (Ref. 9, pp. 108 through 111) are summarized in the table under the "Hazardous Substance Associated With Source" section of this HRS documentation record.

TCE, PCE, 1,1,1-TCA CONTAMINATION BELOW WATER TABLE – BEHR PROPERTY

Boring Code	Depth to water (ft bgs)	Sample Interval (ft bgs)	Hazardous Substance	Concentration Detected (µg/kg)	Year Drilled	References
SB-5-29	26.0	29-31	TCE	47	1994	Refs. 8, pp. 26, 27; 9, p. 38; 10, pp. 20, 37
			PCE	860		
SB-8-24	25.0	24-26	PCE	480	1994	Refs. 8, pp. 26, 27; 9, p. 41; 10, pp. 29, 37
SB-10-29	27.0	29-31	TCE	3,100	1994	Refs. 8, p. 27; 9, p. 43; 10, pp. 35, 38
MWA4-24	25.8	24-26	TCE	1,300	1994	Refs. 8, pp. 40, 41, 42,; 9, p. 54; 10, pp. 55, 65
			PCE	150		
MWB6-24	25.9	24-26	TCE	400	1994	Refs. 8, pp. 40, 41, 42; 9, p. 74; 10, pp. 84, 90
			1,1,1-TCA	420		

Notes:
µg/kg – Microgram per kilogram
bgs – Below ground surface
ft – Feet
PCE – Tetrachloroethene
TCA – Trichloroethane
TCE – Trichloroethene
The depth to water is estimated (Ref. 9, p. 38, 41, 43, 54, 74). In addition, the elevation in the area is relatively flat and therefore below ground surface was used (Ref. 9, pp. 34 through 82).

Chemical Analysis: Behr property (Source 1)

An observed release to the ground water migration pathway in the unconfined aquifer at the Behr property has been established through chemical analysis of ground water samples collected from monitoring wells. The hazardous substances detected in the ground water are TCE; PCE; and 1,1,1-TCA. The ground water sample analysis was completed using methods CLP SOW SOM01.1 or CLP SOW SOM01.2 (Refs. 4, p. 7; 13, p. 3; 13A, p. 2; 14, p. 3; 15, p. 2; 16, p. 29; 17, p. 2). If the background concentration equaled or exceeded the detection limit, a significant increase was considered established if the sample measurement was three times or more above the background concentration (Ref. 1, Table 2-3). VOC concentrations in samples from background wells were either non-detected or below the detection limits.

Background Levels – Behr property

As discussed above, the background wells are screened in the same unconsolidated aquifer as the contaminated wells. The upper and lower aquifers in the unconsolidated material are connected (Section 3.0.1 General Considerations, Site Specific Geology of this HRS documentation record). Based on the ground water flow direction north to south and northeast to south, monitoring wells MWC-001, PZ-022I MWB-004, MW-019S, and MWET-05S are considered upgradient wells (Ref. 18, pp. 43, 45).

BACKGROUND WELL INFORMATION – BEHR PROPERTY – SOURCE 1

Well Code	Screened Aquifer	Screened Interval (ft bgs)	Well Depth (ft bgs)	Well Depth (ft amsl)	Year Drilled	References
MWC-001	UC	102-112	112	633	1994	Refs. 7, p. 70; 9, pp. 76, 77; 18, p. 43; 19, pp. 105, 106
PZ22I	UC	42.6-44.6	45	702.40	1997	Refs. 7, p. 70; 18, p. 43; 19, p. 42
MWB-004	UC	25-35	74	676.64	1994	Refs. 7, p. 70; 9, pp. 68, 69, 70; 18, p. 43; 19, p. 97, 98, 99
MW-019S	UC	13.4-23.4	25	723.01	1997	Refs. 7, p. 70; 18, p. 43; 19, p. 37, 38
MWET-05S	UC	NA	30	719.53[a]	2003	Ref. 7, p. 71; 18, p. 43; 19, p. 37, 38

Notes:
MWET-05S soil boring log: Reference 18 page 43 shows that MWET-05S is located within the Behr property and relatively close to MW-019S. Therefore, the boring log for MW-019S (Ref. 19, pp. 37, 38) could also be used to generally characterize the soil at MWET-05S due to physical proximity.
amsl – Above mean sea level
bgs – Below ground surface
ft – Feet
UC – Unconsolidated aquifer
a – Calculated from top of casing
MW019S: The geology of MW019S is similar to PZ19I due to physical proximity and distance to each other. The two wells are adjacent. Both MW019S and PZ19I are located approximately 300 feet south and 50 feet west of the northeast corner of the Behr property. Therefore, the soil borings logs, soil type, and soil description for these 2 wells are similar (Refs. 7, p. 70; 18, p. 43; 19, p. 37, 38).

BACKGROUND CONCENTRATIONS – BEHR PROPERTY– SOURCE 1

Well Code	Laboratory Sample No.	Sampling Date	Hazardous Substance	Concentration Detected (µg/L)	CRQL (µg/L)	References
MW-019S	E1811	7/17/2007	1,1,1-TCA	5.0 U	5.0	Refs. 4, p. 7; 14, pp. 1 through 17, 20, 21, 33, 34, 36, 37, 65, 66, 149; 15, pp. 1 through 7, 10, 11, 26, 27, 28, 30, 31, 32 18, pp. 2, 3; 20, pp. 1, 2
			TCE	1.1 J	5.0	
			PCE	5.0 U	5.0	
PZ22I	E1835	7/17/2007	1,1,1-TCA	5.0 U	5.0	Refs. 4, p. 7; 16, pp. 1 through 17, 27 through 38, 45, 46, 52, 53, 54, 56, 75, 58, 120, 121; 17, pp. 1 through 7, 14, 15, 24, 26, 27, 28; 18, p. 13; 20, pp. 1, 2
			TCE	4.8 J	5.0	
			PCE	5.0 U	5.0	
MWB-004	E1830	7/17/2007	1,1,1-TCA	5.0 U	5.0	Refs. 4, p. 7; 16, pp. 1 through 17, 27 through 38, 43, 44, 52, 53, 555, 56, 58, 101, 102; 17, pp. 1 through 7, 12, 13, 25, 26, 27, 28; 18, p. 10; 20, pp. 1, 2
			TCE	4.1 J	5.0	
			PCE	5.0 U	5.0	
MWC-001	E1831	7/17/2007	1,1,1-TCA	5.0 U	5.0	Refs. 4, p. 7; 16, pp. 1 through 17, 27 through 38, 43, 44, 52, 53, 55, 56, 58, 104, 105; 17, pp. 1 through 7, 12, 13, 25, 26, 27, 28; 18, p. 13; 20, pp. 1, 2
			TCE	5.0 U	5.0	
			PCE	5.0 U	5.0	
MWET-05S	E1834	7/17/2007	1,1,1-TCA	5.0 U	5.0	Refs. 4, p. 7; 16, pp. 1 through 17, 27 through 38, 45, 46, 52, 53, 54, 56, 57, 58, 117 118; 17, pp. 1 through 7, 14, 15, 23, 24, 26, 27, 28; 18, p. 2; 20, pp. 1, 2
			TCE	2.3 J	5.0	
			PCE	5.0 U	5.0	

Notes:
µg/L – Microgram per liter
CRQL – Contract-required quantitation limit
MDL – Method detection limit
J – Estimated, the values are below CRQL but above MDL
PCE – Tetrachloroethene
TCA – Trichloroethane
TCE – Trichloroethene
U – Not Detected above CRQL

- Contaminated Well Concentrations – Behr property

CONTAMINATED WELL INFORMATION – BEHR PROPERTY – SOURCE 1

Well Code	Screened Aquifer	Screened Interval (ft bgs)	Well Depth (ft bgs)	Well Depth (ft amsl)	Year Drilled	References
MW-007S	UC	20.3-30.3	30	720.18	1997	Refs. 7, p. 70; 18, p. 43; 19, p. 18
MW-008S	UC	19-29	28	722.25	1997	Refs. 7, p. 70; 18, p. 43; 19, p. 20
MWA-004	UC	35-45	45	706	1994	Refs. 7, p. 70; 18, p. 43; 19, pp. 83, 84
MW-010S	UC	19.4-29.4	30	721.32	1997	Refs. 7, p. 70; 18, p. 43; 19, p. 24
MW-011S	UC	19.1-29.1	28	723.5	1997	Refs. 7, p. 70; 18, p. 43; 19, p. 26
MWA-006	UC	30-40	40	711.48	1994	Refs. 7, p. 70; 18, p. 43; 19, pp. 87, 88
MW-032S	UC	13-28	27.50	718.8	2001	Refs. 18, p. 43; 19, pp. 59, 60
MW-034S	UC	16-31	30.85	718.92	2001	Refs. 18, p. 43; 19, pp. 63, 64
MW-028S	UC	37-39	39.80	710.7	2001	Refs. 18, p. 43; 19, pp. 51, 52
MW-039S	UC	18-33	33.60	716.83	2001	Refs. 18, p. 43; 19, pp. 73, 74
MW-035S	UC	16-31	30.85	718.15	2001	Refs. 18, p. 43; 19, pp. 65, 66
MW-037S	UC	13-28	27.80	718.32	2001	Refs. 18, p. 43; 19, pp. 69, 70
MW-038S	UC	15-30	29.20	718.8	2001	Refs. 18, p. 43; 19, pp. 71, 72

Notes:
amsl – Above mean sea level
bgs – Below ground surface
ft – Feet
NA – Not available
UC – Unconsolidated aquifer (upper and lower aquifer are hydraulically connected)
The screened interval is estimated (Ref. 19, p. 18, 20, 24, 26, 51, 52, 59, 60, 63-66, 69 through 74, 83, 84, 87, 88)
As discussed in Section 3.0.1, the above wells are located in the unconsolidated aquifer. The upper and lower aquifers in the unconsolidated material are hydraulically interconnected. The combined aquifer is referred to as the unconsolidated aquifer.

Wells MWC-001, PZ22I, MWET-05S, MW-019S, and MWB-004 are considered appropriate background locations for wells MW-007S, MW-008S, MWA-004, MW-010S, MW-011S, MWA-006, MW-032S, MW-034S, MW-038S, MW-039S, MW-035S, MW-037S, MW-028S because all are screened in the unconsolidated aquifer located at the Behr site. Regional studies have shown the unconsolidated aquifer to be the uppermost recognizable hydrogeologic unit composed of sand and gravel deposits (Refs. 8, pp. 49, 53; 51, p. 1; 52; 58, pp. 10, 11, 12). The background well screened intervals range from 633 to 719.53 ft AMSL, and contaminated wells MW-007S, MW-008S, MWA-004, MW-010S, MW-011S, MWA-006, MW-032S, MW-034S, MW-038S, MW-039S, MW-035S, MW-037S, and MW-028S are screened from 706 to 723.5 ft AMSL. In addition, based on ground water flow directions, background wells MWC-001, PZ22I, MWET-05S, MW-019S, and MWB-004 are upgradient of the contaminated wells. Analytical samples collected from the background and the contaminated well locations were collected during the same time frame and were analyzed using the same analytical procedures. Furthermore, the background and contaminated well are all permanent, monitoring wells with similar construction characteristics such as 2-inch diameter, schedule 40 PVC casing and 10-slot screens.

CONTAMINATION CONCENTRATIONS – BEHR PROPERTY – SOURCE 1

Well Code	Laboratory Sample No.	Sampling Date	Hazardous Substance	Concentration Detected (µg/L)	CRQL (µg/L)	References
MW-007S	E1805	7/17/2007	TCE	14	5.0	Refs. 4, p. 7; 13, pp. 1 through 17, 20, 33, 36, 37, 75, 140; 13A, pp. 1 through 7, 10, 27, 28, 31, 32, 33; 18, p. 18; 20, pp. 1, 2
MW-008S	E1806	7/17/2007	1,1,1-TCA	5.9	5.0	Refs. 4, p. 7; 13, pp. 1 through 17, 22, 23, 33, 36, 37, 77, 78, 140; 13A, pp. 1 through 7, 12, 27, 28, 31, 32, 33; 18, p. 18; 20, pp. 1, 2; 21, p. 1
			TCE	160	5.0	
MWA-004	E1828DL	7/17/2007	TCE	680 D	25	Refs. 4, p. 7; 16, pp. 27 through 38, 41, 52, 53, 55, 93; 17, pp. 1 through 7, 10, 23, 25, 26, 27, 28; 18, p. 10; 20, pp. 1, 2; 21, p. 1
MW-010S	E1807DL	7/17/2007	1,1,1-TCA	1,400 D	500	Refs. 4, p. 7; 13, pp. 1 through 17, 22, 33, 36, 37, 86, 87, 140; 13A, pp. 1 through 7, 12, 27, 28, 31, 32, 33; 18, p. 18; 20, pp. 1, 2; 21, p. 1
			TCE	19,000 D	500	
MW-011S	E1808	7/17/2007	TCE	170	5.0	Refs. 4, p. 7; 13, pp. 1 through 17, 22, 33, 36, 37, 90, 140; 13A, pp. 1 through 7, 12, 27, 28, 31, 32, 33; 18, p. 18; 20, pp. 1, 2; 21, p. 1
MWA-006	E1829	7/17/2007	1,1,1-TCA	760	5.0	Refs. 4, p. 7; 16, pp. 27 through 38, 43, 53, 53, 55, 56, 57, 99; 17, pp. 1 through 7, 12, 23, 25, 26, 27, 28; 18, p. 10; 20, pp. 1, 2
			TCE	4,700	5.0	
MW-032S	E1819	7/18/2007	1,1,1-TCA	14	5.0	Refs. 4, p. 7; 14, pp. 1 through 17, 23, 24, 33, 34, 36, 37, 83, 84, 149; 15, pp. 1 through 7, 12, 13, 27, 28, 30, 31, 32; 18, pp. 4, 5; 20, pp. 1, 2; 21, p. 2
			TCE	110	5.0	
			PCE	21	5.0	
MW-034S	E1821	7/18/2007	TCE	35	5.0	Refs. 4, p. 7; 16, pp. 27 through 39, 52, 53, 55, 56, 57, 69; 17, pp. 1 through 8, 23, 25, 26, 27, 28; 18, p. 8; 20, pp. 1, 2; 21, p. 2
MW-028S	E1816	7/18/2007	TCE	3,200 D	250	Refs. 4, p. 7; 14, pp. 1 through 17, 20, 33, 34,

Well Code	Laboratory Sample No.	Sampling Date	Hazardous Substance	Concentration Detected (µg/L)	CRQL (µg/L)	References
						36, 37, 75; 15, pp. 1 through 7, 10, 27, 28, 30, 31, 32; 18, p. 2; 20, pp. 1, 2; 21, p. 2
MW-039S	E1826	7/18/2007	TCE	530	5.0	Refs. 4, p. 7; 16, pp. 27 through 38, 41, 52, 53, 55, 56, 57, 81; 17, pp. 1 through 7, 10, 23, 25, 26, 27, 28; 18, p. 8; 20, pp. 1, 2; 21, p. 2
MW-035S	E1822	7/18/2007	TCE	370	5.0	Refs. 4, p. 7; 16, pp. 27 through 39, 52, 53, 55, 56, 57, 72; 17, pp. 1 through 8, 23, 25, 26, 27, 28; 18, p. 8, 9; 20, pp. 1, 2; 21, p. 2
MW-037S	E1824	7/18/2007	TCE	23	5.0	Refs. 4, p. 7; 16, pp. 27 through 39, 52, 53, 55, 56, 57, 78; 17, pp. 1 through 8, 23, 25, 26, 27, 28; 18, p. 8; 20, pp. 1, 2; 21, p. 2

Notes:
µg/L – Microgram per liter
CRQL– Contract-required quantitation limit
PCE – Tetrachloroethene
TCA – Trichloroethane
TCE – Trichloroethene
D – Compounds analyzed at secondary dilution factor

The ground water TCE contamination on the Behr property is shown in Figure 2. The estimated ground water TCE plume on the Behr property is shown in Figure 2.

Attribution:

The VOC contamination in the ground water under and immediately downgradient of the Behr facility can be at least in part attributed to a release from the Behr Dayton facility for two reasons. The first reason is that the VOCs in the contaminated soil source on the facility extend into the ground water, creating an observed release by direct observation (Section 3.1.1 of this HRS documentation record). Second, while there are other sources of TCE in the vicinity of Behr Dayton, the VOC, and the TCE concentration in particular, between these other sources and Behr Dayton is significantly lower than that found in the ground water under and immediately downgradient of Behr Dayton documenting that the release of VOCs at Behr Dayton has significantly increased the contaminant concentrations of VOCs above that from other off site sources (Figures 1, 2, and 4 of this HRS documentation record; Ref. 18, p. 43).

On Site Source 1

The Behr Dayton Thermal System VOC Plume consists of a contaminated soil source (Source 1) at the Behr property and an associated TCE-contaminated ground water plume that extends downgradient of the Behr facility (See Sections 2.2.2 and 3.1.1 and Figures 2, 3, and 4 of this HRS documentation record; Ref. 18, p. 43).

TCE, PCE and 1,1,1-TCA are associated with Source 1. TCE, PCE and 1,1,1-TCA contaminated soil may have been released to facility soil from leaks and/or spills on the Behr property. These VOCs have been detected at significant concentrations in numerous soil samples collected from borings and during well installations on the property at SB1-9, SB3-14, SB5-29, SB6-14, SB9-19, SB10-29, MWA1-24, MWA2-19, MWA3-24, MWA4-24, MWA5-24, MWA6-24, MWB2-24, MWB3-24, MWB5-24, MWB6-24, SB4-14, SB8-24 (Refs. 9, pp. 114 through 117; 10, pp. 7, 13, 16, 20, 23, 29, 32, 35, 37, 38, 46, 49, 52, 55, 58, 63, 65, 66, 67, 68, 73, 75, 80, 84, 89, 90, 92; see Section 2.2.2, Source 1, of this HRS documentation record).

Waste materials were stored on site in various waste accumulation areas (Ref. 6, p. 4). Accumulation areas consisted of roll-off boxes, drum storage areas, and waste storage tanks (Ref. 6, p. 4). Accumulation areas changed throughout the site history based on production and construction changes at the site (Ref. 6, p. 4). An SVE system was designed and installed at the site for soil remediation and operated from October 2003 through December 2005 (Ref. 5, p. 8). Based on extracted air concentrations, the SVE system removed 900 pounds of VOCs (Ref. 5, p. 8). A ground water remediation system was designed and installed at the site and operated from June 2004 through December 2005 (Ref. 5, p. 8). The ground water remediation system removed a total of 1,031 pounds of VOCs (Ref. 5, p. 8).

An observed release of PCE, TCE and 1,1,1-TCA to ground water by direct observation has been documented at the Behr property because PCE, TCE and 1,1,1-TCA were detected in soil boring samples collected from below the ground water table (See section 3.1.1 of this HRS documentation record). An observed release of TCE, PCE and 1,1,1-TCA to ground water has been established by chemical analysis because chlorinated solvents (TCE; PCE; and 1,1,1-TCA) concentrations detected in ground water samples collected from under the Behr property are greater than three times the background concentrations (See Section 3.1.1, Observed Release—Chemical Analysis, and Figures 2 and 4 of this HRS documentation record; Ref. 18, p. 43).

Other Off Site Sources

The TCE ground water contamination has been confirmed upgradient of the Behr property (Figure 4 of this HRS documentation record). However, the highest concentration of TCE is present immediately downgradient of the Behr property at 19,000 ug/L for MW-010S (Section 3.1.1, Observed Release, and Figures 2 and 3 of this HRS documentation record).

Dissolved chlorinated VOC constituents, including TCE, have been detected in ground water south, west, north, and northeast of the Behr facility at MW-008S, MWA-004, MW -010S, MW-011S, MWA-006, MW-028S, MW-035S, MW-038S, MW-039S, SIMCLAR-1S, MW-68S, G-4, AC-1 and AC-2 (Refs. 4, p. 9; 5, pp. 7, 8, 9; 18, p. 43; Figures 2 and 4 of this HRS documentation record). In addition to the Behr facility; there are other facilities in the area which potentially used or discharged VOCs in their processes: Gem City Chemicals; DAP; Gayston; Aramark; and the former PermaFix facility (current Environmental Processing facility) (Refs. 41, pp. 1, 2, 3; 42, pp. 4, 5, 6, 7; 47, p. 1; 48, pp. 2, 3, 4, 5; 49, p. 4; 50, p.5). These other sources are described below in this section. Therefore, there are other known sources of VOCs present in the industrialized area surrounding the Behr facility (Refs. 4, p. 9; 7, pp. 34 through 37, 39 through 46, 48 through 49; 18, p. 40; 36, pp. 1, 2; 37, pp. 1, 2, 3, 4; 38, pp. 1, 2, 3, 4; 40, pp. 1, 2, 3, 4, 5; 41, pp. 1, 2, 3; 42, pp. 5, 6, 7; 47, p. 1; 48, pp. 2, 3, 4, 5; and this section of this HRS documentation record).

However, as can be seen in Figure 2 and Sections 2.2.2 and 3.1.1 of this HRS documentation record, the levels of TCE are significantly greater beneath and directly south of the Behr property at MW-008S, MWA-004, MW -010S, MW-011S, MW-028S, MW-035S, MW-038S, MW-039S (Figure 2 of this HRS documentation record; Ref. 18, p.43). In addition, significant levels of VOCs in soil gas have been detected underneath residences south of the Behr property. Also soil gas contamination has been detected in these residences (Refs. 4, pp. 9, 10; 43; 45).

DAP Inc.: DAP is a wholly owned subsidiary of USG Corporation which is located at 220 Janney Road, Dayton, Ohio (Ref. 41, p. 1). DAP manufactures caulking, glazing and adhesive compounds and uses a variety of volatile organic chemicals including 1,1,1 – TCA, toluene, methyl ethyl ketone, methylene chloride, and acetone in their manufacturing process (Ref. 41, p. 1). These chemicals are or have been stored in underground and above-ground storage tanks at the facility (Ref. 41, p. 1). One or more of these chemicals were either spilled or otherwise placed onto the surface soil (Ref. 41, p. 2). Ground water samples collected from the facility indicate the presence of 1,1-DCA, 1,2-DCA, 1,1-DCE, trans 1,2-DCE, cis 1,2-DCE, 1,1,1-TCA, toluene, PCE and TCE (Ref. 41, p. 2). Soil samples collected from the facility

indicates the presence of 1,2-DCA, 1,2-DCE, 1,1,1-TCA, toluene, carbon tetrachloride, 1,1-DCA and TCE (Ref. 41, p. 2). The City of Dayton's Miami Well Field is located 2000-feet northeast and hydraulically downgradient of the facility (Ref. 41, p. 2). 1,1-DCA has been detected in the Production Well Number 15, in a private drinking well and in an Specialty Machine Company industrial well located between the DAP facility and Miami Well Field (Ref. 41, p. 2). TCA and TCE have also been detected in the Specialty Machine Company industrial well (Ref. 41, p. 2). OEPA issued and order on April 30, 1990 to submit a work plan for performing ground water investigation in order to design a ground water containment system that mitigates off property migration of contamination through ground water gradient control (Ref. 41, pp. 4, 10).

Gem City Chemicals Inc.: The Gem City Chemicals Inc. is located at 1287 Air City Avenue, Dayton, Ohio (Ref. 42, p. 4). Gem City received, stored, transferred, blended and distributed chemical products and solvents at the property in or about 1967 (Ref. 42, p. 5). Ten underground storage tanks were removed during April and May 1986 (Ref. 42, p. 5). Approximately two or three of these tanks were used for storage of fuel oil and others for storage of solvent (Ref. 42, p. 5). The conditions of these tanks during operation and removal, specific products stored, and removal procedures were not known by OEPA (Ref. 42, p. 5). The solvents from tanker trucks were transferred to 55-gallon drums at a pouring shed without adequate containment structures for spills or leaks (Ref. 42, p. 5). During 1990-1991, a concrete pad was constructed as containment structure in the location of the pouring shed (Ref. 42, p. 5). However, the area used by the tanker trucks during transfer was still without adequate containment for spills or leaks (Ref. 42, p. 5). In 1987 twelve shallow soil samples from the site were collected by Qsource Engineering with a backhoe (Ref. 42, p. 5). Methylene chloride was detected up to 16 parts per million (ppm), PCE was detected up to 554 ppm, TCE was detected up to 141 ppm, 1,1,1-TCA was detected up to 14 ppm, isopropyl alcohol was detected up to 669 ppm, acetone was detected up to 628 ppm, toluene was detected up to 111 ppm, xylene was detected up to 115 ppm, and methyl ethyl ketone was detected up to 43 ppm (Ref. 42, p. 5). The areas showing contamination included the pouring shed, storage shed, former above ground tank storage area and general location of the USTs (Ref. 42, p. 5). Four monitoring wells were installed and TCE was detected in all four wells (Ref. 42, p. 5). In 1988 Qsource installed two nested monitoring well clusters (shallow, intermediate and deep wells – a total of six additional wells) and collected soil and groundwater samples (Ref. 42, p. 6). TCE, PCE 1,1—DCA, 1,1-DCE, cis 1,2-DCE, trans 1,2,-DCE, benzene, chloroform were detected in selected wells (Ref. 42, p. 6). The site is located at the south boundary of the City of Dayton's well field protection area (Ref. 42, p. 6). The ground water flow direction at the time of the 1988 investigation was towards the City of Dayton South Miami Well Field (Ref. 42, p. 6). A numerical ground water modeling study suggested that the leading edge of the ground water plume from the site would reach South Miami Well Field within three

years (Ref. 42, p. 6). A soil extraction system consisting of 5 SVE wells and a ground water pump and treat system consisting of an extraction well and an air stripper were installed at the site without OEPA oversight and formal approval (Ref. 42, p. 7). The soil vapor system was operational for two years (Ref. 42, p. 7). The OEPA Order stipulated submission of Quality Assurance Project Plan and a Site Assessment Report of the existing ground water extraction and treatment system, and ground water monitoring (Ref. 42, p. 9). The capture zone of an extraction well on the Gem City Chemical property was estimated to be 300-feet and the capture zone underlies the entire actively-operated area of Gem City Chemicals, Inc., and extends to or beyond the facility boundaries to the north and east of the site (Ref. 46, pp. 18, 48). From November 1989 to February 1993, approximately 2,200 to 8,800 pounds of VOCs were removed by the ground water pump and treat system (Ref. 46, p. 51). The SVE system removed an estimated 1,100 pounds of VOCs (Ref. 46, p. 56).

Gayston Inc.: Gayston Corp. formerly operated a metal parts manufacturing facility at 55 Janney Road in Dayton from 1962 to 1987 (Ref. 47, p. 1). Various chlorinated solvent including PCE and 1,1,1-TCA were used as degreasers to clean metal parts (Refs. 47, p. 1;48, p. 2) In 1984, OEPA inspected the site and noted the lack of regular inspections of the hazardous waste drum storage area and failure to maintain required documentation regarding storage of such wastes (Refs. 47, p. 1; 48, p. 2). In 1991, the city of Dayton installed seven ground water monitoring wells down gradient of the site (Refs. 47, p. 1; 48, p. 2). Analytical results of water samples collected from the wells revealed the presence of chlorinated solvents above maximum allowable drinking water standards (Refs. 47, p. 1; 48, pp. 2, 3). Subsequent sampling of soil and ground water underlying the site indicated the former Gayston facility was the source of the contamination (Refs. 47, p. 1; 48, pp. 3, 4, 5). The environmental concern is that the site overlies the Miami Valley Buried Valley Aquifer, an EPA designated sole source aquifer (Ref. 47, p. 1). The site is also situated within the city of Dayton's wellhead protection area (Ref. 47, p. 1). In 1993 OEPA and Gayston Corp. entered into an Administrative Order on Consent in which Gayston Corp. agreed to perform an investigation of the extent of contamination and conduct remedial actions to control and remove the source(s) of chlorinated solvent contamination on their property (Ref. 47, p. 1). A remedial action consisting of soil vapor extraction and air sparging was implemented in 1994 (Ref. 47, p. 1). The operation of the remedial action is ongoing (Ref. 47, p. 1).

Aramark Uniform and Career Apparel, Inc.: Aratex Services, Inc. operated an industrial laundry facility at 1200 Webster Street in Dayton, Ohio (Refs. 49, p. 4; 50, p. 4). Dry cleaning operations were discontinued in 1987 (Ref. 49, p. 4). At the termination of these operations all dry cleaning solvents and equipment were permanently removed from the site (Ref. 49, p. 4). During the removal of three underground storage tanks PCE contaminated soil was found surrounding the tank excavation areas (Ref.

49, p. 4). Ground water was found to be impacted from PCE, TCE, trans-1,2 DCE, and 1,1,1- TCA (Ref. 49, p. 4). The soil to a depth of 15-ft bgs was found to be impacted by chlorinated solvents (Ref. 49, p. 12). To reduce the potential for PCE, TCE and DCE migration from the source area to the underlying ground water, dual SVE/air sparging (AS) system was voluntarily implemented at the site (Ref. 50, p. 4). The system began operation in September 25, 1996 (Ref. 50, p. 5). The SVE/AS system consisted of five SVE wells and 6 sparging wells (Ref. 50, p. 5). The system operated until 2003 when final report was submitted (Ref. 50, pp. 5, 9, 10).

Hazardous Substances Released

PCE, TCE and 1,1,1-TCA have been detected in ground water samples collected from the Behr property at concentrations greater than three times the concentrations detected at upgradient well locations. PCE and TCE in samples from several downgradient ground water wells exceeded the MCL of 5 µg/L. Refer to Section 3.1.1 of this HRS documentation record.

The target drinking water sources are the Dayton Mad River Well Field and the Dayton Miami Well Field (Ref. 22, pp. 2, 3, 4). An observed release to ground water has been documented through direct observation and chemical analysis for Source 1, resulting in a ground water observed release factor value of 550 (See Section 3.1.1 of this HRS documentation record). Hazardous substances released from the source primarily include PCE, TCE and 1,1,1-TCA.

Ground Water Observed Release Factor Value: 550

3.1.2 POTENTIAL TO RELEASE

As specified in the HRS, because an observed release was established for the unconsolidated aquifer, the potential to release was not scored (Ref. 1, Section 3.1.2)

3.2 WASTE CHARACTERISTICS

3.2.1 TOXICITY/MOBILITY

All hazardous substances listed in the table below have been documented in soil and/or ground water samples from Source 1 (See Sections 2.2.2 and 3.1.1 of this HRS documentation record). These hazardous substances were detected at concentrations significantly exceeding background levels.

Hazardous Substance	Source No. (and/or Observed Release)	Toxicity Factor Value	Mobility Factor Value	Does Hazardous Substance Meet Observed Release Criteria?	Toxicity/Mobility	Reference
PCE	1, Observed Release	100	1	Yes	100	Refs. 1, Sections 3.2.13, 2.4.1.2; 2, pp. 3, 013
TCE	1, Observed Release	10,000	1	Yes	10,000	Refs. 1, Sections 3.2.13, 2.4.1.2; 2, pp. 4, 6, 012
1,1,1-TCA	1, Observed Release	1	1	Yes	1	Refs. 1, Sections 3.2.13, 2.4.1.2; 2, pp. 4, 014

Notes:
PCE – Tetrachloroethene
TCE – Trichloroethene
TCA - Trichloroethane

Because an observed release to the ground water migration pathway has been established, a mobility factor of 1 has been applied to the hazardous substances released (Ref. 1, Section 3.2.1.2; Section 3.1.1 of this HRS documentation record). Mobility factor values for contaminants in source samples but not detected in release samples are from EPA's Superfund Chemical Data Matrix (SCDM) (Ref. 2, pp. 4, 6, 012). As shown in the table above, the toxicity/mobility hazardous constituent factor for TCE is 10,000. The toxicity/mobility factor value of 10,000 was assigned based on Table 3-9 of the HRS (Ref. 1, Section 3.2.1.3).

Toxicity/Mobility Factor Value: 10,000

3.2.2 HAZARDOUS WASTE QUANTITY

Source Number	Source Name	Source Type	Source Hazardous Waste Quantity
1	Contaminated Soil	Contaminated Soil	> 0
Sum of Source Hazardous Waste Quantity			> 0

This information is from Section 2.4.2.1 above.

According to the HRS, if the hazardous constituent quantity (Tier A) is not adequately determined for one or more sources with a containment factor value greater than 0 for the pathway being evaluated, and no target subject to Level I or Level II concentrations has been documented for the pathway, the value from either HRS Table 2-6 or 10 should be assigned, whichever is greater (Ref. 1, Section 2.4.2.2, pp. 51591,

51592). Because the hazardous constituent quantity cannot be adequately determined for Source 1 (see Sections 2.2.1 and 2.4.2.1.1 of this HRS documentation record for Source 1) and because actual contamination of a target well has not been established for scoring purposes, the hazardous waste quantity factor value is 10 (Ref. 1, Section 2.4.2.2).

Hazardous Waste Quantity Factor Value: 10
(Ref. 1, Table 2-6)

3.2.3 WASTE CHARACTERISTICS FACTOR CATEGORY VALUE

As specified in the HRS (Ref. 1, Section 3.2.3), the Hazardous Waste Quantity Factor Value of 10 was multiplied by the highest toxicity/mobility value of 10,000, resulting in a product of 100,000 (1×10^5). Based on this product, a Waste Characteristics Factor Category Value of 18 was assigned from Table 2-7 of the HRS (Ref. 1, Section 2.4.3.1).

Utilizing TCE which has the highest Toxicity/Mobility Factor Value of the substances listed in Section 3.2.1 of this HRS documentation record:

Toxicity/Mobility Factor Value: 10,000
Hazardous Waste Quantity Factor Value: 10
Product = 1×10^5

Waste Characteristics Factor Category Value: 18
(Ref. 1, Table 2-7)

3.3 TARGETS

The primary targets are the populations served by municipal wells that could potentially be exposed to contaminated drinking water. The Mad River Well Field contains 67-70 wells, and the Miami River Well Field contains 36-37 wells (Refs. 22, p. 2, 3, 4; 23A; 24, p. 1). The City of Dayton municipal system supplies water to approximately 440,000 people (Refs. 4, p. 7; 22, p. 2; 24, p. 1; 25, p. 1; 26, pp. 4, 5). Drinking water is derived from the Great Miami Buried Valley Aquifer (GMBVA), a federally designated "Sole Source Aquifer", which implies that it serves as a sole or principal source of drinking water for the area and which, if contaminated, would significantly increase risk to public (Ref. 22, p.2). The GMBVA is considered heterogeneous consisting of permeable sand and gravel mixed with discontinuous lenses and aquitards of silty clay and glacial till (Ref. 22, p. 2). The Mad River Well Field Wells and Miami

River Well Field Wells are shown in Reference 23A. These wells were plotted on a 4-mile radius map based on well locations provided by Dayton Water Department (Refs. 22, pp. 2, 3, 4; 23; 23A).

3.3.1 NEAREST WELL

City of Dayton Municipal Drinking Water Well PW-14R is the nearest well to the site and is located 0.5 to 1 mile from the source (Ref. 18, pp. 34, 35; 22, p. 3, 23A).

Level of Contamination (I, II, or potential): Potential

The municipal well fields do not meet the criteria for release to Level I and Level II concentrations. Therefore, the municipal wells will be subjected to potential contamination, and a Nearest Well Factor Value of 9 has been assigned as the nearest well is located 0.5 to 1 mile from the source (Refs. 1, Table 3-11; 18, pp. 34, 35; 22, p. 3, 23A).

Nearest Well Factor Value: 9
(Ref. 1, Table 3-11)

3.3.2 POPULATION

3.3.2.1 Level of Contamination

The population served by water from a point of withdrawal may be evaluated based on the level of contamination for that point of withdrawal (Ref. 1, Section 3.3.2.1). The 4-mile target distance limit is shown in Reference 23.

3.3.2.2 Level I Concentrations

Based on the HRS (Ref. 1, Section 3.3.2.2), there are no points of withdrawal which are known to be subject to Level I contamination.

Level I Contamination Factor Value: 0

3.3.2.3 Level II Concentrations

Based on the HRS (Ref. 1, Section 3.3.2.3), there are no points of withdrawal which are known to be subject to Level II contamination.

Level II Contamination Factor Value: 0

3.3.2.4 Potential Contamination

The City of Dayton obtains drinking water from two municipal well fields, the Mad River Well Field (pumping capacity 163 million gallons per minute [MGD]) and the Miami River Well Field (pumping capacity 107 MGD) (Refs. 22, p. 2; 24, p. 1; 25, p. 1; 26, pp. 3, 4, 5). Each well field has its own treatment plant, the Ottawa Water Treatment Plant and the Miami Water Treatment Plant (Refs. 24, p. 1; 25, p. 1; 26, pp. 3, 4, 5; 28, pp. 1, 2). The Mad River Well Field contains between 67 - 70 wells, and the Miami River Well Field contains 36 - 37 wells (Refs. 22, pp. 2, 3, 4; 23A; 24, p. 1). Four wells in Miami River Well Field are inactive. Therefore, there are 32 active wells in Miami River Well Field. The water from wells from each well field is blended in the respective treatment plant. Each well field distributes water to different areas within City of Dayton (Refs. 22, p. 2; 24, p. 1; 25, p. 1; 26, pp. 3, 4, 5; 27; 28, p. 1). The City of Dayton municipal system supplies water to approximately 440,000 people (Refs. 4, p. 7; 22, p. 2; 24, p. 1; 25, p. 1; 26, pp. 4, 5). The City of Dayton water distribution system is connected via a network of pipes and is broken down between low, high and super high systems that can be opened in case of an emergency. Both Ottawa water treatment plant and the Miami water treatment plant are capable of delivering water to each of the systems (Ref. 28A, p.1). A single well does not supply more than 40 percent of the system's water (Refs. 22, pp. 2, 3; 27, p. 1; 28, p. 2; 29). Therefore, the population was apportioned equally to each well, resulting in a population of 4,444 persons per well (440, 000 persons divided by 99 wells) (Refs. 1, Section 3.3.2; 29; 28, p. 1).

As specified in the HRS (Ref. 1, Section 3.3.2.4), the number of people served by the drinking water from points of withdrawal which are subject to potential contamination were summed. A distance-weighted population value was assigned to each distance category based on the number of people within the distance category. The distance-weighted population values were assigned as summarized below.

<u>Between 0 to 0.25 mile:</u>

No drinking water wells have been identified in this distance category. The distance-weighted population value for 0 to 0.25 miles is 0 (Ref. 1, Table 3-12, p. 51604).

<u>Between 0.25 and 0.5 mile:</u>

No drinking water wells have been identified in this distance category. The distance-weighted population value for 0.25 to 0.5 miles is 0 (Ref. 1, Table 3-12).

Between 0.5 and 1.0 mile:

Three municipal drinking water wells are located within this target distance limit. The wells (PW12R, PW14R, and PW15R) are located in the Miami River Well Field (Refs. 22, pp. 2, 3; 23A). The population allocated to three municipal wells is 13, 332 (Refs. 29; 30). The distance-weighted population value for 0.5 to 1.0 mile is 5,224 (Ref. 1, Table 3-12).

Between 1.0 and 2.0 mile:

Thirty-one municipal drinking water wells are located within this target distance limit. Twenty-seven wells (PW11R, PW37, PW22, PW30, PW17, PW32, PW19, PW34, PW23R, PW09, PW05R, PW24R, PW33, PW31, PW13, PW29, PW06, PW20, PW02R, PW21, PW03, PW28, PW27, PW07R, PW25, PW08, and PW26) are located in the Miami River Well Field, and four wells (PW46, PW07, PW44, and PW43) are located in the Mad River Well Field (Refs. 22, pp. 2, 3, 4; 23A). Of the 27 wells located in the Miami River Well Field, two wells (PW34 and PW37) are inactive (Ref. 28, p. 1). Therefore, population has not been allocated to wells PW34, and PW37. The population allocated to the remaining 29 municipal wells is 128,876 (Refs. 29; 30). The distance-weighted population value for 1.0 to 2.0 miles is 29,384 (Ref. 1, Table 3-12).

Between 2.0 and 3.0 mile:

Seventeen municipal drinking water wells are located within this target distance limit. Three wells (PW35, PW04R and PW36) are located in the Miami River Well Field, and fourteen wells (PW08, PW03R, PW06, PW09, PW02R, PW50, PW63, PW61, PW62, PW60, PW11, PW17R, PW31, and PW18) are located in the Mad River Well Field (Refs. 22, pp. 2, 3, 4; 23A). The wells (PW35 and PW36) located in the Miami River Well Field are inactive (Ref. 28, p. 1). Therefore, population has not been allocated to wells PW35 and PW36. The population allocated to the remaining 15 municipal wells is 66,660 (Refs. 29; 30). The distance-weighted population value for 2.0 to 3.0 miles is 6,778 (Ref. 1, Table 3-12).

Between 3.0 and 4.0 mile:

Twenty-eight municipal drinking water wells are located within this target distance limit. Two wells (RRR1 and RRR2) are located in the Miami River Well Field, and twenty-six wells (PW14, PW12, PW51, PW19, PW20, PW15, PW10, PW29, PW36, PW52, PW53, PW25, PW30, PW26, PW16, PW5R,

PW24R, PW40, PW38, PW54, PW37, PW31R, PW59, PW57, PW56, and PW55) are located in the Mad River Well Field (Refs. 22, pp. 2, 3, 4; 23A). The population allocated to the 28 municipal wells is 124, 432 (Refs. 29; 30). The distance-weighted population value for 3.0 to 4.0 miles is 13,060 (Ref. 1, Table 3-12).

The distance-weighted population values are summed and multiplied by a factor value of 0.10.

DISTANCE-WEIGHTED POPULATION VALUE

Distance Category	Municipal Wells	Population	References	Distance-Weighted Population Value (HRS Rule Table 3-12)
0-0.25	None	0	--	0
0.25-0.5	None	0	--	0
0.5-1.0	Miami River Well Field = 3 Mad River Well Field = 0	13,332	Refs. 29; 30	5,224
1.0-2.0	Miami River Well Field = 25 Mad River Well Field = 4	128,876	Refs. 29; 30	29,384
2.0-3.0	Miami River Well Field =1 Mad River Well Field = 14	66,660	Refs. 29; 30	6,778
3.0-4.0	Miami River Well Field = 2 Mad River Well Field = 26	128,876	Refs. 29; 30	13,060
Total	Miami River Well Field = 31 Mad River Well Field = 44	342,188	--	54,446

Notes:
HRS—Hazard Ranking System
Sum of Distance-Weighted Population Values: 54,446 individuals
Sum of Distance-Weighted Population Values x 0.10: 5,444.6

Potential Contamination Factor Value: 5,445

3.3.3 RESOURCES

Resource use of the surficial aquifer within a 4-mile radius of Source #1 is not known to include any of the uses as enumerated in Section 3.3.3 of Reference 1. Therefore, a resources factor value of 0 is assigned (Ref. 1, Section 3.3.3).

Resources Factor Value: 0

3.3.4 WELLHEAD PROTECTION AREA

The federal Safe Drinking Water Act amendments of 1986 established the Wellhead Protection Program, which requires states to administer a source water protection program for state systems using ground water (Refs. 26, pp. 3, 4; 31; 32, p. 1). In 1992, EPA approved Ohio's Wellhead Protection Program (Refs. 31; 35, p. 1). Dayton's Well Field Protection Program was the first program approved by Ohio EPA (Refs. 26, p. 4; 35, p. 1). The wellhead protection area for the Dayton Miami Well Field is within 1 mile of Source 1, the contaminated soil on the Behr Dayton site (Refs. 18, p. 34; 23A, p. 1; 60, p. 4). Source 1 has a containment factor greater than zero, and Source 1 lies within 1 mile of the wellhead protection area (Refs. 18, p. 34; 23A; Section 2.2.4. of this HRS documentation record). An observed release to ground water at the site is documented, but ground water contamination from the site has not been documented as partially or fully within the wellhead protection area (see Section 3.1.1 of this HRS documentation record). A value of 5 is assigned to the site for the wellhead protection area factor (Ref. 1, Section 3.3.4).

Wellhead Protection Area Factor Value: 5

3.3.5 CALCULATION OF TARGETS FACTOR CATEGORY VALUE

The total targets factor category value is the sum of the nearest well, population, resources, and wellhead protection area (Ref. 1, Section 3.3.5). The total target factor category value for the site is 9 (nearest well) + 5,445 (population) + 0 (resources) + 5 (wellhead protection area) = 5,459.