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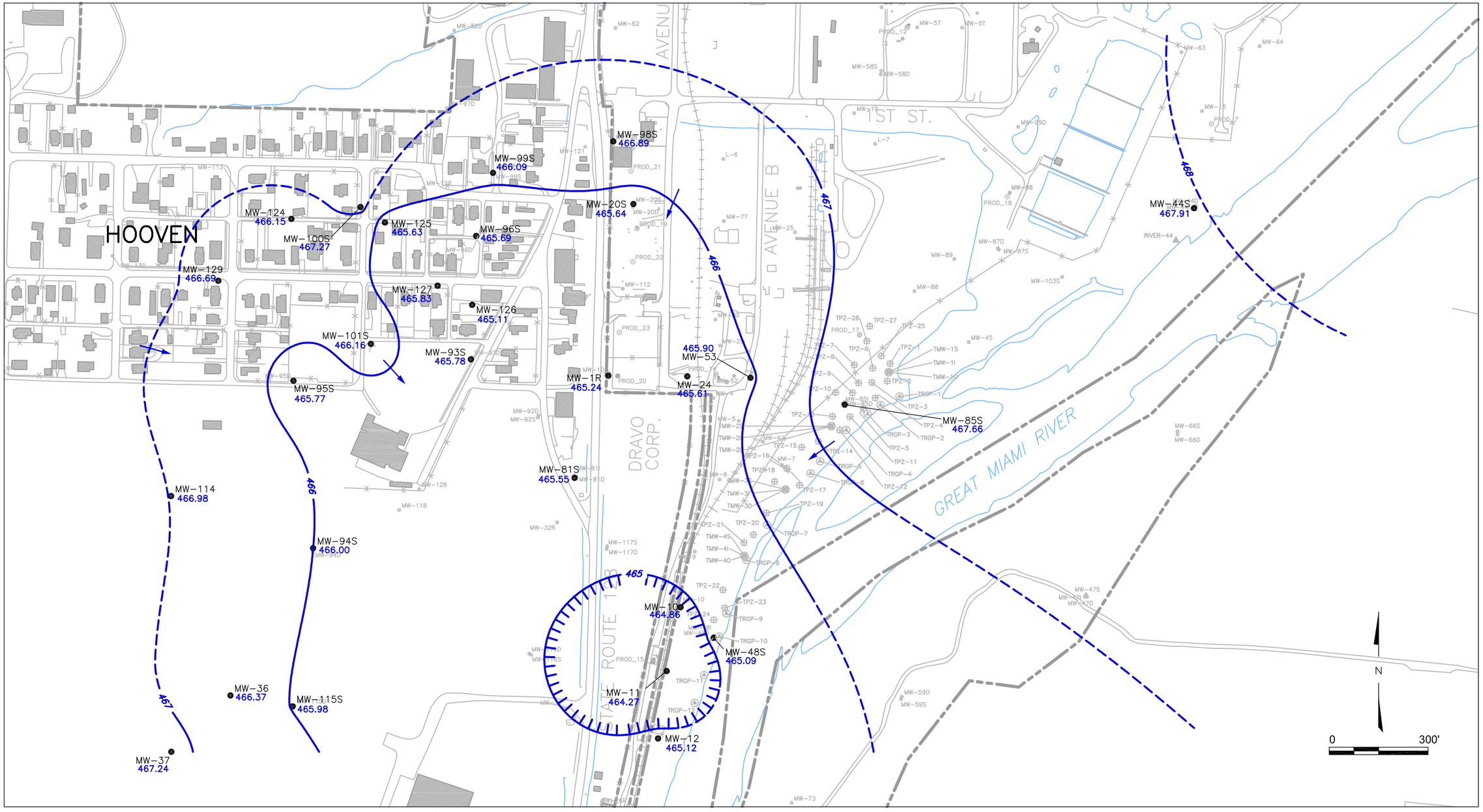

EXPLANATION

PROD_17	PRODUCTION WELL
MW-60D	MONITORING WELL (NOT GAUGED)
MW-93S	MONITORING WELL (GAUGED)
TMW-4S	TEMPORARY MONITORING WELL
TRGP-12	TEMPORARY RIVER GAUGING POINT
TPZ-24	TEMPORARY PIEZOMETER
	ESTIMATED GROUNDWATER FLOW DIRECTION
467.84	GROUNDWATER ELEVATION (ft-msl)
464.5	LINE OF EQUAL ELEVATION OF POTENTIOMETRIC SURFACE (ft-msl, interval 1 ft., dashed where inferred)
	FENCE
	PROPERTY BOUNDARY
	BUILDING, TANK, OR OTHER STRUCTURE

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FIGURE 7

GROUNDWATER ELEVATION MAP WITH POTENTIOMETRIC SURFACE CONTOURS (MAY 11, 2005)

CHEVRON CINCINNATI FACILITY, HOOVEN, OHIO

Drawn By: JLP	Checked By: JP	Scale: 1" = 300'	Date: 6/22/05	File: 500H-PS200505

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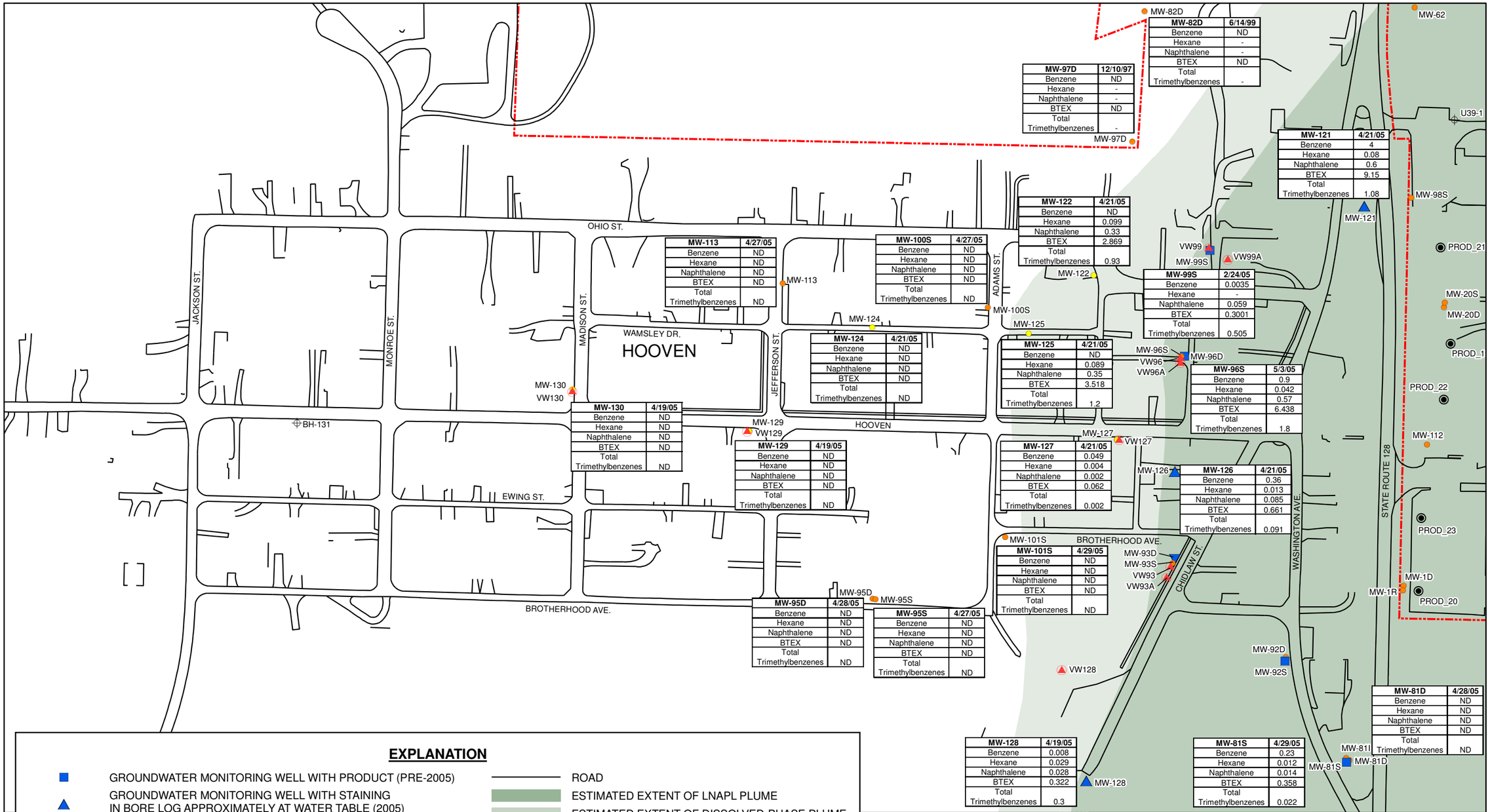

MW-82D	6/14/99
Benzene	ND
Hexane	-
Naphthalene	-
BTEX	ND
Total Trimethylbenzenes	-

MW-97D	12/10/97
Benzene	ND
Hexane	-
Naphthalene	-
BTEX	ND
Total Trimethylbenzenes	-

MW-121	4/21/05
Benzene	4
Hexane	0.08
Naphthalene	0.6
BTEX	9.15
Total Trimethylbenzenes	1.08

MW-122	4/21/05
Benzene	ND
Hexane	0.099
Naphthalene	0.33
BTEX	2.869
Total Trimethylbenzenes	0.93

MW-99S	2/24/05
Benzene	0.0035
Hexane	-
Naphthalene	0.059
BTEX	0.3001
Total Trimethylbenzenes	0.505

MW-113	4/27/05
Benzene	ND
Hexane	ND
Naphthalene	ND
BTEX	ND
Total Trimethylbenzenes	ND

MW-100S	4/27/05
Benzene	ND
Hexane	ND
Naphthalene	ND
BTEX	ND
Total Trimethylbenzenes	ND

MW-124	4/21/05
Benzene	ND
Hexane	ND
Naphthalene	ND
BTEX	ND
Total Trimethylbenzenes	ND

MW-125	4/21/05
Benzene	ND
Hexane	0.089
Naphthalene	0.35
BTEX	3.518
Total Trimethylbenzenes	1.2

MW-96S	5/3/05
Benzene	0.9
Hexane	0.042
Naphthalene	0.57
BTEX	6.438
Total Trimethylbenzenes	1.8

MW-130	4/19/05
Benzene	ND
Hexane	ND
Naphthalene	ND
BTEX	ND
Total Trimethylbenzenes	ND

MW-129	4/19/05
Benzene	ND
Hexane	ND
Naphthalene	ND
BTEX	ND
Total Trimethylbenzenes	ND

MW-127	4/21/05
Benzene	0.049
Hexane	0.004
Naphthalene	0.002
BTEX	0.062
Total Trimethylbenzenes	0.002

MW-126	4/21/05
Benzene	0.36
Hexane	0.013
Naphthalene	0.085
BTEX	0.661
Total Trimethylbenzenes	0.091

MW-101S	4/29/05
Benzene	ND
Hexane	ND
Naphthalene	ND
BTEX	ND
Total Trimethylbenzenes	ND

MW-95D	4/28/05
Benzene	ND
Hexane	ND
Naphthalene	ND
BTEX	ND
Total Trimethylbenzenes	ND

MW-95S	4/27/05
Benzene	ND
Hexane	ND
Naphthalene	ND
BTEX	ND
Total Trimethylbenzenes	ND

MW-128	4/19/05
Benzene	0.008
Hexane	0.029
Naphthalene	0.028
BTEX	0.322
Total Trimethylbenzenes	0.3

MW-81S	4/29/05
Benzene	0.23
Hexane	0.012
Naphthalene	0.014
BTEX	0.358
Total Trimethylbenzenes	0.022

MW-81D	4/28/05
Benzene	ND
Hexane	ND
Naphthalene	ND
BTEX	ND
Total Trimethylbenzenes	ND

EXPLANATION

- GROUNDWATER MONITORING WELL WITH PRODUCT (PRE-2005)
- GROUNDWATER MONITORING WELL WITH STAINING IN BORE LOG APPROXIMATELY AT WATER TABLE (2005)
- GROUNDWATER MONITORING WELL WITH STAINING IN BORE LOG APPROXIMATELY AT WATER TABLE (PRE-2005)
- NESTED DEEP SOIL VAPOR MONITORING WELL
- GROUNDWATER MONITORING WELL (2005)
- GROUNDWATER MONITORING WELL (PRE-2005)
- PRODUCTION WELL
- SOIL BORING
- ROAD
- ESTIMATED EXTENT OF LNAPL PLUME
- ESTIMATED EXTENT OF DISSOLVED-PHASE PLUME
- CHEVRON PROPERTY BOUNDARY

N

0 180'

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FIGURE 8

ESTIMATED EXTENT OF LNAPL AND DISSOLVED-CONTAMINANT PLUME

CHEVRON CINCINNATI FACILITY
HOOVEN, OHIO

Drawn By: CH	Checked By: TC	Scale: 1" = 180'	Date: 9/29/05	File: HHRALNAPLExtent.mxd

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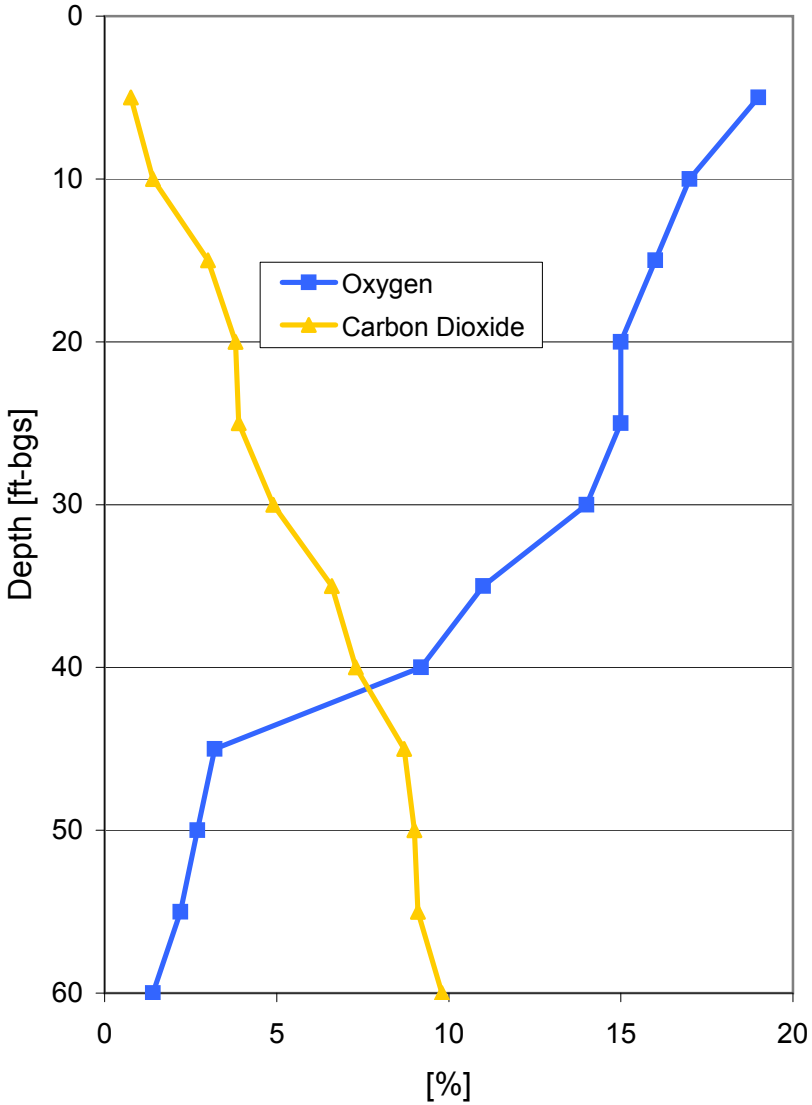
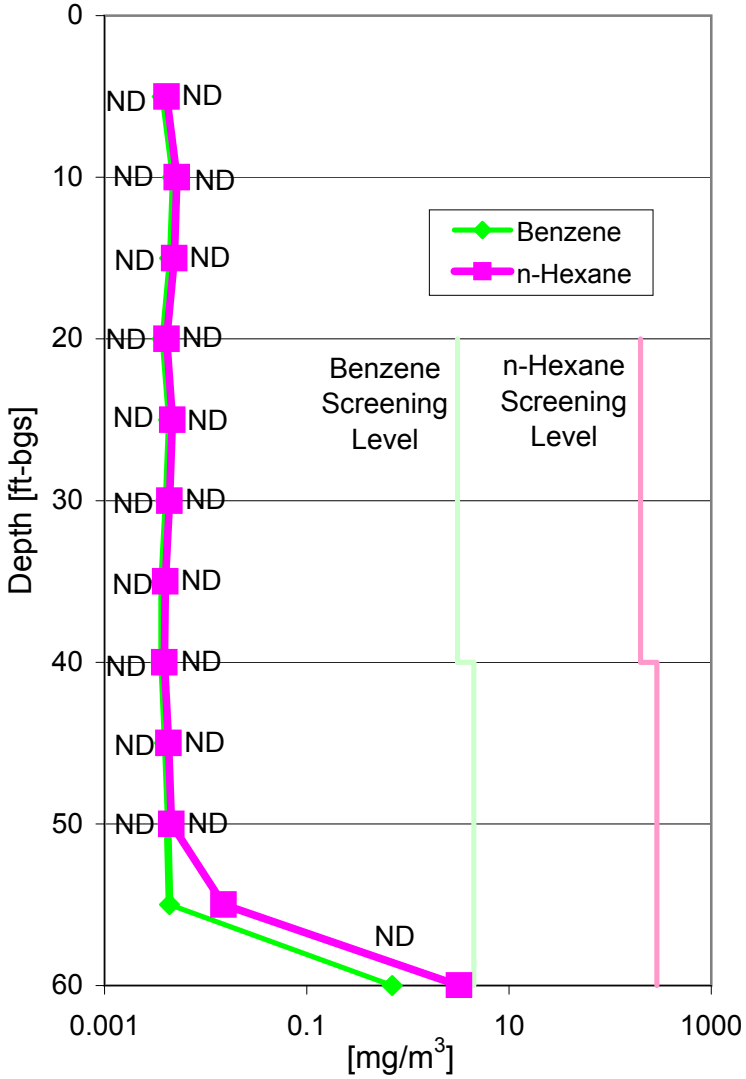
Figure 9: Vapor Well 93 Soil-Gas Profile over LNAPL Plume, Chevron Cincinnati Facility, Hooven, Ohio





Notes:

- All data from 3/31/05
- As described in Section 3.2, screening levels are derived from the OSWER Draft VI Guidance based on semi site-specific attenuation factors (alpha) developed using the Johnson and Ettinger (1991) model and information regarding the source depth and soil type for a specific site, which are provided in Figure 3a and Table 3b-SG of the OSWER Draft VI Guidance.

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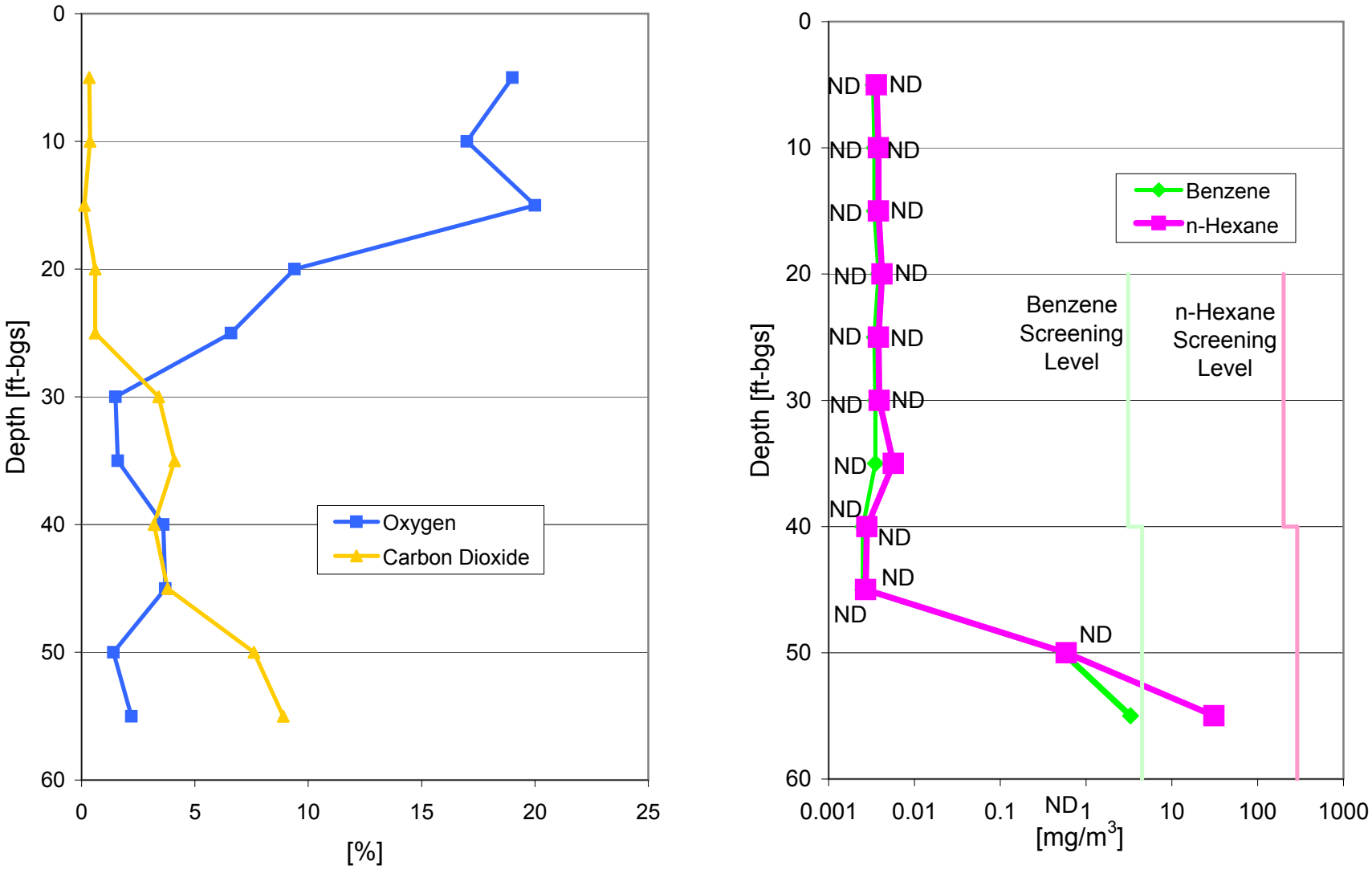
Figure 10: Vapor Well 96 Soil-Gas Profile over LNAPL Plume, Chevron Cincinnati Facility, Hooven, Ohio



Notes:

- 30 ft, 35ft, and 55ft data from 5/2/05, other data from 3/22/05,3/24/05
- As described in Section 3.2, screening levels are derived from the OSWER Draft VI Guidance based on semi site-specific attenuation factors (alpha) developed using the Johnson and Ettinger (1991) model and information regarding the source depth and soil type for a specific site, which are provided in Figure 3a and Table 3b-SG of the OSWER Draft VI Guidance.

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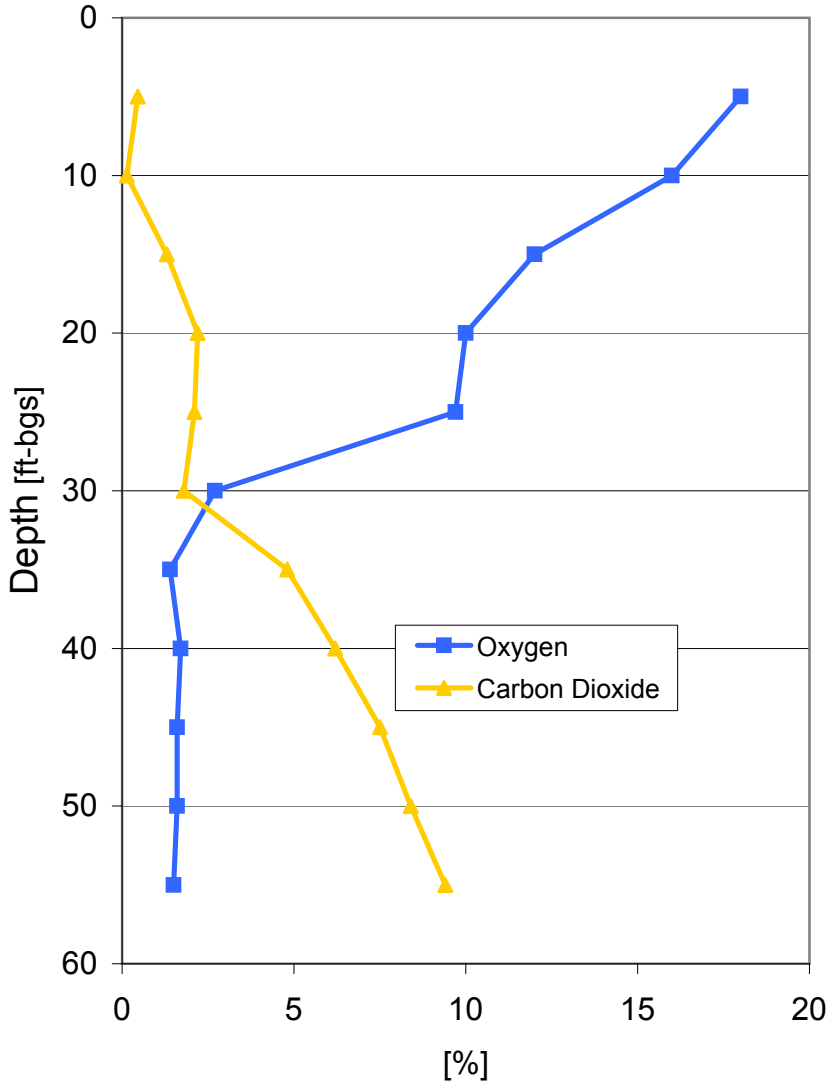
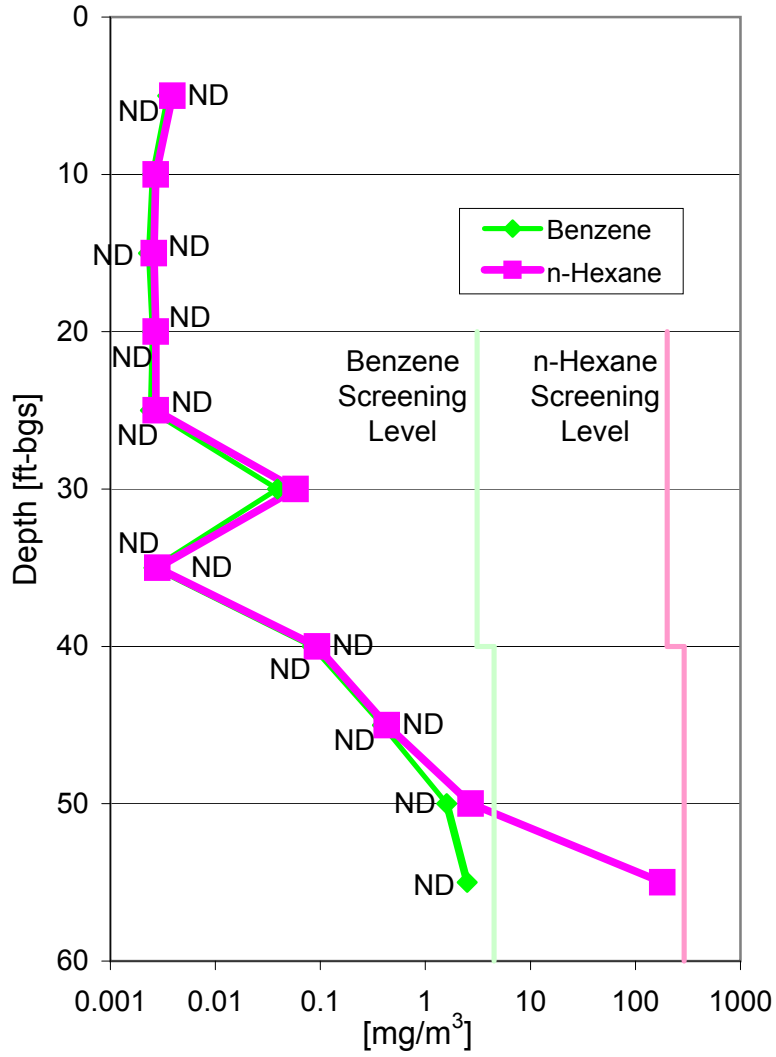
Figure 11: Vapor Well 99 Soil-Gas Profile over LNAPL Plume, Chevron Cincinnati Facility, Hooven, Ohio





Notes:

- All data from 3/29/05-3/30/05
- As described in Section 3.2, screening levels are derived from the OSWER Draft VI Guidance based on semi site-specific attenuation factors (alpha) developed using the Johnson and Ettinger (1991) model and information regarding the source depth and soil type for a specific site, which are provided in Figure 3a and Table 3b-SG of the OSWER Draft VI Guidance.

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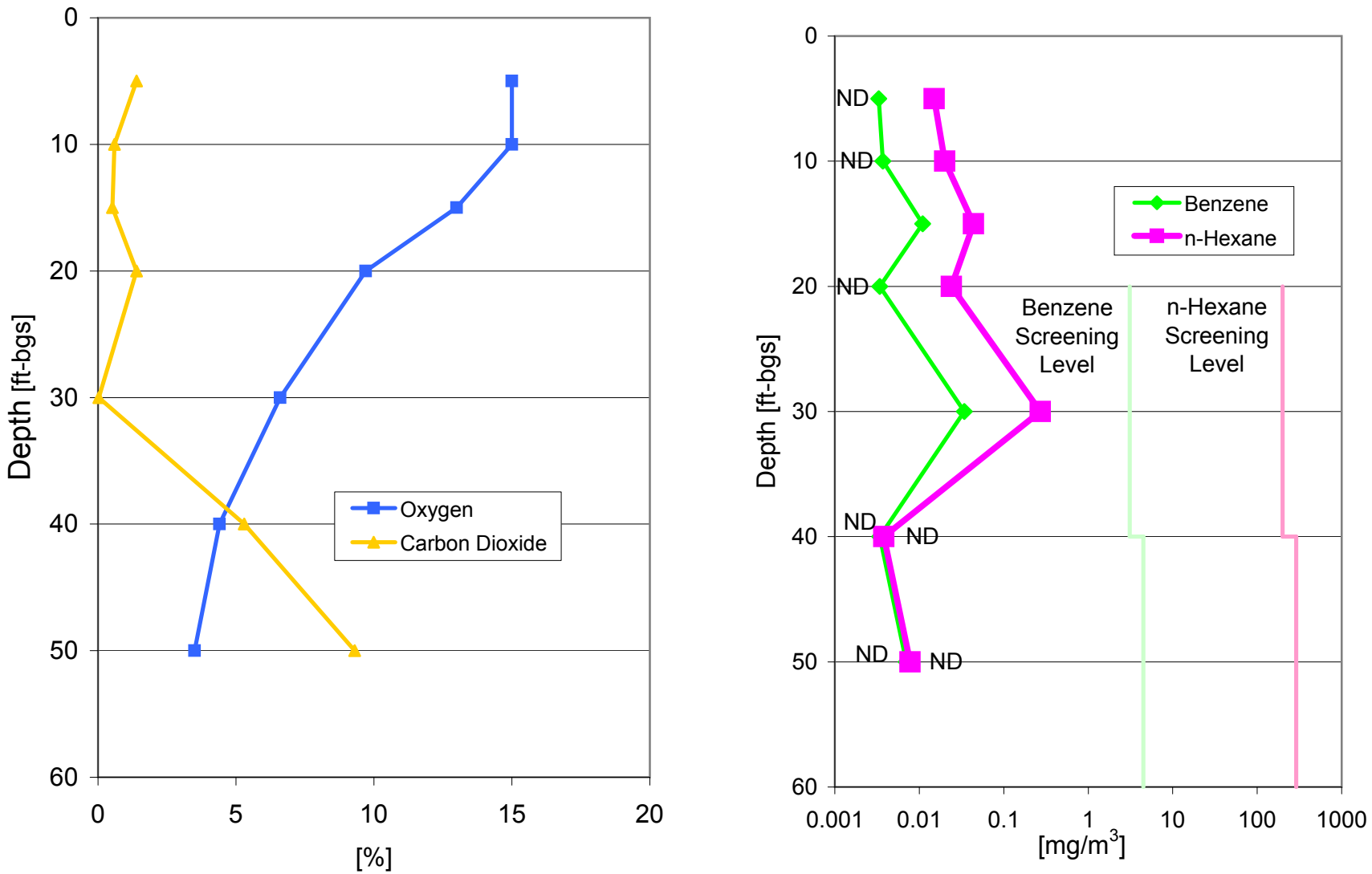
Figure 12: Vapor Well 127 Soil-Gas Profile over Dissolved-Contaminant Plume, Chevron Cincinnati Facility, Hooven, Ohio



Notes:

- All data from 5/3/05-5/4/05
- As described in Section 3.2, screening levels are derived from the OSWER Draft VI Guidance based on semi site-specific attenuation factors (alpha) developed using the Johnson and Ettinger (1991) model and information regarding the source depth and soil type for a specific site, which are provided in Figure 3a and Table 3b-SG of the OSWER Draft VI Guidance.

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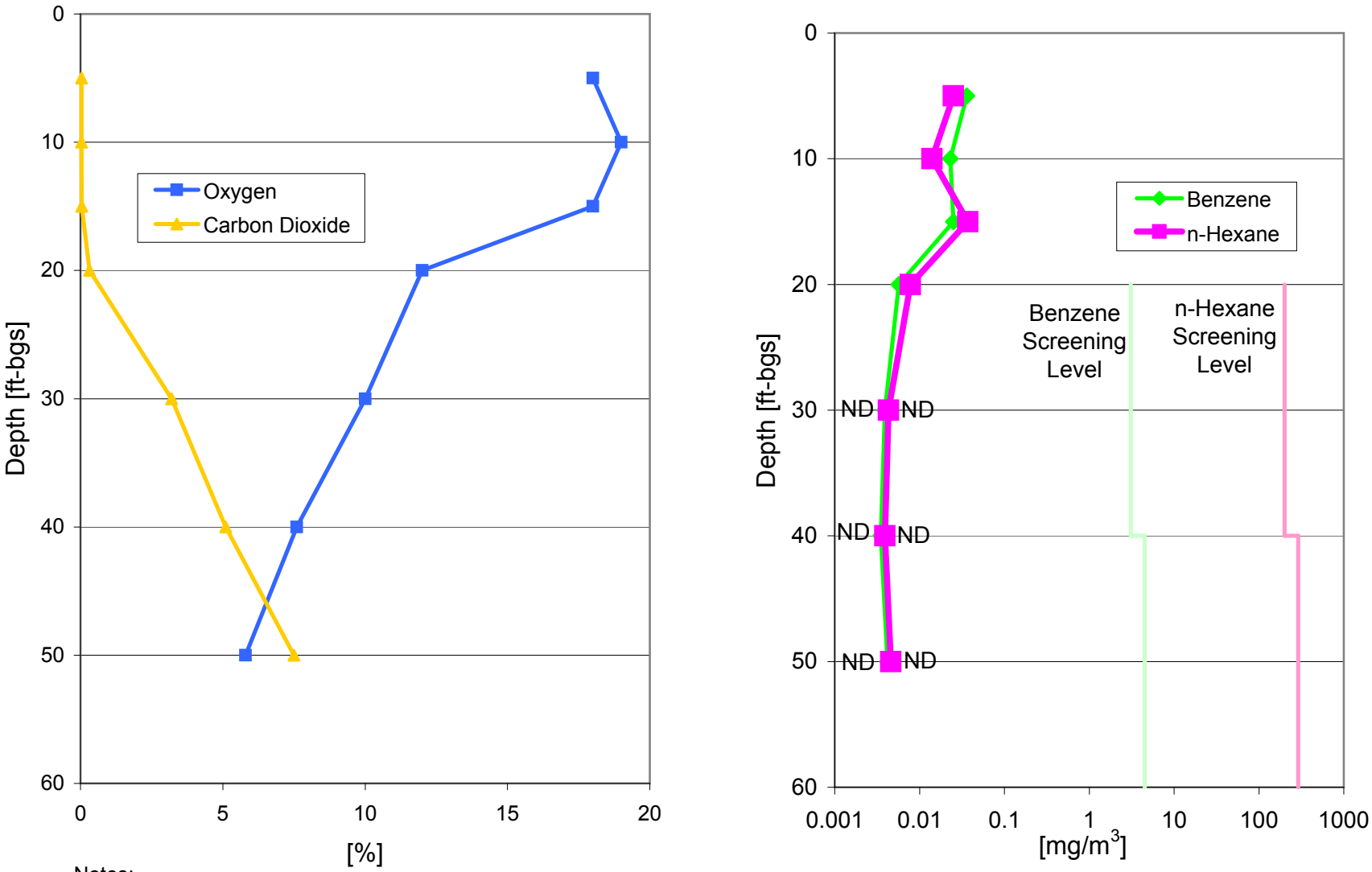
Figure 13: Vapor Well 128 Soil-Gas Profile over Dissolved-Contaminant Plume, Chevron Cincinnati Facility, Hooven, Ohio



Notes:

- All data from 4/9/05
- As described in Section 3.2, screening levels are derived from the OSWER Draft VI Guidance based on semi site-specific attenuation factors (alpha) developed using the Johnson and Ettinger (1991) model and information regarding the source depth and soil type for a specific site, which are provided in Figure 3a and Table 3b-SG of the OSWER Draft VI Guidance.

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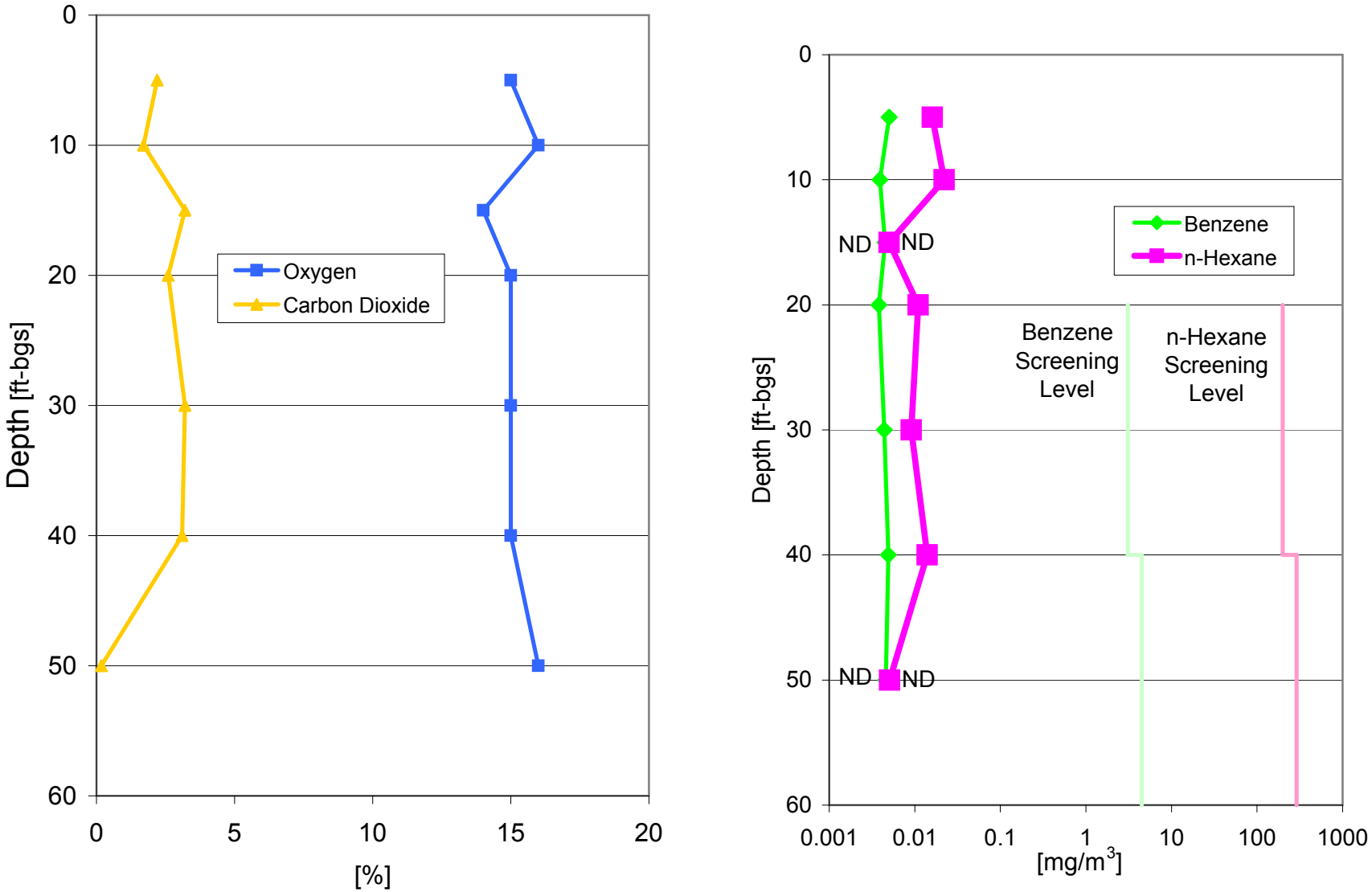
Figure 14: Vapor Well 129 Soil-Gas Profile outside of the LNAPL/Dissolved-Contaminant Plume, Chevron Cincinnati Facility, Hooven, Ohio



Notes:

- All data from 4/7/05
- As described in Section 3.2, screening levels are derived from the OSWER Draft VI Guidance based on semi site-specific attenuation factors (alpha) developed using the Johnson and Ettinger (1991) model and information regarding the source depth and soil type for a specific site, which are provided in Figure 3a and Table 3b-SG of the OSWER Draft VI Guidance.

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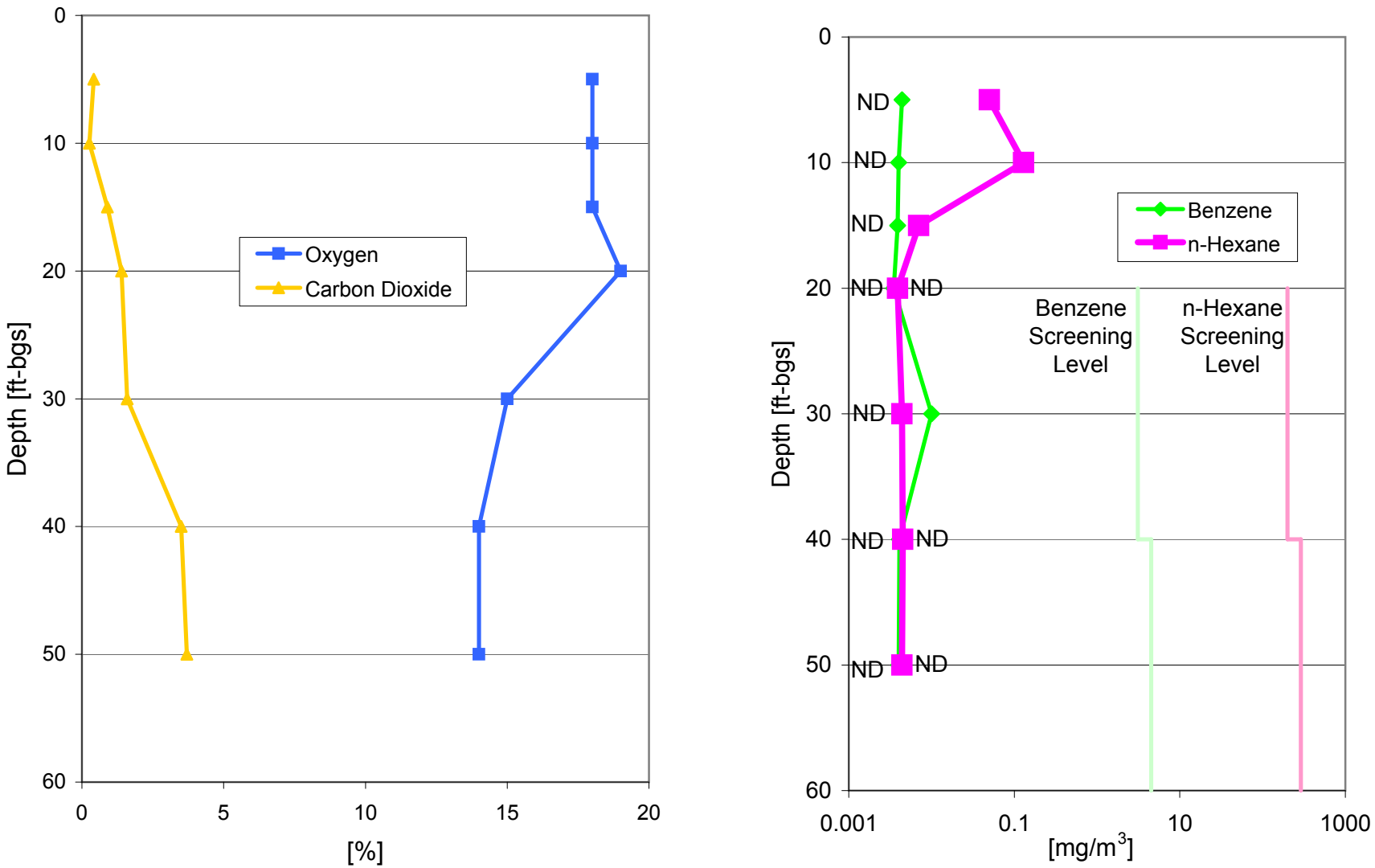
Figure 15: Vapor Well 130 Soil-Gas Profile outside of the LNAPL/Dissolved Contaminant Plume, Chevron Cincinnati Facility, Hooven Ohio



Notes:

- 20 ft and 40 ft data from 5/2/05, other data from 4/4/05-4/5/05.
- As described in Section 3.2, screening levels are derived from the OSWER Draft VI Guidance based on semi site-specific attenuation factors (alpha) developed using the Johnson and Ettinger (1991) model and information regarding the source depth and soil type for a specific site, which are provided in Figure 3a and Table 3b-SG of the OSWER Draft VI Guidance.

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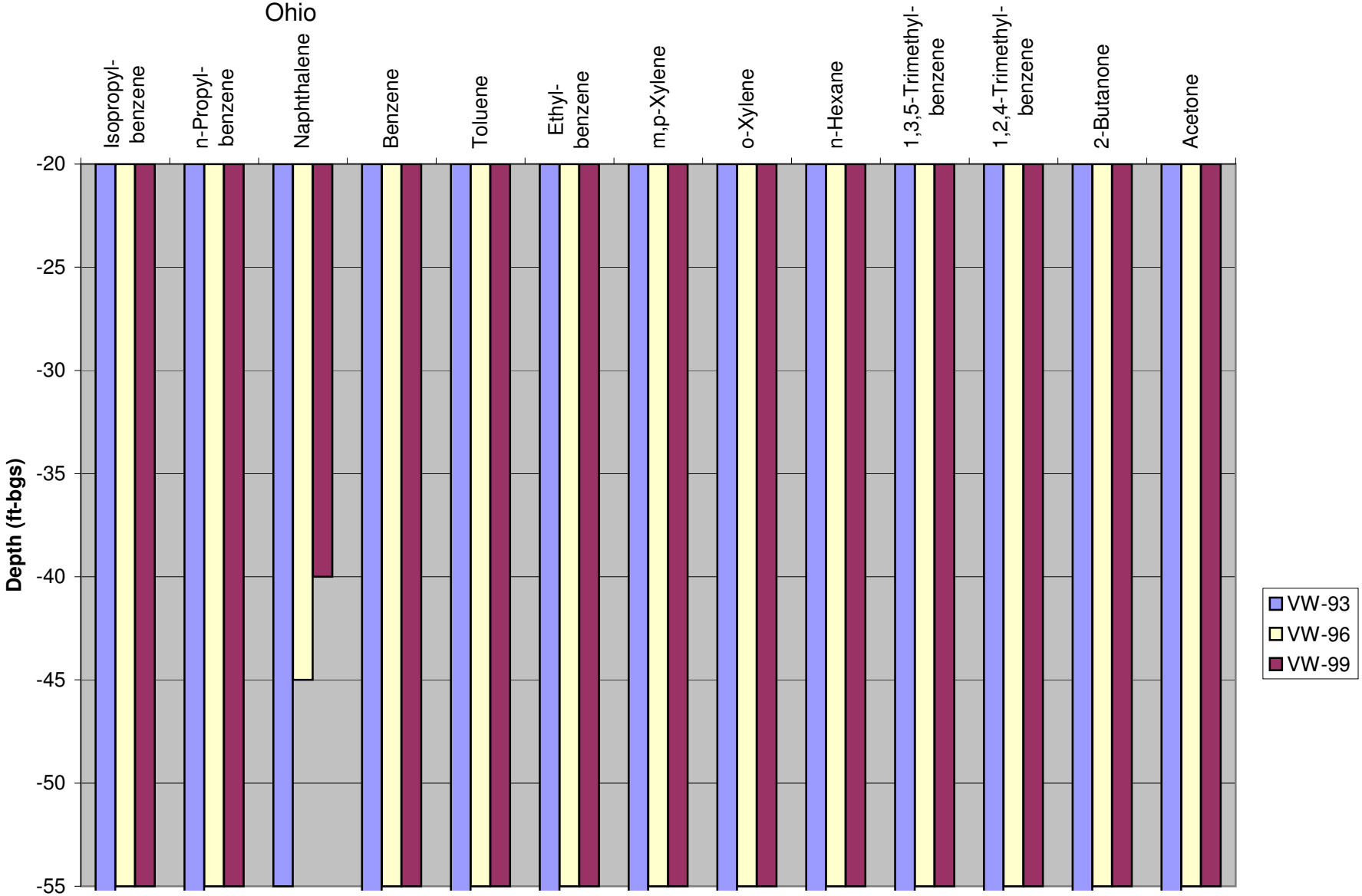
Figure 16: Comparison of Deep Nested Vapor Monitoring Well Data to Table 3b-SG Screening Values for Wells Located Over the LNAPL Plume, Chevron Cincinnati Facility, Hooven, Ohio



Notes:

- Constituent sample concentrations that are below the Table 3b-SG screening value are indicated by the colored bars on this figure.
- Screening values are from Table 3b-SG provided in the OSWER Draft VI Guidance (EPA, 2002) based on an excess cancer risk of 10^{-5} and hazard quotient of 1.
- Constituent concentrations that were reported as "non-detect" were evaluated using the analytical reporting limit.
- All reported concentrations for isopropyl-benzene, n-propyl-benzene, and naphthalene were below the analytical reporting limit. As described in Section 6.5.3.1, naphthalene reporting limits were doubled for this evaluation.
- Samples were also collected at 60 ft-bgs for VW-93.

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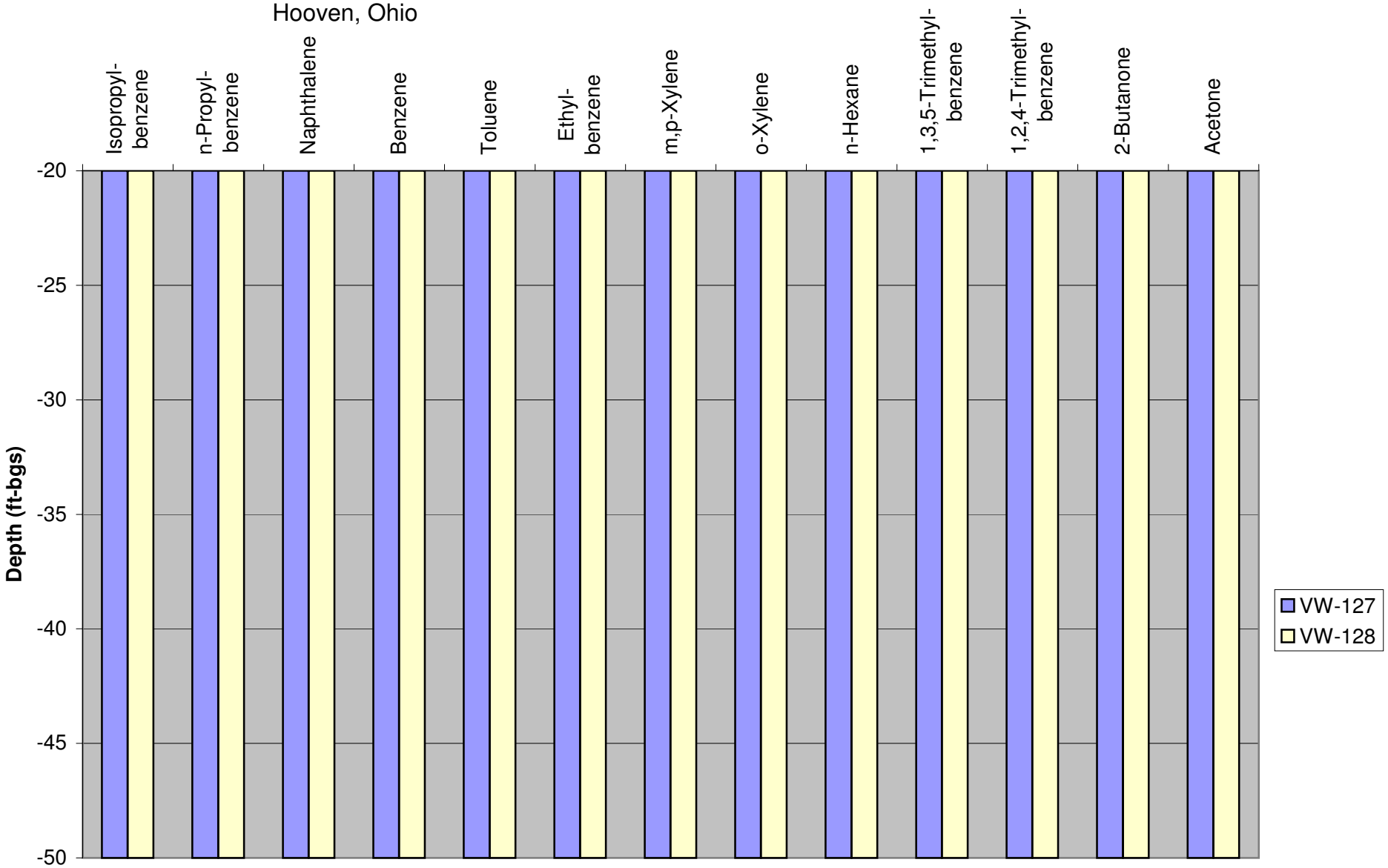
Figure 17: Comparison of Deep Nested Vapor Monitoring Well Data to Table 3b-SG Screening Values for Wells Located Over the Dissolved Contaminant Plume, Chevron Cincinnati Facility, Hooven, Ohio



Notes:

- Constituent sample concentrations that are below the Table 3b-SG screening value are indicated by the colored bars on this figure.
- Screening values are from Table 3b-SG provided in the OSWER Draft VI Guidance (EPA, 2002) based on an excess cancer risk of 10^{-5} and hazard quotient of 1.
- Constituent concentrations that were reported as "non-detect" were evaluated using the analytical reporting limit.
- All reported concentrations for isopropyl-benzene, n-propyl-benzene, and naphthalene were below the analytical reporting limit. As described in Section 6.5.3.1, naphthalene reporting limits were doubled for this evaluation.

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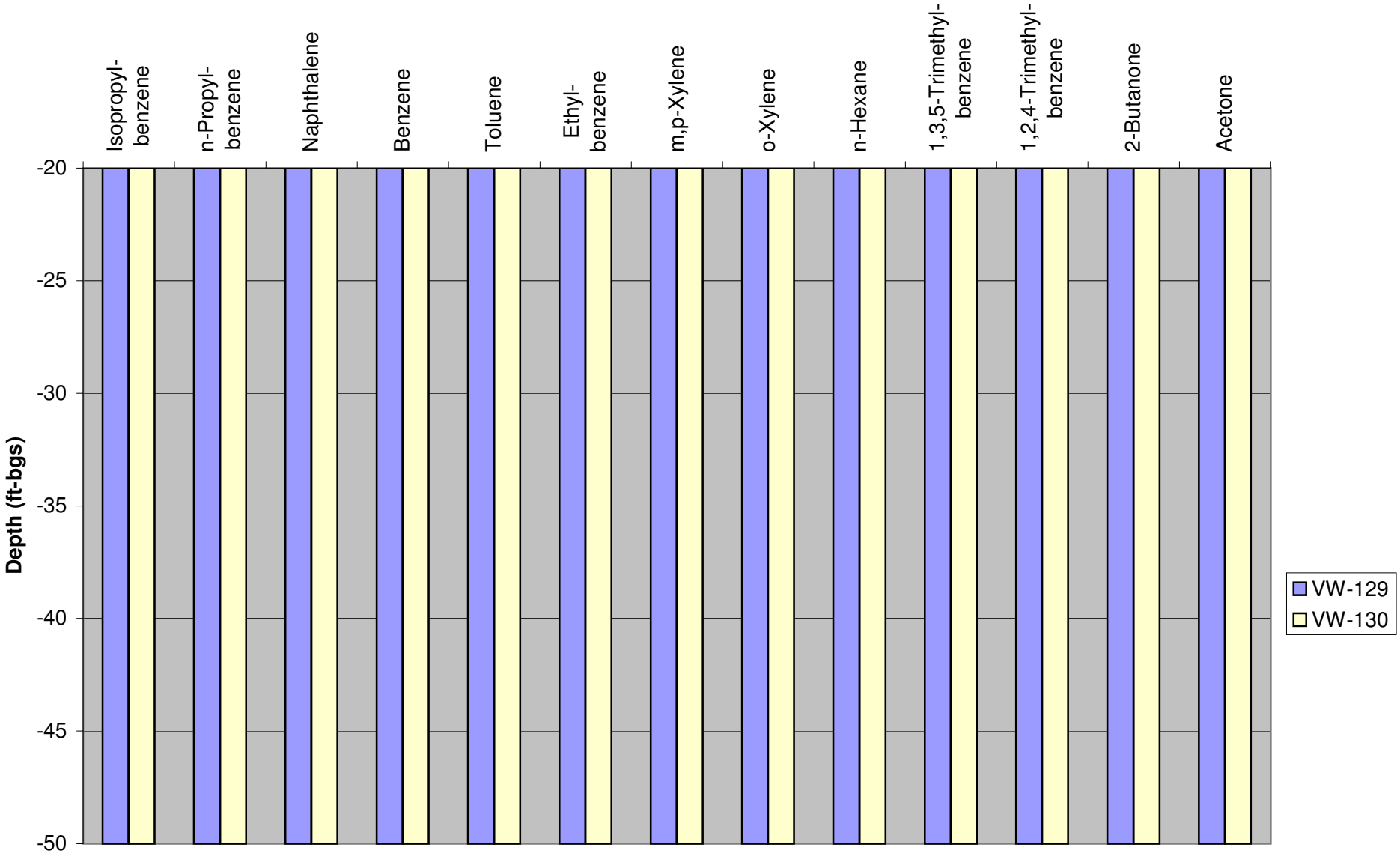
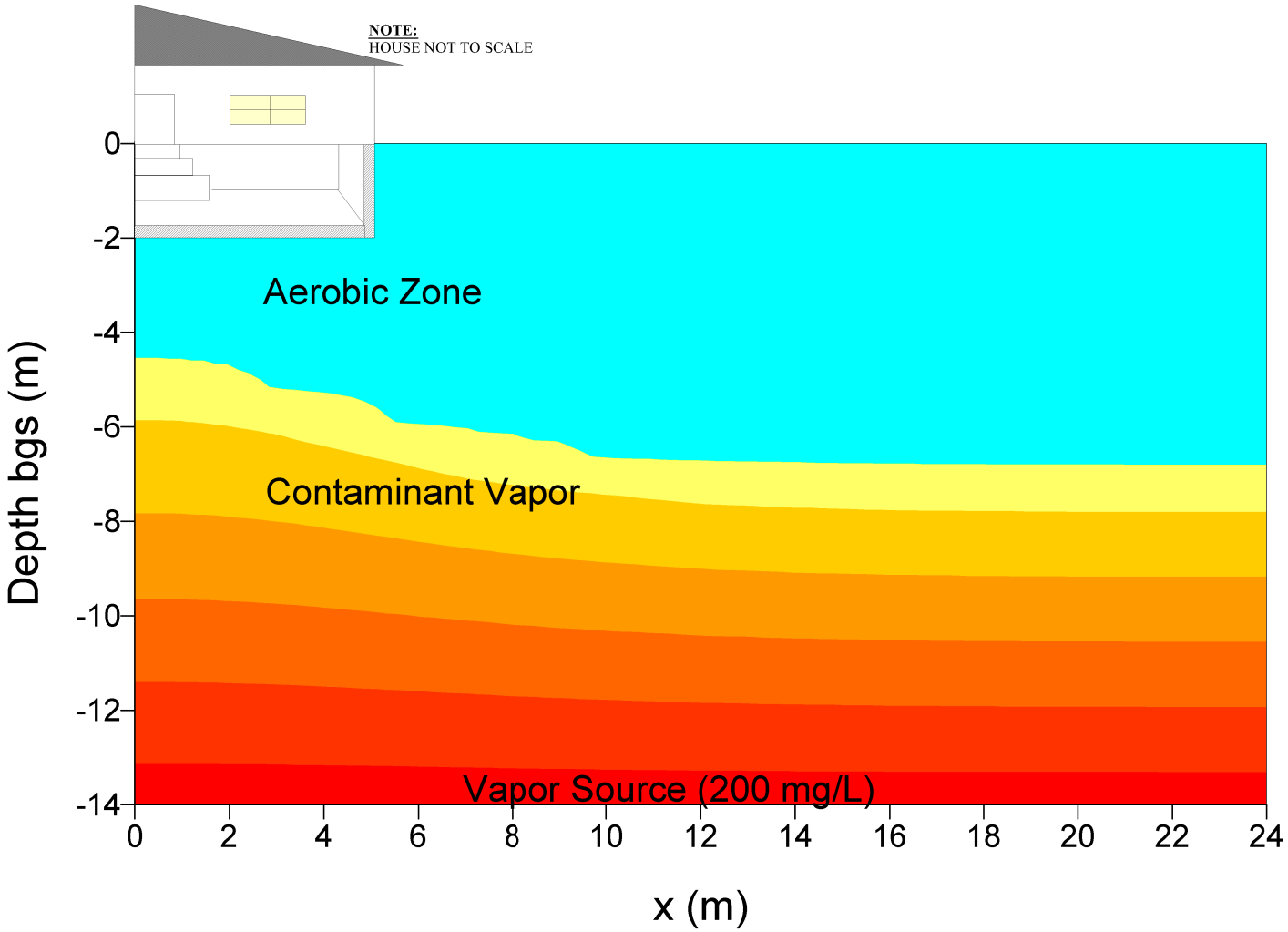
Figure 18: Comparison of Deep Nested Vapor Monitoring Well Data to Table 3b-SG Screening Values for Wells Located Outside the LNAPL/Dissolved Contaminant Plume, Chevron Cincinnati Facility, Hooven, Ohio



Notes:

- Constituent sample concentrations that are below the Table 3b-SG screening value are indicated by the colored bars on this figure.
- Screening values are from Table 3b-SG provided in the OSWER Draft VI Guidance (EPA, 2002) based on an excess cancer risk of 10^{-5} and hazard quotient of 1.
- Constituent concentrations that were reported as "non-detect" were evaluated using the analytical reporting limit.
- All reported concentrations for isopropyl-benzene, n-propyl-benzene, and naphthalene were below the analytical reporting limit. As described in Section 6.5.3.1, naphthalene reporting limits were doubled for this evaluation.



EXPLANATION

Hydrocarbon (orange) and oxygen (blue) zones in sandy soils (schematic).

Modeled figure for illustrative purposes only and not intended to represent Hooven specifically. Model simulation for a generic worst-case scenario: LNAPL plume with saturated gasoline vapors.

Source: GeoSyntec Consultants

GeoSyntec Consultants

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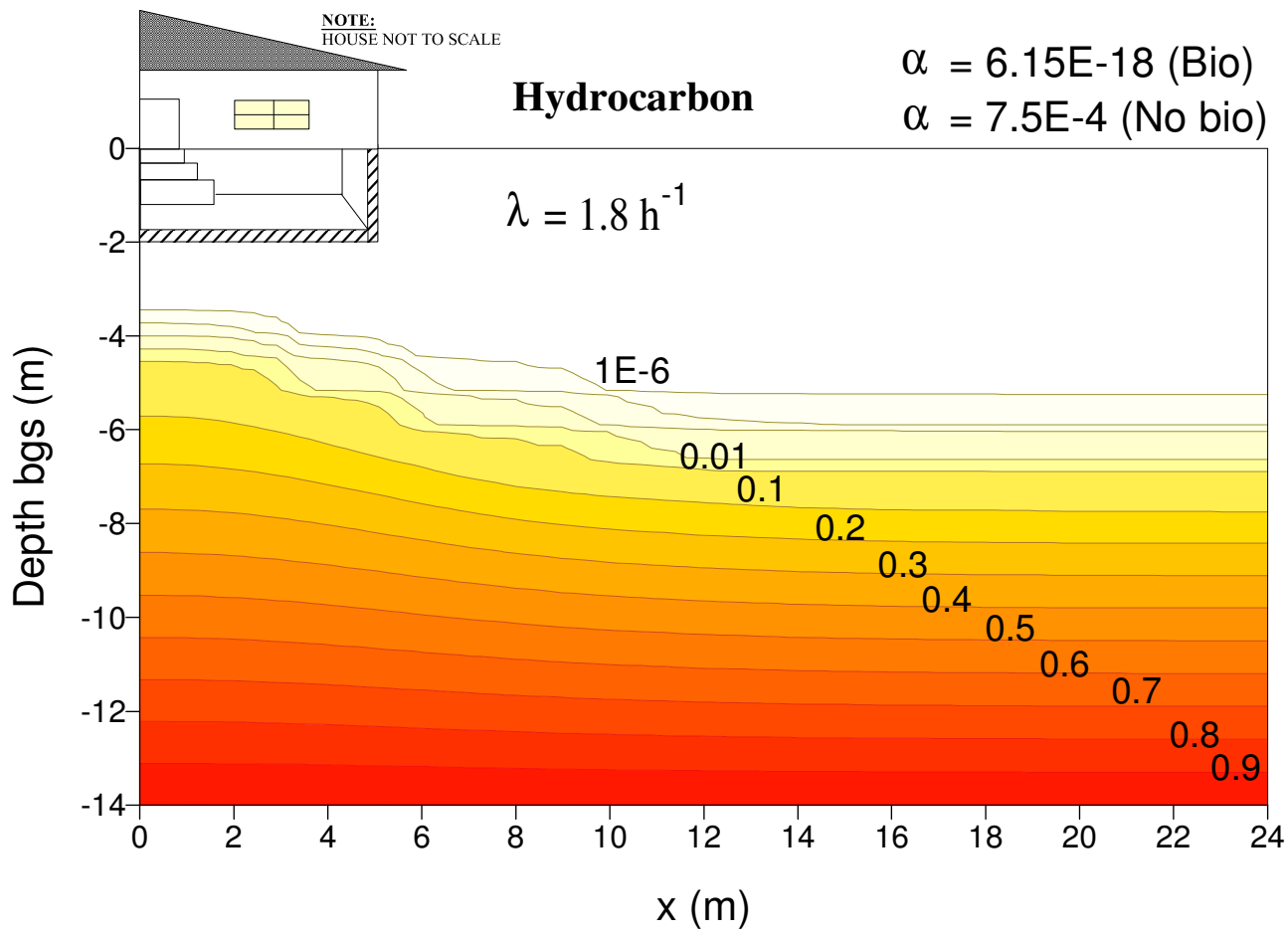
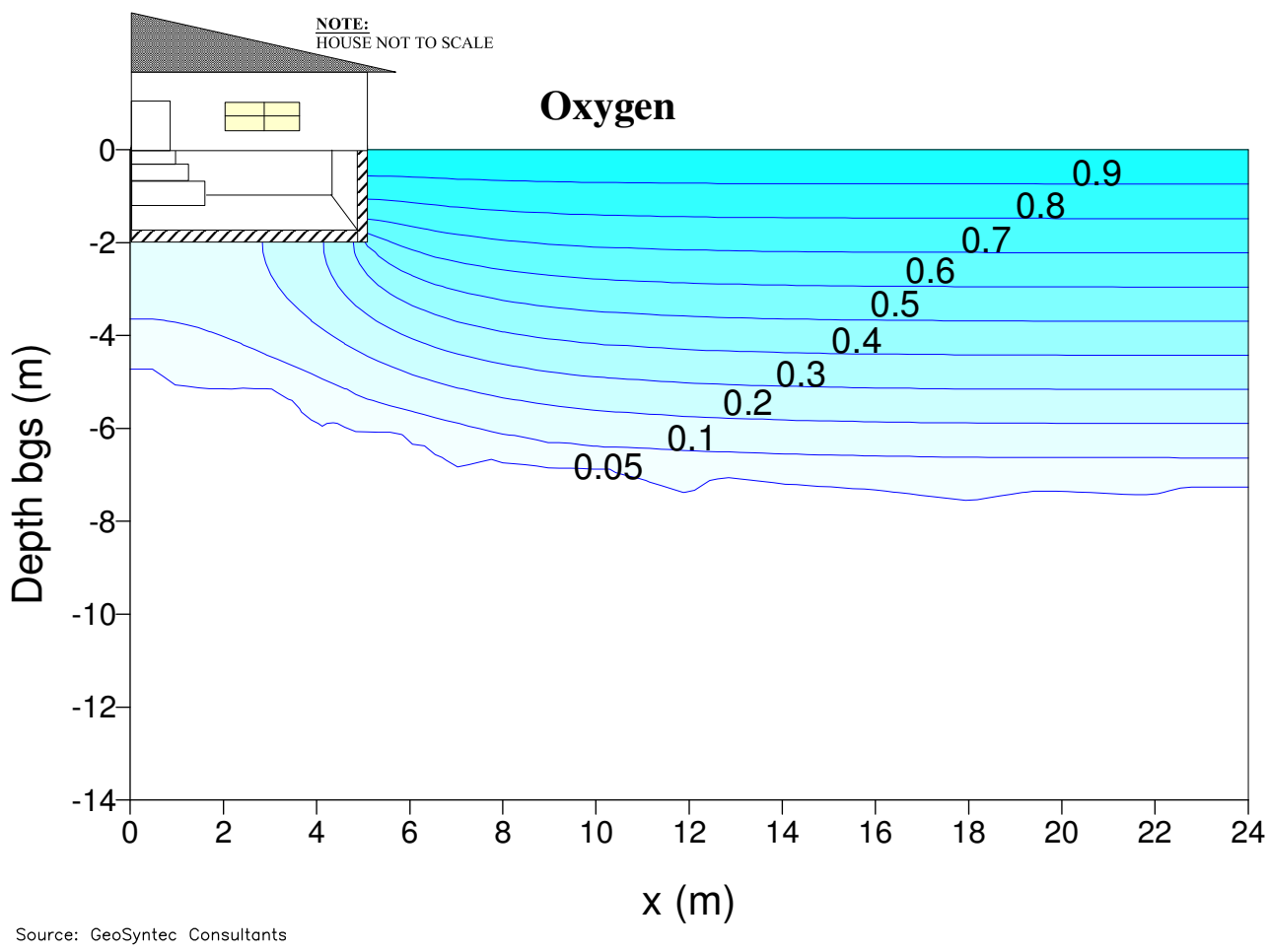
FIGURE 19

HYDROCARBON AND OXYGEN PROFILES IN SANDY SOILS OBTAINED BY MODELING

CHEVRON CINCINNATI FACILITY, HOOVEN, OHIO

Drawn By: SV	Checked By: TC	Scale: NONE	Date: 6/22/05	File: 500-GEOSYNTECFIGS





Source: GeoSyntec Consultants

EXPLANATION

Normalized soil-gas concentration distributions for oxygen and hydrocarbon undergoing aerobic biodegradation with a first-order rate $\lambda = 1.8$ (h^{-1}) and a vapor source concentration of 200 mg/L located beneath a basement foundation at depth of 14 m bgs. Hydrocarbon and oxygen contours are normalized to the source and the atmospheric concentration, respectively.

Attenuation factor for "No Bio" is not intended to represent site conditions and is shown for reference to illustrate the magnitude of bioattenuation.

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FIGURE 20

NORMALIZED SOIL VAPOR DISTRIBUTIONS FOR OXYGEN AND HYDROCARBON UNDERGOING AEROBIC DEGRADATION, λ=1.8/hr, L=14m

CHEVRON CINCINNATI FACILITY, HOOVEN, OHIO

Drawn By: DJR	Checked By: TC	Scale: NONE	Date: 6/22/05	File: 500-GEOSYNTECFIGS

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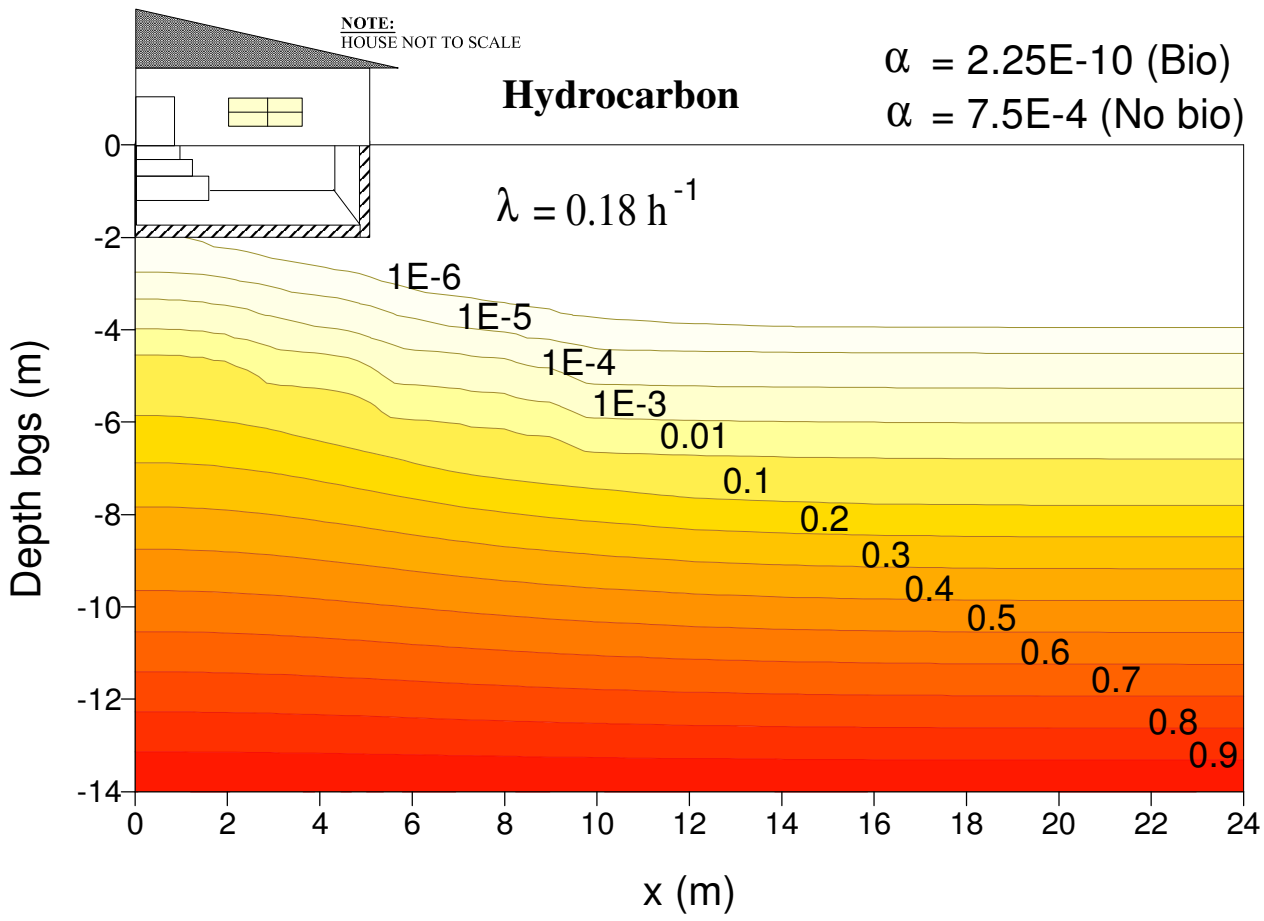

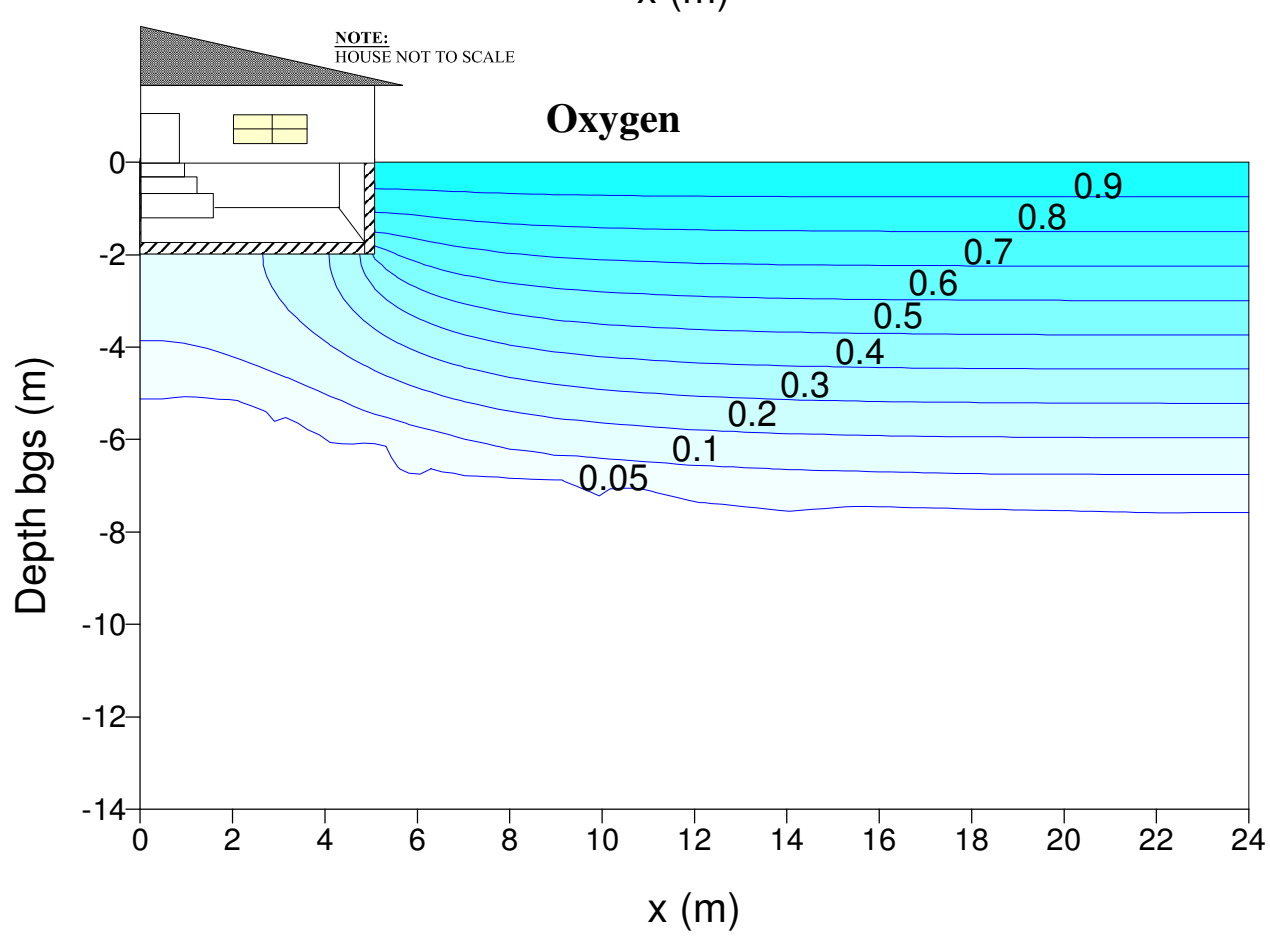

Source: GeoSyntec Consultants

EXPLANATION

Normalized soil gas concentration distributions for oxygen and hydrocarbon undergoing aerobic biodegradation with a first-order rate $\lambda = 0.18$ (h^{-1}) and a vapor source concentration of 200 mg/L located beneath a basement foundation at depth of 14 m bgs. Hydrocarbon and oxygen contours are normalized to the source and the atmospheric concentration, respectively.

Attenuation factor for "No Bio" is not intended to represent site conditions and is shown for reference to illustrate the magnitude of bioattenuation.

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FIGURE 21

NORMALIZED SOIL VAPOR DISTRIBUTIONS FOR OXYGEN AND HYDROCARBON UNDERGOING AEROBIC DEGRADATION, λ=0.18/hr, L=14m

CHEVRON CINCINNATI FACILITY, HOOVEN, OHIO

Drawn By: DJR	Checked By: TC	Scale: NONE	Date: 6/22/05	File: 500-GEOSYNTECFIGS

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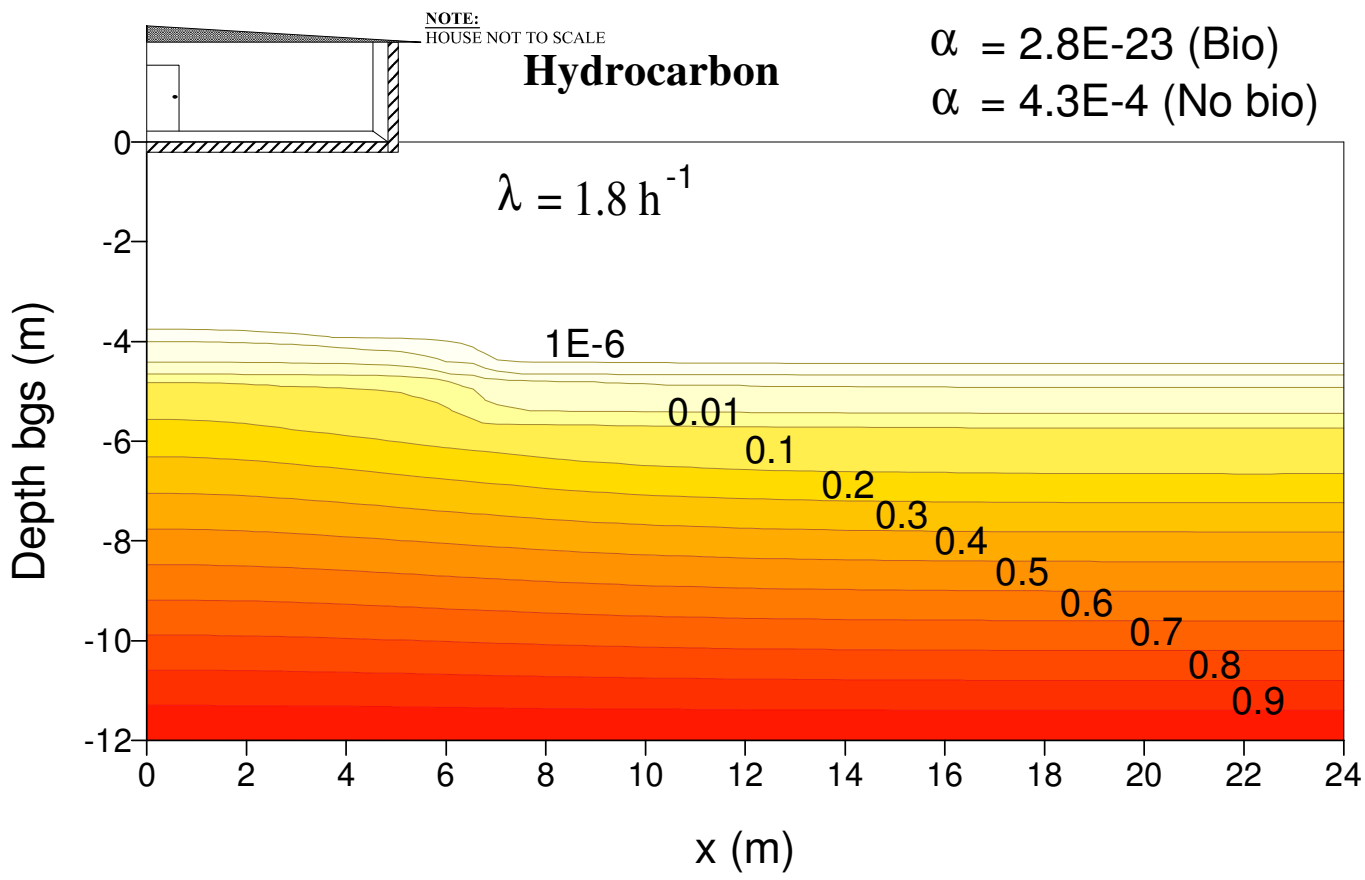

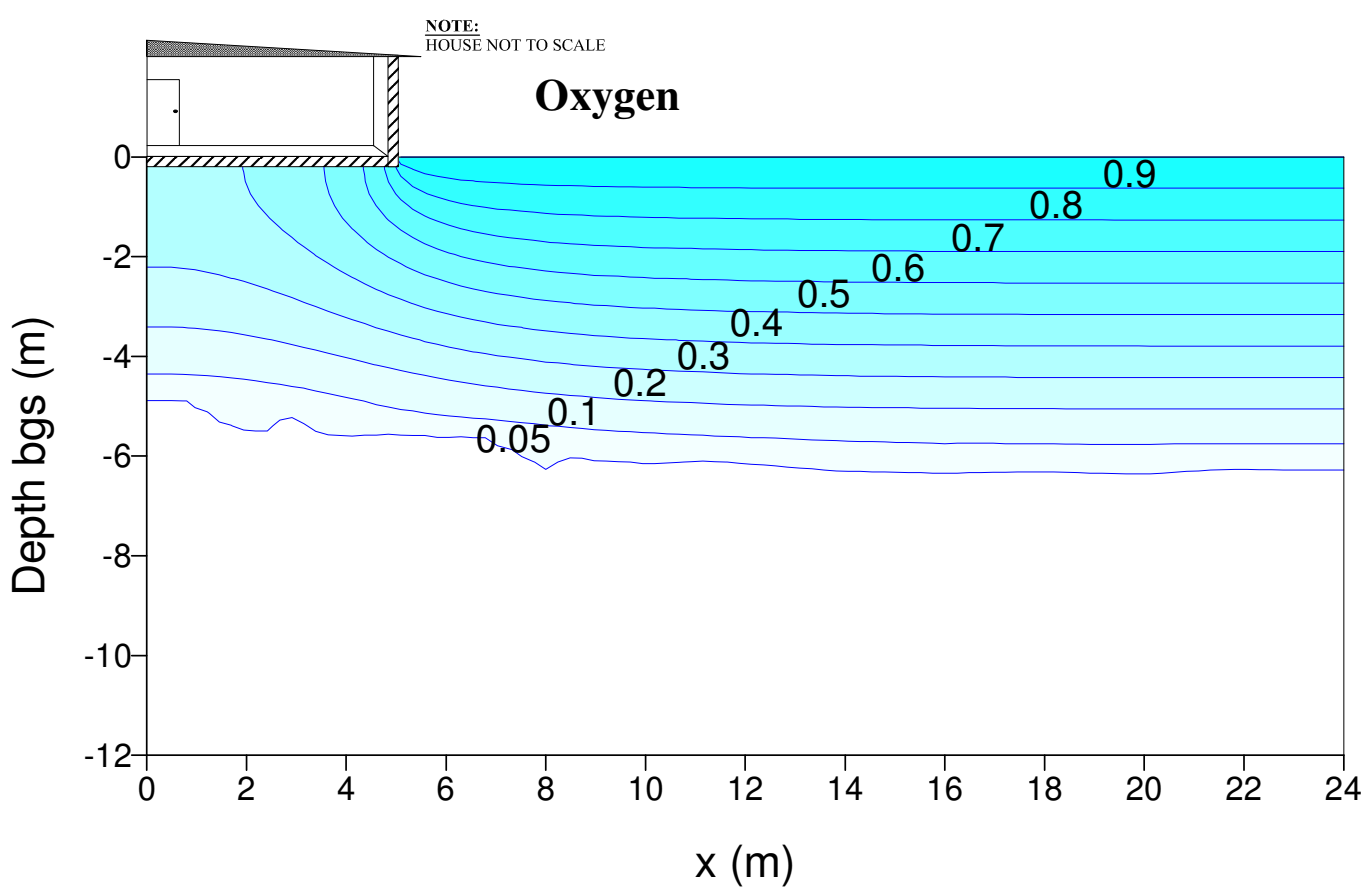

Source: GeoSyntec Consultants

EXPLANATION

Normalized soil-gas concentration distributions for oxygen and hydrocarbon undergoing aerobic biodegradation with a first-order rate $\lambda = 0.18$ (h^{-1}) and a vapor source concentration of 200 mg/L located beneath a slab-on-grade foundation at depth of 12 m bgs. Hydrocarbon and oxygen contours are normalized to the source and the atmospheric concentration, respectively.

Attenuation factor for "No Bio" is not intended to represent site conditions and is shown for reference to illustrate the magnitude of bioattenuation.

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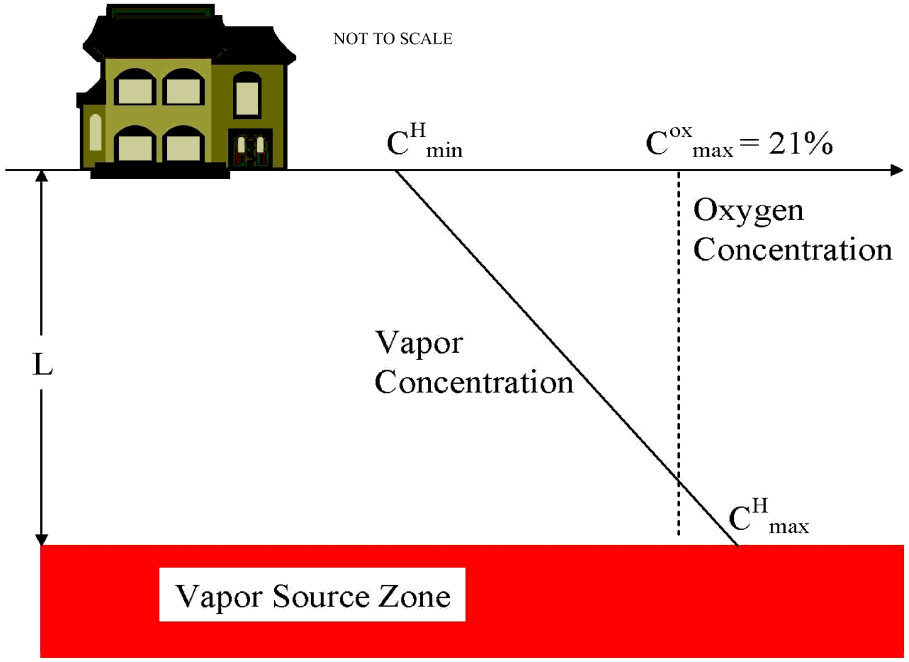
FIGURE 22

NORMALIZED SOIL VAPOR DISTRIBUTIONS FOR OXYGEN AND HYDROCARBON UNDERGOING AEROBIC DEGRADATION, λ=0.18/hr, L=12m

CHEVRON CINCINNATI FACILITY, HOOVEN, OHIO

Drawn By: DJR	Checked By: TC	Scale: NONE	Date: 6/22/05	File: 500-GEOSYNTECFIGS

US EPA ARCHIVE DOCUMENT



Source: GeoSyntec Consultants

EXPLANATION

Generic vertical profiles of O_2 and VOC vapors with no biodegradation.

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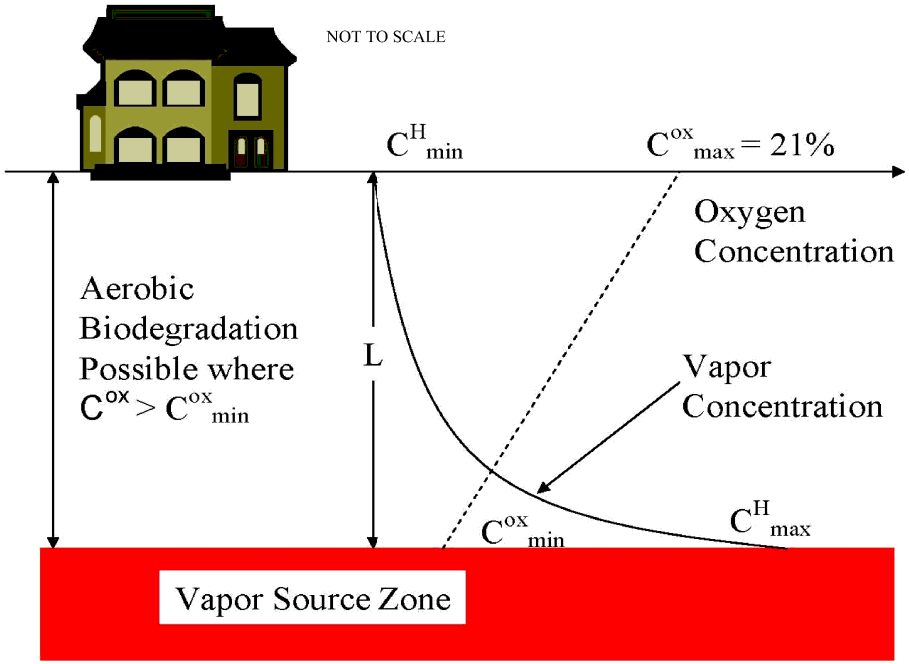
FIGURE 23

GENERAL VERTICAL PROFILES OF OXYGEN AND VOC VAPORS, WITHOUT AEROBIC BIODEGRADATION

CHEVRON CINCINNATI FACILITY, HOOVEN, OHIO

Drawn By: DJR	Checked By: TC	Scale: NONE	Date: 6/22/05	File: 500-GEOSYNTECFIGS



Source: GeoSyntec Consultants

EXPLANATION

Generic vertical profiles of O_2 and VOC vapors with biodegradation.

GEOSYNTEC CONSULTANTS

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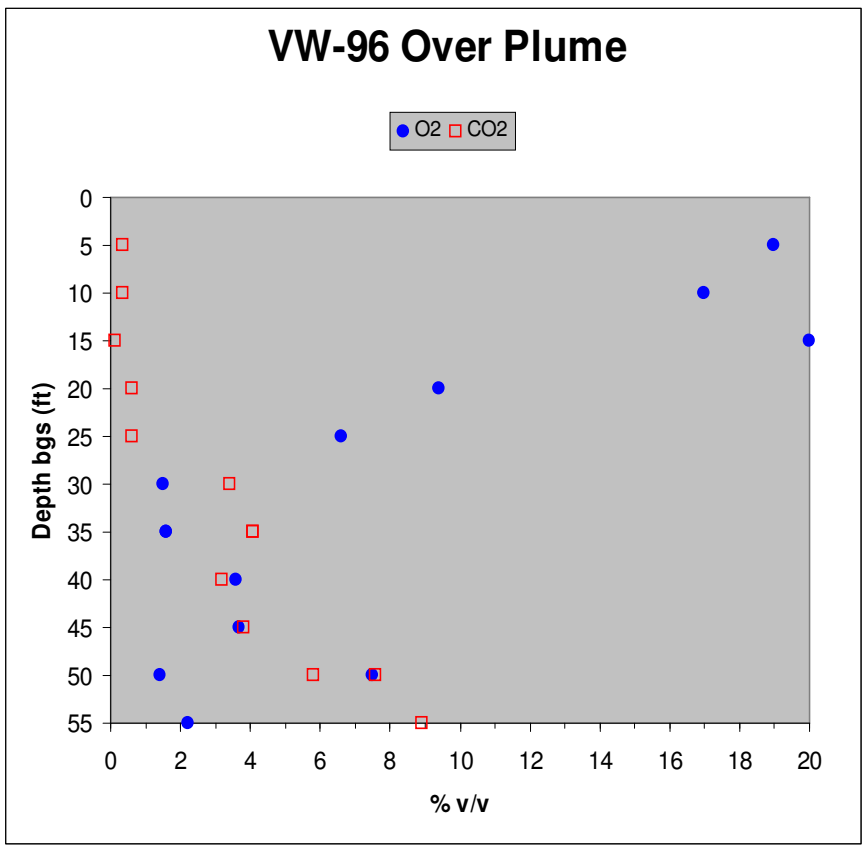
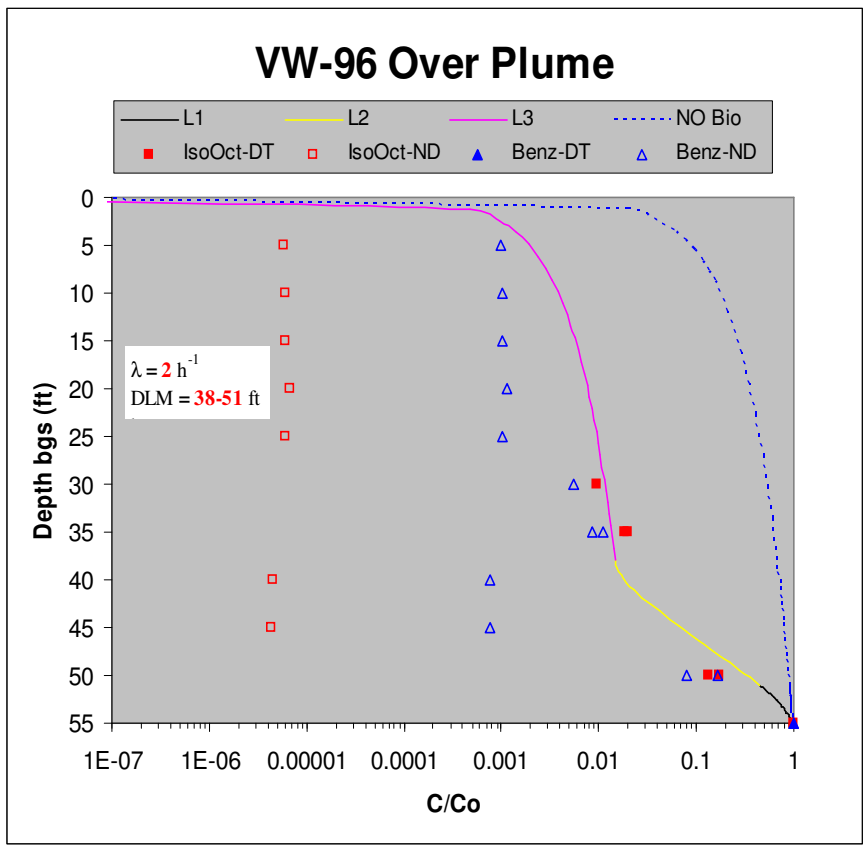
FIGURE 24

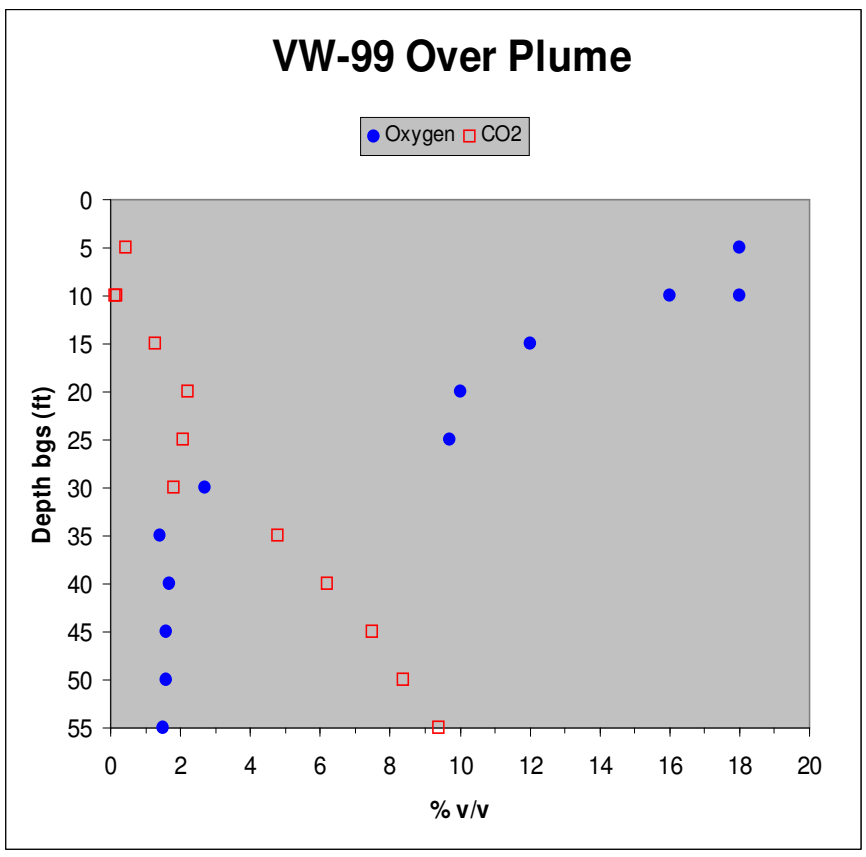
GENERAL VERTICAL PROFILES OF OXYGEN AND VOC VAPORS, WITH AEROBIC BIODEGRADATION

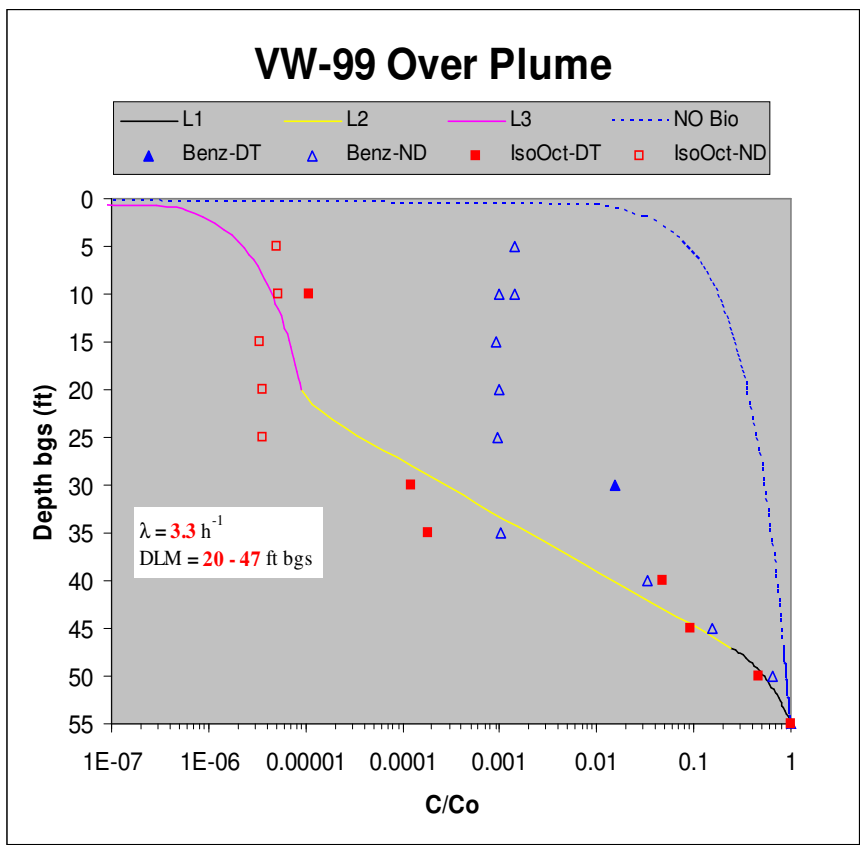
CHEVRON CINCINNATI FACILITY, HOOVEN, OHIO

Drawn By: DJR	Checked By: TC	Scale: NONE	Date: 6/22/05	File: 500-GEOSYNTECFIGS









Source: GeoSyntec Consultants

EXPLANATION

Model calibration for VW-96 and VW-99 using Isooctane (i.e., 2,2,4-Trimethylpentane) data (symbols represent field data and lines represent modeled results, the dashed line represents the no biodegradation case, the yellow continuous line is the reactive dominant layer).

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FIGURE 25

DOMINANT LAYER MODEL CALIBRATION USING VW-96 AND VW-99

CHEVRON CINCINNATI FACILITY, HOOVEN, OHIO

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