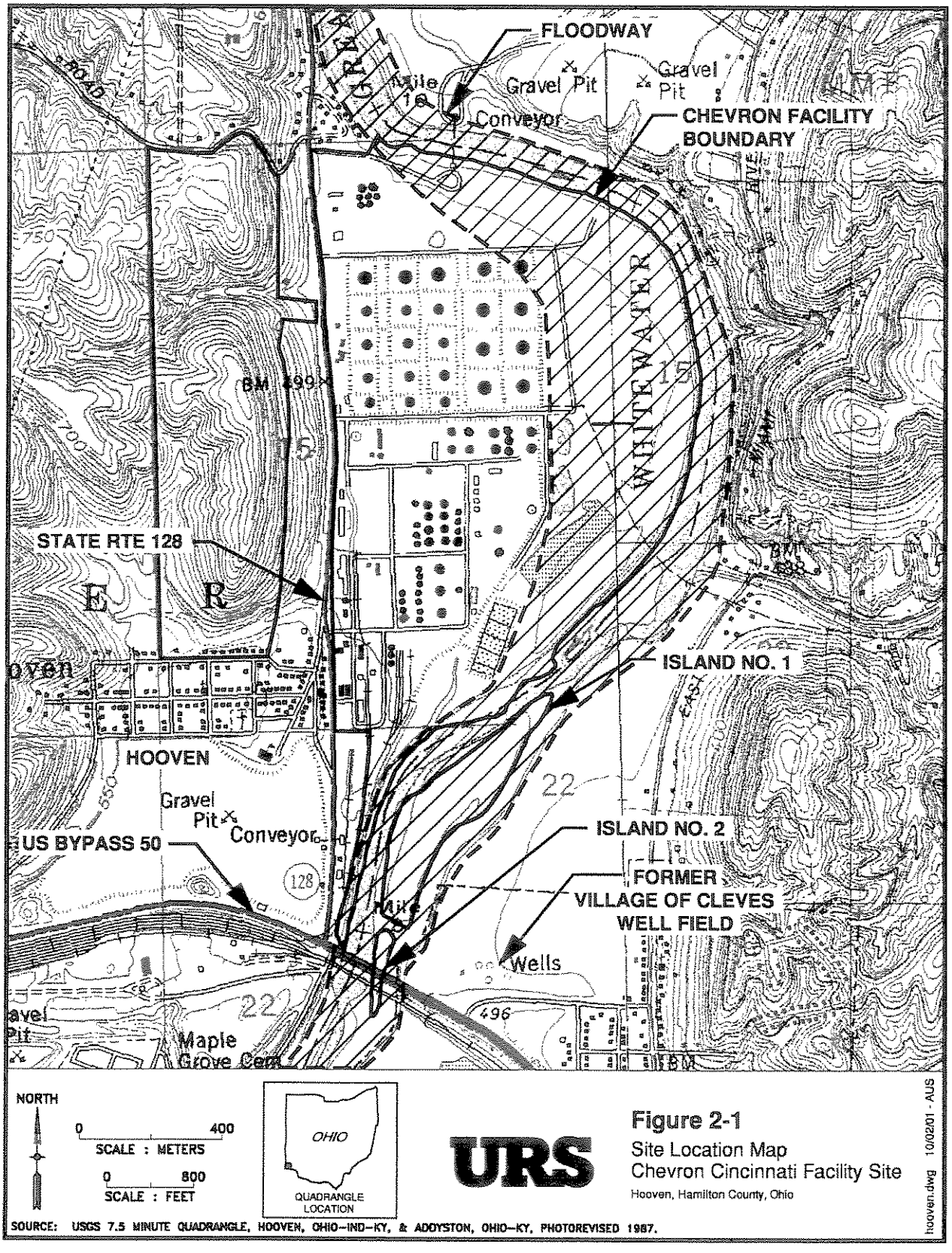


URS

Figure 2-1
Site Location Map
Chevron Cincinnati Facility Site
Hooven, Hamilton County, Ohio

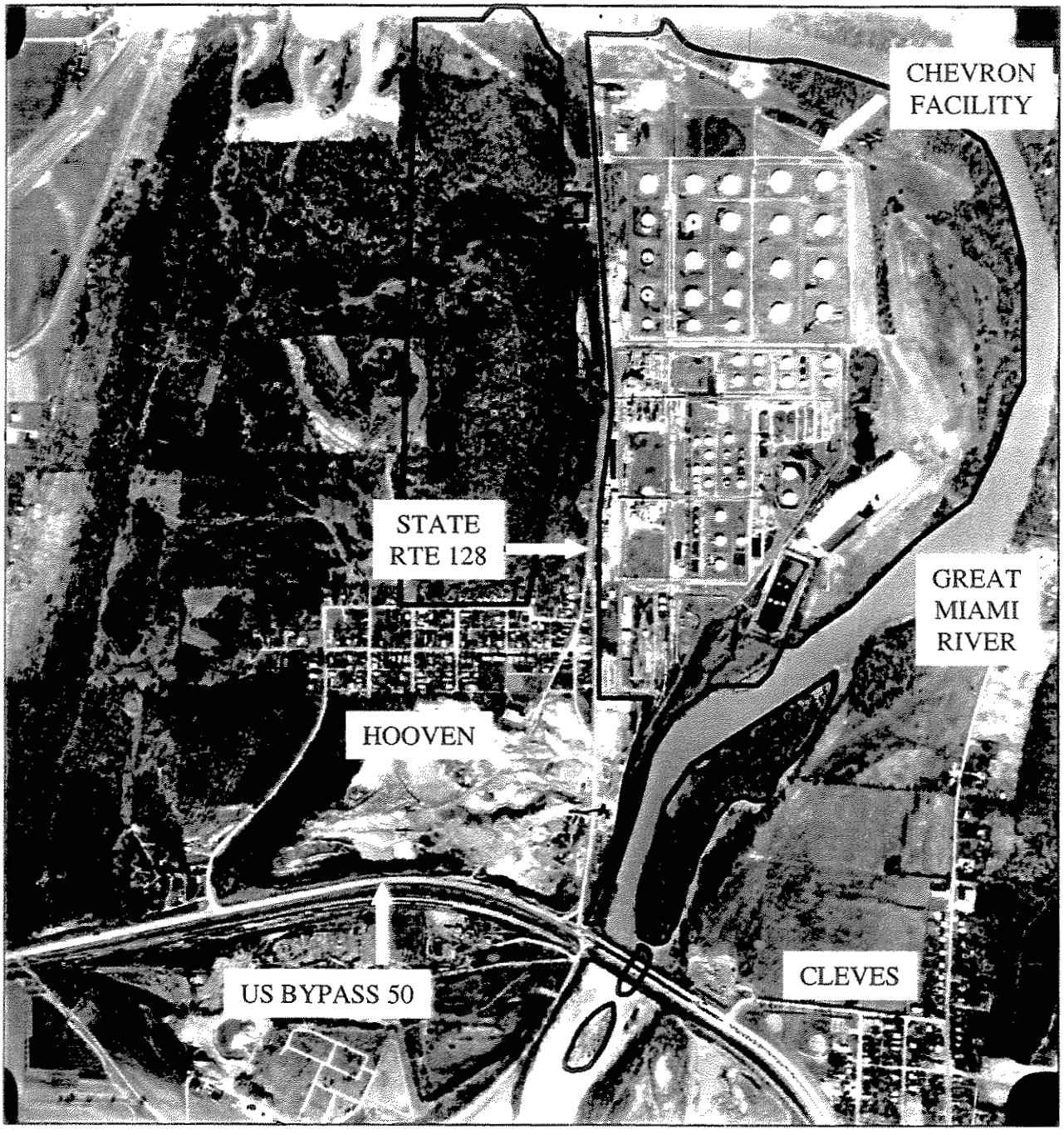
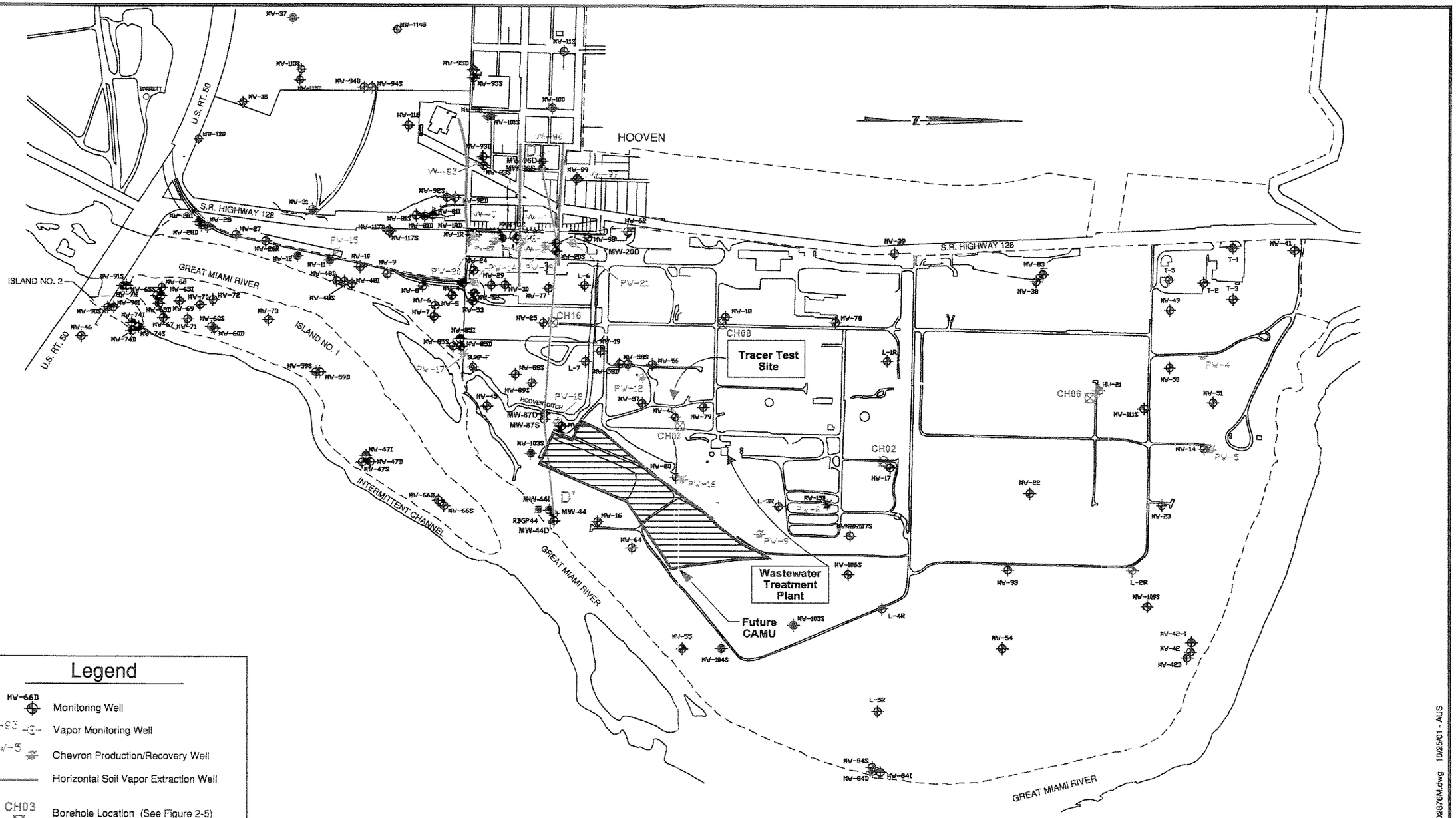


Figure 2-2
Aerial Photograph of the Chevron Cincinnati Facility in March 1975.
Most above grade structures were removed after 1986.



Legend

- Monitoring Well
- Vapor Monitoring Well
- Chevron Production/Recovery Well
- Horizontal Soil Vapor Extraction Well
- Borehole Location (See Figure 2-5)
- D — D' D - D' Transect (See Figure 2-4)
- Chevron Cincinnati Facility Boundary

300 0 150 300 600
SCALE IN FEET

SOURCE OF TOPOGRAPHY HAMILTON COUNTY CAGIS SYSTEM
STATE PLANE COORDINATES OHIO SOUTHERN ZONE, NAD83

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Facility Diagram
CHEVRON PRODUCTS COMPANY
Cincinnati Facility
Hooven, Hamilton County, Ohio

DWN. BY: JK	SCALE: AS SHOWN	DATE: Aug 2000	PROJECT-NO 9905115	FIGURE-NO Figure 2-3
CHKD. BY: KCO				

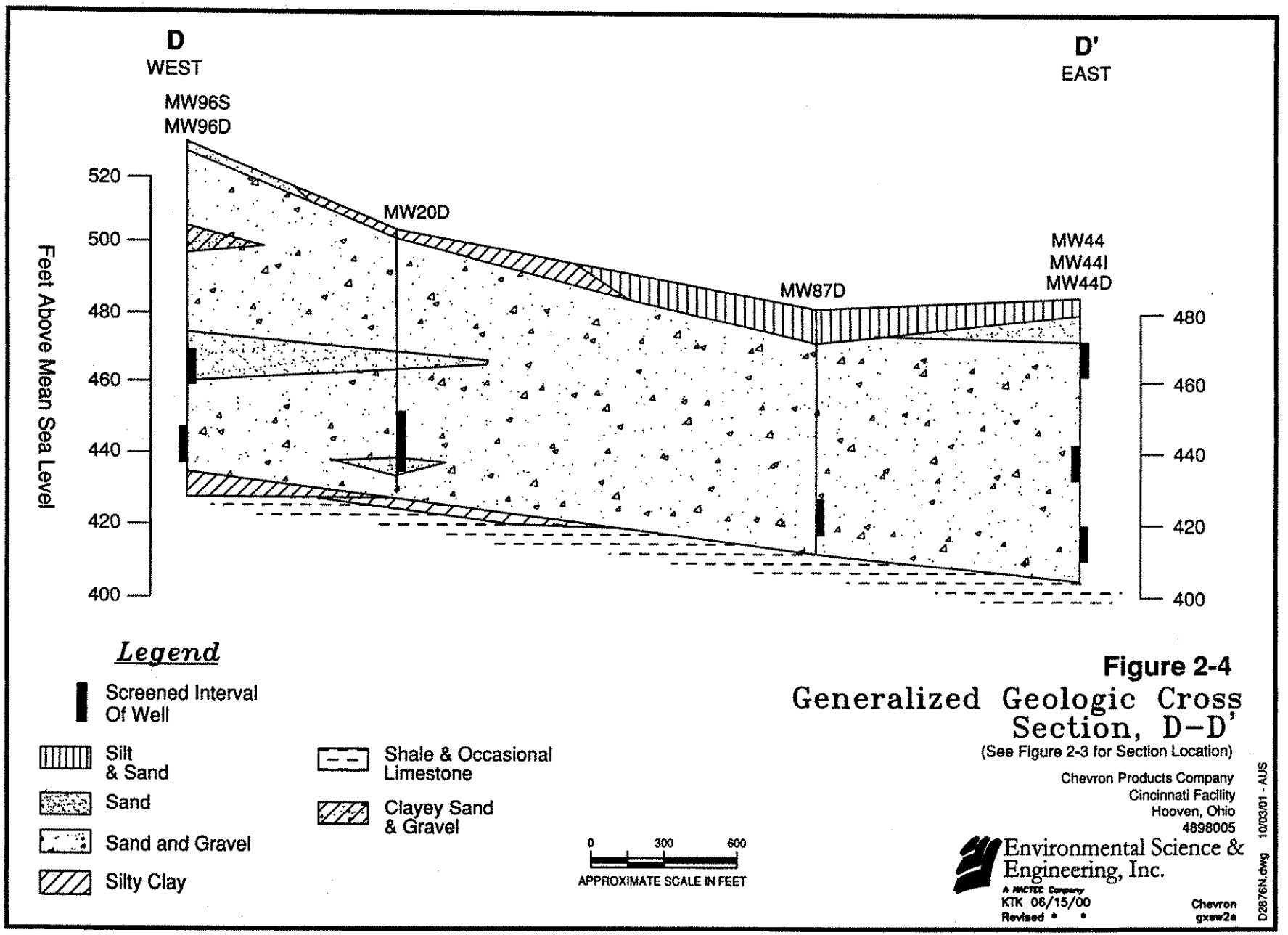

Figure 2-4

Generalized Geologic Cross Section, D–D'

(See Figure 2-3 for Section Location)

Chevron Products Company
Cincinnati Facility
Hooven, Ohio
4898005

Environmental Science & Engineering, Inc.
A NUCTEC Company
KTK 08/15/00
Revised * *
Chevron
gxsw2e

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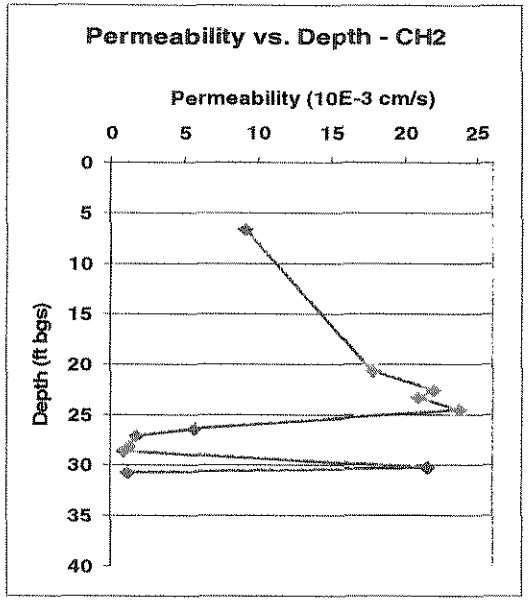
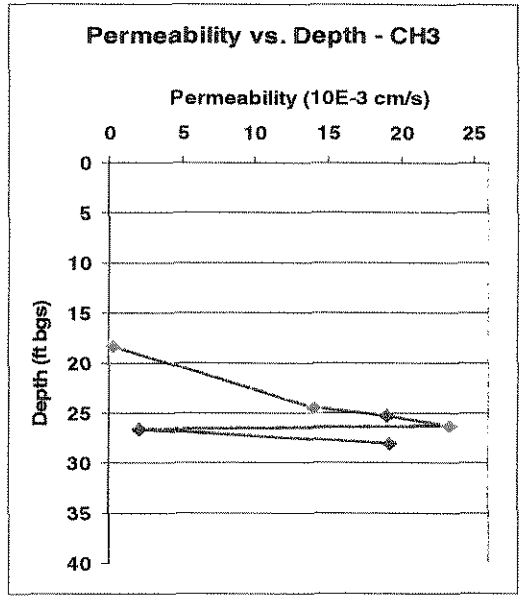
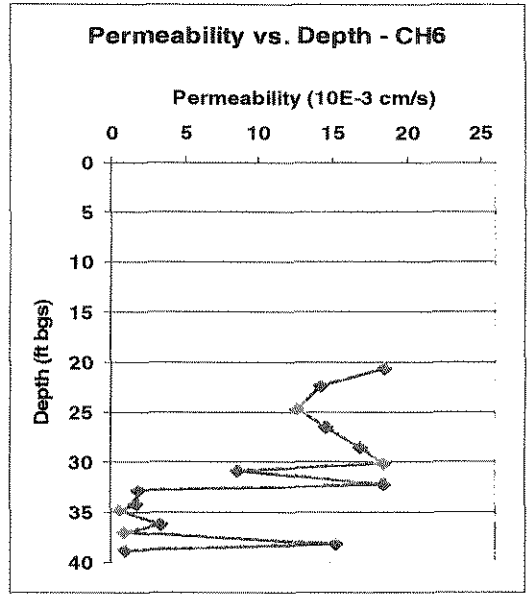
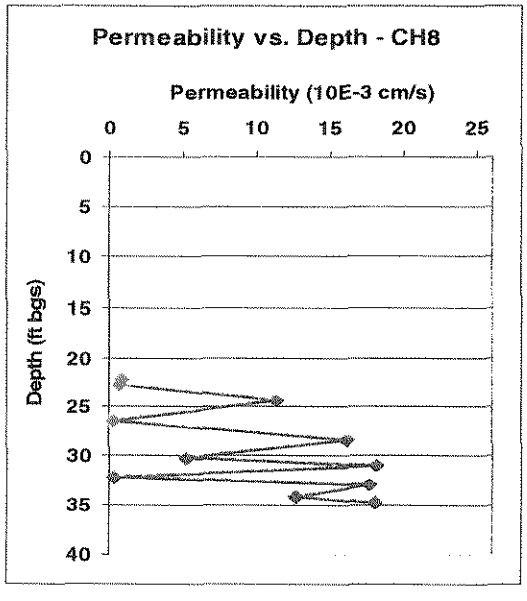








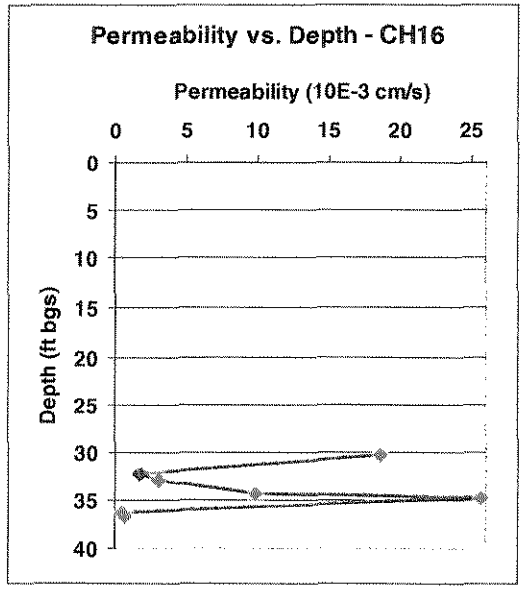


Figure 2-5
Permeability versus Depth
from Borings CH2 - CH16.
(see Figure 2-3
for boring locations)

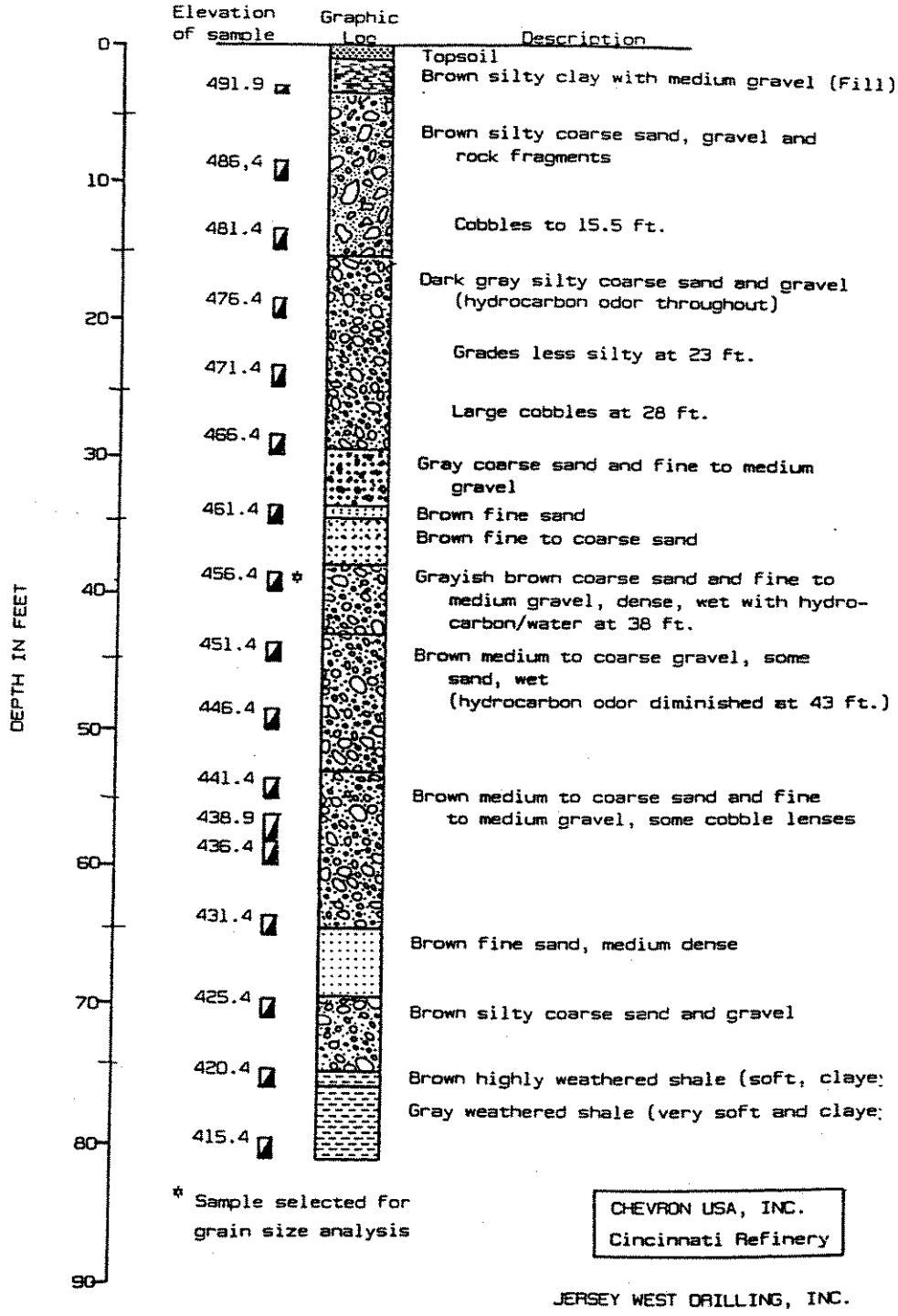
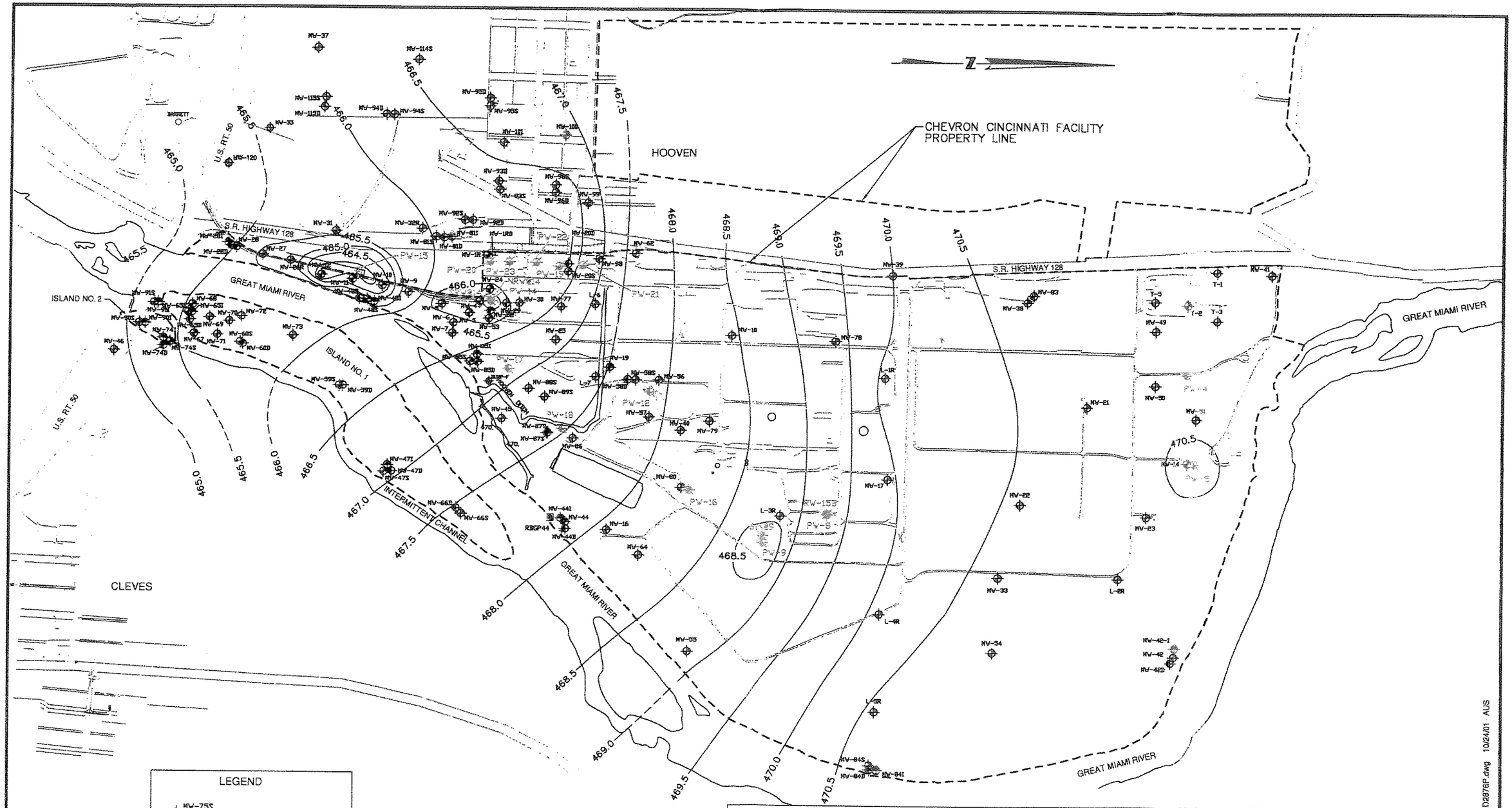


Figure 2-6
Lithology Log of MW-20D



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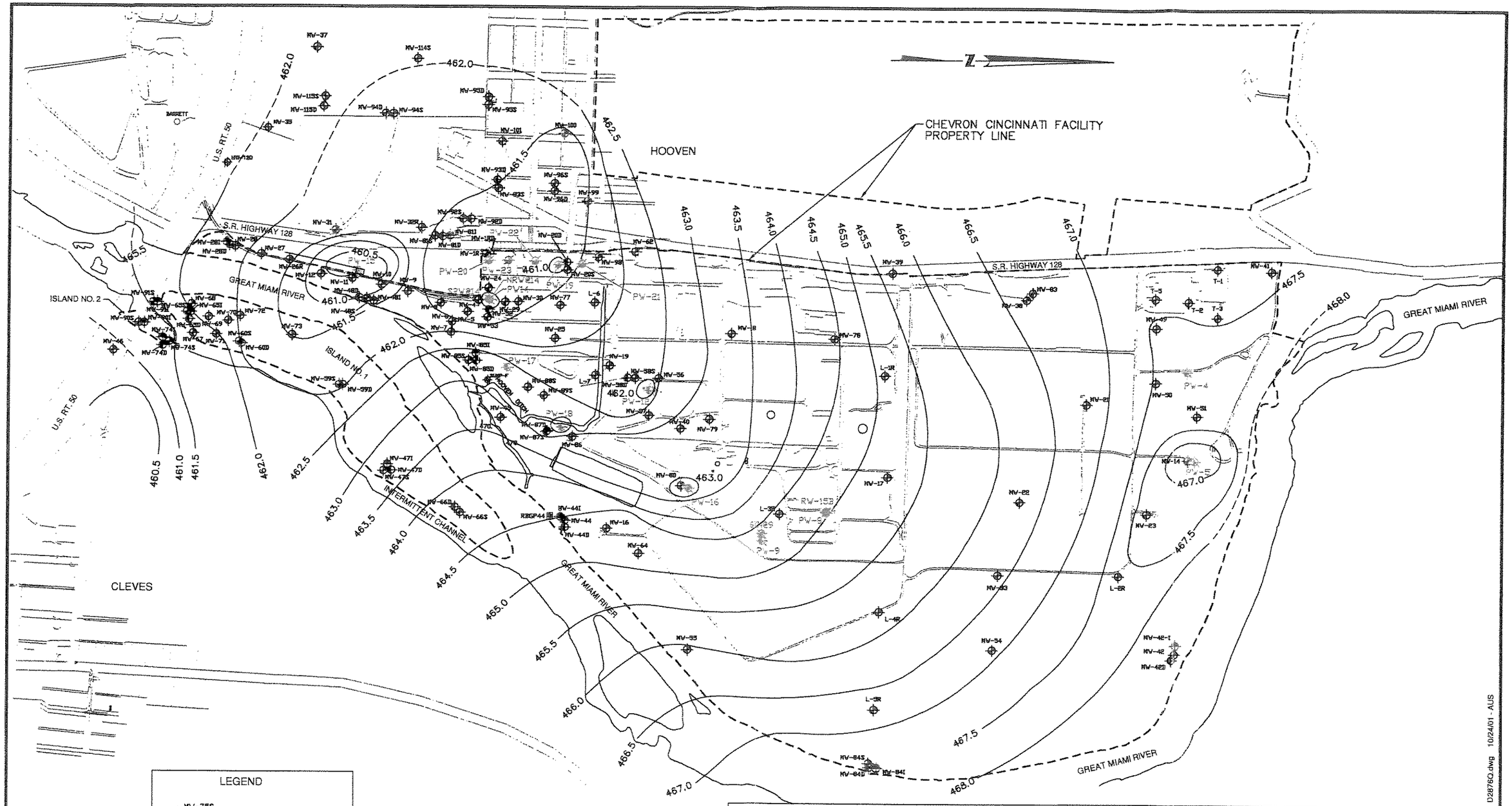
Water Table Contour Map
March 31, 1999; Typical High Water Table
CHEVRON PRODUCTS COMPANY
Cincinnati Facility
Hooven, Hamilton County, Ohio

DWN. BY: JK	SCALE: AS SHOWN	DATE: APRIL 1999	PROJECT-NO 9905115	FIGURE-NO Figure 2-7
CHKD. BY: KCO				



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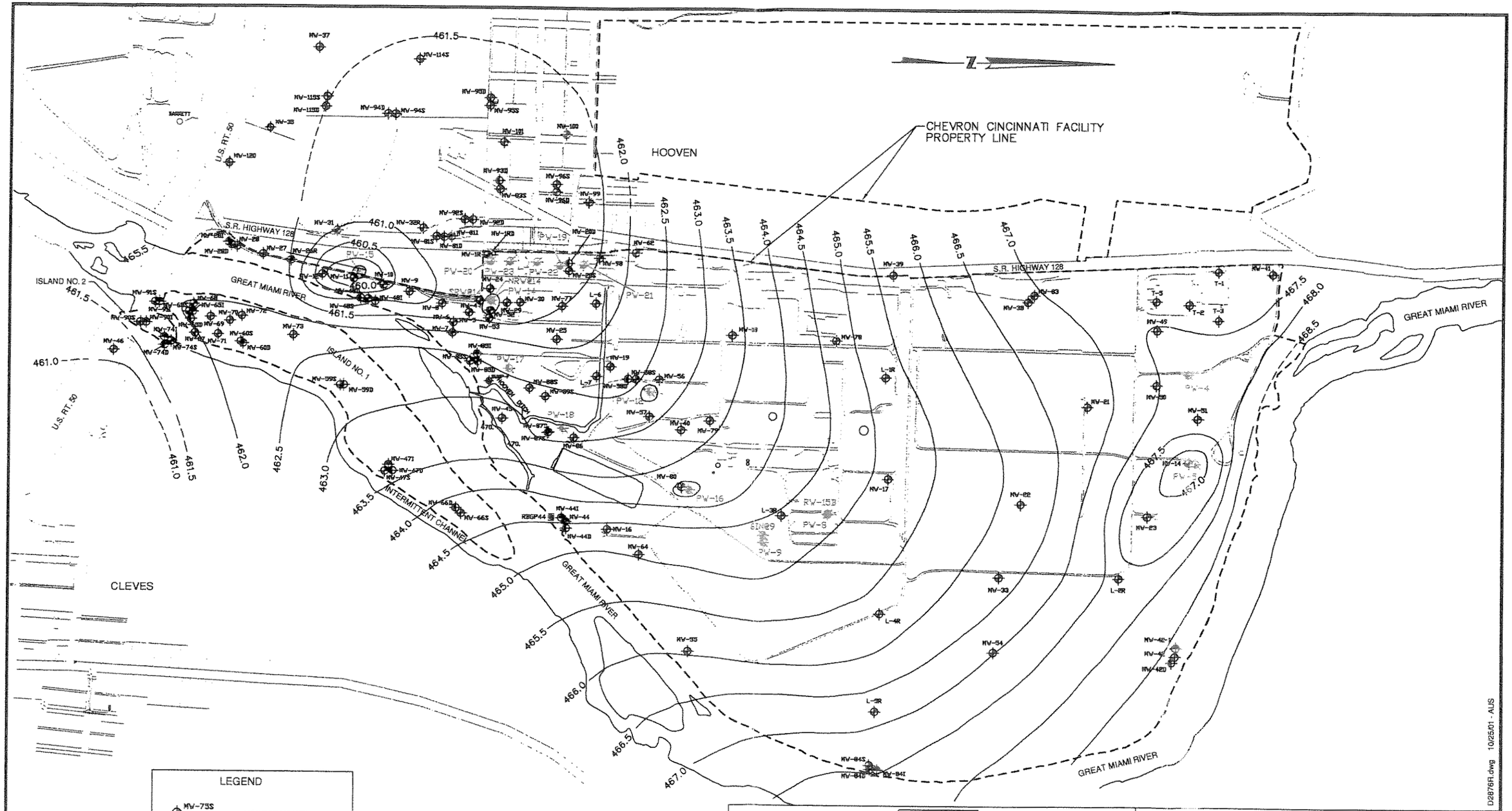
Water Table Contour Map
September 24, 1999; Typical Low Water Table
CHEVRON PRODUCTS COMPANY
Cincinnati Facility
Hooven, Hamilton County, Ohio

DWN. BY: JK	SCALE:	DATE:	PROJECT-NO	FIGURE-NO
CHKD. BY: KCO	AS SHOWN	OCT 1999	9905115	Figure 2-8



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Water Table Contour Map
November 22, 1999; Extreme Low Water Table
CHEVRON PRODUCTS COMPANY
Cincinnati Facility
Hooven, Hamilton County, Ohio

DWN. BY: JK	SCALE:	DATE:	PROJECT-NO	FIGURE-NO
CHK. BY: KCO	AS SHOWN	OCT 1999	9905115	Figure 2-9

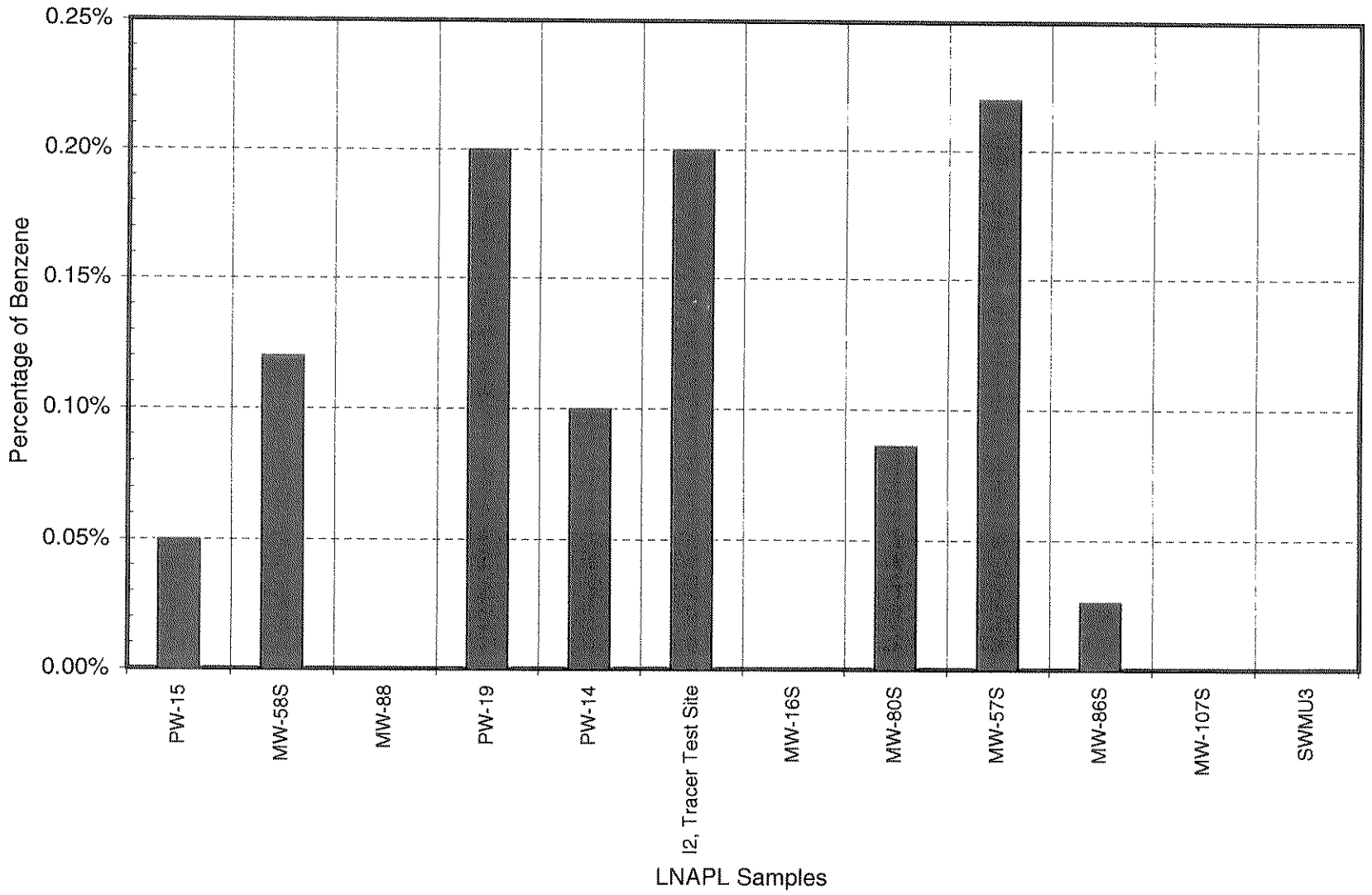


Figure 2.10. Summary of Benzene Analyses of LNAPL Samples

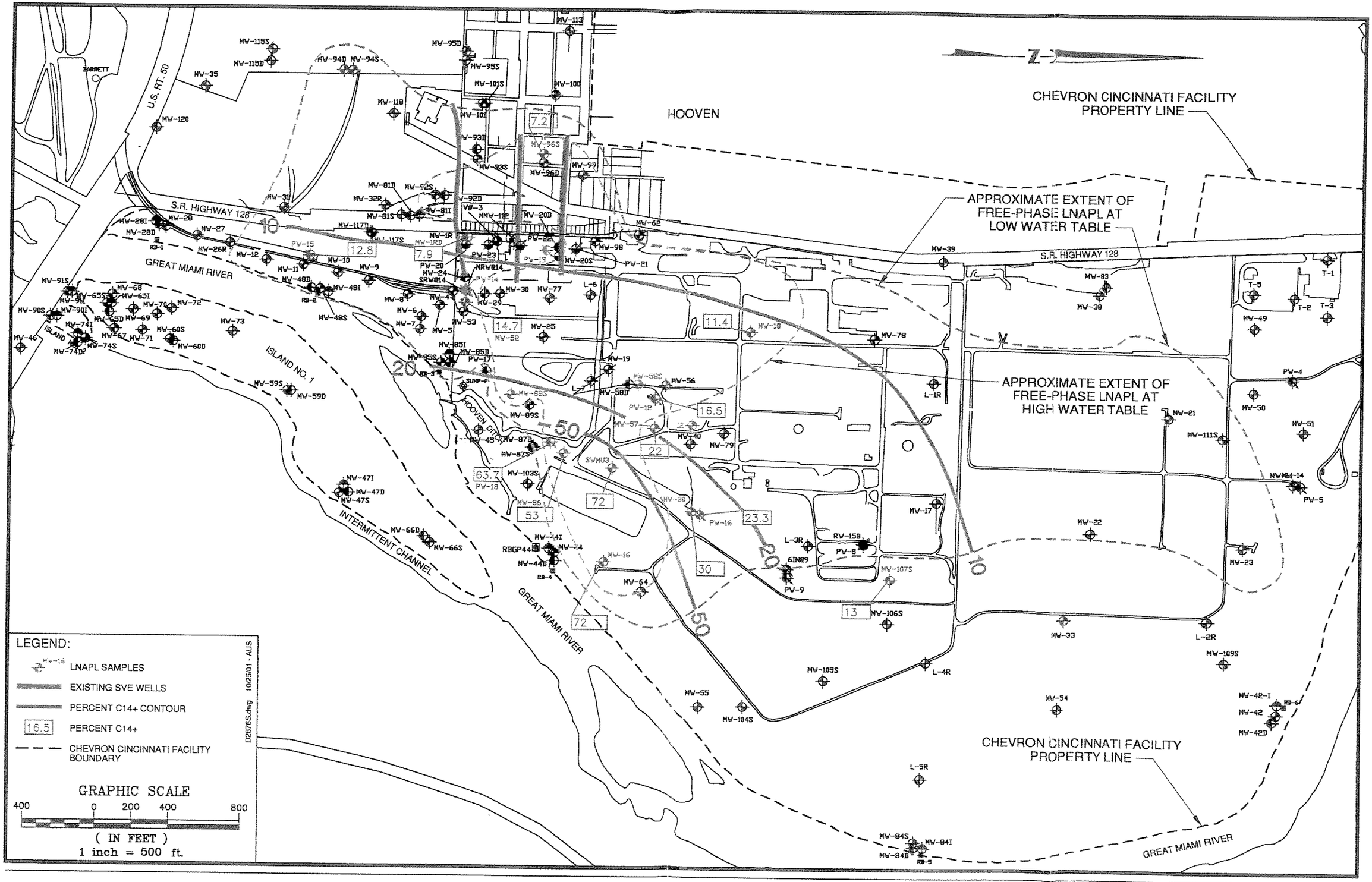
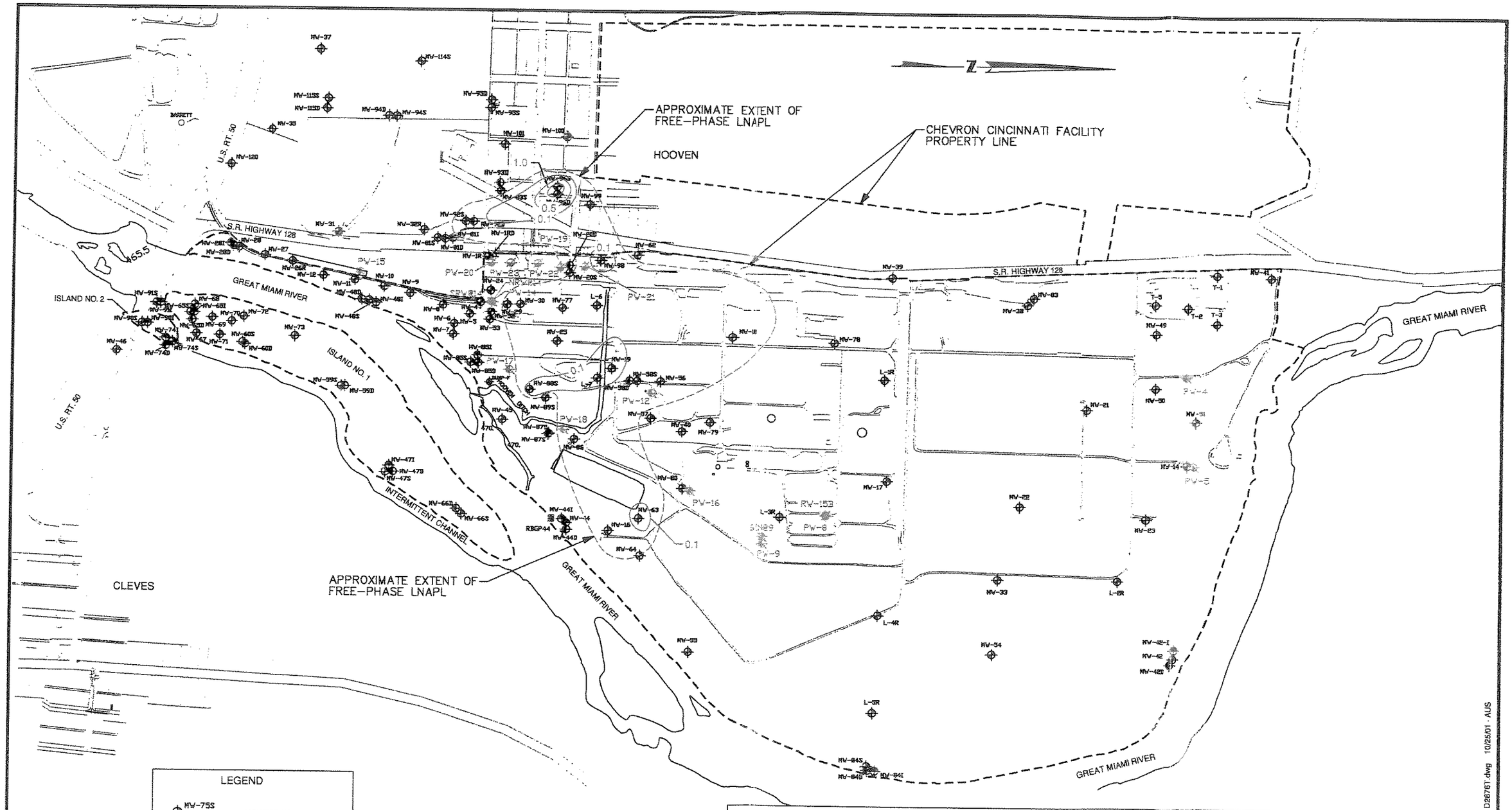


Figure 2-11. Distribution of Hydrocarbon Fractions Heavier than C14



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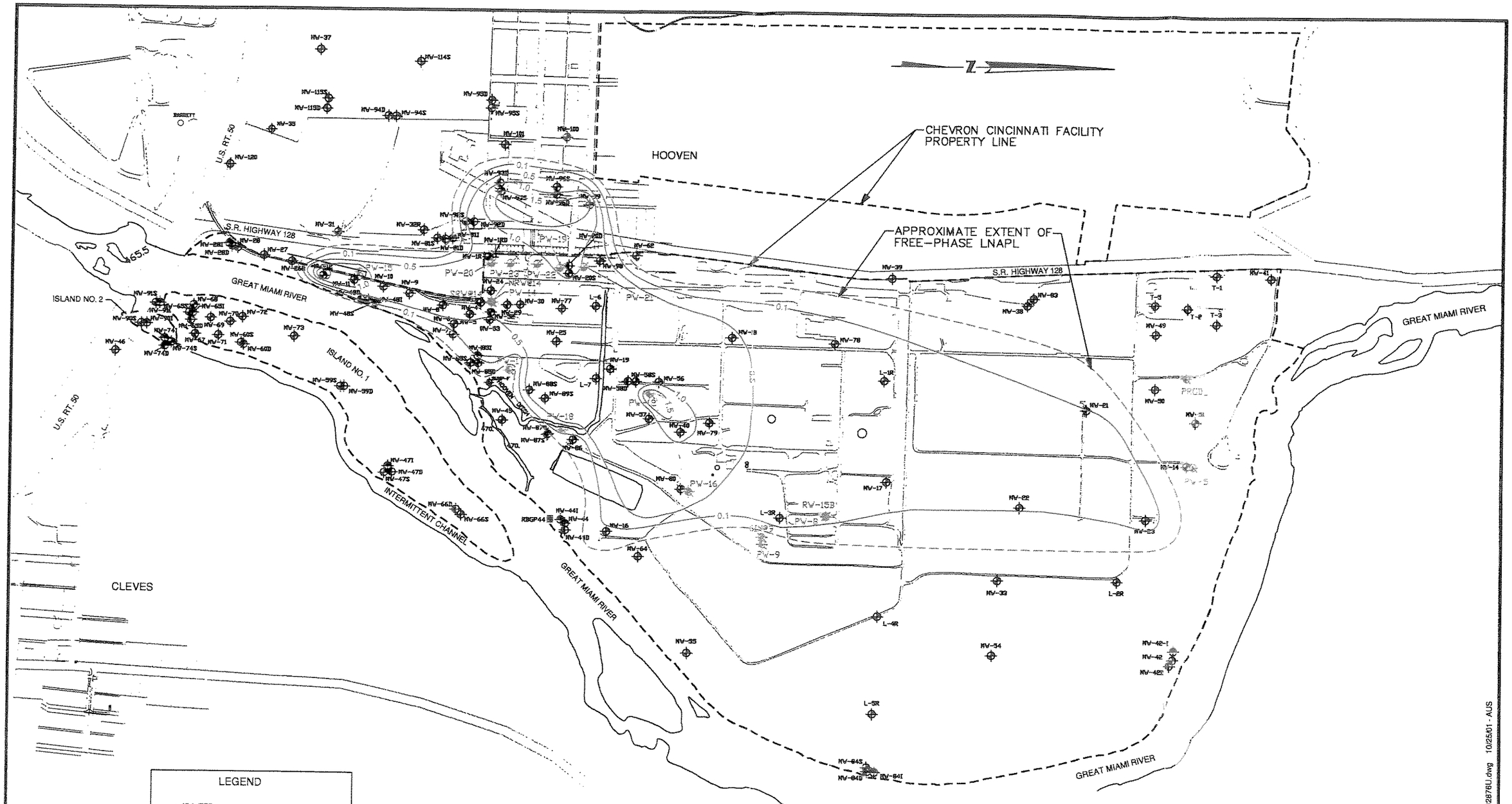
Extent of Free-Phase LNAPL during Typical High Water Table Conditions; March 31, 1999
CHEVRON PRODUCTS COMPANY
Cincinnati Facility
Hooven, Hamilton County, Ohio

DWN. BY: JK	SCALE:	DATE:	PROJECT-NO	FIGURE-NO
CHKD. BY: KCO	AS SHOWN	APRIL 1999	9905115	Figure 2-12



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Extent of Free-Phase LNAPL during Typical Low Water Table Conditions; September 24,1999
CHEVRON PRODUCTS COMPANY
Cincinnati Facility
Hooven, Hamilton County, Ohio

DWN. BY: JK	SCALE: AS SHOWN	DATE: April 1999	PROJECT-NO 9905115	FIGURE-NO Figure 2-13
CHKD. BY: KCO				

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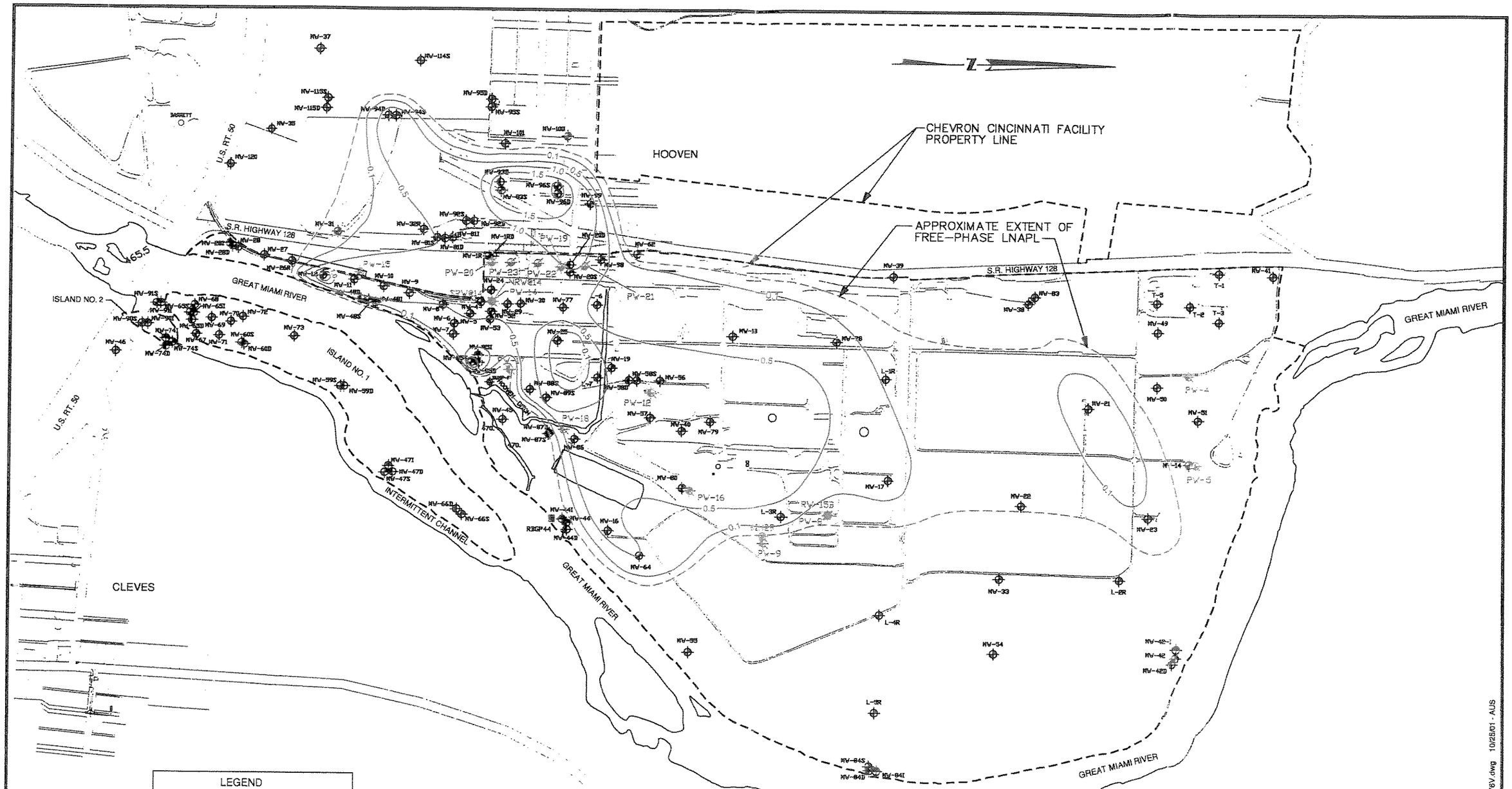

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Extent of Free-Phase LNAPL during Extreme Low Water Table; November 22, 1999
CHEVRON PRODUCTS COMPANY
Cincinnati Facility
Hooven, Hamilton County, Ohio

DWN. BY: JK	SCALE:	DATE:	PROJECT-NO	FIGURE-NO
CHKD. BY: KCO	AS SHOWN	April 1999	9905115	Figure 2-14

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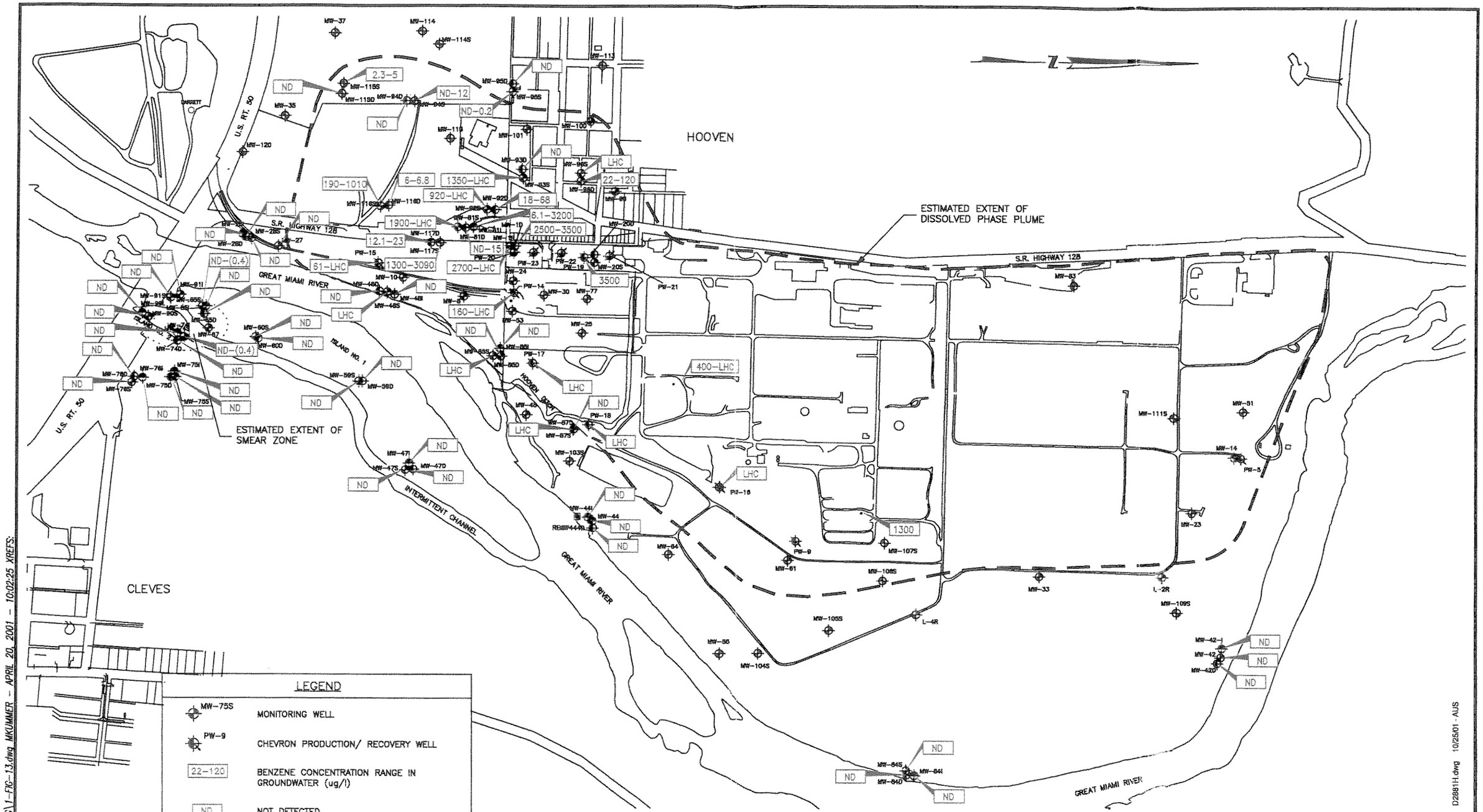

LEGEND

- MW-75S — MONITORING WELL
- PW-9 — CHEVRON PRODUCTION/ RECOVERY WELL
- 22-120 — BENZENE CONCENTRATION RANGE IN GROUNDWATER (ug/l)
- ND — NOT DETECTED
- LHC — LIQUID HYDROCARBON PRESENT
- ESTIMATED EXTENT OF DISSOLVED PHASE PLUME

NOTE: DATA PRESENTED IN TABLE 1

BENZENE DATA ONLY FROM NESTED WELLS AND PRODUCTION WELLS.

SCALE: 1"= 600'

0 600 1200

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DWN. BY: MTM	SCALE: AS SHOWN	DATE: JULY 2000
CHKD. BY: RLB		

Benzene Concentrations in Groundwater

CHEVRON PRODUCTS COMPANY
Cincinnati Facility

Hooven, Hamilton County, Ohio

PROJECT NO: 200049

FIGURE NO: Figure 2-15

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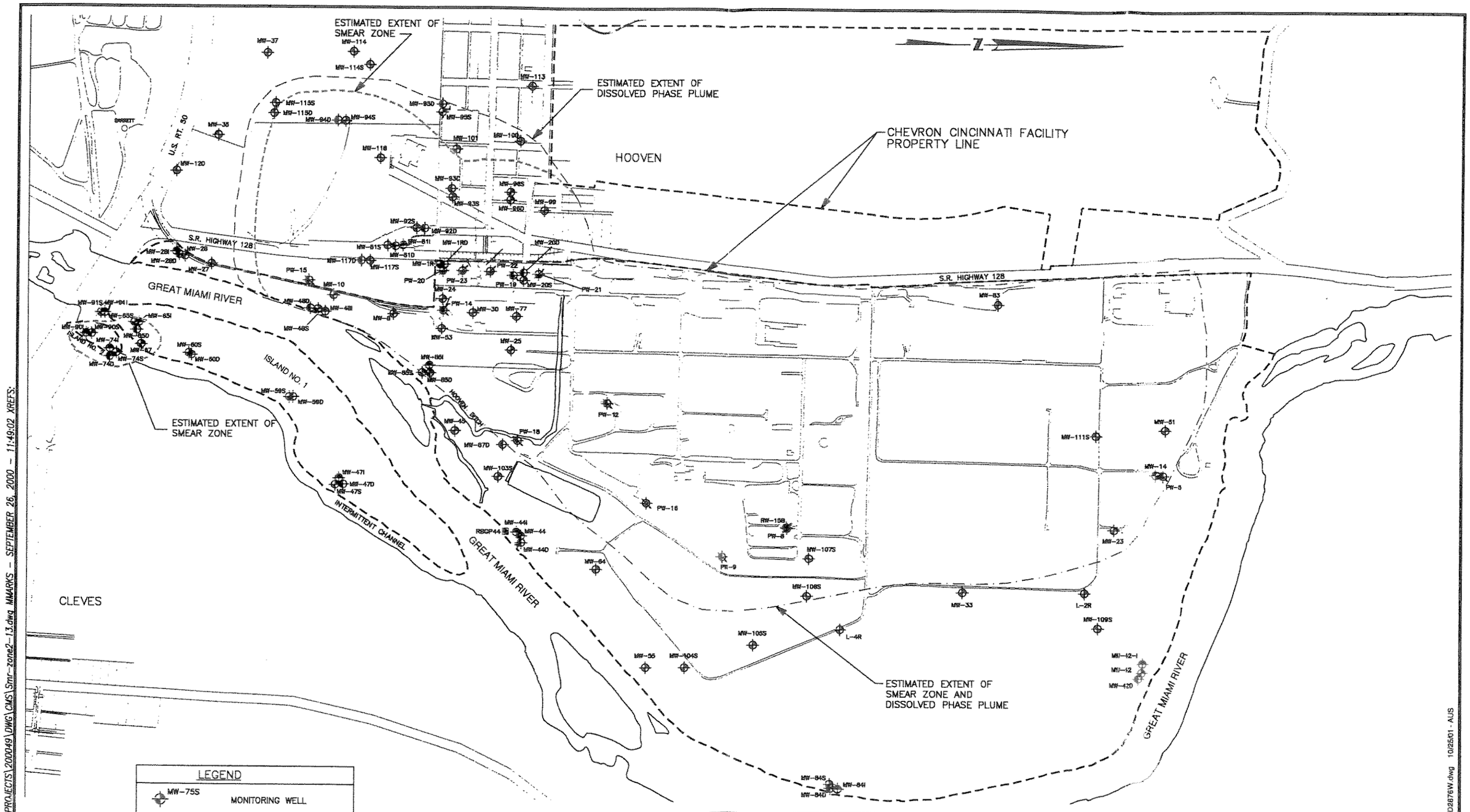

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D'WN. BY: MEB	SCALE:	DATE:	PROJECT NO.:	FIGURE NO:
CHKD. BY: RLB	AS SHOWN	JULY 2000	200049	Figure 2-16

Estimated Extent of LNAPL Smear Zone and Dissolved Phase Plume
CHEVRON PRODUCTS COMPANY
Cincinnati Facility
Hooven, Hamilton County, Ohio

CHEVRON CINCINNATI FACILITY
PROPERTY LINE

Legend

- MW-55 — Existing Monitoring Well to be Sampled
- PW-16 — Existing Production Well to be Sampled
- MW-81S / 23 — Concentration of Total Arsenic Detected during Phase II RFI (ug/L)
- MW-96S / <10 — Concentration of Total Arsenic Detected during Phase I RFI or subsequent Hooven Investigation (ug/L)
- 20 — Arsenic concentration Isopleth (dashed where uncertain)

GRAPHIC SCALE

300 0 150 300 600

(IN FEET)

Figure 2-17
Arsenic in Groundwater
Isopleth Map

RCRA Facility Investigation
Chevron Products Company
Cincinnati Facility
Hooven, Ohio
4898005

Environmental Science & Engineering, Inc.
A MACTEC Company

RED 01/13/00 chevron/rfireport
Revised RED 03/08/00 arsgwiso

D2876X.DWG 10/25/01 - AUS

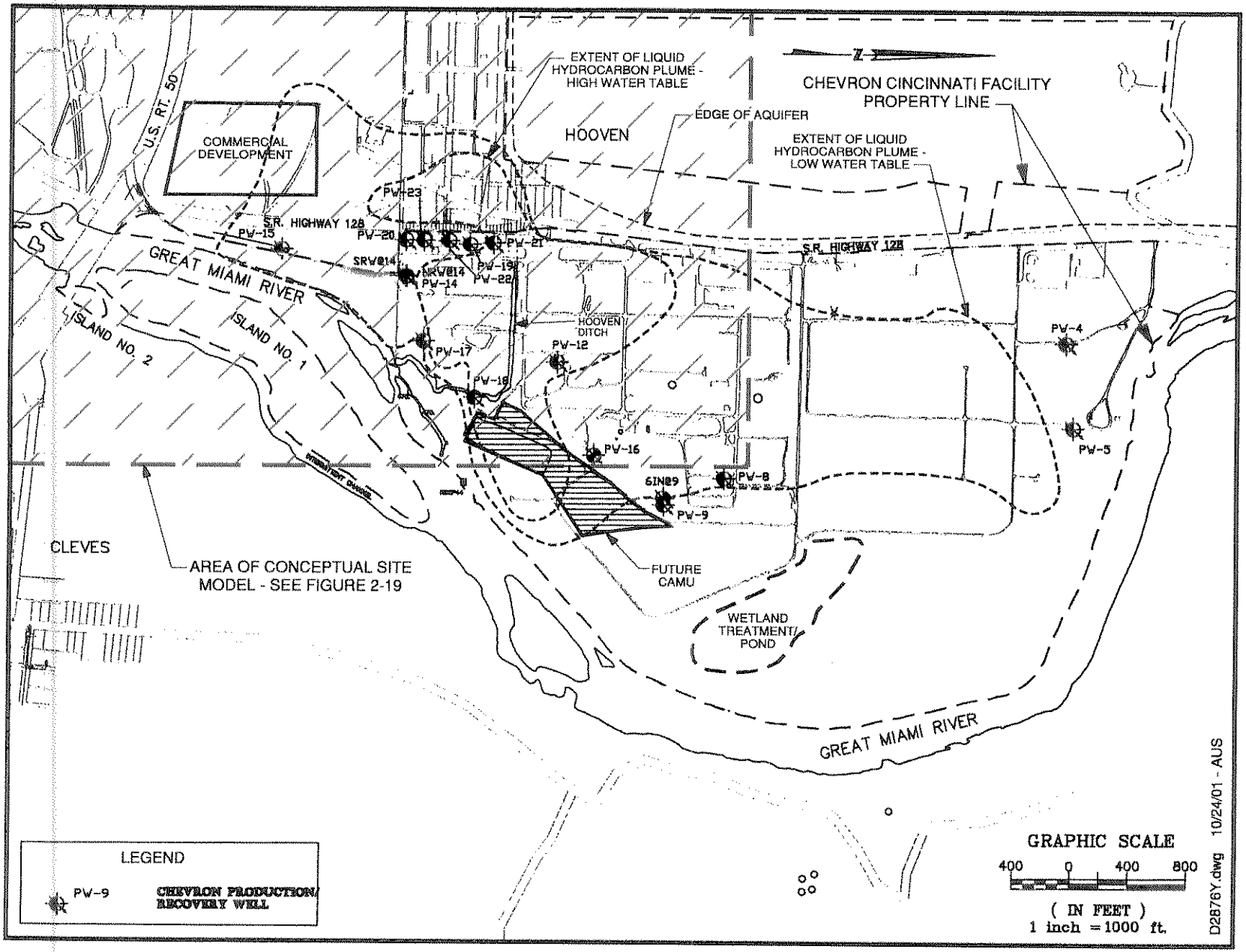


Figure 2-18. Site Map

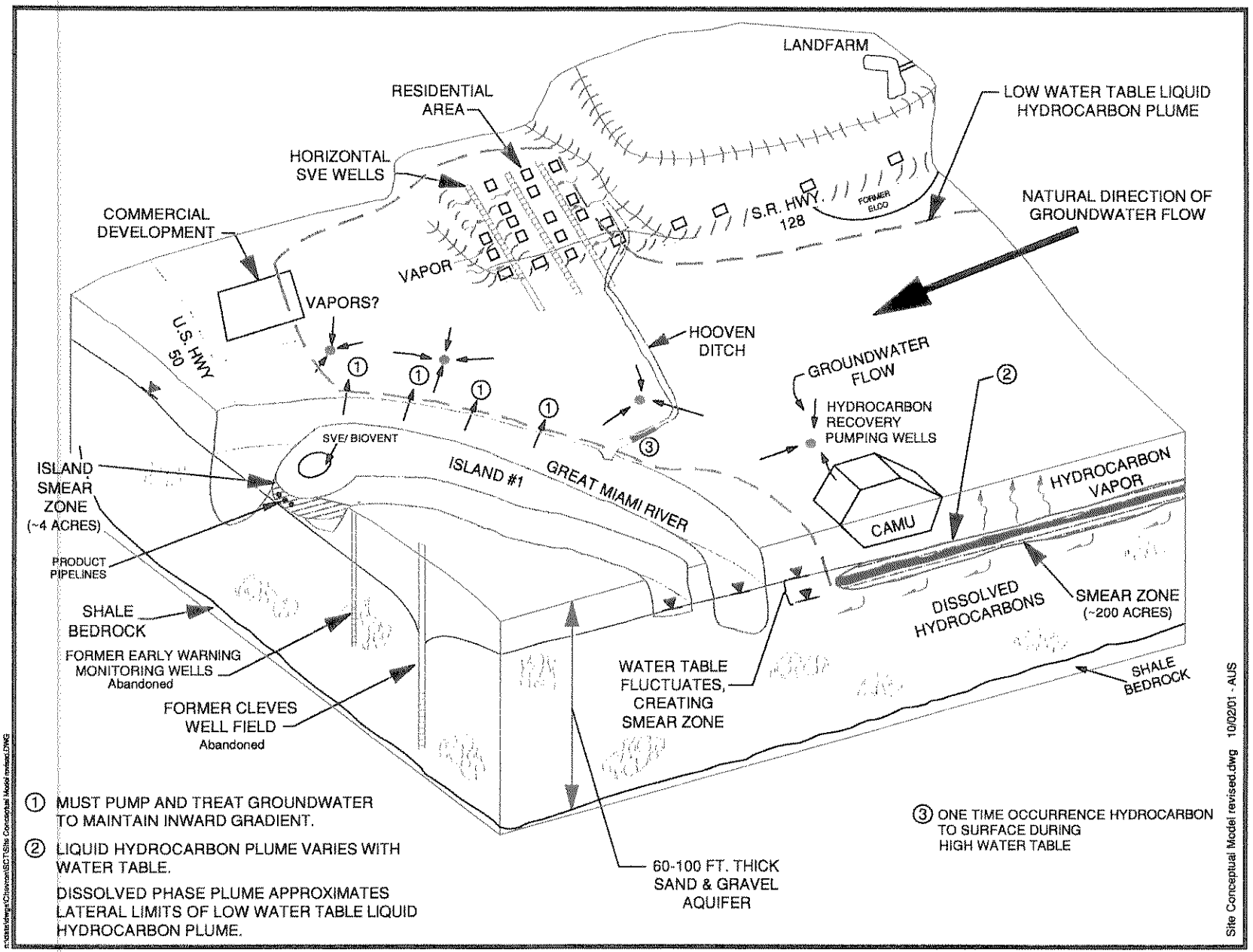
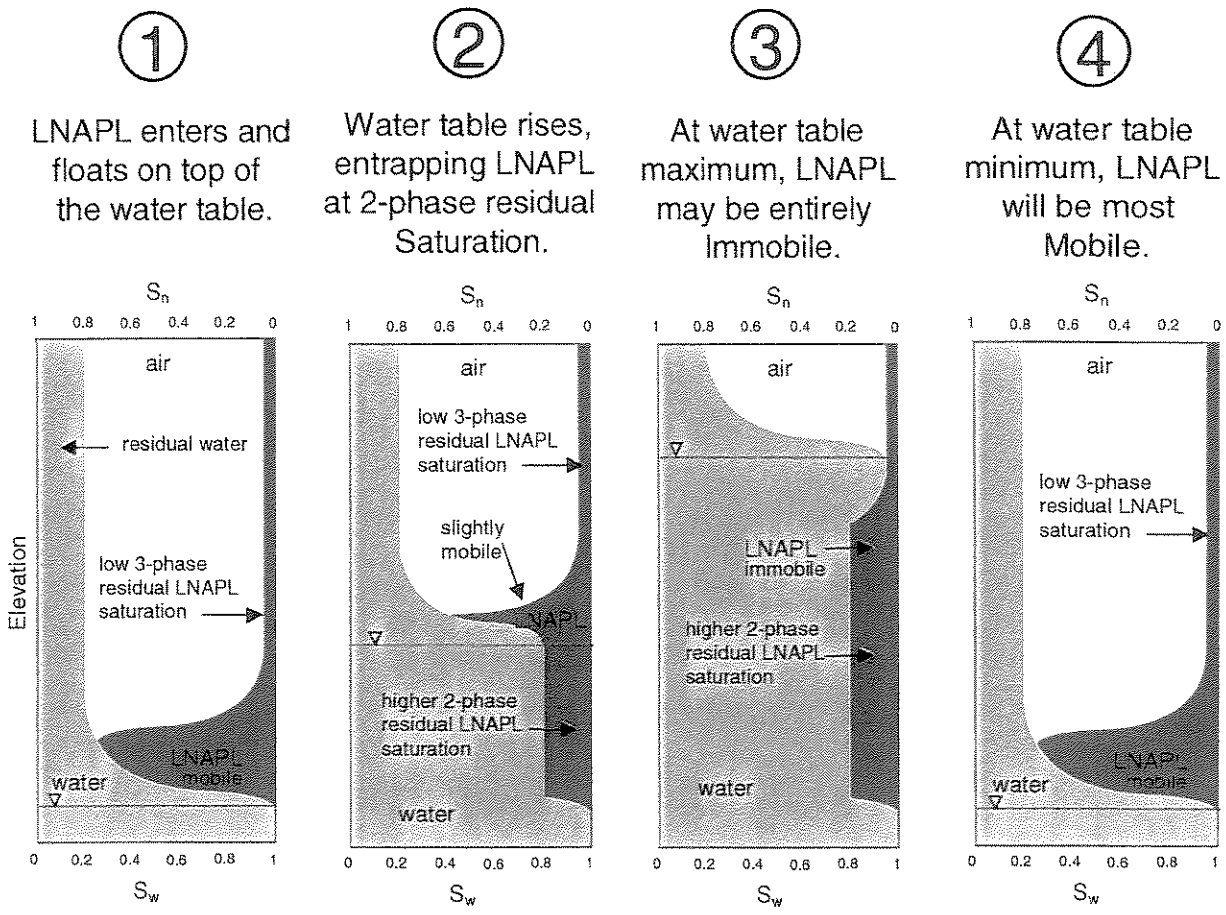


Figure 2-19. Site Conceptual Model, CHEVRON CINCINNATI FACILITY

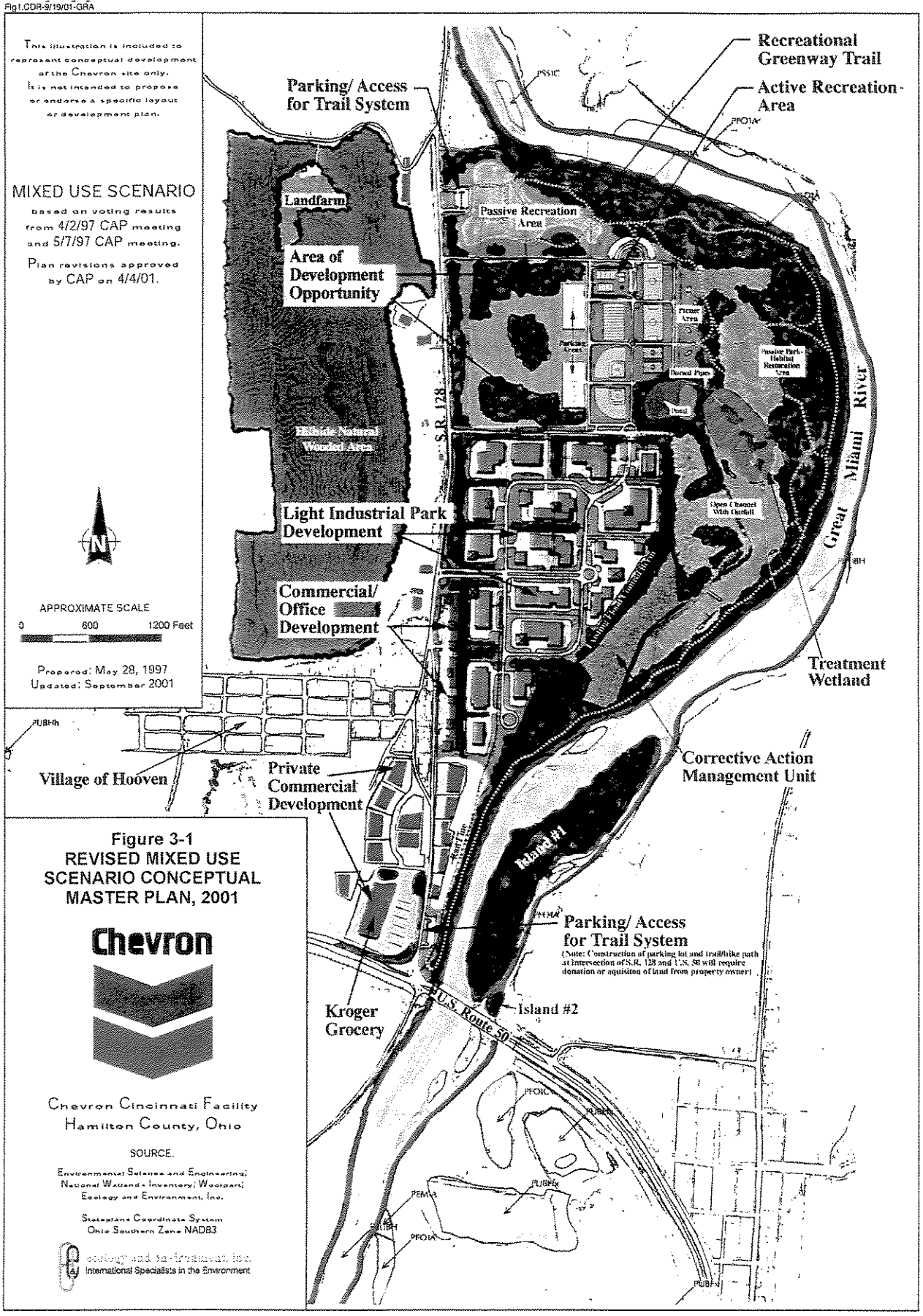


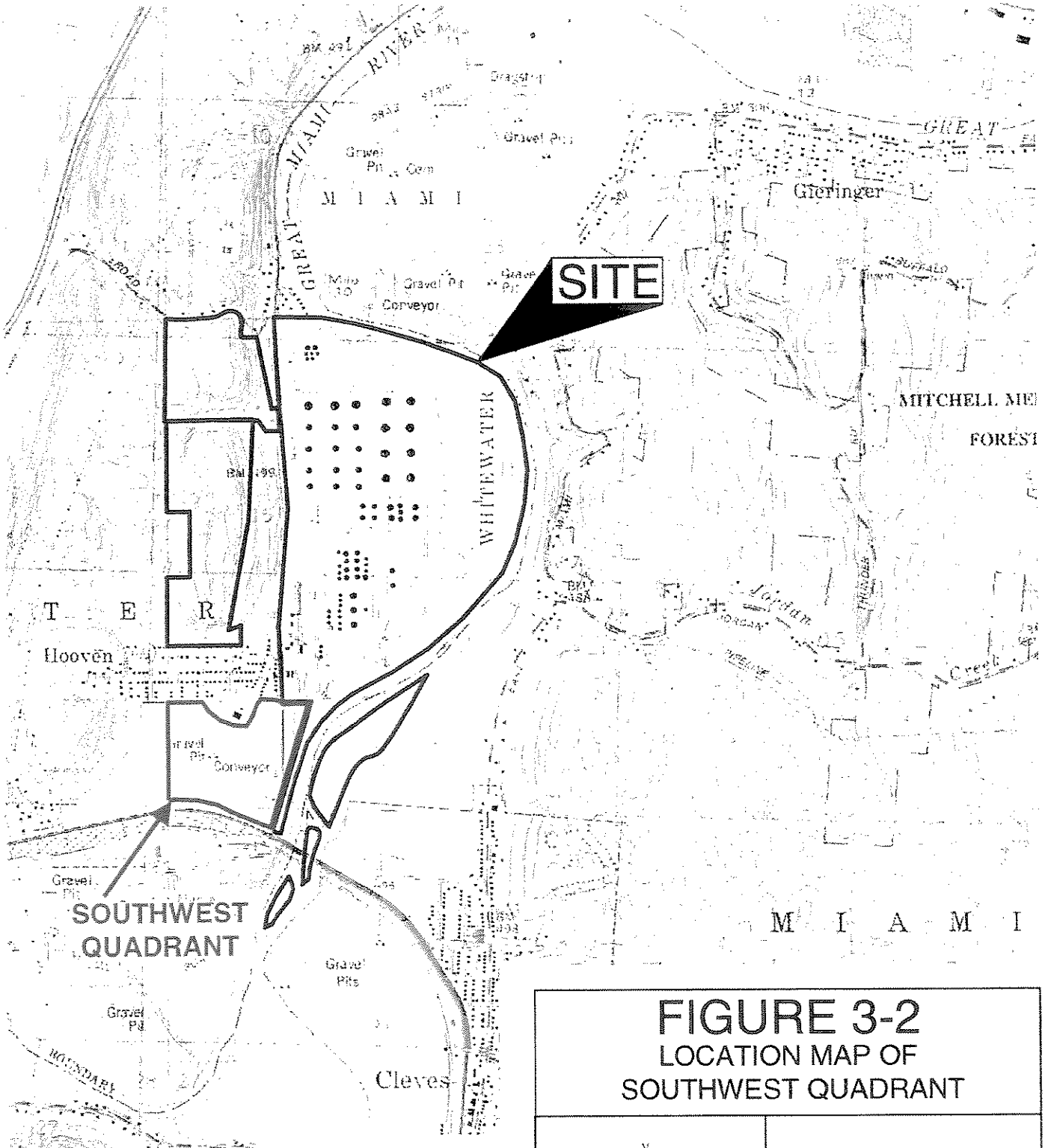
Note: S_w = Saturation of water, S_n = Saturation of LNAPL

Figure 2-20

Schematic of LNAPL Redistribution by a Fluctuating Water Table

02:000603_CC01_00_11-60575
Fig1.CDR-9/19/01-GRA



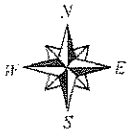


Adapted from United States Geological Survey 7.5 Minute Series 1996, Hooven and Addyston Quadrangles

FIGURE 3-2
LOCATION MAP OF SOUTHWEST QUADRANT

Quadrangle Location

OHIO



1 inch = 2000 feet

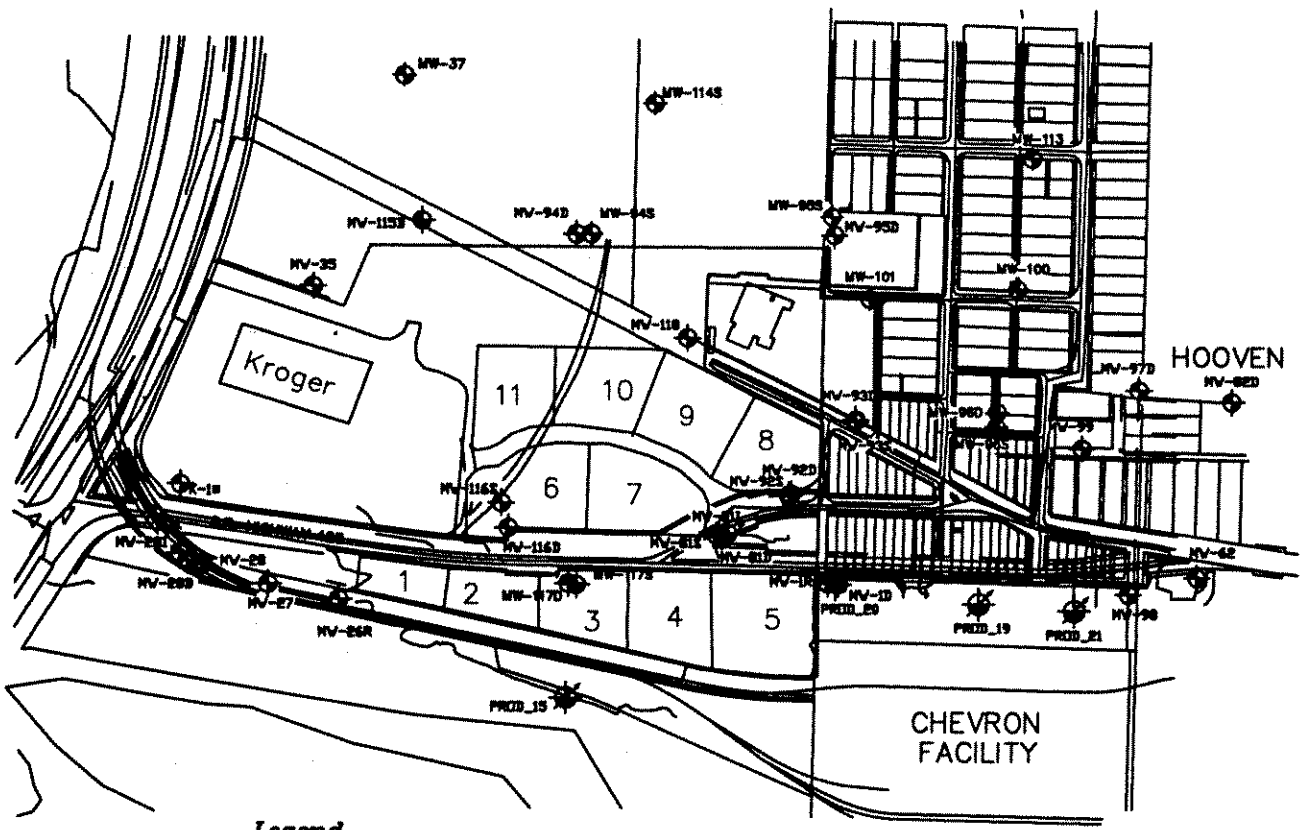
Chevron Products Company

Cincinnati Facility

Hooven, Ohio

URS

10/2/01 ANM



Legend

7 — Golsch parcels in Southwest Quadrant

MW-26R — Monitoring Well Location

PRODUCTION WELL 15 — Chevron Facility Production Well Location

* MW-K-1 has been abandonded *

approx.
0 400 800
feet

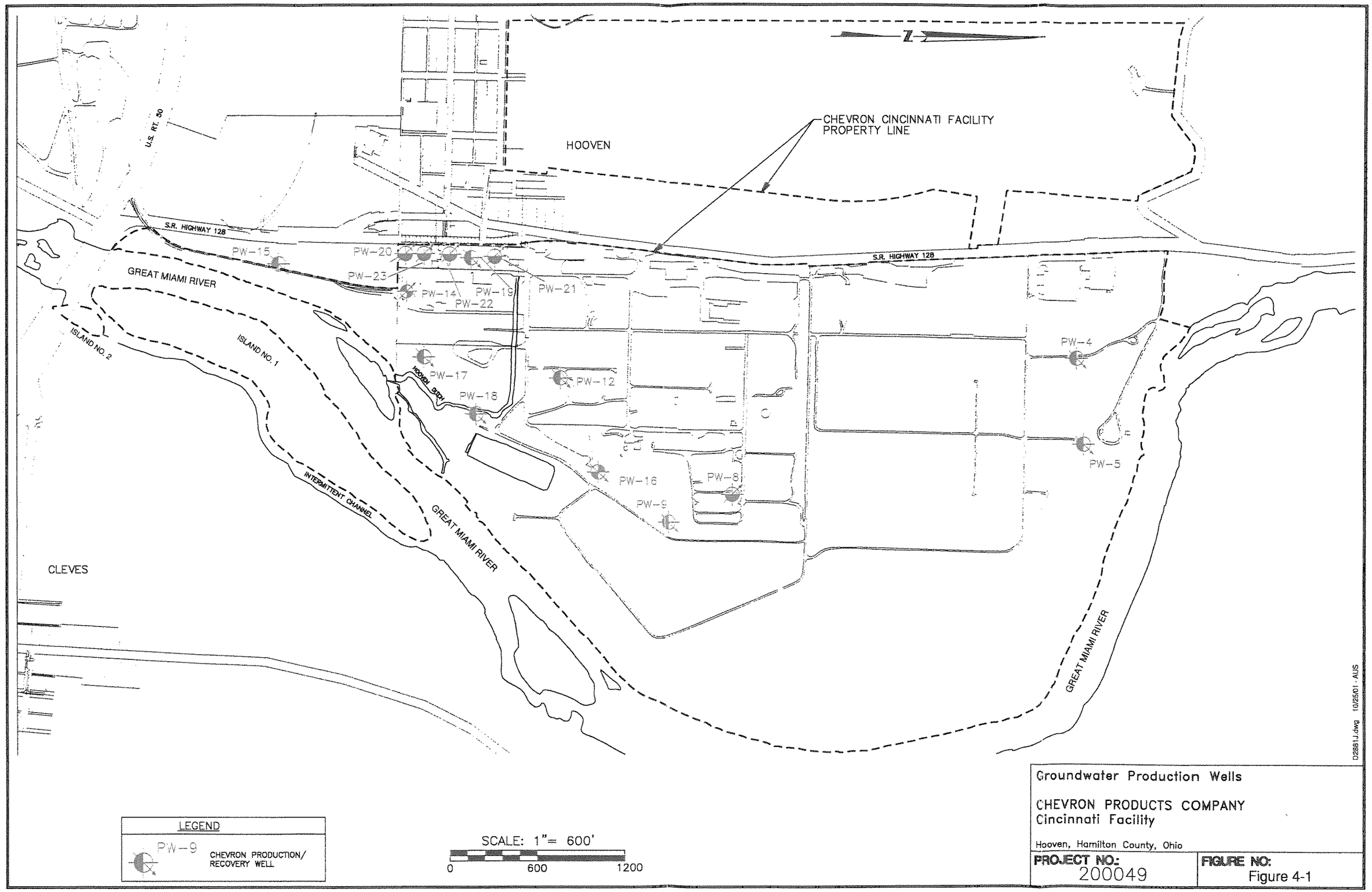
Figure 3-3
Southwest Quadrant and Hooven Area

Chevron Products Company
Managed by Chevron EMC
Cincinnati Facility
Hooven, Ohio
Hamilton County

Harding ESE
A MACTEC Company

KTK 5/21/01
Revised * *
chevoogle quadbase

D2881B 08/30/01 - AUS



Groundwater Production Wells

CHEVRON PRODUCTS COMPANY
Cincinnati Facility

Hooven, Hamilton County, Ohio

PROJECT NO:	FIGURE NO:
200049	Figure 4-1

controlled by measuring the effluent dissolved oxygen (DO) concentration and the oxygen feed is set so that the effluent DO remains at 1.5 mg O_2/L (see Figure 4-2).

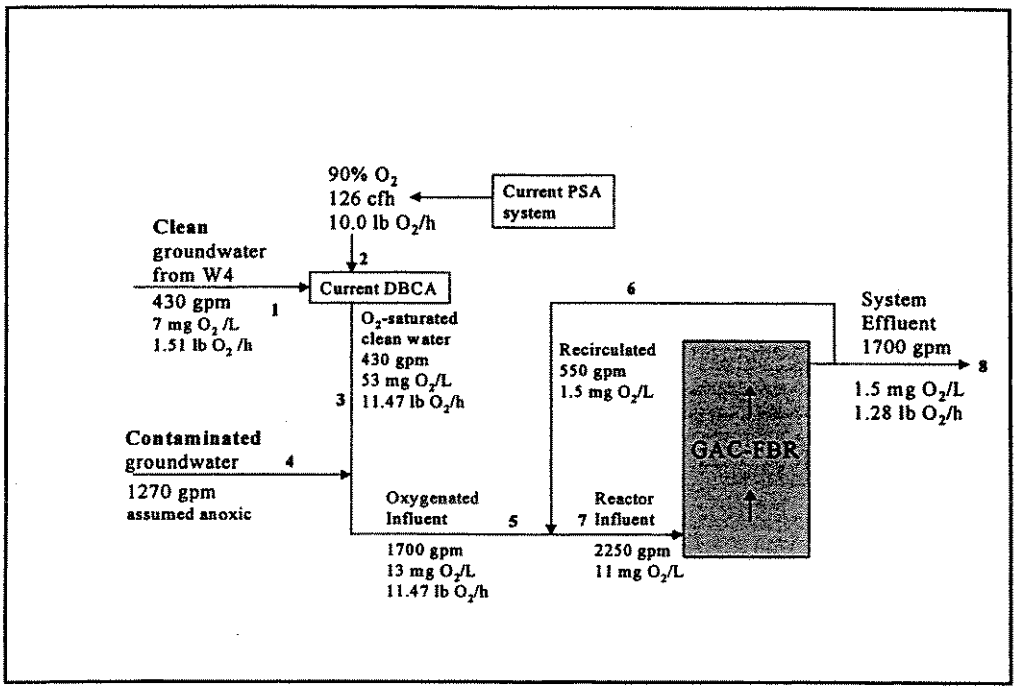


Figure 4-2
Chevron Cincinnati GAC-FBR System Schematic
for High Water Table Operation

During fall and winter, the focus of the pump-and-treat operation shifts to free-phase LNAPL recovery. As a result, the groundwater pumping rate may double, to 3400 gpm, of which 860 gpm is clean oxygen carrier water from PW 4 or 5. This requires that both treatment trains be used; in essence two of the systems depicted in Figure 4-2 are operated in parallel. At times, the system is oxygen-limited, i.e., even with the full 340 cfh oxygen generating capacity in use, the water flow rate must be reduced to meet the 1.5 mg O_2/L parameter in the system effluent.

The effluent from the FBR system is conveyed to an impoundment where it is polished before discharge to the Great Miami River.

Figure 4-3: Summary of Chevron Cincinnati Facility Free-Phase LNAPL Recovery

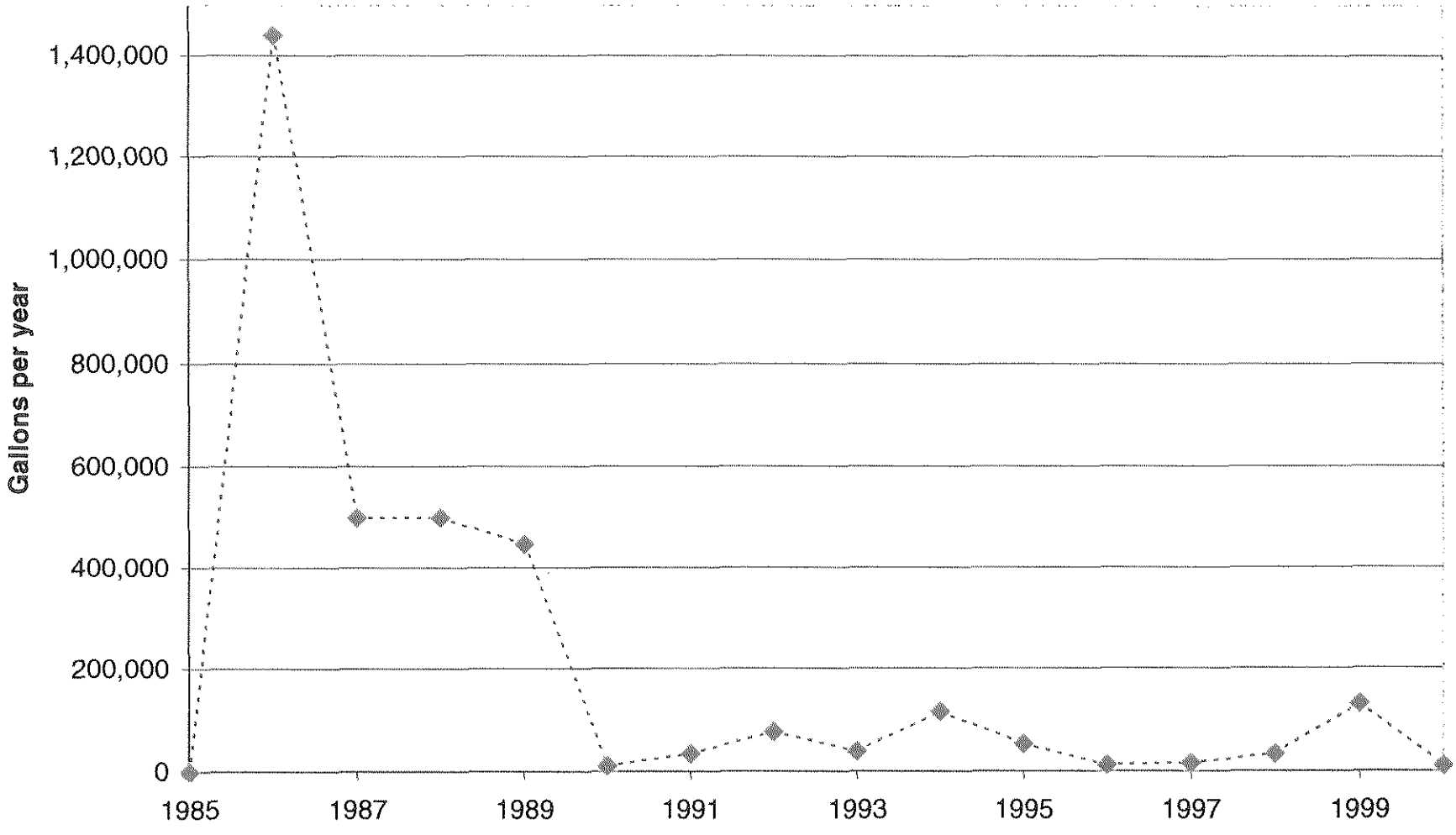
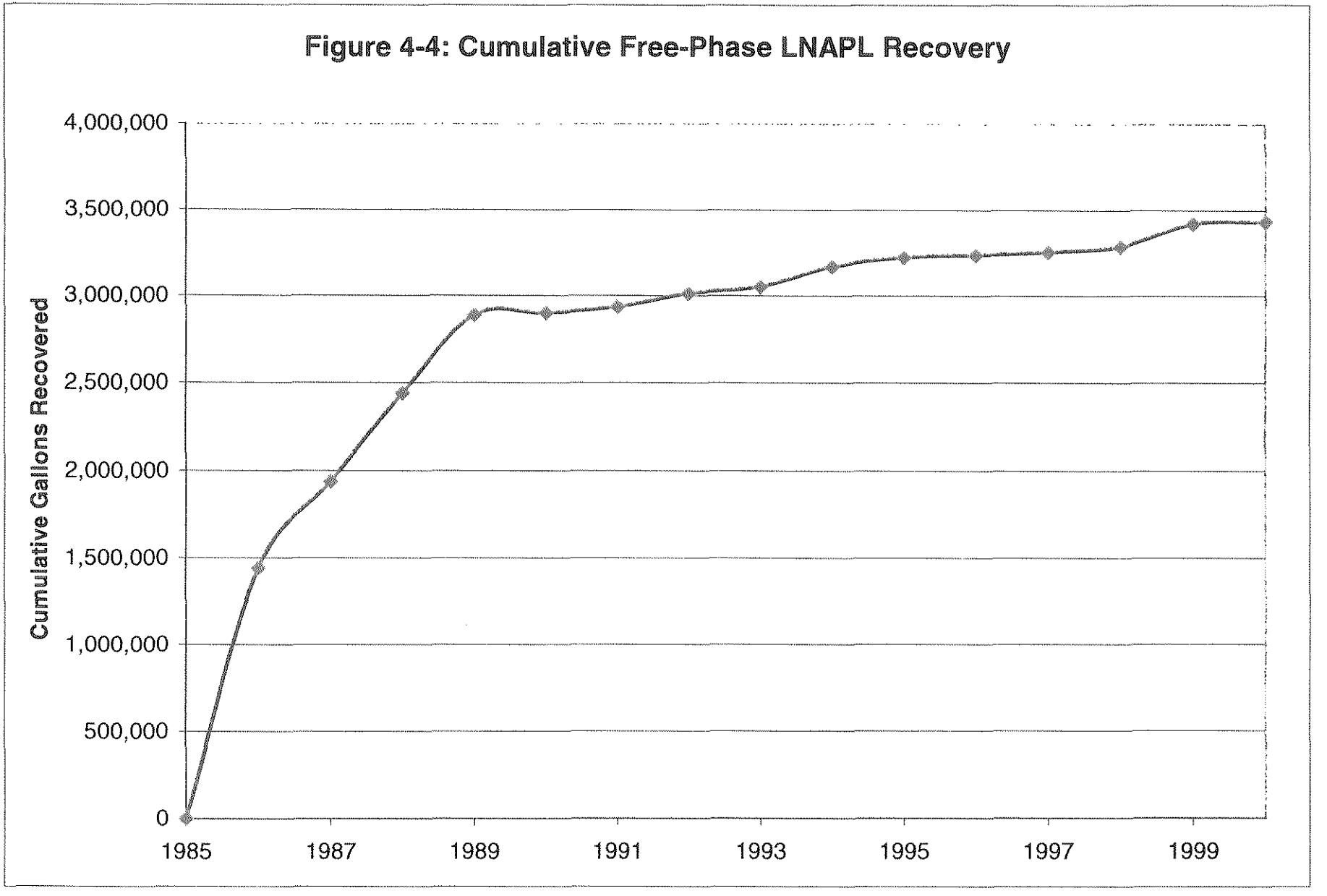


Figure 4-4: Cumulative Free-Phase LNAPL Recovery



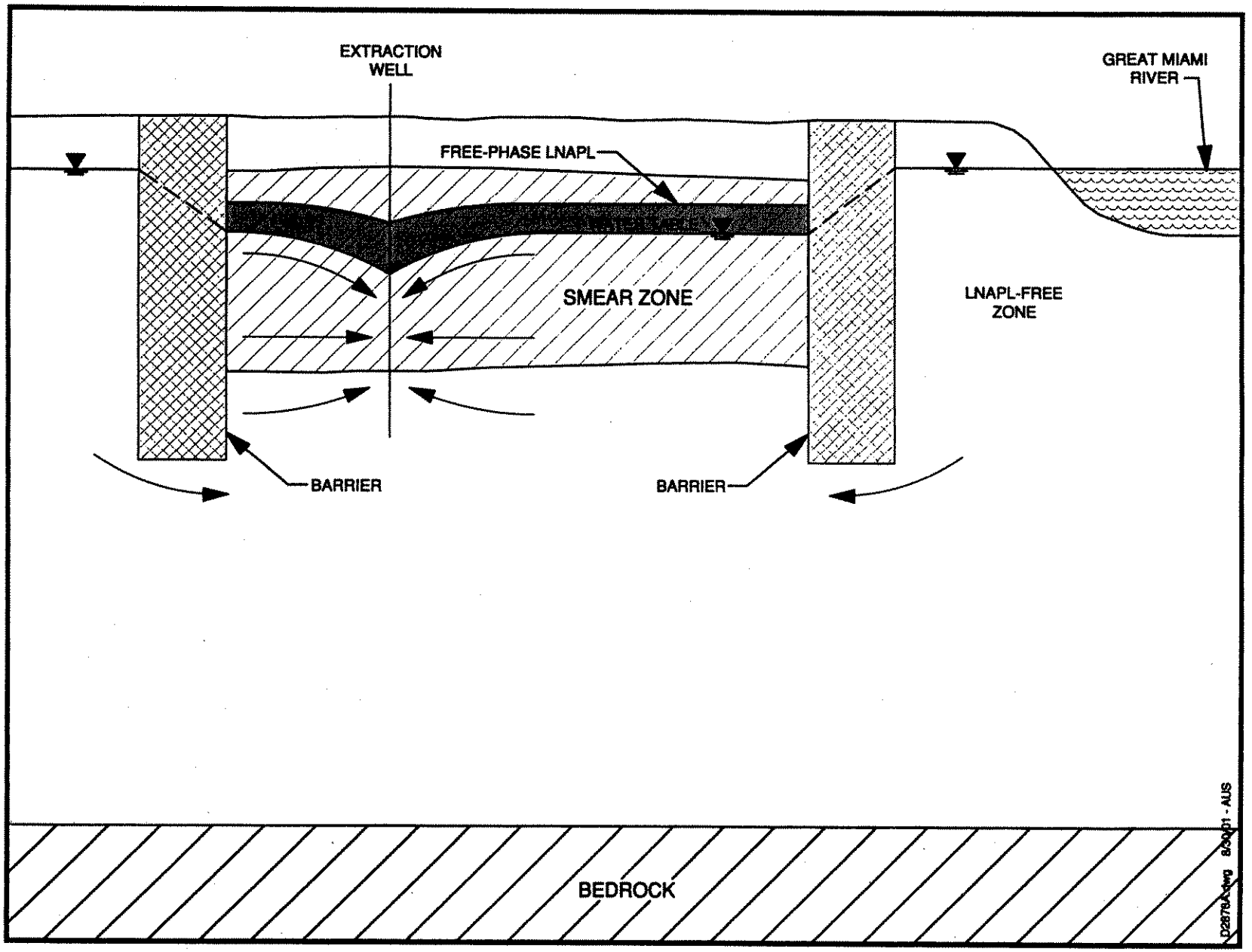


Figure 6-1. Conceptual Design of Partially-Penetrating Barriers at the Chevron Cincinnati Facility

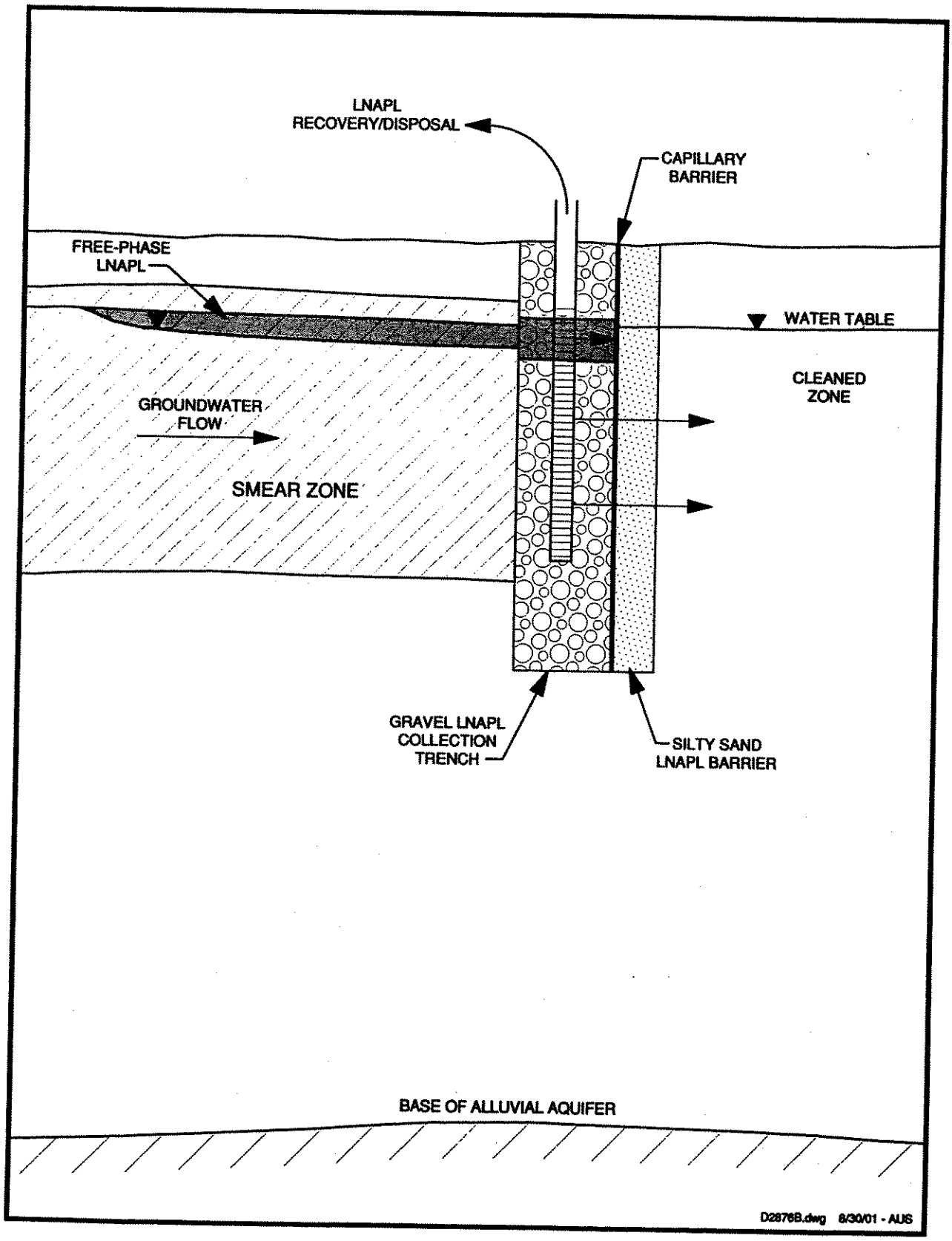


Figure 6-2. Conceptual Design of Capillary Barrier System at the Chevron Cincinnati Facility

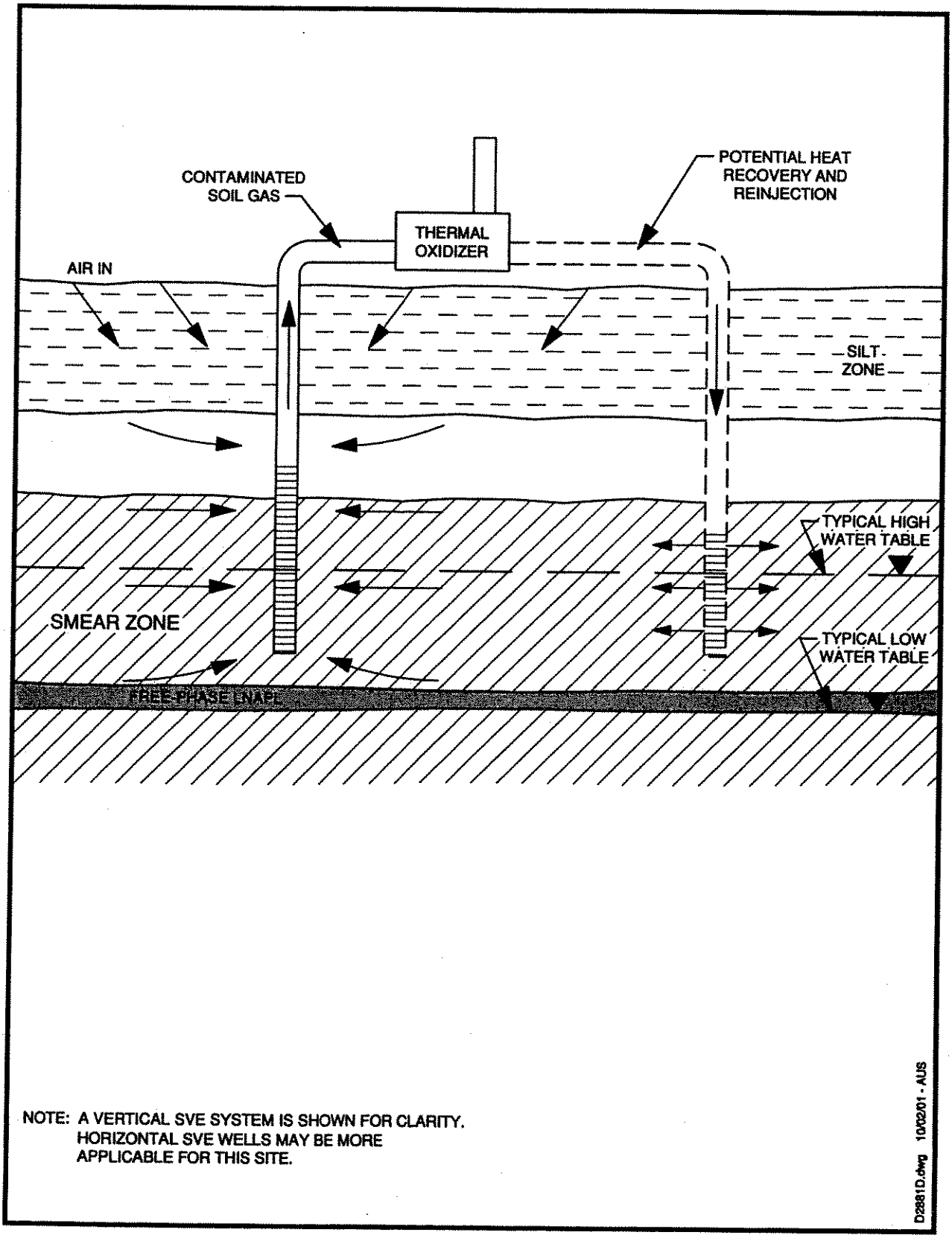


Figure 6-3. Conceptual Design of SVE at the Chevron Cincinnati Facility

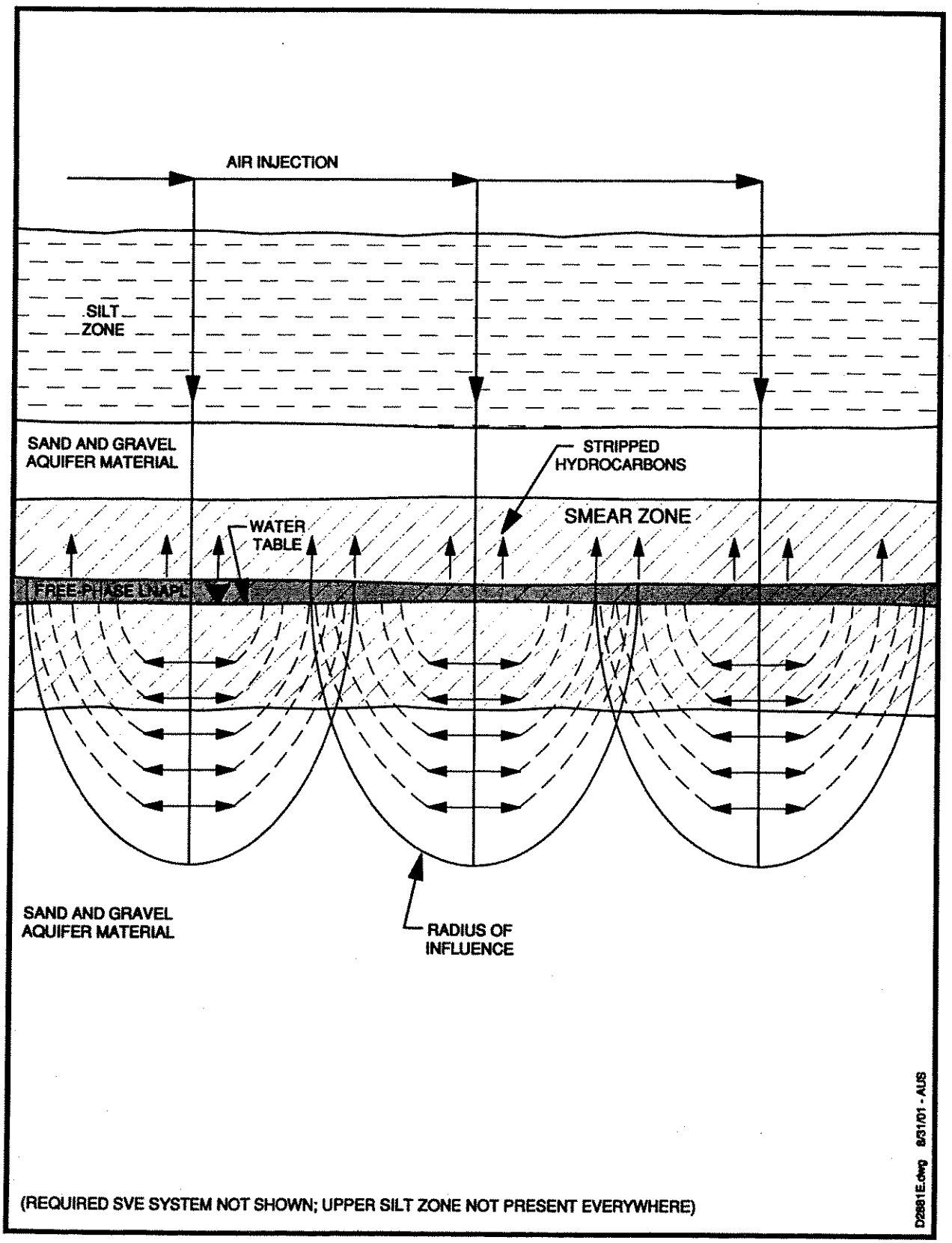


Figure 6-4. Conceptual Design of In-Situ Air Sparging System at the Chevron Cincinnati Facility

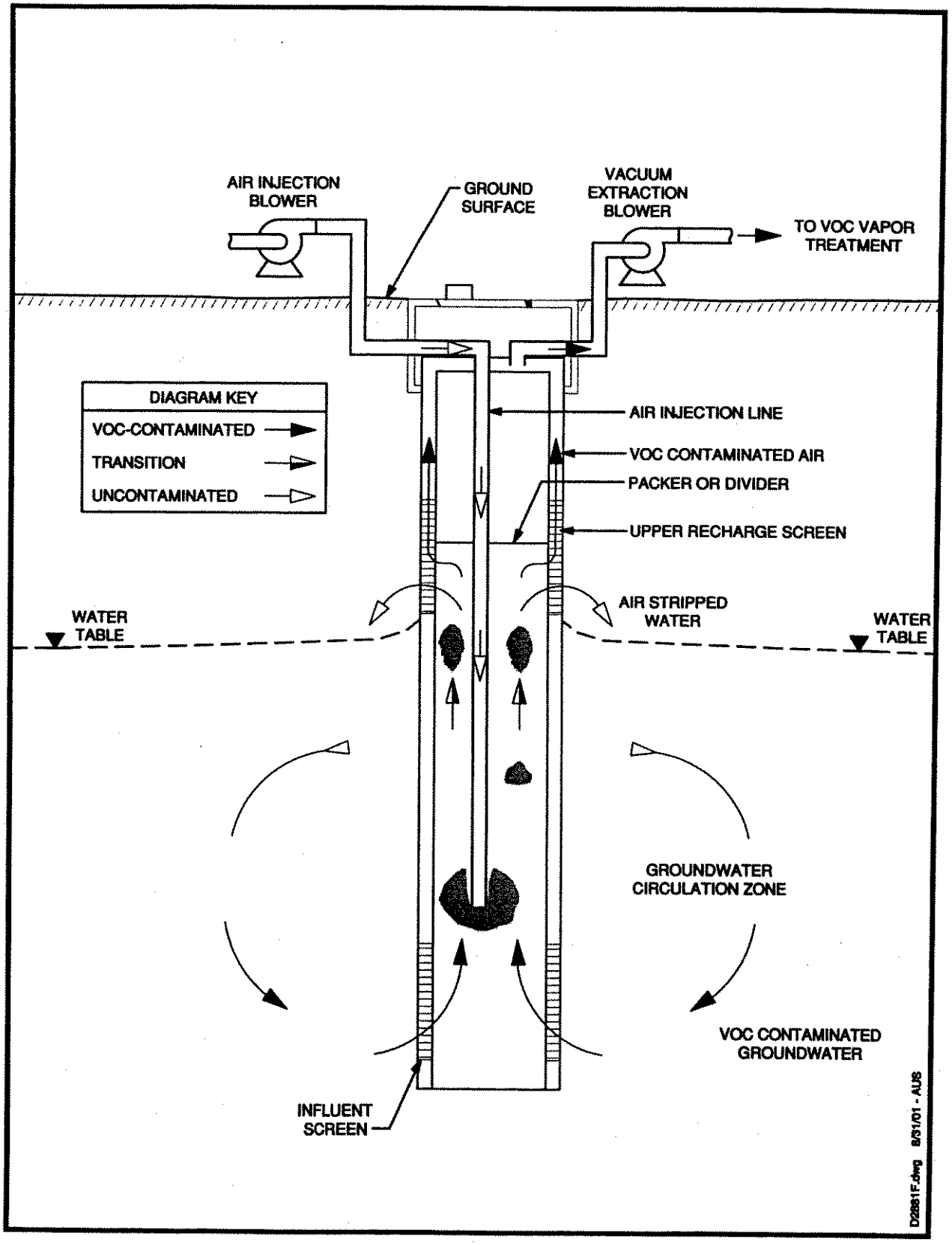


Figure 6-5. Conceptual Design for Groundwater Circulation Well Technology at the Chevron Cincinnati Facility

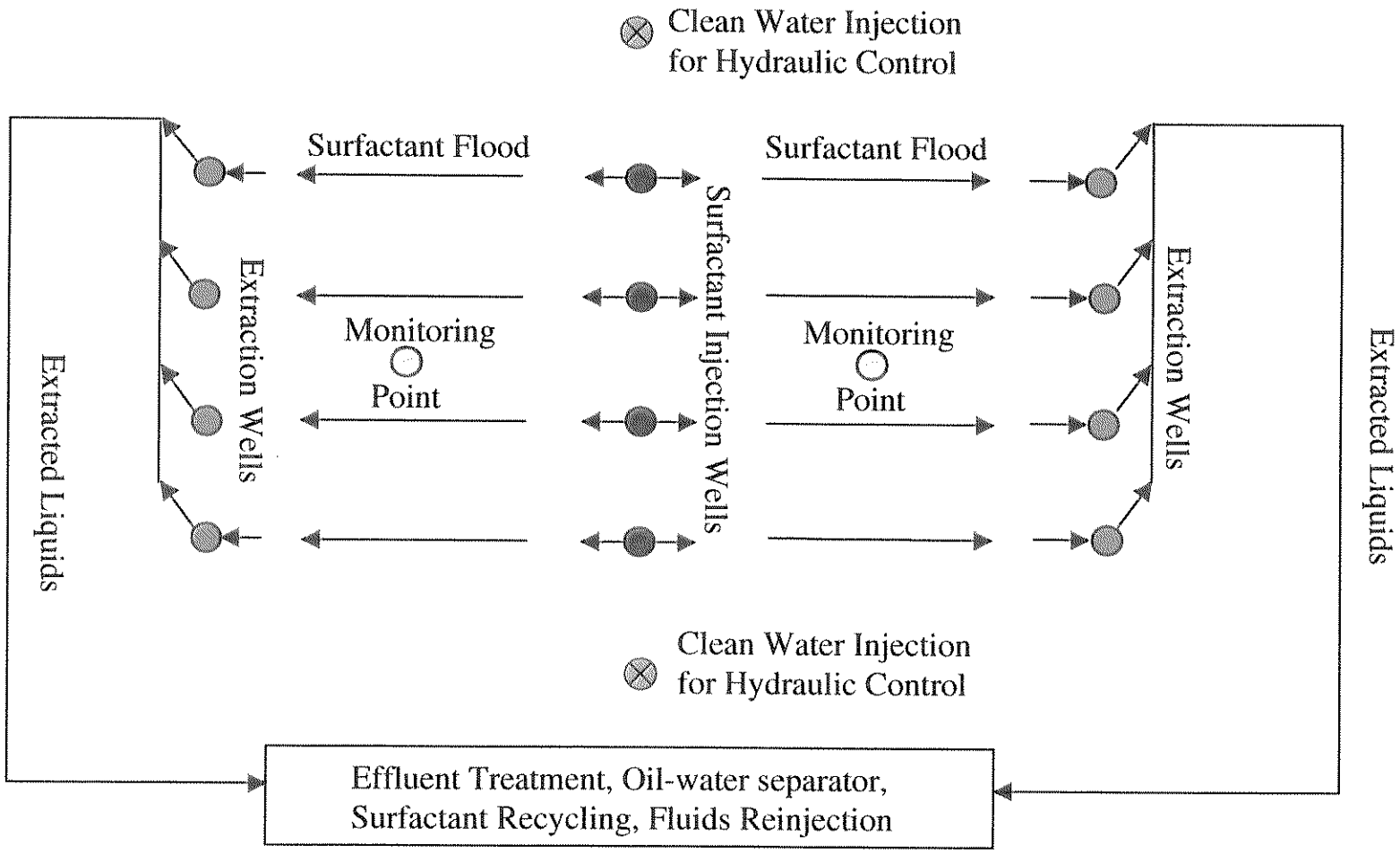


Figure 6-6
Illustration of Dual Line Drive for Surfactant Flooding (Plan View)

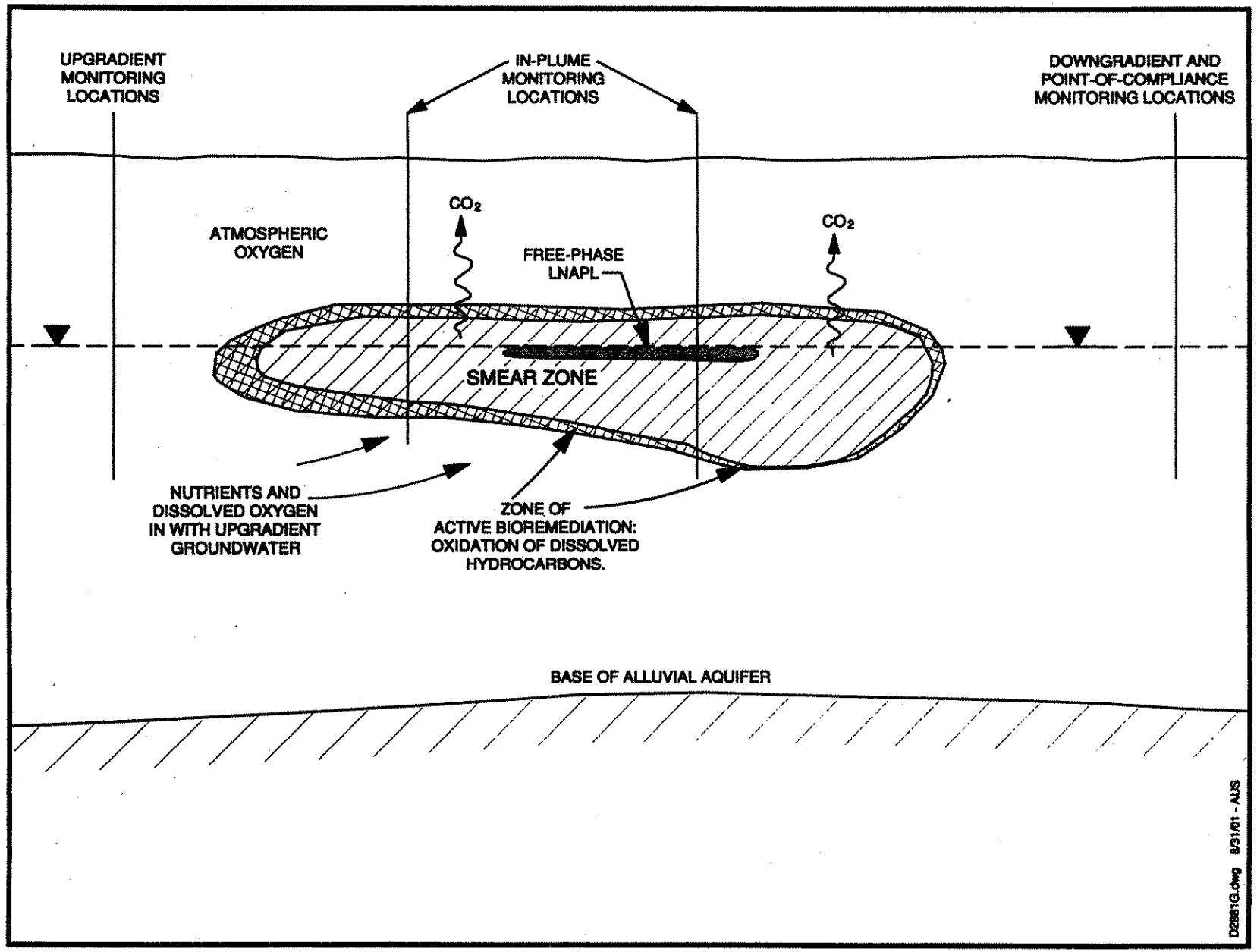


Figure 6-7. Conceptual Design for Monitored Natural Attenuation Technology at the Chevron Cincinnati Facility

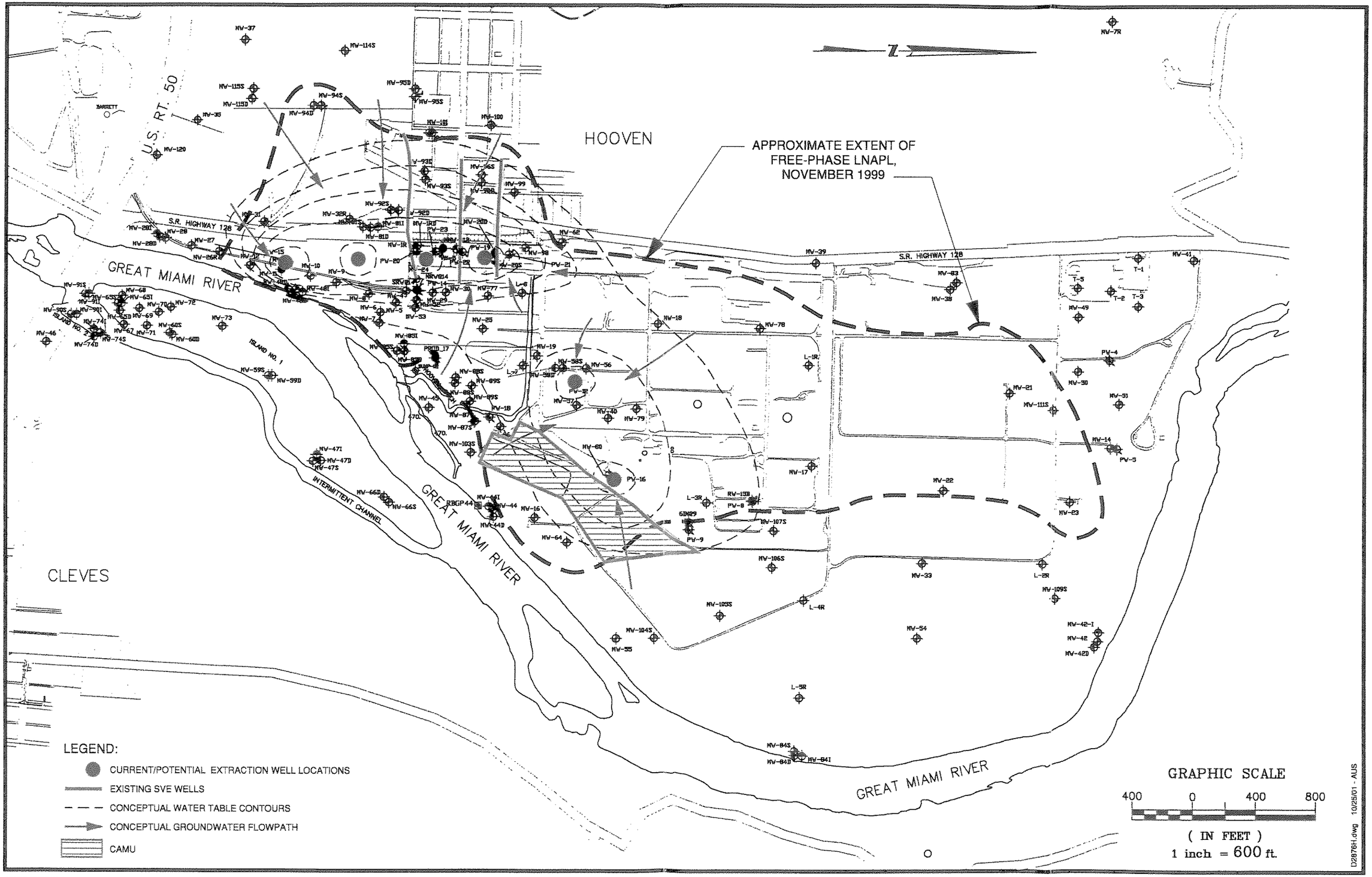


Figure 7-1: Alternative 1: Containment

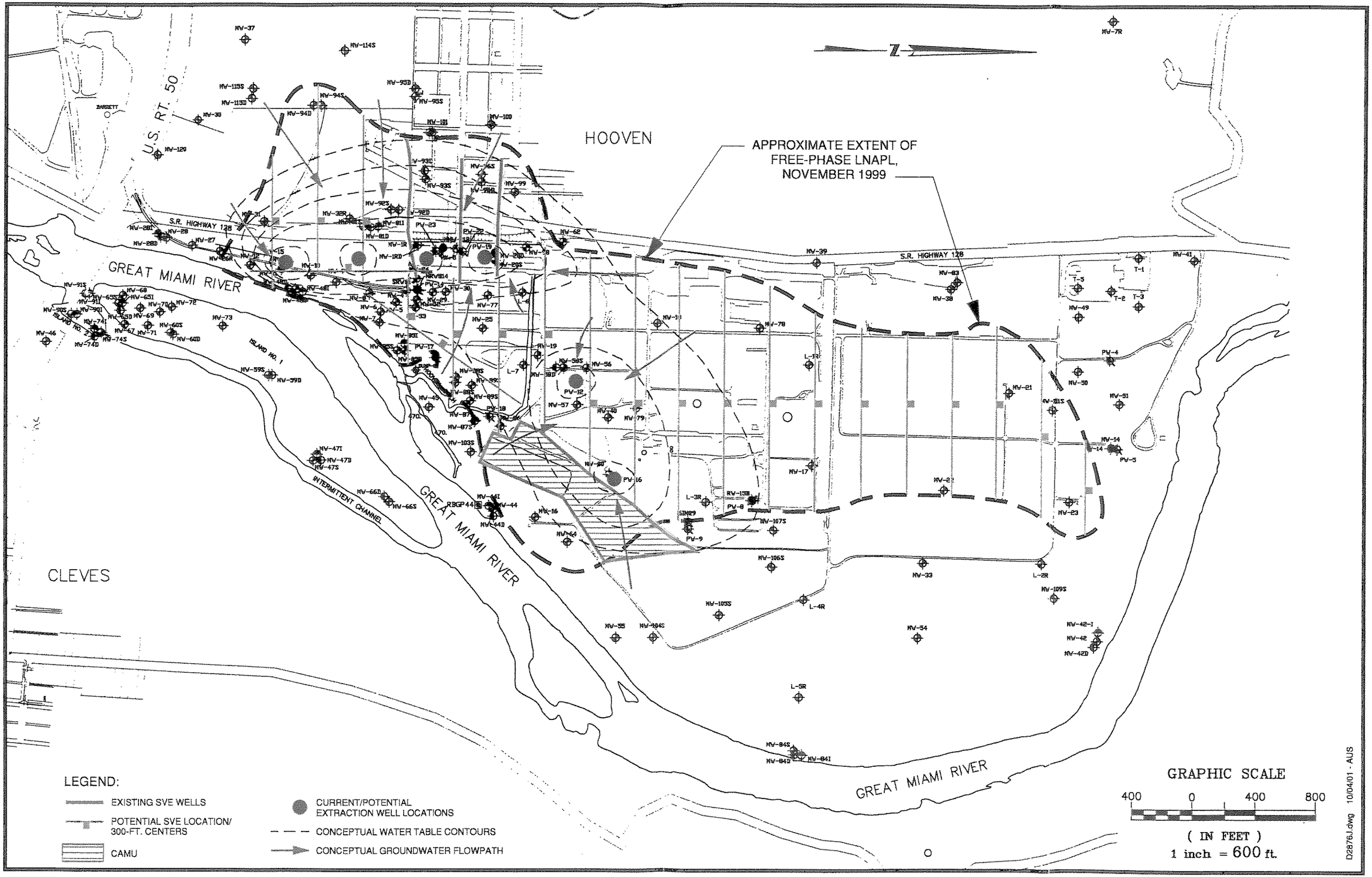


Figure 7-2: Alternative 2: Containment & SVE

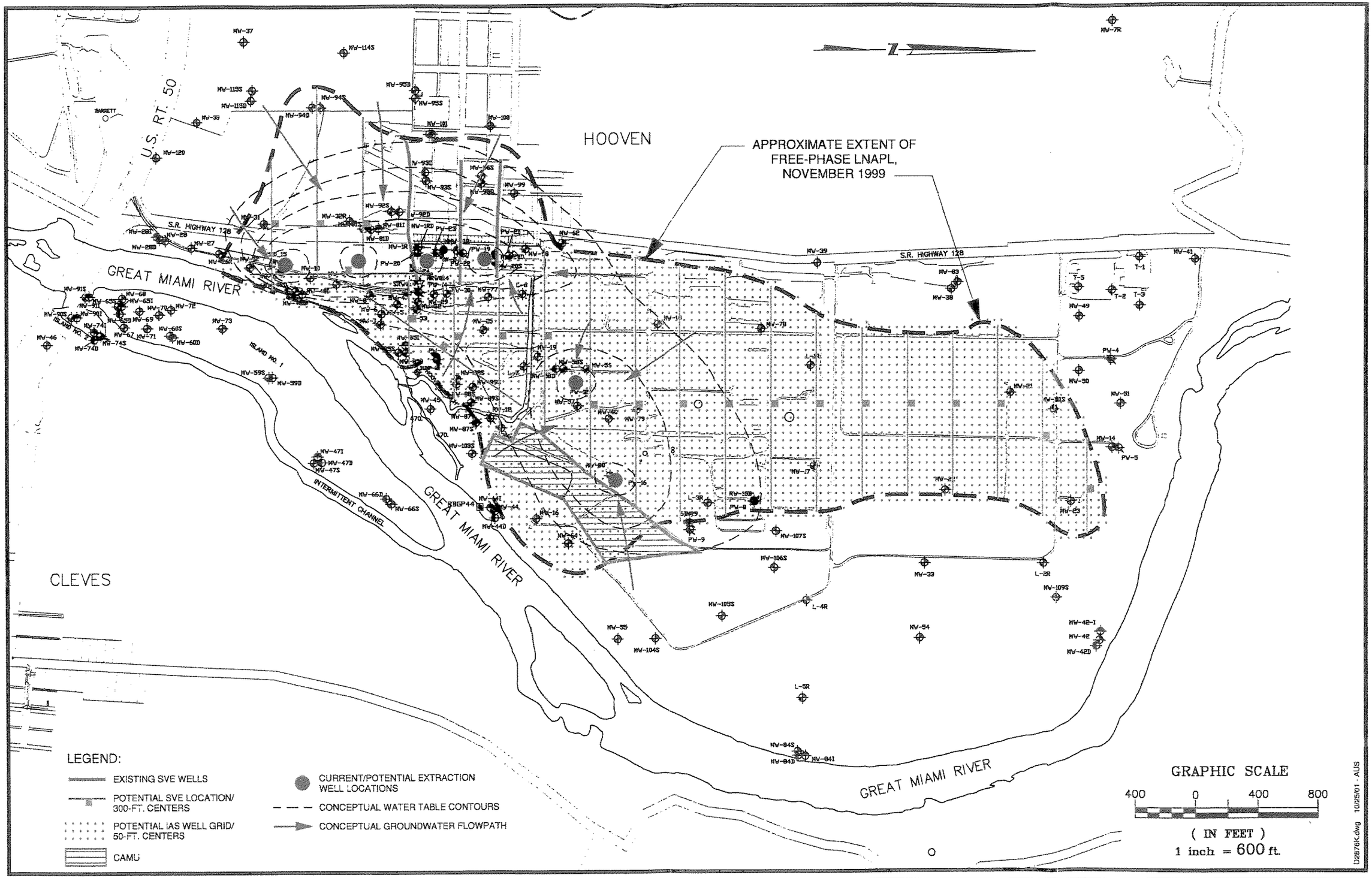


Figure 7-3: Alternative 3: Containment & SVE & IAS

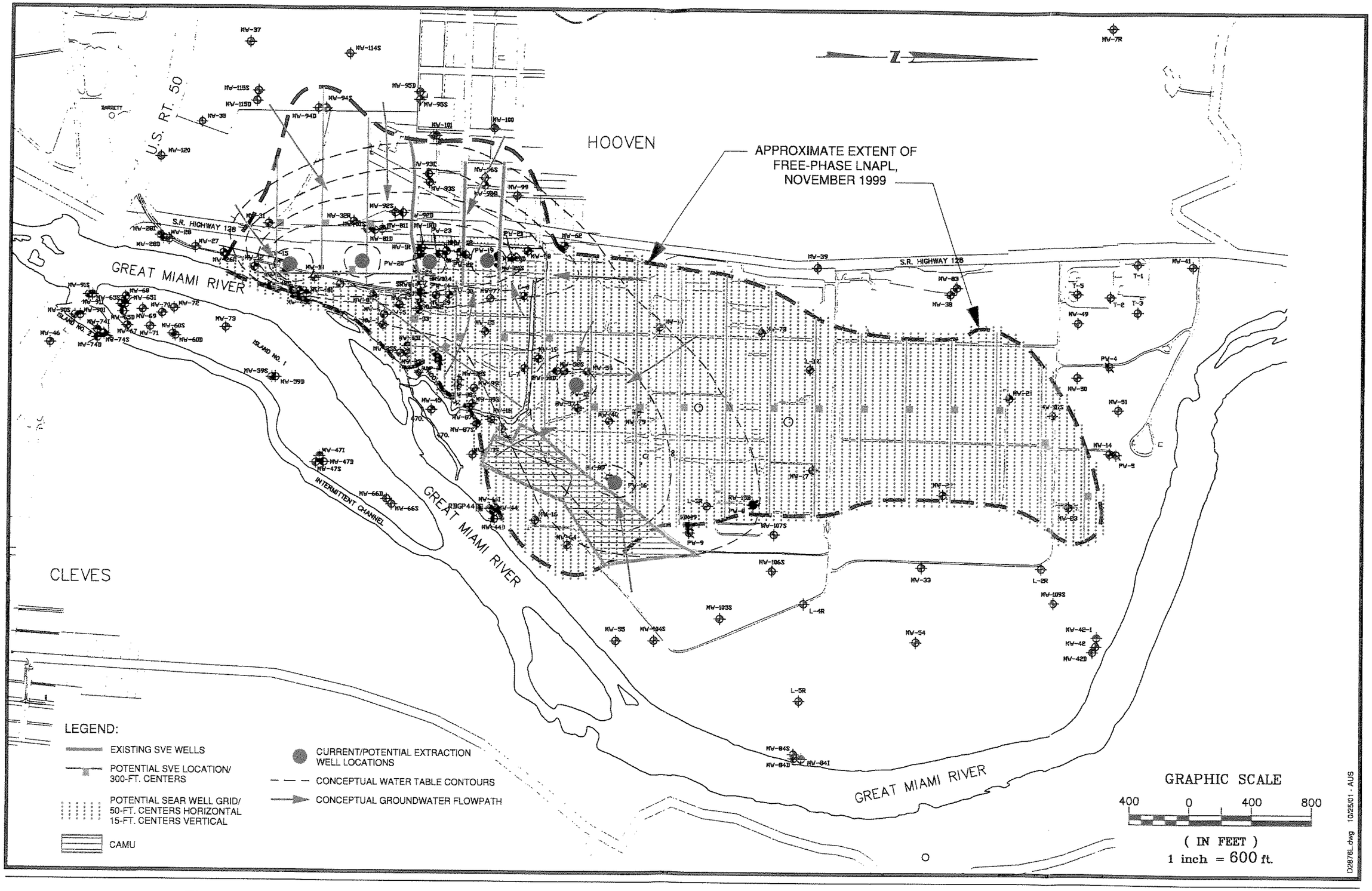


Figure 7-4: Alternative 4: Containment & SVE & SEAR

Table 7-2

Estimated Time from Present Needed for the Groundwater Benzene Concentration to Drop Below the MCL (5μg/L)

Alternative	Initial Source Removal Technology	Time after Initial Source Removal Years	Duration of Initial Source Removal Years	Total Duration Years from Present
1	None	458	0	458
2	SVE	294	12	306
3	SVE + IAS	233	10	243
4	SVE + SEAR	93	8	101

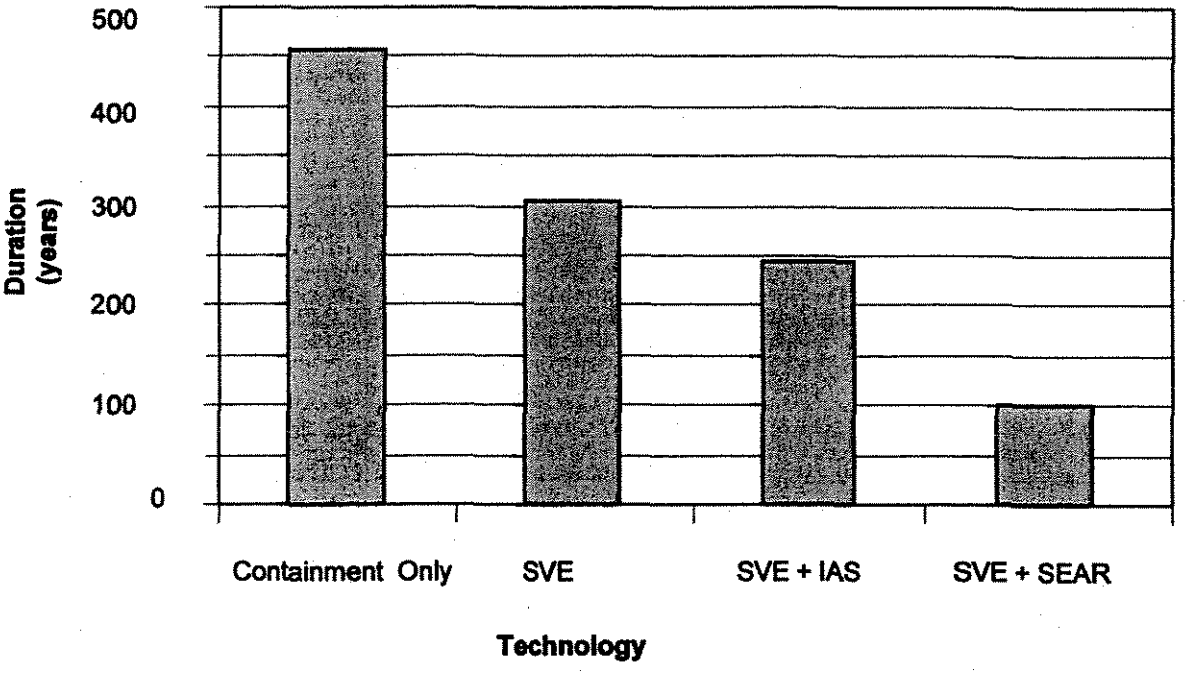


Figure 7-5

Projected Durations from Present to 5 μg/L Benzene, versus Technology

Table 7-4

Present Worth of All Costs Associated with Alternatives 1 through 4

Alternative	Initial Source Removal Technology	Present Worth ($ millions)			
		Initial Source Removal		Ongoing Site Ops.	Grand Total[1]
		Capital	O&M		
1	None	0.00	0.00	49.20	50.45
2	SVE	18.74	23.77	49.08	92.84
3	SVE + IAS	24.78	32.08	48.64	106.74
4	SVE + SEAR	89.76	16.45	42.22	149.68

[1] Includes $1.25 million in fixed costs, as discussed in Appendix B.

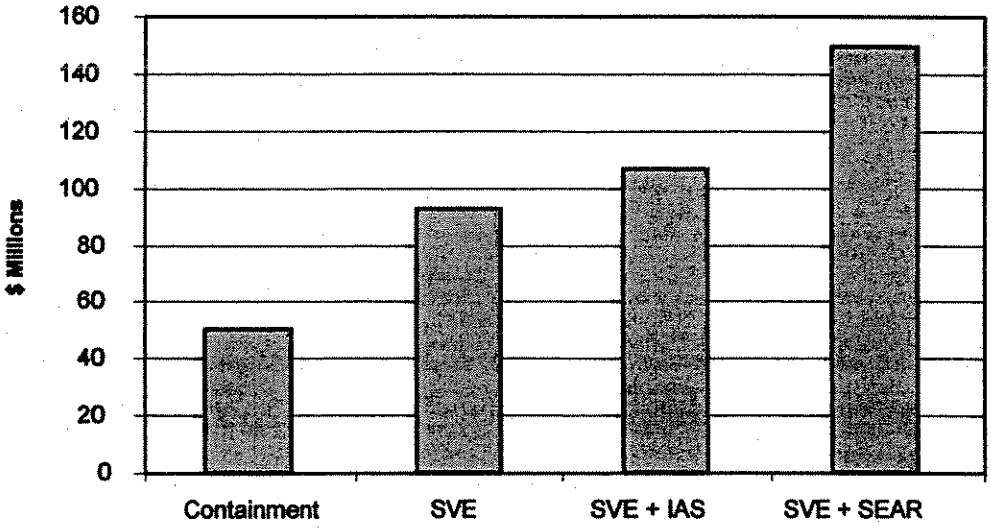


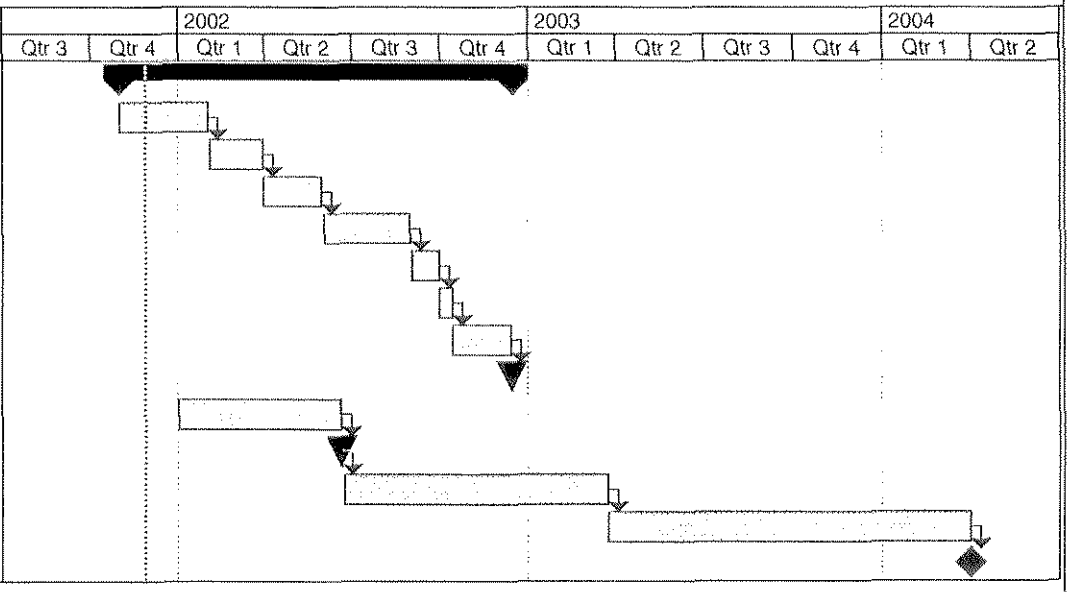
Figure 7-6 Present Worth of Alternatives

The following observations can be made:

- Total present worth costs increase significantly as increasingly aggressive source removal technologies are applied: Alternative 1 (Containment) < Alternative 2 (Containment + SVE) < Alternative 3 (Containment + SVE + IAS) < Alternative 4 (Containment + SVE + SEAR).
- Alternative 4 (Containment + SVE + SEAR) is the fastest alternative, as discussed in Section 7.4.1. It is also the most expensive alternative.

Figure 10-1
Chevron Cincinnati
Groundwater Remedy Implementation Schedule

ID	Task Name
1	**CMS Process**
2	Chevron Submits Draft GWCMS to EPA
3	EPA Submits comments to Chevron
4	Chevron Submits a response to comments
5	EPA approves the GWCMS
6	EPA submits Statement of Basis to Public
7	Public Hearing (probably corresponding with a C
8	End of Comment Period
9	Final Decision Response to Comments
10	Evaluation of Containment Options
11	Selection of Containment Options
12	Design of Selected Option
13	Construction of Selected Option
14	Start of long-term O&M



Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
External Milestone
Deadline

Note: The actual design and construction times will be dependent upon the complexity of the selected containment option.