

**DRAFT FINAL
RCRA FACILITY
INVESTIGATION REPORT
MAIN MANUFACTURING AREA
WATERVLIET ARSENAL,
Watervliet, New York**

VOLUME II

**U.S. Army Corps of Engineers
Baltimore, Maryland**

Prepared by:

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15 Cornell Road
Latham, New York 12110

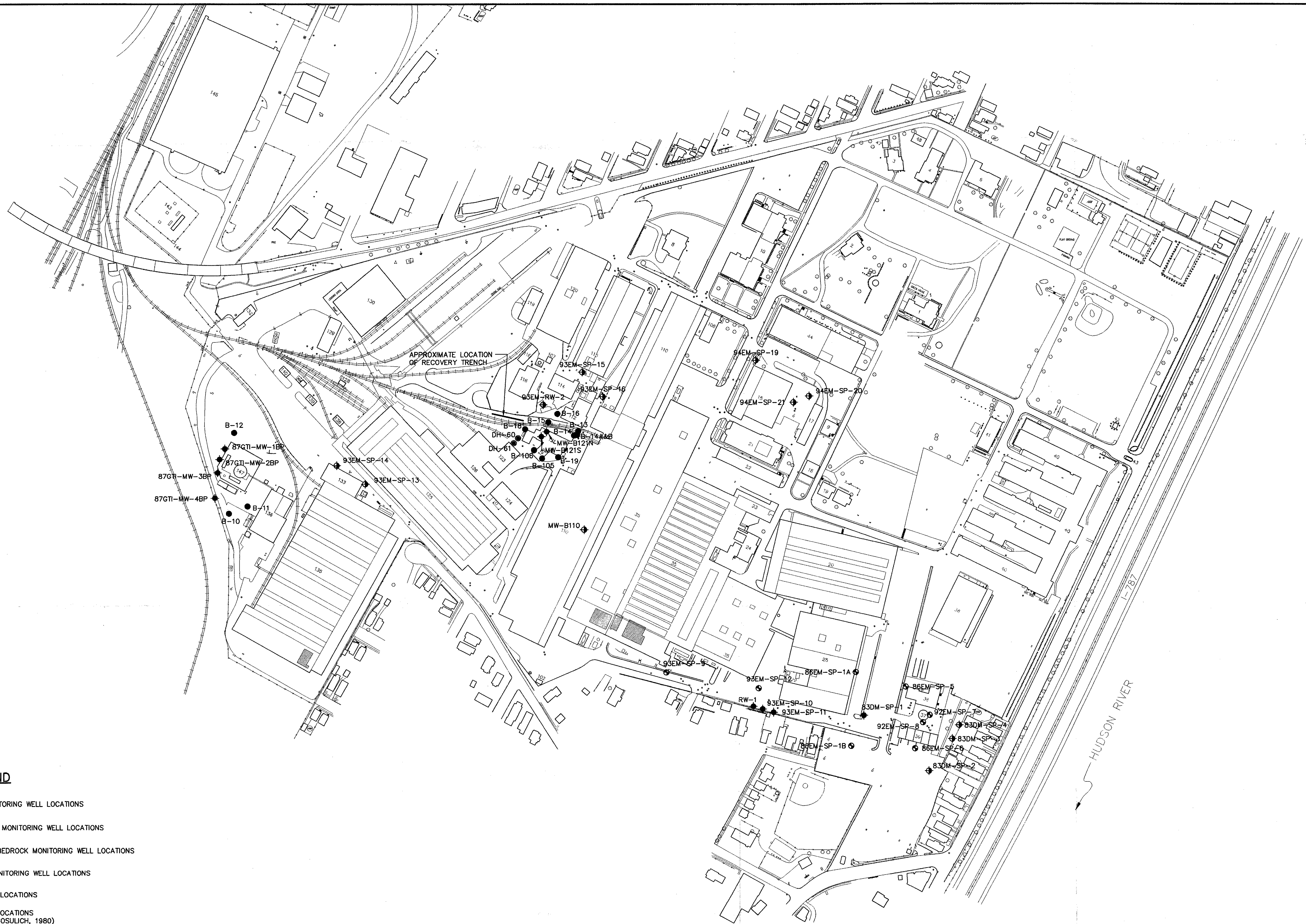
**August 1999
0285-587**



**US Army Corps
of Engineers**

Baltimore District

DRIVEN BY A VISION...to be the BEST



LEGEND

- ◆ HYBRID MONITORING WELL LOCATIONS
- OVERBURDEN MONITORING WELL LOCATIONS
- WEATHERED BEDROCK MONITORING WELL LOCATIONS
- ◆ BEDROCK MONITORING WELL LOCATIONS
- SOIL BORING LOCATIONS
- DRILL HOLE LOCATIONS (WILLIAM F. COSULICH, 1980)
- PROCESS PITS

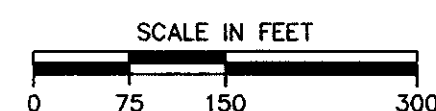
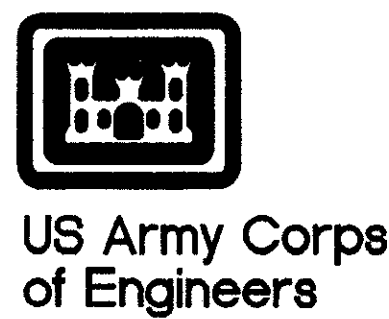


PLATE 1-1

7308 341802900 I:\ACAD\PROJ\285\4879\URAF\FINAL\587-26 Scale: 1:1 Date: 06/09/1999 Time: 10:46



**MALCOLM
PIRNIE**

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DES CG
DWN SMH
CKD KJG

**WATERVLIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017**

**PRE-RFI SOIL BORING AND
MONITORING WELL SAMPLING LOCATIONS**

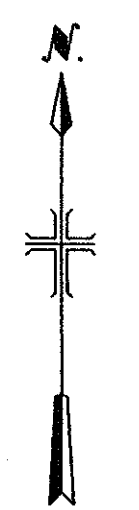
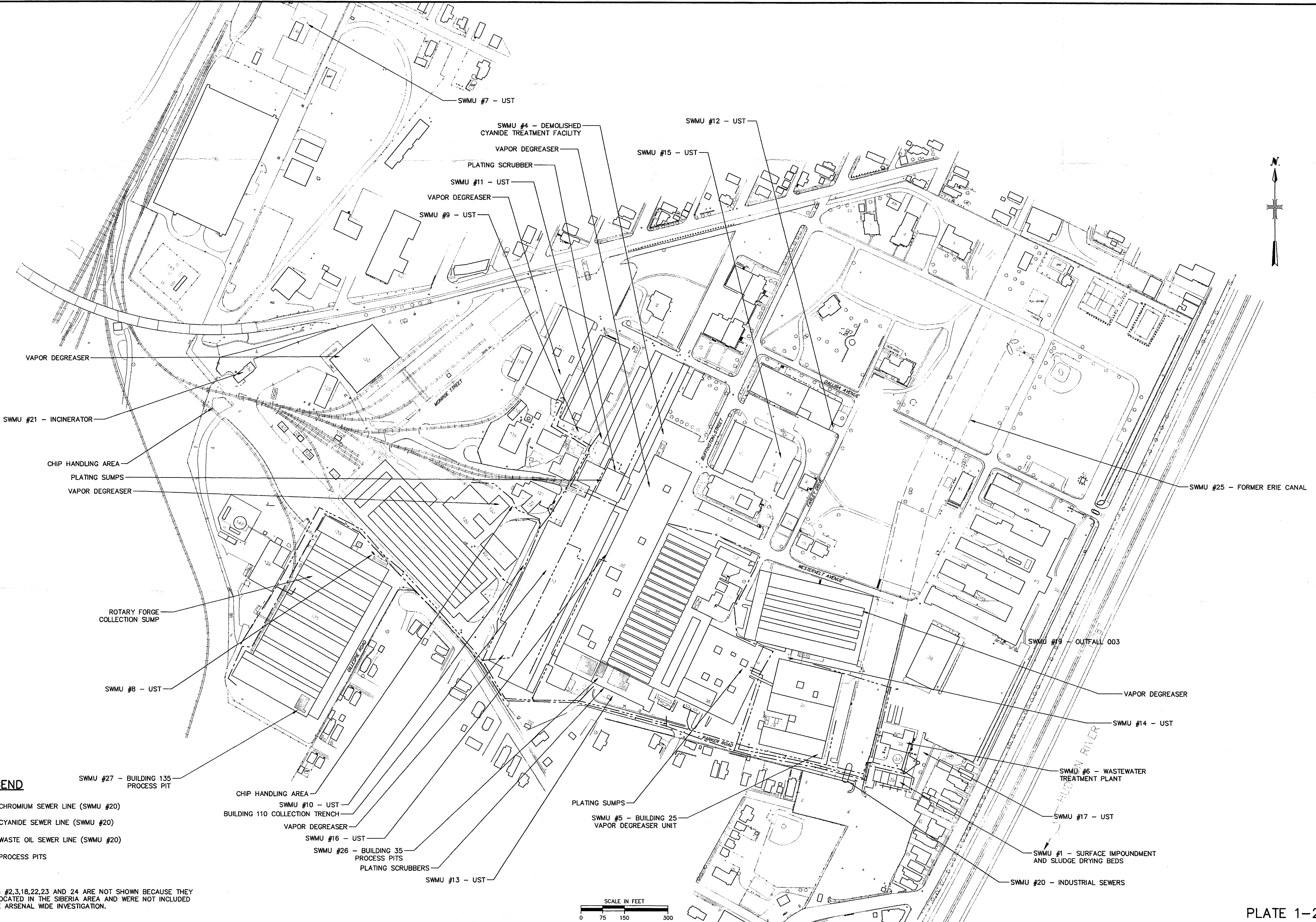
MALCOLM PIRNIE, INC.

DATE MARCH 1999

SHEET OF

DWG. NO. 587-26

XREF: X587-01



LEGEND

- CHROMIUM SEWER LINE (SWMU #20)
- CYANIDE SEWER LINE (SWMU #20)
- WASTE OIL SEWER LINE (SWMU #20)
- PROCESS PITS

NOTE:

SWMUs #2,3,18,22,23 AND 24 ARE NOT SHOWN BECAUSE THEY ARE LOCATED IN THE SIBERIA AREA AND WERE NOT INCLUDED IN THE ARSENAL WIDE INVESTIGATION.

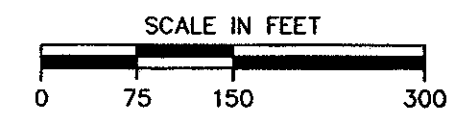
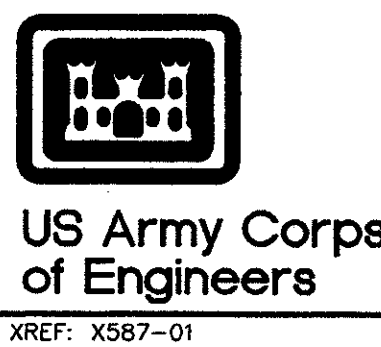


PLATE 1-2



**MALCOLM
PIRNIE**

| REVISIONS | | | |
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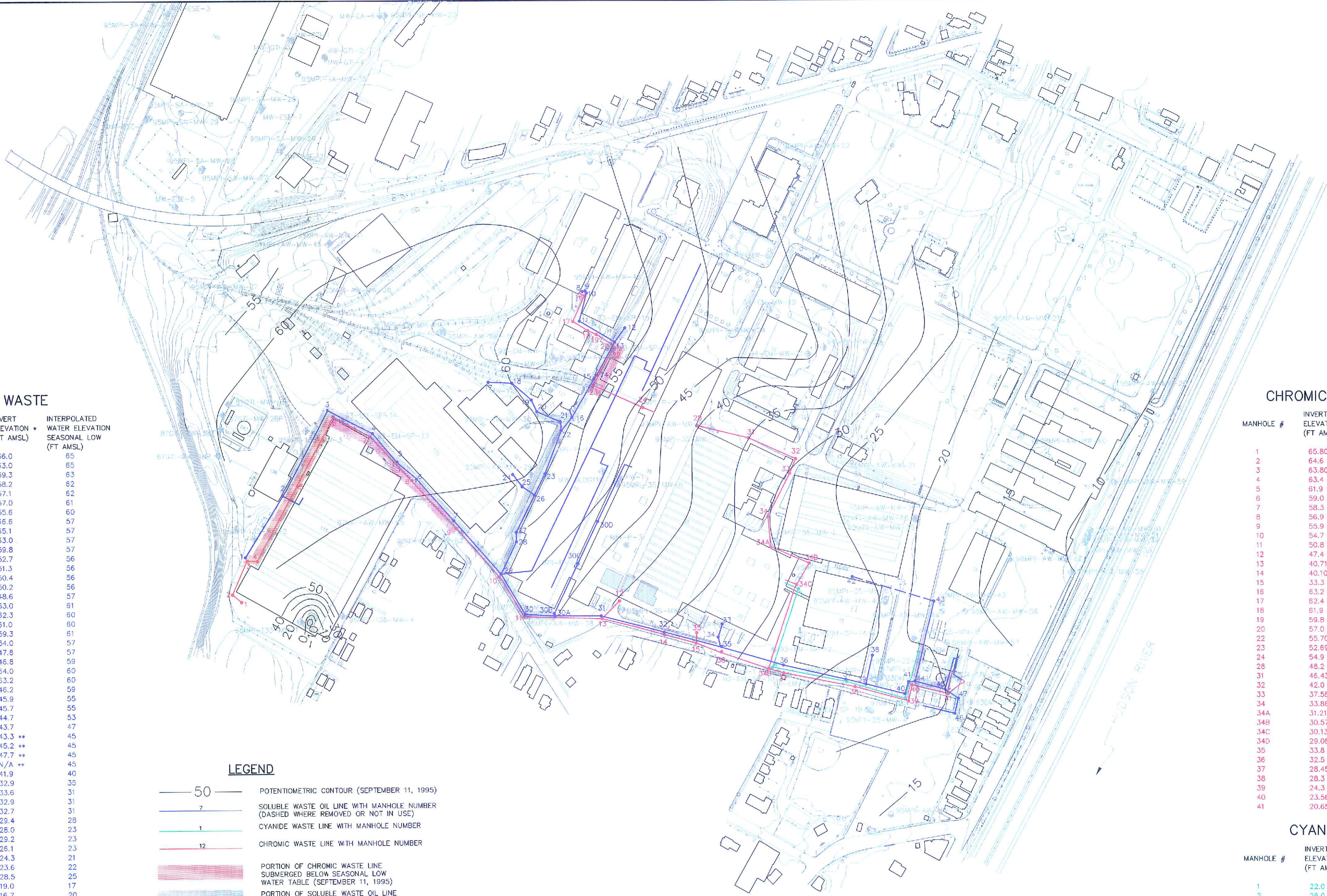
DES DCB
DWN SMH
CKD KJG

**WATERVLIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017**

APPROXIMATE SWMU LOCATIONS

MALCOLM PIRNIE, INC.
DATE JUNE 1999
SHEET 1 OF 1
DWG. NO. 587-56

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OIL WASTE

| MANHOLE # | INVERT ELEVATION * (FT AMSL) | INTERPOLATED WATER ELEVATION SEASONAL LOW (FT AMSL) |
|-----------|------------------------------|---|
| 1 | 66.0 | 65 |
| 2 | 63.0 | 65 |
| 3 | 59.3 | 63 |
| 4 | 58.2 | 62 |
| 5 | 57.1 | 62 |
| 6 | 57.0 | 61 |
| 7 | 55.6 | 60 |
| 8 | 66.6 | 57 |
| 9 | 65.1 | 57 |
| 10 | 63.0 | 57 |
| 11 | 59.8 | 57 |
| 12 | 52.7 | 56 |
| 13 | 51.3 | 56 |
| 14 | 50.4 | 56 |
| 15 | 50.2 | 56 |
| 16 | 48.6 | 57 |
| 17 | 63.0 | 61 |
| 18 | 62.3 | 60 |
| 19 | 61.0 | 60 |
| 20 | 59.3 | 61 |
| 21 | 54.0 | 57 |
| 22 | 47.8 | 57 |
| 23 | 46.8 | 59 |
| 24 | 64.0 | 60 |
| 25 | 63.2 | 60 |
| 26 | 46.2 | 59 |
| 27 | 45.9 | 55 |
| 28 | 45.7 | 55 |
| 29 | 44.7 | 53 |
| 30 | 43.7 | 47 |
| 30A | 43.3 ** | 45 |
| 30B | 45.2 ** | 45 |
| 30C | 47.7 ** | 45 |
| 30D | N/A ** | 45 |
| 31 | 41.9 | 40 |
| 32 | 32.9 | 35 |
| 33 | 33.6 | 31 |
| 34 | 32.9 | 31 |
| 35 | 32.7 | 31 |
| 36 | 29.4 | 28 |
| 37 | 28.0 | 23 |
| 38 | 29.2 | 23 |
| 39 | 26.1 | 23 |
| 40 | 24.3 | 21 |
| 41 | 23.6 | 22 |
| 42 | 28.5 | 25 |
| 43 | 19.0 | 17 |
| 44 | 16.7 | 20 |
| 45 | 16.6 | 20 |
| 46 | 17.8 | 19 |
| 47 | 17.4 | 19 |

CHROMIC WASTE

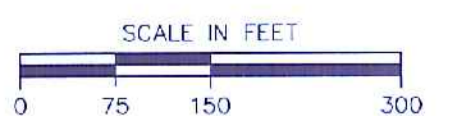
| MANHOLE # | INVERT ELEVATION * (FT AMSL) | INTERPOLATED WATER ELEVATION SEASONAL LOW (FT AMSL) |
|-----------|------------------------------|---|
| 1 | 65.80 | 60 |
| 2 | 64.6 | 60 |
| 3 | 63.80 | 65 |
| 4 | 63.4 | 65 |
| 5 | 61.9 | 65 |
| 6 | 59.0 | 63 |
| 7 | 58.3 | 62 |
| 8 | 56.9 | 61 |
| 9 | 55.9 | 57 |
| 10 | 54.7 | 53 |
| 11 | 50.8 | 47 |
| 12 | 47.4 | 39 |
| 13 | 40.71 | 40 |
| 14 | 40.10 | 35 |
| 15 | 33.3 | 33 |
| 16 | 63.2 | 59 |
| 17 | 62.4 | 57 |
| 18 | 61.9 | 57 |
| 19 | 59.8 | 57 |
| 20 | 57.0 | 56 |
| 22 | 55.70 | 56 |
| 23 | 52.69 | 56 |
| 24 | 54.9 | 50 |
| 28 | 48.2 | 40 |
| 31 | 46.43 | 35 |
| 32 | 42.0 | 30 |
| 33 | 37.58 | 30 |
| 34 | 33.86 | 30 |
| 34A | 31.21 | 30 |
| 34B | 30.57 | 29 |
| 34C | 30.13 | 29 |
| 34D | 29.08 | 28 |
| 35 | 33.8 | 33 |
| 36 | 32.5 | 31 |
| 37 | 28.45 | 26 |
| 38 | 28.3 | 23 |
| 39 | 24.3 | 21 |
| 40 | 23.56 | 20 |
| 41 | 20.65 | 20 |

CYANIDE

| MANHOLE # | INVERT ELEVATION * (FT AMSL) | INTERPOLATED WATER ELEVATION SEASONAL LOW (FT AMSL) |
|-----------|------------------------------|---|
| 1 | 22.0 | 20 |
| 2 | 25.0 | 21 |
| 3 | 28.5 | 24 |
| 4 | 31.1 | 28 |
| 5 | 33.14 | 30 |

- LEGEND**
- 50 — POTENTIOMETRIC CONTOUR (SEPTEMBER 11, 1995)
 - 7 — SOLUBLE WASTE OIL LINE WITH MANHOLE NUMBER (DASHED WHERE REMOVED OR NOT IN USE)
 - 1 — CYANIDE WASTE LINE WITH MANHOLE NUMBER
 - 12 — CHROMIC WASTE LINE WITH MANHOLE NUMBER
 - [Red shaded area] PORTION OF CHROMIC WASTE LINE SUBMERGED BELOW SEASONAL LOW WATER TABLE (SEPTEMBER 11, 1995)
 - [Blue shaded area] PORTION OF SOLUBLE WASTE OIL LINE SUBMERGED BELOW SEASONAL LOW WATER TABLE (SEPTEMBER 11, 1995)

NOTE: * INVERT ELEVATIONS TAKEN FROM AS-BUILT DRAWINGS OF SOLUBLE WASTE OIL COLLECTION SYSTEM, WILLIAM F. COSULICH ASSOCIATES, DECEMBER 1978.
 ** INVERT ELEVATIONS SURVEYED BY MALCOLM PIRNIE, INC., OCTOBER 1996.



SOURCE: WVA GENERAL LIQUID WASTE DISPOSAL MAP, 1/87, DWG. #18-02-01



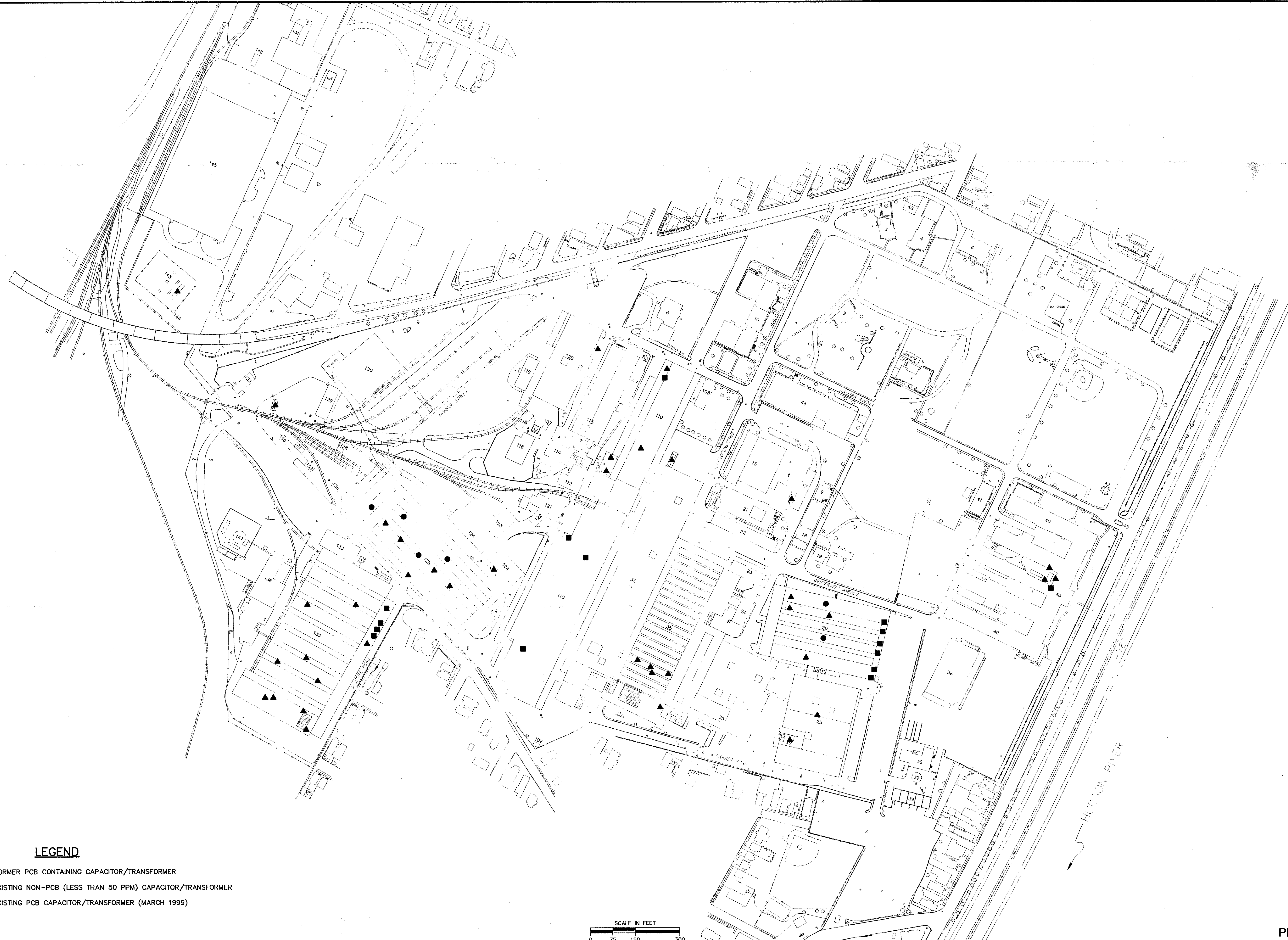
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DES: ARV
 DWN: JAP
 CKD: CG

**WATERVLIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017**

**LIQUID WASTE LINES AND
 AREAS OF SUBMERGENCE**
 SCALE: AS SHOWN

MALCOLM PIRNIE, INC.
 DATE: JUNE 1999
 SHEET 1 OF 1
 DWG. NO. 587-105C



LEGEND

- ▲ FORMER PCB CONTAINING CAPACITOR/TRANSFORMER
- EXISTING NON-PCB (LESS THAN 50 PPM) CAPACITOR/TRANSFORMER
- EXISTING PCB CAPACITOR/TRANSFORMER (MARCH 1999)

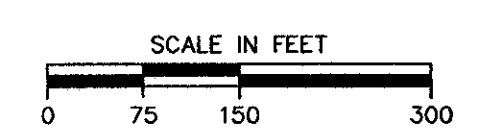
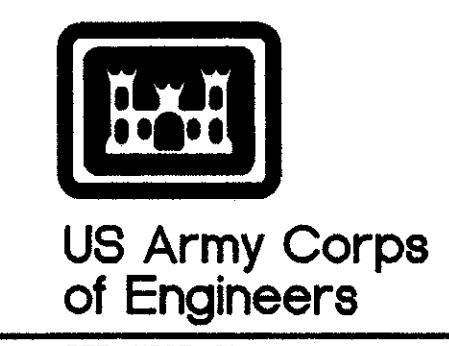


PLATE 1-4

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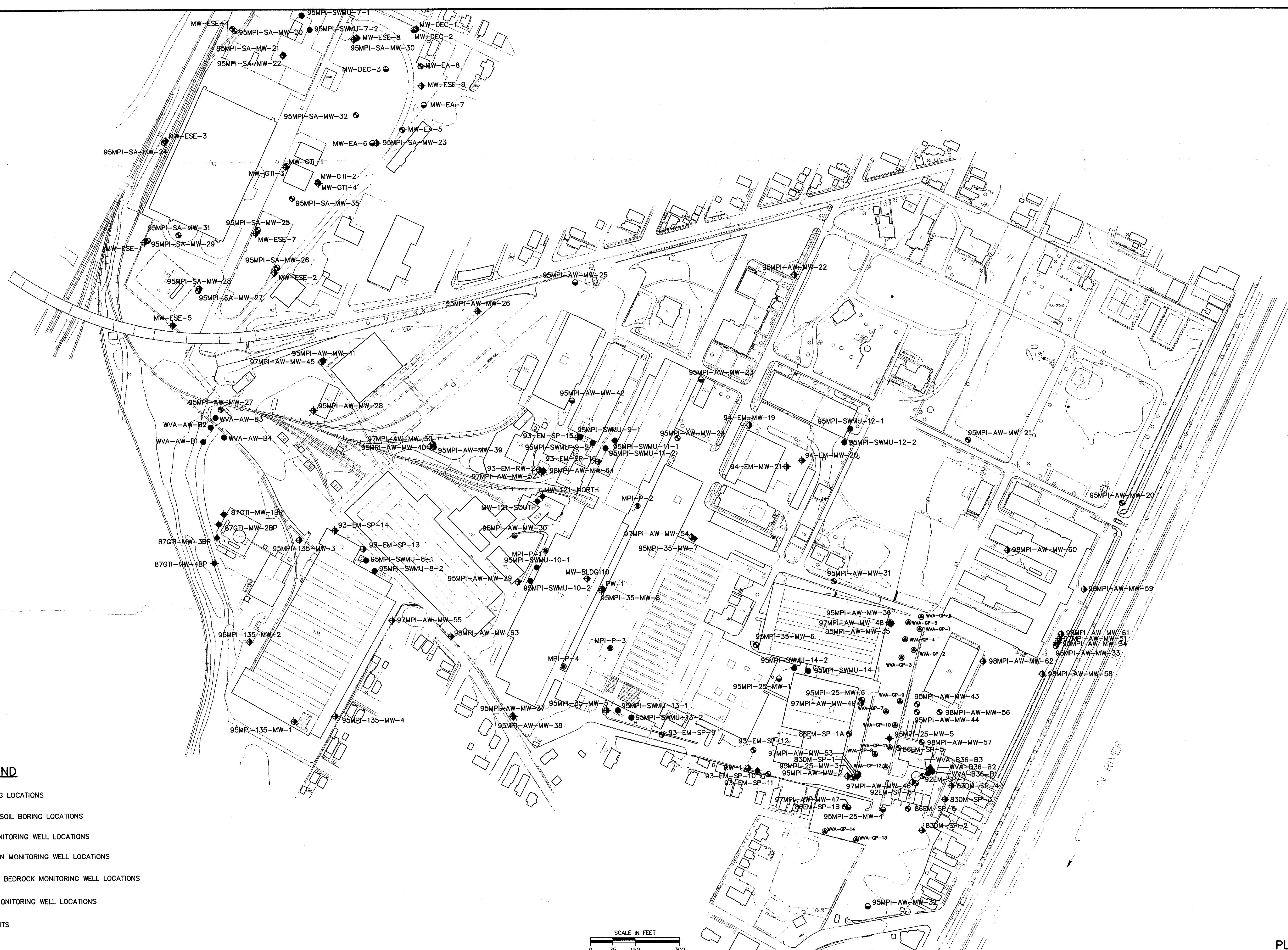
DES ARV
 DWN SMH
 CKD KJG

WATERVLIET ARSENAL
MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017

LOCATIONS OF CURRENT AND FORMER
TRANSFORMERS AND CAPACITORS

MALCOLM PIRNIE, INC.
 DATE JUNE 1999
 SHEET 1 OF 1
 DWG. NO. 587-141

XREF: X587-01



LEGEND

- SOIL BORING LOCATIONS
- ⊙ GEOPROBE SOIL BORING LOCATIONS
- ◆ HYBRID MONITORING WELL LOCATIONS
- ⊖ OVERBURDEN MONITORING WELL LOCATIONS
- ⊙ WEATHERED BEDROCK MONITORING WELL LOCATIONS
- ◆ BEDROCK MONITORING WELL LOCATIONS
- PROCESS PITS

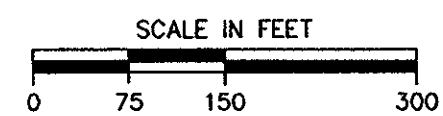
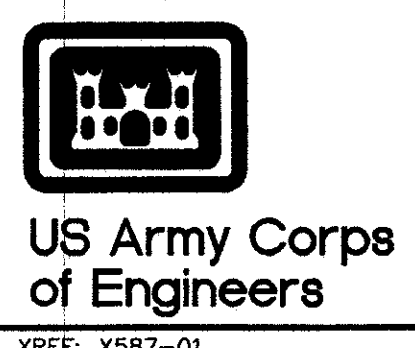


PLATE 3-1

I:\9_341802900\I:\AGAD\PROJ\2485\2485_VR\AS\1_FINAL\3E-115 Scale: 1:11 Date: 06/09/1999 Time: 11:31



| REVISIONS | | | |
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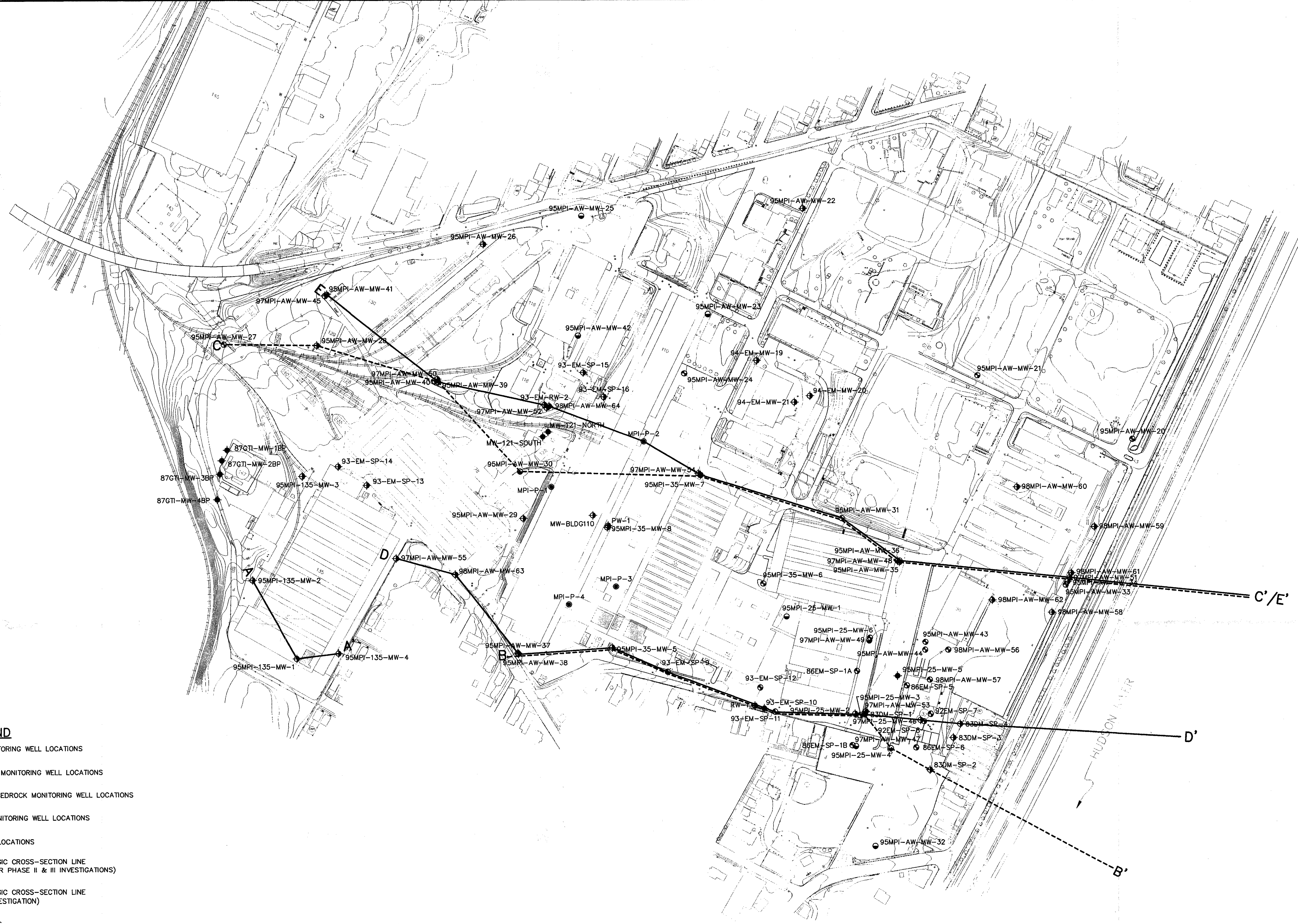
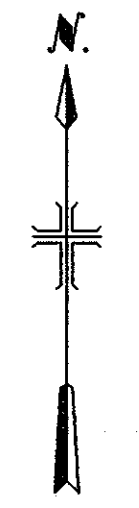
DES ARV
 DWN SMH
 CKD KJG

WATERVLIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017

MONITORING WELL/SOIL BORING
LOCATION MAP

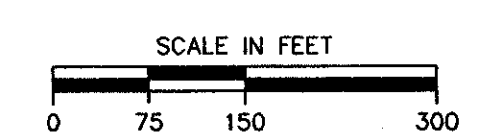
MALCOLM PIRNIE, INC.
 DATE JUNE 1999
 SHEET OF
 DWG. NO. 587-115

XREF: X587-01

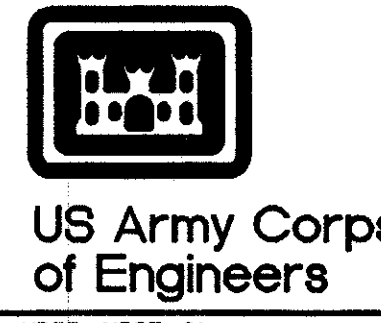


LEGEND

- ◆ HYBRID MONITORING WELL LOCATIONS
- OVERBURDEN MONITORING WELL LOCATIONS
- WEATHERED BEDROCK MONITORING WELL LOCATIONS
- ◆ BEDROCK MONITORING WELL LOCATIONS
- PIEZOMETER LOCATIONS
- E — E' HYDROGEOLOGIC CROSS-SECTION LINE (UPDATED FOR PHASE II & III INVESTIGATIONS)
- - - C - - - C' HYDROGEOLOGIC CROSS-SECTION LINE (PHASE I INVESTIGATION)
- PROCESS PITS



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**MALCOLM
PIRNIE**

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DES — ARV
 DWN — SMH
 OKD — KJG

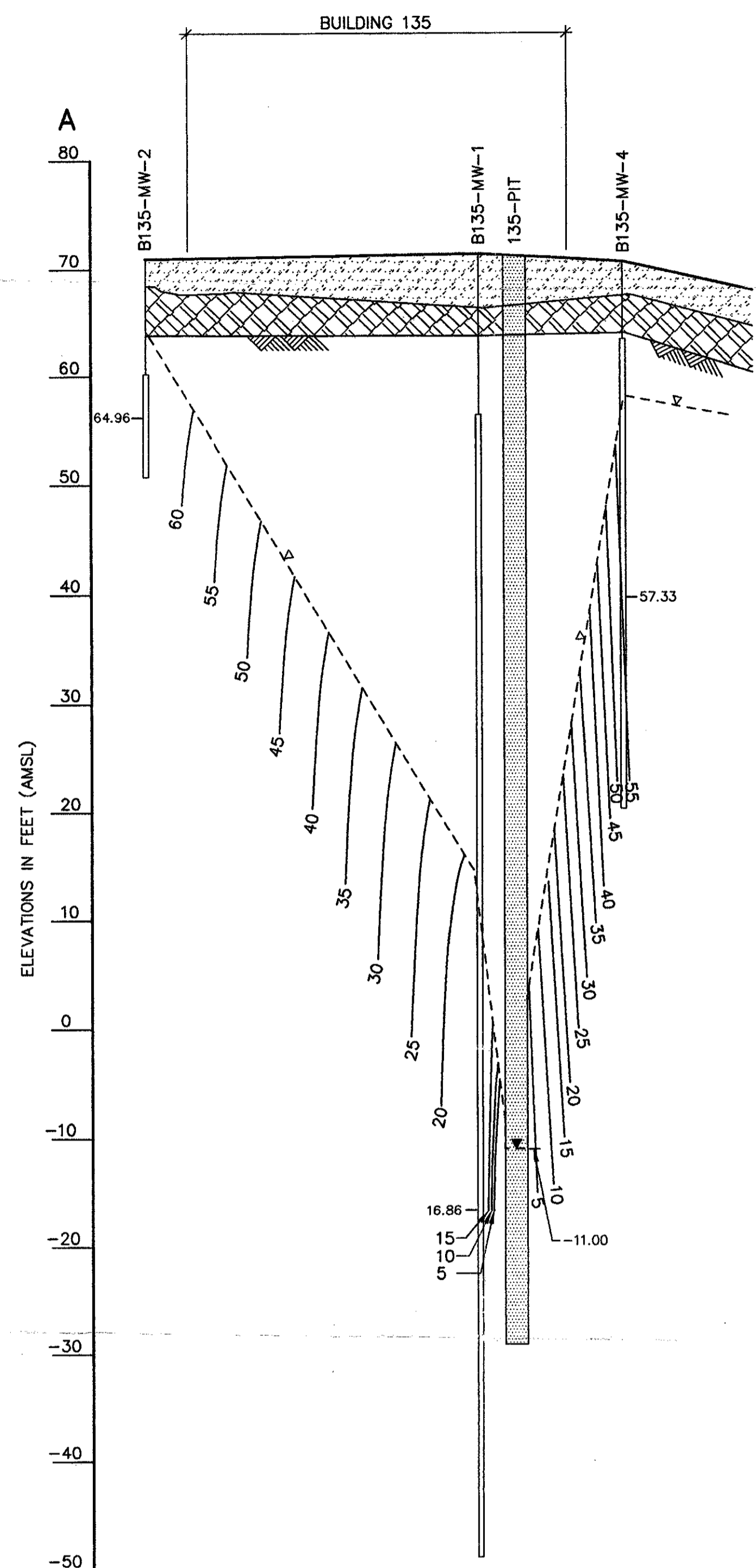
**WATERVLIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017**

**HYDROGEOLOGIC CROSS-SECTION
 LOCATIONS**

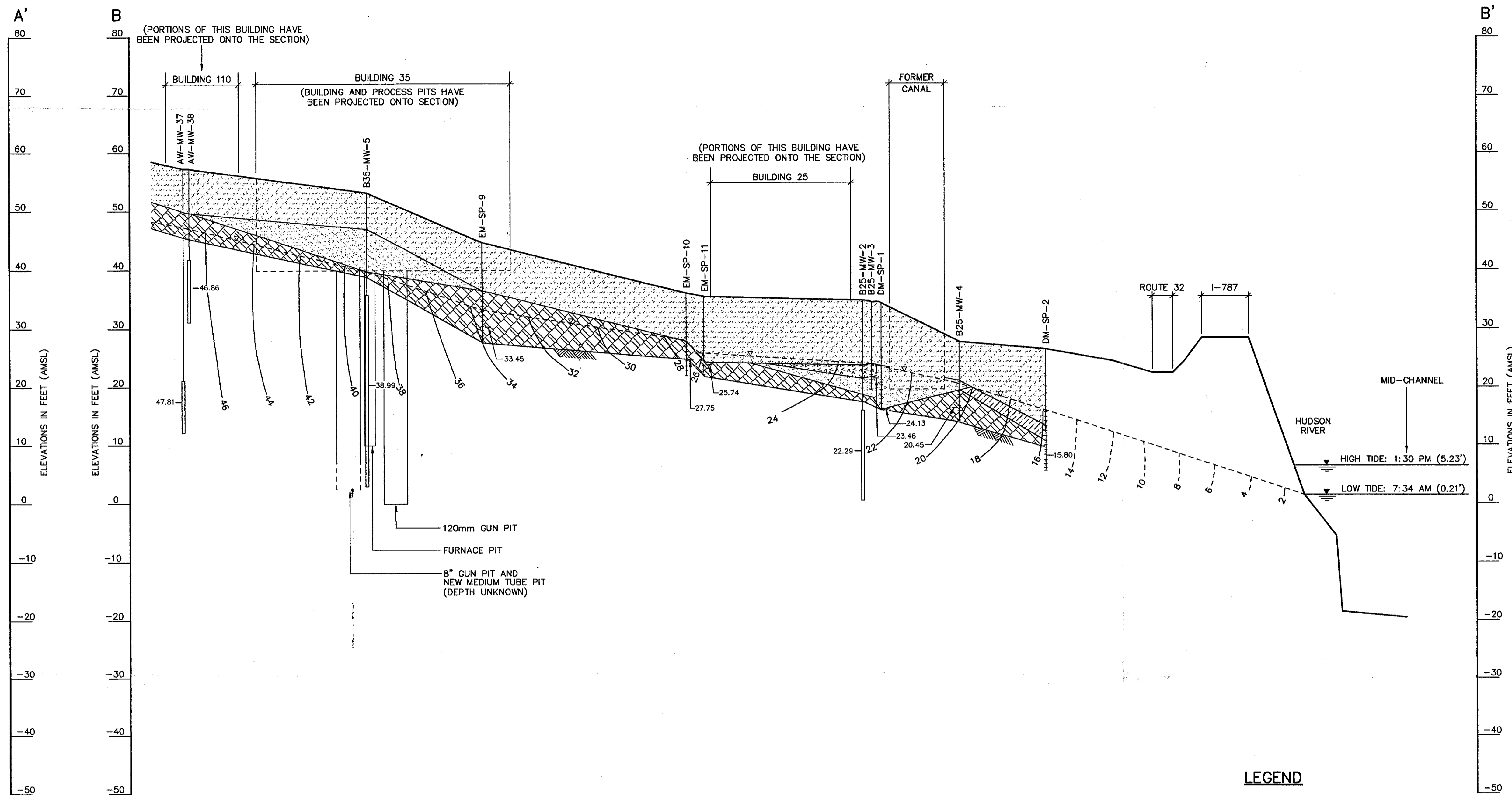
PLATE 4-1

MALCOLM PIRNIE, INC.
 DATE — JUNE 1999
 SHEET — OF —
 DWG. NO. 587-111

XREF: X587-01



SECTION A-A'
SCALE: HORZ. 1"=100'
VERT. 1"=10'



SECTION B-B'
SCALE: HORZ. 1"=100'
VERT. 1"=10'

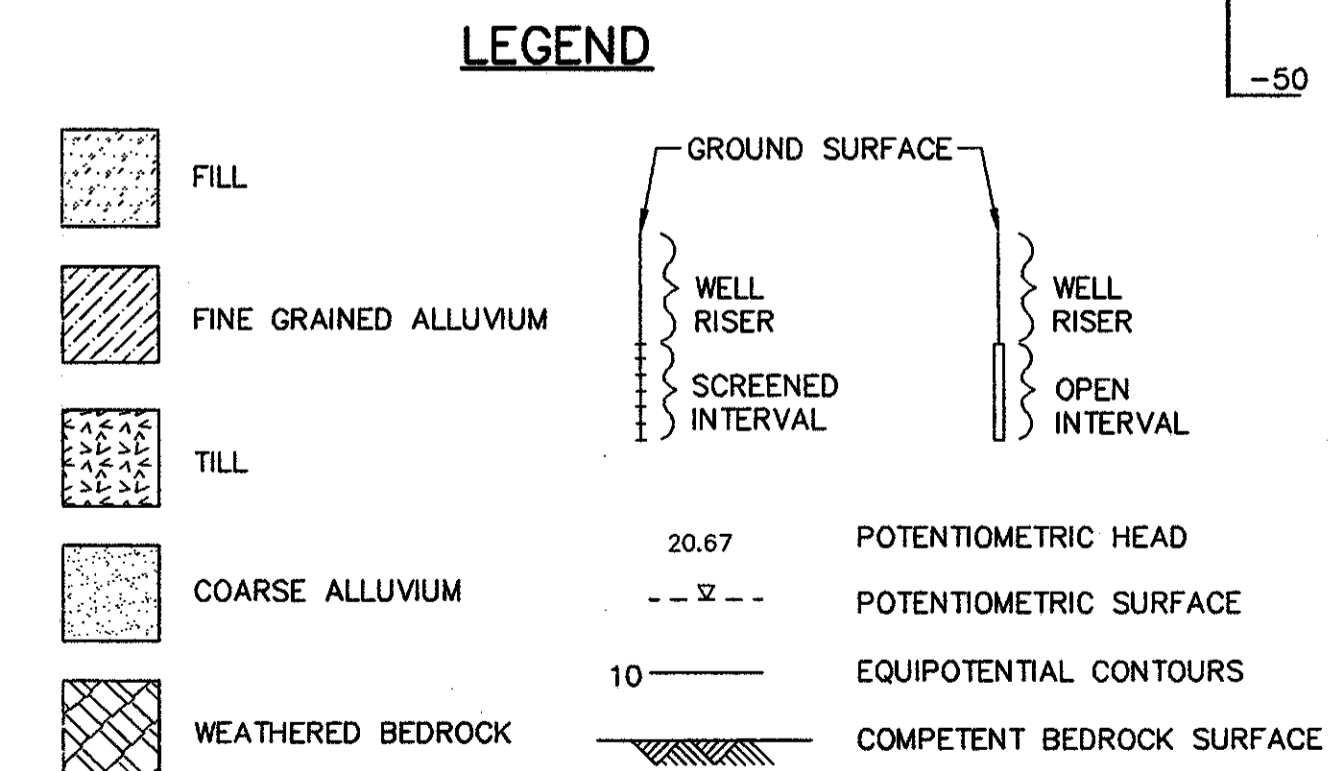
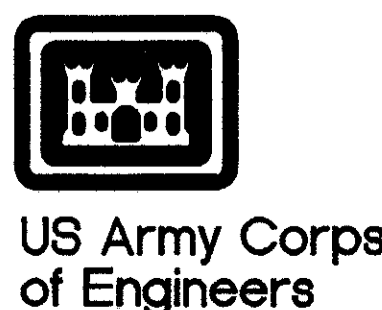


PLATE 4-2



**MALCOLM
PIRNIE**

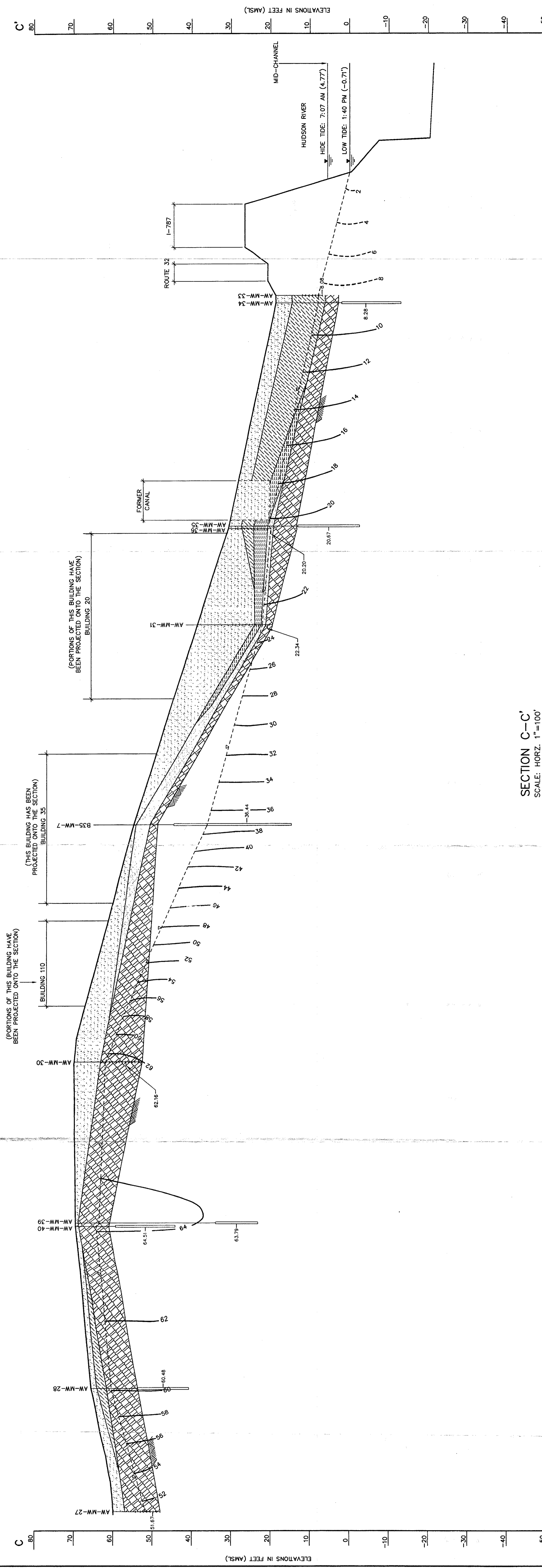
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DES DCB
DWN SMH
CKD KJG

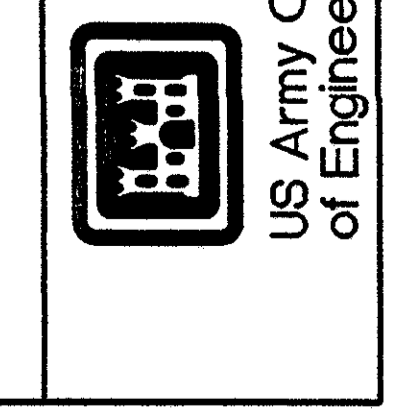
WATERVIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017

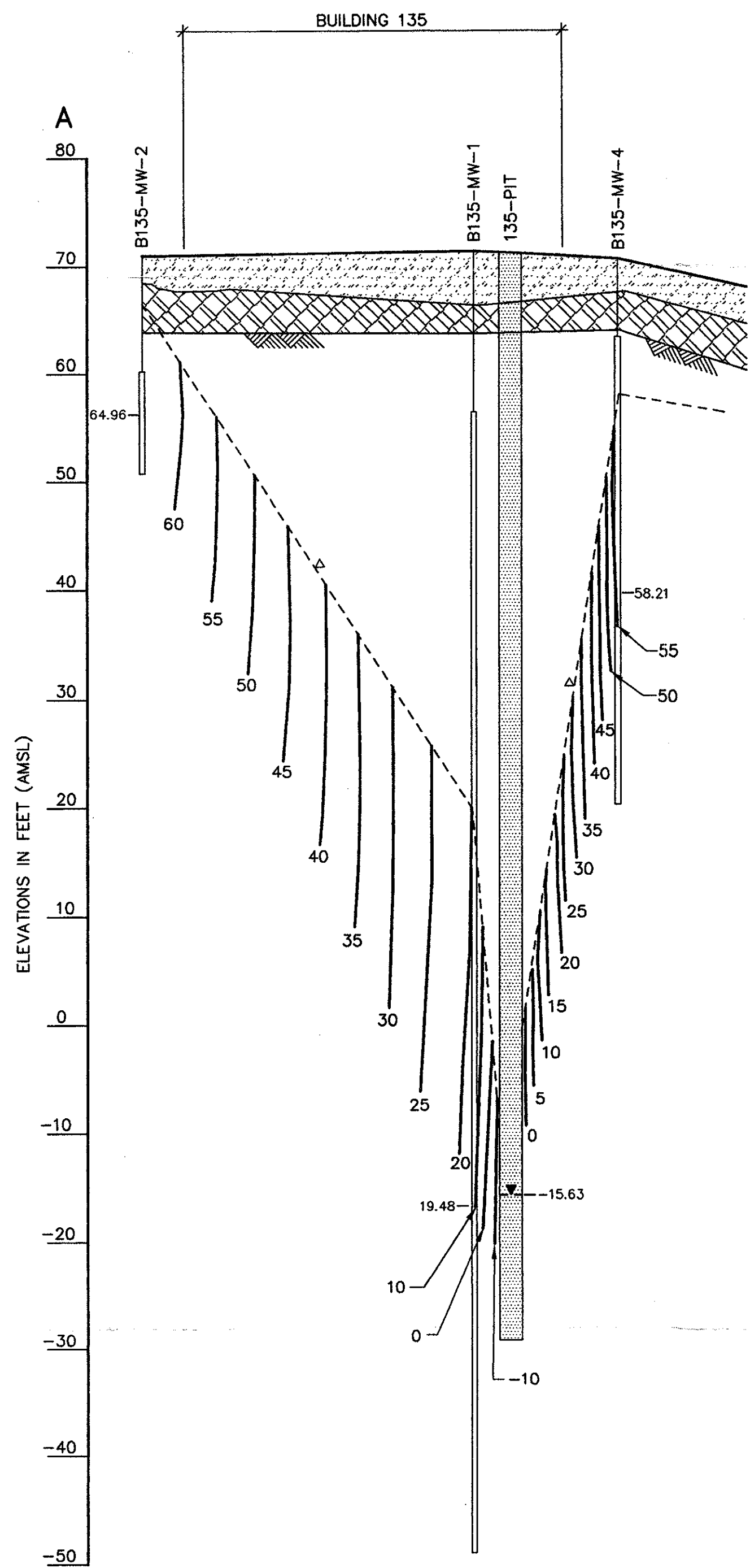
HYDROGEOLOGIC CROSS-SECTIONS
A-A' & B-B' (SEPTEMBER 11, 1995)
SCALE: AS SHOWN

MALCOLM PIRNIE, INC.
DATE JUNE 1999
SHEET ____ OF ____
DWG. NO. 587-74

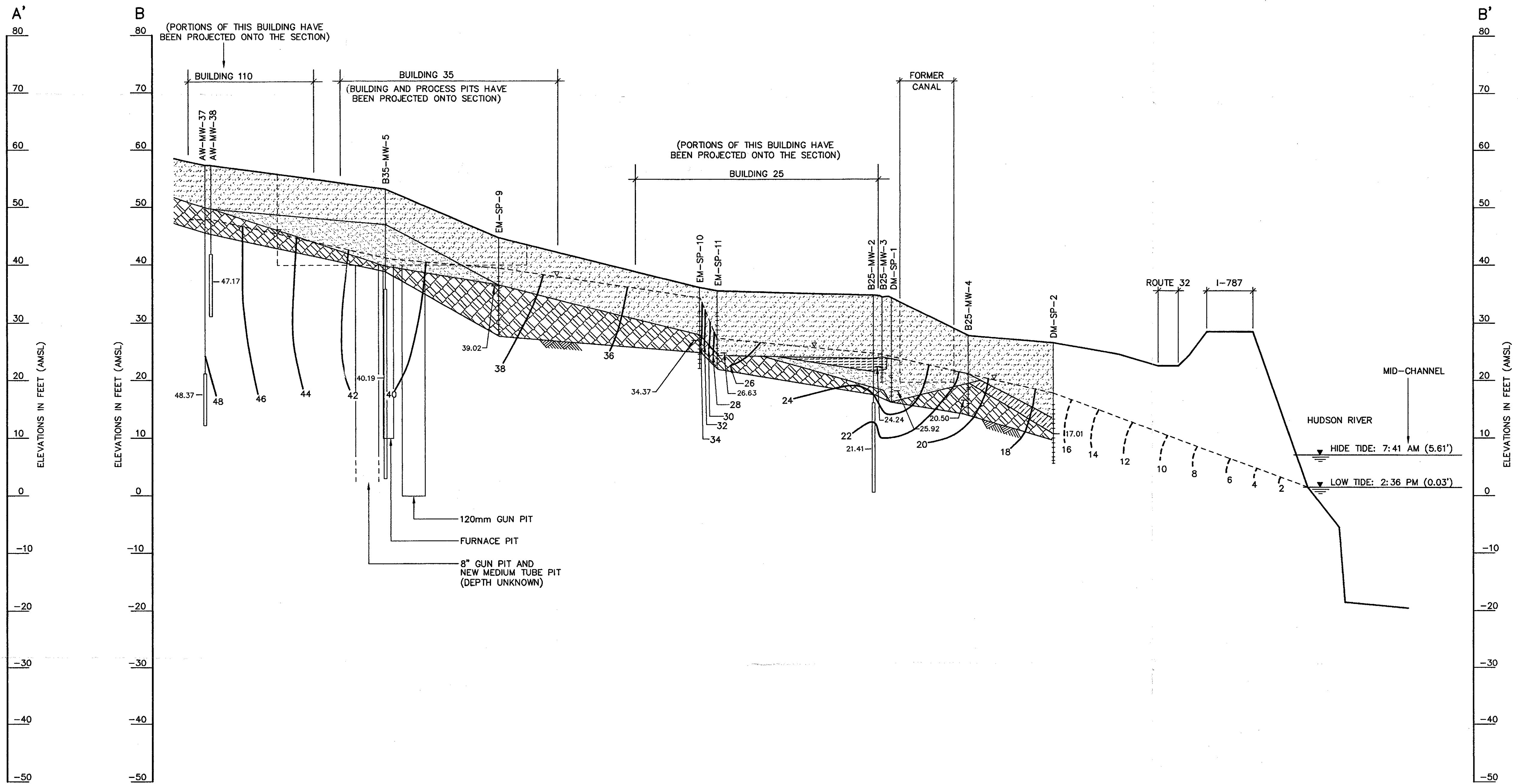


- LEGEND**
- FILL
 - FINE GRAINED ALLUVIUM
 - TILL
 - COARSE ALLUVIUM
 - WEATHERED BEDROCK
 - GROUND SURFACE
 - WELL RISER
 - SCREENED INTERVAL
 - OPEN INTERVAL
 - POTENTIOMETRIC HEAD
 - POTENTIOMETRIC SURFACE
 - EQUIPOTENTIAL CONTOURS
 - COMPETENT BEDROCK SURFACE





SECTION A-A'
SCALE: HORIZ. 1"=100'
VERT. 1"=10'

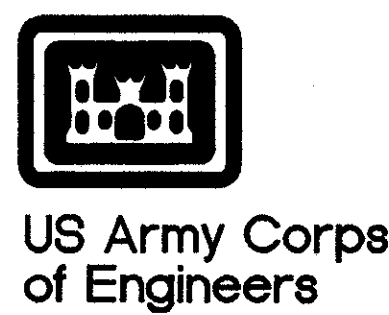


SECTION B-B'
SCALE: HORIZ. 1"=100'
VERT. 1"=10'

LEGEND

- FILL
- FINE GRAINED ALLUVIUM
- TILL
- COARSE ALLUVIUM
- WEATHERED BEDROCK
- GROUND SURFACE
- WELL RISER
SCREENED INTERVAL
- WELL RISER
OPEN INTERVAL
- 20.67 POTENTIOMETRIC HEAD
- - - POTENTIOMETRIC SURFACE
- 10 EQUIPOTENTIAL CONTOURS
- COMPETENT BEDROCK SURFACE

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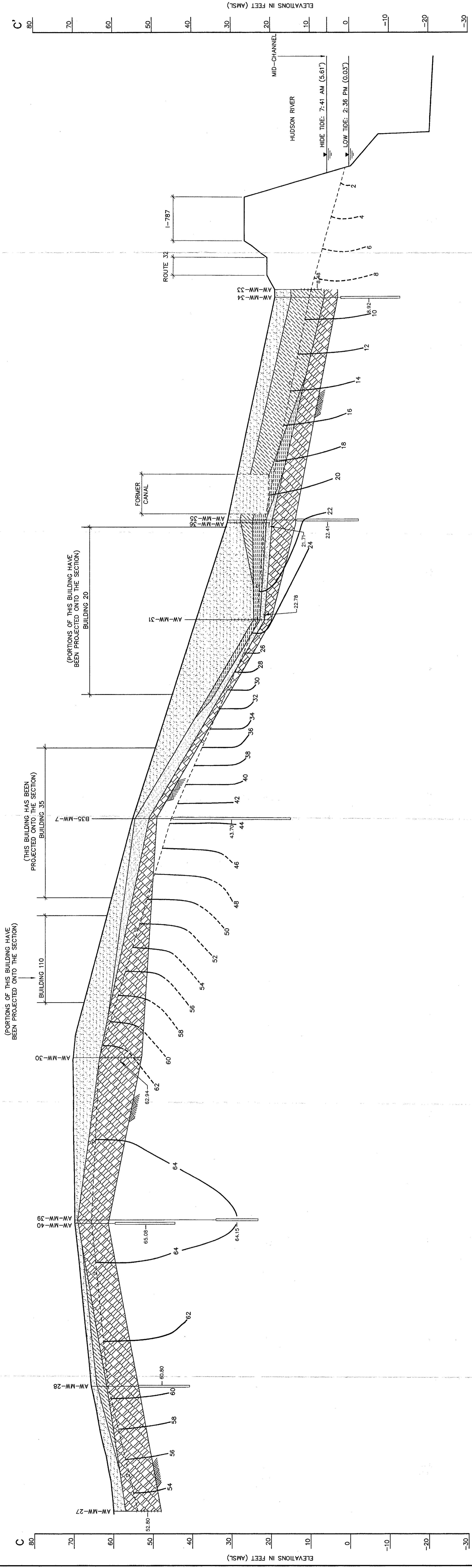
**MALCOLM
PIRNIE**

| REVISIONS | | NO. | BY | DATE | REMARKS |
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| DES | ARV | | | | |
| DWN | SMH | | | | |
| CKD | KJG | | | | |

WATERVIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017

HYDROGEOLOGIC CROSS-SECTIONS
A-A' & B-B' (MAY 20, 1996)
SCALE: AS SHOWN

MALCOLM PIRNIE, INC.
DATE: JUNE 1999
SHEET ____ OF ____
DWG. NO. 587-110



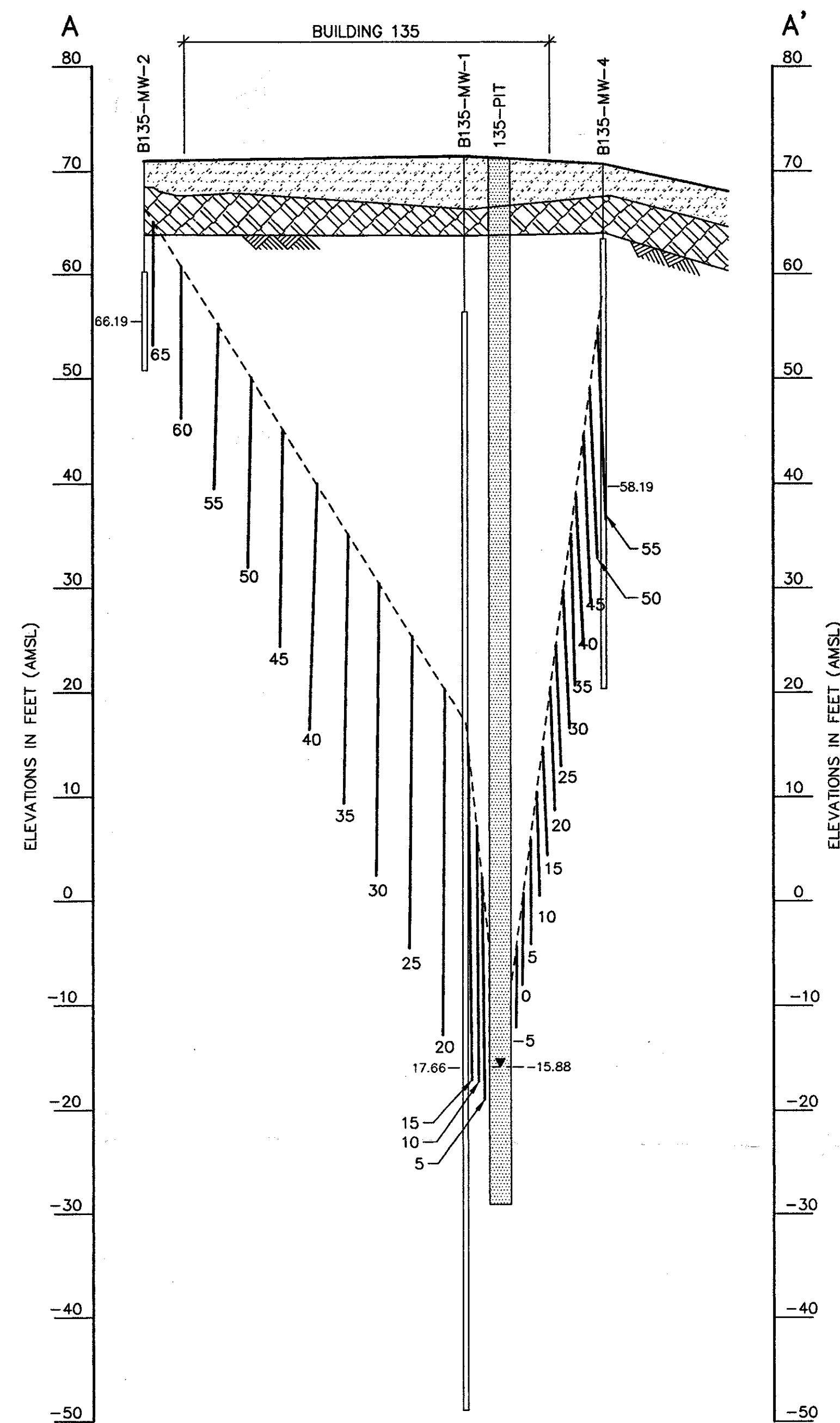
LEGEND

| | | | |
|--|-----------------------|--|------------------------------|
| | FILL | | WELL RISER |
| | FINE GRAINED ALLUVIUM | | WELL RISER SCREENED INTERVAL |
| | TILL | | WELL RISER OPEN INTERVAL |
| | COARSE ALLUVIUM | | POTENTIOMETRIC HEAD |
| | WEATHERED BEDROCK | | POTENTIOMETRIC SURFACE |
| | | | EQUIPOTENTIAL CONTOURS |
| | | | COMPETENT BEDROCK SURFACE |

| | | | |
|--------------------------------|--|---|---|
| US Army Corps of Engineers | WATERVLIET ARSENAL MAIN MANUFACTURING AREA USACE CONTRACT NO. DACA31-94-D-0017 | HYDROGEOLOGIC CROSS-SECTION C-C' (MAY 20, 1996) SCALE: AS SHOWN | MALCOLM PIRNIE, INC. DATE: JUNE 1999 SHEET ___ OF ___ DWG. NO. 587-108 |
| | PLATE 4-5 | | |

7508 3-41-0002900 L:\CAD\B01\0285\587\3\BRAF1.FINAL\587-108 Scale: 1:1 Date: 06/09/1999 Title: 13.23

7906 J:\1802500 E:\ACAD\PROJ\0285\5879\USACE_FINAL\057.dwg, 5/11/99, 1:11 Date: 05/06/1999 Time: 13.44



SECTION A-A'
SCALE: HORZ. 1"=100'
VERT. 1"=10'

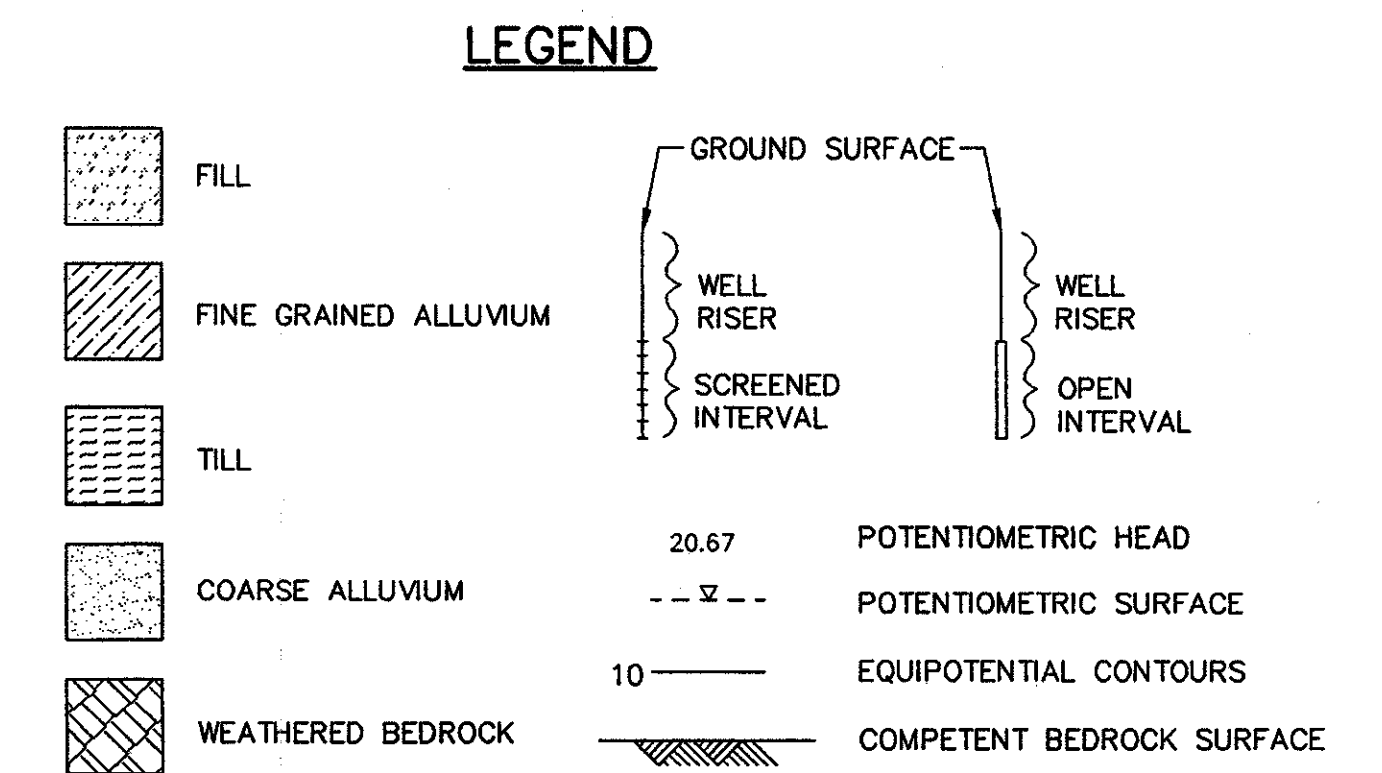
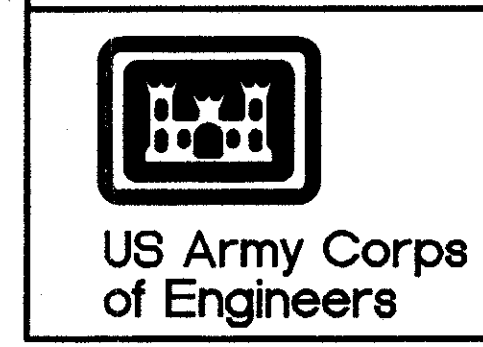


PLATE 4-6



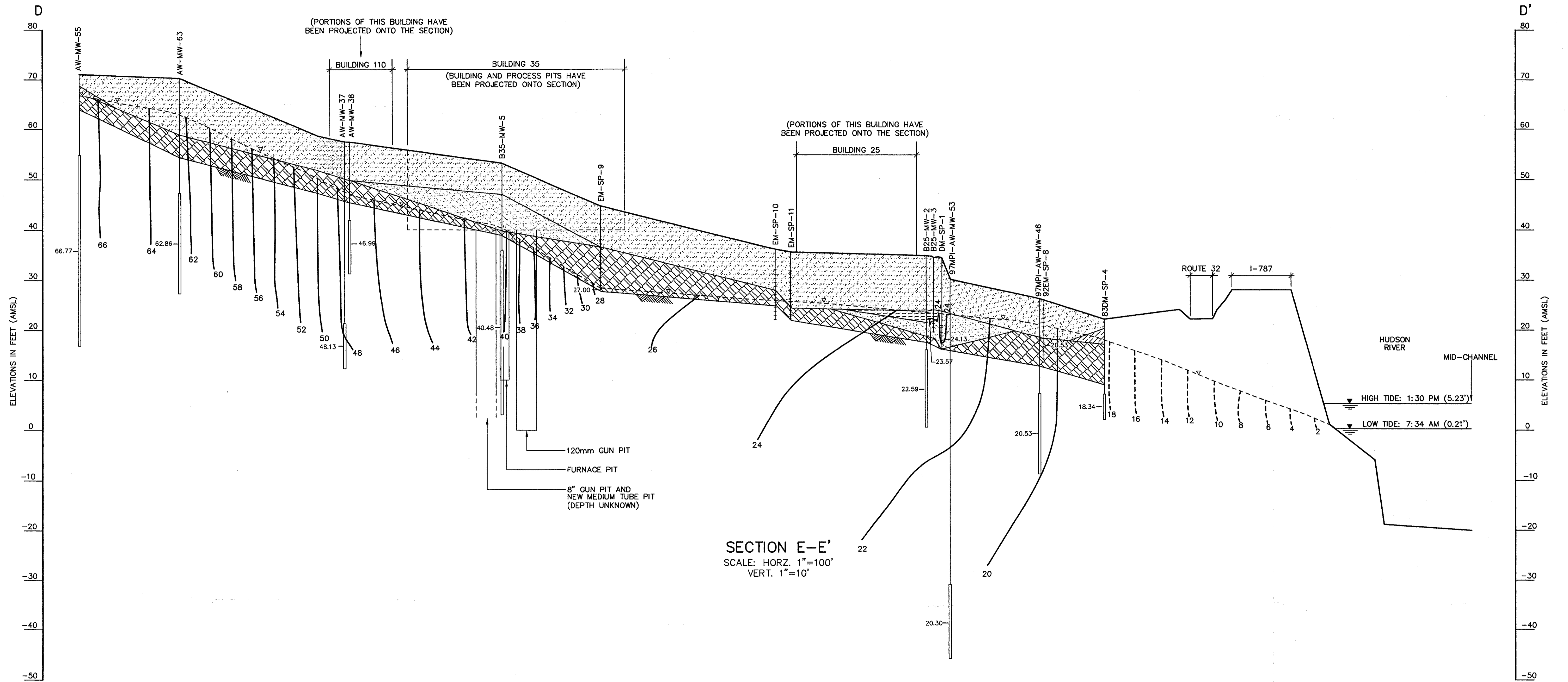
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DES ARV
DWN SMH
CKD KJG

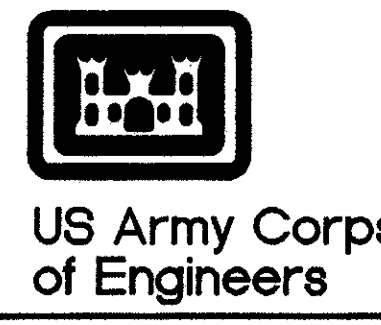
WATERVIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017

HYDROGEOLOGIC CROSS SECTIONS
A-A' AND D-D' (FEBRUARY 11, 1999)
SCALE: AS SHOWN

MALCOLM PIRNIE, INC.
DATE JUNE 1999
SHEET 1 OF 2
DWG. NO. 587-140



7609 3448002800 E:\ACAD\PROJECTS\587\587-116 Scale: 1:11 Date: 06/09/1999 Time: 13.30



**MALCOLM
PIRNIE**

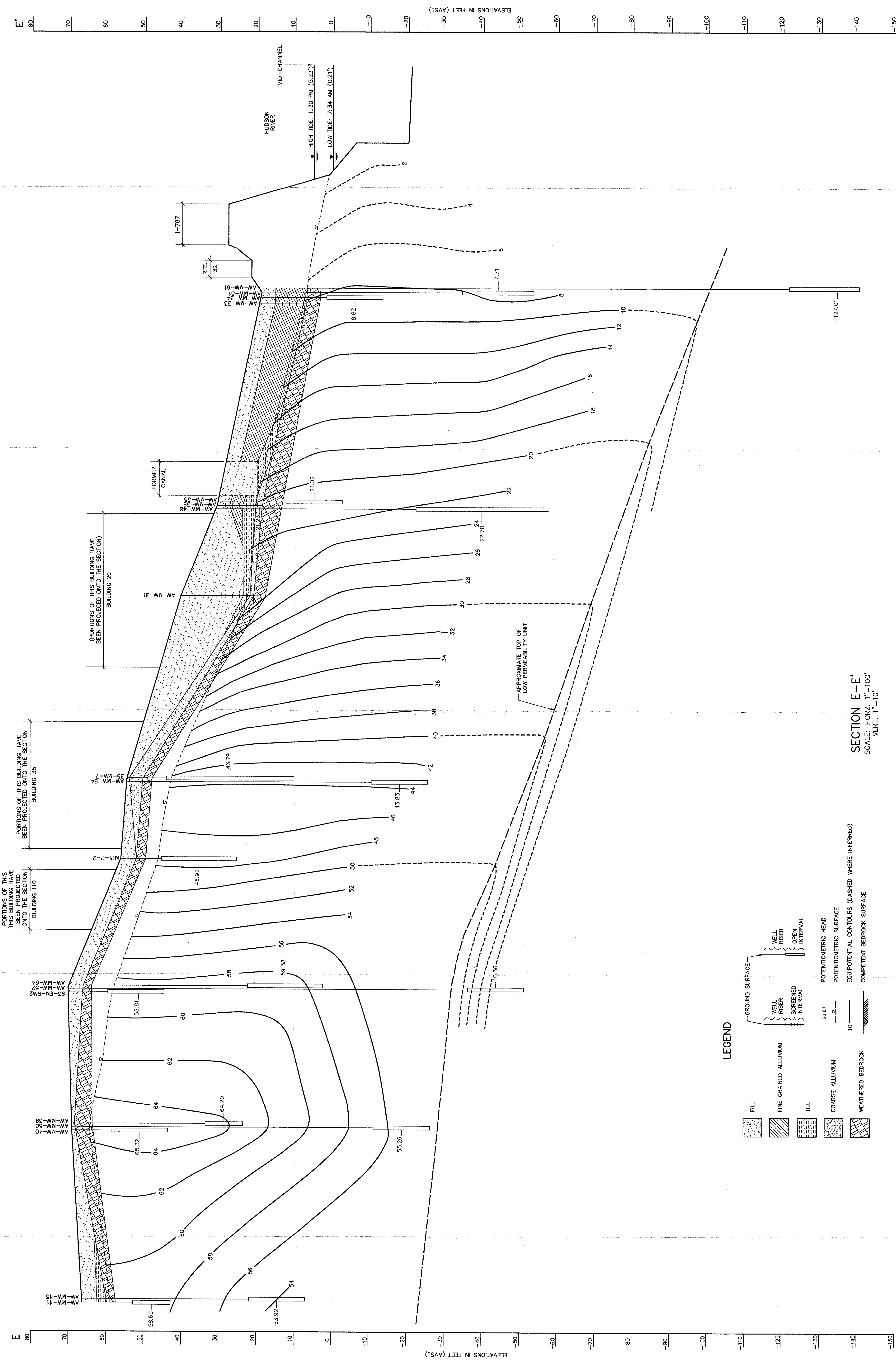
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| NO. | BY | DATE | REMARKS |
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DES - ARV
DWN - SMH
OKD - KJG

**WATERVIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017**

**HYDROGEOLOGIC CROSS-SECTIONS
A-A' AND D-D' (FEBRUARY 11, 1999)
SCALE: AS SHOWN**

MALCOLM PIRNIE, INC.
DATE: JUNE 1999
SHEET 2 OF 2
DWG. NO. 587-116



ELEVATIONS IN FEET (AMSL)

ELEVATIONS IN FEET (AMSL)

- LEGEND**
- GROUND SURFACE
 - WELL RISER
 - SCREENED INTERVAL
 - OPEN INTERVAL
 - POTENTIOMETRIC HEAD
 - POTENTIOMETRIC SURFACE
 - EQUIPOTENTIAL CONTOURS (DASHED WHERE INFERRERD)
 - COMPETENT BEDROCK SURFACE
- FILL
 FINE GRAINED ALLUVIUM
 TILL
 COARSE ALLUVIUM
 WEATHERED BEDROCK

SECTION E-E'
 SCALE: HORIZ. 1"=100'
 VERT. 1"=10'

PLATE 4-7

HYDROGEOLOGIC CROSS-SECTION E-E'
 (FEBRUARY 11, 1999)
 SCALE: AS SHOWN

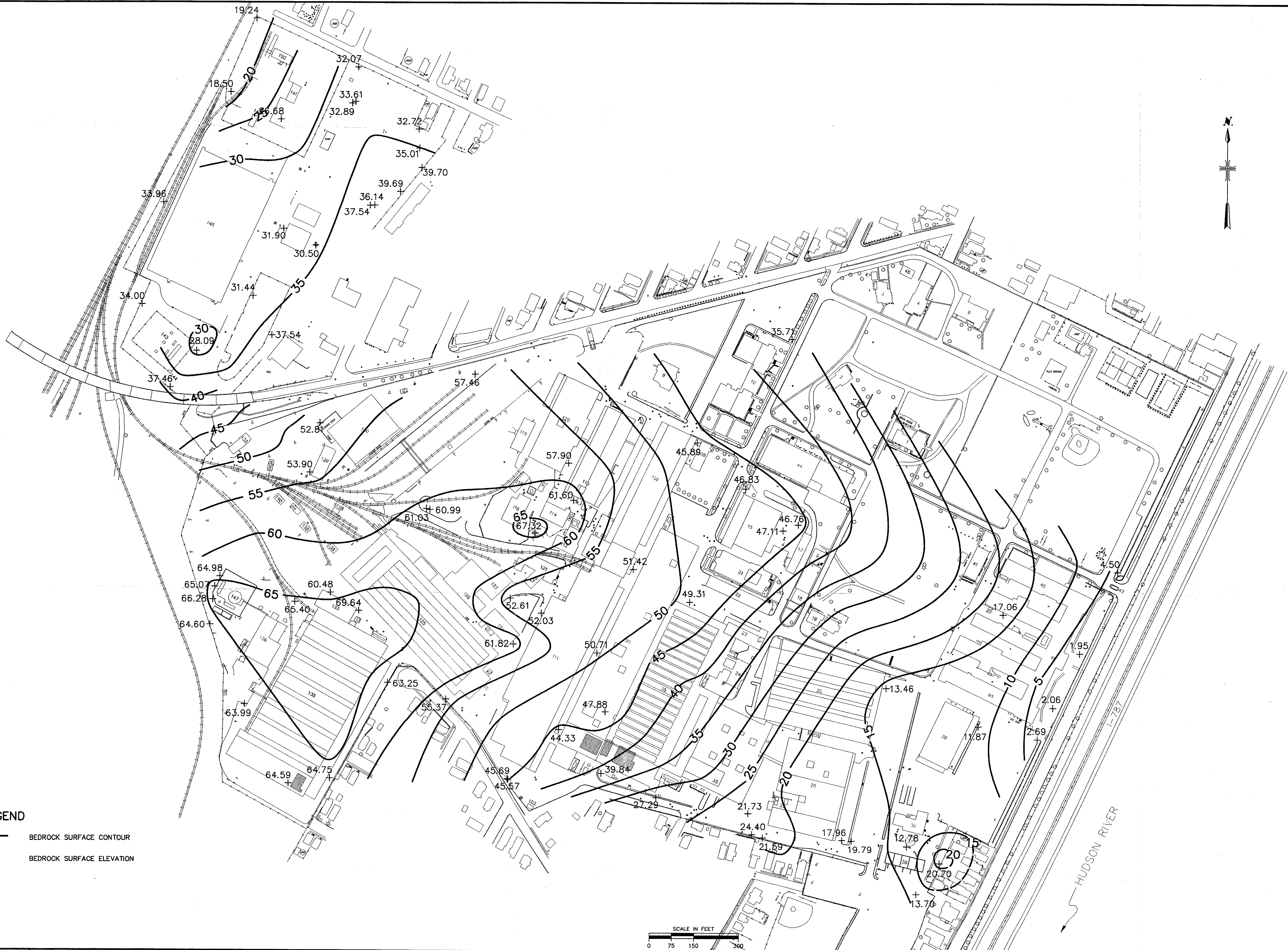
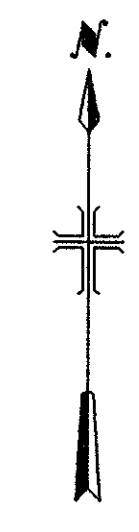
WATERVLIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017

| NO. | BY | DATE | REVISIONS | REMARKS |
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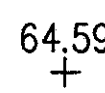
MALCOLM PIRNIE
 US Army Corps of Engineers

MALCOLM PIRNIE, INC.
 DATE: JUNE 1999
 SHEET: OF
 DWG. NO. 587-120A

7926 24:02:2900 : \\CAD\PROJ\106\587\94\047\FIN\11987-120A 24:02:11:04:08/05/1999 Tmp: 13:47



LEGEND

-  60 BEDROCK SURFACE CONTOUR
-  64.59 BEDROCK SURFACE ELEVATION

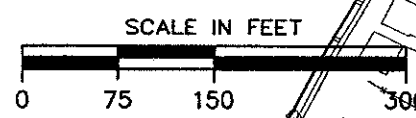
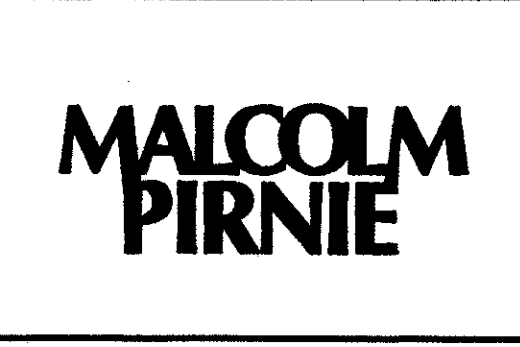
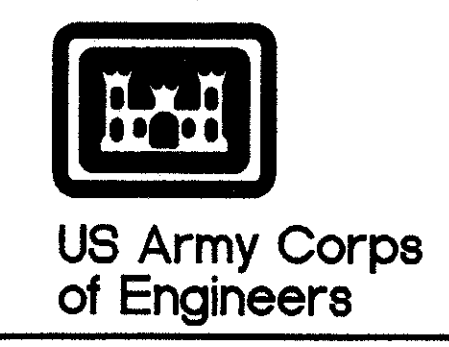


PLATE 4-8

7808 3418002900 1_VACADY PROJ 0285 5879 URNET_FINAL_587-133 Scale: 1:11 Date: 06/09/1999 Time: 13:50



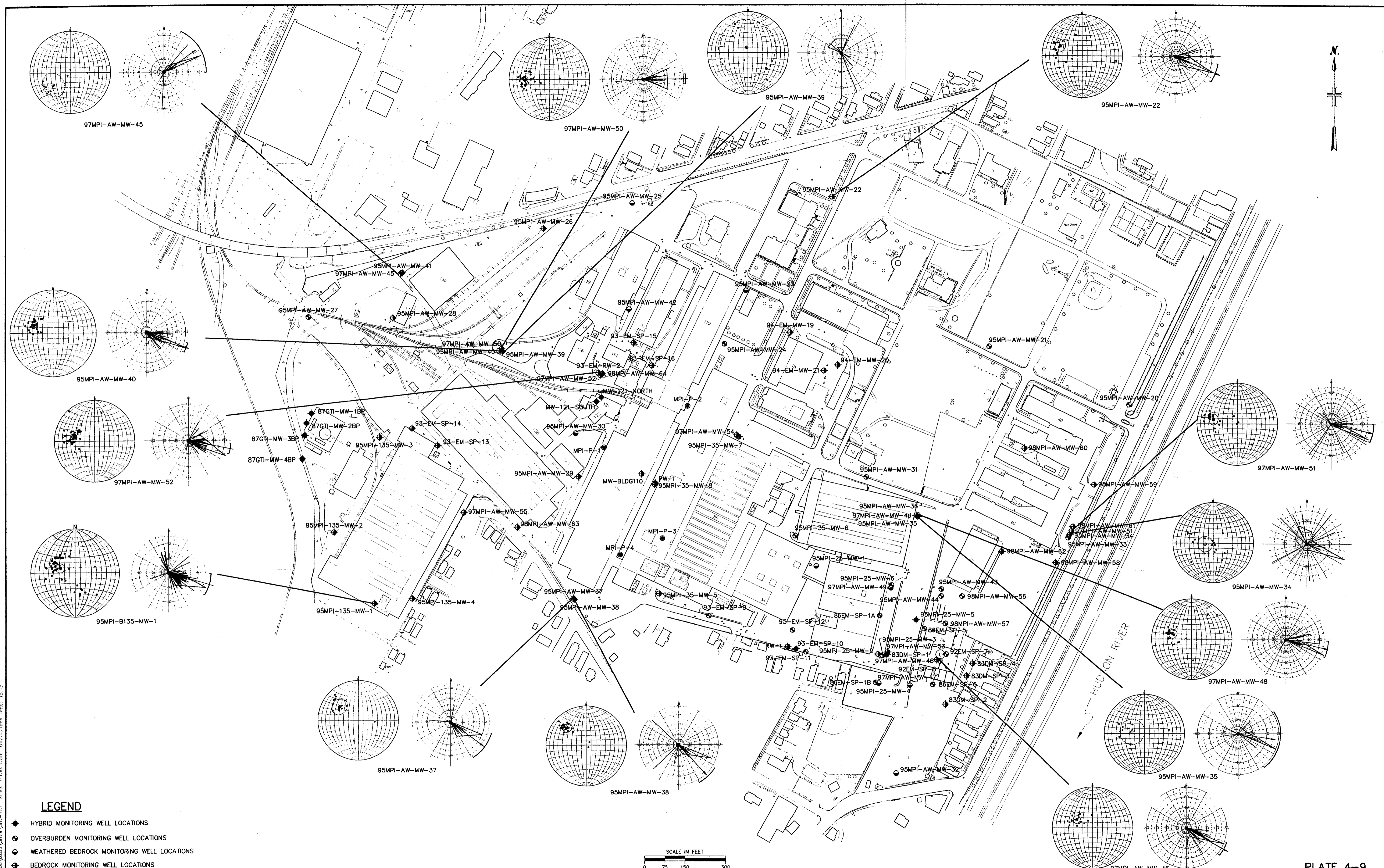
| REVISIONS | | | |
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| NO. | BY | DATE | REMARKS |
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DES DCB
 DWN JAP
 CKD KJG

**WATERVLIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017**

**GENERALIZED BEDROCK SURFACE
 CONTOUR MAP**

MALCOLM PIRNIE, INC.
 DATE JUNE 1999
 SHEET OF
 DWG. NO. 587-133



LEGEND

- ◆ HYBRID MONITORING WELL LOCATIONS
- OVERBURDEN MONITORING WELL LOCATIONS
- WEATHERED BEDROCK MONITORING WELL LOCATIONS
- ⊕ BEDROCK MONITORING WELL LOCATIONS

| NO. | | BY | DATE | REVISIONS | REMARKS |
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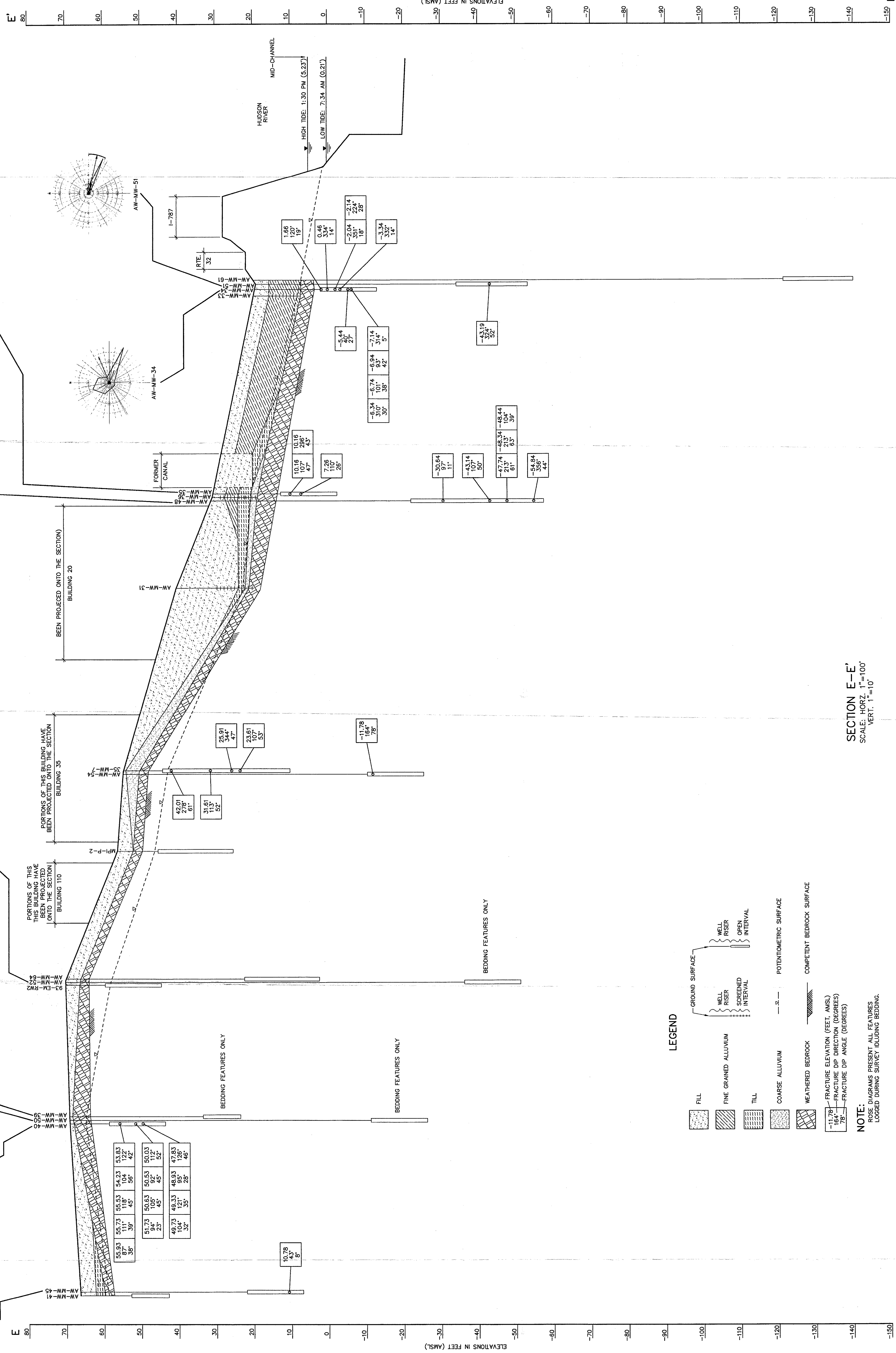
DES ARV
 DWN SMH
 CKD KJG

**WATERVLIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017**

**FEATURE ORIENTATION
 MAPPING DATA
 SCALE: AS SHOWN**

PLATE 4-9
 MALCOLM PIRNIE, INC.
 DATE MARCH 1999
 SHEET OF
 DWG. NO. 587-113

3.07: 028557900 1: A:CAD:PROJ:\028557900\587-113: Scale: 1:1500 Date: 04/14/1999 Time: 15.13
 XREF: X587-01



SECTION E-E'
SCALE: HORIZ. 1"=100'
VERT. 1"=10'

- LEGEND**
- FILL
 - FINE GRAINED ALLUVIUM
 - TILL
 - COARSE ALLUVIUM
 - WEATHERED BEDROCK
 - COMPETENT BEDROCK SURFACE
 - GROUND SURFACE
 - WELL RISER
 - SCREENED INTERVAL
 - POTENTIOMETRIC SURFACE
 - WELL RISER OPEN INTERVAL
 - FRACTURE ELEVATION (FEET, AMSL)
 - FRACTURE DIP DIRECTION (DEGREES)
 - FRACTURE DIP ANGLE (DEGREES)

NOTE:
ROSE DIAGRAMS PRESENT ALL FEATURES LOGGED DURING SURVEY INCLUDING BEDDING.

USACE CONTRACT NO. DACA31-94-D-0017

WATERVLIET ARSENAL
MAIN MANUFACTURING AREA

ORIENTATION OF FRACTURES ALONG
HYDROGEOLOGIC CROSS-SECTION E-E'

SCALE: AS SHOWN

U.S. Army Corps of Engineers

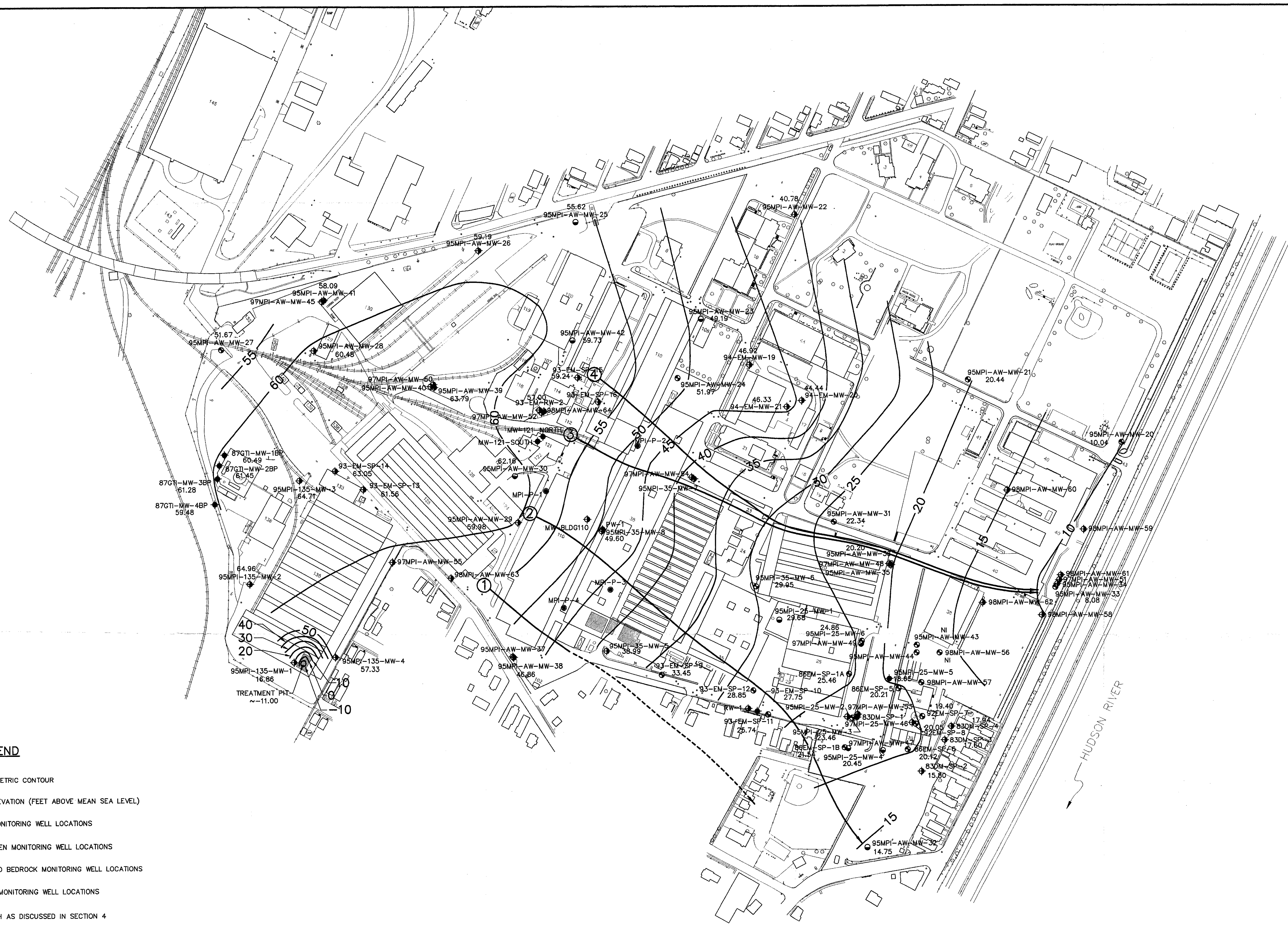
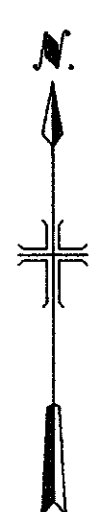
MALCOLM PIRNIE, INC.

DATE: JUNE 1999

SHEET: OF

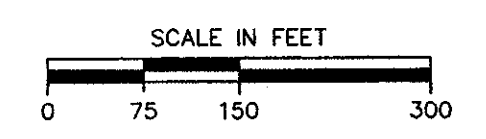
DWG. NO. 587-147

PLATE 4-10

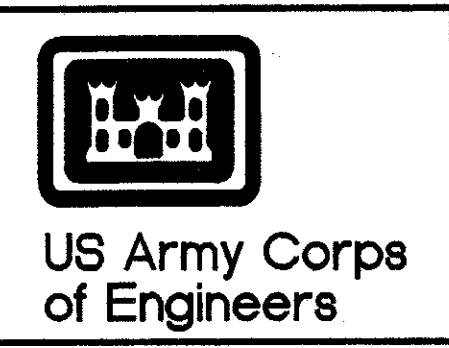


LEGEND

- 60 — POTENTIOMETRIC CONTOUR
- 49.60 WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- ◆ HYBRID MONITORING WELL LOCATIONS
- OVERBURDEN MONITORING WELL LOCATIONS
- WEATHERED BEDROCK MONITORING WELL LOCATIONS
- ⊕ BEDROCK MONITORING WELL LOCATIONS
- ① FLOW PATH AS DISCUSSED IN SECTION 4
- NI AW-MW-43 AND AW-MW-44 WERE NOT INSTALLED AS OF SEPTEMBER 11, 1995



7808 3418002000 L:\CAD\1\003\0385\5679\DRAWING_FINAL\587-114_Sect4_1:150.Dwg Date: 05/09/1995 Time: 14:38 XREF: X587-01



**MALCOLM
PIRNIE**

| NO. | | BY | DATE | REVISIONS | REMARKS |
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| DES | ARV |
| DWN | SMH |
| CKD | KJG |

**WATERLIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017**

**SHALLOW POTENTIOMETRIC CONTOUR
MAP (SEPTEMBER 11, 1995)**

PLATE 4-11

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| MALCOLM PIRNIE, INC. | |
| DATE | JUNE 1999 |
| SHEET | OF |
| DWG. NO. | 587-114 |

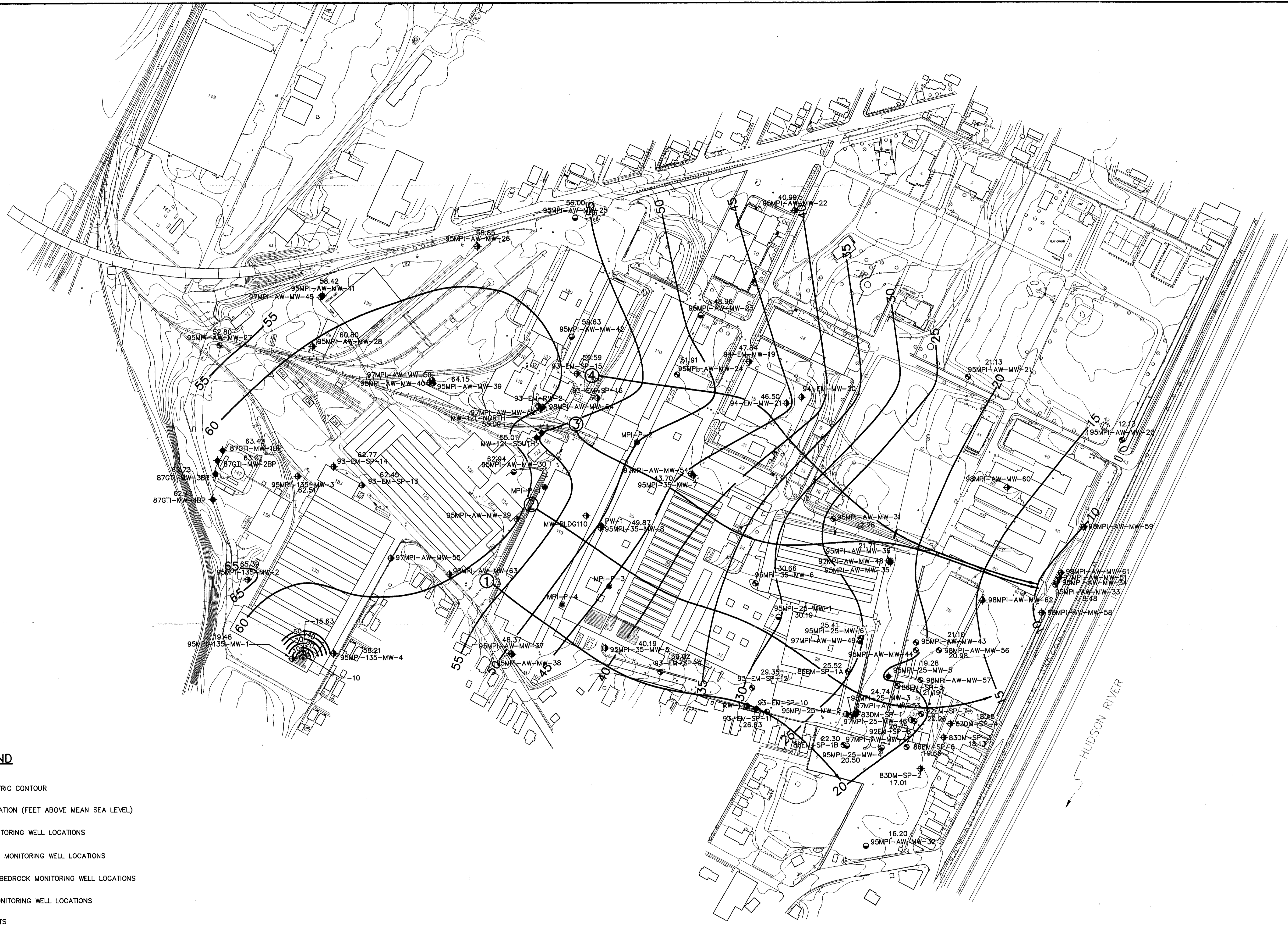


PLATE 4-12

MALCOLM PIRNIE, INC.

DATE JUNE 1999

SHEET OF

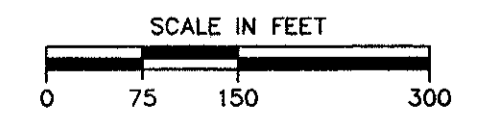
DWG. NO. 587-112

WATERVLIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017

SHALLOW POTENTIOMETRIC CONTOUR MAP
 (MAY 20, 1996)

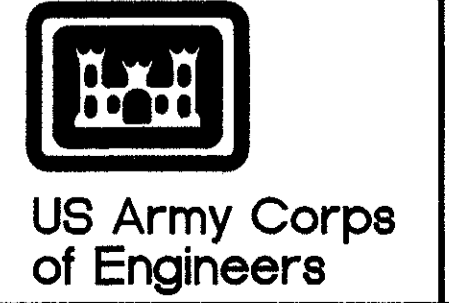
LEGEND

- 60 — POTENTIOMETRIC CONTOUR
- 49.60 WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- ◆ HYBRID MONITORING WELL LOCATIONS
- OVERBURDEN MONITORING WELL LOCATIONS
- WEATHERED BEDROCK MONITORING WELL LOCATIONS
- ⊕ BEDROCK MONITORING WELL LOCATIONS
- PROCESS PITS
- ① FLOW PATH AS DISCUSSED IN SECTION 4



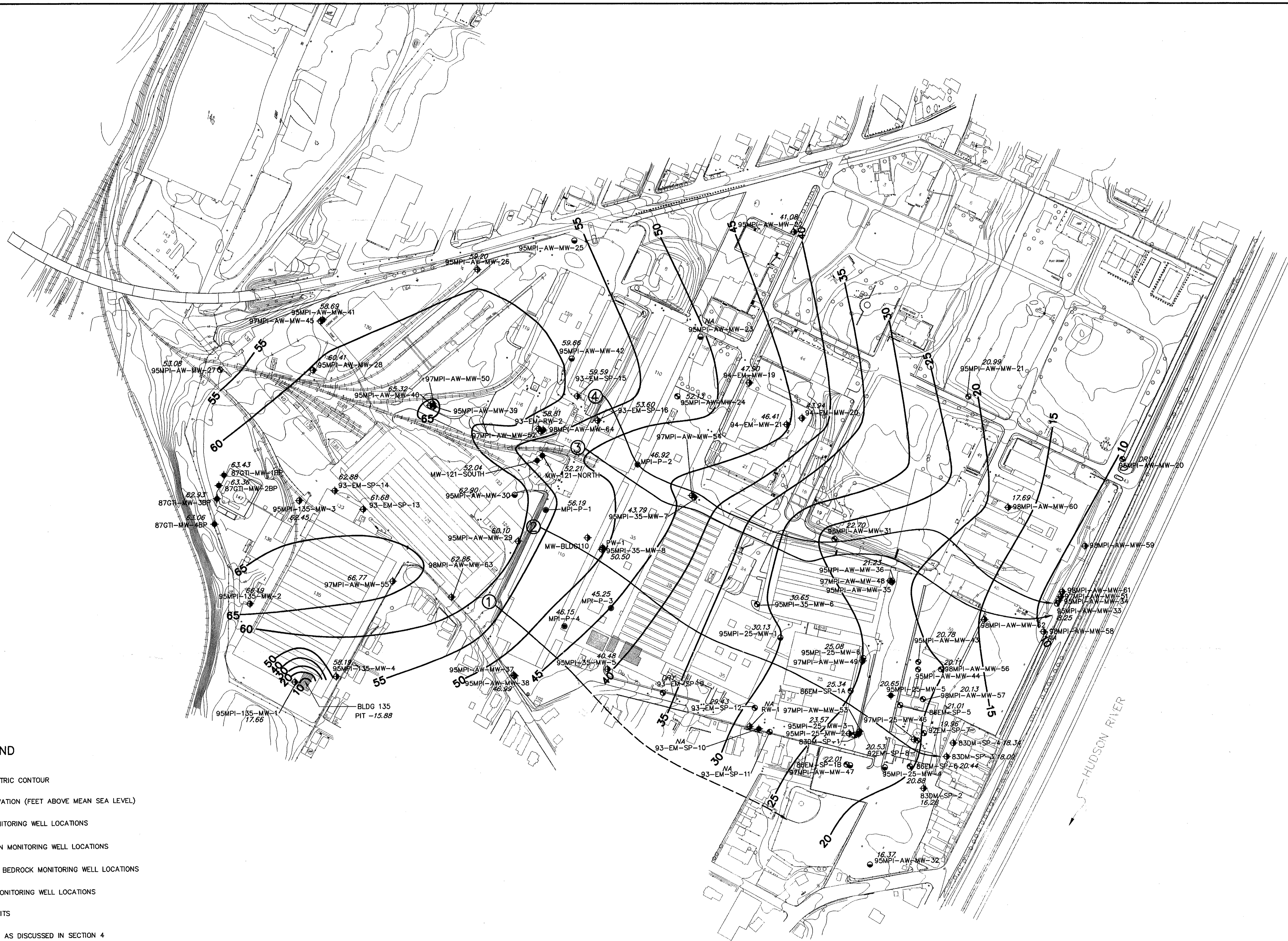
| REVISIONS | | REMARKS |
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DES ARV
 DWN SMH
 CKD KJG



MALCOLM PIRNIE

7806 341802390 E:\ACAD\PROJ\0285\587\587-112 Scale: 1:1 Date: 05/09/1999 Time: 15:00 XREF: X587-01



LEGEND

- 60 — POTENTIOMETRIC CONTOUR
- 49.60 WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- ◆ HYBRID MONITORING WELL LOCATIONS
- OVERBURDEN MONITORING WELL LOCATIONS
- WEATHERED BEDROCK MONITORING WELL LOCATIONS
- ◆ BEDROCK MONITORING WELL LOCATIONS
- PROCESS PITS
- ① FLOW PATH AS DISCUSSED IN SECTION 4
- NA NOT ACCESSIBLE

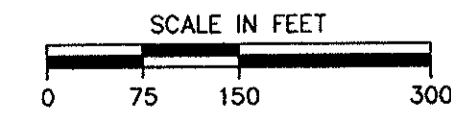
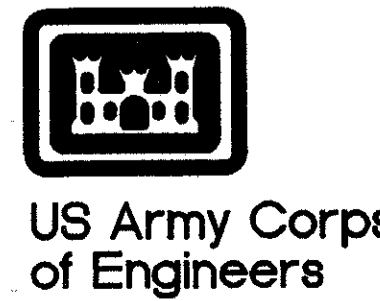


PLATE 4-13

7808 3418020200 I:\ACAD\PROJECTS\5879\DRAWING\FINAL\587-132 Scale: 1:1 Date: 06/09/1999 Time: 15:18



**MALCOLM
PIRNIE**

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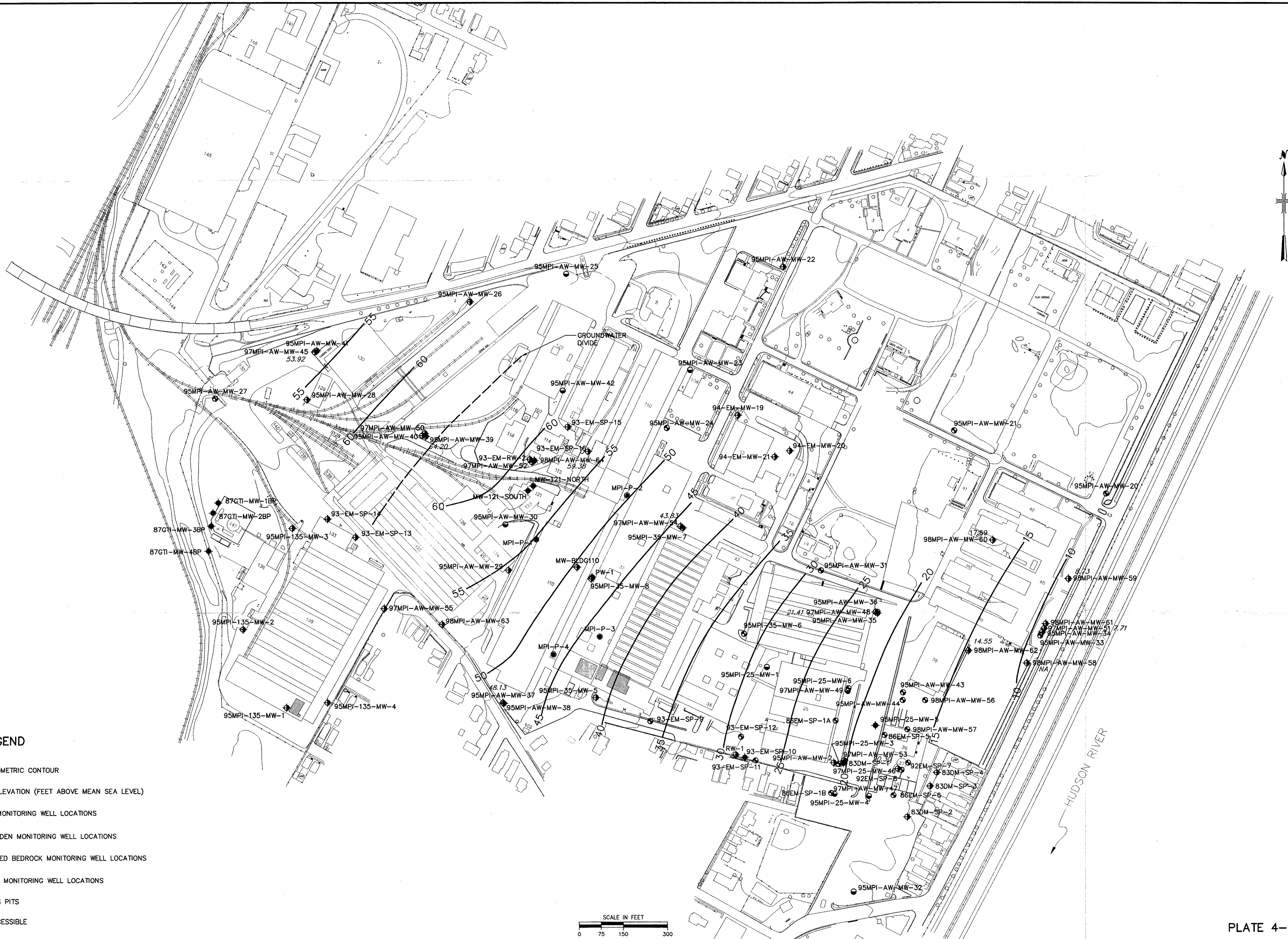
DES ARV
 DWN SMH
 OKD KJC

**WATERVLIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017**

**SHALLOW POTENTIOMETRIC CONTOUR MAP
 (FEBRUARY 11, 1999)**

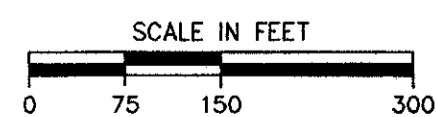
MALCOLM PIRNIE, INC.
 DATE JUNE 1999
 SHEET OF
 DWG. NO. 587-132

XREF: X587-01



LEGEND

- 60 — POTENTIOMETRIC CONTOUR
- 49.60 WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)
- ◆ HYBRID MONITORING WELL LOCATIONS
- OVERBURDEN MONITORING WELL LOCATIONS
- WEATHERED BEDROCK MONITORING WELL LOCATIONS
- ◆ BEDROCK MONITORING WELL LOCATIONS
- PROCESS PITS
- NA NOT ACCESSIBLE



**WATERVLIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017**

**INTERMEDIATE POTENTIOMETRIC
CONTOUR MAP (FEBRUARY 11, 1999)**

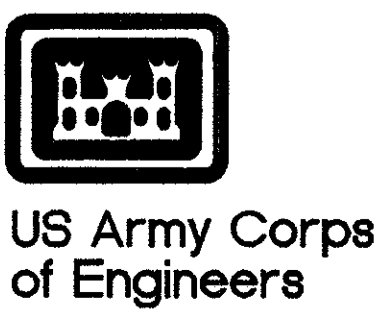
PLATE 4-14

MALCOLM PIRNIE, INC.

DATE JUNE 1999

SHEET ____ OF ____

DWG. NO. 587-144

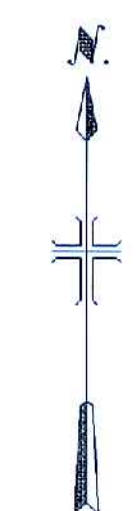


**MALCOLM
PIRNIE**








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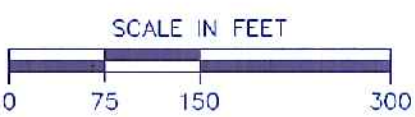
DES ARV
DWN SMH
CKD KJG

7/06 3418002900 1: VACADYPROJ\0285\5878 DRAFT_FINAL_587-144 Scale: 1:11 Date: 06/09/1999 Time: 15:20 XREF: X587-01



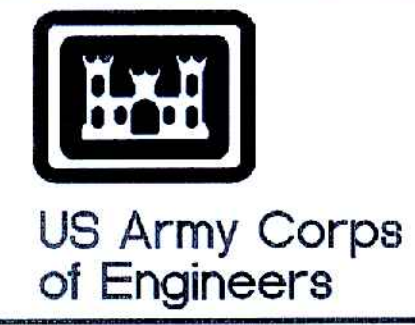
LEGEND

-  PROCESS PITS
-  APPROXIMATE LOCATIONS SANITARY CATCH BASINS
-  APPROXIMATE LOCATIONS STORM CATCH BASINS
-  APPROXIMATE LOCATIONS SANITARY MANHOLE
-  APPROXIMATE LOCATIONS STORM MANHOLE
-  APPROXIMATE LOCATIONS STORM PIPES
-  APPROXIMATE LOCATIONS SANITARY PIPES



SOURCE: WVA--GENERAL SANITARY SEWER PLAN 11/88, DWG #18-04-01, WVA--GENERAL STORM DRAINAGE PLAN 11/88, DWG# 18-04-01

PLATE 4-15



**MALCOLM
PIRNIE**

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DES: CG
 DWN: JAP
 CKD: KJG

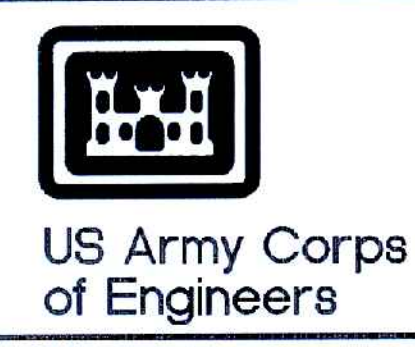
WATERVLIET ARSENAL
 USACE CONTRACT NO. DACA31-94-D-0017

**SANITARY AND STORM
 SEWER LINES**

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 MALCOLM PIRNIE, INC.
 DATE: JUNE 1999
 SHEET ____ OF ____
 DWG. NO. 587-104

4871 026587100 1 VACAD\PROJ\0283\88\WVA\DRIFT_FINAL\587-104.dwg 08/02/99 07:20 Scale: 1:1 Date: 08/02/99 Time: 07:20 XREF: X587-01

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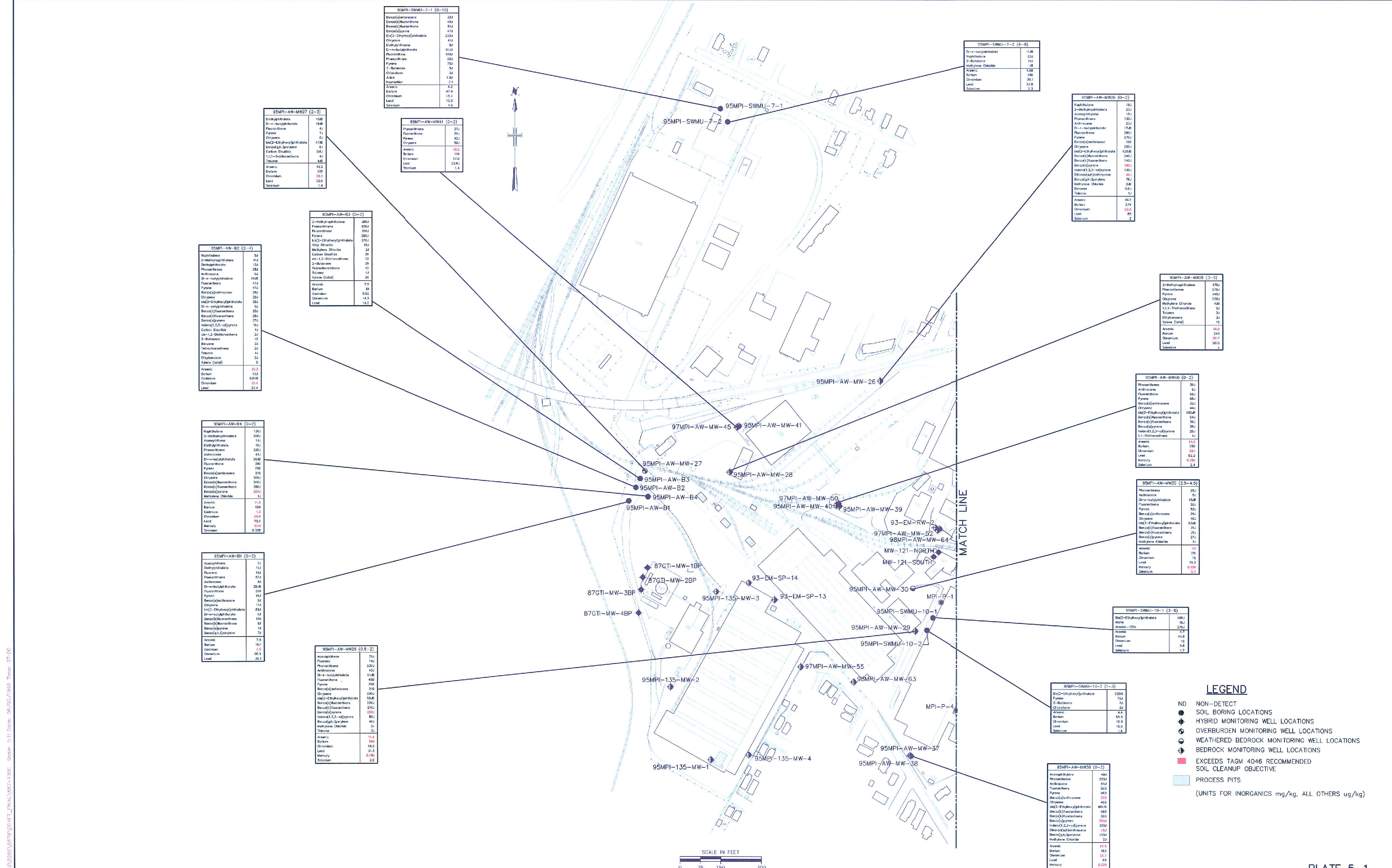
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DES ARV
 DWN SMH
 OKD KJG

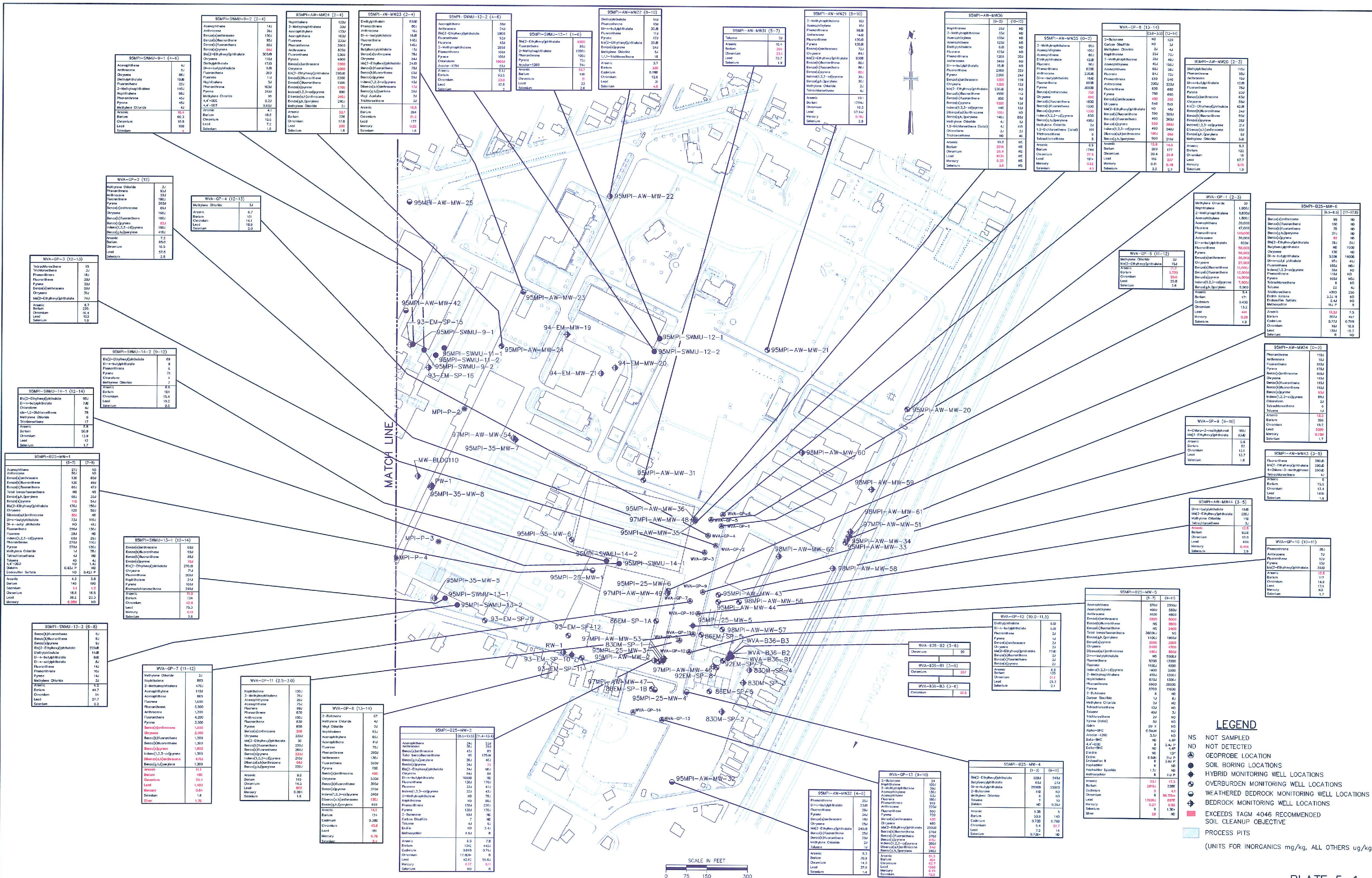
**WATERVLIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017**

**SUMMARY OF SOIL
 INDIVIDUAL PARAMETER RESULTS**

MALCOLM PIRNIE, INC.
 DATE JUNE 1999
 SHEET 1 OF 2
 DWG. NO. 587-130C



4571 025558107 1: MALCOLM PIRNIE\9393\9393\06\FE\FINAL\587-131C_Scaner: 11/11/99, Date: 08/02/1999, Time: 07:05



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| DWN | SMH | | | | |
| CKD | KJG | | | | |

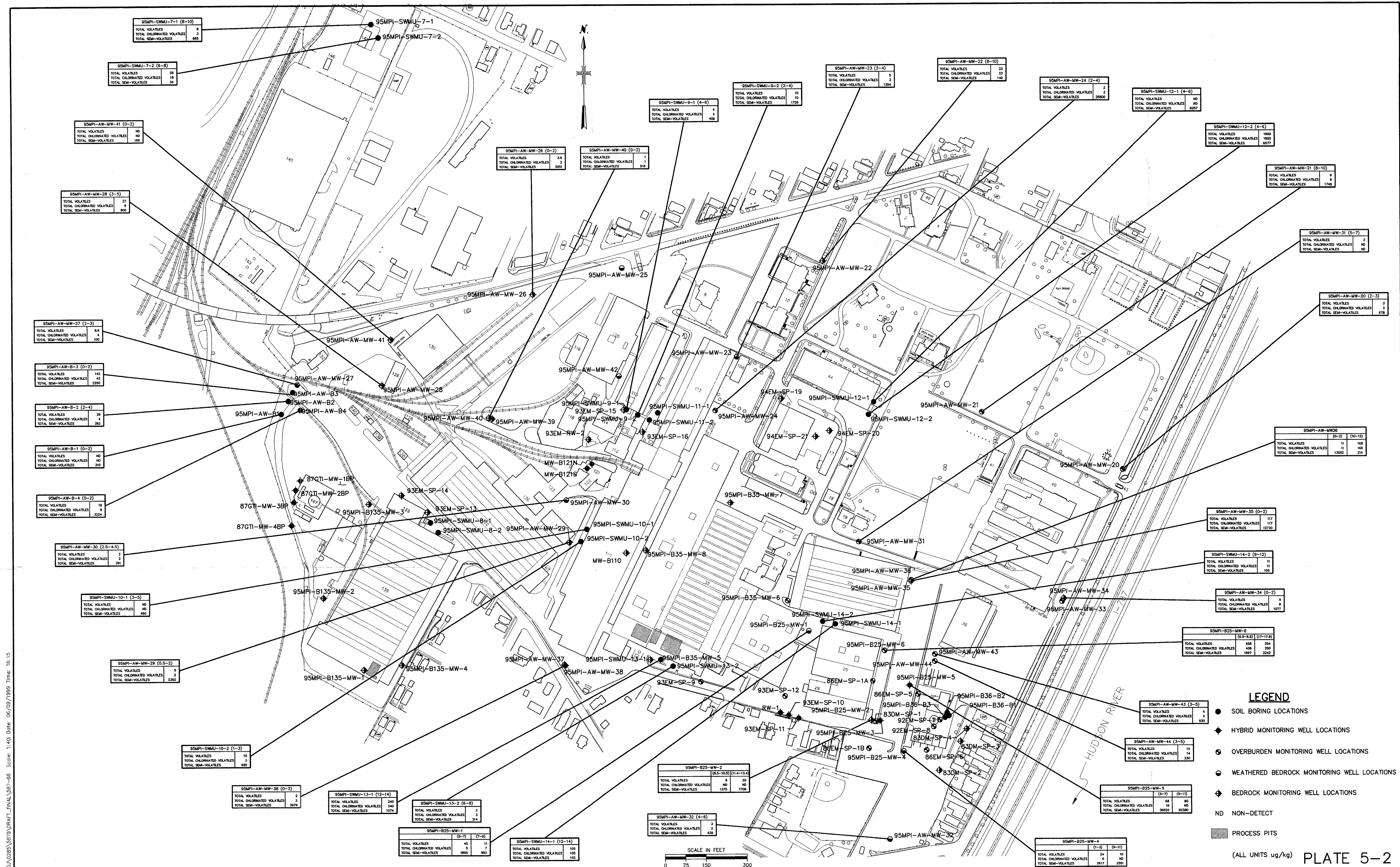
WATERVLIET ARSENAL MAIN MANUFACTURING AREA USACE CONTRACT NO. DACA31-94-D-0017

SUMMARY OF SOIL INDIVIDUAL PARAMETER RESULTS

MALCOLM PIRNIE, INC.
DATE: JUNE 1999
SHEET 2 OF 2
DWG. NO. 587-131C

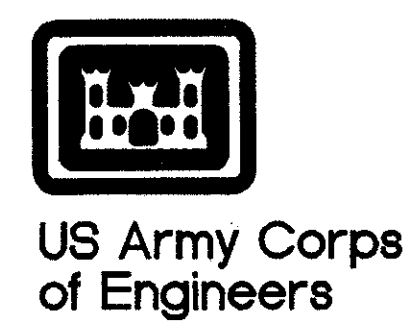
PLATE 5-1

341602800 1. ACADVP/PC/285/5873 DRAFT_FINAL_587-66. Scale: 1:401. Date: 06/09/1999. Time: 16:15
 XREF: X587-01



- LEGEND**
- SOIL BORING LOCATIONS
 - ◆ HYBRID MONITORING WELL LOCATIONS
 - ⊙ OVERBURDEN MONITORING WELL LOCATIONS
 - ⊖ WEATHERED BEDROCK MONITORING WELL LOCATIONS
 - ⊕ BEDROCK MONITORING WELL LOCATIONS
 - ND NON-DETECT
 - PROCESS PITS
- (ALL UNITS ug/kg)

PLATE 5-2



**MALCOLM
PIRNIE**

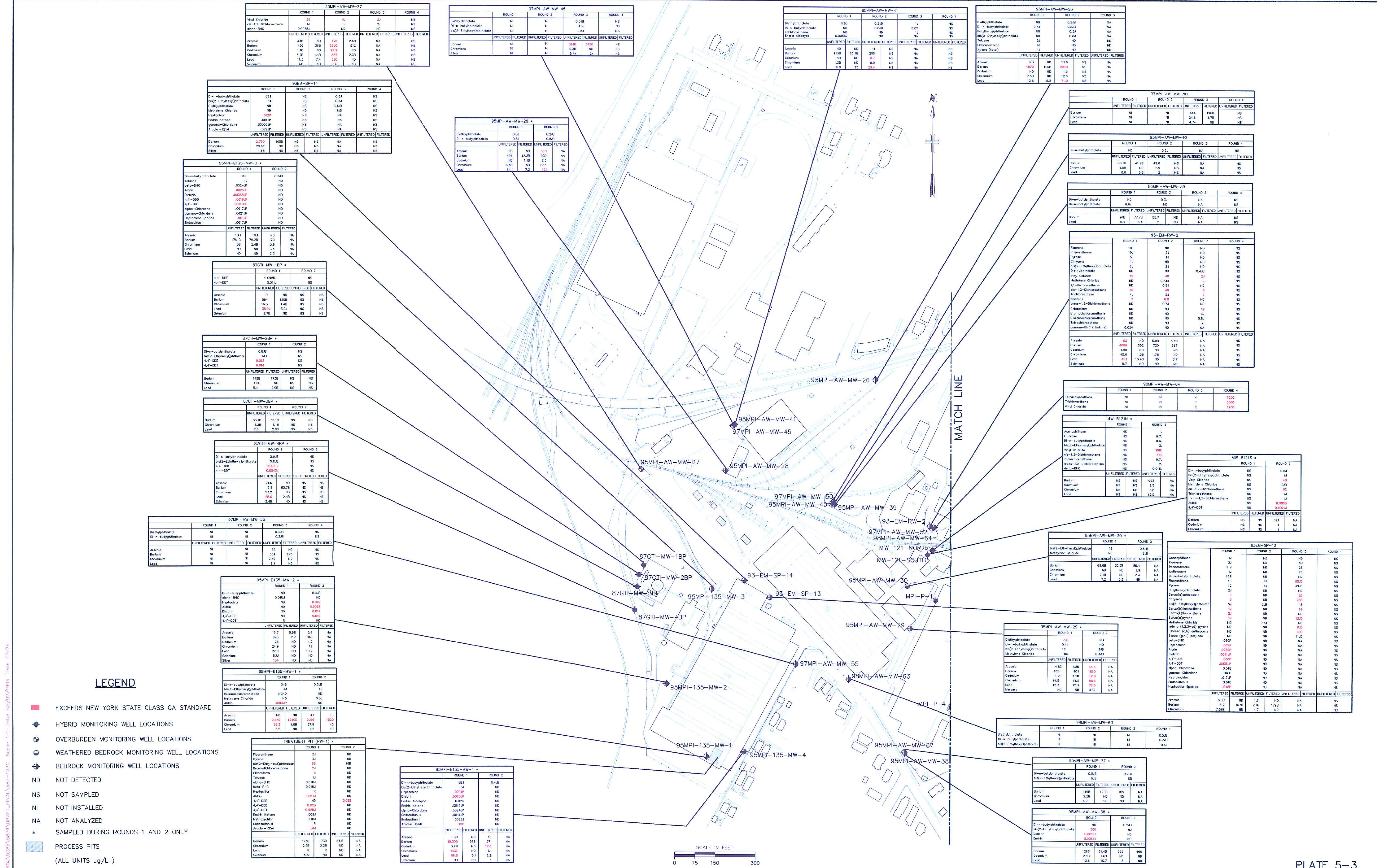
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DES DCB
DWN SMH
CKD KJG

**WATERVLIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017**

SUMMARY OF SOIL SAMPLING RESULTS

MALCOLM PIRNIE, INC.
 DATE JUNE 1999
 SHEET 1 OF 1
 DWG. NO. 587-66



LEGEND

- EXCEEDS NEW YORK STATE CLASS GA STANDARD
- ◆ HYBRID MONITORING WELL LOCATIONS
- ⊕ OVERBURDEN MONITORING WELL LOCATIONS
- ⊖ WEATHERED BEDROCK MONITORING WELL LOCATIONS
- ⊕ BEDROCK MONITORING WELL LOCATIONS
- ND NOT DETECTED
- NS NOT SAMPLED
- NI NOT INSTALLED
- NA NOT ANALYZED
- * SAMPLED DURING ROUNDS 1 AND 2 ONLY
- PROCESS PITS (ALL UNITS ug/L)

95MPI-D135-MW-1

| PARAMETER | ROUND 1 | ROUND 2 | STATUS |
|------------------------------|---------|---------|--------|
| Di-n-butylphthalate | ND | 0.54 | NS |
| Di-2-Ethylhexylphthalate | ND | ND | NS |
| Bis(2-Chlorophenyl)phthalate | ND | 0.41 | NS |
| Methylene Chloride | ND | 0.41 | NS |
| Arsenic | ND | 4.1 | NS |
| Barium | 2,640 | 1,040 | NS |
| Cadmium | 5.5 | 1.80 | NS |
| Chromium | 5.5 | 7.2 | NS |
| Lead | ND | ND | NS |
| Selenium | ND | ND | NS |

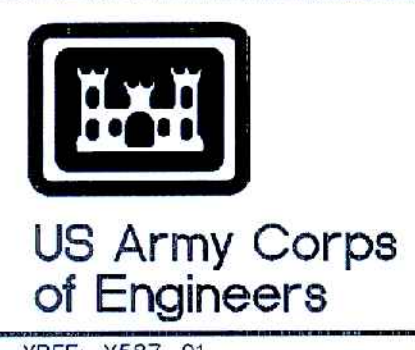
95MPI-D135-MW-3

| PARAMETER | ROUND 1 | ROUND 2 | STATUS |
|------------------------------|---------|---------|--------|
| Di-n-butylphthalate | ND | 0.48 | NS |
| Di-2-Ethylhexylphthalate | ND | 0.48 | NS |
| Bis(2-Chlorophenyl)phthalate | ND | 0.0024 | NS |
| Methylene Chloride | ND | 0.014 | NS |
| Arsenic | 21.5 | ND | NS |
| Barium | 311 | 65.78 | NS |
| Cadmium | 22.2 | ND | NS |
| Chromium | 28.5 | 2.48 | NS |
| Lead | 28.5 | 3.53 | NS |
| Selenium | 3.48 | ND | NS |

95MPI-D135-MW-2

| PARAMETER | ROUND 1 | ROUND 2 | STATUS |
|------------------------------|---------|---------|--------|
| Di-n-butylphthalate | ND | 0.48 | NS |
| Di-2-Ethylhexylphthalate | ND | 0.48 | NS |
| Bis(2-Chlorophenyl)phthalate | ND | 0.0024 | NS |
| Methylene Chloride | ND | 0.014 | NS |
| Arsenic | 21.5 | ND | NS |
| Barium | 311 | 65.78 | NS |
| Cadmium | 22.2 | ND | NS |
| Chromium | 28.5 | 2.48 | NS |
| Lead | 28.5 | 3.53 | NS |
| Selenium | 3.48 | ND | NS |

4871 0295587000 1: \AGCA\PROJ\0295587000\QIP\MPL\FINAL\95MPI-123C_Site.mxd 09/02/1999 10:59:02 AM



| NO. | BY | DATE | REVISIONS | REMARKS |
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DES: ARV
 DWN: SMH
 CKD: KJG

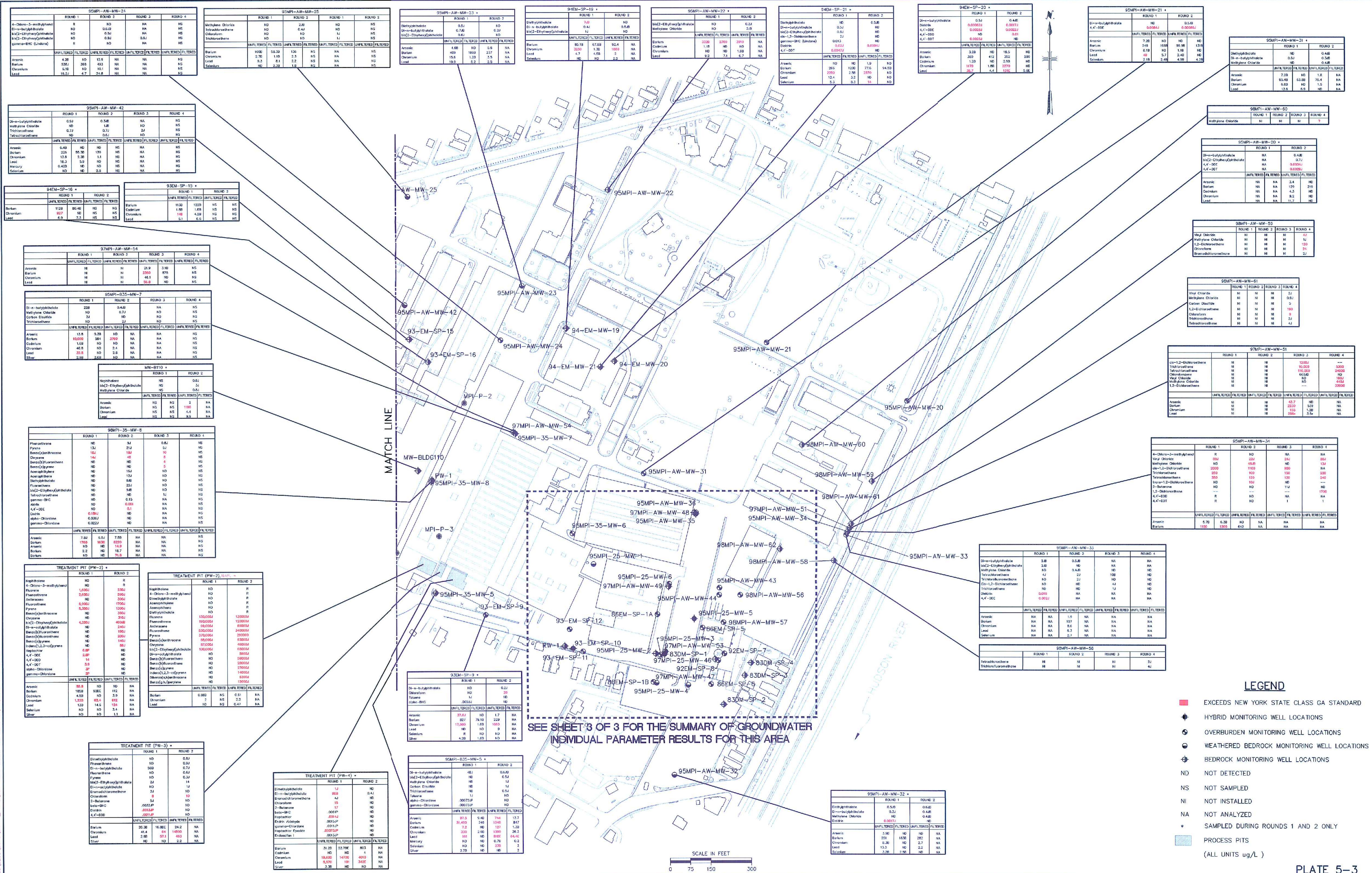
**WATERVIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017**

**SUMMARY OF GROUNDWATER
 INDIVIDUAL PARAMETER RESULTS**

MALCOLM PIRNIE, INC.
 DATE: JUNE 1999
 SHEET 1 OF 3
 DWG. NO. 587-123C

PLATE 5-3

4871 025587.rtd I:\VAD\025587\025587_01.dwg:PLT:FINAL_587-1222 Date: 11/11/09 Time: 07:27



LEGEND

- EXCEEDS NEW YORK STATE CLASS GA STANDARD
- HYBRID MONITORING WELL LOCATIONS
- OVERBURDEN MONITORING WELL LOCATIONS
- WEATHERED BEDROCK MONITORING WELL LOCATIONS
- BEDROCK MONITORING WELL LOCATIONS
- ND NOT DETECTED
- NS NOT SAMPLED
- NI NOT INSTALLED
- NA NOT ANALYZED
- * SAMPLED DURING ROUNDS 1 AND 2 ONLY
- PROCESS PITS

(ALL UNITS ug/L)

SEE SHEET 3 OF 3 FOR THE SUMMARY OF GROUNDWATER INDIVIDUAL PARAMETER RESULTS FOR THIS AREA

WATERVLIET ARSENAL MAIN MANUFACTURING AREA USACE CONTRACT NO. DACA31-94-D-0017

SUMMARY OF GROUNDWATER INDIVIDUAL PARAMETER RESULTS

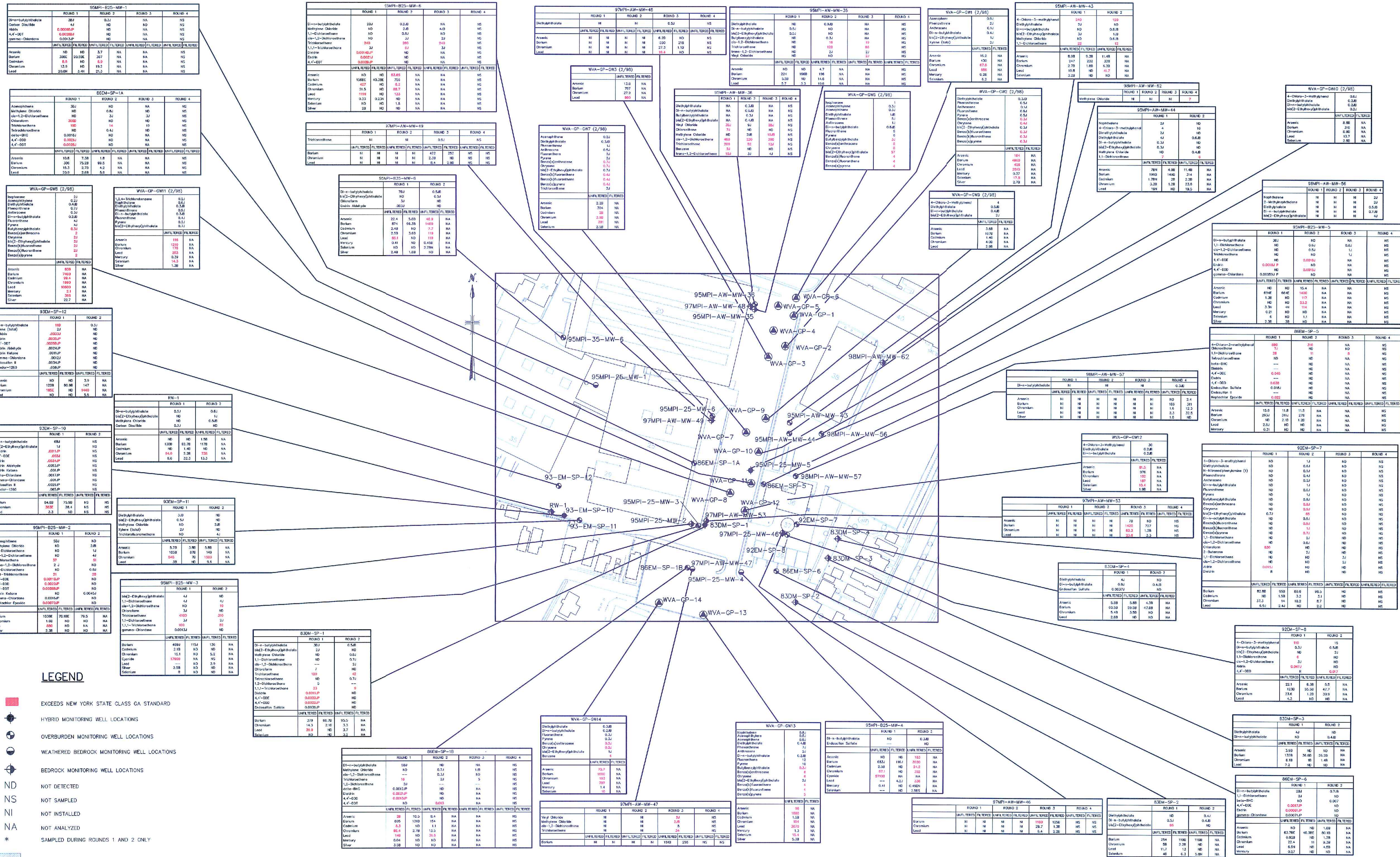
PLATE 5-3
MALCOLM PIRNIE, INC.
DATE JUNE 1999
SHEET 2 OF 3
DWG. NO. 587-122C



| REVISIONS | |
|-----------|---------|
| NO. | REMARKS |
| | |
| | |

DES ARV
DWN SMH
CKD KJC

4871: 025658700 1 V:\AD\BROA\DATA\REPORTS\PLATE 5-3.dwg Scale: 1:11 Date: 08/02/99 Time: 07:28



LEGEND

- EXCEEDS NEW YORK STATE CLASS GA STANDARD
- HYBRID MONITORING WELL LOCATIONS
- OVERBURDEN MONITORING WELL LOCATIONS
- WEATHERED BEDROCK MONITORING WELL LOCATIONS
- BEDROCK MONITORING WELL LOCATIONS
- ND NOT DETECTED
- NS NOT SAMPLED
- NI NOT INSTALLED
- NA NOT ANALYZED
- * SAMPLED DURING ROUNDS 1 AND 2 ONLY
- PROCESS PITS (ALL UNITS ug/L)

REVISIONS

| NO. | BY | DATE | REMARKS |
|-----|----|------|---------|
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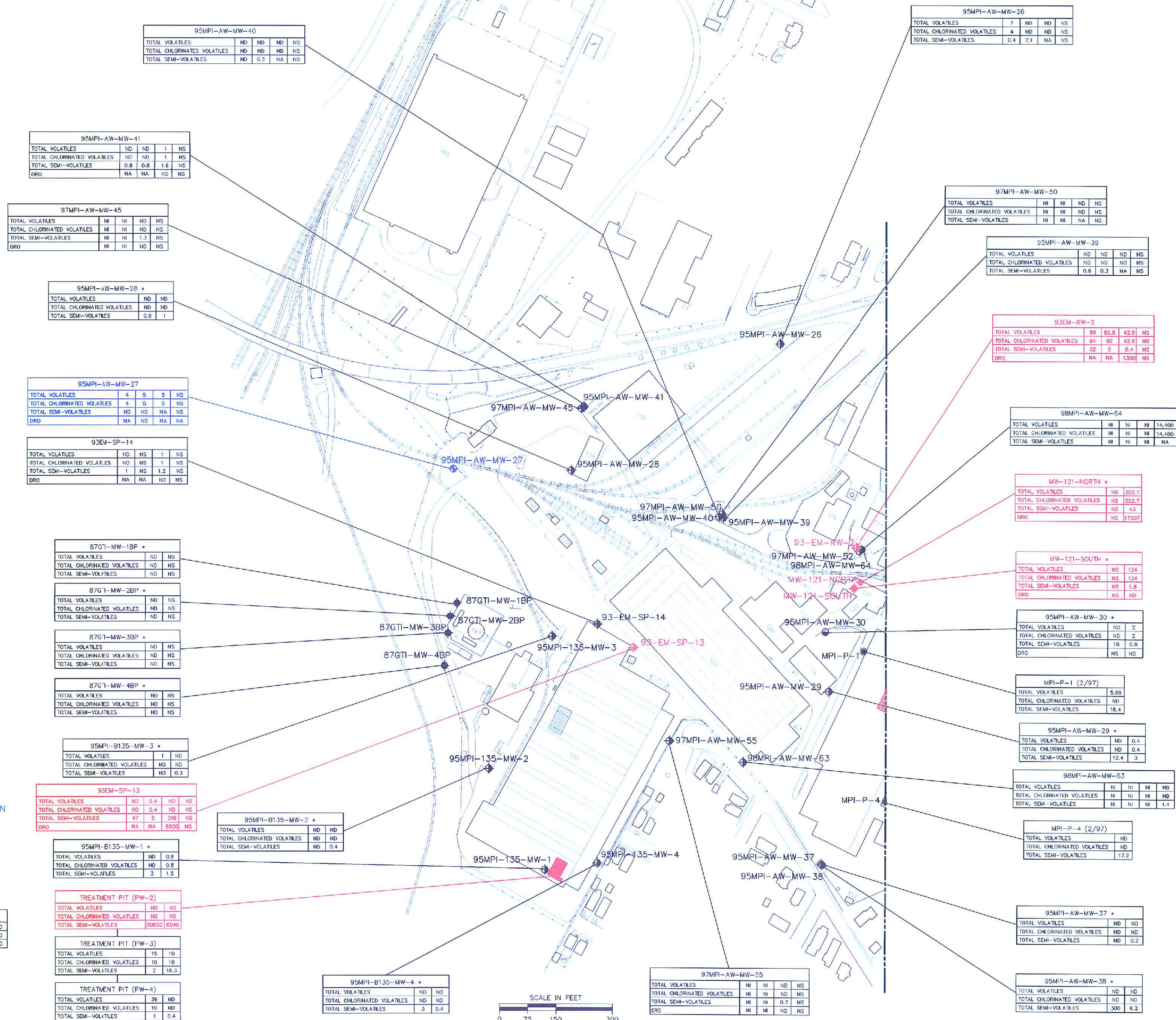
DESIGNATIONS

| | |
|-----|-----|
| DES | ARV |
| DWN | SMH |
| CKD | KJG |

WATERLIET ARSENAL MAIN MANUFACTURING AREA USACE CONTRACT NO. DACA31-94-D-0017

SUMMARY OF GROUNDWATER INDIVIDUAL PARAMETER RESULTS

MALCOLM PIRNIE, INC.
DATE: MARCH 1999
SHEET 3 OF 3
DWG. NO. 587-124C



LEGEND

- ◆ HYBRID MONITORING WELL LOCATIONS
 - OVERBURDEN MONITORING WELL LOCATIONS
 - ⊙ WEATHERED BEDROCK MONITORING WELL LOCATIONS
 - ⊕ BEDROCK MONITORING WELL LOCATIONS
 - ND NOT DETECTED
 - NS NOT SAMPLED
 - NI NOT INSTALLED
 - NA NOT ANALYZED
 - * SAMPLED DURING ROUNDS 1 AND 2 ONLY
 - PROCESS PITS (ALL UNITS ug/L)
- PAST OR PRESENT POL SHEEN
■ PAST OR PRESENT FREE PHASE POL
- ROUND 4 SAMPLE
 ROUND 3 SAMPLE
 ROUND 2 SAMPLE
 ROUND 1 SAMPLE
- | WELL DESIGNATION | ND | NI | NS | NA |
|-----------------------------|-----|-----|----|----|
| TOTAL VOLATILES | ND | ND | ND | ND |
| TOTAL CHLORINATED VOLATILES | ND | ND | ND | ND |
| TOTAL SEMI-VOLATILES | 300 | 6.2 | ND | ND |

| 95MPI-135-MW-3 * | | | | |
|-----------------------------|----|----|------|----|
| TOTAL VOLATILES | ND | ND | ND | NS |
| TOTAL CHLORINATED VOLATILES | ND | ND | ND | NS |
| TOTAL SEMI-VOLATILES | 47 | 5 | 318 | NS |
| DRO | NA | NA | 9500 | NS |

| 95MPI-B135-MW-1 * | | | | |
|-----------------------------|----|-----|-----|----|
| TOTAL VOLATILES | ND | ND | 0.8 | NS |
| TOTAL CHLORINATED VOLATILES | ND | ND | 0.8 | NS |
| TOTAL SEMI-VOLATILES | 3 | 1.5 | NS | NS |

| TREATMENT PIT (PW-2) | | | | |
|-----------------------------|-------|------|----|----|
| TOTAL VOLATILES | ND | ND | ND | NS |
| TOTAL CHLORINATED VOLATILES | ND | ND | ND | NS |
| TOTAL SEMI-VOLATILES | 20600 | 6049 | NS | NS |

| TREATMENT PIT (PW-3) | | | | |
|-----------------------------|----|------|----|----|
| TOTAL VOLATILES | 15 | 10 | NS | NS |
| TOTAL CHLORINATED VOLATILES | 10 | 10 | NS | NS |
| TOTAL SEMI-VOLATILES | 2 | 18.3 | NS | NS |

| TREATMENT PIT (PW-4) | | | | |
|-----------------------------|----|-----|----|----|
| TOTAL VOLATILES | 36 | ND | NS | NS |
| TOTAL CHLORINATED VOLATILES | 19 | ND | NS | NS |
| TOTAL SEMI-VOLATILES | 1 | 0.4 | NS | NS |

| 95MPI-B135-MW-2 * | | | | |
|-----------------------------|----|-----|----|----|
| TOTAL VOLATILES | ND | ND | ND | NS |
| TOTAL CHLORINATED VOLATILES | ND | ND | ND | NS |
| TOTAL SEMI-VOLATILES | ND | 0.4 | NS | NS |

| 95MPI-B135-MW-4 * | | | | |
|-----------------------------|----|-----|----|----|
| TOTAL VOLATILES | ND | ND | ND | NS |
| TOTAL CHLORINATED VOLATILES | ND | ND | ND | NS |
| TOTAL SEMI-VOLATILES | 3 | 0.4 | NS | NS |

| 97MPI-AW-MW-55 | | | | |
|-----------------------------|----|----|-----|----|
| TOTAL VOLATILES | NI | NI | ND | NS |
| TOTAL CHLORINATED VOLATILES | NI | NI | ND | NS |
| TOTAL SEMI-VOLATILES | NI | NI | 0.7 | NS |
| DRO | NI | NI | ND | NS |

| 95MPI-AW-MW-26 | | | | |
|-----------------------------|-----|-----|----|----|
| TOTAL VOLATILES | 7 | ND | ND | NS |
| TOTAL CHLORINATED VOLATILES | 4 | ND | ND | NS |
| TOTAL SEMI-VOLATILES | 0.4 | 2.1 | NA | NS |

| 97MPI-AW-MW-50 | | | | |
|-----------------------------|----|----|----|----|
| TOTAL VOLATILES | NI | NI | ND | NS |
| TOTAL CHLORINATED VOLATILES | NI | NI | ND | NS |
| TOTAL SEMI-VOLATILES | NI | NI | NA | NS |

| 95MPI-AW-MW-39 | | | | |
|-----------------------------|-----|-----|----|----|
| TOTAL VOLATILES | ND | ND | ND | NS |
| TOTAL CHLORINATED VOLATILES | ND | ND | ND | NS |
| TOTAL SEMI-VOLATILES | 0.6 | 0.3 | NA | NS |

| 93EM-RW-2 | | | | |
|-----------------------------|----|------|------|----|
| TOTAL VOLATILES | 85 | 82.8 | 42.8 | NS |
| TOTAL CHLORINATED VOLATILES | 84 | 82 | 42.8 | NS |
| TOTAL SEMI-VOLATILES | 32 | 5 | 0.4 | NS |
| DRO | NA | NA | 1300 | NS |

| 98MPI-AW-MW-64 | | | | |
|-----------------------------|----|----|----|--------|
| TOTAL VOLATILES | NI | NI | NI | 15,400 |
| TOTAL CHLORINATED VOLATILES | NI | NI | NI | 15,400 |
| TOTAL SEMI-VOLATILES | NI | NI | NI | NA |

| MW-121-NORTH * | | | | |
|-----------------------------|----|-------|----|----|
| TOTAL VOLATILES | NS | 302.7 | NS | NS |
| TOTAL CHLORINATED VOLATILES | NS | 302.7 | NS | NS |
| TOTAL SEMI-VOLATILES | NS | 4.3 | NS | NS |
| DRO | NS | 17007 | NS | NS |

| MW-121-SOUTH * | | | | |
|-----------------------------|----|-----|----|----|
| TOTAL VOLATILES | NS | 134 | NS | NS |
| TOTAL CHLORINATED VOLATILES | NS | 134 | NS | NS |
| TOTAL SEMI-VOLATILES | NS | 1.8 | NS | NS |
| DRO | NS | ND | NS | NS |

| 95MPI-AW-MW-30 * | | | | |
|-----------------------------|----|-----|----|----|
| TOTAL VOLATILES | ND | 2 | NS | NS |
| TOTAL CHLORINATED VOLATILES | ND | 2 | NS | NS |
| TOTAL SEMI-VOLATILES | 18 | 0.8 | NS | NS |
| DRO | NS | ND | NS | NS |

| MPI-P-1 (2/97) | | | | |
|-----------------------------|------|----|----|----|
| TOTAL VOLATILES | 5.99 | NS | NS | NS |
| TOTAL CHLORINATED VOLATILES | ND | NS | NS | NS |
| TOTAL SEMI-VOLATILES | 16.4 | NS | NS | NS |

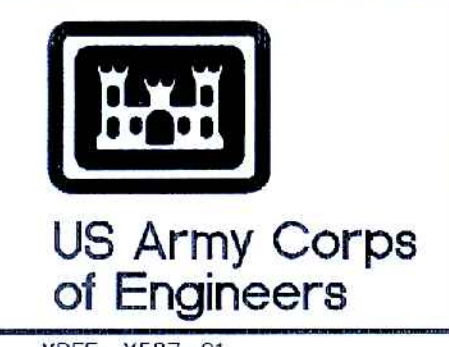
| 95MPI-AW-MW-29 * | | | | |
|-----------------------------|------|-----|----|----|
| TOTAL VOLATILES | 1 | 0.4 | NS | NS |
| TOTAL CHLORINATED VOLATILES | ND | 0.4 | NS | NS |
| TOTAL SEMI-VOLATILES | 12.4 | 3 | NS | NS |

| 98MPI-AW-MW-63 | | | | |
|-----------------------------|----|----|----|-----|
| TOTAL VOLATILES | NI | NI | NI | ND |
| TOTAL CHLORINATED VOLATILES | NI | NI | NI | ND |
| TOTAL SEMI-VOLATILES | NI | NI | NI | 1.4 |

| MPI-P-4 (2/97) | | | | |
|-----------------------------|------|----|----|----|
| TOTAL VOLATILES | ND | NS | NS | NS |
| TOTAL CHLORINATED VOLATILES | ND | NS | NS | NS |
| TOTAL SEMI-VOLATILES | 17.2 | NS | NS | NS |

| 95MPI-AW-MW-37 * | | | | |
|-----------------------------|----|-----|----|----|
| TOTAL VOLATILES | ND | ND | NS | NS |
| TOTAL CHLORINATED VOLATILES | ND | ND | NS | NS |
| TOTAL SEMI-VOLATILES | ND | 0.2 | NS | NS |

| 95MPI-AW-MW-38 * | | | | |
|-----------------------------|-----|-----|----|----|
| TOTAL VOLATILES | ND | ND | NS | NS |
| TOTAL CHLORINATED VOLATILES | ND | ND | NS | NS |
| TOTAL SEMI-VOLATILES | 300 | 6.2 | NS | NS |



| REVISIONS | | | |
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| NO. | BY | DATE | REMARKS |
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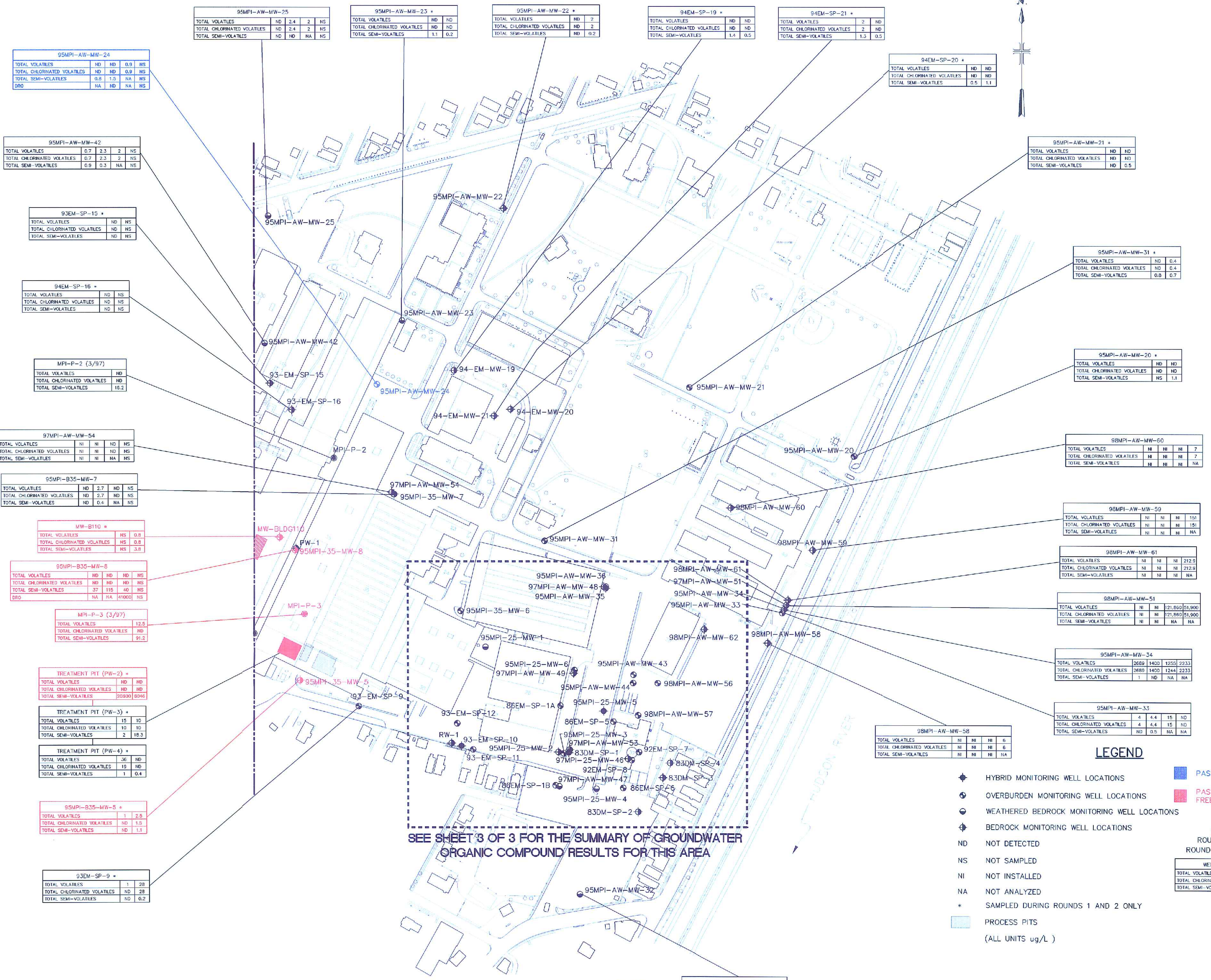
DES - ARV
 DWN - SMH
 CKD - K.JG

**WATERLIET ARSENAL
 MAIN MANUFACTURING AREA
 USACE CONTRACT NO. DACA31-94-D-0017**

**SUMMARY OF GROUNDWATER SAMPLING
 TOTAL ORGANIC COMPOUND RESULTS**

MALCOLM PIRNIE, INC.
 DATE - MARCH 1999
 SHEET 1 OF 3
 DWG. NO. 587-118C

XREF: X587-01

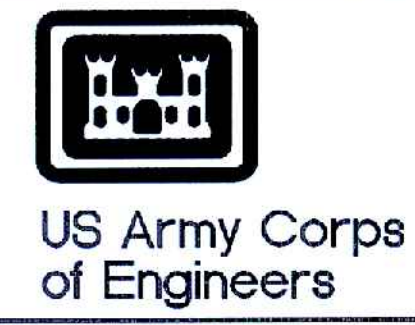
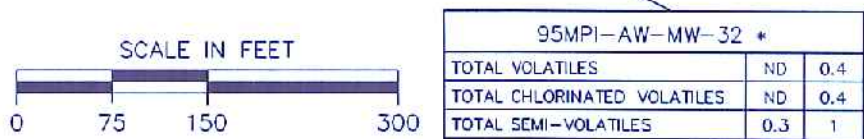


SEE SHEET 3 OF 3 FOR THE SUMMARY OF GROUNDWATER ORGANIC COMPOUND RESULTS FOR THIS AREA

LEGEND

- ◆ HYBRID MONITORING WELL LOCATIONS
- ⊕ OVERBURDEN MONITORING WELL LOCATIONS
- ⊙ WEATHERED BEDROCK MONITORING WELL LOCATIONS
- ⊖ BEDROCK MONITORING WELL LOCATIONS
- ND NOT DETECTED
- NS NOT SAMPLED
- NI NOT INSTALLED
- NA NOT ANALYZED
- * SAMPLED DURING ROUNDS 1 AND 2 ONLY
- PROCESS PITS (ALL UNITS ug/L)
- PAST OR PRESENT POL SHEEN
- PAST OR PRESENT FREE PHASE POL

| WELL DESIGNATION | ROUND 4 SAMPLE | | | | ROUND 3 SAMPLE | | | | ROUND 2 SAMPLE | | | | ROUND 1 SAMPLE | | | |
|------------------|-----------------|-----------------------------|----------------------|-----|-----------------|-----------------------------|----------------------|-----|-----------------|-----------------------------|----------------------|-----|-----------------|-----------------------------|----------------------|-----|
| | TOTAL VOLATILES | TOTAL CHLORINATED VOLATILES | TOTAL SEMI-VOLATILES | ... | TOTAL VOLATILES | TOTAL CHLORINATED VOLATILES | TOTAL SEMI-VOLATILES | ... | TOTAL VOLATILES | TOTAL CHLORINATED VOLATILES | TOTAL SEMI-VOLATILES | ... | TOTAL VOLATILES | TOTAL CHLORINATED VOLATILES | TOTAL SEMI-VOLATILES | ... |
| 95MPI-AW-MW-31 | ND | ND | 0.4 | ... | ND | ND | 0.4 | ... | ND | ND | 0.4 | ... | ND | ND | 0.4 | ... |



MALCOLM PIRNIE

| REVISIONS | | | | DES | BY | DATE | REMARKS |
|-----------|----|------|---------|-----|----|------|---------|
| NO. | BY | DATE | REMARKS | | | | |
| | | | | ARV | | | |
| | | | | SMH | | | |
| | | | | KJG | | | |

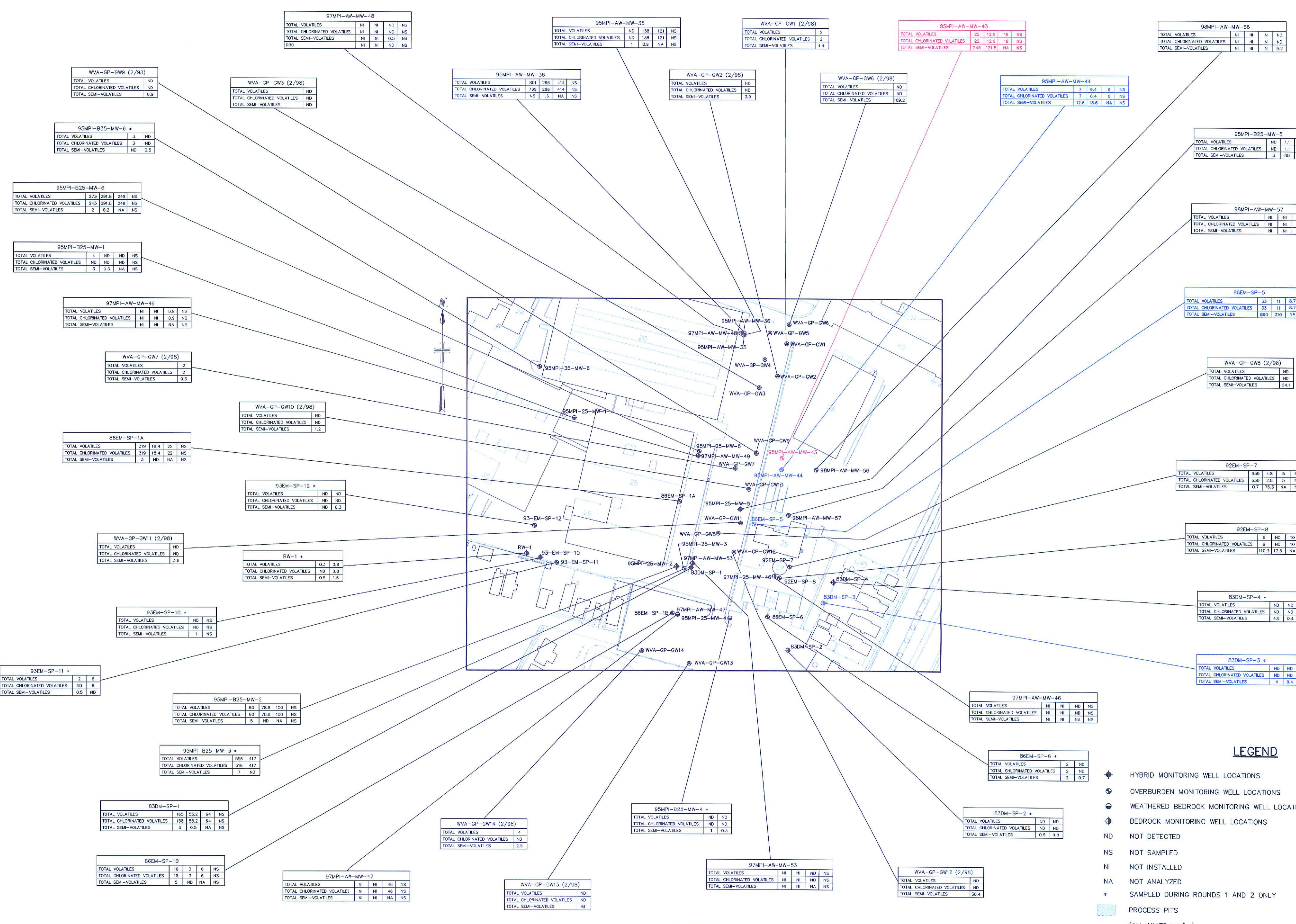
**WATERVLIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017**

**SUMMARY OF GROUNDWATER SAMPLING
TOTAL ORGANIC COMPOUND RESULTS**

| |
|----------------------|
| MALCOLM PIRNIE, INC. |
| DATE: JUNE 1999 |
| SHEET 2 OF 3 |
| DWG. NO. 587-119C |

4871 028507100 1 LACAD\FRG\A\0395\587\0395\0395\FINAL\587-119C_Sheet_1-11.Dwg: 06/02/1999 Time: 07:29 XREF: X587-01

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SCALE IN FEET
0 50 100 200

LEGEND

- ◆ HYBRID MONITORING WELL LOCATIONS
 - OVERBURDEN MONITORING WELL LOCATIONS
 - ⊙ WEATHERED BEDROCK MONITORING WELL LOCATIONS
 - ⊕ BEDROCK MONITORING WELL LOCATIONS
 - ND NOT DETECTED
 - NS NOT SAMPLED
 - NI NOT INSTALLED
 - NA NOT ANALYZED
 - * SAMPLED DURING ROUNDS 1 AND 2 ONLY
 - PROCESS PITS
 - (ALL UNITS ug/L)
- PAST OR PRESENT POL SHEEN

■ PAST OR PRESENT FREE PHASE POL

ROUND 4 SAMPLE

ROUND 3 SAMPLE

ROUND 2 SAMPLE

ROUND 1 SAMPLE

| WELL DESIGNATION | ND | ND | ND | ND |
|-----------------------------|-----|-----|----|----|
| TOTAL VOLATILES | ND | ND | ND | ND |
| TOTAL CHLORINATED VOLATILES | ND | ND | ND | ND |
| TOTAL SEMI-VOLATILES | 300 | 6.2 | ND | ND |



| REVISIONS | | | |
|-----------|----|------|---------|
| NO. | BY | DATE | REMARKS |
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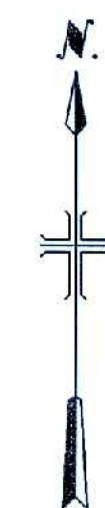
DES ARV
DWN SMH
OKD KJG

**WATERVLIE ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017**

**SUMMARY OF GROUNDWATER SAMPLING
TOTAL ORGANIC COMPOUND RESULTS**

MALCOLM PIRNIE, INC.
DATE JUNE 1999
SHEET 3 OF 3
DWG. NO. 587-121C

XREF: X587-01



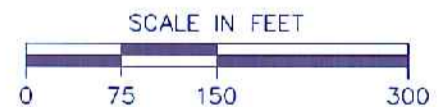
LEGEND

- HYBRID MONITORING WELL LOCATIONS
 - OVERBURDEN MONITORING WELL LOCATIONS
 - WEATHERED BEDROCK MONITORING WELL LOCATIONS
 - BEDROCK MONITORING WELL LOCATIONS
 - PIEZOMETER LOCATIONS
 - TETRACHLOROETHENE & BREAKDOWN PRODUCTS
 - NOT DETECTED OR $\leq 1\mu\text{g/L}$
 - PROCESS PITS
- VINYL CHLORIDE (Red)

 DICHLOROETHENE (Yellow)

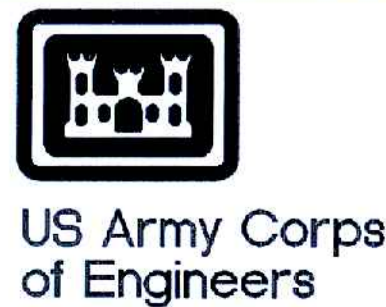
 TETRACHLOROETHENE (Blue)

 TRICHLOROETHENE (Green)
- DIAMETER = $K \cdot \log(\text{Total Chlorinated Volatiles})$



NOTE:
RESULTS ARE MAXIMUM VALUE DETECTED.
PACKER SAMPLES NOT INCLUDED.

4871 0382687100 \A\ACAD\VPROA\2285\4871\587-107C_Scale: 1:11 Date: 08/20/1999 Time: 07:47



**MALCOLM
PIRNIE**

| NO. | | BY | DATE | REVISIONS | REMARKS |
|-----|--|----|------|-----------|---------|
| | | | | | |
| | | | | | |
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DES: ARV
DWN: SMH
CKD: KJG

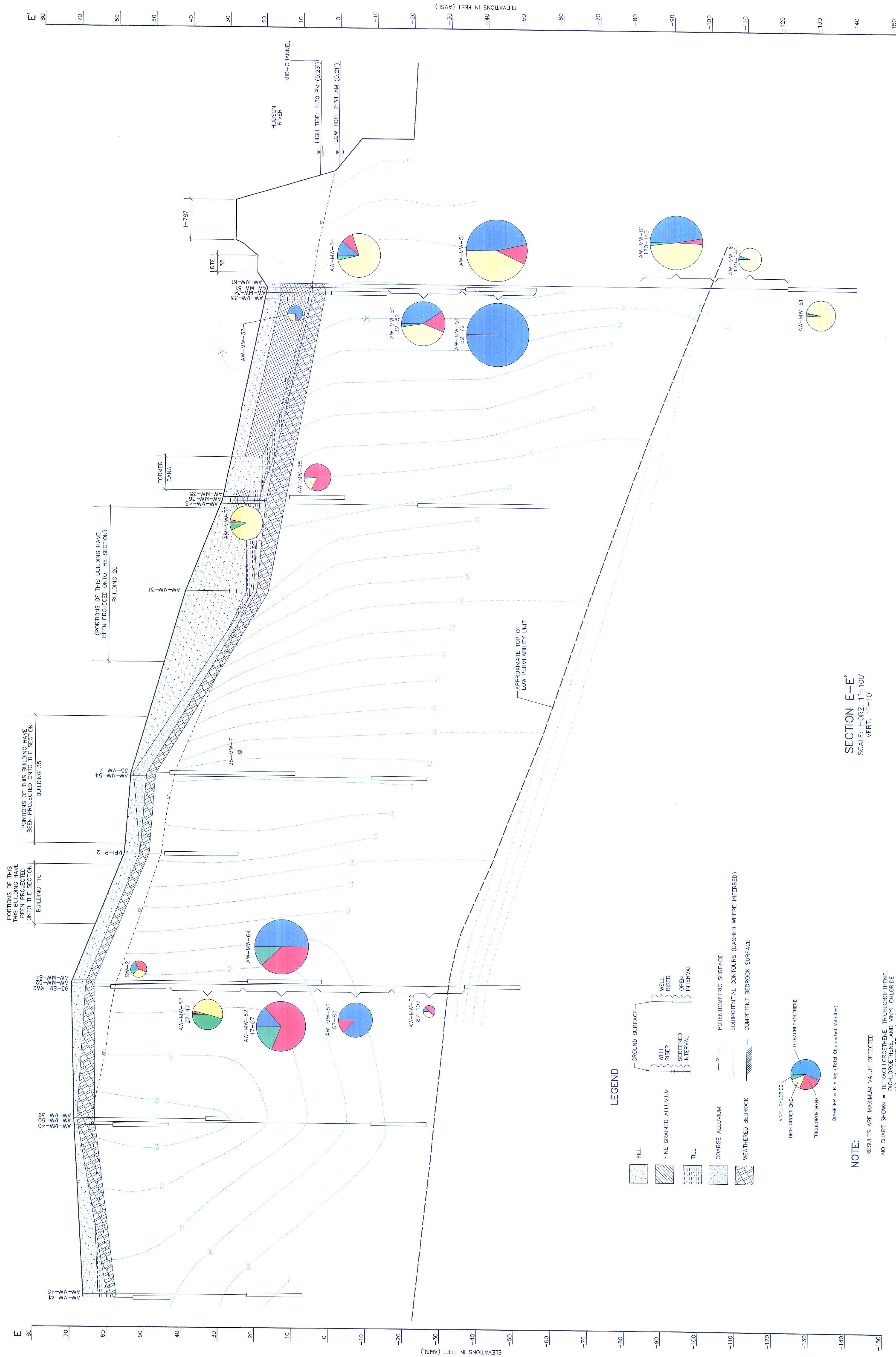
**WATERVLIET ARSENAL
MAIN MANUFACTURING AREA
USACE CONTRACT NO. DACA31-94-D-0017**

**DISTRIBUTION OF TETRACHLOROETHENE,
TRICHLOROETHENE, DICHLOROETHENE,
AND VINYL CHLORIDE IN GROUNDWATER
SCALE: AS SHOWN**

PLATE 6-1

MALCOLM PIRNIE, INC.
DATE: JUNE 1999
SHEET ____ OF ____
DWG. NO. 587-107C

XREF: X587-01



SECTION E-E'
 SCALE: HORIZ. 1"=100'
 VERT. 1"=10'

LEGEND

- FILL
- FINE GRAINED ALLOUVIUM
- TILL
- COARSE ALLOUVIUM
- WEATHERED BEDROCK
- GROUND SURFACE
- WELL RISER
- SCREENED INTERVAL
- OPEN INTERVAL
- POTENTIOMETRIC SURFACE
- EQUIPOTENTIAL CONTOURS (DASHED WHERE INFERRED)
- COMPETENT BEDROCK SURFACE
- VINYL CHLORIDE
- DICHLOROETHENE
- TRICHLOROETHENE
- TETRACHLOROETHENE
- DIAMETER = K * log (Total Chlorinated Volatiles)

NOTE:
 RESULTS ARE MAXIMUM VALUE DETECTED
 NO CHART SHOWN = TETRACHLOROETHENE, TRICHLOROETHENE,
 DICHLOROETHENE, AND VINYL CHLORIDE,
 NOT DETECTED OR $\leq 1 \mu\text{g/l}$

| US Army Corps of Engineers | MALCOLM PIRRIE | REVISIONS <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>NO.</th> <th>DATE</th> <th>BY</th> <th>CHKD.</th> <th>REMARKS</th> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table> | NO. | DATE | BY | CHKD. | REMARKS | | | | | | ARV JAP KJG |
|--|---------------------------|--|------|------|-------|---------|---------|--|--|--|--|--|-------------------|
| | | NO. | DATE | BY | CHKD. | REMARKS | | | | | | | |
| | | | | | | | | | | | | | |
| WATERLIET ARSENAL MAIN MANUFACTURING AREA USACE CONTRACT NO. DACA31-94-D-0017 | | VERTICAL DISTRIBUTION OF TETRACHLOROETHENE, TRICHLOROETHENE, DICHLOROETHENE, AND VINYL CHLORIDE | | | | | | | | | | | |

MALCOLM PIRRIE, INC.
 DATE: APRIL 1999
 SHEET: OF
 DWG. NO. 567-145

PLATE 6-2