

314063

R3RP

**FINAL
SITE INSPECTION PRIORITIZATION
HUDSON RIVER PSYCHIATRIC CENTER
POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK**

PREPARED UNDER

**REPORT NO.: 8003-414
WORK ASSIGNMENT NO. 038-2JZZ
CONTRACT NO. 68-W9-0051**

SEPTEMBER 28, 1995

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VOLUME 2 OF 2

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REFERENCE NO. 3

ENGINEERING INVESTIGATIONS AT INACTIVE HAZARDOUS WASTE SITES

PHASE II INVESTIGATION

Hudson River Psychiatric Center Site No. 314063
Town of Poughkeepsie Dutchess County

DATE: March 1991

VOLUME I - Report



Prepared for:
**New York State
Department of
Environmental Conservation**

50 Wolf Road, Albany, New York 12233
Thomas C. Jorling, *Commissioner*

Division of Hazardous Waste Remediation
Michael J. O'Toole, Jr., P.E., *Director*

By:
Lawler, Matusky & Skelly Engineers

ENGINEERING INVESTIGATIONS AT INACTIVE
HAZARDOUS WASTE SITES
IN THE STATE OF NEW YORK
PHASE II INVESTIGATION

Hudson River Psychiatric Center
Town of Poughkeepsie, Dutchess County
NYSDEC I.D. No. 314063

Volume I - Report

Prepared for

DIVISION OF HAZARDOUS WASTE REMEDIATION
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
50 Wolf Road, Albany, New York 12233
Thomas C. Jorling, Commissioner



By

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March 1991

LMSE-91/0221&576/031

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4	Area 2	
5	Area 3	
6	Area 5	
7	Area 6	

CHAPTER 1

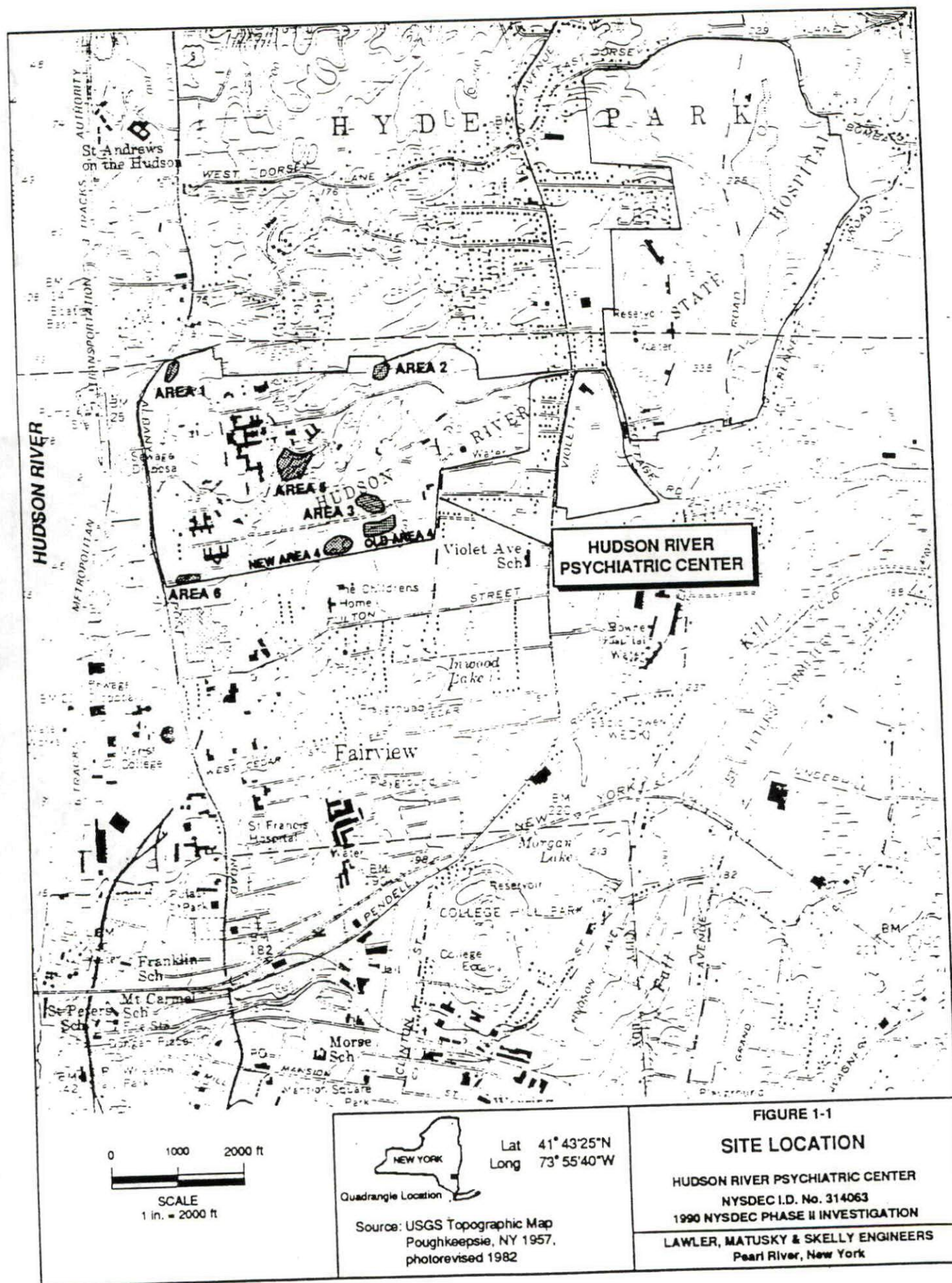
EXECUTIVE SUMMARY

The Hudson River Psychiatric Center (HRPC) is located in the City of Poughkeepsie off Route 9 in Dutchess County, New York (Figure 1-1). Except for a portion owned privately, the HRPC is owned by the State of New York. The site consists of six separate fill areas on the property. Figure 1-2 shows the locations of the pertinent physical features of the site and property lines, and is oriented to Photos 1-5. The areas are:

- *Area 1*, in the northwestern portion of the property; used as part of the golf course
- *Area 2*, in the northeastern part of the property
- *Area 3*, in the southeastern portion of the site; a ball field occupies a part of the area
- *Area 4*, south of Area 3; no longer owned by the State of New York
- *Area 5*, in the center of the HRPC property; an unnamed tributary is culverted underneath this area
- *Area 6*, in the southwestern part of the site; includes a picnic shelter

Surface waters in the area include an unnamed tributary of the Hudson River that drains the northern portion of the property and passes along the northern boundary of Area 1. Another unnamed tributary flows through the main portion of the site and passes by or through Areas 2, 3, 5, and 6. All surface waters are part of the Hudson River drainage basin, which is an important water supply source for Dutchess County (the City of Poughkeepsie water supply intake on the Hudson River is located approximately 1000 ft downstream of one of the unnamed tributaries).

The six HRPC disposal areas reportedly received municipal wastes from the City and Town of Poughkeepsie as well as wastes from the facility itself. Wastes were disposed of on the site for over 100 years, until about 1974. There is no recorded evidence indicating that any of these wastes were hazardous. Numerous site inspections conducted over the years by the



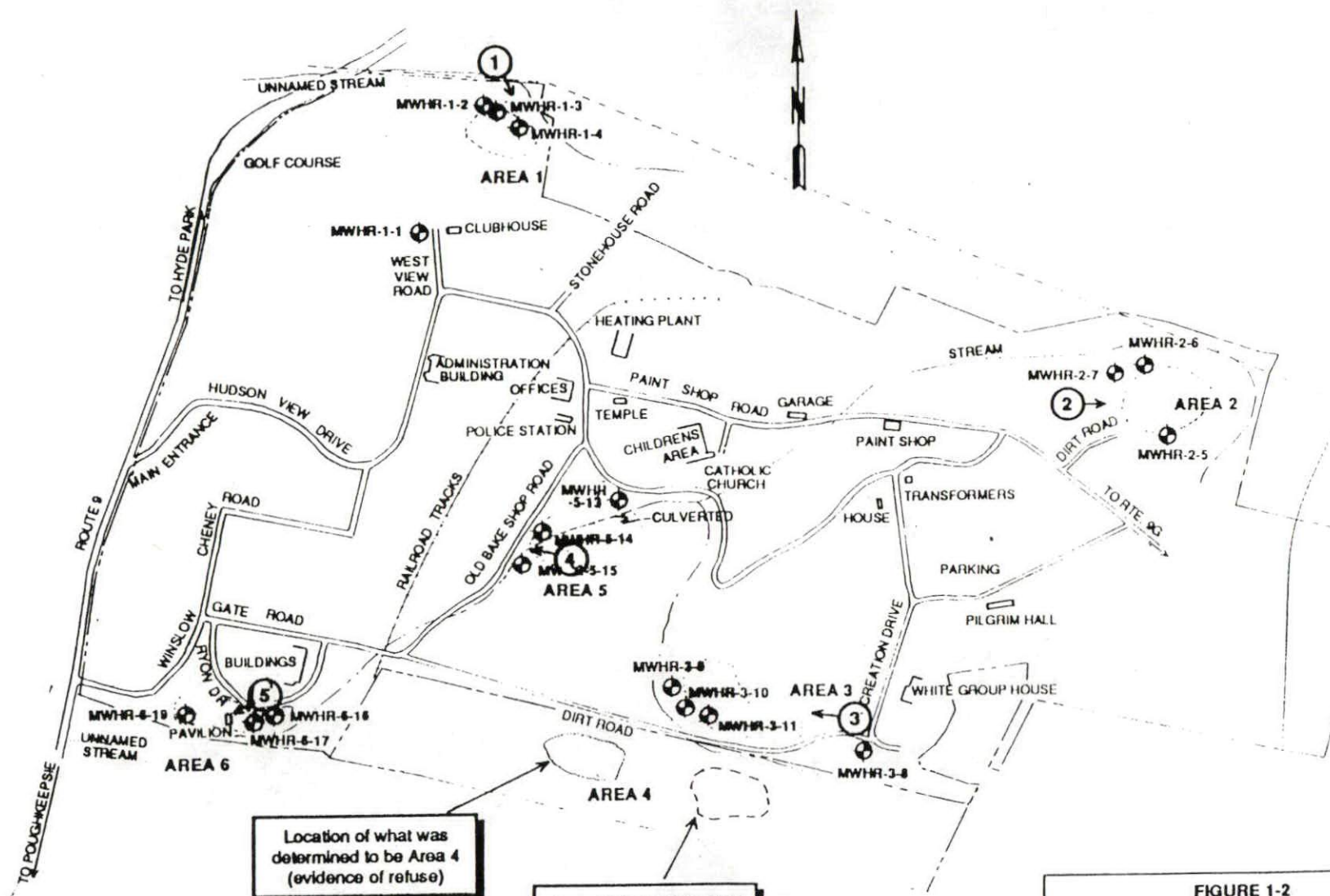


FIGURE 1-2
SITE SKETCH
AND PHOTO ORIENTATION

HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC I.D. No. 314063
1990 NYSDEC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

LEGEND

- ⊕ Monitoring well location
- ① Photo location and orientation

Location of what was
determined to be Area 4
(evidence of refuse)

Area originally described
as Area 4
(no evidence of landfill
no evidence of refuse)

0 400 800 ft
SCALE
1 in. = 800 ft

Dutchess County Department of Health (DCDOH) cited many violations. The report on a Phase I investigation conducted in 1986 recommended that a Phase II investigation be conducted. A site inspection and sampling program was conducted by NUS Corporation, which collected and analyzed several surface water and sediment samples from three of the areas on the site.

Under the direction of the New York State Department of Environmental Conservation (NYSDEC), a Phase II investigation was undertaken by Lawler, Matusky & Skelly Engineers (LMS) to determine (1) the level and nature of any contaminants emanating from the site and (2) whether hazardous waste has been released to the environment. Eighteen monitoring wells were installed and sampled on-site; in addition, 11 surface water samples, 19 sediment samples, four leachate samples, one shallow soil sample, and one boring soil sample were collected and analyzed. Results of the investigation are summarized below:

- *Area 1.* The groundwater contained some organic chemicals, which are indicative of a release of gasoline or other petroleum products, and high iron and manganese values, which are typical leachate characteristics. The surface water showed some contamination by iron and manganese, and the sediments indicated a possible source of coal tars or diesel fuel. Based on the contamination found, Area 1 is not considered hazardous.
- *Area 2.* The groundwater is slightly contaminated with iron and manganese, probably as a result of leachate. The surface waters showed no contamination directly related to the landfill, whereas the sediment contained metals downstream of the fill. Based on the contamination found, Area 2 is not considered hazardous.
- *Area 3.* The groundwater along the western boundary of this area contained some organic and metallic contamination, particularly iron and manganese. The surface water and sediment also showed some metals contamination; however, the sediment also showed the presence of a petroleum product or asphalt source upstream of the upstream sediment sample. The fill area on the southern side is contaminated with organic chemicals associated with gasoline, petroleum products, and/or diesel fuel. Some metals contamination was also observed in the fill material. The groundwater collected from the monitoring well installed in this same hole was not contaminated. The data do not indicate that Area 3 should be classified as hazardous.
- *Area 4.* The surface water and sediment showed slight contamination by benzene and chlorobenzene and other chemicals associated with a fuel source.



PHOTO 1. Area 1. Looking southeast at stream with debris and leachate.



PHOTO 2. Area 2. Looking east below fill. Note debris and depth of uncovered fill.

10/20/11



PHOTO 3. Area 3. Looking west at ball field and fill beyond.

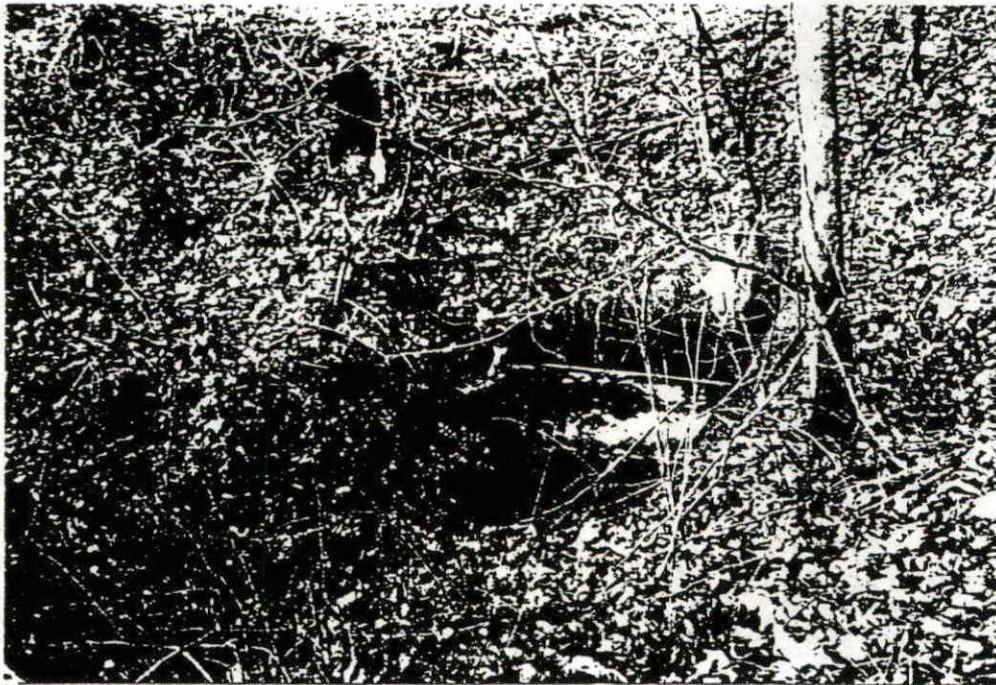


PHOTO 4. Area 5. Looking west at exit from culvert.



PHOTO 5. Area 6. Looking west at picnic pavilion.

None of the data indicated that Area 4 should be classified as hazardous, however. No groundwater data were available.

- *Area 5.* The groundwater beneath the site was not found to be contaminated with organics or metals that could be directly attributed to the landfill. Some metallic contamination of the surface water and sediment was observed, but it was confined largely to iron and manganese. No contamination was found that could cause Area 5 to be classified as hazardous.
- *Area 6.* Stream sediment from this area is contaminated with polychlorinated biphenyls (PCBs) that require further investigation. Some concentrations are above the NYSDEC guidelines for definition of hazardous sediments. The apparent PCB spill requiring a response consistent with the Federal PCB Spill Policy (40CFR761G). Groundwater is slightly contaminated with metals, as is the sediment. The sediment is also contaminated with organic chemicals indicative of petroleum products or asphalt materials.

Recommendations for further work and investigations are described below:

- *Area 1.* Leachate control measures should be installed to prevent leachate from entering the surface water. After installation the area can be delisted.
- *Area 2.* The area should be delisted as a hazardous site and closed in accordance with NYSDEC Part 360-2.15. This includes removing and disposing of surface debris and covering and grading the western side of the fill.
- *Area 3.* MWHR3-11 should be resampled for target compound list (TCL) organics and inorganics during or immediately after a rainstorm to determine whether contamination in the fill can enter the groundwater. Three leachate samples should be analyzed for TCL organics and inorganics to determine whether the leachate contains hazardous chemicals. If the additional sampling does not indicate any potential for hazardous materials to migrate from the fill, the site can be delisted, possibly with leachate control measures installed.
- *Area 4.* Based on the discovery of a section believed to contain wastes reportedly dumped in the area during the May 1990 resampling event, additional samples should be collected to better define any contamination. The effort should include new wells.
- *Area 5.* With the exception of periodic inspection and cleaning of the culvert, no further work is required and the site can be delisted.
- *Area 6.* Initial remedial measures are required at this area to isolate the PCB contamination from possible contact with personnel. A focused feasibility study (FFS) is recommended to delineate the extent of the PCB contamination and develop the most feasible remedial action. This will require additional sediment and shallow soil sampling as well as soil borings to

determine the vertical and horizontal limits of PCBs. Monitoring wells and surface waters should be resampled to verify the absence of PCBs. The FFS will result in remedial alternatives, the most cost-effective method of cleanup, and a conceptual design consistent with any EPA requirements.

Attached is the NYSDEC form for additional changes to the Registry of Inactive Hazardous Waste Disposal sites.



ADDITIONS/CHANGES TO REGISTRY OF INACTIVE HAZARDOUS WASTE DISPOSAL SITES

1. SITE NAME Hudson River Psychiatric Center		2. SITE NO. 314063	3. TOWN Poughkeepsie	4. COUNTY Dutchess
5. REGION 3	6. CLASSIFICATION Current <u>2a</u> / Proposed _____	7. ACTIVITY ☐ Add ☐ Reclassify ☐ Delist ☐ Modify _____		
8a. DESCRIBE LOCATION OF SITE (Attach U.S.G.S. Topographic Map showing site location). The site is approximately 2 miles north of Route 44 and 55 on Route 9. See Figure 1-1, this report.				
b. Quadrangle <u>Poughkeepsie, NY</u> c. Site Latitude <u>41° 43' 25"N</u> Longitude <u>73° 55' 40"W</u> d. Tax Map Number <u>6163-03</u>				
9a. BRIEFLY DESCRIBE THE SITE (Attach site plan showing disposal/sampling locations). The site consists of six separate disposal areas for disposal of municipal and hospital waste. See Figure 1-2, this report.				
b. Area <u>700</u> acres c. EPA ID Number <u>NYD 980779490</u> d. PA/SI ☒ Yes ☐ No				
e. Completed: ☒ Phase I ☒ Phase II ☐ PSA ☒ Sampling				
10. BRIEFLY LIST THE TYPE AND QUANTITY OF THE HAZARDOUS WASTE AND THE DATES THAT IT WAS DISPOSED OF AT THIS SITE No known hazardous wastes deposited at the site.				
11a. SUMMARIZED SAMPLING DATA ATTACHED ☐ Air ☒ Groundwater ☒ Surface Water ☒ Soil ☐ Waste ☒ EP Tox ☐ TCLP				
b. List contravened parameters and values See Tables 4-1, 4-5, 4-6 and 4-8.				
12. SITE IMPACT DATA				
a. Nearest surface water: Distance <u>0</u> ft. Direction <u>-</u> Classification <u>B and D</u>				
b. Nearest groundwater: Depth <u>1</u> ft. Flow Direction _____ ☐ Sole Source ☐ Primary ☐ Principal				
c. Nearest water supply: Distance <u>700</u> ft. Direction <u>West</u> Active ☒ Yes ☐ No				
d. Nearest building: Distance <u>0</u> ft. Direction <u>Northeast</u> Use <u>Hospital facilities</u>				
e. Crops or livestock on site? ☐ Yes ☒ No				
f. Exposed hazardous waste? ☐ Yes ☒ No				
g. Controlled site access? ☐ Yes ☒ No				
h. Documented fish or wildlife mortality? ☐ Yes ☒ No				
i. Impact on special status fish or wildlife resource? ☐ Yes ☒ No				
j. Within a State Economic Development Zone? ☐ Yes ☐ No				
k. For Class 2a: Code _____ Health Model Score _____				
l. For Class 2: Priority Category _____				
m. HRS Score <u>NS</u>				
n. Significant Threat ☐ Yes _____ ☐ No ☐ Unknown				
13. SITE OWNER'S NAME See other side of sheet		14. ADDRESS See other side of sheet		15. TELEPHONE NUMBER (914) 452-8000
16. PREPARER <u>Edward A. Maikish, Project Manager, Lawler, Matusky & Skelly Engineers</u> Name, Title and Organization <u>26 March 1991</u> _____ Date Signature				
17. APPROVED _____ Name, Title and Organization _____ Date Signature				

Areas 1-3,5,6

NYS Hudson River State Hospital
Dept. of Audit, Control & Claims Unit
7th Avenue, Gov. Smith Building
Albany, NY 12236

Area 4

R. Vasantha and Urabagilu Nagarata Krishna
37 Cathy Road
Poughkeepsie, NY 12601

CHAPTER 2

OBJECTIVES

Lawler, Matusky & Skelly Engineers (LMS), under contract to the New York State Department of Environmental Conservation (NYSDEC), conducted a Phase II investigation of the Hudson River Psychiatric Center (HRPC), located in the City of Poughkeepsie, Dutchess County, New York. The investigation was targeted to address specific concerns regarding past waste disposal practices and to provide additional information on the site to determine whether hazardous waste was disposed of on the site and released from the site. Specific objectives of the Phase II investigation are to:

- Provide a geological and hydrogeological site assessment, including determination of depth to groundwater and aquifers of concern.
- Identify and evaluate the presence, concentration, and nature of contamination and determine to the extent limited by the scope of work its release and the degree to which it may threaten surrounding areas.
- Using information compiled in the study, determine the significance of any release and the degree to which it may threaten surrounding areas.
- Prepare a report documenting findings and any recommendations for possible future work.

CHAPTER 3

DESCRIPTION OF PHASE II INVESTIGATION

3.1 LITERATURE REVIEW

Relevant files maintained by NYSDEC offices in Albany and New Paltz (Region 3 office) were reviewed by LMS personnel. Files maintained by the New York State Department of Health (NYSDOH), the Dutchess County Department of Health (DCDOH), and the U.S. Environmental Protection Agency's (EPA) New York and Edison, New Jersey, offices were also examined for site-related information. The review included a reading of the Phase I report prepared by EA Science & Technology (EA) and a site inspection report prepared by NUS Corporation. All existing data collected by previous investigators were obtained and summarized.

While the file review was under way, access permission was received from the owners of the site, and local utility companies were contacted about the proposed drilling locations so that underground lines could be marked prior to start-up of the field work.

3.2 SITE RECONNAISSANCE

The HRPC site consists of six individual disposal areas. Each area was investigated individually, and a final assessment of the overall site was made. Plates 1 and 2 show the overall site survey map and the vicinity map with adjoining owners, respectively. The following is a brief de-scription of each of the six sites:

- *Area 1.* Disposal Area 1 is located in the northeast corner of a golf course in an area bordered on the north by trees and a stream, on the east by a line of trees, and on the south and west by the rest of the golf course. The site is approximately 3 acres in size. Plate 3 is the site survey map for Area 1.
- *Area 2.* Disposal Area 2 is located off Paint Shop Road and is surrounded by woods on all sides. A stream runs along the northern portion of the site. The western and northern sides of the fill are bordered by a steep slope

exhibiting visible signs of debris. The site is approximately 2-3 acres in size. Plate 4 is the site survey map for Area 2.

- *Area 3.* Disposal Area 3, approximately 3 acres in size, is located off the southwest corner of a ball field. Its remaining sides are bordered by trees and a stream that runs along its southwest corner. Winslow Gate Road runs along its southern boundary. Plate 5 is the site survey map for Area 3.
- *Area 4.* Disposal Area 4, on the southern side of Winslow Gate Road, is approximately 5 acres in size and is bordered on its east and south sides by forest and on its west side by extensive outcroppings. This is the area originally described in the work scope as being Area 4. Further investigation by LMS and NYSDEC personnel indicated that the actual area is southwest of the area described above.
- *Area 5.* Disposal Area 5 is approximately 3 acres in size and is situated between Hudson View Drive and Old Bake Shop Road. It is a triangular piece of property bordered on the south by trees, on the northwest by Old Bake Shop Road, and on the northeast by Hudson View Drive. A stream that originates as two branches, one from Area 2 and the other from Area 3, is culverted underneath the site. Plate 6 is the site survey map for Area 5.
- *Area 6.* Disposal Area 6, located near Ryon Hall, is bordered on the north by Ryon Drive, on the west by Winslow Gate Road, on the east by a parking lot, and on the south by a stream that originates from Area 5. Included within the area is a parking lot. The site is approximately 2 acres in size. Plate 7 is the site survey map for Area 6.

Before field activities were initiated, a site reconnaissance was conducted from 27 to 29 November 1989 to:

- Mark designated locations for drilling and sampling.
- Determine the accessibility of the site to the drill rig and the presence of any potential hazards to drilling.
- Locate a water supply for drilling.
- Conduct air monitoring at the site to determine the level of personnel protection required during future activities.

Each of the six separate areas constituting the HRPC site was considered individually. Initial air monitoring at each site was conducted using an HNU photoionization detector (PID), an OVA flame ionization detector (FID), and a Neotronics combustible gas indicator (CGI).

Measurements were taken at upwind and downwind locations in the breathing zone, 4 to 6 ft above the ground. After completion of the air monitoring, sampling locations (drilling, surface water/sediment) were staked, soil gas points were flagged, and the ground surface was tested with a rod for potential soil gas installation problems. After the rod was driven to a depth of 6-12 in., the OVA probe was inserted into the hole to test for the presence of methane. During the site reconnaissance any suggested work scope changes were noted, including the possible need for additional samples and deletion or addition of wells. Information collected, such as air monitoring data, is included in Appendix B, which also contains site photographs taken during the reconnaissance.

Based on the information gathered during the site reconnaissance, LMS prepared a site-specific health and safety plan (HASP) to be followed by all field personnel during future activities on the site. A copy of the HASP is included as Appendix C.

The site that was originally believed to be Area 4 was eliminated from further investigation during development of the original work scope. Therefore, no geophysics, soil gas, or groundwater samples were collected from the area. During development of the work scope for the additional sampling of Area 6 sediments, NYSDEC asked that surface water/sediment and shallow soil samples be collected from Area 4 as identified originally. Upon investigation NYSDEC determined that an area off the HRPC property several hundred feet southwest of Area 3 was the actual Area 4 (see Figures 1-1 and 1-2). Overhead power lines parallel the southern border of Area 4. During the reconnaissance of the area many mounds of earth and mixed waste were found. The composition of this fill included clothing, luggage, and municipal fill mixed with a large number of molded parts from some type of manufacturing facility. Whether these parts originated in any way from the psychiatric center is unknown. At the southern end of the fill zone, just beneath overhead power lines, a small ponded area approximately 50 ft by 60 ft with wetland-type vegetation was identified along the eastern shore. The depth was unknown; however, the water near the shore was 1.5 ft deep. The water was very turbid and orange-brown in color during this inspection. One surface water, one sediment, and one shallow soil sample were collected.

3.3 GEOPHYSICS SURVEY

To aid in monitoring well selection, LMS developed a draft geophysics work scope for the HRPC based on the findings of the site reconnaissance. The work scope was reviewed for applicability by personnel from NYSDEC and International Exploration, Inc. (INTEX), Warminster, PA, the geophysics subcontractor. The final work scope included modifications recommended by INTEX. Results of the geophysics and soil gas surveys were used to determine final locations of the monitoring wells. Appendix D contains the INTEX geophysics results report.

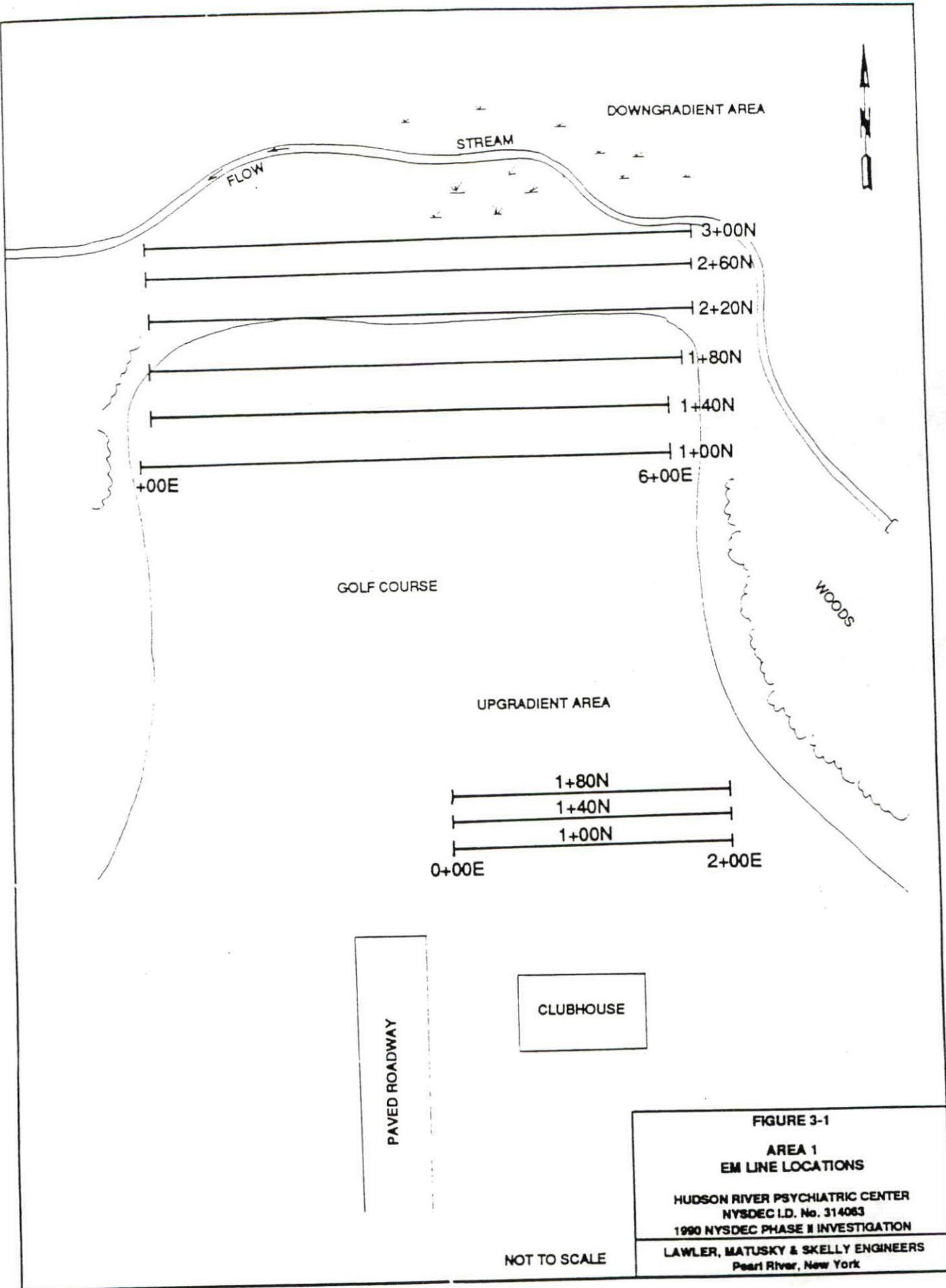
In general, a Geonics EM-31 unit was used to collect the electromagnetic (EM) survey data. In some cases data from both the horizontal and the vertical mode were collected: the vertical mode provides sensitive data to delineate possible buried metal; the horizontal mode records broad patterns such as contaminant plumes.

Vertical electrical soundings (VES) were run using a Soiltest R-40C unit with a Wenner electrode array. VES data were used to determine the depths to groundwater and bedrock; a maximum depth of 50 ft was attainable.

3.3.1 Area 1

Five lines were proposed along the bottom of the golf course, running from east to west - three in the grassy area and the other two in the woods at the northern end of the area. Three lines were also to be laid out just north of the upgradient well location. The data were to be used to determine thickness of fill and overburden, depth to bedrock, depth to groundwater, location of any contaminant plume, and location of underground water lines. All lines were to be surveyed with a Geonics EM-31.

After discussion with LMS personnel, INTEX decided to run six 500-ft EM survey lines at the downgradient location (Figure 3-1). The lines were located 40 ft apart with 5-ft station intervals. Three upgradient lines were also laid out as stipulated in the work scope (Figure



3-1). Electromagnetic data were collected in the two locations in both the horizontal and the vertical modes.

Figure 3-2 presents the data collected in the horizontal mode at the upgradient location. The symmetrical pattern of elevated conductivity lines indicates cultural interference, most likely a buried metal object such as an underground water line. There was no evidence from the survey to suggest that the fill extended to this area.

Figures 3-3 and 3-4 present the data collected from the downgradient locations in the horizontal mode and the vertical mode, respectively. Because of the linearity of the data, the fill boundary appears to be along the 180N line. A conductivity low at 180N, 300E (see Figure 3-4) indicates the possible presence of a buried object. A high conductivity value is observed at 260N, 400E (see Figure 3-3). This conductivity value, together with the broad area of high conductivity observed at 100-180N, 415-290E (see Figures 3-3 and 3-4), indicates the possible presence of a leachate plume flowing approximately northeast.

Resistivity soundings were taken at three locations in Area 1 (Figure 3-3) and were collected using a Soiltest R-40C unit. The first point, VES No. 1, was located at 180N, 300E, near the presumed edge of the fill. A four-layer subsurface was detected. The first two layers totaled 20 ft in depth and are of fairly high resistivity. The third layer was of low resistivity (<100 ohm-ft), approximately 41 ft thick, and was either saturated soil and/or a contaminant plume. The fourth layer shows a marked increase in resistivity and may indicate the presence of bedrock. At VES No. 2 (180N, 450E) and No. 3 (260N, 400E) only three layers were found. The first (high resistivity) layer was 4-5 ft deep; the second (low resistivity), about 31-36 ft deep. The high resistivity layer found below the second layer probably corresponded to bedrock. VES No. 1 is located very close to the low conductivity value observed (see Figure 3-3); the source of this high resistivity/low conductivity value is unknown. The second (presumed saturated) layer at VES No. 3 had a much lower resistivity than the corresponding layer in either VES No. 1 or VES No. 2, which could indicate a leachate plume.

On the basis of the geophysics data collected from Area 1, it was recommended that the upgradient well be placed near the center (or east side) of line 180, to avoid possible buried

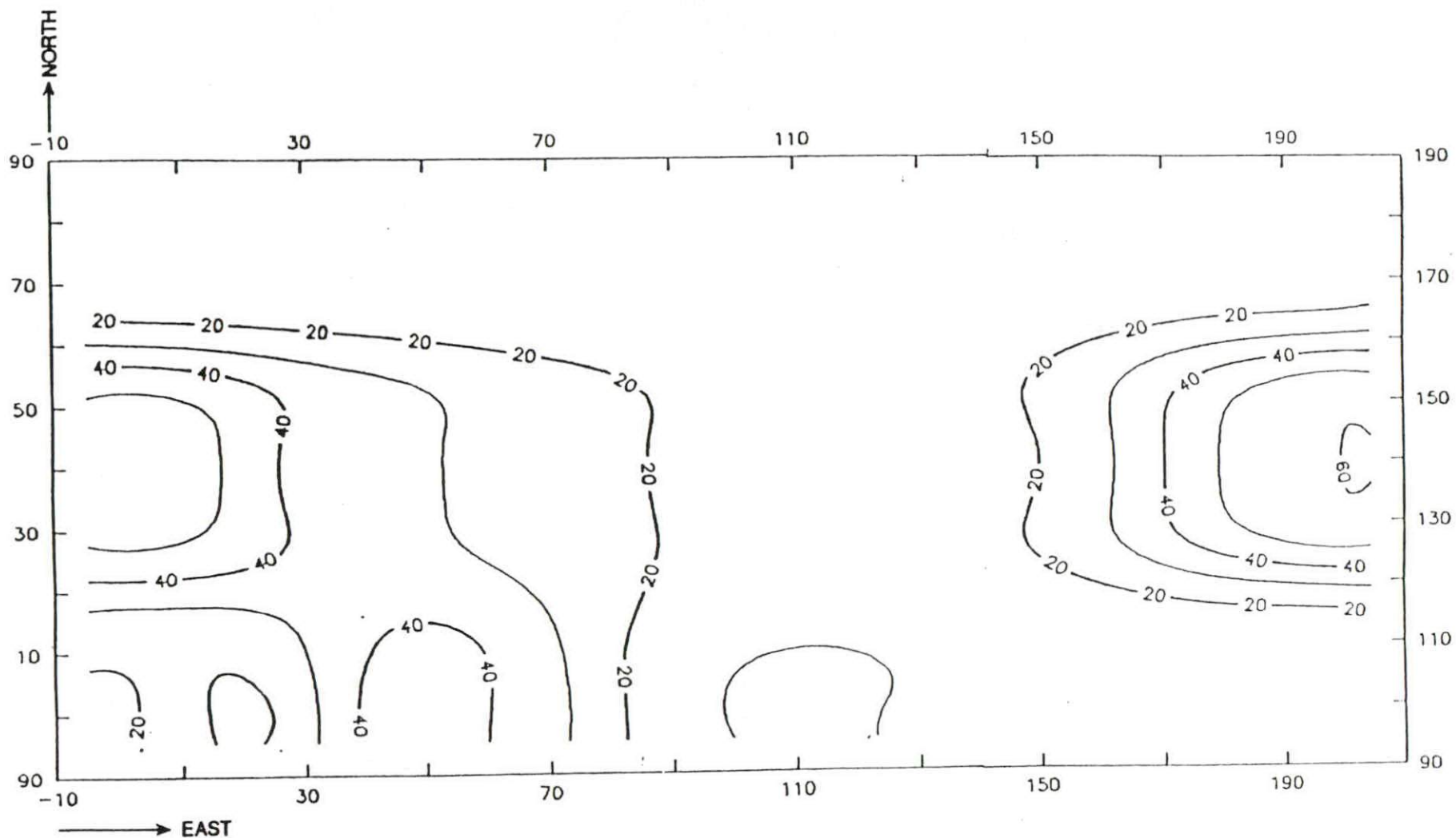


FIGURE 3-2
EM CONTOUR MAP
AREA 1 UPGRADIENT
HORIZONTAL MODE

HUDSON RIVER PSYCHIATRIC CENTER
 NYSDEC I.D. No. 314063
 1990 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
 Pearl River, New York

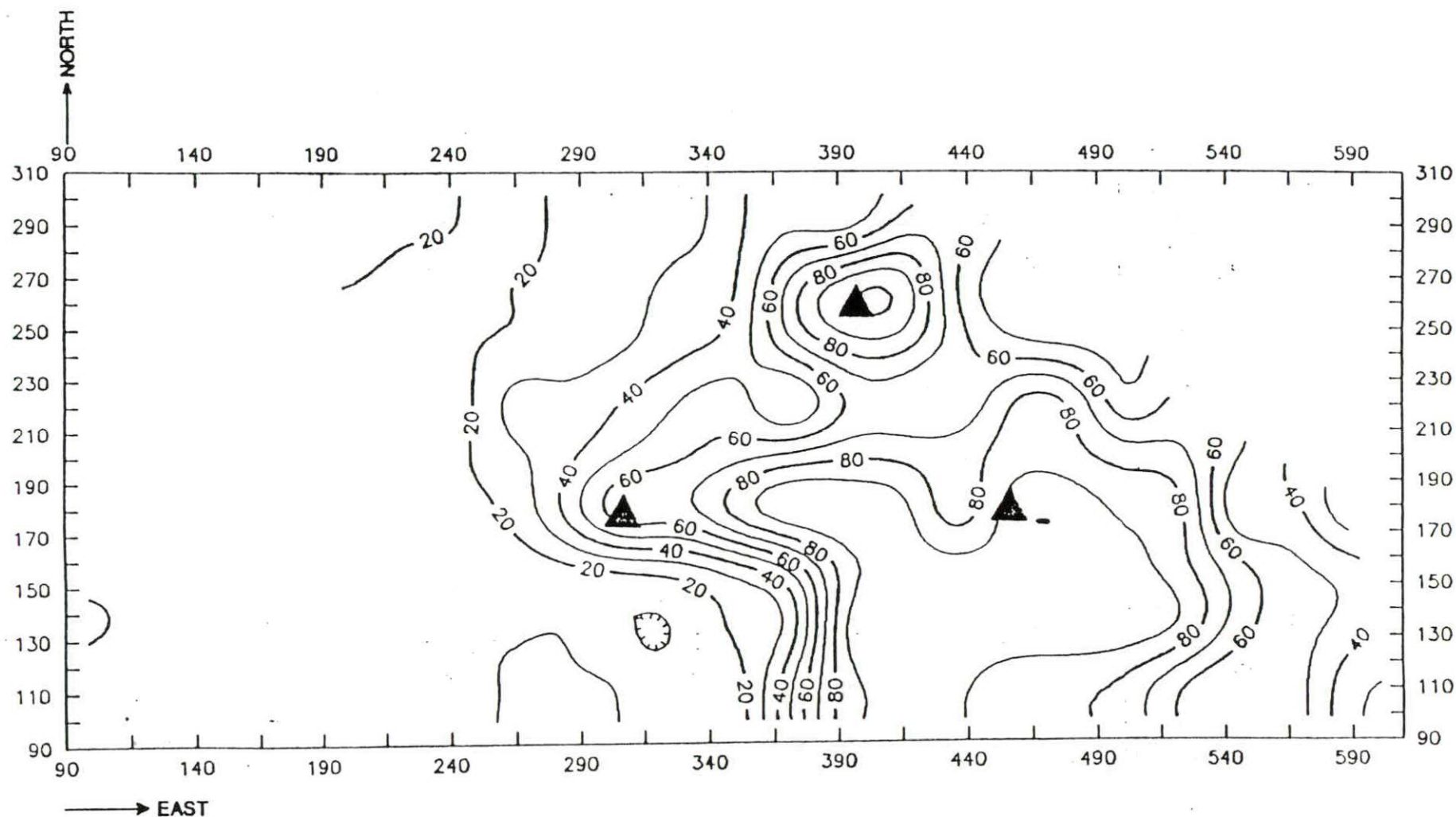


FIGURE 3-3

EM CONTOUR MAP
AREA 1 DOWNGRADIENT
HORIZONTAL MODE

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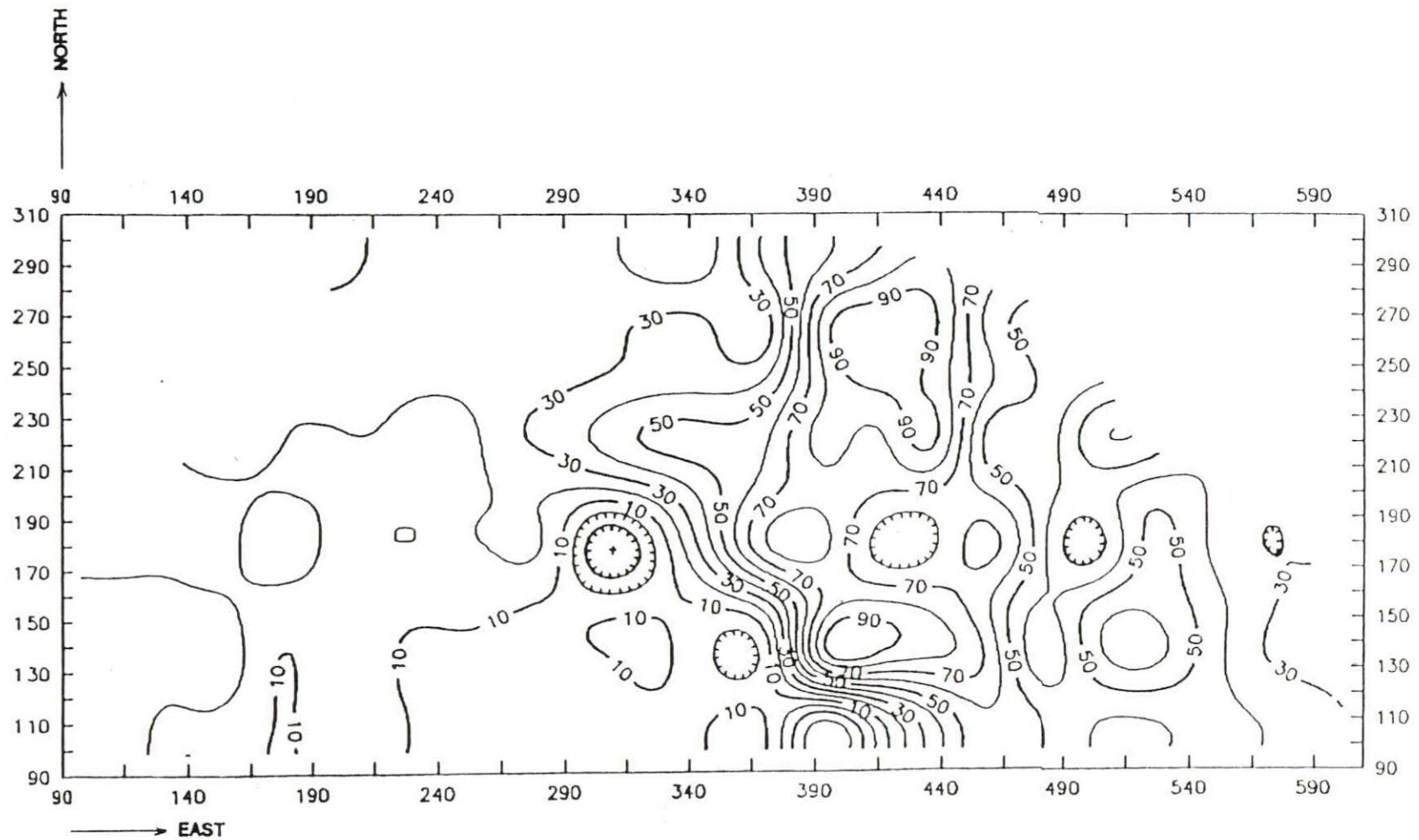


FIGURE 3-4
EM CONTOUR MAP
AREA 1 DOWNGRADIENT
VERTICAL MODE

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cultural features, and a downgradient well should be placed near the high conductivity anomaly at 260 N, 400 E.

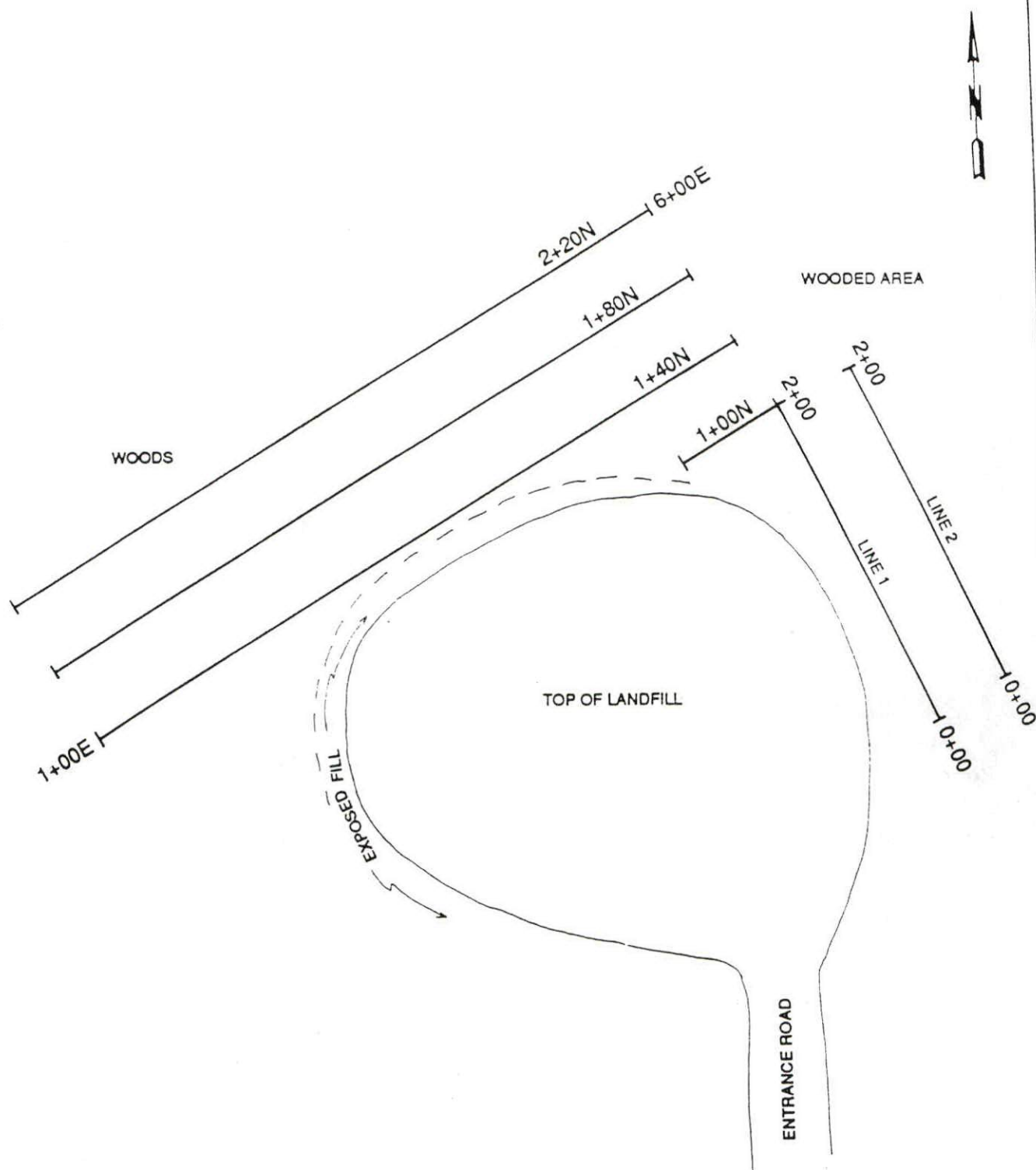
3.3.2. Area 2

In Area 2 four EM-31 lines were proposed along the western edge of the fill. Resistivity soundings were proposed along the same lines as the EM-31 survey lines. The EM data would be used to identify location and direction of groundwater flow; the VES data, to locate depth to bedrock. Two upgradient VES soundings were to be conducted on the eastern edge of the fill to determine the depth to bedrock and groundwater.

Three EM survey lines were run along the northwestern perimeter of the exposed fill and two additional lines along the eastern side (Figure 3-5). These lines were spaced 40 ft apart and had 5-ft station intervals. EM readings were taken in both the vertical and horizontal survey mode. No VES soundings were conducted because the ground was frozen.

Figures 3-6 and 3-7 present the data collected in the downgradient direction from the vertical and horizontal modes, respectively. A possible contaminant plume is indicated traveling toward the northwest. The highest conductivity values are observed running along the 350E line at 160N. This corresponds to a low conductivity value seen in the vertical mode (see Figure 3-6).

Figure 3-8 presents the data collected from the upgradient side. On the basis of the readings at the south end of the area covered by the geophysics survey, it was recommended that the upgradient well be placed near the north end of the EM lines to avoid possible buried debris or other cultural interferences. It was also recommended that a downgradient well be placed near 430E, 160N.



NOT TO SCALE

**FIGURE 3-5
AREA 2
EM LINE LOCATIONS**

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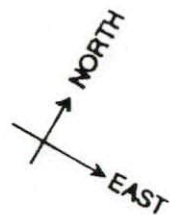
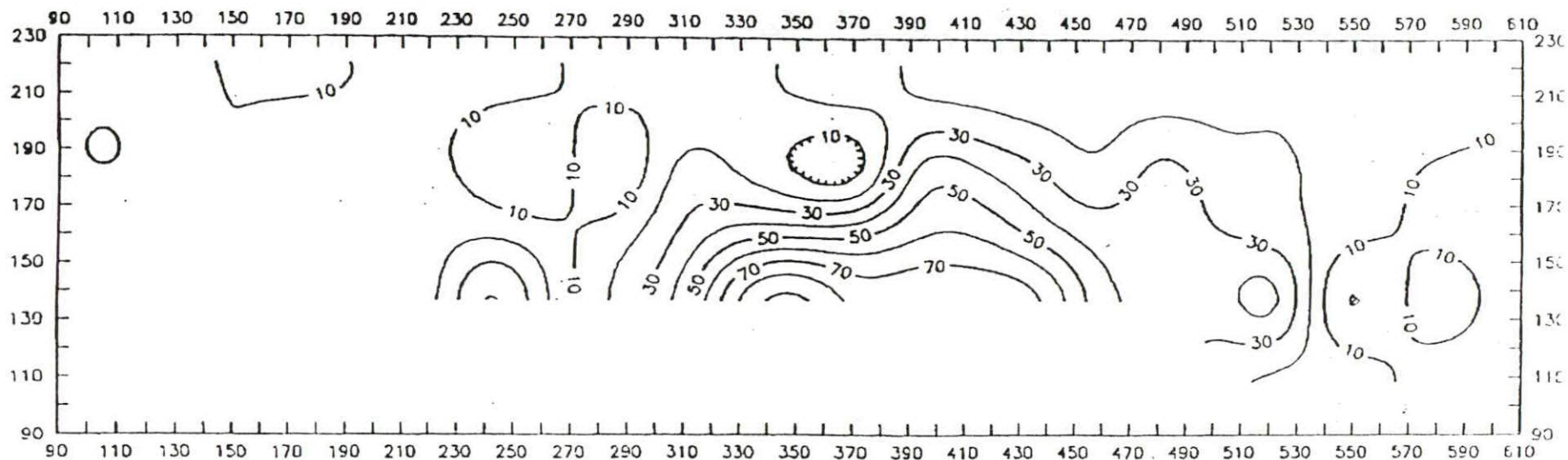


FIGURE 3-6
EM CONTOUR MAP
AREA 2 (NORTHWEST) DOWNGRADIENT
VERTICAL MODE
 HUDSON RIVER PSYCHIATRIC CENTER
 NYSDEC I.D. No. 314063
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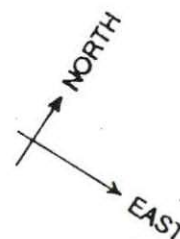
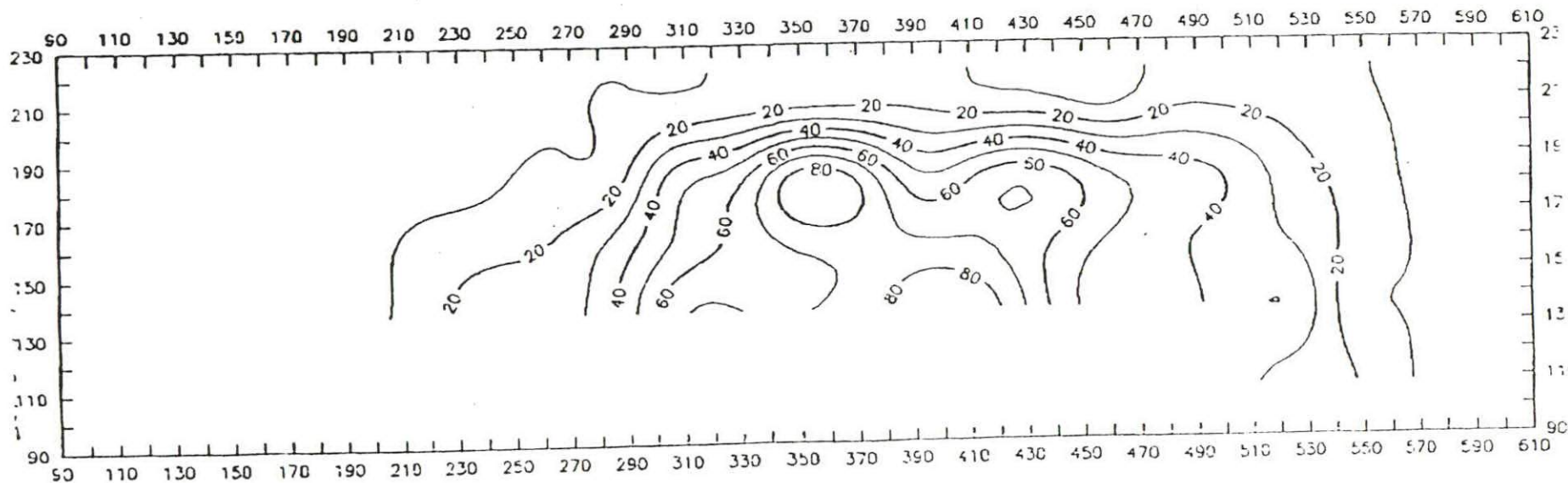


FIGURE 3-7
EM CONTOUR MAP
AREA 2 (NORTHWEST) DOWNGRADIENT
HORIZONTAL MODE
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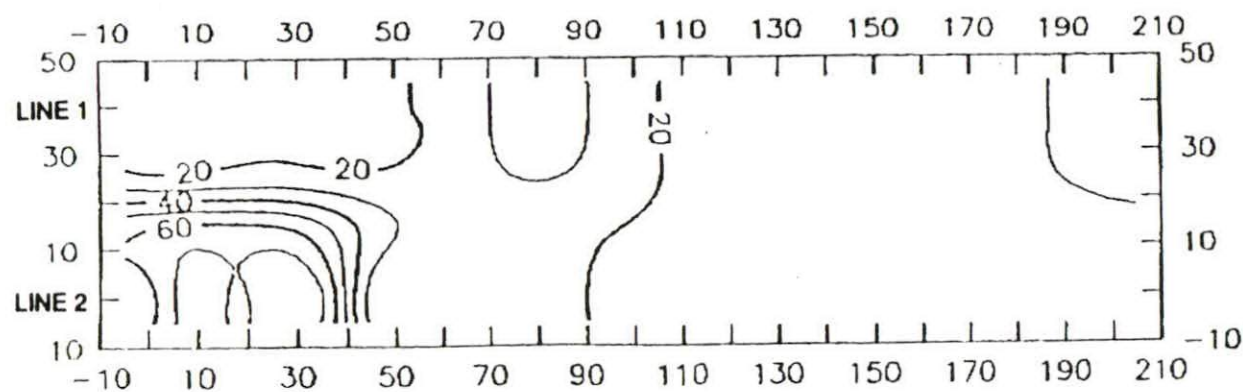


FIGURE 3-8

EM CONTOUR MAP
AREA 2 (EAST) UPGRADIENT
LINES 1, 2

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3.3.3 Area 3

At Area 3 three VES and EM survey lines were proposed along the western boundary and two along the southern boundary of the fill. The combination of the two would indicate the depth to bedrock and the estimated thicknesses of both the unconsolidated material and the fill. The information would also be used to discern any high conductivity plumes and consequently the flow gradient. In actuality, five lines were run along the south side of the fill and four lines along the west side. EM results alone were obtained since the ground was frozen. All lines were spaced at 40-ft intervals and stations were located at 5-ft intervals. Only horizontal readings were obtained at this site. Figure 3-9 shows the locations of the survey lines.

Figure 3-10 presents the data collected from the southern area surveyed at Area 3. The figure shows a high conductivity line running east to west, which could indicate the boundary of the fill or leachate beneath the fill. A buried metal object may be located at 340E, 180N, as indicated by the conductivity low at this spot. The geophysics data taken from the west side of the fill (Figure 3-11) indicate a similar linear high conductivity running north to south, possibly the edge of the fill or a leachate plume. An unexplained high conductivity value is observed west of the stream at the north end of the surveyed area.

One VES reading was taken along the west side of the site. A three-layer system was found, with the top (high resistance) layer approximately 4 ft thick, the middle (low resistance) layer approximately 30 ft thick, and the third (highly resistive) layer located 35 ft below the ground surface.

On the basis of the geophysics data collected from Area 3, it was recommended that one well be placed along the 460E line and another along the 180E line between 300 and 500N.

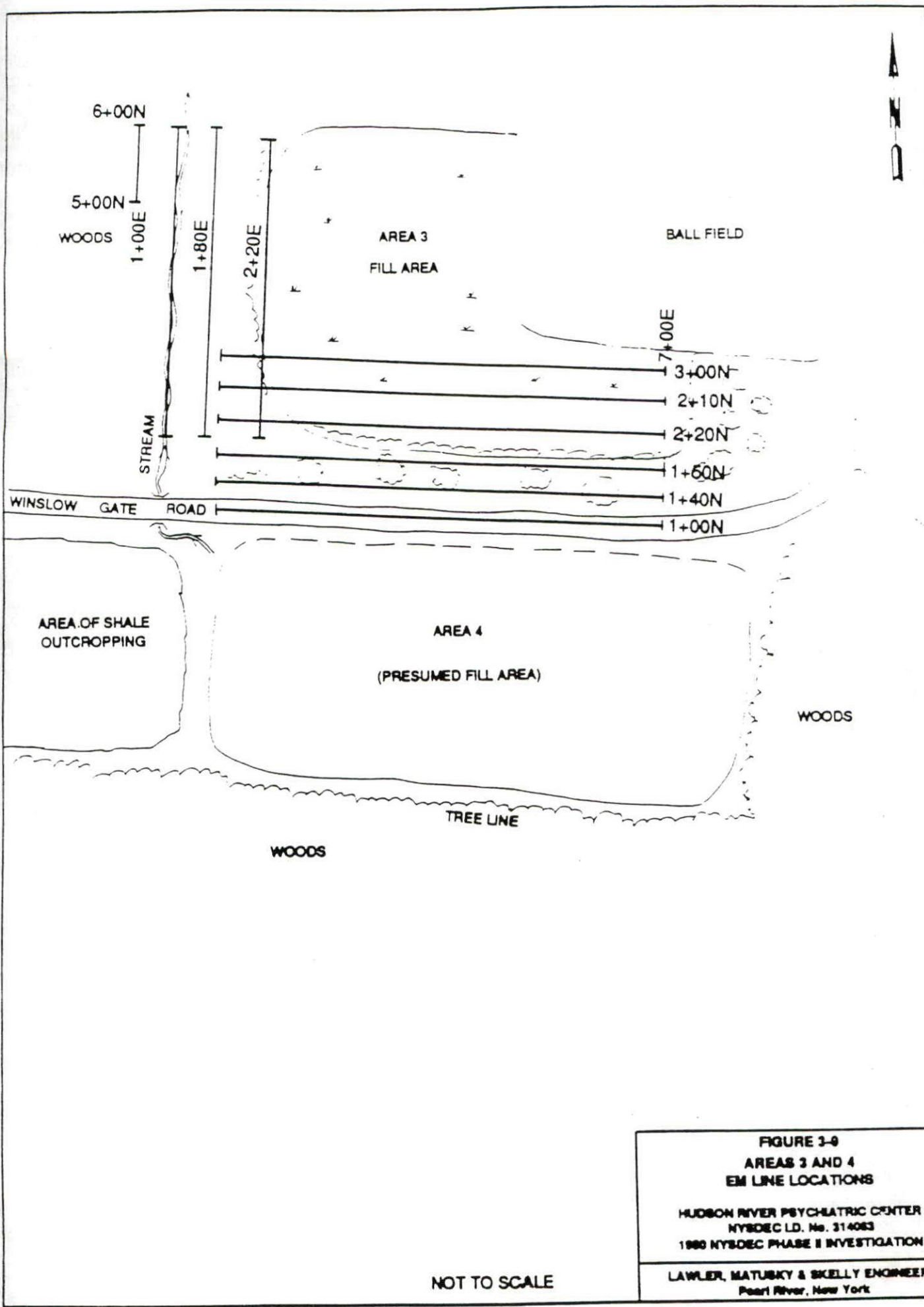


FIGURE 3-9
AREAS 3 AND 4
EM LINE LOCATIONS

HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC L.D. No. 314083
1980 NYSDEC PHASE II INVESTIGATION

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Pearl River, New York

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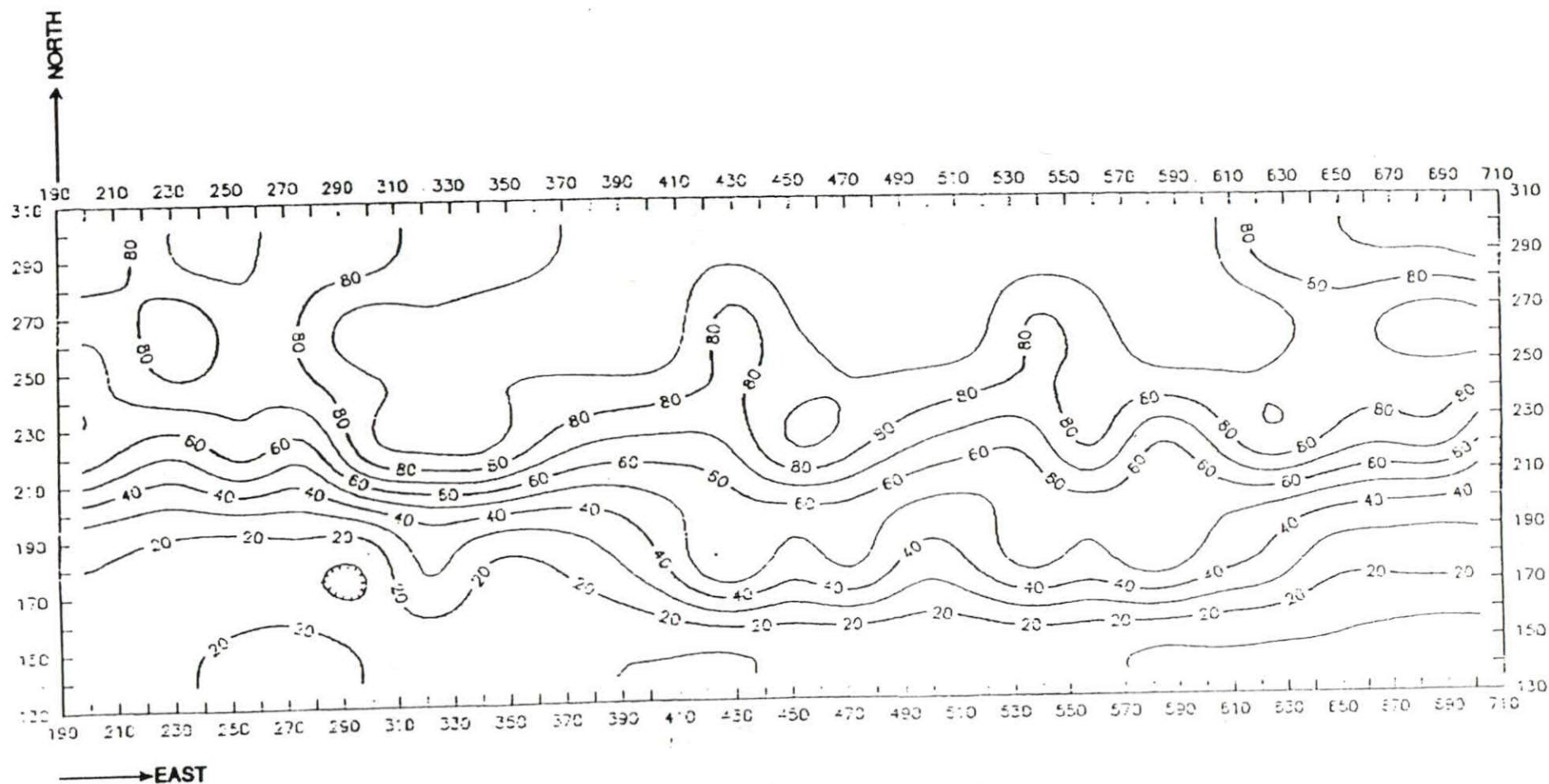


FIGURE 3-10
EM CONTOUR MAP
AREA 3-4 (SOUTH)
HORIZONTAL MODE

HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC I.D. No. 314063
1990 NYSDEC PHASE II INVESTIGATION

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Pearl River, New York

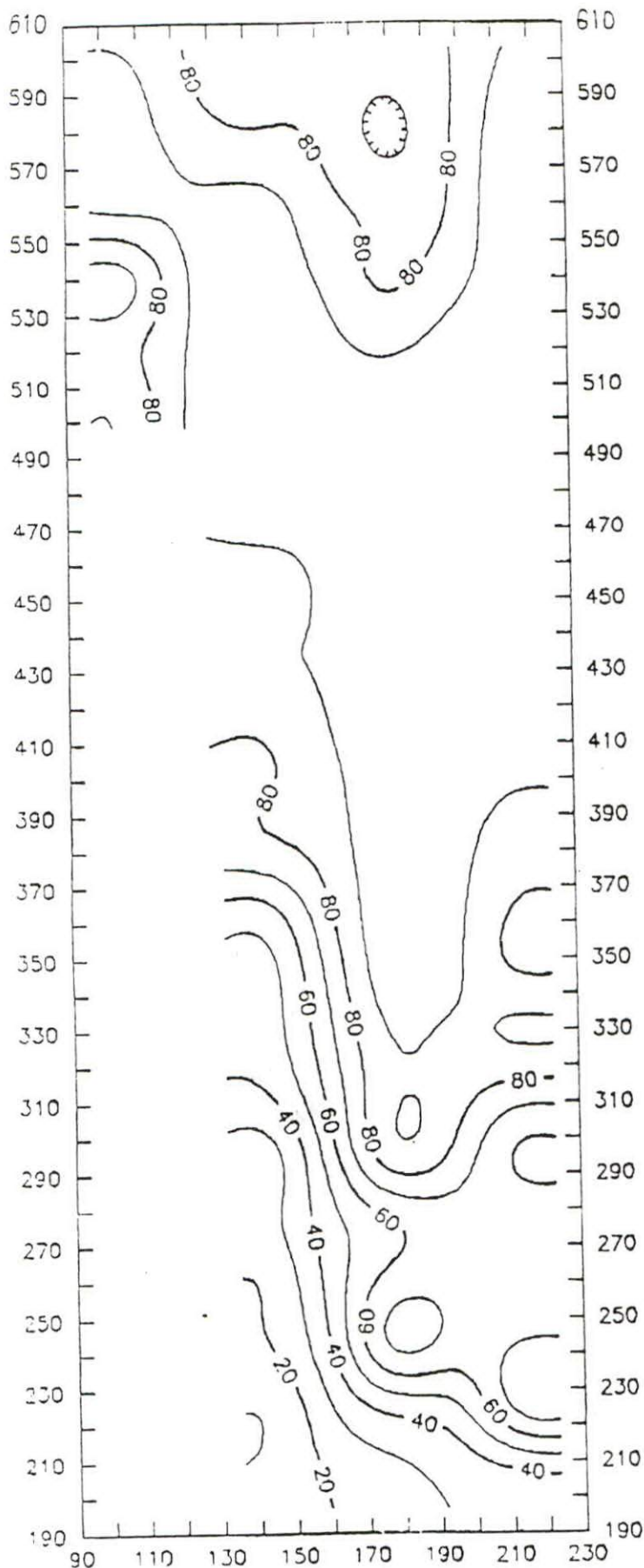


FIGURE 3-11
EM CONTOUR MAP
AREA 3-4 (WEST)
HORIZONTAL MODE

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 1990 NYSDEC PHASE II INVESTIGATION

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3.3.4 Area 5

Three EM and VES survey lines were recommended in Area 5 to locate underground pipes; to determine depth to bedrock, depth of fill, and depth to groundwater; and to determine any contaminant plumes and their gradients.

The actual survey consisted of four survey lines that paralleled the dirt road along the western side of the site. Three additional lines, parallel to the first four, were started at the southern end of the site and covered about half the distance of the other four (Figure 3-12). EM results alone were obtained because the ground was frozen. All lines were spaced at 40-ft intervals and stations were located at 5-ft intervals. Readings were taken in both the vertical and horizontal modes.

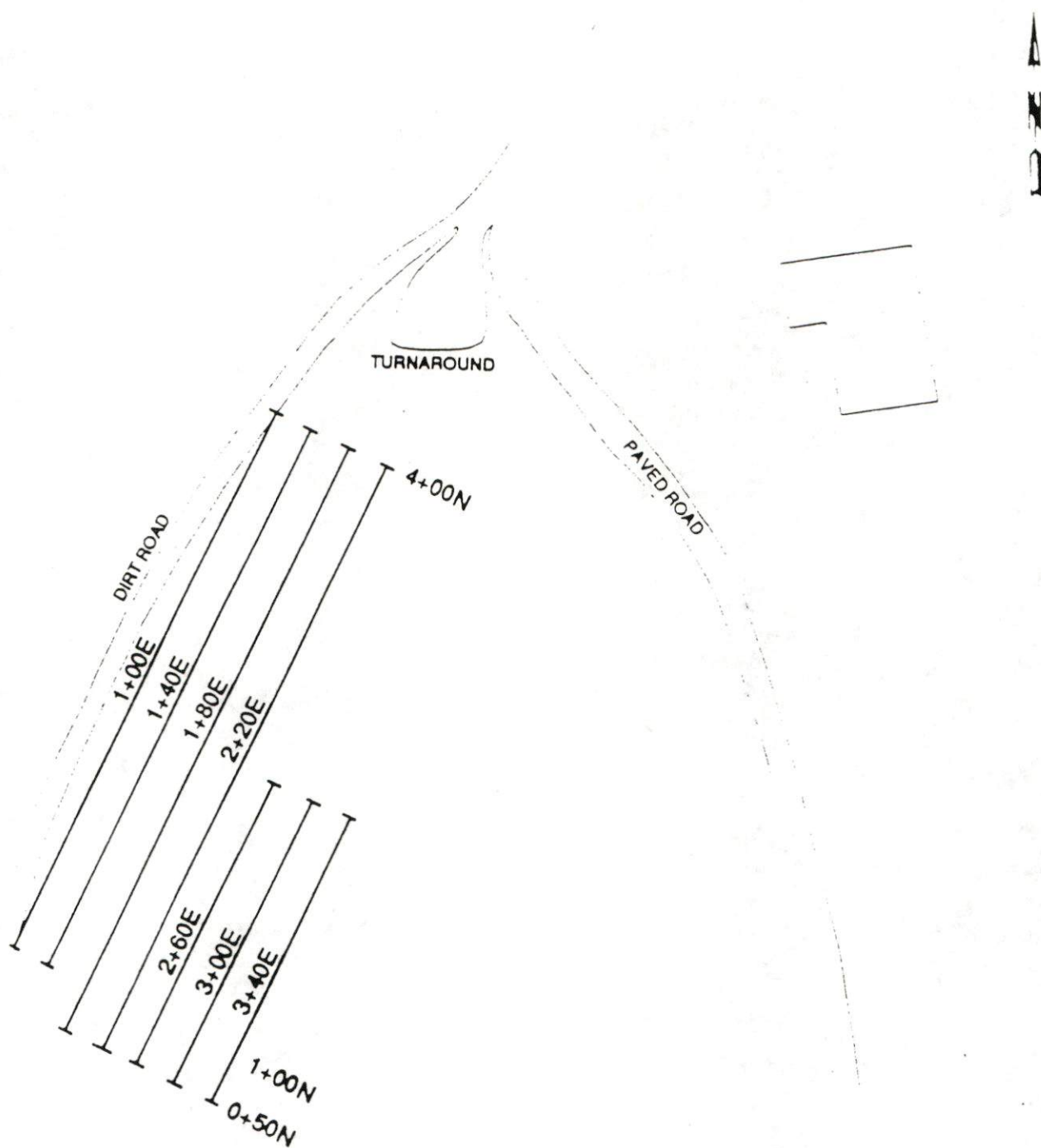
Figures 3-13 and 3-14 show the horizontal and vertical modes, respectively, at Area 5. Both figures show areas of cultural interference. Three areas of possible buried metal are shown: 180E, 360N; 170E, 170N; and 280E, 90N. A linear trend that may indicate the underground culvert appears to run northeast to southwest. High conductivity readings not associated with buried metal are found at 300E, 140N.

It was recommended that a well be placed near 300E, 140W, based on the geophysics data collected from Area 5.

3.3.5 Area 6

VES soundings were proposed along a line parallel to the stream, within 20-30 ft of the top edge of the bank, to determine depths to bedrock, fill, and overburden. EM traverses were to be conducted along the same area as the VES soundings to provide information on depth to groundwater and to locate leachate.

Seven survey lines were run approximately parallel to the stream. Only EM results were obtained because the ground was frozen and VES readings could not be obtained. Traverses



NOT TO SCALE

43

FIGURE 3-12
AREA 5
EM LINE LOCATIONS

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FIGURE 3-13
EM CONTOUR MAP
AREA 5
HORIZONTAL MODE

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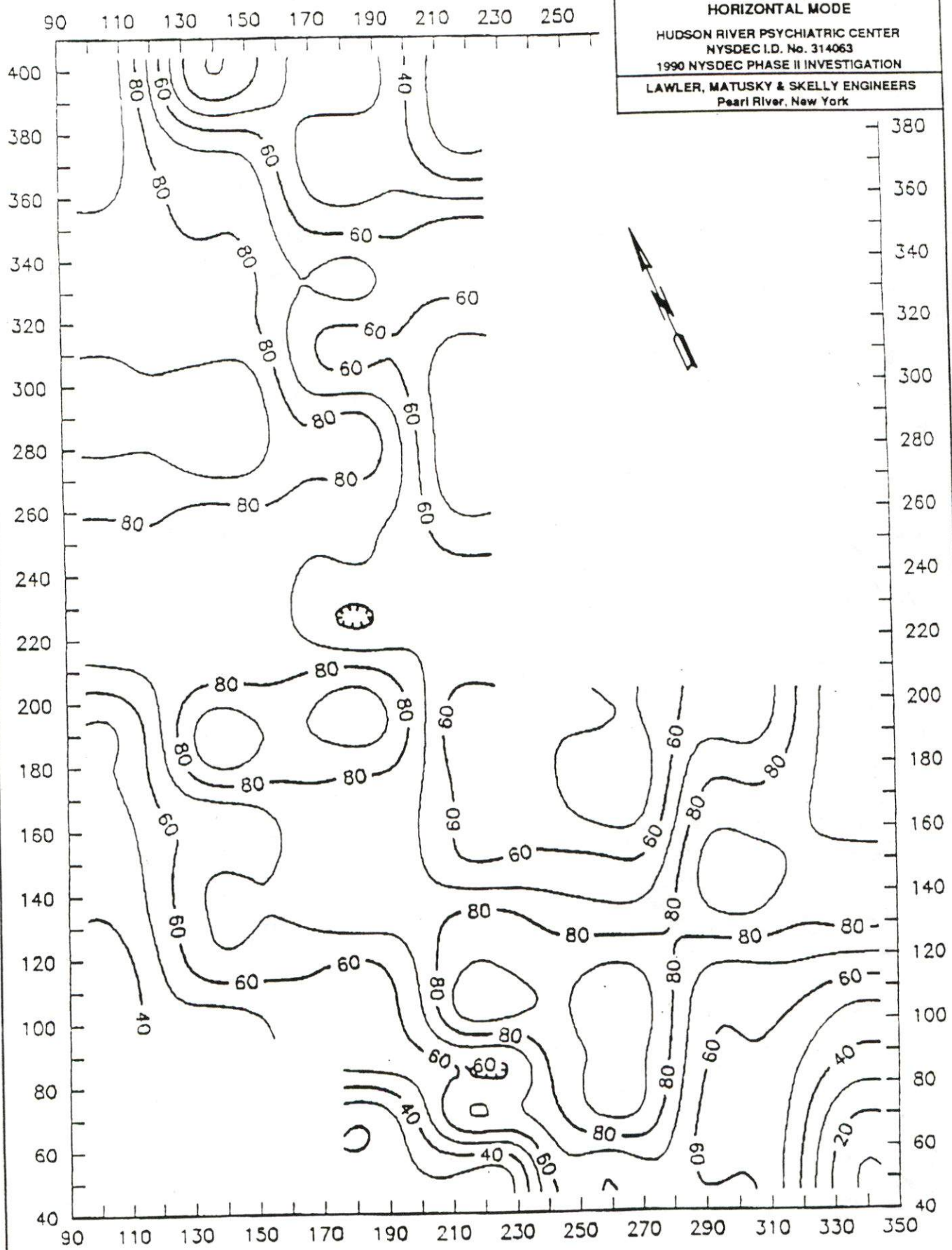


FIGURE 3-14

EM CONTOUR MAP

AREA 5

VERTICAL MODE

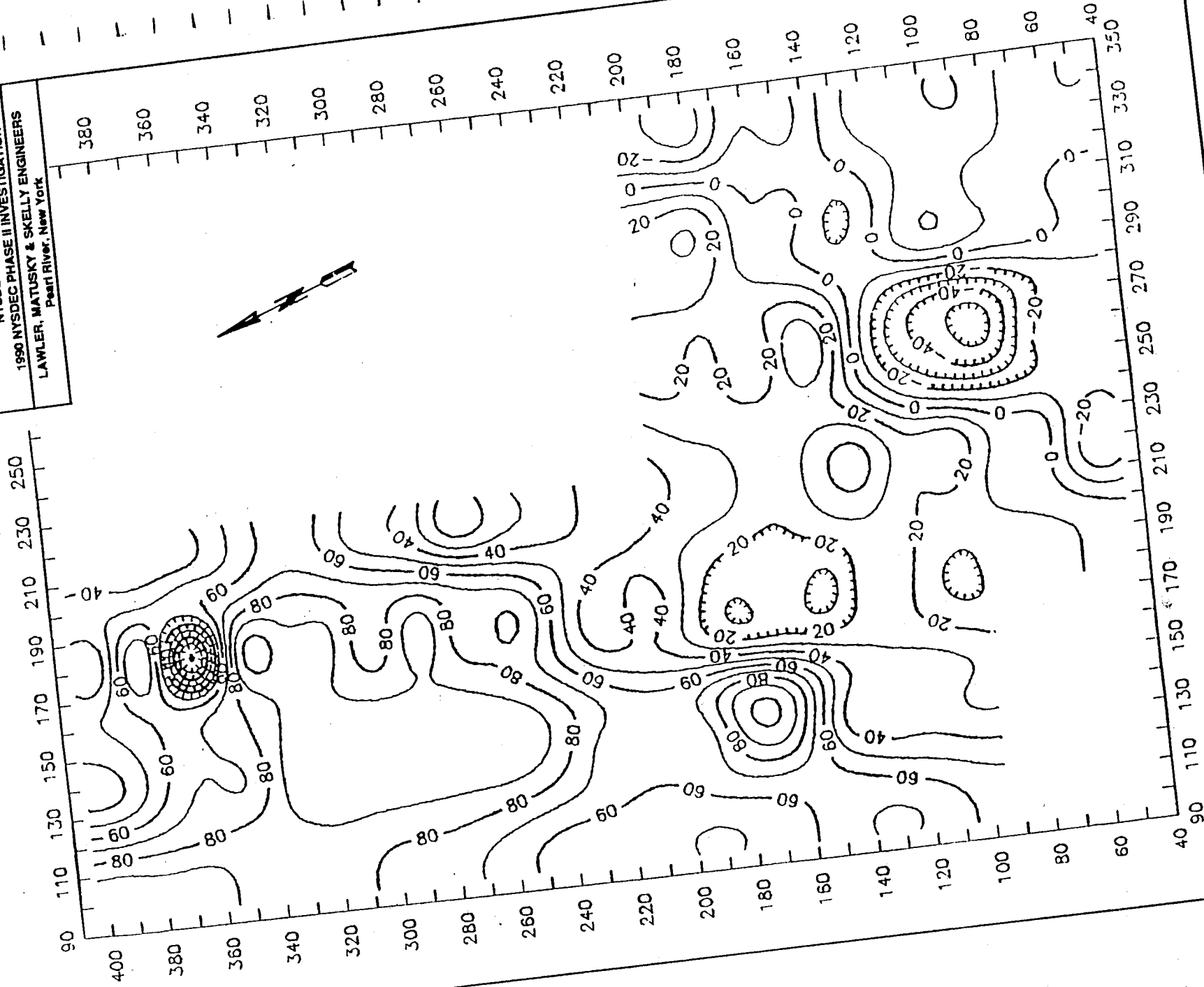
HUDSON RIVER PSYCHIATRIC CENTER

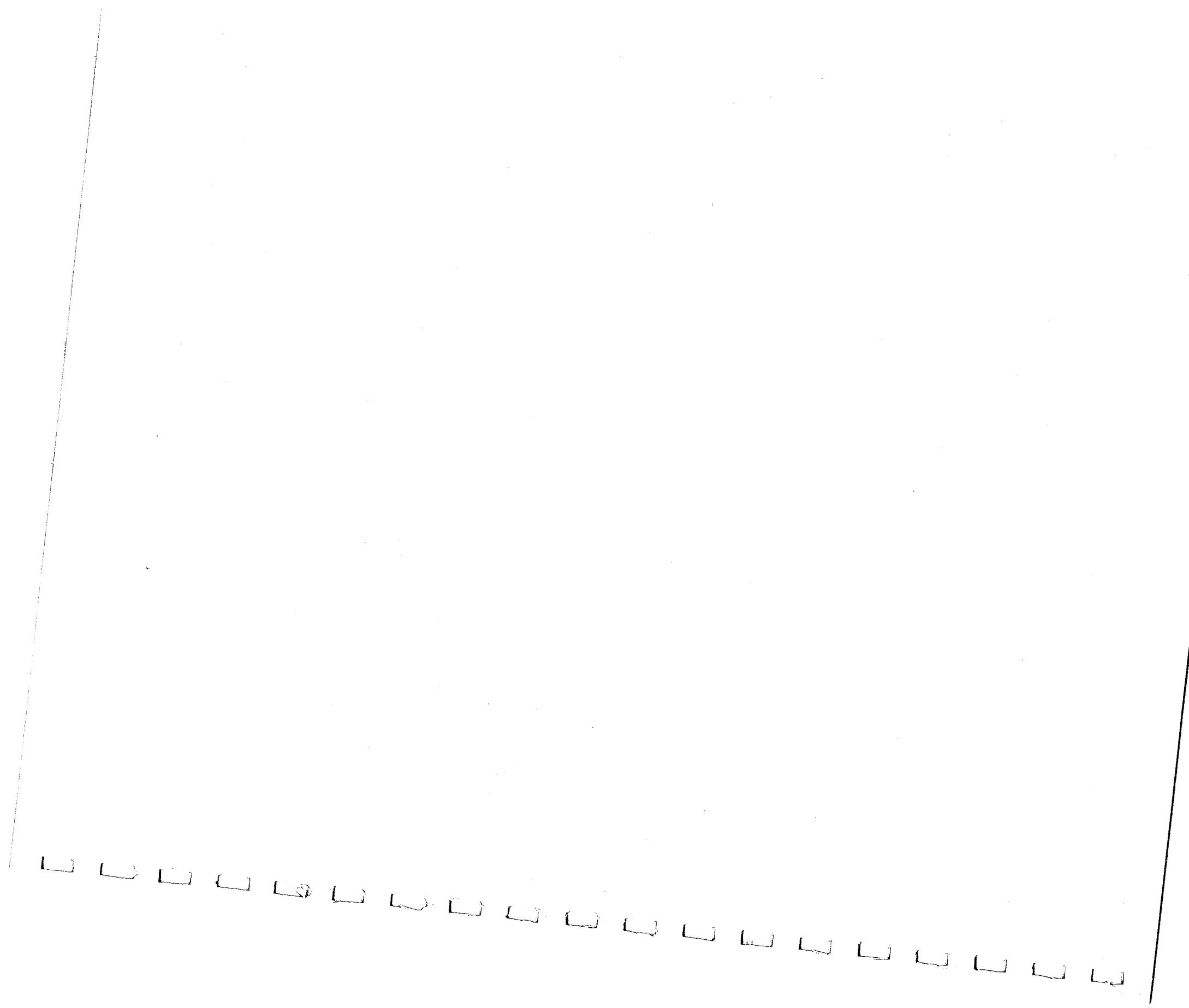
NYSDEC I.D. No. 314063

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were located 40 ft apart and stations were at 5-ft intervals. All readings obtained in this area were vertical. Figure 3-15 shows the location of the survey lines.

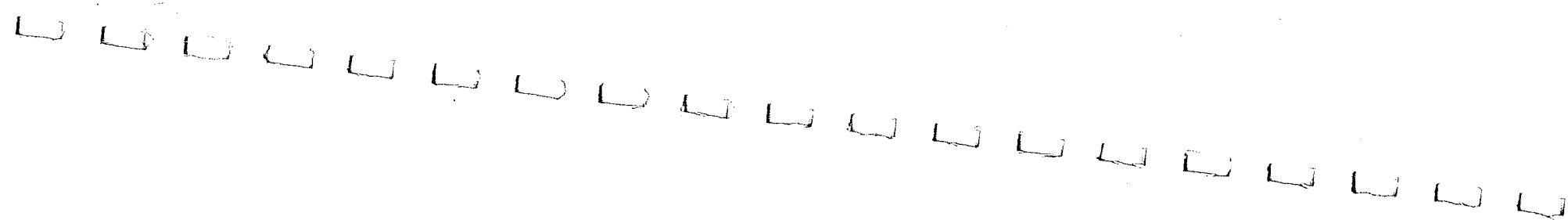
Figure 3-16 presents the data collected in the vertical mode from Area 6. High conductivity values were observed in the northeast and northwest corners. In the northwest the values generally indicate the presence of the parking lot. In the northeast corner, however, a low conductivity reading at 180N, 640E is not totally explained by the presence of a metal trash can; in all likelihood additional buried metal is located in this area. Generally higher conductivity readings are observed trending toward the east near 170N, 670E, possibly indicating the presence of a leachate plume.

Based on the geophysics data collected from Area 6, it was recommended that a monitoring well be placed along the line shown on Figure 3-16.

3.4 SOIL GAS SURVEY

The original work scope suggested that 60 soil gas points be installed over the site to ascertain whether the proposed drilling locations were correct. The purpose of the soil gas survey was to extract pore-space vapor samples from pinpoint locations in the vicinity of the proposed monitoring well locations. These soil gas points would then be analyzed for volatile organics using both flame ionization and photoionization gas chromatograph (GC) techniques. All 60 points were located and flagged during the site reconnaissance, and were installed in the vicinity of the originally flagged locations, in the general area of the proposed monitoring wells, during the soil gas survey that took place from 3 to 11 December 1989. (Specific locations are described in Sections 3.4.1 through 3.4.5.)

The proposed soil gas points were to be installed 4 to 6 ft below grade, for best results, at a depth above the saturated zone. An initial test hole was drilled to 4 ft using a slam bar (a long steel rod with a movable weight attached to the top). The rod was then removed and inspected to ascertain whether the saturated zone had been encountered. If the slam bar met with refusal, the rod was retracted and a new hole was drilled a short distance away. Once a satisfactory hole was drilled, the soil gas point, which consisted of a stainless steel rod and



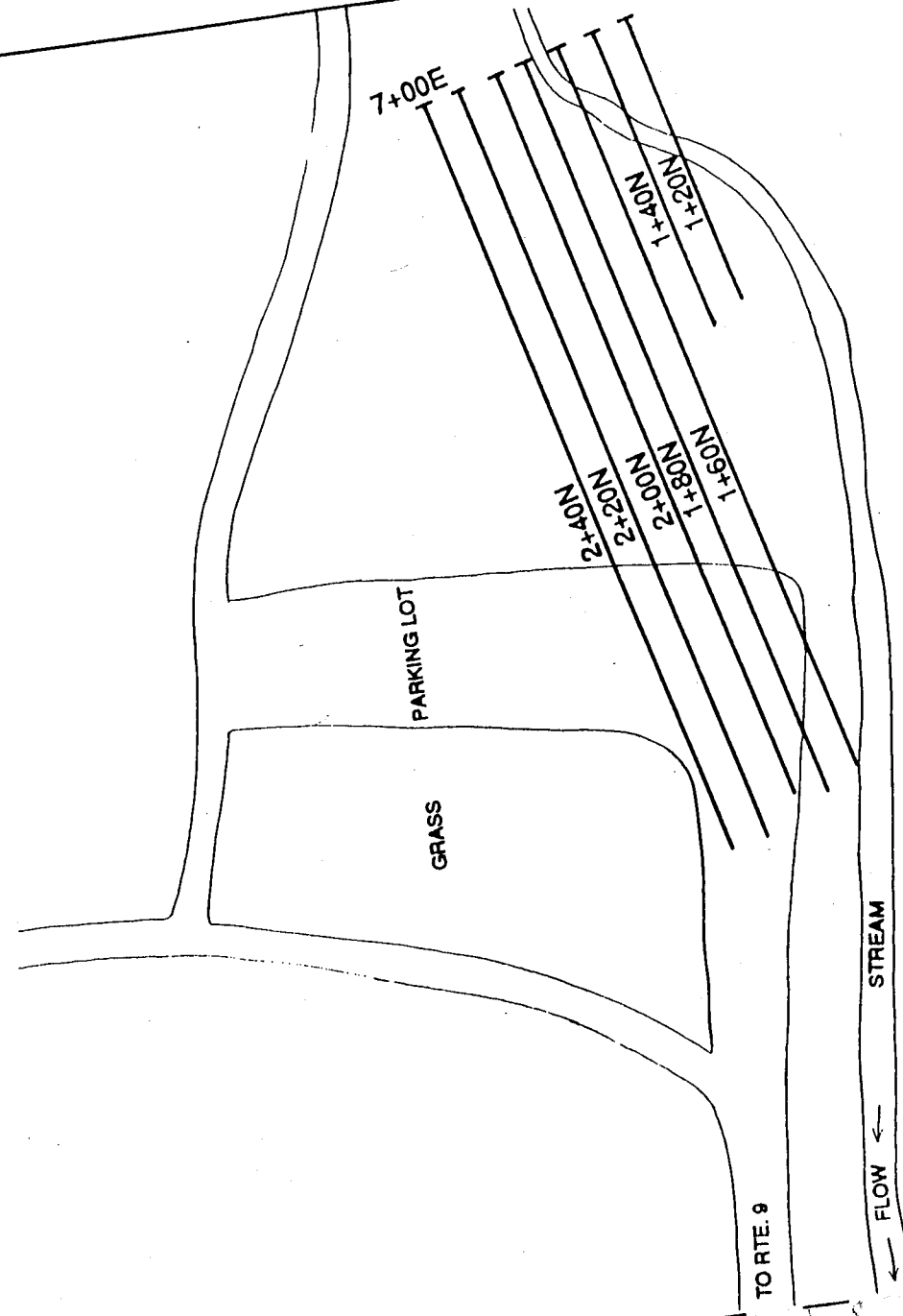


FIGURE 3-15
AREA 6
EM LINE LOCATIONS
HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC LD. No. 314063
1990 NYSDEC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

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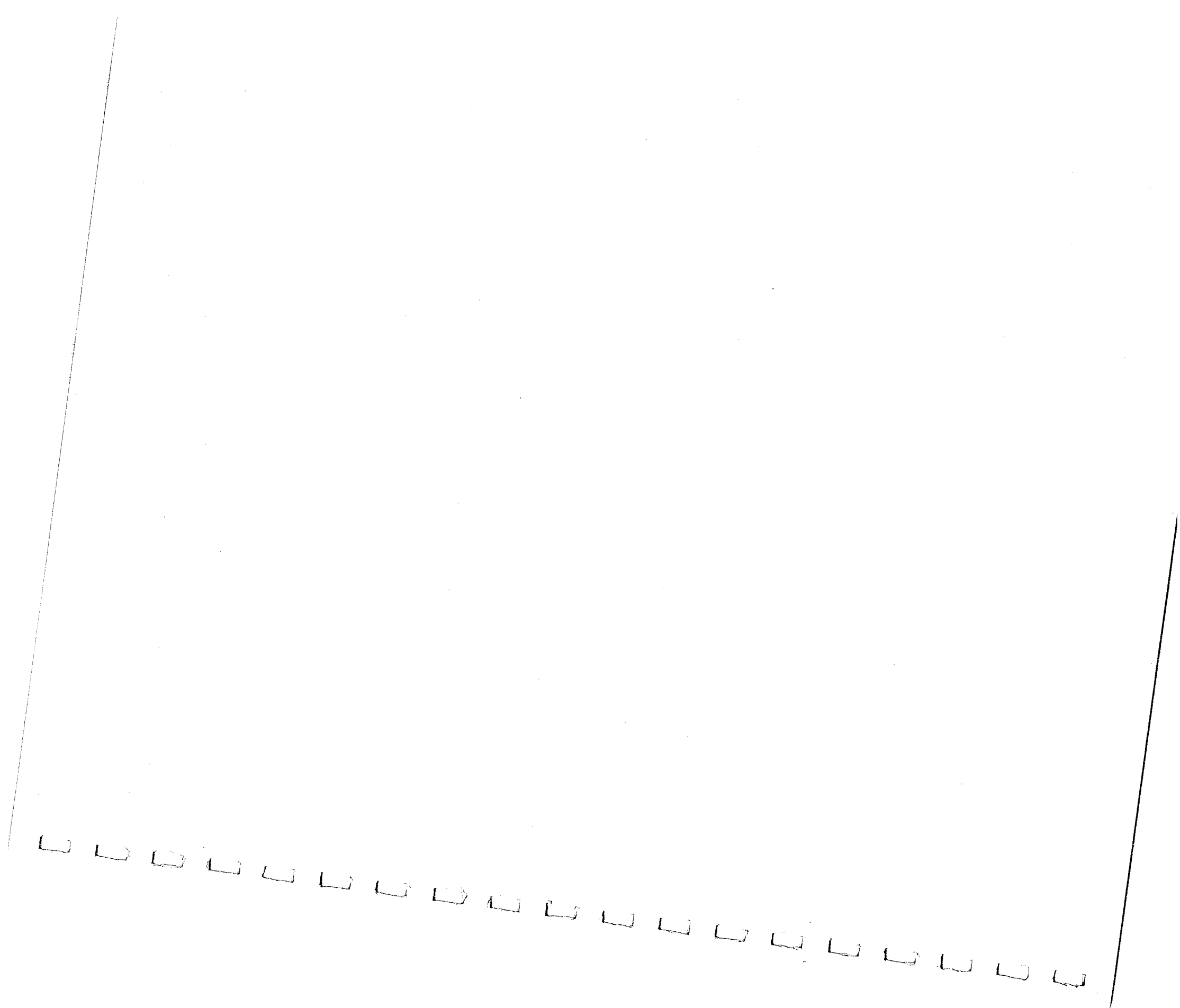
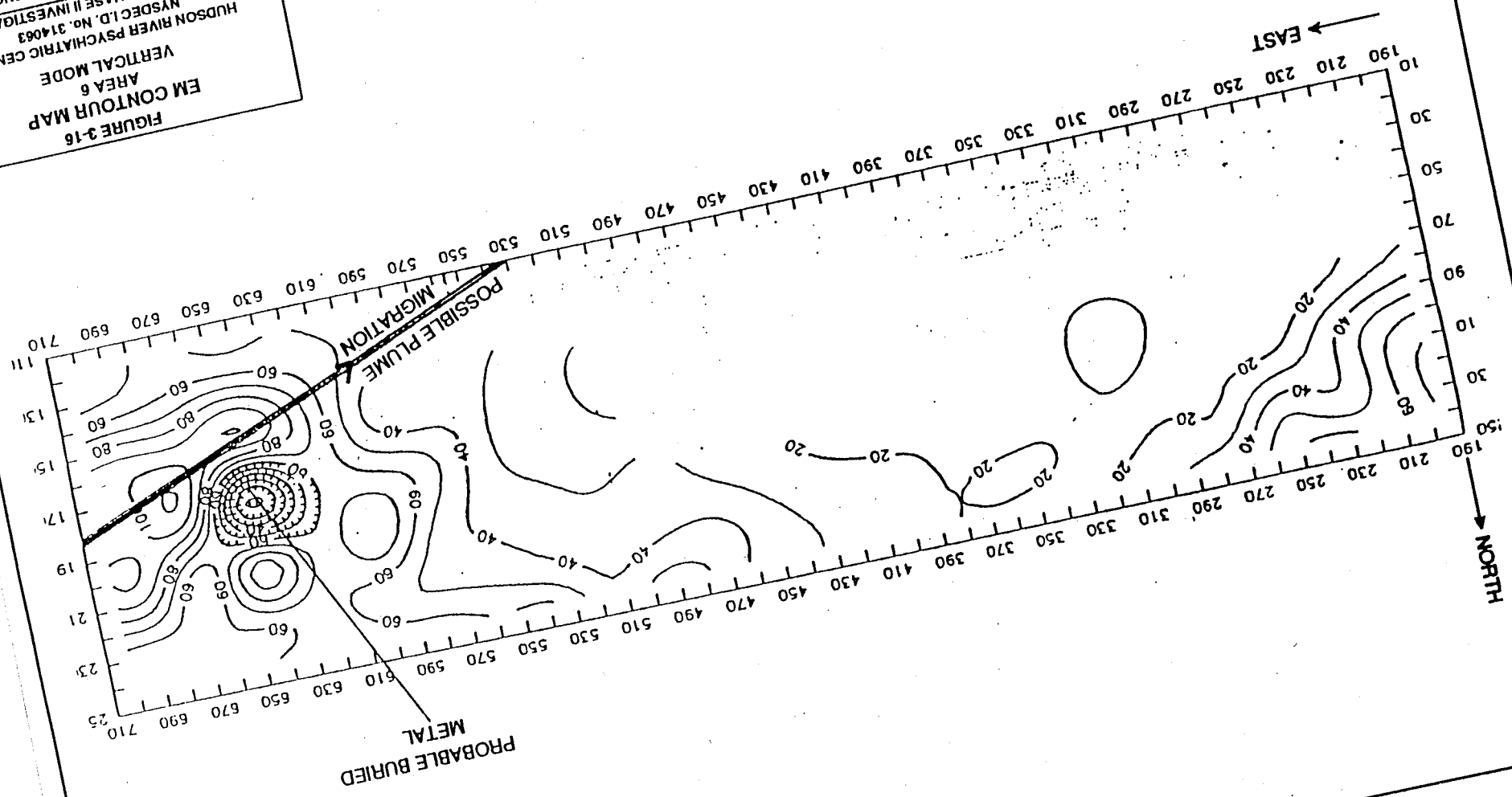
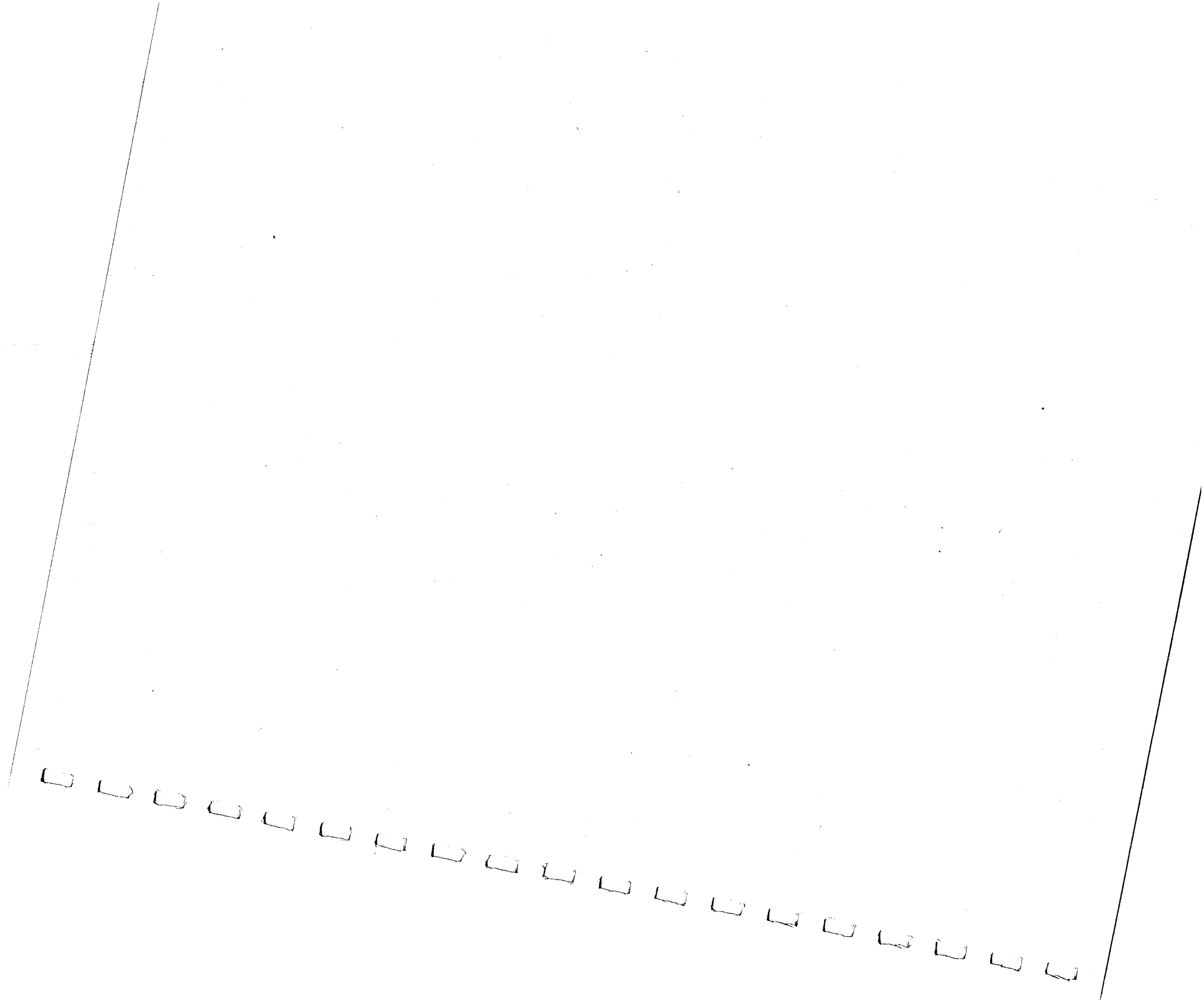


FIGURE 3-16
EM CONTOUR MAP
AREA 6
VERTICAL MODE
HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC I.D. No. 314063
1990 NYSDEC PHASE II INVESTIGATION
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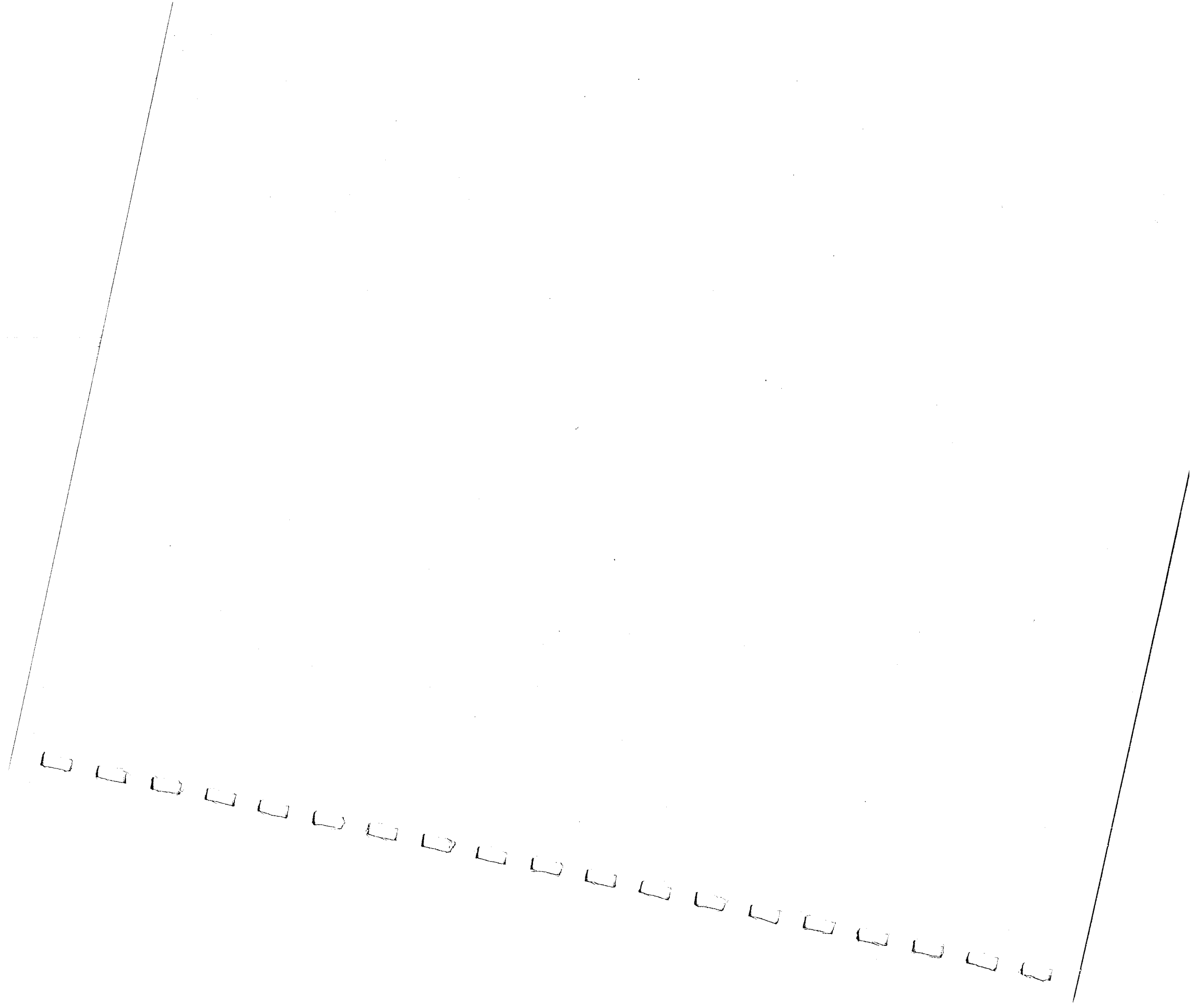


The point
was then driven to the desired depth (~6 ft) by a rod and hammer assembly. After

its associated Teflon umbrella (to prevent cave-in), was installed in the test hole. The point
was then driven to the desired depth (~6 ft) by a rod and hammer assembly. After
installation, the rod and hammer assembly was removed from the hole, leaving the point and
attached Teflon tubing in place. A layer of dry sand was poured into the hole to a depth of
approximately 0.5 ft above the stainless steel point to allow an area for gas capture.
Bentonite powder and small volumes of water were then added alternately to seal the
remaining annular space of the hole. At the surface a soft clay seal was molded around the
tubing and over the ground to prevent the downward flow of ambient air during purging and
sampling of the hole. A clay plug was also placed over the end of the Teflon tubing to
prevent insects and debris from entering the tubing prior to sampling (Figure 3-17).

Sampling took place shortly after installation of the points was complete, except during or
after periods of rain. During a rainstorm the upper soil layer becomes saturated; as this layer
of water travels downward it creates a trapped layer between the lower saturated zone and
the downward-moving water layer. As water moves farther down, it increases the gas pressure
within the trapped pore space, which may force organic compounds in a gaseous state to re-
dissolve into either the moving water column or the underlying saturated zone. This could
change the concentrations that would be detected and make them no longer representative
of steady-state conditions. Sampling was generally halted for a 24-hr period following pre-
cipitation events to allow the upper saturated zone to reach equilibrium with the lower
saturated zone. After installation the point was purged using a battery-powered vacuum
pump for approximately 2-3 min at a flow rate of 2 liters per minute (lpm) (see Figure 3-17).

If the flow was less than that, the pumping time was extended to remove the same amount
of gas. During purging the OVA was used to monitor the effluent from the system for total
organics. While the pump was still on, a gas-tight syringe was used to withdraw a 1-5 ml
sample through the septum on the sample port. The sample was sealed in the syringe, kept
in the dark, and immediately transported to the mobile laboratory for injection into the
analytical system. The sample was then injected via a packed column injector HNU model
421 GC located in the mobile laboratory. The results were plotted on a site map that also
and a report prepared on the proposed monitoring wells. The soil gas data were used in
showed the locations of the geophysics data (Section 3.3) to derive recommendations for the final
conjunction with the geophysics data (Section 3.3) to derive recommendations for the final



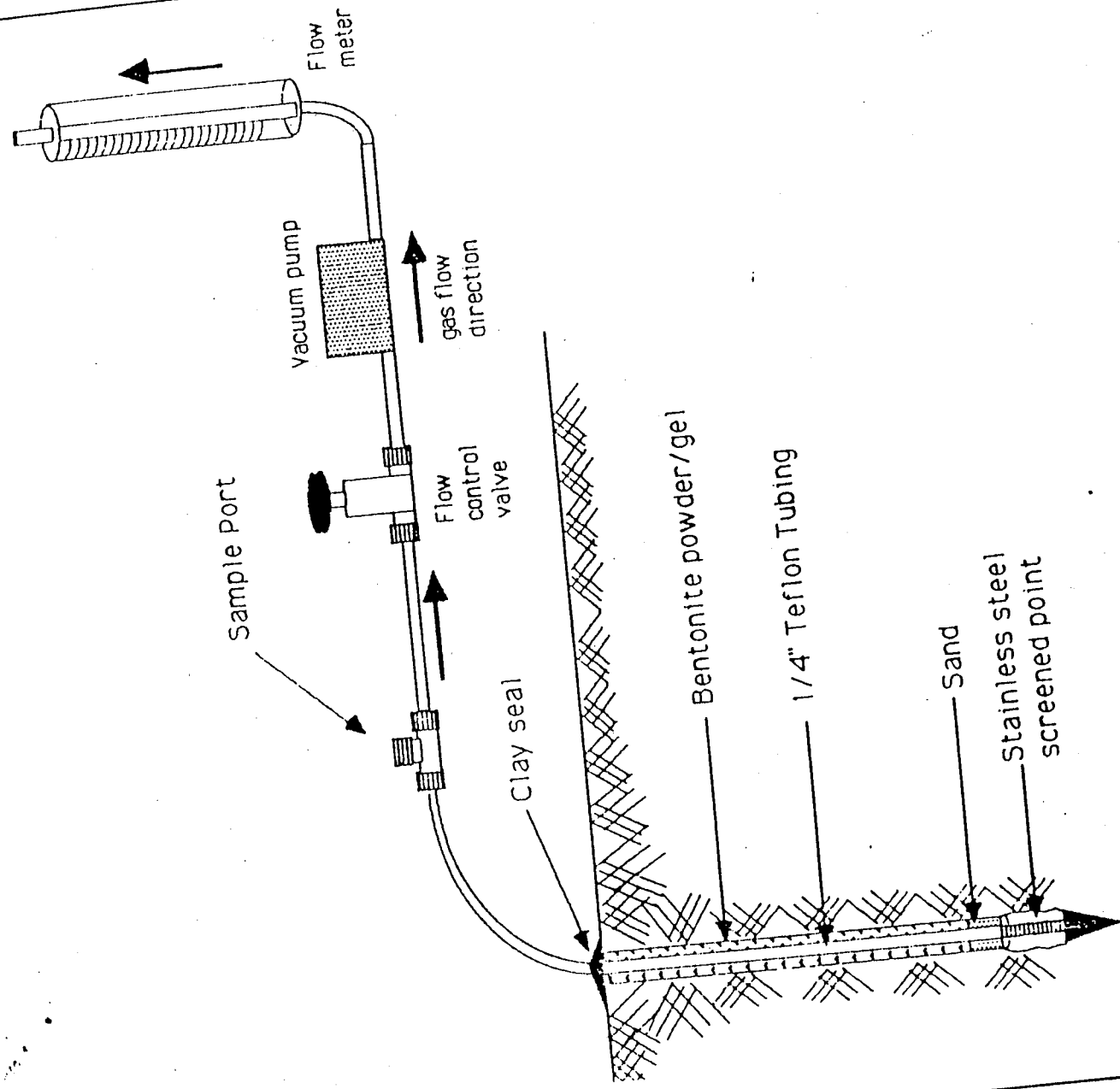
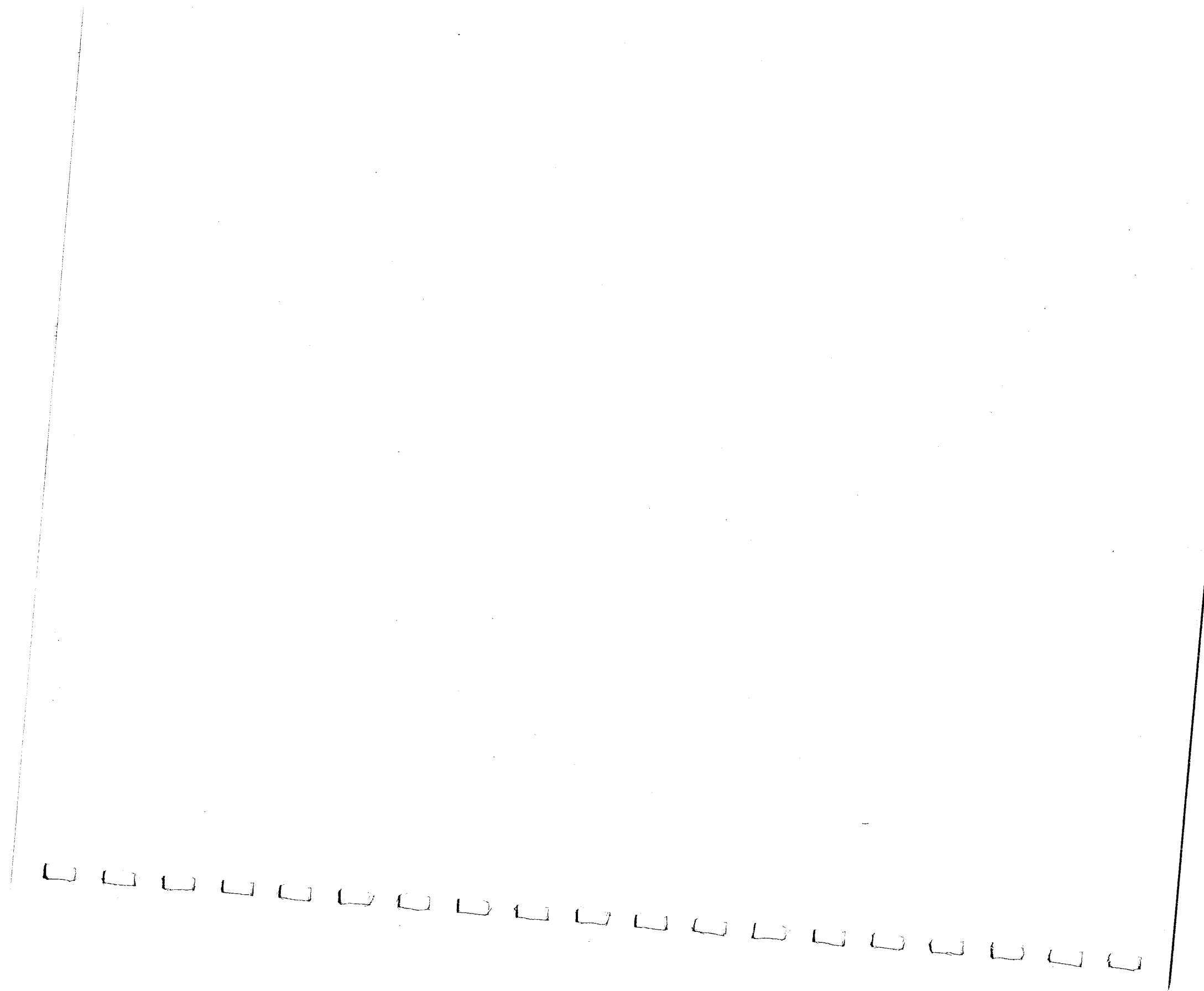


FIGURE 3-17

SOIL GAS SAMPLING
FLOW DIAGRAM

HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC I.D. No. 314063
1990 NYSDEC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

Source: Soil gas analysis report from Hudson River Psychiatric Center, Tetra-K Testing, Inc.



- for the soil gas

-itoring wells.

locations of the
survey results.

3.4.1 Area 1

urvey results.

3.4.1 Area 1

Ten soil gas points were installed at approximately equal intervals along the northern edge of the grassy area at the edge of the fill. Two other points were installed along the western side of the golf course at its highest point overlooking the Hudson River (see Figure 3-18 for location). Table 3-1 and Figure 3-18 present the data collected from the soil gas survey of these points. The depth of the soil gas point (SGP), HNU, OVA, or HNU, OVA, are also shown. Only three soil gas points were installed at a depth of the soil gas point (SGP), HNU, OVA, or HNU, OVA, are also shown. Only three soil gas points were installed at a depth of the soil gas point (SGP), HNU, OVA, or HNU, OVA, are also shown.

[illegible]

CGI meter deflections, and SGHR1-3. Also identified organic contaminants in the manufacture of a paint solvent and cleaning agent. Also identified a 60% lower explosive level.

Chlorobenzene is a constituent of gasoline, is used as a solvent, and is a constituent of methane, which was also detected by the CGI also recorded at the same location. The concentration of methane was 100 mg/m³ of unknowns.

The analysis was 90 mg/m³ of unknown hydrocarbon, possibly xylene, a concentration significantly above background conductivity. The analysis was also located near an area of above-background proposed location. This indicates a significant concentration of methane, which is the soil gas points sampled approximately 80 ft east of its originally proposed location.

(LEL), indicating SGHR1-3 was also located not more than approximately 80 ft east of the center of a possible release

[illegible]

SGHR1-5 contained benzene, toluene, and acetone. The identified were acetone, 20 mg/m³ of unknowns, and methane.

Two other compounds identified at Area 1. It contained SGHR1-5 were 20 mg/L. Two other compounds identified at Area 1. It contained SGHR1-5 were 20 mg/L. Two other compounds identified at Area 1. It contained SGHR1-5 were 20 mg/L.

[illegible]

reading of 30. Because of this finding, which confirmed the original proposal, the highest concentration (18.4 mg/m³) recorded in any of the samples moved approximately 10 to 15 ft east of its originally proposed location. The highest concentration (18.4 mg/m³) recorded in any of the samples moved approximately 10 to 15 ft east of its originally proposed location. The highest concentration (18.4 mg/m³) recorded in any of the samples moved approximately 10 to 15 ft east of its originally proposed location.

contained 350 mg/m³ of unknowns and shifted approximately 10 ft east toward the geophysics survey.

It also contained 35% *CC* MWHR1-4 was shifted approximately 100% to the *CC* activity identified during the *GC* analysis.

It also contains areas.

areas. The MW...
recorded on the GC.
...area of high co...

which was also in an area of high

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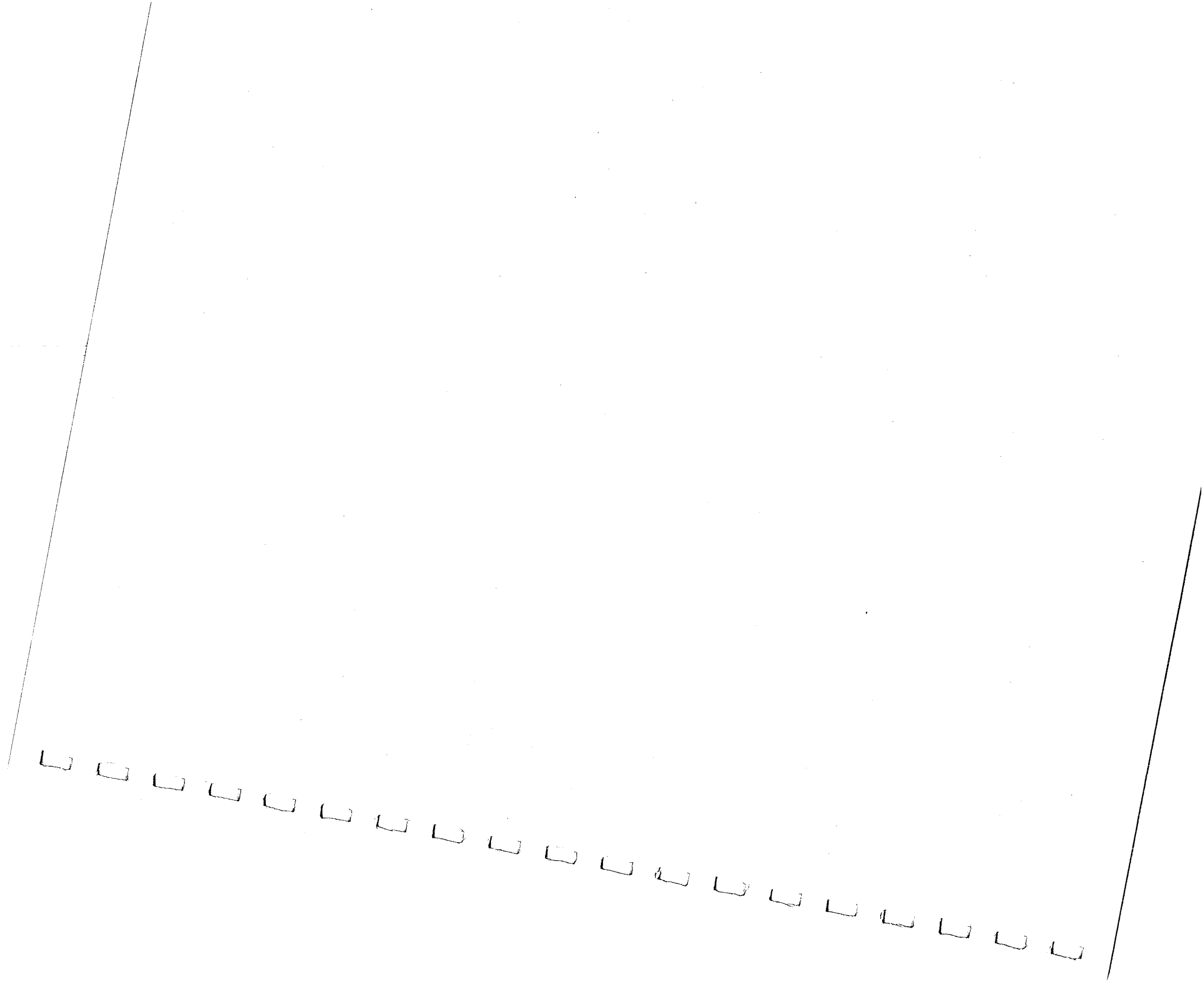
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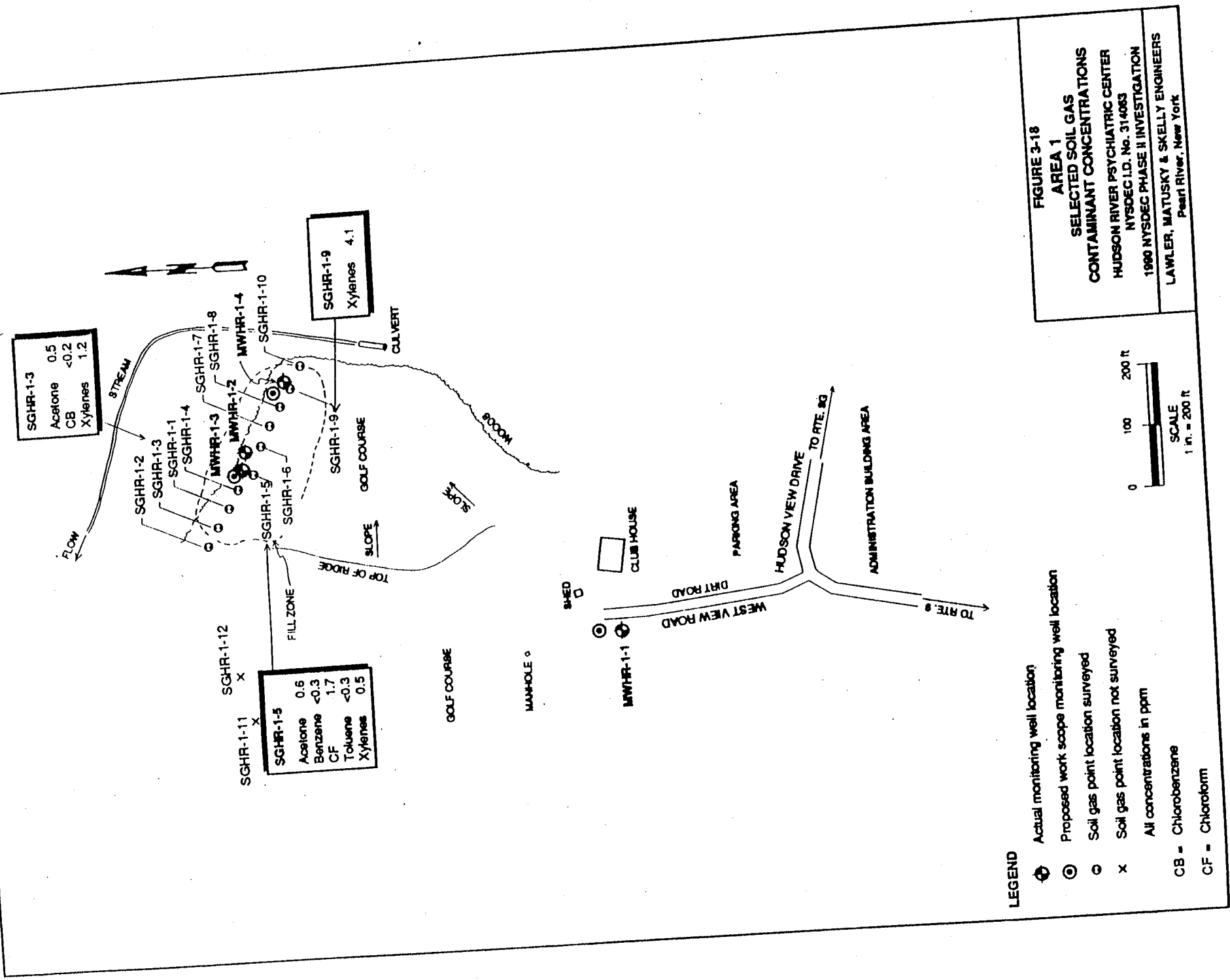
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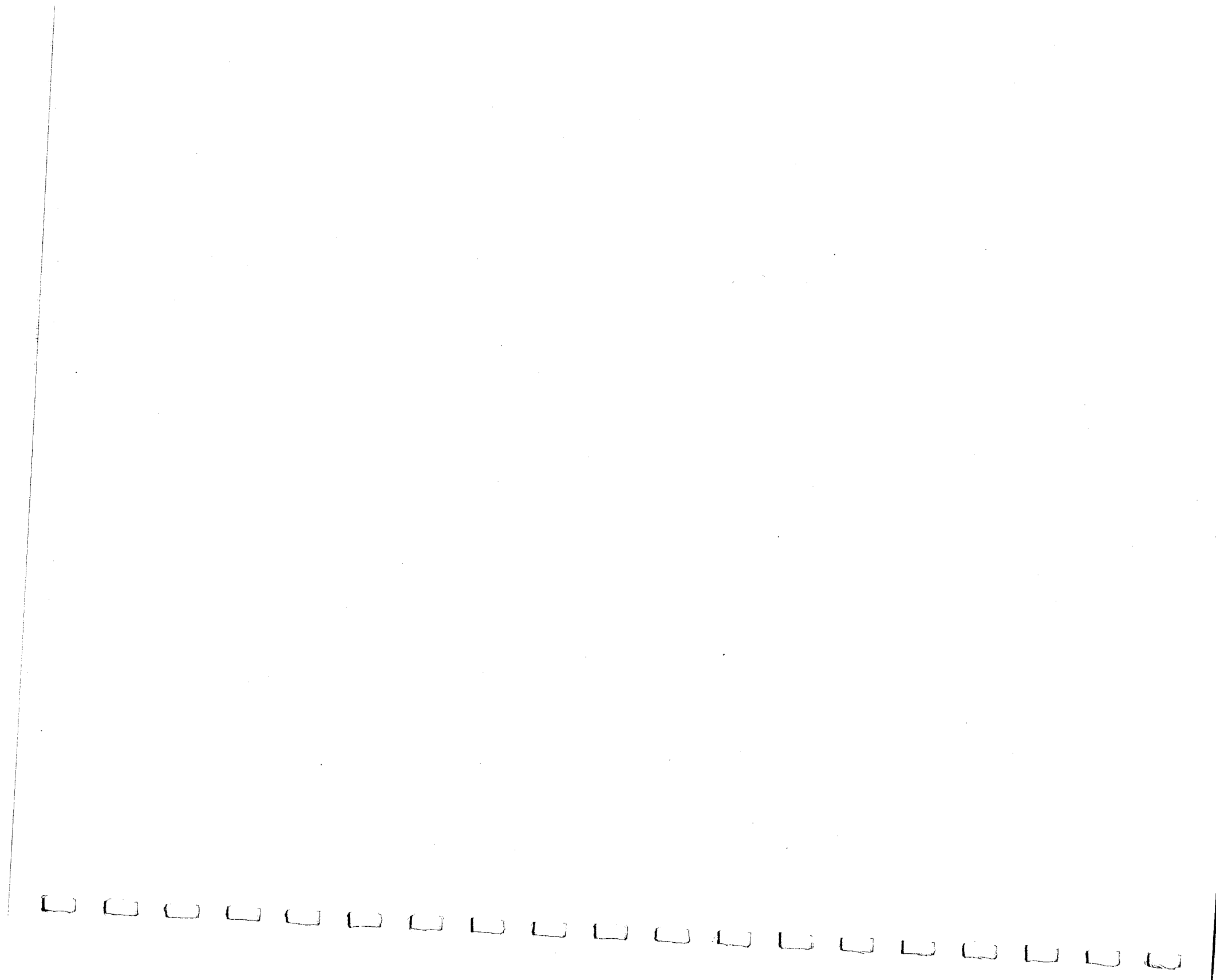
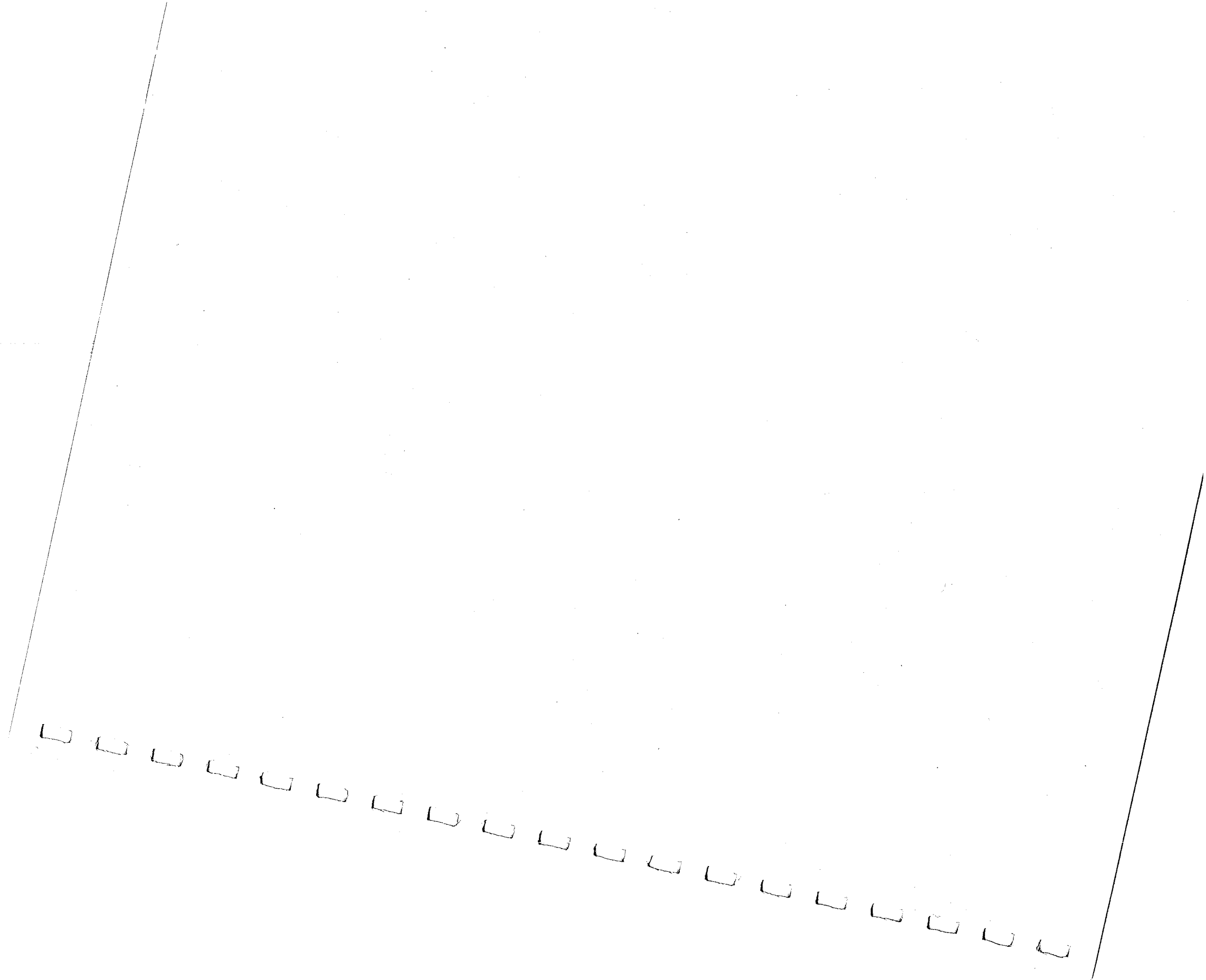


TABLE 3-1
 AREA 1 SOIL GAS SAMPLING DATA SUMMARY
 Hudson River Psychiatric Center NYSDEC I.D. No. 314063

COMPOUND	1-12	1-11	1-10	1-9	1-8	1-7	1-6	1-5	1-4	1-3	1-2	1-1
SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR
Acetone	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Benzene	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Chlorobenzene	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Chloroform	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Toluene	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Xylenes	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
OTHERS	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Methane	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Unknowns	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Depth, ft	0	0	0	0	0	0	0	0	0	0	0	0
HNU	0	0	0	0	0	0	0	0	0	0	0	0
OVA (w/filter)	0	0	0	0	0	0	0	0	0	0	0	0
OVA (w/out filter)	0	0	0	0	0	0	0	0	0	0	0	0
CGI, %LEL	0	0	0	0	0	0	0	0	0	0	0	0
Compound not detected at method detection limit; see Appendix E for detection limit.												
- Not quantifiable in ppm.												
- Detected but not quantified.												
- Not detected at analytical detection limit.												
- Negative meter deflection.												
- Lower explosive limit.												

3-11a



Because no soil gas data were obtained at the upgradient location, the upgradient well remained where it was.

3.4.2 Area 2

Eight soil gas points were installed on the downgradient (northwestern) side of the landfill in two rows of four, with each point spaced approximately the same distance apart. The remaining four were installed on the upgradient (southeastern) side of the landfill near the proposed location of the upgradient well (Figure 3-19). Table 3-2 and Figure 3-19 present the data collected from Area 2 for the soil gas survey. As can be seen, no positive readings were detected on the GC, CGI, or OVA, nor was methane detected on the GC. Several slight deflections were observed on the HNU, with SGHR2-19 and SGHR2-22 registering 1.5 ppm on the meter. Because of the lack of readings for the soil gas survey, the final locations for the downgradient monitoring wells were based on field correlation with the geophysical survey results.

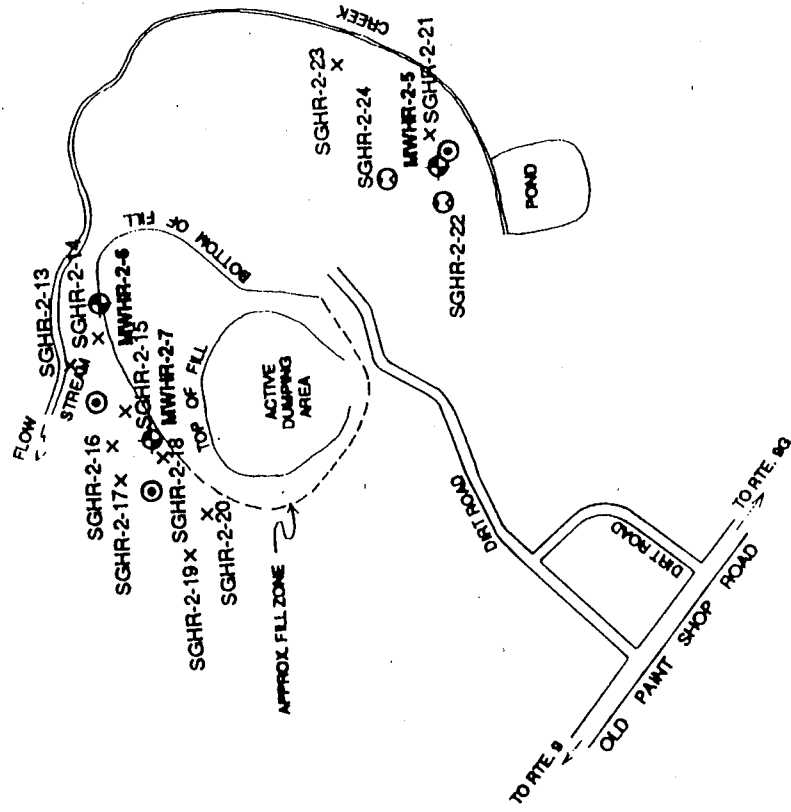
Two areas of high conductivities were identified. The locations of the two downgradient wells (MWHR2-6 and MWHR2-7) were believed to be within these two areas; field correlation was necessary to determine the final location, however.

3.4.3 Area 3

Eight soil gas points were installed on the western side of the fill in two rows of four each spaced approximately the same distance apart. Four other soil gas points were placed along the southern edge of the fill in the area bordering Area 4 (Figure 3-20). SGHR3-27 and -28 could not be sampled because of the tightness of the soil; no positive readings were detected in either of the other two points. Table 3-3 and Figure 3-20 contain the results of the soil gas survey from Area 3. Based on the geophysics data and field observation of leachate emanating from the area, monitoring well MWHR3-11 was installed between SGHR3-25 and -26. Of the eight soil gas points located along the western edge of the site, five had positive readings on the GC. SGHR3-30 contained acetone, benzene, and ethylbenzene (the latter generally found as a component of gasoline); SGHR3-31 had acetone, benzene, chloroform,



AND



No volatiles detected
in any soil gas points

LEGEND

- Actual monitoring well location
- ⊙ Proposed work scope monitoring well location
- ⊙ Soil gas point location surveyed
- x Soil gas point location not surveyed

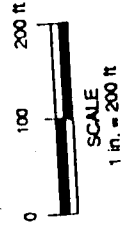
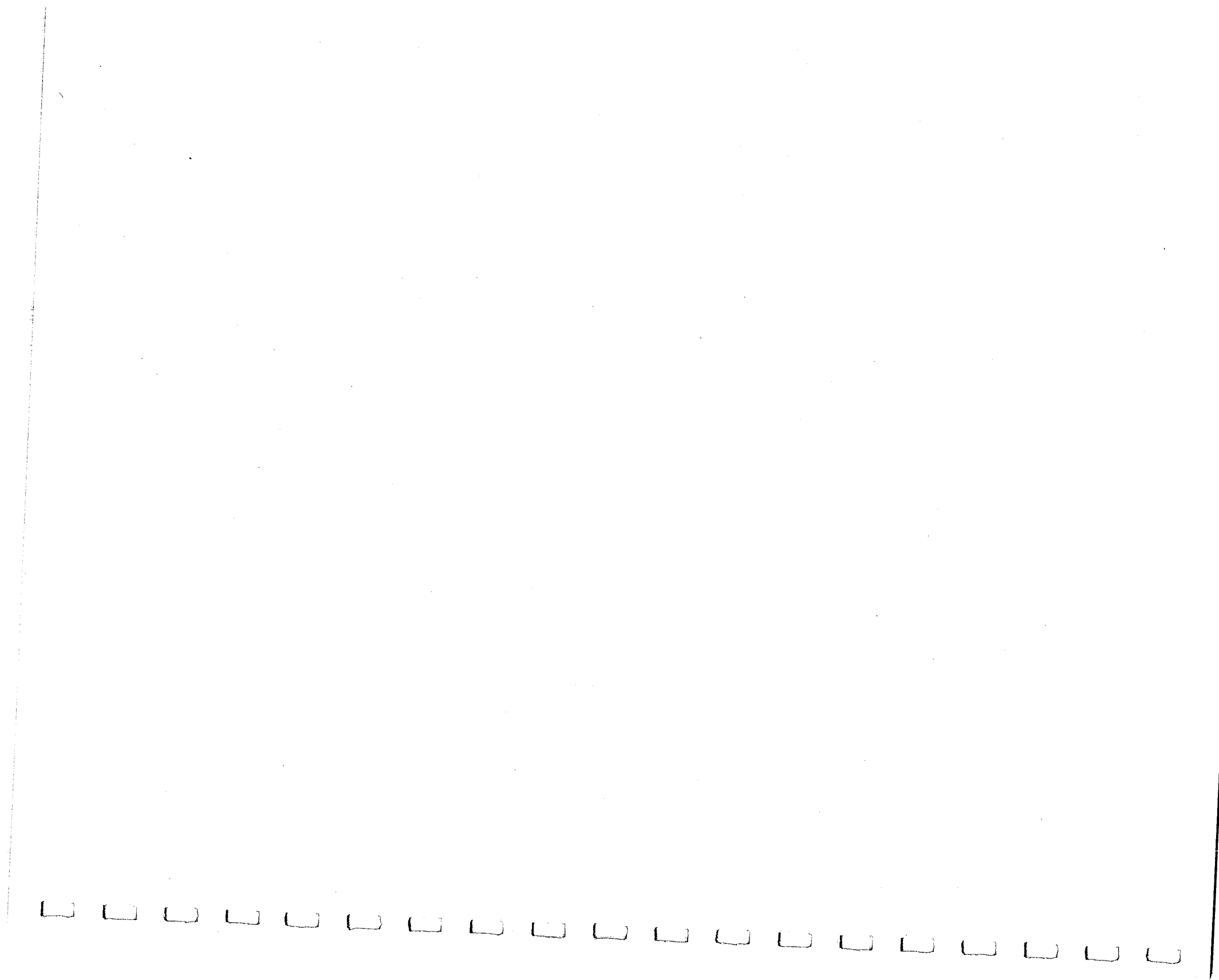


FIGURE 3-19
AREA 2
SELECTED SOIL GAS
CONTAMINANT CONCENTRATIONS
HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC I.D. No. 314083
1990 NYSDEC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York



AREA 2 SOIL GAS SAMPLING DATA SUMMARY

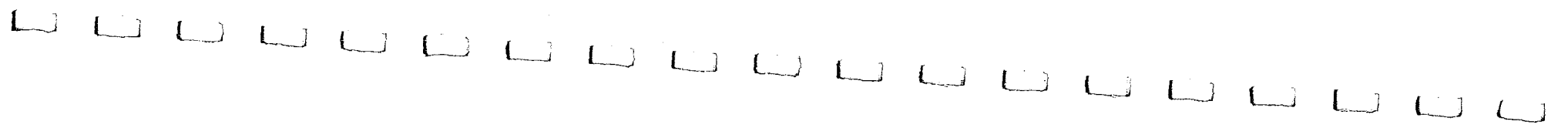
Hudson River Psychiatric Center NYSDEC I.D. No. 314063

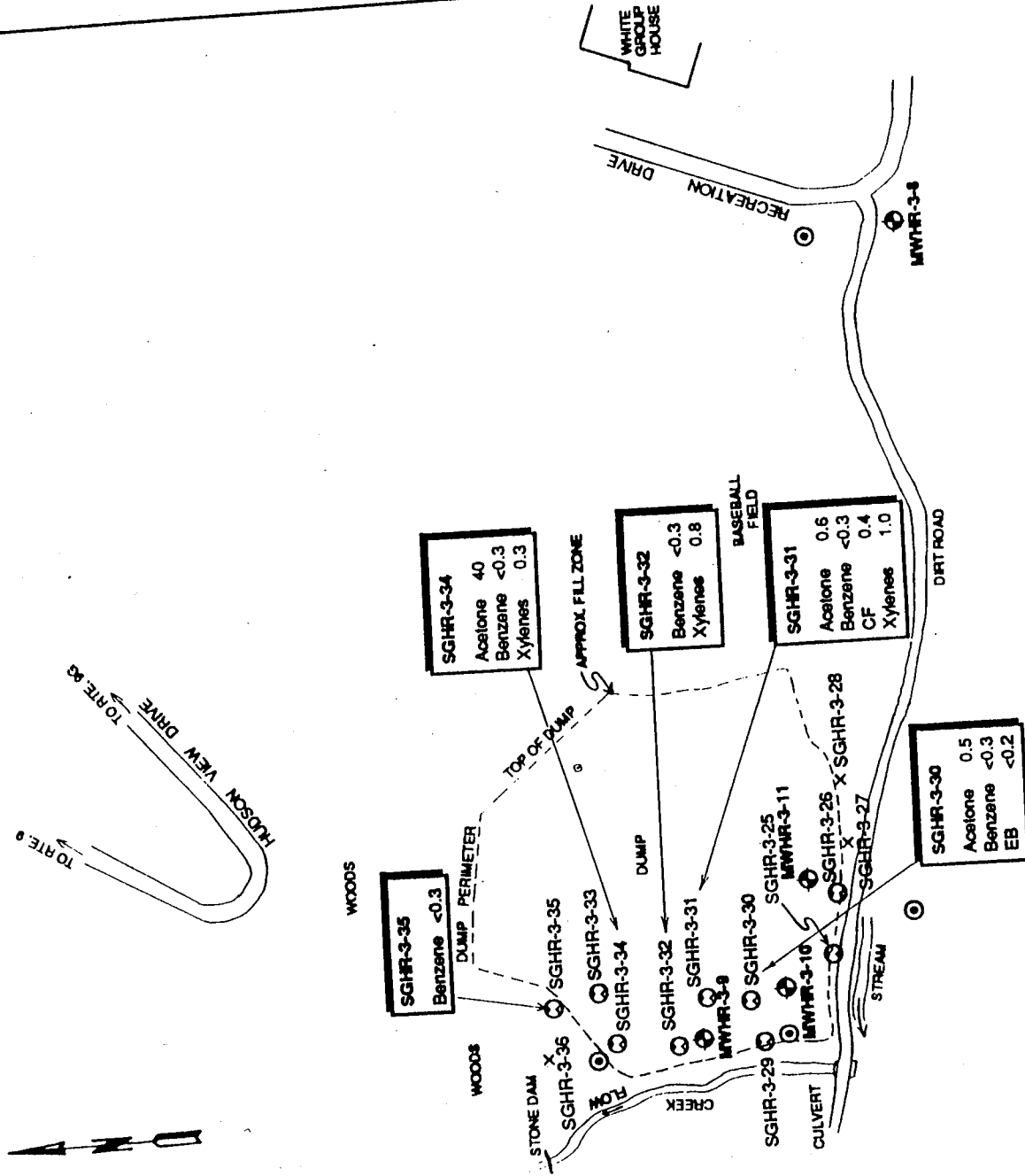
TABLE 3-2

COMPOUND	SGHR 2-13	SGHR 2-14	SGHR 2-15	SGHR 2-16	SGHR 2-17	SGHR 2-18	SGHR 2-19	SGHR 2-20	SGHR 2-21	SGHR 2-22	SGHR 2-23	SGHR 2-24
Volatiles organics	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
OTHERS	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Methane	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Depth, ft	5.8	4.0	5.5	5.5	0	3.0	0.2	4.0	4.0	0.6	1.5	U
HNU	0	0.1	0.1	0	0	0	0.2	0.2	0.2	0.6	1.5	U
OVA (w/out filter)	0	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU	NU
OVA (w/filter)	0	0	0	0	0	0	0	0	0	0	0	0
CGI	0	0	0	0	0	0	0	0	0	0	0	0

U - Unknown.
 ND - Not detected at analytical detection limit; see Appendix E for detection limit.
 NU - Not used.
 NM - Negative meter deflection.

3-12A





LEGEND

- Actual monitoring well location
- Proposed work scope monitoring well location
- ⊙ Soil gas point location surveyed
- x Soil gas point location not surveyed
- All concentrations in ppm
- EB = Ethylbenzene
- CF = Chloroform

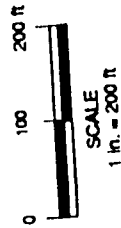


FIGURE 3-20
AREA 3
SELECTED SOIL GAS
CONTAMINANT CONCENTRATIONS
HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC I.D. No. 314063
1990 NYSDEC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York



TABLE 3-3
 AREA 3 SOIL GAS SAMPLING DATA SUMMARY
 Hudson River Psychiatric Center NYSDC I.D. No. 314063

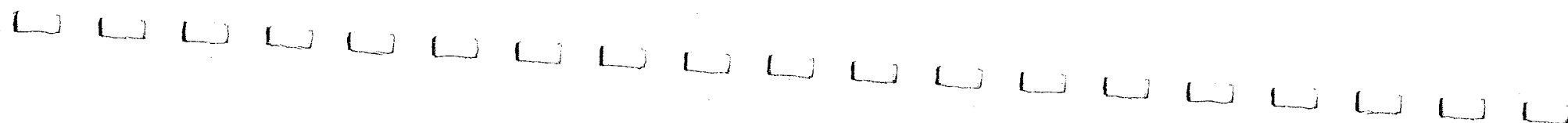
COMPOUND	3-25	3-26	3-27	3-28	3-29	3-30	3-31	3-32	3-33	3-34	3-35	3-36
SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR
Volatiles	ND z	ND/ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Acetone	ND z	ND/ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Benzene	ND z	ND/ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Chloroform	ND z	ND/ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Ethylbenzene	ND z	ND/ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Xylenes	ND z	ND/ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
OTHERS	ND	ND/ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Methane	ND	ND/ND	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Unknowns	3.0	5.0	5.0	5.5	3.7	5.3	6.0	4.0	0	0	0	0
Depth, ft	0.1	0	0.1	0	0	0	1.5	0	0	0	0	0
OVA (w/out filter)	NU	NU	0	0	0	0	0	0	0	0	0	0
OVA (w/filter)	NU	NU	0	0	0	0	0	0	0	0	0	0
CGI	NU	NU	0	0	0	0	0	0	0	0	0	0

Units: mg/m³ & ppm

< - Compound not detected at method detection limit.

• - Not quantifiable in ppm.
 z - Water sample units are in ug/l.
 D - Detected but not quantified.
 ND - Not detected at analytical detection limit; see Appendix E for detection limit.
 NR - Not run; no sample could be collected.
 NU - Not used.

3-12B



xylene, methane, and 110 mg/m³ of unknowns; SGHR3-35 contained benzene, methane, and 80 mg/m³ of unknowns. All three of these points were located along the top row, which was farther into the filled area. SGHR3-32 had benzene, xylene, methane, and 60 mg/m³ of unknowns; SGHR3-34 had acetone, benzene, xylene, methane, and 130 mg/m³ of unknowns. These last two points were located on the bottom row. Because of problems with the meters (the batteries were losing charges quickly), few instrument readings could be obtained. MWHR3-9 was moved approximately 30 ft and MWHR3-10 about 80 to 100 ft south of their original locations to account for the positive soil gas readings and high conductivity readings found in the geophysics survey.

3.4.4 Area 5

Eight soil gas points were installed on the western side of the fill and the drainage channel. Four other soil gas points were placed on the southern edge of the site to the east of the drainage channel (Figure 3-21). In Area 5 the most important factor was the location of the power line and drainage conduits that run underneath the area; therefore, the final location of the monitoring wells was dependent more on the geophysics survey results than on the soil gas survey results.

Table 3-4 and Figure 3-21 present the data collected from the soil gas survey of Area 5. SGHR5-38 detected benzene, carbon tetrachloride, chlorobenzene, xylene, methane, and 12 mg/m³ of unknowns. SGHR5-39 had toluene, xylene, methane, and positive deflections on the HNU. SGHR5-48 found methylene chloride and methane, and a high (60) reading was recorded on the HNU. Field observation indicated that the soil had an oily look to it at this point. Carbon tetrachloride and methylene chloride are usually used as solvents. All of these points were situated to the east of the drainage culvert. Consequently, MWHR5-15 was moved east of its original location to a point just north of SGHR5-38. This was also an area of high conductivity, although the high readings could be due to the drainage channel. The location of the drainage channel was verified with HRPC personnel before drilling was initiated. SGHR5-40 detected tetrachloroethylene, which is normally used as a cleaning solvent. MWHR5-14 was left as originally staked because it was near SGHR5-40.



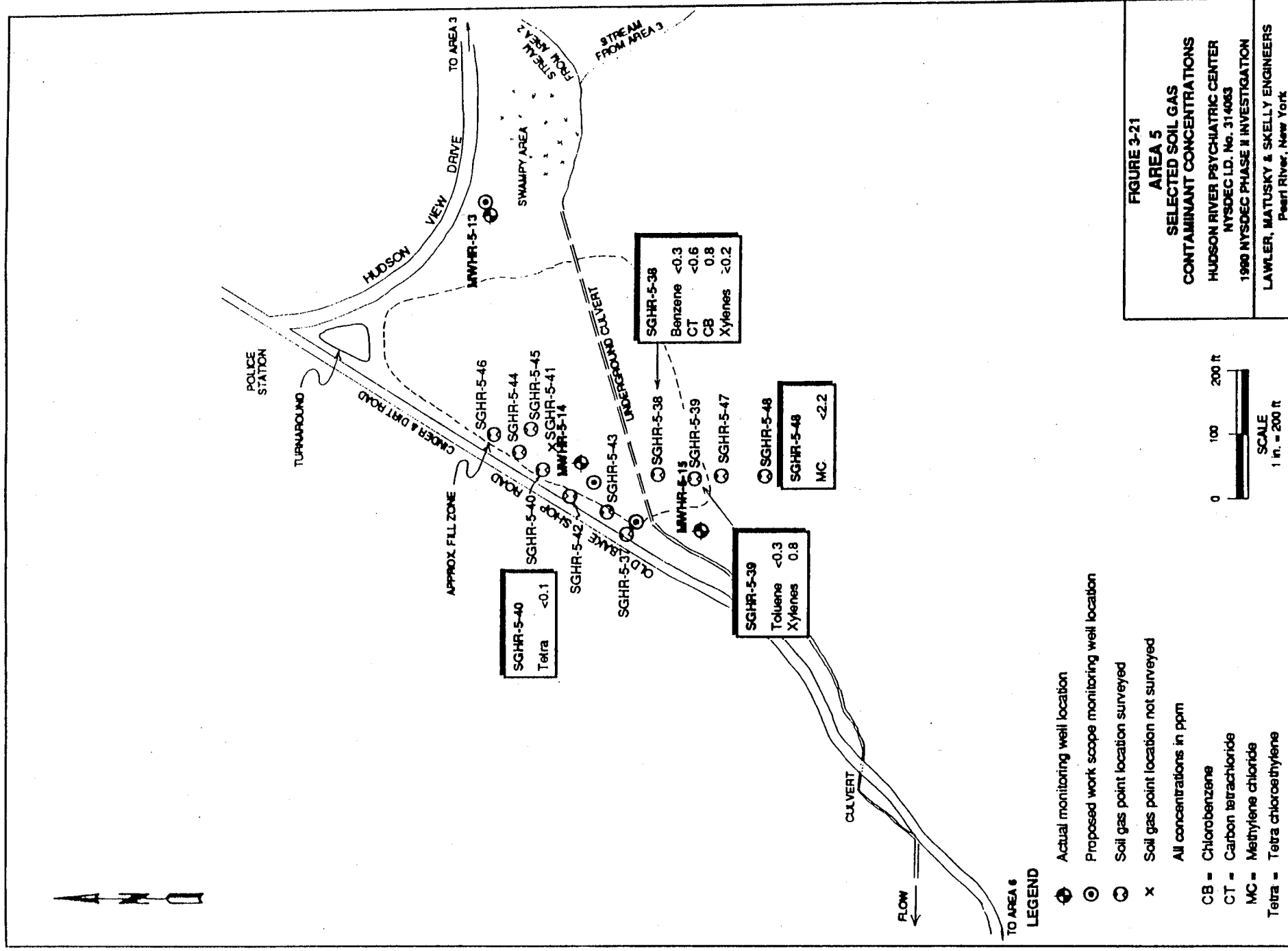




TABLE 3-4
AREA 5 SOIL GAS SAMPLING DATA SUMMARY
Hudson River Psychiatric Center NYSDEC I.D. No. 314063

[illegible]



3.4.5 Area 6

Twelve soil gas points were situated on the southern edge of the fill: six to the east of the pavilion and six to the west. Table 3-5 and Figure 3-22 present the data collected from the Area 6 soil gas survey. No positive readings were found in the GC data; however, several positive readings were obtained on the HNU and OVA. MWHR6-18 was deleted from the drilling program and the remaining two downgradient wells were located based on the geophysics results and the location of gas and water lines.

3.5 GROUNDWATER INVESTIGATION

3.5.1 General Monitoring Well/Boring Details

Seventeen monitoring wells were installed in the five fill areas located throughout the site. Each area was treated as a separate site and thus had its own upgradient well. Drilling, well construction, installation, and logging were supervised by an LMS geologist. The drilling subcontractor, American Auger and Ditching Inc. of West Monroe, New York, used two drilling crews during the course of the project. The equipment included both a truck-mounted Mobile B-57 and a CME-55 soil boring rig mounted on an all-terrain vehicle (ATV). NYSDEC oversight from the central office was provided throughout the project. Borings were advanced through unconsolidated overburden and fill material using 4.25-in. hollow-stem augers. Soil sampling was conducted continuously from the ground surface to the top of the bedrock surface using a 1.375-in. I.D. split-spoon sampler according to standard penetration test method ASTM-D 1586. Soil identification was based on the guidelines of Exhibit 3 in the contract.

After removal, each soil sample was scanned for signs of organic vapors and radioactivity. Augering continued through the overburden to an approximate depth of 8 ft into the saturated zone. If bedrock was encountered before this depth was reached, a core of the underlying bedrock was taken using an HQ (3.79-in. O.D.) and NQ (2.98-in. O.D.) wireline system. When a sufficient supply of water for sampling had been intercepted, either a 2-in. screened PVC monitoring well was installed in the borehole or a 3-in. PVC solid riser was



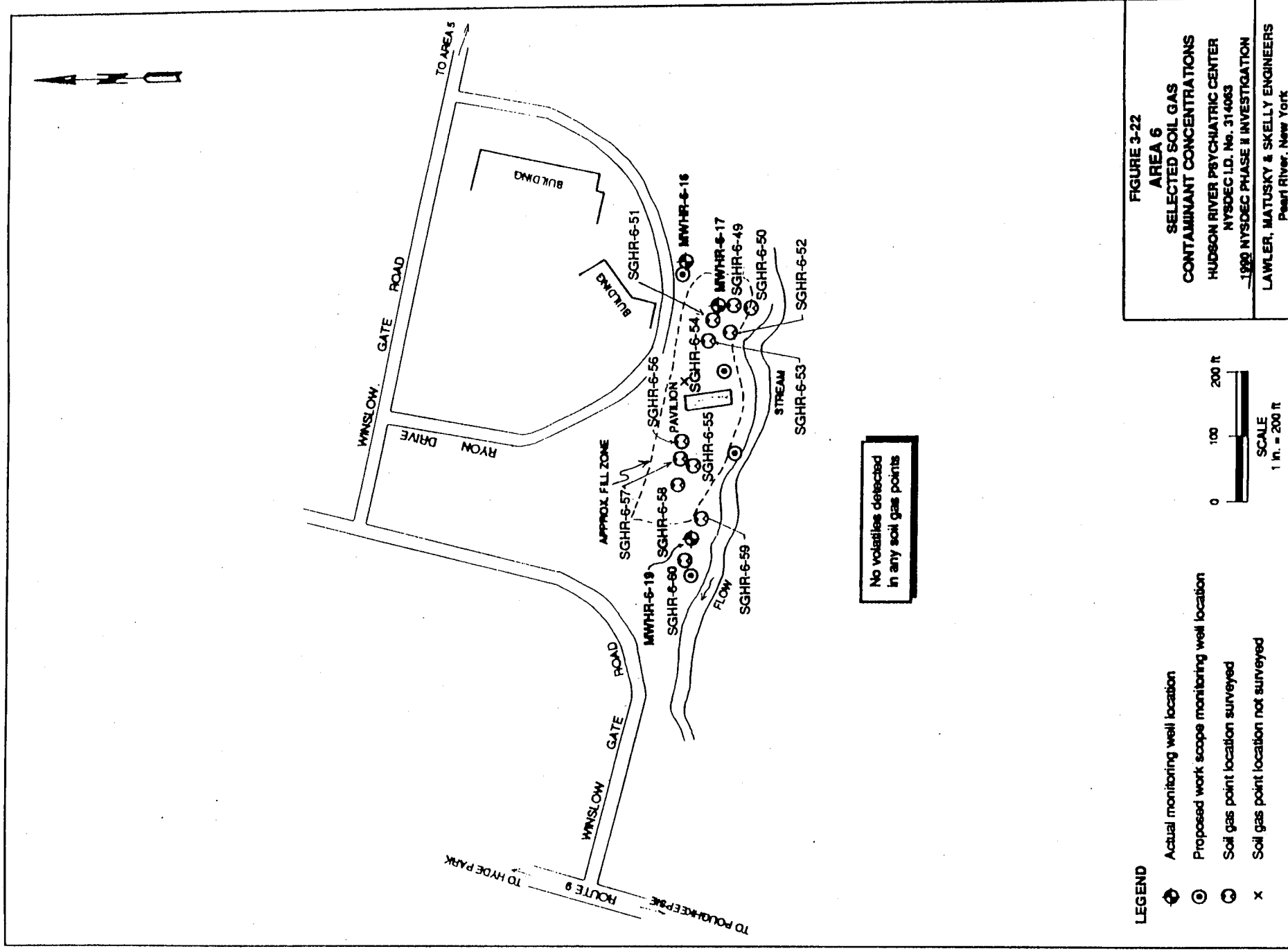
AREA 6 SOIL GAS SAMPLING DATA SUMMARY
Hudson River Psychiatric Center NYSDEC I.D. No. 314063

TABLE 3-5

COMPOUND	6-49	6-50	6-51	6-52	6-53	6-54	6-55	6-56	6-57	6-58	6-59	6-60
SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR	SGHR
Volatiles	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Methane	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND	ND/ND
Depth, ft	3.5	2.0	4.5	4.5	5.0	5.0	4.2	5.0	5.0	3.9	4.0	3.8
HNU	0	0	6	0	NM	2.5	0	9	7	0.2	0.3	0.2
OVA	0	0	2	0	12	0	0.1	0	0	0.6	0.3	0.3
(w/out filter)	0	0	0	0	12	0	0	0	0	0.6	0	0
OVA	0	0	9	0	12	0	0	0	0	0.6	0	0
(w/filter)	0	0	0	0	12	0	0	0	0	0.6	0	0
CGI	0	0	0	0	>0	>0	>0	0	0	0	0	0

> - Reading greater than zero but not quantified.
 ND - Not detected at analytical detection limit; see Appendix E for detection limit.
 NM - Negative meter deflection.







grouted into the top of bedrock and the remaining open bedrock corehole was advanced as the primary water-bearing zone for sampling. Screened overburden, screened interface, and open-hole bedrock wells were installed. General construction details followed Exhibit 3 and were approved by the NYSDEC oversight personnel at the facility. Appendix F contains the boring logs and well construction diagrams.

The following subsections describe field conditions encountered during drilling and monitoring well installation at individual locations. The areas of concern are described in numerical order, i.e., 1 through 6, and the individual wells are also described numerically.

3.5.1.1 *Area 1.* Four monitoring wells were installed at Area 1. Construction details are described below.

Test Boring/Monitoring Well MWHRI-1. Drilling was initiated on 23 January 1990 at the upgradient location of Area 1. The well was located at the northwestern edge of the paved road (West View Drive) that leads to the golf course country club (see Figure 3-18). The ground surface of the well location is approximately 80 ft higher than the downgradient wells.

Drilling continued through a gravelly glacial till to the top of bedrock, which was intercepted at 34 ft. Because no saturated zones were encountered in the unconsolidated zone, coring into bedrock was used to advance the boring. A 3-in. PVC riser was set at 42.5 ft through which NQ cores were taken to a depth of 80.5 ft. Bedrock was identified as an altered and plastically deformed shale, mudstone, and sandstone. Groundwater was found at or near the bedrock surface. Water yield was estimated at less than 5 gpm, sufficient for sampling purposes. No abnormal instrument readings were noted during the drilling or well installation (Appendix F).

MWHRI-1 was developed on 6 February using the Moyno pump that was attached to the drill rig. Water was lifted by pumping high volumes of air followed by a small amount of water. The well has a low yield. Development lasted approximately 1.5 hrs,



with a beginning turbidity of 280 nephelometric turbidity units (NTU) and a final turbidity value of 27 NTU. Well development data are provided in Appendix G.

Test Boring/Monitoring Well MWHRI-2. MWHRI-2 was installed on 6 February 1990 at the foot of a relatively steep incline at the northernmost edge of the psychiatric facility (see Figure 3-18). This boring/well was located near the northern end of what was an old dump area and is currently used as a golf course. The boring was advanced through approximately 4 ft of mixed cover material and then encountered municipal fill consisting of cinders, ash, paper, glass, plastic, and wood. A light petroleum odor and a creosote-type hydrocarbon was noted in small spots through the uppermost saturated zone. No deflection was noted on monitoring instruments used during the drilling. (See Appendix F for air monitoring data.)

The fill extended to 15 ft and then encountered generally fine-grained but permeable sediments. Auger refusal was encountered at 23.3 ft and shale chips were recovered in the split-spoon sample from this interval. A 3.625-in. rollerbit was used to open the hole to 25 ft and a 2-in. PVC monitoring well was installed at 24.5 ft with a 5-ft slotted screen. The sand pack, bentonite, and grout were installed according to NYSDEC guidelines.

MWHRI-2 was developed on 7 February using the airlift method. This was accomplished using the drill rig's Moyno pump. Actual development lasted for 3.5 hrs excluding setup, teardown, and decontamination. Beginning turbidity values were approximately 90 NTU; after several hours of airlift development, the levels were generally between 80 and 130 NTU. NYSDEC approval to stop development was given after it was determined that the cause of the slightly elevated turbidity was dissolved ash in the groundwater, which gave it a gray tint.

Test Boring/Monitoring Well MWHRI-3. Drilling for MWHRI-3 began on 5 February 1990. This boring, located approximately 20 ft east of MWHRI-2, was installed at a depth of 15 ft (see Figure 3-18). A 10-ft slotted screen section was installed to allow groundwater to flow into the well. The screen was set in an interval that consisted

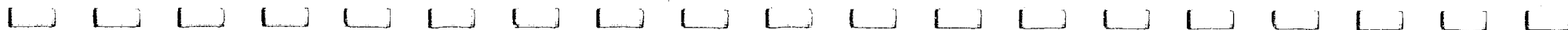


mainly of municipal fill with a small amount of cinders and ash at the top of the screen. Slight petroleum odors as well as visual traces of some type of tar or creosote were noted on the split spoon during drilling. No meter deflections were recorded (Appendix F).

MWHR1-3 was developed on 7 February using the airlift method followed by hand pumping. The drill rig Moyno pump was used to initially pump fines from the sand pack into the water column; the fines were then removed by surging with a hand pump that consisted of polyethylene tubing fitted with a foot valve. This process was repeated until the turbidity values were reduced from more than 1000 NTU to a final turbidity value of 25 NTU. This well yielded greater than 10 gpm during development, with little drawdown.

Test Boring/Monitoring Well MWHR1-4. Drilling began at MWHR1-4 on 6 February 1990. This location was at the foot of the slope of the golf course in the eastern corner of the area containing fill (Figure 3-18). The boring contained approximately 2 ft of mixed cover that was coarser grained than the material in the two previous borings, MWHR1-2 and MWHR1-3. Beneath this cover material was a 2-ft horizon of cinders, ash, and wood, followed by more common-looking municipal waste, including paper, wood, rubber, plastic, and metal. No meter readings above background were recorded (Appendix F). The fill, which was 8.5 ft thick, was underlain by fine-grained but permeable sediments. A monitoring well was installed at 19 ft using 10 ft of 2-in. slotted screen. Remaining well construction details followed the approved work scope specifications.

MWHR1-4 was developed on 7 February using the Moyno pump powered by the drill rig. The well was alternately airlifted and then evacuated for a period of 2 hrs. During the airlifting, turbidity values were recorded in the range of 120-150 NTU. Rapid pumping lowered these levels to between 20 and 30 NTU. The well recovered in approximately 1 min after being pumped nearly dry.



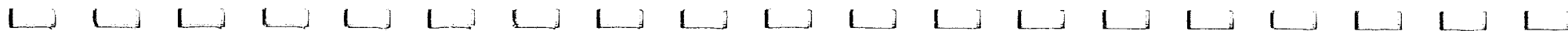
3.5.1.2 *Area 2.* Three monitoring wells were drilled at Area 2. Construction details are described below.

Monitoring Well/Boring MWHR2-5. Drilling for MWHR2-5 began on 31 January 1990. This was the upgradient well located approximately 200 ft southeast of the landfill in a wooded area (see Figure 3-19). Unconsolidated overburden was fairly thin, and weathered shale was encountered at 3.6 ft. Augers were advanced through the weathered rock to a depth of 10 ft, where HQ coring was used to advance the boring to a depth of 18 ft. A 3-in. PVC casing was grouted in place at that depth and NQ coring was used to drill the boring to a depth of 31 ft. The underlying bedrock was composed of gray mudstone and sandstone. Fractures were not high-yielding conduits but were sufficient for the purposes of the investigation. Air data are provided in Appendix F.

MWHR2-5 was developed on 7 February using the drill rig Moyno pump and air-lift method. Approximately 1 hr of development was needed to lower turbidity from greater than 200 NTU to 45 NTU.

Monitoring Well/Test Boring MWHR2-6. A downgradient monitoring well located at the base of the northern fill slope was initiated on 31 January 1990 (see Figure 3-19). No overburden was located in this area; a large outcrop of horizontally bedded siltstone and sandstone was found at the ground surface. Augers were used to cut 2 ft into the competent rock so that the protective steel casing could be installed with only a modest stickup. HQ coring was performed through bedrock to a depth of 7 ft where a 3-in. PVC riser was installed and grouted in place. NQ coring continued to a depth of 40 ft into the bedrock, which became increasingly competent with depth. A low to moderate groundwater yield was estimated in this well.

MWHR2-6 was developed manually on 7 February with a PVC bailer. The well was silty, with an initial turbidity higher than 200 NTU. After approximately 4 hrs, groundwater turbidity was lowered to 150 NTU. With approval by the on-site NYSDEC representative, development ceased at this point because the groundwater flowed into



the well directly from the fractured bedrock. Groundwater from this area may contain a relatively large percentage of suspended solids.

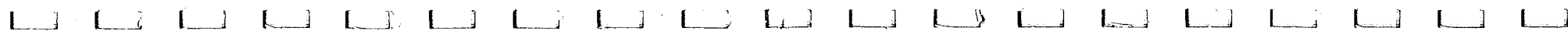
Monitoring Well/Test Boring MWHR2-7. The second downgradient well was located approximately 200 ft west of MWHR2-6 along the northern fill slope (see Figure 3-19). Drilling commenced on 31 January 1990 through a very shallow layer of unconsolidated material consisting of silt, clay, and broken shale.

HQ coring was initiated at 7.2 ft through well-fractured shale and mudstone. The bedding angle was low, and competency increased with depth. A 3-in. PVC riser was installed at a depth of 15.25 ft after which NQ coring was used to further advance the hole to 30 ft. The hole was pumped out and no significant recovery was measured. Coring continued to 35 ft and water recovered to approximately 21 ft.

MWHR2-7 was initially developed on 1 February and the well was found to have a low-yield water source. Turbidity during pumping remained greater than 200 NTU. The well was then hand bailed on 7 February with a PVC bailer. Turbidity was initially near 200 NTU, but after approximately 4 hrs of bailing the turbidity was lowered to 37 NTU.

3.5.1.3 *Area 3.* Three monitoring wells were constructed in Area 3 with the specifications described below.

Monitoring Well/Test Boring MWHR3-8. The upgradient well for Area 3 was located approximately 500 ft east of the fill above the baseball field and drilled on 24 January 1990 (Figure 3-20). The well was located at the edge of a wooded zone that has mature trees. Approximately 0.5 ft of ash and cinders were identified at the surface; beneath the ash were clay, silt, and pebbles to a depth of 4 ft, where bedrock was encountered. HQ coring continued through weathered and highly fractured fine- to medium-grained sandstone and mudstone to a depth of 10 ft from the ground surface. The well was constructed with 10 ft of slotted 2-in. PVC and solid riser set at 9 ft. The remaining specifications followed the Exhibit 3 guidelines.

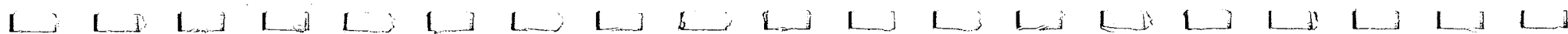


MWHR3-8 was developed on 7 February using a gasoline-powered centrifugal pump. The initial water level was approximately 8.5 ft below ground level, and beginning turbidity values were 104 NTU. A pumping rate of less than 0.5 liters per minute (lpm) was used for 1.5 hrs to bring turbidity down to a final level of 22 NTU. Although the bedrock was highly fractured, the relative yield of the well was low.

Monitoring Well/Test Boring MWHR3-9. Work began at this location on 24 January 1990. MWHR3-9 was located along the western face of the fill area (Figure 3-20). The drill site was moved downslope to avoid drilling through substantial fill material. Overburden consisted of clay and silt. Auger refusal was encountered at 12.5 ft and HQ coring was used to advance to a depth of 32.4 ft. The bedrock, which consisted of gray mudstone and sandstone, was highly fractured. The corehole was pumped out at a rate of 0.5 gpm and a 2-in. PVC monitoring well was set with 15 ft of slotted screen at a depth of 32 ft to cover the overall fractured zone of bedrock. Remaining construction details followed those found in the work scope.

MWHR3-9, which was developed on 7 February, initially used a gasoline-powered centrifugal pump for approximately 2 hrs. Depth to groundwater was approximately 8 ft. Because the initial pumping rate was less than 1 gpm, pumping had to stop for a short period to allow the well to recover adequately. Initial turbidity measurements of more than 200 NTU were brought down by pumping to 76 NTU and later to 40 NTU following hand bailing.

Monitoring Well/Test Boring MWHR3-10. MWHR3-10 was located in the southwestern corner of the filled area (see Figure 3-20). Like the previously drilled well (MWHR3-9), a location down the slope of the bank was chosen to avoid drilling through substantial thicknesses of fill material. Drilling began on 24 January 1990. The overburden consisted of mixed sands, silt, and gravel with small amounts of plastic, paper, and wood fill to a depth of 19 ft, where well-fractured silt and sandstone was encountered.

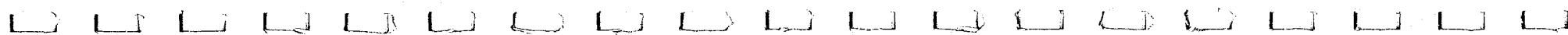


Bedrock was cored to 29 ft and a 2-in. monitoring well was installed with 10 ft of slotted screen. Standard NYSDDEC construction methods were used to complete the monitoring well.

MWHR3-10 was developed on 7 February using a gasoline-powered centrifugal pump. Depth to groundwater was approximately 8 ft prior to development. Pumping was conducted for 1 hr at 3 gpm, with a starting turbidity of greater than 200 NTU. Turbidity was quickly lowered to below 50 NTU, with a final level of 4 NTU.

Monitoring Well/Test Boring MWHR3-11. MWHR3-11 was located along the south face of Area 3 fill (see Figure 3-20). Drilling began on 23 January 1990 through mixed fill. Deflections of the monitoring equipment used at the auger head and on split spoons taken within the first 10 ft were as high as 100% of the lower explosive limit (LEL), 110 HNU units, and 4.0 OVA units (see Appendix F). No abnormal readings were noted in the breathing space. An indistinguishable odor was observed from split-spoon samples and a composite was made for laboratory analysis from the 6-10 ft horizon. Analyses to be performed on the sample included TCL organics, TCL semivolatiles, pesticides, PCBs, and EP toxicity metals. Mixed fill material was identified directly above the bedrock surface, which was encountered at 13.1 ft. HQ rock cores were taken from 13.1 ft to a depth of 28 ft. Bedrock was identified as highly fractured siltstone, shale, and sandstone. Orange leachate was noted in fractures several feet below the bedrock surface. A 2-in. monitoring well was installed at a depth of 27 ft with 10 ft of slotted screen, using typical well construction specifications. Open-hole bedrock wells were generally not suited to this area because of the highly fractured nature of the bedrock.

MWHR3-11 was developed on 7 February using a gasoline-powered centrifugal pump. Initial depth to groundwater was approximately 6.5 ft below grade. The well was pumped for just over 1.5 hrs. An initial turbidity measurement of 155 NTU was recorded, with a final measurement of 16 NTU.



3.5.1.4 **Area 4.** This area was not investigated as part of the groundwater investigation with the exception of MWHR3-11, which was a well originally scheduled to be drilled as part of the Area 4 investigation but was subsequently added to the Area 3 investigation. Well MWHR4-12 was never drilled as it was part of the original Area 4 groundwater investigation that was never conducted.

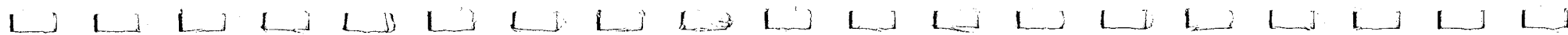
3.5.1.5 **Area 5.** Three monitoring wells were installed in Area 5.

Monitoring Well/Test Boring MWHR5-13. MWHR5-13 was installed as the upgradient sampling point for Area 5. The location was along the roadway north of the culvert that directs surface water through the fill (see Figure 3-21). Drilling began on 29 January 1990 through fine-grained sediments consisting of silt, clay, and sand in the upper 15 ft. Grain size increased with depth. A 2-in. PVC monitoring well was installed at 23.5 ft using 15 ft of slotted screen and standard well construction specifications.

MWHR5-13 was developed on 7 February using the drill rig-mounted Moyno pump to first airlift the well water and then purge the mobilized sediments. Groundwater was measured at 15.5 ft below grade prior to any activities. Initial turbidity values were over 200 NTU and dropped to a low of 14 NTU after approximately 2.5 hrs of development.

Before MWHR5-13 was drilled, a boring was taken to refusal adjacent to this site. The pilot boring met with refusal at 68.5 ft; no confining layers were identified, although fine-grained material was found in abundance in horizons below 25 ft. The pilot boring was grouted and MWHR5-13 was drilled 10 ft to the north.

Monitoring Well/Test Boring MWHR5-14. MWHR5-14 was set east of the dirt road within the fill to avoid buried electrical utilities located along the roadway (Figure 3-21). Drilling began on 30 January 1990 and material encountered consisted of mixed bulky-type fill (ash, cinders, glass, wood, styrofoam, and cement). Fill material was found in samples up to the 15-ft horizon, followed by mixed sand and silt to a depth of 27 ft.



A 2-in. PVC monitoring well with 10 ft of slotted screen was installed at a depth of 24.5 ft; standard NYSDEC guidelines were followed to complete the well construction.

MWHR5-14 was developed on 7 and 8 February using the drill rig-mounted Moyno pump for both airlifting and removal of well water. Groundwater level was measured at approximately 13 ft below grade prior to any development activities. On 7 February initial turbidity was over 200 NTU; after 1.5 hrs of pumping it was lowered to 156 NTU. Development continued for approximately 1.5 hrs on 8 February and the final turbidity level was 42 NTU.

Monitoring Well/Test Boring MWHR5-15. The second downgradient well for Area 5 was located east of the culverted stream that flows through the fill area (see Figure 3-21). The well site is adjacent to a fairly steep slope that rises approximately 20 ft to a bedrock outcrop. No fill material was noted in the overburden, which consisted of mixed sand and gravel to a depth of 14.5 ft. HQ coring was performed through competent shale and mudstone from 14.5 to 20.5 ft where a 3-in. PVC riser was installed. NQ coring continued to a depth of 35 ft. Several rather large fractures were identified in the lower portions of the corehole during coring. The well was finished as an open-hole bedrock well. No meter deflections were noted during drilling, which began on 25 January 1990 (Appendix F).

MWHR5-15 was developed on 7 February using a gasoline-powered centrifugal pump. The initial water level before pumping was approximately 1.1 ft below grade and initial turbidity was 135 NTU. The well was developed for more than 4 hrs at which point the turbidity was brought down to a final measurement of 12 NTU.

3.5.1.6 *Area 6.* Three wells were drilled in Area 6; construction details are provided below.

Monitoring Well/Test Boring MWHR6-16. The upgradient monitoring location was set in the parking lot northeast of the fill zone (see Figure 3-22). Drilling began on 31 January 1990 and was advanced through primarily fine-grained silt, sands, and clays to a depth of approximately 25 ft, where weathered and broken siltstone and mudstone was



encountered. HQ coring continued into bedrock to a depth of 37.8 ft. A 2-in. PVC monitoring well was installed at a depth of 37.5 ft using 10 ft of slotted screen and NYSDEC-approved construction specifications.

MWHR6-16 was developed on 7 February using a gasoline-powered centrifugal pump. The static water level was initially just under 8 ft below grade, with turbidity between 57 and 125 NTU. After a little over an hour of pumping at approximately 3.5 gpm, the turbidity was reduced to 5 NTU.

Monitoring Well/Test Boring MWHR6-17. Drilling for MWHR6-17 began on 2 February 1990 near the southern end of the fill zone, east of the picnic area (Figure 3-22). Mixed coarse-grained material covered a layer of cinder and ash fill found between 0.5 and 10 ft. Below the fill was a fine-grained silt, clay, and sand horizon above consolidated bedrock. Coring began at 28.5 ft at the bedrock surface in gray, thinly bedded shale and siltstone. A 3-in. PVC riser was installed in the bedrock at 33 ft and coring then continued to a depth of 50 ft. The well was finished as an open-hole bedrock well.

MWHR6-17 was developed on 2 February using a gasoline-powered centrifugal pump. Turbidity was relatively constant during development, from 47 to 73 NTU, and 54 NTU after 1 hr of pumping. With NYSDEC approval development ceased after a total of 240 gal of water had been removed with only a slight reduction in turbidity.

Monitoring Well/Test Boring MWHR6-18. This well was eliminated because the geophysics and soil gas results did not indicate a need for it.

Monitoring Well/Test Boring MWHR6-19. The second downgradient well for Area 6 was located at the southern end of the paved parking lot west of the fill zone (Figure 3-22). Drilling began on 22 January 1990 through a relatively thin, 5-ft layer of unconsolidated material. Small amounts of cinder and ash fill were identified near the middle of this layer. Bedrock coring began at 5 ft and a 3-in. PVC riser was installed in competent rock at a depth of 10 ft. Coring then continued using the NQ-sized barrel to a depth

U U

of 36 ft through competent gray, fine- to medium-grained sandstone. The well was then finished as an open-hole bedrock well.

MWHR6-19 was developed on 6 February using the Moyno pump connected to the drill rig for both airlifting and water removal. Groundwater was approximately 8.5 ft below grade. Turbidity was initially 200 NTU, and declined to a final level of 26 NTU during the 2-hr development period.

3.5.2 Hydraulic Conductivity Testing

Following groundwater sampling, the in situ aquifer media in either the screened interval or the open-hole section of the monitoring wells was tested for aquifer parameters. Slug testing was performed on the entire system of monitoring wells; no blockage or obstructions were noted. Well construction at the various areas around the site dictated that the Hvorslev method be used in calculating final hydraulic conductivities for the individual wells.

Slug tests were performed by instantaneously raising or lowering the static water level in the well and monitoring the time required for the water level to return to a static state. Water levels were monitored using a pressure-sensitive transducer electronically linked to a strip-chart recorder. A solid stainless steel slug of known volume was either inserted or removed to change the water levels. Following one of these procedures water flowed into or out of the casing until the head differential was equalized. The time required for practical equalization of the hydrostatic pressure differences is plotted against the ratio of the head changes.

Data were also input into a computer program that used the least-squares method of calculating a Hvorslev model for hydraulic conductivity (K) (Refs. 1 and 2, Appendix A). The answer derived manually and the answer derived by computer were compared; the answers were within a reasonable range of each other. Using the computer-derived conductivity values requires caution as they are more rigidly bound by the variables input into the program and their use in interpretation may vary at times from manual calculations (Ref. 3, Appendix A). Table 3-6 presents the hydraulic conductivity data calculated by these two methods.



3-25A

HYDRAULIC CONDUCTIVITIES

Hudson River Psychiatric Center NYSDC I.D. No. 314063

TABLE 3-6

HYDRAULIC CONDUCTIVITIES				
AREA	MONITORING WELL I.D.	TYPE OF FORMATION	MANUAL CALCULATIONS (METERS/DAY)	COMPUTER MODEL (METERS/DAY)
1	MWHR1-1	Open-hole bedrock	3.3×10^{-1}	4.2×10^{-2}
	MWHR1-2	Screened overburden	2.1×10^{-1}	1.8×10^{-1}
	MWHR1-3	Screened fill material	4.9×10^{-1}	2.8×10^{-1}
2	MWHR1-4	Screened overburden	1.8	1.3
	MWHR2-5	Open-hole bedrock	1.1×10^{-1}	4.5×10^{-2}
	MWHR2-6	Open-hole bedrock	2.0×10^{-2}	7.1×10^{-2}
3	MWHR2-7	Open-hole bedrock	7.9×10^{-2}	6.8×10^{-2}
	MWHR3-8	Screened bedrock	9.5×10^{-2}	6.5×10^{-2}
	MWHR3-9	Screened bedrock	4.9	4.5
5	MWHR3-10	Screened interface	3.1	1.7
	MWHR3-11	Screened bedrock	2.2	1.8
6	MWHR5-13	Screened overburden	3.3	3.7
	MWHR5-14	Screened overburden	2.1	1.9
	MWHR5-15	Open-hole bedrock	3.0×10^{-1}	3.3×10^{-1}
6	MWHR6-16	Screened bedrock	8.1	8.5
	MWHR6-17	Open-hole bedrock	2.3	2.6
	MWHR6-19	Open-hole bedrock	1.1×10^{-1}	1.0×10^{-1}

NOTE: Final calculated hydraulic conductivities are rounded to first decimal place.



Only one well was screened in a fill zone (MWHR1-3 at Area 1). The calculated hydraulic conductivity was at a minimum five times greater than at any other well tested at the site. Strictly open-hole bedrock wells were consistent and ranged within only two orders of magnitude. Several monitoring wells, both interface (open between bedrock and overburden) and bedrock, were installed in bedrock using slotted screen. These wells were installed with slotted PVC screen, as opposed to being finished as open-hole wells, because the bedrock was extremely fractured and collapse was a major threat. Owing to the extremely fractured nature of some areas of the bedrock, its calculated hydraulic conductivity would be expected to be higher than that of the open-hole wells in much more competent bedrock. As can be seen from Table 3-6, this was indeed the case. In general, overburden was found more conductive than the competent bedrock, but only by a maximum of two orders of magnitude.

The slug tests and subsequent hydraulic conductivity calculations showed great consistency among the sampled media, including competent fractured bedrock, highly fractured bedrock surfaces, and unconsolidated glacial debris.

3.6 OTHER PHASE II WORK TASKS

No additional work was performed at the HRPC site during the Phase II investigation.

3.7 SAMPLING

The following sections describe the detailed sampling program for the site. Appendix H contains the sampling logs.

3.7.1 Soil Sampling

No isolated soil sampling was proposed for the Phase II investigation; however, contingency plans were made to allow for the analysis of individual samples if there were apparent indications of contamination. One such soil sample, from boring MWHR3-11, was collected during the drilling portion of the investigation. During drilling in the upper 10 ft, an indistinguishable petroleum odor was noted along with positive readings on the organic vapor



meters. A composite was made over the 6-10 ft horizon, which was then submitted for volatile, semivolatile, pesticides, PCBs, metals, EP toxicity metals, and cyanide analyses.

NYSDEC requested additional sampling at Areas 6 and 4. The second sampling event took place in May 1990. One soil sample was collected near the location of the surface water/sediment sample taken in Area 4 (Section 3.7.3; Figure 3-23). This sample, SSHR4-18E, taken in what appeared to be a leachate flow pathway into the water body, was analyzed for TCL organics, inorganics, and EP toxicity metals.

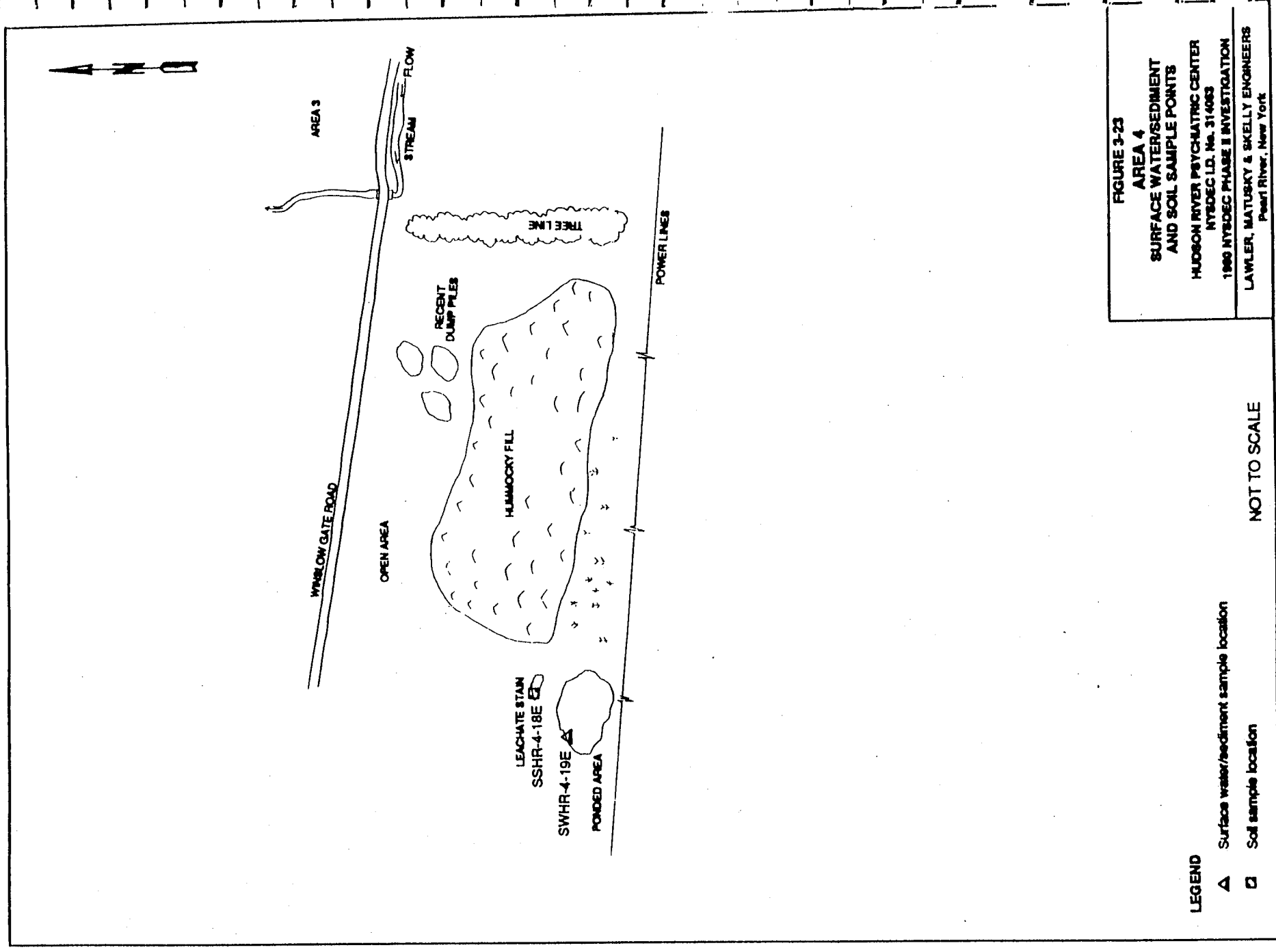
3.7.2 Groundwater Sampling

Seventeen monitoring wells were sampled between 27 February and 6 March 1990. The wells, which were installed and sampled according to NYSDEC Phase II protocols, are grouped around five small landfills on the site. Well sampling logs are included in Appendix H. *Note:* The two numbers used to identify the sample were transposed by mistake in the sampling logs and chain-of-custody forms. The first number should refer to the area number, i.e., 1 through 6; the second number should refer to the well number. In this and all subsequent sections the correct numbering is used.

The static water level and bottom depth of each well were measured prior to sampling. The borehole volume was calculated and at least four borehole volumes were purged from each well unless the well was purged dry before the calculated volume was purged. For purging purposes, because of the sand pack, a borehole diameter of 5 in. was assumed for overburden and interface wells. A borehole diameter of 3 in. was used for bedrock wells cored with a 3-in. core barrel. Purging was accomplished with a centrifugal pump and dedicated polyethylene tubing fitted with a foot valve. During purging, pH, turbidity, specific conductance, and temperature were measured at various intervals. The objective during purging was to achieve representative groundwater samples of less than 50 NTU, which would meet NYSDEC water clarity requirements.

After purging, the wells were allowed to recover to at least 85% of their initial water column volumes before sampling. Samples were collected using a dedicated Teflon bailer.







Temperature, pH, specific conductance, and turbidity were measured at the start and end of sampling. Table 3-7 summarizes these data. Samples were placed in precleaned bottles/vials provided by Aquatec, Inc., of South Burlington, Vermont, and LMS. Sample bottles were labeled with the well number, site name, job number, date/time, and parameters for chemical analysis. Preservatives were added in the field where applicable. Samples were packed in iced coolers and shipped under chain-of-custody protocol to Aquatec by overnight courier on the same day as sample collection. The following sections describe the sampling of each area in detail (see Appendix H for detailed logs).

3.7.2.1 *Area 1.* Area 1 was sampled first. Upgradient well MWHR1-1 was purged dry twice with the QED purge pump system and allowed the maximum 2-hr recovery permitted by NYSDEC before it was sampled. It recovered to only 59% of the original water column depth. The three downgradient wells, MWHR1-2, 1-3, and 1-4, were purged with a centrifugal pump and dedicated tubing. MWHR1-2 became turbid very quickly during sampling. An additional sample was collected at MRHR1-2 and filtered for dissolved metals analysis.

A blind duplicate labeled MWHR4-12 was collected from well MWHR1-3. Bottles for the two sets were filled together to ensure as much homogeneity as possible. The sample water from MWHR1-3 had a slightly sulfuric and/or fuel-type odor. Before MWHR1-4 was sampled, a field blank was taken on the bailer. Field blank water supplied by Aquatec was poured through the bailer into a clean set of sample bottles. The sample water from the well, collected immediately afterward, had a sulfuric and/or fuel-type odor.

3.7.2.2 *Area 2.* Area 2, also known as the Edgewood Dump, has one upgradient well, MWHR2-5, and two downgradient wells, MWHR2-6 and 2-7. The wells were quickly purged dry three times using a centrifugal pump and dedicated tubing and allowed to recover sufficiently before sampling.

3.7.2.3 *Area 3.* The sampling crew noted many active leachate seeps during the sampling of Area 3. MWHR3-8, the upgradient well, was quickly purged to dryness. The downgradient wells, MWHR3-9, 3-10, and 3-11, all recovered as they were being purged. Sample turbidities



TABLE 3-7

GROUNDWATER SAMPLING CHEMISTRIES

Hudson River Psychiatric Center NYSDEC I.D. No. 314063

MONITORING WELL I.D.	VOLUME PURGED (Gal)	TEMP. (°C)		pH (Units)		SPEC. COND. (µmhos/cm)		TURB. (NTU)	
		Start/End	Start/End	Start/End	Start/End	Start/End	Start/End	Start ^a /End	Start ^a /End
MWHR1-1	35	9.8/8.6	8.0/8.2	638/634	15/15/15				
MWHR1-2	8.5	8.5/8.3	6.9/6.8	521/534	110/1000/1000				
MWHR1-3	70	9.4/11.1	6.9/6.9	584/578	<1/<1/<1				
MWHR1-4	15	11.0/11.4	6.5/6.5	884/851	3/11/12				
MWHR2-5	16.5	6.4/6.3	7.5/7.3	366/386	8/7/10				
MWHR2-6	44	6.9/7.5	7.2/7.1	1095/1086	24/20/17				
MWHR2-7	20	8.7/8.9	7.2/7.2	806/841	20/5/5				
MWHR3-8	7.5	8.1/8.5	7.1/7.5	527/544	9/7/7				
MWHR3-9	180	9.2/9.7	6.7/6.6	1460/1420	10/7/5				
MWHR3-10	355	12.7/12.6	6.9/6.9	750/776	11/25/40				
MWHR3-11	140	12.6/13.7	7.1/6.9	722/714	10/9/9				
MWHR5-13	14	10.8/9.9	7.3/7.1	1080/1229	25/82/79				
MWHR5-14	125	11.5/11.5	6.8/7.0	1106/1056	45/110/117				
MWHR5-15	75	9.7/8.7	7.5/7.5	662/658	1/3/3				
MWHR6-16	155	12.0/12.4	7.3/7.3	658/649	35/20/15				
MWHR6-17	130	11.4/13.1	7.2/7.3	575/601	26/10/8				
MWHR6-19	42	7.8/8.4	7.4/7.4	664/662	21/22/16				

^aMetals sample turbidity measured to verify sample <100 NTU.



were low at all four wells. A strong sulfuric odor emanated from the sample water from MWHR3-9.

3.7.2.4 *Area 5*. Area 5 has one upgradient and two downgradient wells. All of the wells were purged with a centrifugal pump and dedicated tubing. MWHR5-13, the upgradient well, was purged and sampled first. Ten borehole volumes were removed from MWHR5-14 before the turbidity dropped below 50 NTU. Because the sample water became increasingly turbid, an additional sample was collected and filtered from MWHR5-14 for dissolved metals analysis. The MWHR5-15 turbidity remained low during the purge and sample process.

3.7.3 Surface Water/Sediment Sampling

The original work scope called for six surface water/sediment sampling locations, two each in Areas 1, 5, and 6. At each area upstream and downstream locations were to be sampled. During the site reconnaissance, streams bordering Area 2 and Area 3 were observed; leachate coming from the fill areas was discharging into the streams. Upon further investigation the streams bordering Areas 2 and 3 were discovered to join just upstream of Area 5. After the site reconnaissance, NYSDEC was contacted and LMS recommended additional surface water/sediment sampling of Areas 2 and 3 to determine from which area, if any, the contamination originated. It was agreed subsequently that four additional surface water/sediment samples would be collected for the Phase II investigation.

Surface water/sediment sampling was originally planned to take place at the same time as the groundwater sampling program. However, after consultation with NYSDEC, it was decided to schedule sampling for the week of 10 December, before the onset of cold weather and after the soil gas points had been installed. Area 1 was sampled on 11 December, but because of problems with the coolers, the program was aborted until new bottles could be obtained. When opened, the coolers exhibited an odor identified by the mobile laboratory (which was still on-site analyzing the soil gas samples) as acetone, methyl ethyl ketone, and toluene. Consequently, the Area 1 samples were discarded. Replacement sampling would have had to be postponed until the week of 17 December, when new bottles could be obtained. By then, all, or at least some, of the streams would be frozen. Therefore the



surface water/sediment sampling program was delayed until a prolonged thaw took place, on 27-28 February 1990.

All surface water sample bottles were filled directly from the water body. Stainless steel spoons were used to collect sediment samples. Sampling was performed by area and began below the golf course at Area 1. Sample chemistries are provided on Table 3-8. SWHR1-1 was taken in the small brook at a point upgradient of the eastern end of Area 1 (Figure 3-24). The corresponding upgradient sediment sample taken at this location, SDHR1-1, was composed of sand, silt, and clay. Sample depth was between 1 and 6 in. below the sediment surface, in shallow water.

The downgradient surface water sample, SWHR1-2, was taken just downstream of a 4-ft culvert that carries surface water flowing past the northern end of the area (Figure 3-24). Sample bottles were filled directly from the surface water stream. The downgradient sediment sample taken at this location, SDHR1-2, was at a depth of 1-6 in. below the bottom surface and consisted primarily of sand.

The upgradient surface water sample for Area 2, SWHR2-7, was taken a short distance from the upgradient well MWHR2-5 (Figure 3-25). Ice from a small brook running from a ponded area southeast and upgradient of the landfill was broken away and silt was allowed to clear before the sample was taken. Sediment sample SDHR2-7 taken from this location contained organic material. The downgradient surface water sample (SWHR2-8) was taken along the northeastern corner of fill just north of MWHR2-7 (Figure 3-25). Sample bottles were filled directly from the stream and the corresponding downgradient sediment sample (SDHR2-8) was then taken.

The upgradient surface water and sediment samples (SWHR3-9, SDHR3-9) for Area 3 were located southwest of the fill area, directly at the outfall point where the surface water crosses the dirt roadway (Figure 3-26). The downgradient surface waters and sediment samples (SWHR3-10 and SDHR3-10) were taken at a point in the stream where it flowed past the toe of the fill area, approximately 350 ft north of the upgradient sampling point (Figure 3-26).



TABLE 3-8

SURFACE WATER SAMPLING CHEMISTRIES

Hudson River Psychiatric Center NYSDEC I.D. No. 314063

SURFACE WATER I.D.	TEMPERATURE (°C)	pH (Units)	SPEC. COND. (µmhos/cm)	TURBIDITY (NTU)
SWHR1-1	9.9	7.5	881	6
SWHR1-2	5.2	7.8/7.6	595/633	3/5
SWHR2-7	1.5	6.52	847	1
SWHR2-8	1.9	7.56	822	2.5
SWHR3-9	2.1	7.6	682	0.1
SWHR3-10	1.2	7.23	710	3
SWHR5-3	3.2	6.83	902	2
SWHR5-4	2.8/2.9	7.43/7.7	833/862	2/1.5
SWHR6-5	3.2	7.61	816	7.5
SWHR6-5 MS/MSD	3.2	7.61	816	7.5
SWHR6-6	6.9	7.83	761	5



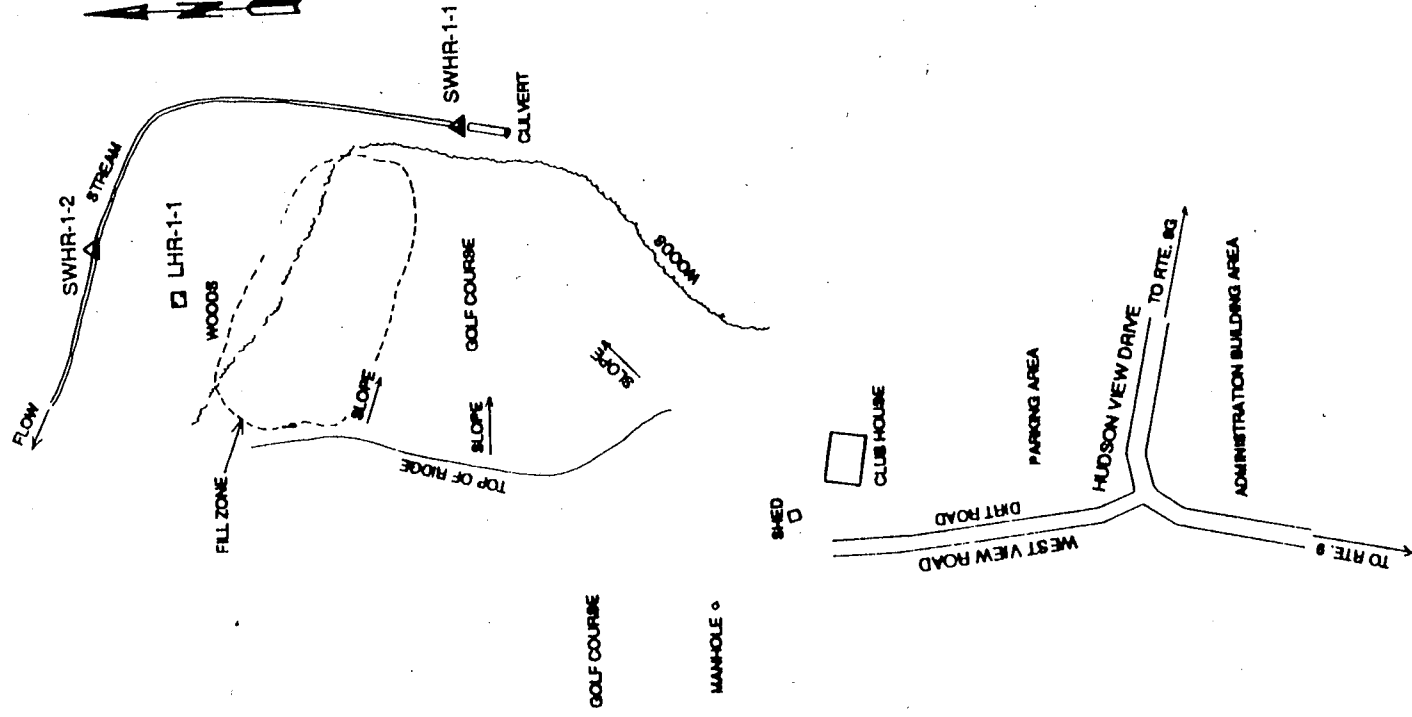


FIGURE 3-24

AREA 1

SURFACE WATER/SEDIMENT
AND LEACHATE SAMPLE POINTS

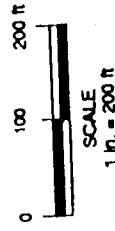
HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC I.D. No. 314083

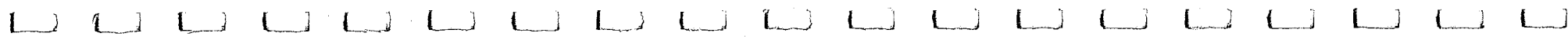
1980 NYSDEC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

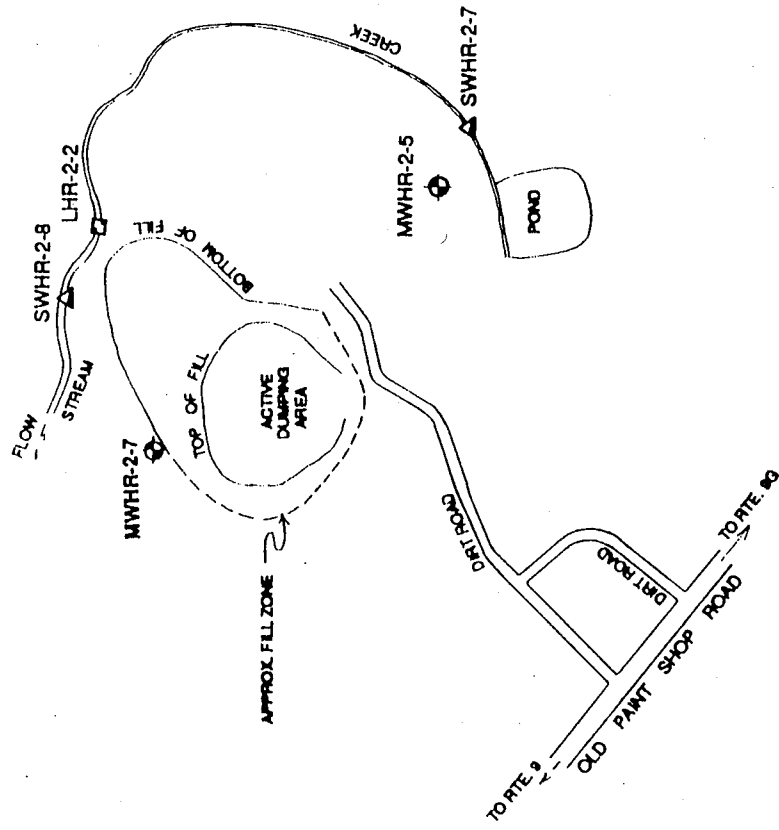
LEGEND

▲ Surface water/sediment sample location

□ Leachate sample location







LEGEND

- Monitoring well location
- Surface water/sediment sample location
- Leachate sample location



FIGURE 3-25

AREA 2

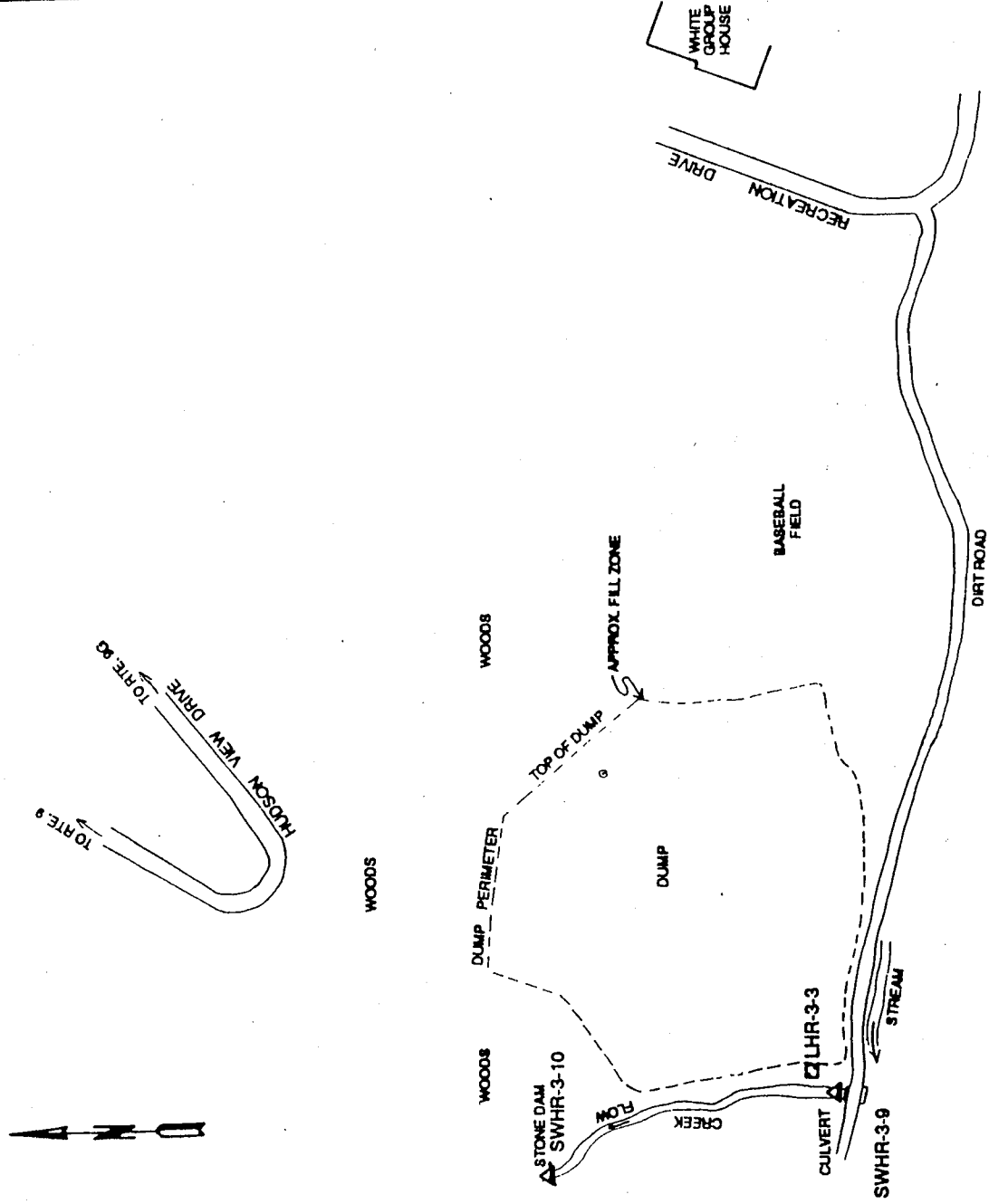
SURFACE WATER/SEDIMENT AND LEACHATE SAMPLE POINTS

HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC I.D. No. 314063

1990 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York





LEGEND

- ▲ Surface water/sediment sample location
- Leachate sample location

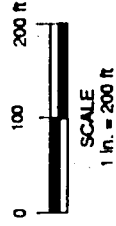
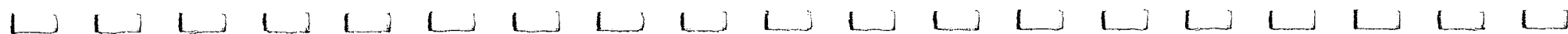
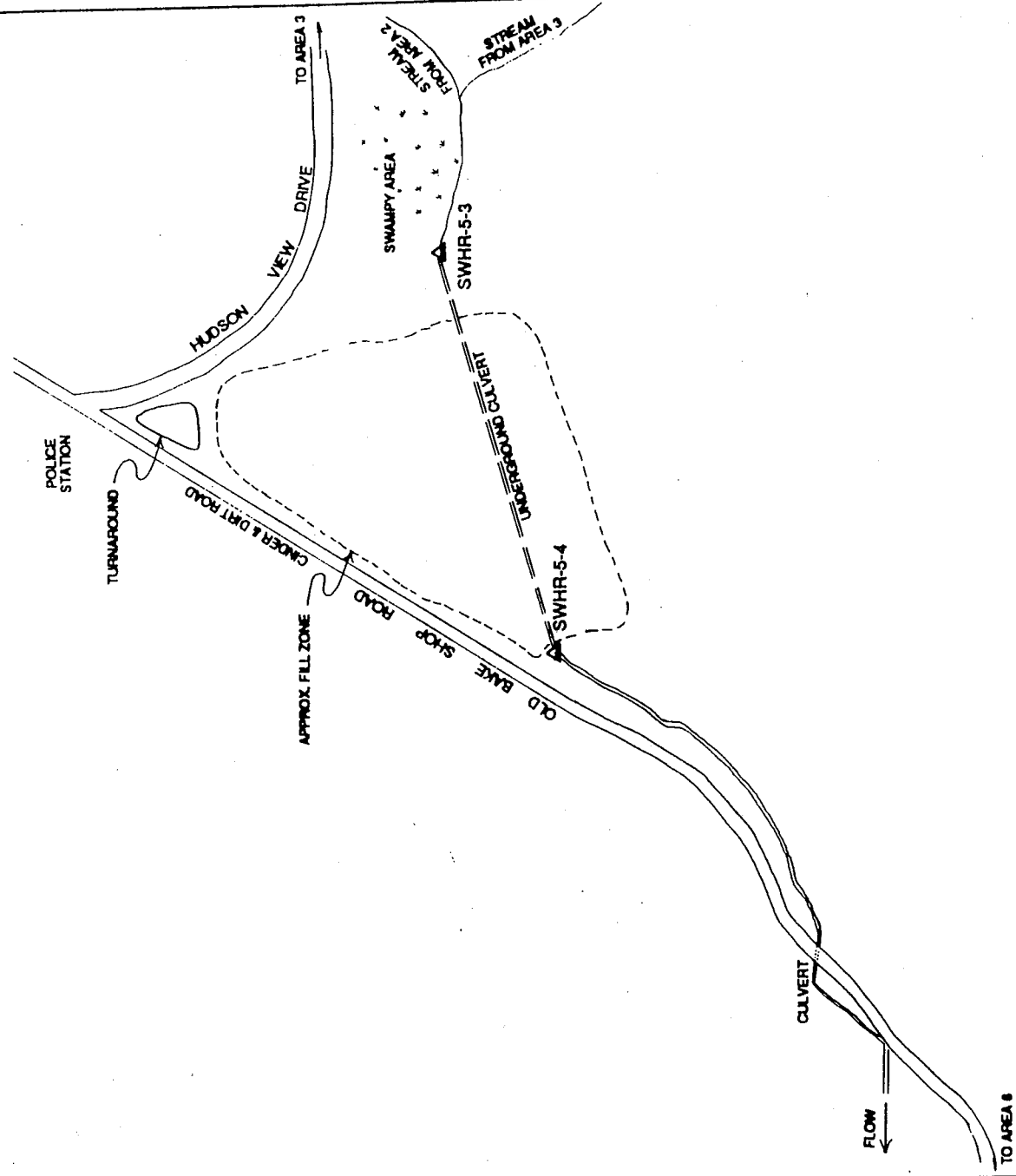


FIGURE 3-26
AREA 3
 SURFACE WATER/SEDIMENT
 AND LEACHATE SAMPLE POINTS
 HUDSON RIVER PSYCHIATRIC CENTER
 NYSDEC I.D. No. 314063
 1990 NYSDEC PHASE II INVESTIGATION
 LAWLER, MATUSKY & SKELLY ENGINEERS
 Pearl River, New York





LEGEND

- ▲ Surface water/sediment sample location

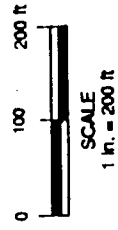


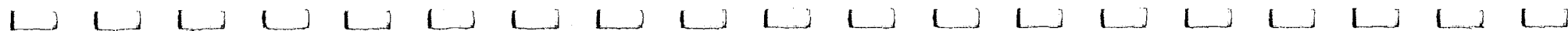
FIGURE 3-27

AREA 5

SURFACE WATER/SEDIMENT
SAMPLE POINTS

HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC I.D. No. 314083

1990 NYSDEC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York



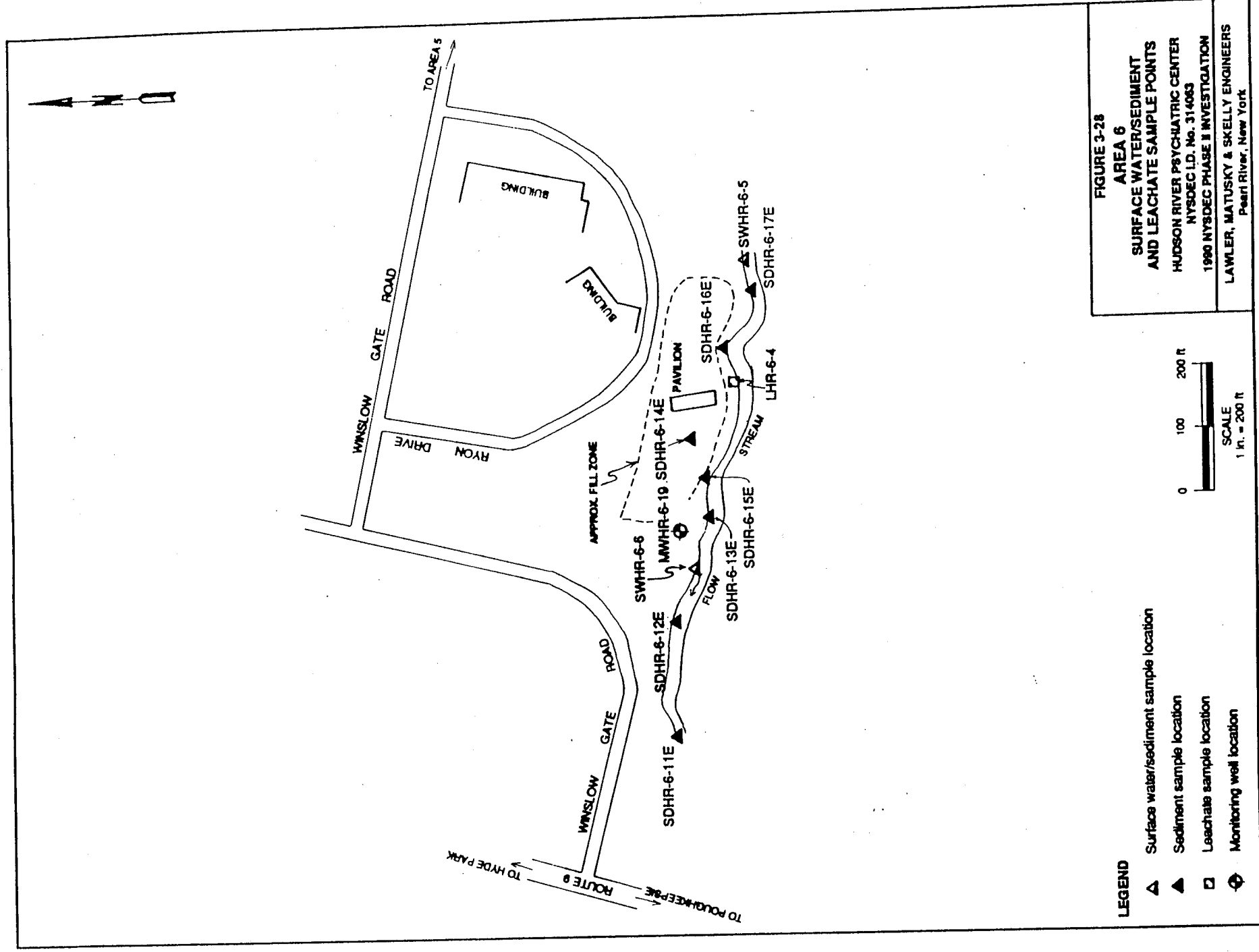
The upgradient surface water and sediment sample for Area 5 was taken from the stream that has been diverted through the fill area. SWHR5-3 was located immediately upstream of the culvert, as was the upgradient sediment sample SDHR5-3 (Figure 3-27). The downgradient surface water and sediment samples for Area 5 (SWHR5-4, SDHR5-4) were taken within 10 ft of the outfall of the culverted surface water flow south of the fill area (Figure 3-27). At this location a landfill odor was noted coming from the culvert. The sediment sample was taken from an area where both the rocks and the sediment were stained red.

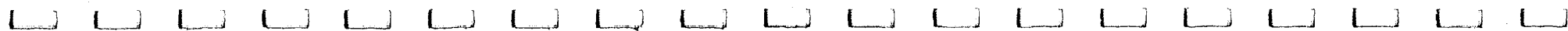
The upgradient surface water and sediment samples for Area 6 (SWHR6-5, SDHR6-5) were located southeast of the fill area near the middle of the fairly broad stream that runs in an east-west direction and eventually discharges off the site under Route 9 (Figure 3-28). Sediment was very sandy and the streambed was stained red, like the downgradient Area 5 sampling area. The downgradient location for surface water and sediment (SWHR6-6, SDHR6-6) was just south of MWHR6-19 (Figure 3-28). Sediment was marsh-like, with much organic material throughout.

Because high levels of PCBs were found in the downstream sediment samples, eight additional samples were taken adjacent to the streambed in Area 6 on 3 May 1990. Sampling started from an area 75 ft downstream of the former upgradient sediment sample (SDHR6-5) to a point just above where the stream runs under Route 9 (Figure 3-28). Sample numbers were consecutively numbered from the farthest downgradient sample (SDHR6-11E) to the sample adjacent to the original upgradient sampling location (SDHR6-17E). Sampling was done in this order (from downstream to upstream) to prevent possible cross-contamination that could result from disruption of the streambed. These additional samples were taken directly from the main streambed channel, the inlet just west of the picnic building, and a leachate seep east of the picnic shelter. These samples were analyzed for PCBs only, using EPA Method 8080.

One sediment sample (SDHR4-19E) and one surface water sample (SWHR4-19E) were collected from Area 4 during the May 1990 sampling event. These samples were collected from an area where ponded water was mixed with leachate, a location decided upon by NYSDEC representatives in the field. The samples were analyzed for TCL organics and







inorganics; the surface water sample was also analyzed for conventional parameters. The approximate sampling locations are shown on Figure 3-23. Samples were taken after the site survey and are therefore not actually located on the survey maps.

3.7.4 Leachate Sampling

The original work scope did not require leachate sampling; the downstream surface water stations at Areas 1, 5, and 6 were to be located below where leachate was observed to enter the stream. However, following the site reconnaissance and the finding of leachate entering streams along Areas 2 and 3, recommendations were made to include one leachate sample from Areas 1, 2, 3, and 6 (no leachate was observed at Area 5). NYSDEC agreed with the recommendation and asked that the leachate samples from Areas 2 and 3 be analyzed for EP toxicity metals. In addition, the leachate samples from Areas 1 and 6 were to be collected and analyzed for EP toxicity metals and organics. As described in Section 3.6, the leachate sampling program was to take place concurrently with the surface water/sediment sampling program. Area 1 was sampled on 11 December 1989, but again, because of the problems with the coolers (see Section 3.6), the sample was discarded and the sampling program postponed until a prolonged thaw took place.

Leachate sampling was conducted concurrently with the surface water and sediment sampling. Four individual samples were collected at Areas 1, 2, 3, and 6. Table 3-9 presents the conventional chemistry data collected from these samples. LHR1-1 was located north of the golf course in Area 1 where a fairly large leachate seep was flowing from the hillside (Figure 3-24). The seep covered an area approximately 8 ft wide and apparently had been present for some time since all rock and tree trunk surfaces near the ground were thoroughly stained an orange-red color. Conductivity was low in comparison with the adjacent surface water, and temperature was near freezing.

LHR2-2 was collected from a moderately sized 2-3 ft wide seep located at the toe of the northeastern corner of Area 2 (Figure 3-25). At this point the seep merged quickly with the surface water stream that flows past the landfill. Conductivity was relatively high in comparison to the adjacent surface water.



TABLE 3-9

LEACHATE SAMPLING CHEMISTRIES

Hudson River Psychiatric Center NYSDEC I.D. No. 314063

LEACHATE I.D.	TEMPERATURE (°C)	pH (Units)	SPEC. COND. (µmhos/cm)	TURBIDITY (NTU)
LHR1-1	1.1	7.4	585	16
LHR2-2	5.5	6.95	1700	15
LHR3-3	3.5	7.43	804	4.5
LHR6-4	16.1	6.86	870	2



LHR3-3 was located in the southwestern corner of the Area 3 fill (Figure 3-26). This seep was several feet wide and was fed by leachate that flowed intermittently along the ground surface from east to west along the southern border of the fill. The seep quickly mixed with the surface water passing by the fill and any rock and tree surfaces that came in contact with the stream were stained. Conductivity and temperature values were similar to those of the surface water course into which it mixed.

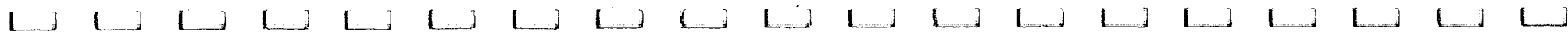
LHR6-4 was collected from a small seep emanating from several small holes in the side of the bank (Figure 3-28). This seep flowed into the surface water within several feet of its outbreak. All measurements except temperature were similar to those of the surface water. The temperature of the seep was more than 10°C higher than all of the previous leachate samples.

3.7.5 Drum Material Sampling

Because no drill cuttings or purge, development, or decontamination water was required to be drummed, drummed materials were not generated or sampled.

3.8 AIR MONITORING

Air monitoring was conducted during the site inspection to determine the levels of protection. All of the readings were at background levels. Air monitoring was also conducted during all intrusive activities with an HNU, OVA or organic volatile monitor (OVM), and CGL. Each split spoon was monitored with one or more of the above instruments (some instruments were inoperative some of the time because of cold or wet weather). Although some of the split spoons had high readings, the readings in the breathing zone never exceeded background levels. The calibration data and monitoring data are provided in Appendix B.



CHAPTER 4

SITE ASSESSMENT

4.1 SITE HISTORY

The Hudson River Psychiatric Center occupies an area of approximately 700 acres on Route 9, just north of the City of Poughkeepsie in Dutchess County. Except for a portion owned privately, it is owned by the State of New York. The site is an active psychiatric complex and consists of a number of buildings and large, undeveloped lands. The main part of the site is bordered on the west by the Hudson River and Route 9; on the east by Route 9G and some residences; on the north by a residential area; and on the south by the Children's Home, some residences, and a manufacturing/storage facility. Another large, undeveloped area to the east of Route 9G is part of the site but was not investigated during this study. The areas under investigation are six separate disposal areas, described in detail in Section 3.2.

Two unnamed tributaries to the Hudson River are located in the vicinity of the six disposal areas. The disposal areas received wastes from HRPC and both the City and Town of Poughkeepsie. The HRPC wastes were disposed of on-site for over 100 years, until about 1973 or 1974. The City and Town of Poughkeepsie wastes were disposed of at the site from the 1960s to the 1970s. No records were kept of the types and quantities of wastes disposed of, although they appear to have been putrescible household refuse; commercial garbage, including various paper and cardboard materials; and construction and demolition debris. To date there is no evidence that any of the wastes disposed of were hazardous (Ref. 4, Appendix A).

The Dutchess County Department of Health (DCDOH) conducted numerous inspections of the site in the mid- to late 1960s and early 1970s. These inspection reports, which consisted of both handwritten memos and checklists, did not specify which of the six areas were being inspected and a follow-up conversation with DCDOH did not provide any more information. In summary, these inspection reports stated that poor housekeeping at the site was generally the rule, i.e., the refuse was not necessarily compacted, nor was a daily cover applied; slopes



of less than 2 to 1 were not always maintained, which led to excessive runoff down the sides; the top of the fill was generally kept flat, which led to ponding of waters on the surface. Blowing paper and other debris, as well as rodents and insects, were observed along with leachate from the fill material. Improper cover was used in some cases (it was too coarse to be an effective impervious layer). A copy of these inspection reports can be found in

Appendix K.

Because of the recurring problems with the site, DCDOH requested a meeting with representatives of HRPC via a letter dated 10 January 1974 (Ref. 5, Appendix A). As a result of the meeting, held on 14 February 1974, HRPC was required to submit an engineering report on the expansion of the sites, provide adequate cover and slopes, fence in the area, and exterminate any rodents on-site. It was also suggested that HRPC hire an outside carter to haul their refuse to an area off-site (Ref. 6, Appendix A). Additional reports of inspections conducted after the meeting, including one by a Dutchess Community College class, indicated similar problems at the site (Ref. 7, Appendix A). On 7 January 1975 HRPC received a Notice of Hearing from DCDOH on the alleged violations of Part 8 of the New York State Sanitary Code, the Public Law of the State of New York, the Conservation Law of the State of New York, and Part 360 of the NYSDEC Rules and Regulations. The records investigated provide no information on the outcome of the hearing, scheduled for 28 January 1975 (Ref. 8, Appendix A). However, a letter to the New York State Department of Law (NYSDEL) from HRPC dated 3 February 1975 contains a copy of a bid request for removal of rubbish, refuse, and swill at HRPC for a period of one year (Ref. 9, Appendix A). A follow-up letter to NYSDOL dated 11 February 1975 indicated that HRPC's proposed budget for fiscal year 1975-1976 included a sufficient amount of funds to enter into a contract for refuse removal (Ref. 10, Appendix A). The letter further stated that after a contract was signed the existing dump site would be closed, covered, graded, and seeded. Apparently a contract was signed, since the records indicate no further dumping.

A NYSDEC Inactive Hazardous Waste Disposal Site Report was prepared and received at NYSDEC Region 3 offices on 10 November 1984. This report described the golf course area (Area 1) as gently rolling terrain, formerly a wet area filled in with municipal waste from the City and Town of Poughkeepsie. The Ryon Hall site (Area 6) sloped gently to the creek on



its southwest face; it received institutional wastes in the 1950s and 1960s. The ball field site - northwest (Area 5) is an area of flat terrain with a creek piped under the disposal area; it received municipal wastes from the Town and City of Poughkeepsie. The ball field site - southwest (Area 3) is described as sloping gently to the west, with grass cover to the creek; it received municipal wastes from the City and Town of Poughkeepsie in the 1960s. The northeast site (Area 2) consists of gently rolling terrain sloping to a creek one-quarter mile to the north. It received institutional wastes (beds, frames, mattresses, wheel chairs, etc.) and cinders from the heating plant (Ref. 11, Appendix A).

In August 1986 EA Science and Technology (EA) stated in its Phase I investigation report that HRPC landfilled its wastes on the site for over 100 years, until 1973 or 1974, and that the City and Town of Poughkeepsie used the disposal areas in the 1960s and 1970s. It went on to say that the landfills were created in topographic low areas, such as wetlands, which resulted in leachate formation in several of the fill areas. In general, institutional wastes were disposed of on the site; an on-site incinerator was used for pathogenic and pharmaceutical waste. Area 2 was used solely by HRPC. The city and town wastes generally consisted of construction and demolition debris; household garbage, including putrescible materials; and commercial garbage, including various paper and cardboard materials. No data were collected during the Phase I investigation and no data were available to use for assessment. A preliminary HRS score was developed (Migration Score = 0; Direct Contact Score = 0), but there was insufficient information to determine a final score. EA therefore recommended that a Phase II investigation be conducted at the site. As part of the investigation, 11 test borings/observation wells were to be installed, and groundwater, surface water, leachate, and sediment were to be sampled and analyzed (Ref. 4, Appendix A). Using EA's recommended Phase II investigation work scope, NYSDEC developed the final work plan conducted by LMS.

On 14 May 1986 NUS Corporation conducted an off-site reconnaissance of the HRPC site for EPA and recommended a site investigation to identify the six areas that could not be observed during the off-site inspection and to assess the site's environmental impact. A medium priority was given to the site because of the environmentally sensitive areas that were used as the landfills (Ref. 12, Appendix A). On 26 February 1987 NUS conducted an on-site

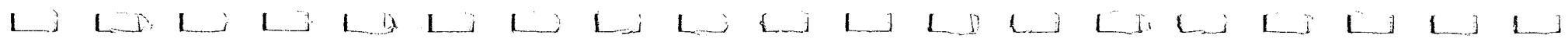
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inspection and collected one soil, eight surface water, and eight sediment samples and had them analyzed for TCL organics and inorganics. The organic sampling results of the sediments indicated the presence of acenaphthene, dibenzofuran, phenanthrene, anthracene, fluoranthene, pyrene, fluorene, chrysene, and several other polycyclic aromatic hydrocarbons (PAHs) in Areas 1, 5, and 6. PCBs were detected in Area 6 and pesticides were detected in the sediments in all three areas. One surface water sample contained low levels of pesticides (Area 6); the other samples were not contaminated with organics. The soil sample from the leachate in Area 1 did not have any detectable organics. All samples contained measurable amounts of metals. The data collected during this investigation are discussed in detail in Section 4.5; the actual data are contained in Appendix K. On the basis of this information NUS prepared an EPA Form 2070-12 summarizing the information obtained to date on the site. NUS also scored the site, based on the analytical data collected, as follows: Migration Score = 40.74; Direct Contact Score = 50.00; Fire/Explosion Score = Not scored (Ref. 13, Appendix A).

The following paragraphs discuss area-specific history.

4.1.1 Area 1

On 3 April 1967 DCDOH inspected the site and observed leachate emanating from the golf course (Ref. 14, Appendix A). On 2 May 1967 a site visit was conducted by DCDOH with City and Town of Poughkeepsie personnel (Ref. 15, Appendix A) and HRPC personnel. A letter prepared on 6 June 1967 as a follow-up to this site visit offered alternative recommendations: that the refuse in the golf course area be excavated; that substantial amounts of gravel fill material be placed in the areas of leachate discharge; or that the existing stream on the north side of the site be piped, the swamp area excavated and filled in with gravel, and the refuse excavated to the top of the gravel area (Ref. 16, Appendix A). The last alternative was considered the most practical and feasible, and HRPC was instructed to act immediately to eliminate the problem. On 25 April 1968 DCDOH and several local residents again inspected the site and found that no action had been taken by HRPC to correct the problem: leachate was still emanating from the fill.



4.1.2 Area 2

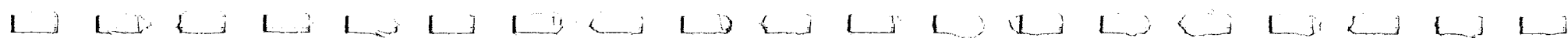
An inspection of Area 2 on 1 April by DCDOH reported large areas of uncovered refuse (Ref. 14, Appendix A). On 3 April 1967 those areas were covered but a steep face was left uncovered. As stated previously, there are many site inspection reports on HRPC, and although the area inspected is not identified, indications are that it is Area 2. This information could not be confirmed in discussions with DCDOH. A 1964 topographic map of the HRPC indicates little use of Area 2 as a fill area (Ref. 17, Appendix A). This conclusion is based on the evidence presented by the map, which does not show either a steep slope on the western side or the stream. The buildings shown on the map to the south of Area 2 are no longer in existence. It is possible that the debris from these buildings was disposed of in Area 2 or Area 4.

4.1.3 Area 3

During the site inspection of Area 1 on 2 May 1967, Area 3 was also inspected (Ref. 15, Appendix A). It was recommended that HRPC clean and pipe the stream. Area 3 is also shown on the 1964 topographic map as the athletic field (Ref. 17, Appendix A). The map shows the tree line nearly as it exists today. Not shown on the map is the stream that runs beneath Winslow Gate Road and along the southwestern boundary of Area 3. The stream may not have existed at this time.

4.1.4 Area 4

Area 4, a construction and demolition (C & D) site, received some refuse prior to its receiving C & D waste. On 22 June 1979 a letter sent to the Area Coordination from Cristo Bros. requested permission to dispose of the C & D waste. On 10 July an application was sent to NYSDEC for approval of a C & D site. The request included complete engineering plans provided by Hayward & Pakan Associates, Form 47-19-6 (6/77), Environmental Assessment Form Parts 1 and 2, a location map, additional information requested by DCDOH, and deep test results. DCDOH approved the site by letter on 16 July and inspected it on 14 August. The site inspection report stated that the site was an active C &



D site. A note on the bottom of the report indicates that an inspection took place on 14 February 1980 and no leachate was in evidence. A handwritten note at the bottom of the 16 July 1979 letter indicates that the site was closed satisfactorily by 2 September 1980. The above information is contained in Appendix K.

The property containing the site was sold at public auction to R. Vasantha Krishna and Urubagilu Nagaraja in November 1979. The final sale was completed on 13 February 1980. In 1986 the property was sold to Loedy & Loedy Enterprises Ltd., which refused to complete the sale after discovering that the site was on the NYSDEC Inventory of Hazardous Waste Sites (Appendix K). The site owners, their attorney, and personnel from HRPC, NYSDEC, and the Office of Mental Health inspected the site on 8 September 1988. No evidence of C & D waste or leachate was observed, as documented in a letter by the owner's attorney (Ref. 18, Appendix A). On 15 August 1989 the attorneys for the owners submitted a petition to delist Area 4 from the State Registry of Hazardous Waste Sites (Appendix K). On 22 August an internal NYSDEC memo stated that the petition had been reviewed, and recommended that the area be removed from the description of the HRPC site (Ref. 19, Appendix A). On 6 September 1989 NYSDEC's Bureau of Hazardous Site Control replied to the attorneys in a letter, stating that the petition was being reviewed and a decision on the delisting would be forthcoming (Ref. 20, Appendix A). Accordingly, upon initiation of the Phase II investigation, it was decided to drop the investigation of Area 4 even though it had been included in the original work scope. After completion of the initial sampling event, however, NYSDEC requested that some sampling be conducted at Area 4. During the second sampling event, when locations for sample collection at Area 4 were being investigated, LMS and NYSDEC personnel realized that the work scope location of Area 4 was wrong. The actual location was to the southwest (see Figures 1-1 and 1-2). The 1964 topographic map shows the prefill topography of Area 4 (Ref. 17, Appendix A). Two ponded areas are evident. It is likely that the area received the waste from the demolition of the two buildings near Area 2.



again inspected by DCDOH on 1 May 1968, and leachate was again observed emanating from the site (Ref. 21, Appendix A).

The 1964 topographic map of Area 6 shows two pavilions (Ref. 17, Appendix A); only one covered pavilion and one concrete pad exist at present. A footbridge and a building to the west of the area are shown on the 1964 map but no longer exist.

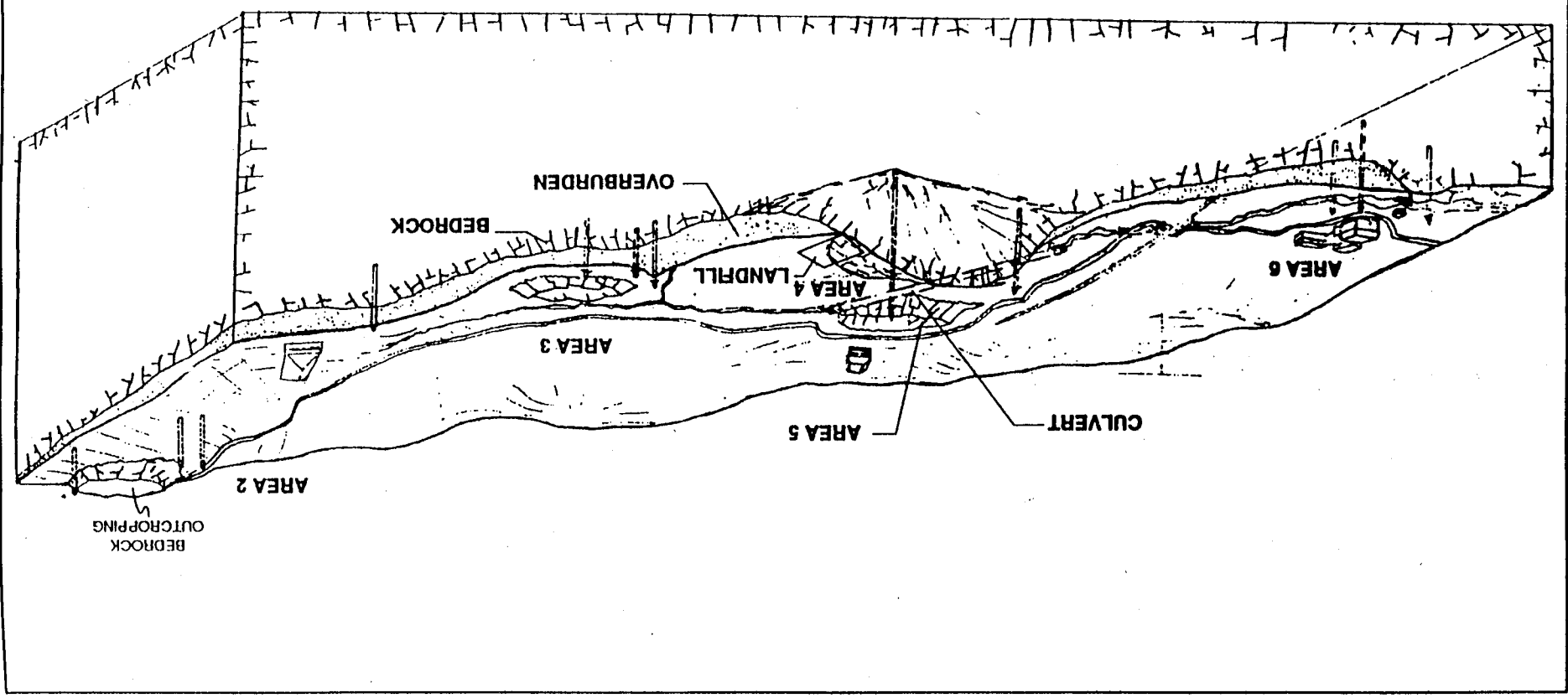
4.2 SITE TOPOGRAPHY

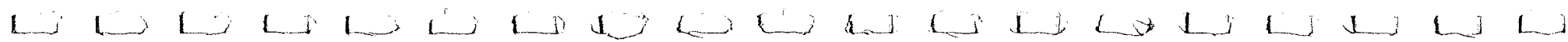
HRPC is located in an area of varied topography generally described as a rolling upland of moderate elevation, caused in part by the nature and structure of the underlying rock formations as affected by erosion and in part by the mantle of glacial deposits (Ref. 22, Appendix A). Elevation at the five areas of concern ranges between 250 and 70 ft above mean sea level. Topographic relief divides the site into two drainage basins. An unnamed stream at the northernmost end of the site runs from east to west and receives surface drainage from the northern portion of the site; it then flows past Area 1 and runs under Route 9, discharging into a swamp adjacent to the Hudson River. The second water course flows in a southwesterly direction. Initially it passes by Area 2, where it is joined by a small stream that flows by the downgradient side of Area 3. The two combined water courses are then culverted beneath Area 5, where water exits and soon afterward travels westerly past Area 6. Surface water leaves this portion of the property as it passes beneath Route 9 and then discharges a short distance away into the Hudson River. The general topography of the site trends downward in a westerly direction toward the Hudson River. Thus, overall groundwater flow direction is believed to be in the westerly direction (Ref. 23, Appendix A). Figure 4-1 is an idealized block diagram depicting a generalized cross-section of the site (approximately northeast to southwest) and surface features.

U O U U U U U U U U U U U U U U U U

IDEALIZED BLOCK DIAGRAM DEPICTING
GENERALIZED CROSS SECTION
AND SURFACE FEATURES
HUDSON RIVER PSYCHIATRIC CENTER
NYS DEC ID. No. 314063
1990 PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

NOT TO SCALE





4.3 SITE GEOLOGY

4.3.1 Overburden

Surficial soils overlying bedrock were examined throughout the HRPC site during test boring and monitoring well installation. In general, the material encountered was classified as nonstratified (glacial) and stratified (fluvioglacial) drift (Ref. 24, Appendix A). Differences in thickness of unconsolidated material were usually the result of different depths to bedrock, as bedrock will tend to influence surface topography in this area.

Unconsolidated deposits over bedrock were thicker at the elevated position of the upgradient well (MWHR1-1) than at the lower elevations of the downgradient wells. The overburden layer ranged in thickness from 34 ft in the elevated areas to 24 ft in the low-lying zone. Upgradient, a nonstratified layer of melt-out till contained rounded crystalline cobbles and coarse-grained sediments. Downgradient deposits consisted of moderately stratified outwash sediments; coarse-grained material found near the bedrock surface was overlain by finer-grained sediments.

Area 2 contained only a thin veneer of short-transport flow till in the upgradient location (MWHR2-5) and downgradient along the western fill slope (MWHR2-7). Bedrock was identified at the ground surface at the remaining downgradient drilling location (MWHR2-6).

Area 3 contained a relatively thin till layer of varying density till throughout the investigated zone. Most of the material was melt-out till, with some thin lodgement till near the base. The unconsolidated deposits were between 0 and 11 ft thick.

The upgradient location at Area 5 contained a substantial layer (68 ft) of fluvioglacial material above the underlying shale bedrock. A thinner (10 ft) layer of flow till containing angular shale gravels was identified at the downgradient locations.

U U U U U U U U U U U U U U U U U U

A 28-ft-thick layer of flow till was identified in the upgradient location of Area 6; a short distance to the southeast a more cohesive and less permeable lodgement till was identified above the bedrock surface.

Overall, most of the glacial till material on-site yielded little water. In several cases stratified sand layers yielded sufficient quantities of water for sampling. Bedrock fractures in the upper zone yielded most of the available water on-site.

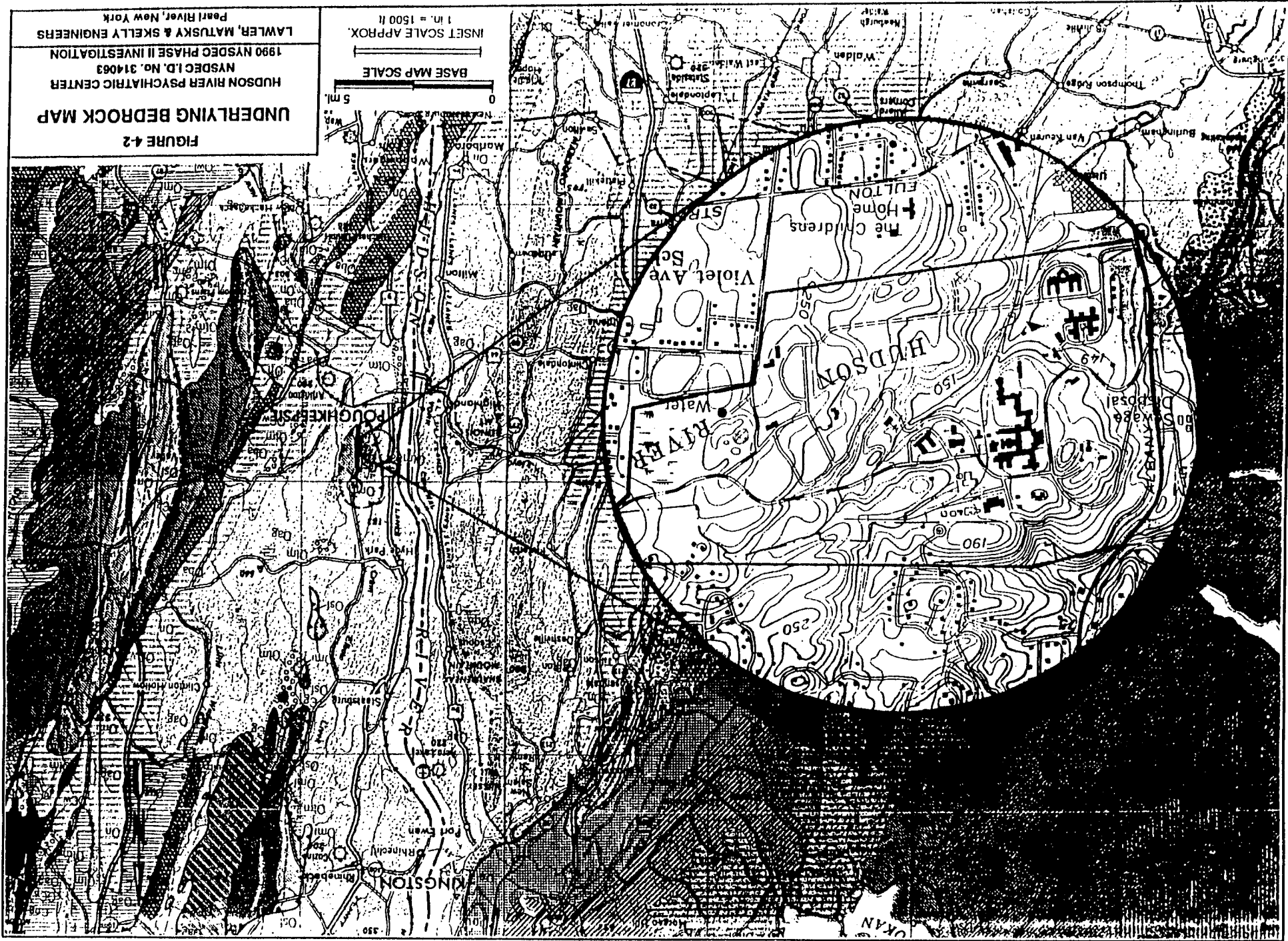
4.3.2 Bedrock Geology

Published sources and monitoring well data identify bedrock beneath the site as Ordovician shale, siltstone, and sandstone. The entire site is generally identified as part of the Hudson River formation, which extends over a relatively large area. The zone in the immediate vicinity of the site is overlaid by two similar formations (Figure 4-2). The easternmost zone was identified as the Stuyvesant Falls formation, composed of siltstone and shale. The Austin Glen formation, primarily a shale, siltstone, sandstone, and graywacke formation, is located along the western end of the facility (Figure 4-2). The boundary between the two bedrock groups runs north-south through the approximate middle of the site. During the Phase II drilling, Austin Glen shale and siltstone were identified in bedrock cores taken primarily in Areas 1, 5, and 6 along the western portion of the site. Bedrock cores from Areas 2 and 3 contained much larger percentages of coarser grained silt and sandstone. These were identified as part of the Stuyvesant Falls formation. The apparent delineation of this formation was similar to what was identified on the published New York State bedrock map (Refs. 25 and 26, Appendix A).

4.4 HYDROGEOLOGY

Overall, groundwater and surface water flow across the site in a westerly direction. Surface water courses consist of two unnamed tributaries that tend to flow either at the toe of the downgradient fill slopes or, as in one case, through the center of the fill material itself. The unnamed tributaries run to the southwest; at the edge of the site both unnamed tributaries

U U U U U U U U U U U U U U U U U U



UNDERLYING BEDROCK MAP

FIGURE 4-2

HUDSON RIVER PSYCHIATRIC CENTER

NYSDC I.D. No. 314063

1990 NYSDC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS

Pearl River, New York

INSET SCALE APPROX.

1 in. = 1500 ft

BASE MAP SCALE

0 5 ml.

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pass beneath Route 9 en route to a final discharge in the Hudson River less than 0.5 mile away (Figure 4-3).

As might be expected, sudden changes in local topography influence the direction of groundwater flow in isolated areas. However, the overall flow is determined by the east to west topographic change within the Hudson River drainage basin.

A substantial amount of information was gathered during the monitoring well installation portion of the Phase II investigation. No truly confining material was identified in any area where overlying unconsolidated material was fully penetrated and bedrock was encountered. In general, consolidated sediments consisting of fine material were found in the upper layers, leaving the coarse fraction in contact with the bedrock surface. Based on the information available, the overall piezometric surface on-site has a relatively uniform westerly flow component. Although a closer inspection of the site will show many fairly narrow, steep valleys that appear to be bordered predominantly by bedrock ridges that may alter the local flow direction, the major flow direction is still to the west. It is believed that groundwater recharging from precipitation and runoff enters both unconsolidated material and bedrock outcroppings and flows both into and out of each material. It is apparent from an inspection of the cores that most of the bedrock is fairly competent, and only in Area 3 was a substantial yield found in the fractured bedrock interval. The large number of surface seeps and substantial wetland areas identified in association with the streams indicates that the streams probably receive groundwater both from areas where the actual saturated zone reaches the ground surface and from recharge areas in wetlands. This assumption is based on the observation of long-term leachate seeps and the fact that the streams are not identified as intermittent.

The following paragraphs indicate the individual flow patterns at the relative areas:

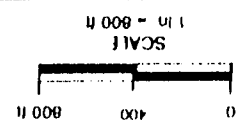
4.4.1 Area 1

This northernmost fill area is located near the toe of a basin-like depression (Figure 4-4). Whether this depression was man-made or a creation of ice and runoff is unknown. A small

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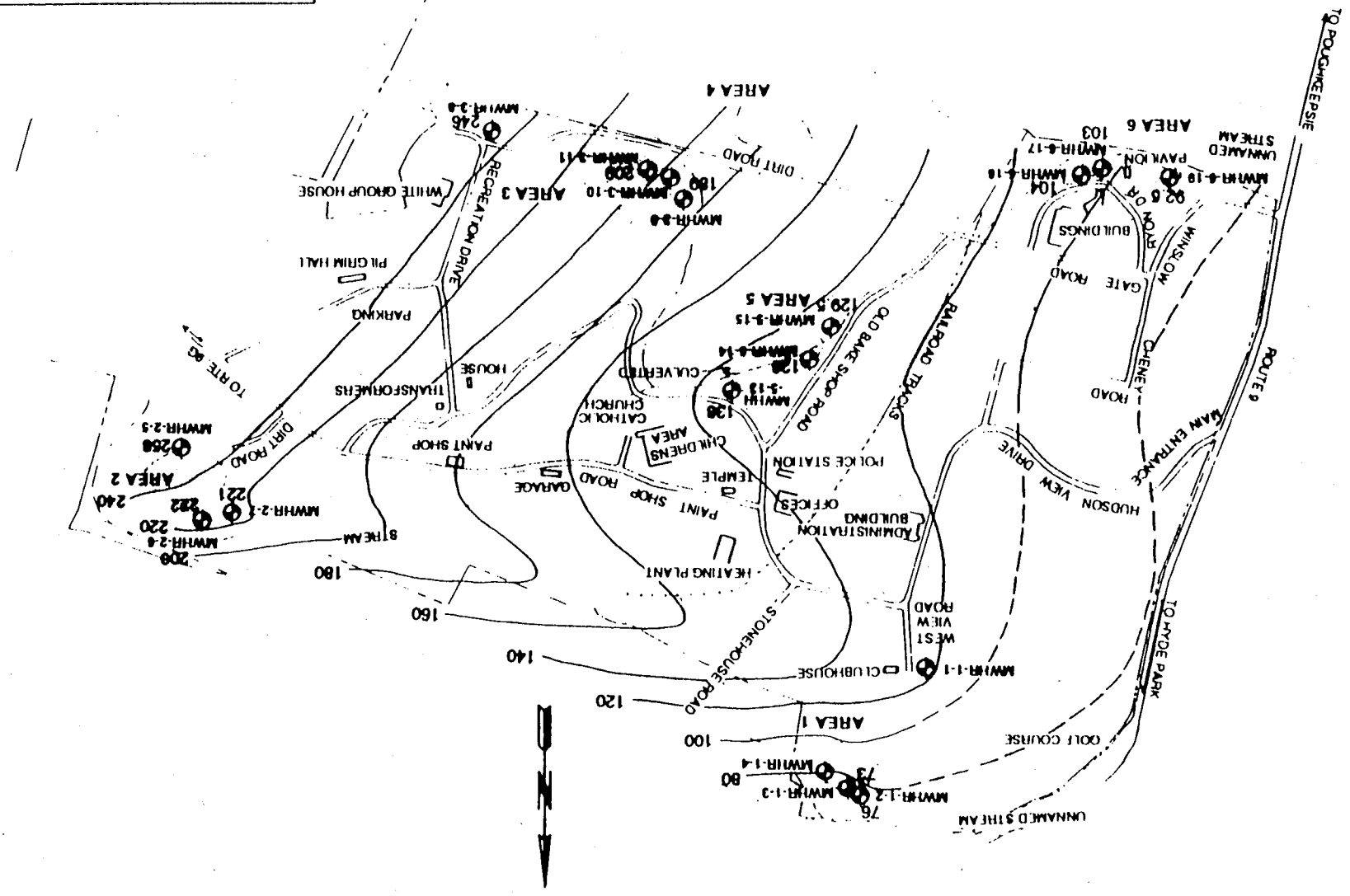
LEGEND

Monitoring well location in ft. approx. USGS datum
Groundwater contour line
(dashed line indicates inferred contour)
Contour interval 20 feet

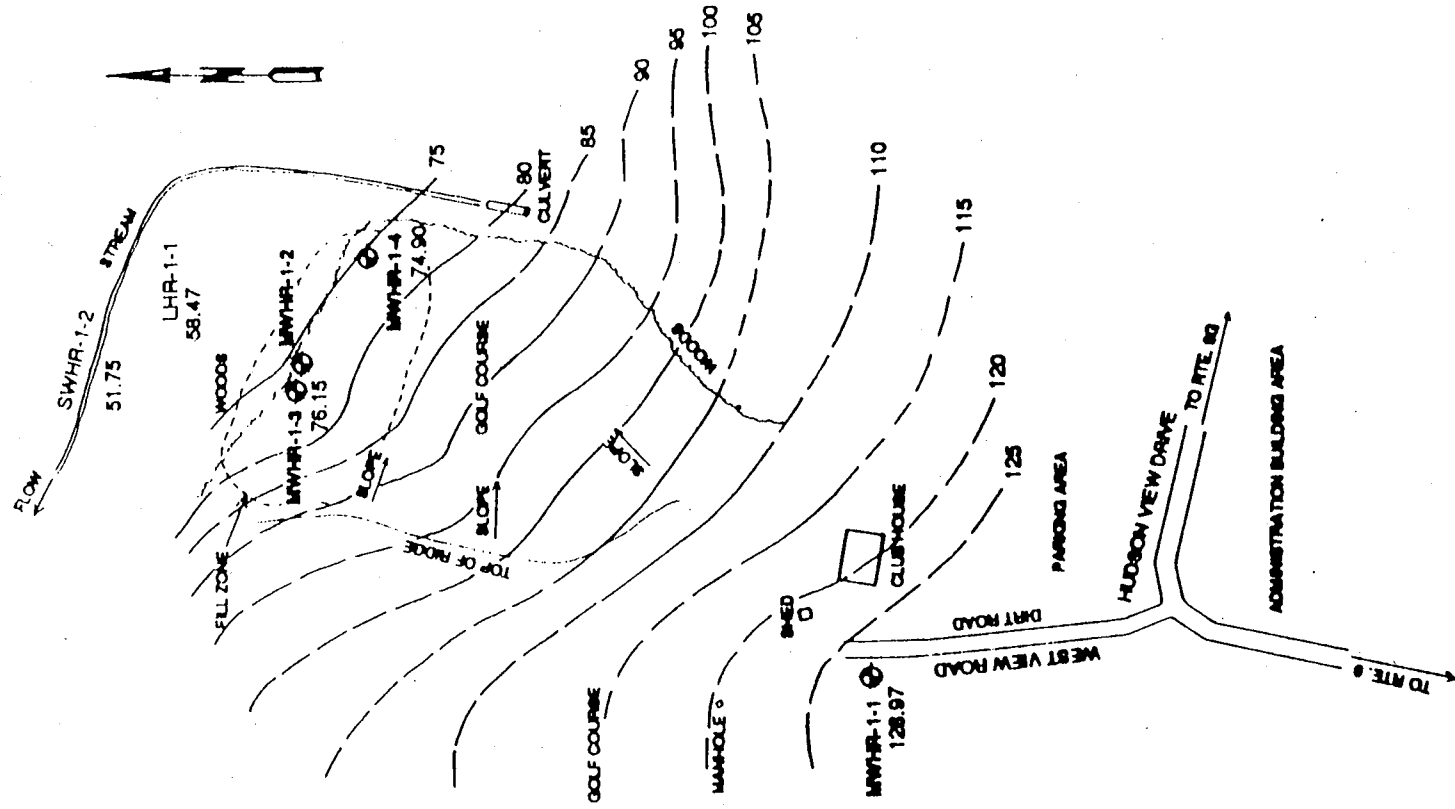


OVERALL SITE
GROUNDWATER CONTOUR MAP
HUDSON RIVER PSYCHIATRIC CENTER
NYSDOC I.D. No. 314063
1990 NYSDOC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

FIGURE 4-3



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LEGEND

- Monitoring well location
(Groundwater elevation in ft. approx. USGS datum)
- Groundwater contour line
Contour interval 5 feet
(dashed line indicates inferred contour)

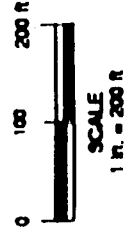


FIGURE 4-4
AREA 1
GROUNDWATER CONTOUR MAP
HUDSON RIVER PSYCHIATRIC CENTER
NYSDOEC LD. No. 314083
1980 NYSDOEC PHASE II INVESTIGATION
LAWLER, MATURSKY & SKELLY ENGINEERS
Pearl River, New York

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brook that may flow intermittently over the course of the year runs along the eastern slope of the bowl, then turns to the west and flows along the northern edge of the fill area. It is difficult to determine exactly where the fill ends, as debris protrudes above the surface throughout the wooded area. Between the points where the steepest landfill slope ends and the stream flows west (approximately 100-200 ft), several leachate seeps appear at the ground surface. All seeps flow in a northerly direction toward the stream, where they mix with the stream; the stream then flows west toward the Hudson River, approximately 1500 ft away.

Groundwater flow direction was triangulated using the monitoring points installed during the Phase II investigation as well as several surface water seeps in areas that were thoroughly saturated at the ground surface. Between the upgradient point (MWHR1-1) and the remaining downgradient wells (approximately 700 ft north), the groundwater surface drops over 50 ft in elevation. This closely follows the overall surface topography, which drops nearly 80 ft between the two areas. The overall gradient for the groundwater surface is 8.8%; the average gradient, 12.8%.

4.4.2 Area 2

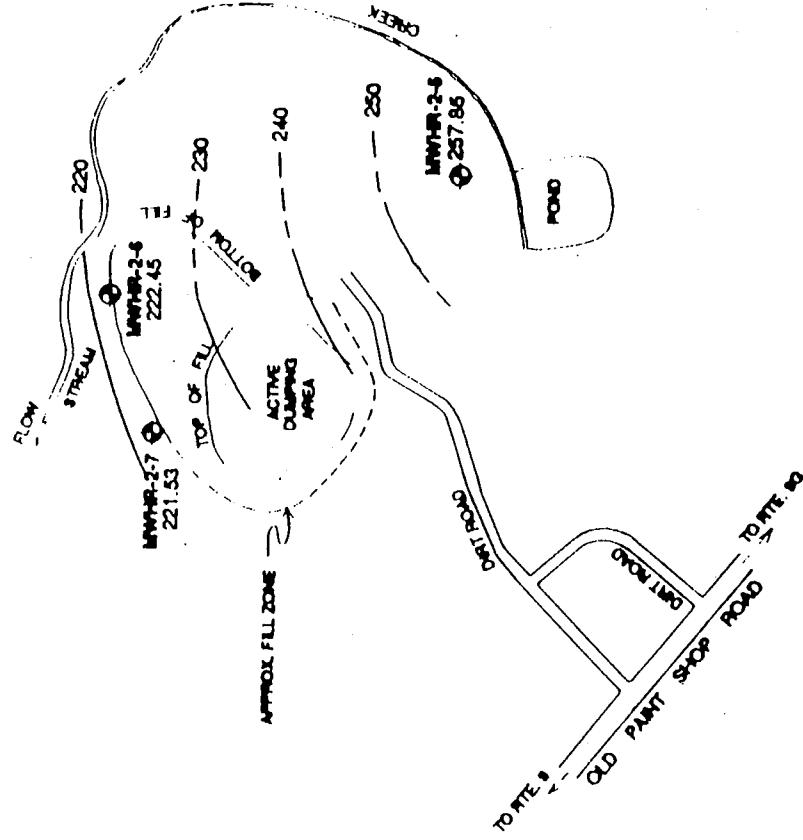
The overall drainage pattern for Area 2 was triangulated using surface water impoundments, monitoring points, and leachate seeps that appear to flow steadily. From these data a consistent northerly flow direction was calculated (Figure 4-5). The groundwater elevation dropped nearly 40 ft over a horizontal distance of nearly 550 ft in this area. The average hydraulic gradient for this area is 7.1%. Groundwater and surface water elevations at the downgradient sampling locations MWHR2-6, MWHR2-7, and LHR2-2 were very close, indicating a uniform groundwater surface at the northern end of the site.

4.4.3 Area 3

Groundwater flow and surface drainage are generally in the same northwesterly direction (Figure 4-6). Ground elevation drops over 82 ft from the upgradient well to the farthest downgradient surface water sampling point (SWHR 3-10). The overall horizontal distance was just under 1200 ft, making the average surface gradient just under 7%. The actual



▲ N D



LEGEND

- ⊕ Monitoring well location
(Groundwater elevation in ft. approx. USGS datum)
- - - Groundwater contour line
Contour interval 10 feet
(dashed line indicates inferred contour)

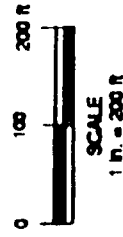
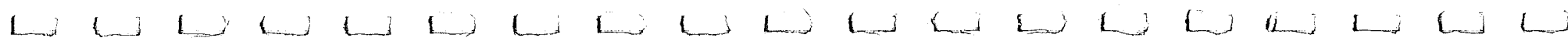
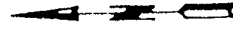


FIGURE 4-5
AREA 2
GROUNDWATER CONTOUR MAP
HUDSON RIVER PSYCHIATRIC CENTER
NYSDOC LD. No. 314093
1980 NYSDOC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York





TO RTE. 9
HUDSON VIEW DRIVE
TO RTE. 90

WOODS

WOODS
DUMP PERIMETER
180

WOODS

STONE DAM

CREEK FLOW

TOP OF DUMP
200
APPROX. FILL ZONE

DUMP

210

220
BASEBALL FIELD

230

240

RECREATION DRIVE

WHITE GOULD HOUSE

MWHR-3-9
189.02

MWHR-3-10
200.39

MWHR-3-11
200.29

MWHR-3-8
246.28

DIRT ROAD

STREAM

CULVERT

LEGEND

- Monitoring well location
(Groundwater elevation in ft. approx. USGS datum)
- Groundwater contour line
Contour interval 10 feet
(dashed line indicates inferred contour)

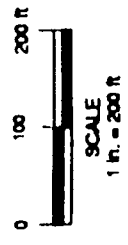
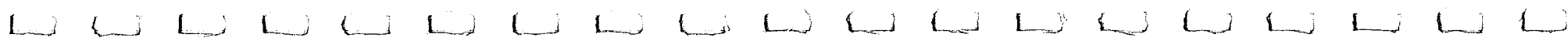


FIGURE 4-6
AREA 3
GROUNDWATER CONTOUR MAP
HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC I.D. No. 314083
1980 NYSDEC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York



gradient varies since the upgradient well is located on a small ridge overlooking the entire area. The ground close to the base of the higher relief area is nearly level for approximately 800 ft, then drops off to the streambed near the western edge of the landfill.

Groundwater flow direction was calculated using the monitoring wells as reference points. All groundwater was identified at or near the bedrock surface and no confining conditions were encountered during drilling and sampling. Based on the reference points used to triangulate groundwater flow, the piezometric surface drops just over 57 ft from one end to the other.

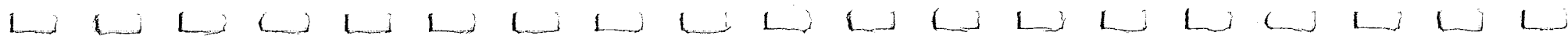
At 6% the overall hydraulic gradient is less than the overall surface gradient. Groundwater flow is to the northwest. This is aided by the flow of the creek and the increasingly downward surface grade in the northerly direction. These topographic conditions are isolated and may have a negligible effect on groundwater flow when the whole site is taken into consideration.

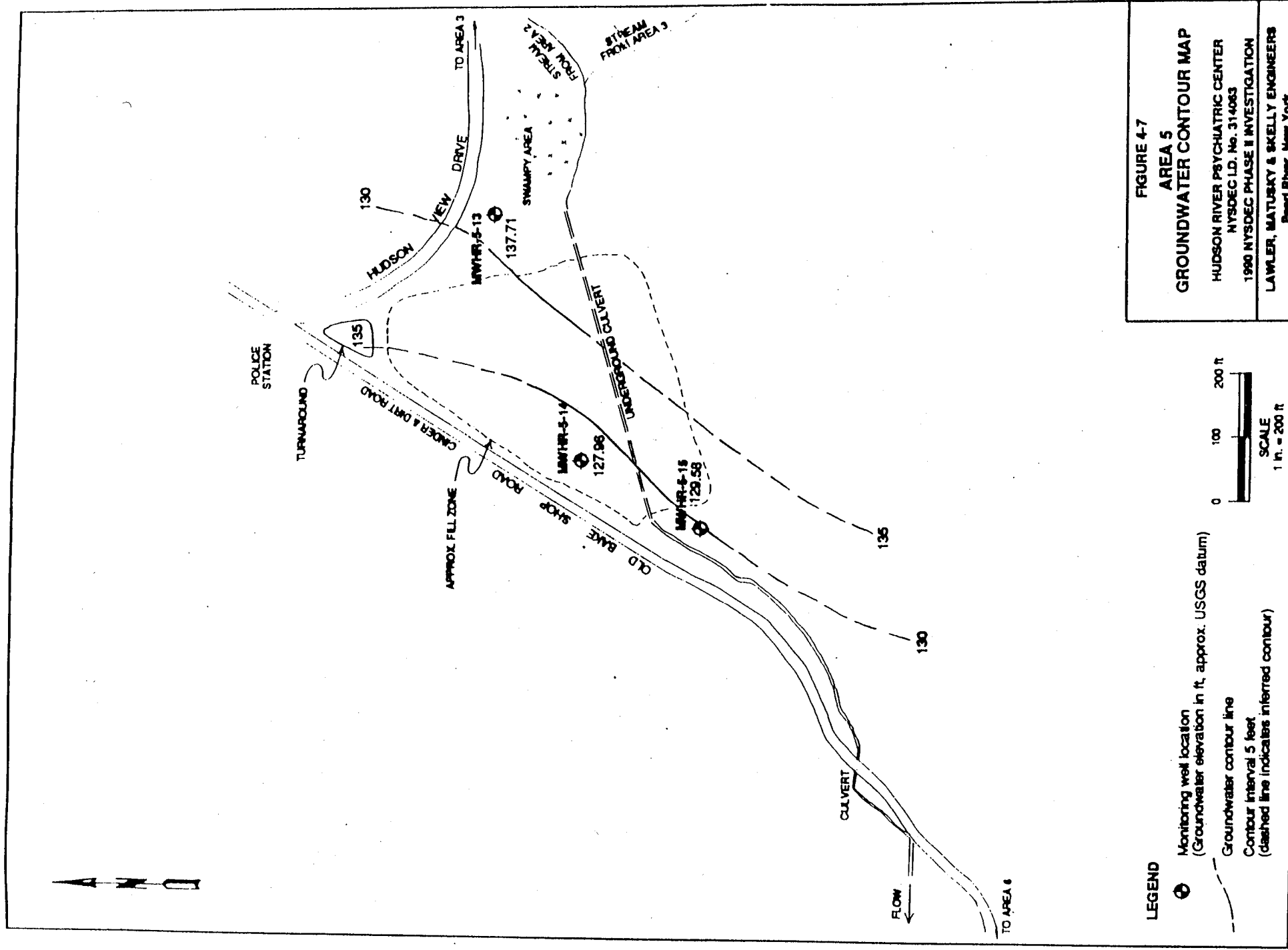
4.4.4 Area 5

Groundwater flow in Area 5 was triangulated using the three monitoring wells installed during the Phase II investigation. These points are aligned in such a way that a narrow area of the fill zone falls within the contoured interval; however, the flow direction in the upper saturated zone is generally westerly (Figure 4-7).

The overall surface and hydraulic gradients across the area are relatively low at 2.9% and 2.2%, respectively.

Surface water from the stream is channeled from the upgradient side of the fill and is directed into the culvert that was installed through the fill zone. The average pitch of the culvert is 0.7% through the fill zone and the length of the drainage culvert is approximately 500 ft from inlet to outlet. Groundwater flow in Area 5 is influenced less by the immediate topographic and surface water conditions than it is at some of the other areas on the site.





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4.4.5 Area 6

Groundwater flow direction in Area 6 was calculated using the three monitoring wells (MWHR6-16, -17, -19) installed on the site as well as several points along the adjacent stream (Figure 4-8). These points were located in areas where the stream had a swampy characteristic that would indicate a more consistent groundwater elevation near the surface. These surface water elevations were tied in with the water elevations in the wells and the final groundwater contour calculations were made.

The overall gradient from upgradient monitoring well MWHR6-16 to the downgradient-most sediment location (SDHR6-11E) is approximately 2%. Overall groundwater flow direction is in the westerly direction toward the Hudson River. Locally, the major components of flow are in the west-southwesterly direction toward the lower-lying stream located immediately south of the site and the Hudson River to the west. It is possible that a slight northerly flow component exists just south of the stream. No information is available regarding this possible flow component because the off-site property south of the stream was not investigated. If this northerly flow exists, it would indicate that the stream is the local discharge drainage point.

4.5 OTHER DATA

Tables 4-1 and 4-2 summarize the existing data collected on the HRPC site prior to the Phase II investigation. These data consist mostly of soil, sediment, and surface water sampling data. (The raw data are contained in Appendix K.)

4.5.1 Surface Water Data

The unnamed stream that passes by Area 1 of the HRPC property is a Class B surface water, as classified by the New York State Division of Water Resources (DWR). The unnamed stream discharges to the Hudson River approximately 1 mile upstream of the water supply intake for the City of Poughkeepsie. The other unnamed stream, which flows through Areas 2, 3, 5, and 6, is a Class D surface water. This stream also discharges into the Hudson River.



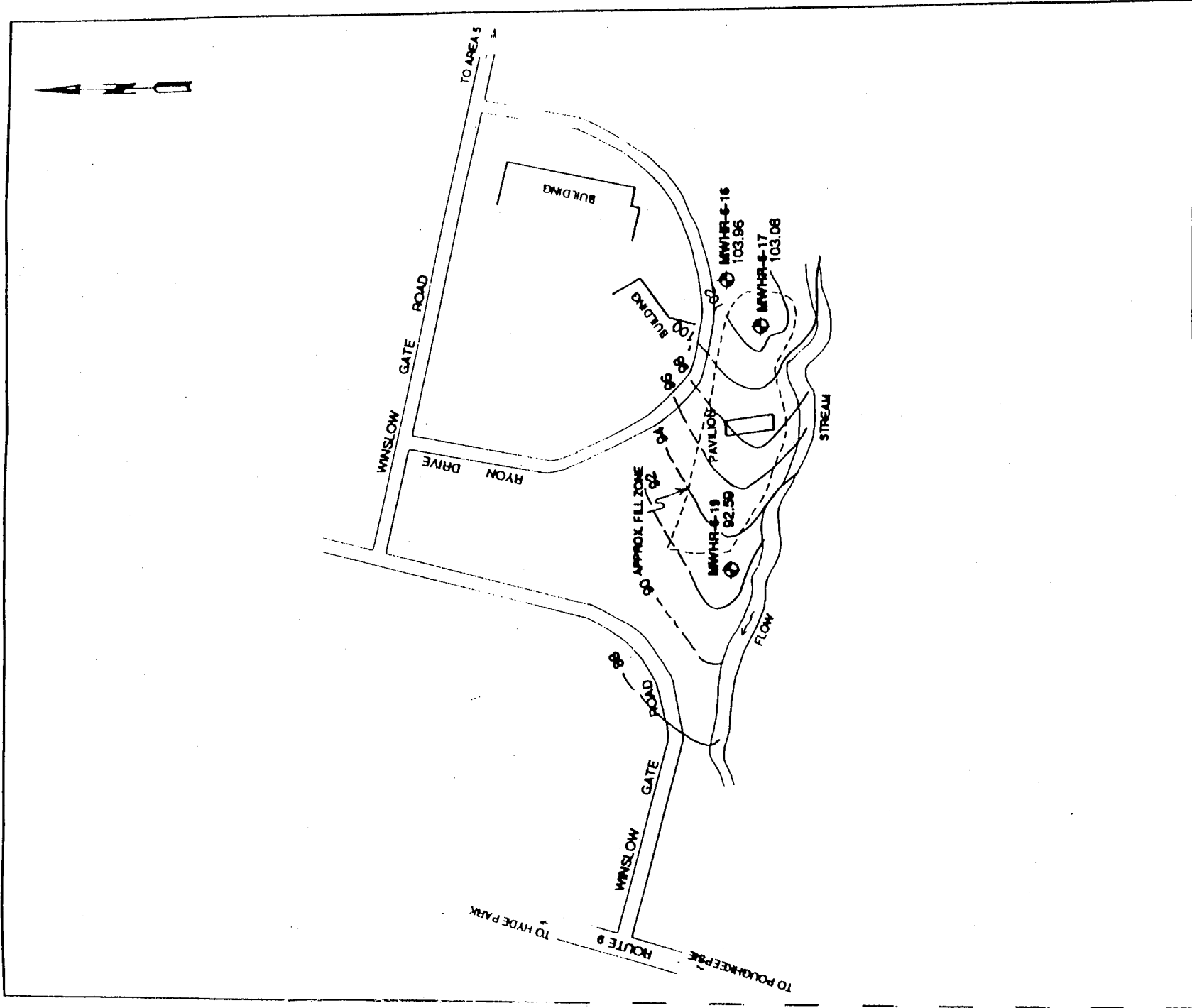


FIGURE 4-8
AREA 6
GROUNDWATER CONTOUR MAP

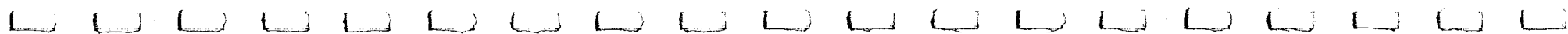
HUDSON RIVER PSYCHIATRIC CENTER
 NYSDEC I.D. No. 314063
 1990 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
 Pearl River, New York

LEGEND

- Monitoring well location
(Groundwater elevation in ft. approx. USGS datum)
- Groundwater contour line
- Contour interval 2 feet
(dashed line indicates inferred contour)

0 100 200 ft
 SCALE
 1 in. = 200 ft

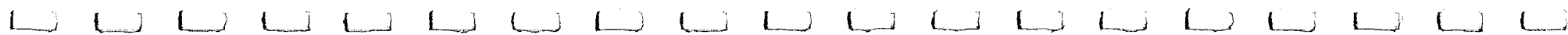


EXISTING 1987 SURFACE WATER DATA
Hudson River Psychiatric Center NYSDC I.D. No. 314063

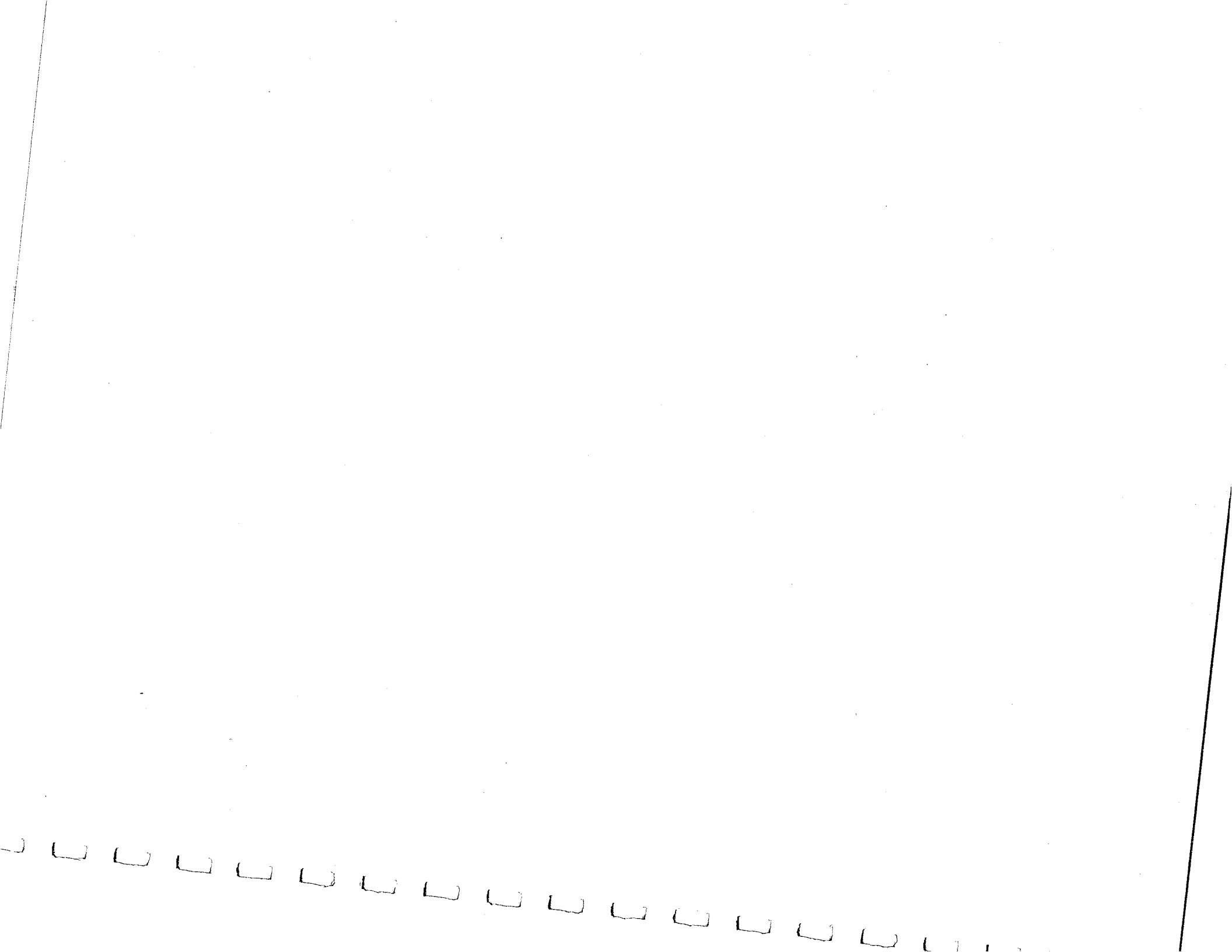
TABLE 4-1

SAMPLE ID: NUS3-	SW-1	SW-2	NYSDC	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	BLK. 1	NYSDC
MATRIX	WATER	WATER	SW STD.	WATER	WATER	WATER	WATER	WATER	WATER	BLANK	SW STD.
SAMPLER	NUS	NUS	CLASS:	NUS	NUS	NUS	NUS	NUS	NUS	NUS	CLASS:
DATE	26 Feb	26 Feb	B (g)	26 Feb	26 Feb	26 Feb	26 Feb	26 Feb	26 Feb	26 Feb	D (g)
VOLATILES											
Acetone	Q	Q	NS	Q	Q	ND	ND	ND	ND	36	NS
Toluene	ND	ND	NS	ND	ND	Q	ND	ND	ND	Q	NS
SEMIVOLATILES											
Bis(2-ethylhexyl) phthalate	ND	ND	NS	ND	ND	ND	ND	ND	ND	17	NS
PESTICIDES/PCBs											
4,4'-DDE	ND	ND	0.001	ND	ND	0.061	ND	ND	ND	ND	0.001
4,4'-DDD	ND	ND	0.001	ND	ND	0.051	ND	ND	ND	ND	0.001
4,4'-DDT	ND	ND	0.001	ND	ND	0.011	ND	ND	ND	ND	0.001
METALS											
Aluminum	338 E	20 E	100 (i)	20 E	20 E	612 E	2030 E	20 E	20 E	20 E	NS
Arsenic	Q	Q	NS	Q	Q	Q	Q	Q	Q	Q	NS
Barium	[37]	[12]	NS	[26]	ND	[48]	244	[25]	[41]	ND	NS
Calcium	73,200	68,300	NS	87,100	74,100	93,600	108,000	79,400	91,800	ND	NS
Chromium	ND	ND	395	ND	ND	ND	15	ND	ND	ND	NS
Copper	[11]	ND	23.2	ND	ND	ND	65	ND	ND	ND	NS
Iron	4830	246	300	672	109	4500	145,000	[82]	1680	ND	NS
Lead	9.0	ND	8.7	[2.0]	[3.0]	14	55	[2.0]	[1.0]	ND	NS
Magnesium	10,100	9530	NS	10,800	9860	11,600	13,100	11,900	11,100	ND	NS
Manganese	408	86	NS	220	ND	415	3780	31	507	ND	NS
Mercury	Q	Q	0.20 GV	Q	Q	Q	Q	Q	Q	Q	0.20 GV
Potassium	[1100]	[903]	NS	[2840]	2160	2510	2260	[1280]	[2580]	ND	NS
Silver	ND	ND	0.1 (i)	ND	ND	ND	ND	10	ND	ND	NS
Sodium	39,400	43,400	NS	65,700	71,600 E	49,000 E	50,000 E	44,000 E	49,000 E	Q	NS
Thallium	ND	ND	8.0	ND	ND	ND	ND	ND	ND	[2.0]	20
Vanadium	ND	ND	14	ND	ND	ND	[27]	ND	ND	ND	190
Zinc	29	ND	30	ND	ND	25	298	[13]	ND	[14]	733

All data in ug/l.
 1 - Compound present above the instrument detection limit, but below the contract-specified detection limit.
 (g) - Hardness: 220 mg equivalent CaCO3/l.
 (i) - Ionic.
 (q) - Hardness: 270 mg equivalent CaCO3/l.
 - Compound present above the instrument detection limit, but below the contract-specified detection limit.
 E - Value estimated due to interference.
 Q - Analysis did not pass QA/QC requirements.
 GV - Guidance value.
 ND - Not detected.
 NS - No standard.



4-14B1



EXISTING 1987 SOIL/SEDIMENT DATA SUMMARY Hudson River Psychiatric Center NYSDEC I.D. No. 314063

TABLE 4-2 (Page 2 of 2)

SAMPLE I.D.	NUS3- MATRIX	DATE	METALS									
SED-1	SED-2	SED-3	SED-4	SED-5	SED-6	SED-7	SED-8	SOIL	SOIL	DATA (r)		
880	11,900	9200	5560	12,500	9980	9220	17,300	10,000 - 300,000	6200	35 E	Aluminum	6200
8.9 E	8.5 E	14 E	9.3 E	13 E	38 E	9.4 E	9.8 E	0.6 - 10.0	35 E	Antimony	35 E	67 E
12 E	2 E	8 E	3.7 E	16 E	17 E	4.6 E	5.4 E	1.0 - 40	67 E	Arsenic	316	316
80	[42]	116	104	104	6.4	ND	1.6	100 - 3500	ND	Barium	ND	1.3
ND	ND	ND	ND	ND	ND	ND	1.3	0.1 - 40	ND	Beryllium	ND	3260
ND	ND	ND	ND	ND	105	ND	3260	0.01 - 7	8.2	Cadmium	10,100	14
9470	7920	8230	3400	5620	19,200	16,200	3260	100 - 400,000	ND	Calcium	ND	ND
18	19	ND	ND	ND	105	22	14	5 - 3,000	ND	Chromium	ND	33
[3.8]	ND	ND	31	56	289	175	36,800	1 - 40	63	Cobalt	ND	7820
35	31	ND	ND	50,100	58,900	25,800	36,800	2 - 100	282,000	Copper	107	111
31,700	33,100	53,200	10,800	223	169	228	111	7,000 - 550,000	107	Iron	269	104
32	29	95	99	2160	4740	7630	7820	2 - 200	107	Lead	11760	199
7400	9340	4840	2710	907	6660	413	199	600 - 5,000	3630	Magnesium	11760	199
2040	643	2710	402	907	6660	413	199	100 - 4,000	3630	Manganese	2.6	0.2
0.25	0.17	0.4	0.4	0.3	0.83	1.1	0.2	0.01 - 0.08	2.6	Mercury	ND	[111]
22	28	9.7	ND	ND	26	[111]	[1782]	5 - 1000	ND	Nickel	[1714]	ND
[444]	[679]	[484]	[402]	[2840]	[1190]	[1140]	[1782]	400 - 30,000	ND	Potassium	ND	ND
ND	ND	53	ND	ND	ND	3.2	ND	0.1 - 5	ND	Silver	[1290]	ND
Q	Q	678 E	Q	1550	[11790]	Q	Q	750 - 7,500	1.1 E	Sodium	[126]	26
ND	ND	ND	ND	ND	ND	ND	ND	NS	1.1 E	Thallium	[26]	26
27	23	[13]	[4.0]	84	141	29	104	20 - 500	269	Vanadium	269	104
148	150	150	111	802	794	413	104	10 - 300	269	Zinc	269	104

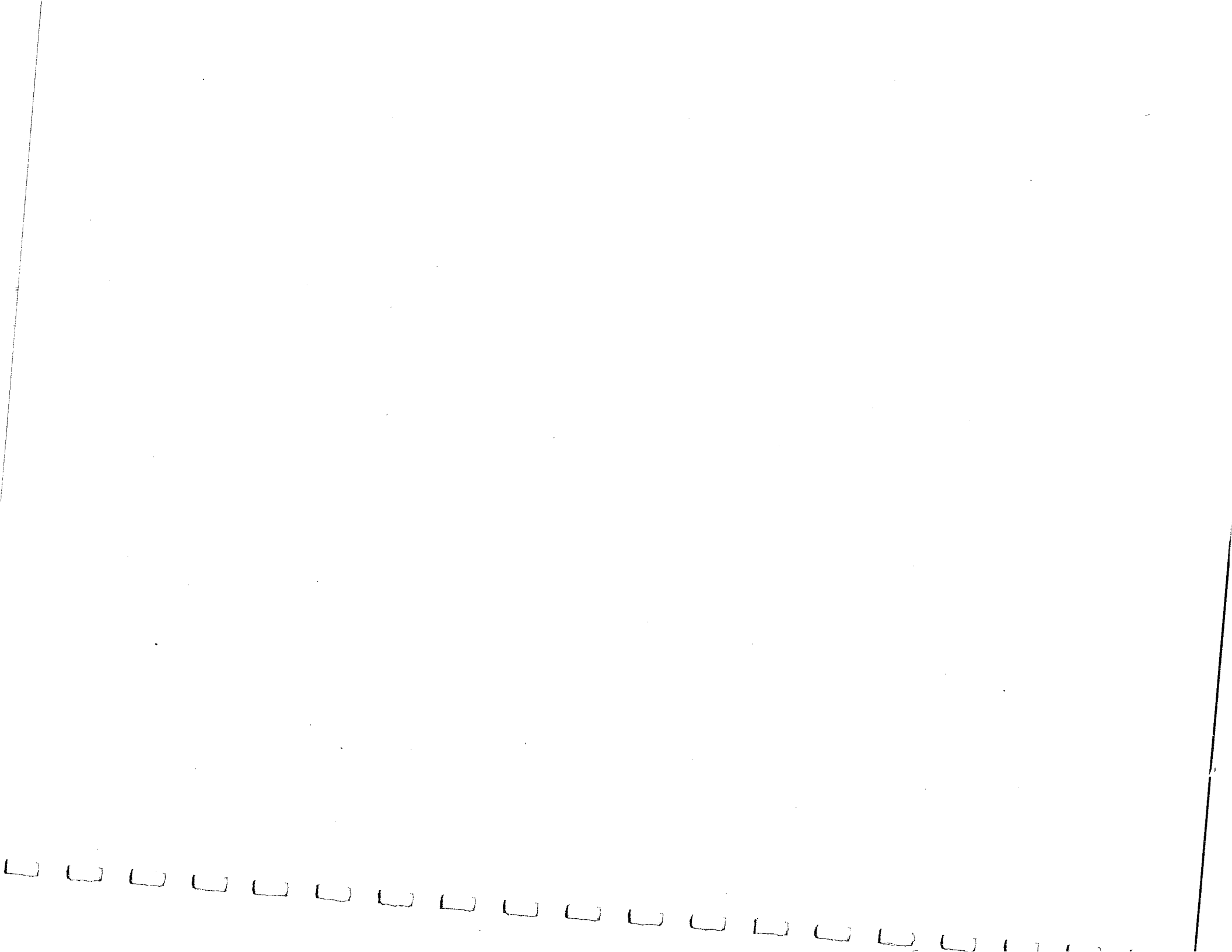
All data in mg/kg.
 (1) - Compound present below quantitation limit, but above instrument detection limit.
 (r) - Ref. 27, Appendix A.
 E - Value estimated due to interference.
 Q - Analysis did not pass QA/QC requirements.
 ND - Not detected.
 NS - No standard.



approximately 1000 ft upstream of the City of Poughkeepsie water supply intake. The City of Poughkeepsie water supply services a population of approximately 30,000 people (Ref. 28, Appendix A). The HRPC had its own intake on the Hudson River (located approximately 500 ft downstream of the unnamed stream near Area 1), but it is now unused. HRPC currently uses City of Poughkeepsie water (Ref. 29, Appendix A). Because of the potential impact of the site's discharge of leachate from the landfills to the streams traversing the sites, which in turn discharge into the Hudson River, assessment of the surface water data is important. The chemicals in the leachate can be carried into the Hudson River and eventually into the drinking water supply of a large population. Therefore, the Class B and D surface water standards were used to evaluate the existing and Phase II data collected on the site.

In February 1987 NUS Corporation, under contract to EPA, conducted an inspection of the HRPC site. During this inspection NUS collected eight surface water samples; the locations are shown on Figure 4-9. Samples SW1 and SW2 were taken downstream and upstream of Area 1, respectively, similar to Phase II sampling stations SWHR1-2 and SWHR1-1. Samples SW3 and SW4 were taken downstream and upstream of Area 5, respectively, similar to Phase II stations SWHR5-4 and SWHR5-3. Samples SW5 and SW8 were taken downstream and upstream of Area 6, respectively, similar to Phase II stations SWHR6-6 and SWHR6-5. Sample SW6 was taken from a pond near the picnic shelter at Area 6 and SW7 was taken from a small stream draining through Area 6 near the picnic shelter. These samples were analyzed for TCL organics and metals. Table 4-1 summarizes the data collected on the surface water samples.

Also shown on the table are the Class B and Class D surface water standards. The surface water standards for some metals are dependent on the hardness of the water, which is calculated based on the concentration of calcium and magnesium (Ref. 30, Appendix A). For consistency, the calcium and magnesium data acquired during the Phase II investigation were used to calculate hardness. The two values used were 220 mg/l for Class B, Area 1, and 270 mg/l for Class D, Area 5 and Area 6. Both of the hardness values indicate hard water (Ref. 31, Appendix A).



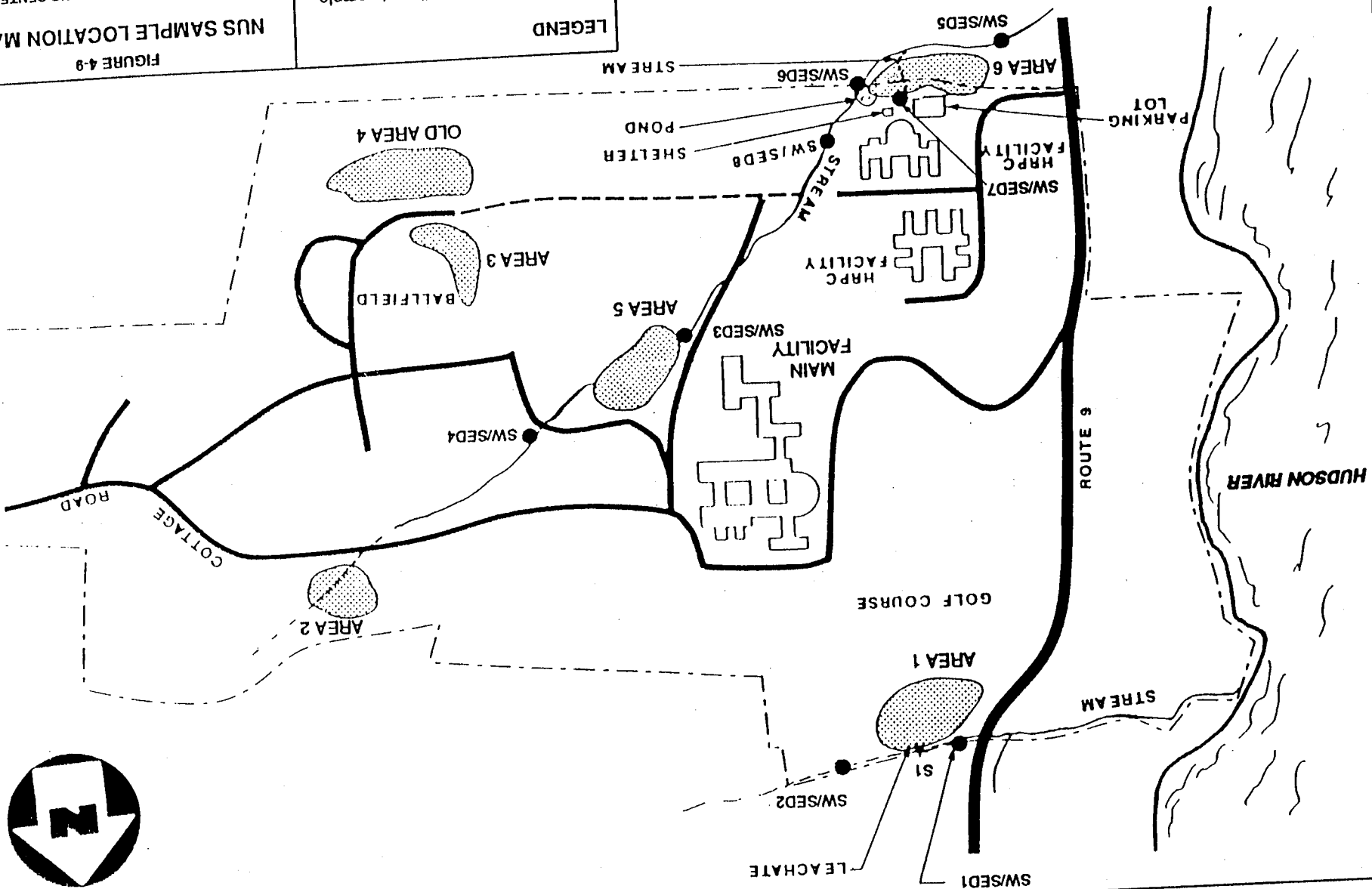
Source: NUS Corporation 1987 Site Inspection Report.

NUS SAMPLE LOCATION MAP
 HUDSON RIVER PSYCHIATRIC CENTER
 NYSDEC I.D. No. 314063
 1990 NYSDEC PHASE II INVESTIGATION
 LAWLER, MATUSKY & SKELLY ENGINEERS
 Pearl River, New York

NOT TO SCALE

● Surface water/sediment sample
 ★ Soil sample

LEGEND





The presence of organic compounds was not confirmed in either of the samples collected near Area 1. Metals were present in both samples, but the downstream sample (SW1) had higher concentrations, particularly of aluminum, iron, and manganese. The aluminum and iron standard (100 and 300 $\mu\text{g/l}$, respectively) was exceeded in the downstream sample. No copper, lead, or zinc were detected in the upstream sample, although they were found in the sample downstream of the landfill. The lead contained in the downstream sample violated the Class B standard of 8.7 $\mu\text{g/l}$. The leachate emanating from the landfill possibly contains quantities of these metals.

Neither sample acquired near Area 5 contained any detectable organic compounds. As in Area 1, metals were detected in both samples, with the downstream sample containing higher concentrations, especially of iron and manganese. Only the iron downstream sample exceeded the Class D surface water standard of 300 $\mu\text{g/l}$. It is apparent that the fill is affecting the quality of the stream, but less so than at Area 1. This is probably a result of the culverting and enclosing of the stream as it passes through the fill area.

Neither of the samples collected from the stream that runs along the southern boundary of Area 6 contained organic compounds. Metals were found in both samples, however, with the downstream sample (SW5) containing higher quantities of aluminum and iron than the upstream sample (SW8). The iron concentration in both the upstream and downstream samples exceeded the Class D standard of 300 $\mu\text{g/l}$. Zinc was detected in the downstream sample but not the upstream sample.

The pond sample near Area 6 (SW6) contained 0.06 $\mu\text{g/l}$ of 4,4'-DDE, 0.05 $\mu\text{g/l}$ of 4,4'-DDD, and 0.01 $\mu\text{g/l}$ of 4,4'-DDT. All three compounds were detected at below the method detection limit (BMDL). All three compounds exceeded the Class D surface water standard (0.001 $\mu\text{g/l}$). High concentrations of metals, particularly iron, aluminum, barium, copper, manganese, and zinc, were observed in this sample. The Class D standards of 300 $\mu\text{g/l}$ for iron and 45.2 $\mu\text{g/l}$ for copper were exceeded.



The small stream near Area 6 contained no organics and no metals exceeding any of the referenced standards. It is apparent that the pond in Area 6 discharges to the stream and is the primary contributor of the chemicals found in the downstream sample at Area 6.

4.5.2 Soil/Sediment Sampling Data

There are no NYSDEC or NYSDOH standards to evaluate either soil or sediment samples; however, the sample data are presented and comments are provided on the quantity of the chemicals present. Background native soil data are provided for comparison purposes (Ref. 27, Appendix A). In February 1987 NUS collected one soil sample and eight sediment samples from the HRPC site. Figure 4-9 shows the locations of these samples and Table 4-2 presents the data collected.

The sediment samples were collected in the same location as the corresponding surface water samples described in Section 4.5.1. Soil sample S1 was a surface soil collected where the leachate discharges from the northern edge of Area 1 (see Figure 4-9). Neither the soil sample nor the sediment samples associated with Area 1 contained any volatile organic compounds at detectable quantities. The soil sample also did not contain any semivolatiles or pesticides/PCBs. The downstream sediment sample (SED1) contained 52,020 $\mu\text{g/kg}$ of polycyclic aromatic hydrocarbons (PAHs); the upstream sample (SED2) contained only 12,940 $\mu\text{g/kg}$. Both samples contained detectable quantities of dibenzofuran (760 and 230 $\mu\text{g/kg}$, respectively), although the SED2 sample was at BMDL levels. PAHs, which are found in conjunction with dibenzofuran, are normally associated with coal tars used for waterproofing materials, pipe coating materials, roads, roofing and sealant materials, and insulation. Whether any of these materials were disposed of on the landfill is unknown, but it is likely because of the increased concentration from upstream to downstream. Naphthalene and naphthalene-like substances were also found in both samples; however, the SED1 sample was approximately 11 times higher in concentration than the SED2 sample (2100 vs 190 $\mu\text{g/kg}$). Naphthalene and naphthalene-like substances are generally associated with diesel fuel. Only one pesticide (4,4'-DDE at BMDL levels in SED2) was detected in any of the samples collected at Area 1. Metals were also found in both samples, but with the exception of the manganese concentration, quantities generally were similar in both samples and in some cases

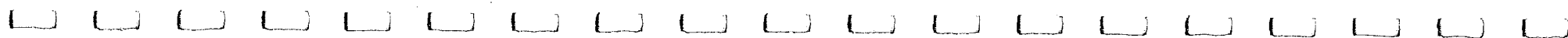


slightly less in the downstream sample. The manganese concentration in SED1 was about three times higher than in SED2 (2040 vs 623 mg/kg). It is apparent that the metals leaching from the landfill (evidenced in the surface water samples) are not necessarily finding their way into the sediments. The soil sample also contained metals; however, except for the iron and manganese concentration, none of the metals were different in quantity from those collected in the sediments.

The Area 5 sediment samples also contained no volatile organics. The two samples (SED3 and SED4) contained similar quantities of PAHs, with the downstream sample containing less than the upstream sample. The downstream sample also contained a small quantity of dibenzofuran, and low levels (BMDL) of phthalate acid esters (PAEs) were found in both sediment samples. PAEs, used in plastics and plasticizers, are common landfill contaminants. 4-Methyphenol, also known as para-cresol, was detected in the upstream sample. Para-cresol is obtained from coal tars. No other semivolatile compounds were detected above the detection limit in either of these sediment samples.

In the pesticide/PCB fraction several pesticides were detected above the detection limit in both samples. These included 4,4'-DDT at 85 $\mu\text{g/kg}$ in SED4, 4,4'-DDD at 6.2 $\mu\text{g/kg}$ in SED3, and 4,4'-DDE at 16 and 46 $\mu\text{g/kg}$ in SED3 and SED4, respectively. Metals, including aluminum, iron, manganese, and zinc, were also found in high quantities in both samples. Except for zinc, the downstream sample had higher metals concentrations than the upstream sample. Although the organics do not appear to be leaching into the culvert from the fill, the metals do appear to be entering the stream in some manner.

The sediment samples collected in the vicinity of Area 6 also contained no volatile organics, with the exception of 9 $\mu\text{g/kg}$ of chlorobenzene in sample SED8. Sample SED5 contained 2890 $\mu\text{g/kg}$ of PAHs; sample SED8 contained no PAHs, indicating a source between the two samples, most likely the pond (from which sample SED6 was taken), which contained 12,000 $\mu\text{g/kg}$ of PAHs. The stream sample from the parking lot (SED7) also contained high (17,900 $\mu\text{g/kg}$) PAHs. PAEs were found in both the pond and downstream sediment samples. No pesticides/PCBs were detected in the upstream sediment sample, but small quantities of pesticides (4,4'-DDE, 4,4'-DDD, and 4,4'-DDT) were found in the pond sample. The small



stream near the picnic area and parking lot contained no pesticides but a very high quantity (1,700,000 µg/kg) of Aroclor 1260. The downstream sediment sample contained only one pesticide, 4,4'-DDE at low levels, but contained Aroclor 1260 at 1600 µg/kg and Aroclor 1248 at 1700 µg/kg. The small stream is the obvious source of the Aroclor 1260; whether the Aroclor 1248 is from a separate source, was misidentified in the sample, or was diluted out of the small stream sample is unknown. It is apparent that a source for PCBs exists in the area; however, since the sample with the high concentration was taken upgradient of the presumed fill area (as shown on Figure 4-9), the source may be unrelated to fill activities. Again, high metals were found in all samples, including the upstream sample. The concentrations of iron, manganese, vanadium, and zinc were all higher in the downstream sample (SED5) than in the upstream sample (SED8). All other metals were similar in concentration in both upstream and downstream samples. The pond sample (SED7) contained high levels of zinc; the small stream sample (SED6) contained very high levels of iron, manganese, vanadium, and zinc. It is apparent that the small stream is the source of the high metals found in the downstream sediment sample.

In summary, the PAHs and metals found in the upstream sample above Area 5 are from another source, possibly either Area 2 or Area 3, and there appears to be little carryover of either PAHs or metals from Area 5 to Area 6.

4.6 PHASE II RESULTS

4.6.1 Site Inspection

The site inspection was conducted from 27 to 29 November 1989. At this time access points for the drill rig, decontamination areas, and other sampling locations were identified and noted. All of the monitoring equipment was calibrated upon arrival at the site and an initial perimeter air monitoring survey was conducted of each area. Upon completion of the air monitoring survey, monitoring well locations and surface water/sediment sampling locations were staked. Soil gas sample points were also located and flagged. Surface waters observed flowing alongside Areas 2 and 3 were not identified in the original work scope. It was later decided that upstream and downstream surface water/sediment samples at these two locations



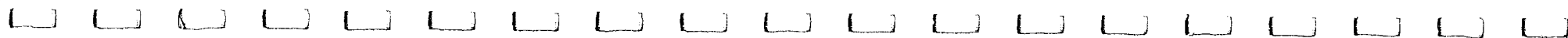
would aid in the assessment. Leachate was observed entering the surface water at four of the five areas. The additional surface water/sediment and leachate samples recommended by LMS on the basis of the site reconnaissance were subsequently added to the work scope. In addition to these extra work scope items, a well along the southern boundary of Area 3 was recommended since Area 4 was no longer under investigation. This well, which was situated between the two areas, would provide data coming off or onto Area 4. The well was subsequently added to the work scope with NYSDEC approval. Appendix B contains the calibration data sheets and the site inspection report for the HRPC site.

On 27 November 1989 LMS and HRPC personnel met to discuss the work plan, health and safety requirements of HRPC, a water supply, and storage facilities. It was agreed that any hydrant on the site could be used by LMS for water and an area was made available to store the vehicles overnight. HRPC also provided LMS with their contractor health and safety plan, which was appended to LMS' HASP. Subsequent to the site inspection discussions were held with on-site HRPC personnel regarding the location of underground utilities. The underground utility locators were also contacted to determine the location of major public utilities (AT&T, Central Hudson Gas & Electric, New York Telephone, etc.).

After the first round of samples was collected, NYSDEC requested that LMS develop a work scope to collect additional sediment samples at Area 6 and soil, surface water, and sediment samples from Area 4. During the reconnaissance of Area 4, NYSDEC discovered that the area described in the work scope as Area 4 was not a fill area at all. The actual fill area was southwest of the work scope location. At that time sample locations were identified and samples from Area 4 were collected and analyzed.

4.6.2 Geophysics Data

The geophysics survey for HRPC was conducted by INTEX in two sessions. Areas 1, 5, and 6 were surveyed from 11 to 15 December 1989; Areas 2 and 3 from 26 to 28 December. The raw data report received from INTEX is contained in Appendix D, and the results are discussed in Section 3.3.



4.6.3 Soil Gas Data

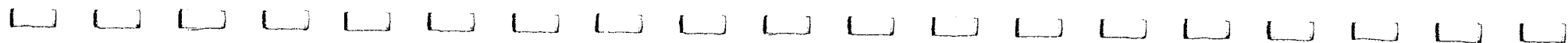
The soil gas survey took place from 3 to 11 December 1989. The data collected as part of the Phase II investigation are discussed in Section 3.4. Where soil gas chemicals were quantified, the data are discussed in conjunction with the groundwater data. Appendix E contains the raw data report.

4.6.4 Subsurface Soil Data

One soil sample was collected from one boring during the drilling of the monitoring wells at the site. The boring, MWHR3-11, was located in Area 3 and the sample was collected from the 6- to 10-ft depth and analyzed for the full TCL organic and inorganic list. The results are shown in Table 4-3 along with background soil data for comparison purposes (Ref. 27, Appendix A). The raw data are contained in Appendix I and the quality assurance/quality control (QA/QC) report is presented in Appendix J.

Volatile organics were detected in the soil from the boring at a total concentration of 207 $\mu\text{g/kg}$. The chemicals found include acetone at 88 $\mu\text{g/kg}$, total xylenes at 100 $\mu\text{g/kg}$, tetrachloroethene (TETRA) at 7 $\mu\text{g/kg}$, toluene at 8 $\mu\text{g/kg}$, and chlorobenzene at 6 $\mu\text{g/kg}$. Although the two soil gas points (SGHR3-25 and -26) located near MWHR3-11 contained no detectable quantities of volatiles, other soil gas points in Area 3 contained appreciable amounts of acetone, benzene, and xylenes. The sample also contained 1781 $\mu\text{g/kg}$ of tentatively identified compounds (TICs) consisting of unknown aromatics and a substituted benzene.

Semivolatile organics were detected in the soil sample. These compounds, which consisted of polycyclic aromatic hydrocarbons (PAHs), naphthalene-like substances, phthalate acid esters (PAEs), and 4-methylphenol, were detected in the sediments collected during the previous investigation by NUS. Bis(2-ethylhexyl)phthalate (B2EHP) was found at the highest concentration, 2800 $\mu\text{g/kg}$, which exceeded the calibration range of the GC. TICs, mostly unknowns, totaling 144,300 $\mu\text{g/kg}$ were also found in the sample.



1990 BORING DATA SUMMARY
Hudson River Psychiatric Center NYSDEC I.D. No. 314063

TABLE 4-3

PARAMETER		PARAMETER		PARAMETER	
MWHR		MWHR		MWHR	
3-11		3-11		3-11	
NATIVE SOIL		TYPICAL		RANGE (ppm)(r)	
CONCS.		CONCS.		CONCS.	
VOLATILES					
Acetone	88				
Tetrachloroethene	7				
Toluene	8 b)				
Chlorobenzene	6				
Xylenes (total)	100				
Tentatively Identified Compounds					
Unknown aromatic	1721 (3)				
Substituted benzene	60				
SEMIVOLATILES					
4-Methylphenol	550				
2-Methylnaphthalene	700				
Phenanthrene	240				
Di-n-butylphthalate	760				
Bis(2-ethylhexyl)phthalate	28000 e				
Tentatively Identified Compounds					
Unknown	29800 a) (3)				
Unknown acid	8100				
Unknown aromatic	17700 (3)				
Unknown alkane	76700 (12)				
Substituted alkane	12000				
PESTICIDES/PCBs					
Aroclor 1242	990				
Aroclor 1254	1000				
All data in ug/kg.					
() - Number of unknown compounds in total.					
a - Suspected aldiol condensation product.					
b - Found in associated blanks.					
c - Concentration exceeds GC/MS calibration range.					
d - Estimated concentration; compound present below quantitation limit.					
e - All data in mg/kg.					
+ - Correlation coefficient for the metal standard addition is <0.995.					
(r) - Ref. 27, Appendix A.					
B - Value is less than the contract-required detection limit but greater than the instrument detection limit.					
F - Serial dilution percent difference is high.					
R - Duplicate analysis not within control limits.					
N - Spiked sample recovery is not within control limits.					
W - Post-digestion spike out of control limits; sample absorbance is less than 50% of spike absorbance.					
ND - Not detected at analytical detection limit; see Appendix I for detection limit.					
NS - No standard.					
METALS					
Aluminum	29700 F	30032			
Antimony	ND				
Arsenic	8.3 R N +	5.3			
Barium	83.1 F	62.5 B			
Beryllium	1.8 B	1.4 B			
Cadmium	ND				
Calcium	10800 F R	8614			
Chromium	47.9	46.2			
Cobalt	31.1	29.1			
Copper	140 F R N	111			
Iron	96900 F	83393			
Lead	181	163			
Magnesium	12500 F	13600			
Manganese	1050 F R	827			
Mercury	1.2 R	1.6			
Nickel	57.9	66.3			
Potassium	1610 B	921 B			
Selenium	ND N W	ND			
Silver	4.8 N	3.1			
Sodium	ND	ND			
Thallium	ND W	ND			
Vanadium	36.9	32.7			
Zinc	710 F R N	530			
Cyanide	ND	48.5			
Percent solids (%)	48.5				



Two PCBs - Aroclor 1242 at 990 µg/kg and Aroclor 1254 at 1000 µg/kg - were detected in the soil sample collected from MWHR3-11. These PCBs are different from the Aroclors detected in the previous investigation by NUS. The values do not represent high levels of contamination (EPA, NYSDEC, and other regulatory agencies routinely use 10,000 to 25,000 µg/kg as a cleanup level) (Refs. 32 and 33, Appendix A). The level is also much lower than the NYSDEC definition of PCB hazardous waste, >50,000 µg/kg (Ref. 33, Appendix A).

Metals detected in the soil sample collected from MWHR3-11 were within or less than the range of metals found in background native soils, except for copper, magnesium, mercury, and zinc. Mercury at 1.2 mg/kg was about two orders of magnitude higher than that found in native soils (0.01 to 0.08 mg/kg). Cyanide was not detected in the sample.

EP toxicity metals were requested to be run on this soil sample. However, since the data were found to be noncompliant and not usable, they are not discussed here. The QA/QC report can be found in Appendix J.

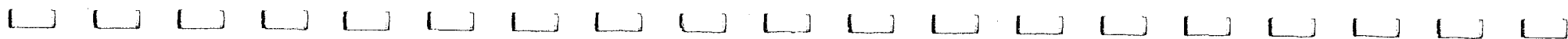
4.6.5 Surface Soil Sampling Data

Only one shallow soil sample, taken during the second sampling event at Area 4 (SSHR4-18E), was collected as part of the Phase II investigation. The results are presented in Table 4-4 and shown on Figure 4-10. (Note that in Appendix J the results are listed under SDHR4-18E.)

No volatiles detected in the sample were not also found in the method blank; also, no TICs were detected.

Two PAEs detected in the soil sample from Area 4 were also detected at BMDL levels. Phthalates are typically found in plastics and plasticizers and are therefore very common in landfills. Several TICs were found, but with the exception of an unknown aliphatic hydrocarbon, all compounds detected were also found in the method blank.

No pesticides or PCBs were detected in the soil from Area 4.



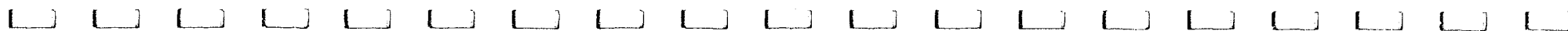
1990 ADDITIONAL SOIL SAMPLE DATA SUMMARY

Hudson River Psychiatric Center NYSDEC I.D. No. 314063

TABLE 4-4 (Page 1 of 2)

PARAMETER	4-18E	4-18E	RE
SAMPLE No. SSHR-	4-18E		RE
VOLATILE ORGANICS (ug/kg)			
Methylene chloride	11 bj	NR	
Acetone	ND	NR	
Benzene	ND	NR	
Chlorobenzene	ND	NR	
Tentatively Identified Compounds			
SEMIVOLATILES (ug/kg)			
Butyl benzyl phthalate	ND	230 j	
Bis(2-ethylhexyl)phthalate	ND	260 j	
Tentatively Identified Compounds			
Unknown	1500 jb	2570 bj (3)	
2-Pentanone,			
4-hydroxy-4-meth	17000 abj	13000 abj	
Unknown hexanedioic acid est	ND	1500 bj	
Unknown aliphatic hydrocarbo	ND	1830 j (2)	
PESTICIDES/PCBs (ug/kg)	ND	NR	

- () - Number of unknown compounds in total.
a - Suspected aldel condensation product.
b - Found in associated blank.
j - Estimated concentration; compound present below quantitation limit.
ND - Not detected at analytical detection limit; see Appendix I for detection limit.
NR - Not run.
RE - Reextracted analysis.



4-22A2

TABLE 4-4 (Page 2 of 2)
 1990 ADDITIONAL SOIL SAMPLE DATA SUMMARY
 Hudson River Psychiatric Center NYSDEC I.D. No. 314063

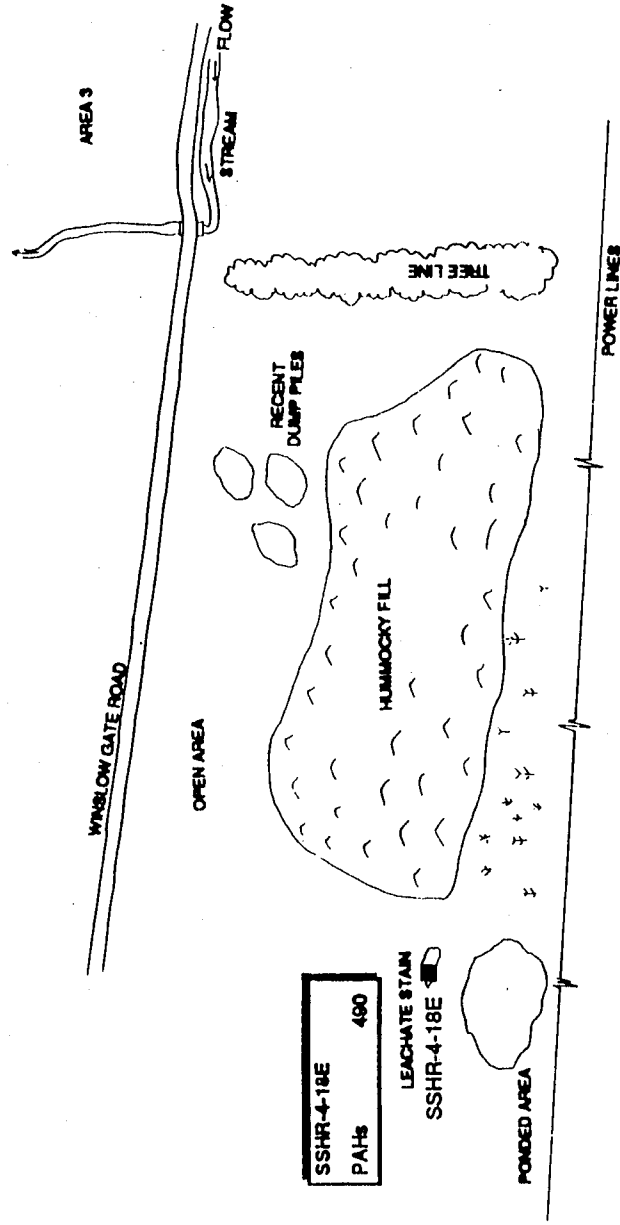
PARAMETER	SSH	4-18E	EP TOX STD.
EP TOX METALS (mg/l)			
Arsenic, total	< 1		5
Barium, total	< 10		100
Cadmium, total	< 0.1		1
Chromium, total	< 1		5
Lead, total	< 1		5
Mercury, total	< 0.04		0.20
Selenium, total	< 0.1		1
Silver, total	< 1		5

< - Compound not detected at method detection limit.

NATIVE SOIL	CONCS.	TYPICAL	RANGE (ppm) (r)	PARAMETER
	SSH	4-18E		METALS (mg/kg)
Aluminum	10500		10,000 - 300,000	
Antimony	ND		0.6 - 10	
Arsenic	4.8		1 - 40	
Barium	72.4		100 - 3,500	
Beryllium	ND		0.1 - 40	
Cadmium	3.6		0.01 - 7	
Calcium	3840		100 - 400,000	
Chromium	12.2		5 - 3,000	
Cobalt	ND		1 - 40	
Copper	32.6		2 - 100	
Iron	32100		7,000 - 550,000	
Lead	37.9 SA		2 - 200	
Magnesium	5300		600 - 6,000	
Manganese	388		100 - 4,000	
Mercury	ND		0.01 - 0.08	
Nickel	21.4		5 - 1,000	
Potassium	1220		400 - 30,000	
Selenium	ND W		0.1 - 2.0	
Silver	ND		0.1 - 5	
Sodium	ND		750 - 7,500	
Thallium	ND		NS	
Vanadium	21.2		20 - 500	
Zinc	118		10 - 300	
Cyanide	ND		-	

(r) - Ref. 27, Appendix A.
 W - Post-digestion spike out of control limits; sample absorbance is less than 50% of spike absorbance.
 ND - Not detected at analytical detection limit; see Appendix 1 for detection limit.





SSH-4-18E
PAHs 490

LEACHATE STAIN
SSH-4-18E

LEGEND

- Soil sample location
- All organic soil results in $\mu\text{g/kg}$
- PAHs = Polycyclic aromatic hydrocarbons

NOT TO SCALE

FIGURE 4-10

AREA 4

SOIL SAMPLE

CONTAMINANT CONCENTRATIONS

HUDSON RIVER PSYCHIATRIC CENTER

NYSDEC LD. No. 314083

1980 NYSDEC PHASE II INVESTIGATION

LAWLER, MATURSKY & SKELLY ENGINEERS

Pearl River, New York



All metals found in the soil were either less than or within the range of native soils. Eight of the metals analyzed for were not detected. Cyanide was not detected in the sample.

EP toxicity metals were run on the soil sample collected from Area 4. None of the metals were found above EP toxicity standards.

4.6.6 Monitoring Well Data

The groundwater data collected as part of the Phase II investigation are presented in Table 4-5; the raw data are contained in Appendix I, the QA/QC report in Appendix J. *Note:* In the raw data reports the number referring to the area designation was transposed with the number indicating the well number. The tables and figures reflect the correct numbering, i.e., the first number indicates area, the second, well number. Also shown on the table are the groundwater standards (where violations are noted, the standard is cited in the text) and natural ambient groundwater concentrations. Wells were installed at each of the five areas on the site; consequently, each area is considered separately for assessment purposes.

4.6.6.1 *Area 1.* Four wells, one upgradient and three downgradient, were installed at Area 1, the golf course. Figure 4-11 summarizes the pertinent data collected from this area.

Methylene chloride was the only TCL volatile detected in the upgradient well, MWHR1-1. Its 11 µg/l concentration exceeded the groundwater standard of 5 µg/l; however, because it was also found in the method blank its presence is thought to be due to laboratory contamination. MWHR1-2 also had small quantities of methylene chloride and no other volatiles. MWHR1-4, the well located nearest the northeast corner, had the highest concentration (22 µg/l) of volatiles - benzene, toluene, and xylene (BTX) and chlorobenzene - of any of the downgradient wells. BTX is generally associated with gasoline products; chlorobenzene is usually used as a solvent. The chlorobenzene value of 15 µg/l also exceeded the groundwater standard of 5 µg/l, and the benzene value (2 µg/l) exceeded the groundwater standard of none detected. None of these compounds were detected in the soil gas point nearest the well (SGHR1-9); however, concentrations of BTX were found in SGHR1-5 and chlorobenzene was found in SGHR1-3. During the site reconnaissance a strong petroleum-



TABLE 4-5 (Page 1 of 5)
 1990 MONITORING WELL DATA SUMMARY
 Hudson River Psychiatric Center NYSDEC I.D. No. 314063

VOLATILES													
SAMPLE No.: MWHR-													
1-1													
1-2													
1-3													
4-12													
1-4													
2-5													
2-6													
2-7													
3-8													
3-9													
FIELD													
TRIP													
BLANK													
NYSDEC GW CLASS GA STANDARD													
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VOLATILES													
SAMPLE No.: MWHR-													
3-9	MS	MSD	3-10	3-11	5-13	5-14	5-15	6-16	6-17	6-19	CLASS GA STANDARD		
7 b	6 b	10	ND	ND	ND	ND	ND	ND	ND	ND	5.0	5.0	50
Methylene chloride	1,2-Dichloroethene (total)												
Compounds	Chlorodifluoromethane												
NR	NR	19 b	23 b	19 b	10 b	10 b	22 b	13 b	23 b	50			

All data in ug/l.
 b - Found in associated blanks.
 ! - Estimated concentration; compound present below quantitation limit.
 MS - Matrix spike.
 ND - Not detected at analytical detection limit; see Appendix I for detection limit.
 NR - Not run.
 MSD - Matrix spike duplicate.



TABLE 4-5 (Page 2 of 5)
 1990 MONITORING WELL DATA SUMMARY
 Hudson River Psychiatric Center NYSDEC I.D. No. 314063

Hudson River Psychiatric Center NYSDEC ID. NO. 314003													
SEMIVOLATILES													
SAMPLE No.: MWHR-													
1-1	1-2	1-3	4-12	1-4	2-5	2-6	2-7	3-8	3-9	FIELD	TRIP	CLASS GA	STANDARD
(Blind Dup. of 1-31)													
ND	ND	ND	ND	9.1	ND	ND	ND	ND	ND	ND	ND	50	50
ND	ND	ND	ND	11.1	ND	ND	ND	ND	ND	ND	ND	50	50
ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	50
ND	ND	ND	ND	14.1	ND	ND	ND	ND	ND	ND	ND	50	50
ND	ND	ND	ND	8.1	ND	ND	ND	ND	ND	ND	ND	50	50
ND	ND	ND	ND	13.1	ND	ND	ND	ND	ND	ND	ND	50	50
ND	ND	ND	ND	71.1	ND	ND	ND	ND	ND	ND	ND	50	50
ND	ND	ND	14 abj	14 abj	ND	ND	ND	ND	ND	ND	ND	50	50
ND	15 abj	ND	80.1 (3)	ND	ND	ND	ND	ND	ND	ND	ND	50	50
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ND	ND	ND	ND	ND	ND								



1990 MONITORING WELL DATA SUMMARY
Hudson River Psychiatric Center NYSDEC I.D. No. 314063

TABLE 4-5 (Page 3 of 5)

SAMPLE No.: MWHR- NYSDEC GW CLASS GA STANDARD									
OTHER PARAMETERS	Conductivity (umhos/cm)	692	559	622	886	375	1130	835	596
	Total dissolved solids (ppm)	390	5330	360	366	228	727	529	326
	Total suspended solids (ppm)	25	1030	6.6	7.0	27	32	9.1	3.3
	Chemical oxygen demand (ppm)	5.8	34	<5	<5	19	16	7.3	11
	pH (std. units)	8.2	7.5	6.9	6.9	7.2	7.0	7.1	6.8
SAMPLE No.: MWHR- NYSDEC GW CLASS GA STANDARD									
OTHER PARAMETERS	Conductivity (umhos/cm)	1350	796	740	1350	1190	732	653	717
	Total dissolved solids (ppm)	695	493	455	775	663	407	400	437
	Total suspended solids (ppm)	38	77	9.7	250	130	3.4	15	29
	Chemical oxygen demand (ppm)	59	9.2	8.1	10	14	9.4	5.0	7.1
	pH (std. units)	6.5	6.9	7.0	7.1	7.1	7.6	7.3	7.3
> - Compound present below quantitation limit. NS - No standard.									



TABLE 4-5 (Page 4 of 5)

1990 MONITORING WELL DATA SUMMARY

Hudson River Psychiatric Center NYSDC I.D. No. 314063

SAMPLE No.												METALS											
MWHR-1-1												1-2											
1-3												1-4											
1-5												1-6											
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GV - Guidance value.
ND - Not detected at analytical detection limit;
see Appendix I for detection limit.

NR - Not run.
NS - No standard.
SA - Value determined by the method
of standard addition.

All data in ug/l.
- Sum of iron and manganese not to exceed 500 ug/l.
- Ref. 27, Appendix A.
- Value is less than the contract-required detection limit,
but greater than the instrument detection limit.
- Value estimated due to interference.
- Spiked sample recovery is not within control limits.
- Post-digestion spike out of control limits; sample
absorbance is less than 50% of spike absorbance.



TABLE 4-5 (Page 5 of 5)

1990 MONITORING WELL DATA SUMMARY

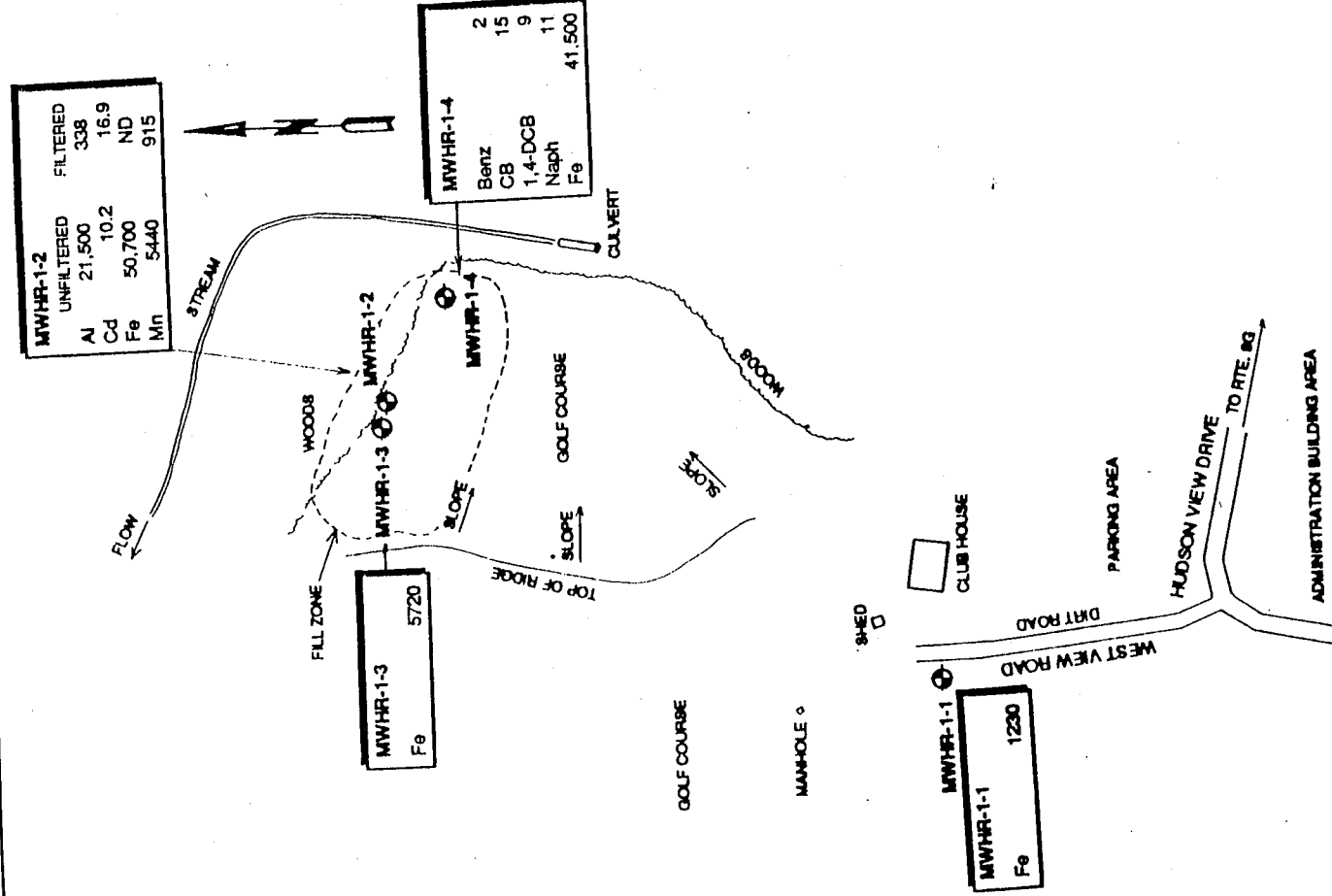
Hudson River Psychiatric Center NYSDEC I.D. No. 314063

SAMPLE No.	MWHR	METALS										NYSDEC CLASS GA	NATURAL AMBIENT GW
		3-9	DUP	3-10	3-11	5-13	5-14	5-15	6-16	6-17	6-19		
Aluminum	ND	ND	927	340	5920	5920	ND	ND	335	ND	799	NS	<5.0 - 1000
Antimony	ND	ND	ND W	ND W	ND	ND	ND	ND	ND	ND	ND W	3.0 GV	.
Arsenic	11.6	10.8	ND	ND	ND	ND W	ND W	ND W	ND W	ND	ND	25	<1.0 - 30.0
Barium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	233	1000	10.0 - 500
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.0 GV	<10.0
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10	<1.0
Calcium	143000	145000	128000	117000	157000	109000	107000	77800	114000	99400	96800	NS	1000 - 150000
Chromium	ND	ND	ND	ND	ND	11.0	ND	ND	ND	ND	ND	50	<1.0 - 5.0
Cobalt	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	<10
Copper	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	200	<1.0 - 30
Iron	32700	32900	1850	589	9820	10700	108	144	886	907	1610	300 *	10 - 10000
Lead	ND	ND	ND W	ND W	6.7	5.9 SA	ND W	ND W	ND W	ND W	ND W	25	<15
Magnesium	25100	25200	16700	15500	18100	18200	15600	13700	12400	13800	17800	35000 GV	1000 - 50000
Manganese	1170	1180	832	49.8	430 E	2190	1310	158	630	436	150	300 *	<1.0 - 1000
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	<1.0
Nickel	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	<10 - 50
Potassium	31600	31400	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	1000 - 10000
Selenium	ND N	ND N	ND	ND	ND W	ND W	ND W	ND W	ND W	ND W	ND W	10	<1.0 - 10
Silver	ND N	ND N	ND	ND	ND	ND	ND	ND	ND	ND	ND	50	<5.0
Sodium	56400	57100	18200	17300	112000	110000	112000	56100	12700	16500	33000	20000	500 - 120000
Thallium	ND W	ND W	ND W	ND W	ND W	ND W	ND W	ND W	ND W	ND W	ND W	4.0 GV	.
Vanadium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	<1.0 - 10
Zinc	28.3	21.6	ND	ND	36.7	44.7	ND	ND	ND	ND	ND	300	<10 - 2000
Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	100	.

All data in ug/l.
 - Sum of iron and manganese not to exceed 500 ug/l.
 - Ref. 27, Appendix A.
 - Value estimated due to interference.
 - Spiked sample recovery is not within control limits.
 - Post-digestion spike out of control limits; sample absorbance is less than 50% of spike absorbance.

GV - Guidance value.
 ND - Not detected at analytical detection limit;
 see Appendix I for detection limit.
 NS - No standard.
 SA - Value determined by the method of standard addition.





LEGEND

⊕ Groundwater monitoring well location

All concentrations in $\mu\text{g/l}$

Benz = Benzene
 CB = Chlorobenzene
 1,4-DCB = 1,4-dichlorobenzene
 Naph = Naphthalene
 Al = Aluminum
 Cd = Cadmium
 Fe = Iron
 Mn = Manganese

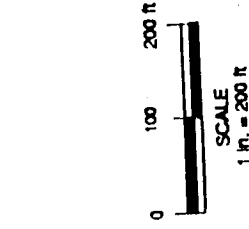


FIGURE 4-11
 AREA 1

SELECTED GROUNDWATER
 CONTAMINANT CONCENTRATIONS
 HUDSON RIVER PSYCHIATRIC CENTER
 NYSDC I.D. No. 314083
 1989 NYSDC PHASE II INVESTIGATION
 LAWLER, MATUSKY & SKELLY ENGINEERS
 Pearl River, New York



like odor was noted in this general vicinity, further indicating the presence of a gasoline or other petroleum product. TICs, ranging from a high of 29 µg/l in MWHR1-4 to a low of 9 µg/l in MWHR1-2, were also found in each well. TICs consisted of chlorodifluoromethane (CDFM), which was also found in the method blank, indicating possible laboratory contamination, and an unknown.

Semivolatiles were detected in only one well, MWHR1-4. The semivolatiles detected were 1,4-dichlorobenzene (1,4-DCB) at 9 µg/l and naphthalene at 11 µg/l. The 1,4-DCB, which exceeded the groundwater standard of 4.7 µg/l, is used chiefly as an insecticidal fumigant and in mothballs. The naphthalene value exceeded the NYSDEC guidance value of 10 µg/l. Naphthalene and naphthalene-like substances are usually a component of diesel fuel and are also used in mothballs. TICs, detected in both MWHR1-3 and MWHR1-4, totaled 15 µg/l and 120 µg/l, respectively.

~~No pesticides or PCBs were detected in any of the monitoring wells at Area 1.~~

The total concentrations of all organics detected in the wells at Area 1 are summarized below:

	MWHR1-1	MWHR1-2	MWHR1-3	MWHR1-4
TCL volatiles	11	4	0	22
TIC volatiles	26	9	25	29
TCL semivolatiles	0	0	0	20
TIC semivolatiles	0	0	15	120
Pesticides/PCBs	0	0	0	0
Total	37	13	40	191

Note that only MWHR1-4 exceeded the groundwater standard total of 100 µg/l of principal organic contaminants and unspecified organic contaminants (POCs and UOCs).

The upgradient background well (MWHR1-1) had high concentrations of iron and sodium. The iron value (1230 µg/l) exceeded the groundwater standard of 300 µg/l, and the sodium



value (49,300 $\mu\text{g/l}$) exceeded the groundwater standard of 20,000 $\mu\text{g/l}$. All of the other metals were within the range of typical groundwater (Ref. 27, Appendix A). MWHR1-2, the downgradient well nearest the northwest corner, had the highest iron content (50,700 $\mu\text{g/l}$) of any of the wells. The filtered sample, however, contained no iron, indicating that the iron was in suspended form. Cadmium exceeded the groundwater standard of 10 $\mu\text{g/l}$ in both the filtered (16.9 $\mu\text{g/l}$) and unfiltered (10.2 $\mu\text{g/l}$) samples from this well. Manganese exceeded the standard of 300 $\mu\text{g/l}$ in both samples, with the unfiltered sample (5440 $\mu\text{g/l}$) containing six times as much manganese. Although no standard exists, aluminum was found outside the range for natural groundwater, at 21,500 $\mu\text{g/l}$. Chromium, copper, and nickel values, although less than the standard (of there is no standard), were also higher than the range for natural background groundwater (Ref. 27, Appendix A). For all these metals except chromium, the filtered sample was either not detected or was low enough to be within the range of natural background. The 1030 $\mu\text{g/l}$ unfiltered metals content is due to the high total suspended solids (TSS) content. Because iron and sodium were found in levels above the standard in the background well, the groundwater does not have a metals problem (except for manganese and cadmium).

MWHR1-3 had high concentrations of iron and sodium that exceeded the groundwater standard. MWHR1-4 had high iron and manganese values that exceeded the groundwater standard. Neither well had any other metals exceeding typical natural groundwater (Ref. 27, Appendix A). Typical iron values for local wells drilled in the Hudson formation are close to 500 $\mu\text{g/l}$ (Ref. 34, Appendix A). Cyanide was not detected in any of the wells at Area 1.

The hardness of the groundwater from under Area 1 is 322 mg/l as calculated from the calcium and magnesium concentrations (Ref. 30, Appendix A). This value places the groundwater in the very hard, i.e., >300 mg/l, category (Ref. 31, Appendix A). TSS values were all fairly low except for MWHR1-2, which contained 1030 mg/l of TSS, accounting for the high metals found in this sample as compared to the filtered sample. Total dissolved solids (TDS) values were also much higher (by an order of magnitude) in this sample than in any of the others. This could indicate the presence of leachate in the groundwater at this area. Chemical oxygen demand (COD) values and specific conductivity data were not



unusual. The pH values ranged from a low of 6.4 at MWHR1-4 to a high of 8.2 at MWHR1-1; all but MWHR1-4 were within the groundwater standard of 6.5 to 8.5.

4.6.6.2 *Area 2.* One upgradient and two downgradient wells were installed and sampled as part of the Phase II investigation. The data are provided in Table 4-5 and are summarized on Figure 4-12.

No TCL volatiles were detected in any of the samples collected from Area 2, which substantiates the finding of no volatiles in the soil gas samples. One TIC, CDFM, was detected in each of the wells at concentrations ranging from 8 to 23 µg/l. However, since it was also detected in the method blank, its presence is probably due to laboratory contamination.

No TCL semivolatiles were detected in any of the groundwater samples; one TIC, 4-hydroxy-4-methyl-2-pentanone (HMP), was detected in all samples. The concentration ranged from 10 to 16 µg/l.

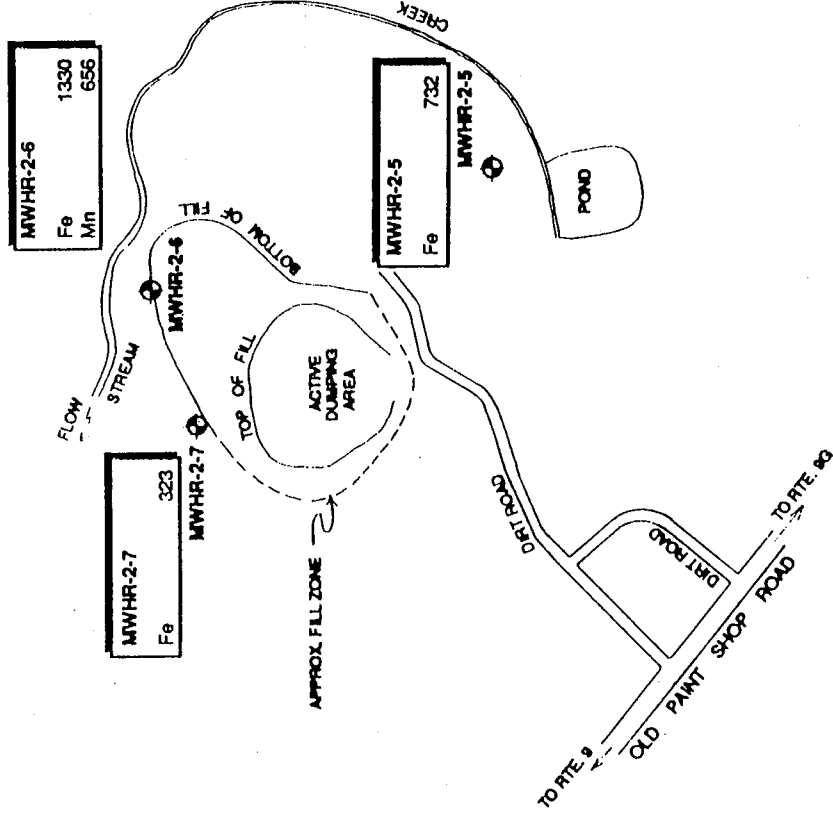
No pesticides or PCBs were detected in any of the samples collected at Area 2.

The total concentrations of all organics detected in the wells at Area 2 are summarized below:

	MWHR2-5	MWHR2-6	MWHR2-7
TCL volatiles	0	0	0
TIC volatiles	8	23	8
TCL semivolatiles	0	0	0
TIC semivolatiles	10	16	12
Pesticides/PCBs	0	0	0
Total	18	39	20



N



LEGEND

Groundwater monitoring well location

All concentrations in $\mu\text{g/l}$

Fe = Iron

Mn = Manganese

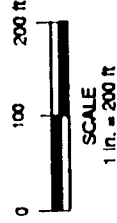


FIGURE 4-12
AREA 2

SELECTED GROUNDWATER
CONTAMINANT CONCENTRATIONS

HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC L.D. No. 314083

1980 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York



None of the wells exceeded the groundwater standard of a total of 100 $\mu\text{g/l}$ of POCs and UOCs.

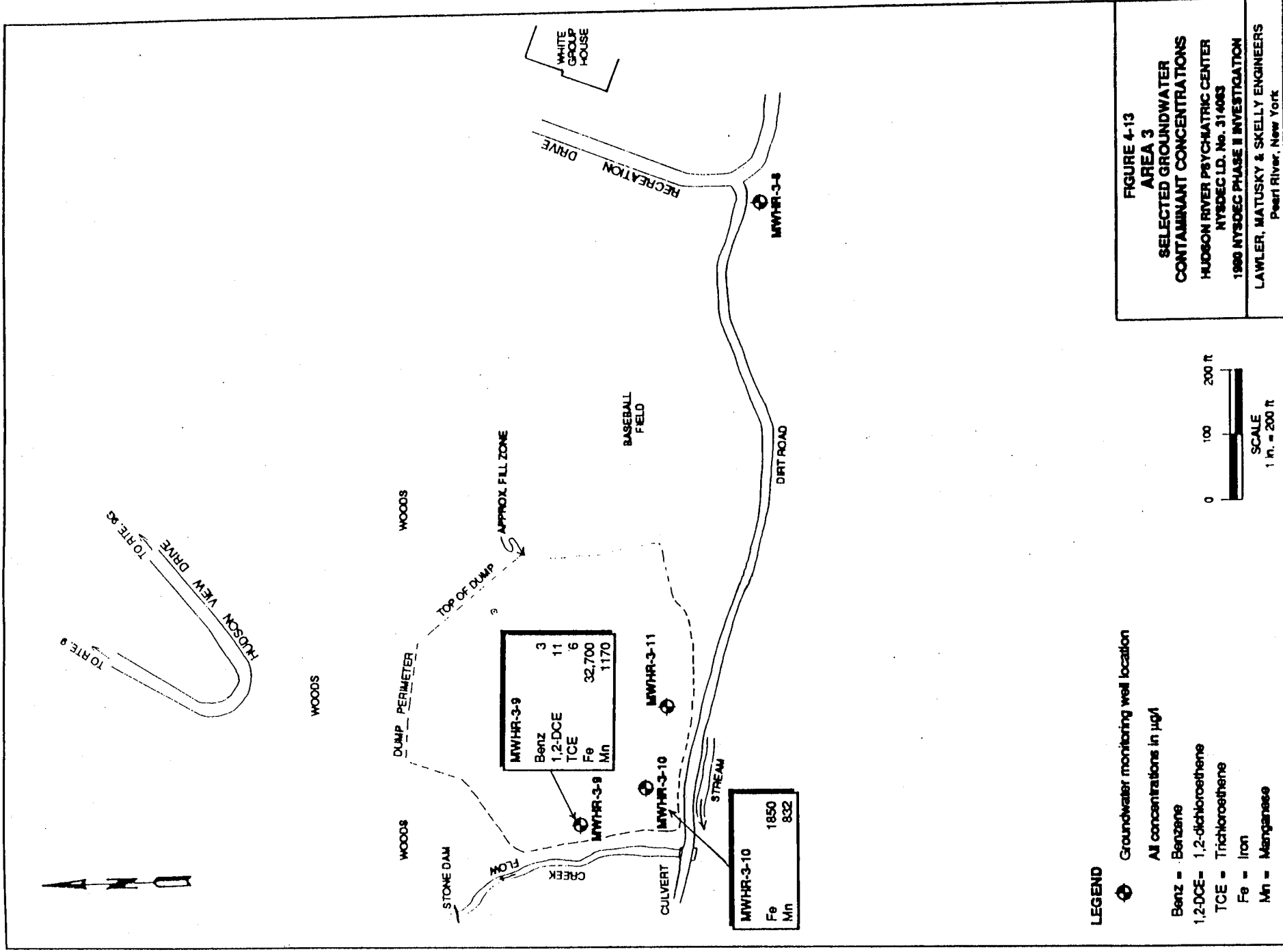
With the exception of the calcium, magnesium, and sodium concentrations, downgradient well MWHR2-7 had the lowest concentrations of any of the metals found at the area. Only the iron value of 323 $\mu\text{g/l}$ exceeded the groundwater standard of 300 $\mu\text{g/l}$ in this well. MWHR2-5, the upgradient well, had only iron exceeding the standard; its value of 732 $\mu\text{g/l}$, however, was twice that of downgradient well MWHR2-7. MWHR2-6, another downgradient well, had by far the most metallic contaminants, with the iron, manganese, and sodium values exceeding the groundwater standards of 300, 300, and 20,000 $\mu\text{g/l}$, respectively. Drinking water wells in the area have a naturally high iron content (Ref. 34, Appendix A). The magnesium, calcium, and aluminum values were also highest in this sample, but with the exception of the calcium value were within the range of natural groundwater. The chromium value, although below the groundwater standard, was still greater than that found in ambient groundwater (Ref. 27, Appendix A). Cyanide was not detected in any of the wells.

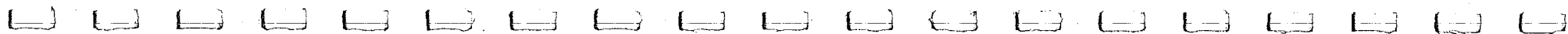
The increase in the calcium and magnesium concentrations from upgradient to downgradient increased the hardness from 186 to 477 mg/l , from a hard water to a very hard water (Ref. 31, Appendix A). There were no significant differences in the conventional parameters, although there was a slight increase in conductivity and TDS from upgradient to downgradient. The pH for all three wells was close to the neutral value of 7.

4.6.6.3 *Area 3.* Four wells were drilled at Area 3, which is located near the ball field: one upgradient, two downgradient along the western edge, and one downgradient along the southern boundary with Area 4. The last well was added during the site reconnaissance when drilling was eliminated at Area 4. The added well in this area was intended to monitor groundwater in Area 3 and groundwater coming into Area 3 from Area 4. Table 4-5 presents the data from Area 3, which are summarized in Figure 4-13.

Upgradient well MWHR3-8 had no TCL volatile organics and only one TIC, CDFM, at 27 $\mu\text{g/l}$. MWHR3-11, the downgradient well on the southern side near Area 4, also had no TCL volatiles and only one TIC, CDFM, at 23 $\mu\text{g/l}$. A soil sample was acquired from this well (see







Section 4.6.4), and TCL volatiles, including TETRA, toluene, chlorobenzene, acetone, and xylenes, were detected. MWHR3-10, the southernmost downgradient well, located on the western side of the fill, had no TCL volatiles and only CDFM, a TIC compound, was detected at 19 µg/l. As CDFM was also found in the method blank, its being found in all three wells is probably due to laboratory contamination.

MWHR3-9, the northernmost downgradient well, on the western side of the fill, had several TCL volatiles, with 1,2-dichloroethene (1,2-DCE) and trichloroethene (TCE) exceeding the groundwater standard of 5 µg/l and benzene exceeding the groundwater standard of none detected. Methylene chloride at 2 µg/l and chlorobenzene at 3 µg/l were detected below the groundwater standard. The only soil gas points with positive detections were found in the general vicinity of MWHR3-9. The volatiles detected in the soil gas points were acetone, benzene, ethylbenzene, and xylenes. Although not the same volatiles detected in MWHR3-9 (except for benzene), the finding in both media substantiates the conclusion that volatiles are present. 1,2-DCE was found above the groundwater standard in the matrix spike (MS) and matrix spike duplicate (MSD) taken from this well. Methylene chloride was also detected above the groundwater standard in both the MS and MSD samples; it was also found in the method blank, however, indicating probable laboratory contamination. No TICs were detected in the sample from MWHR3-9.

No TCL semivolatiles were found in upgradient well ^{AJD}MWHR3-8 in two of the three downgradient wells, MWHR3-10 and MWHR3-11. MWHR3-11 is the same well that detected semivolatiles in the soil sample acquired during drilling. Several TICs were detected in each of the three wells, with totals of 60 µg/l in MWHR3-8, 26 µg/l in MWHR3-10, and 104 µg/l in MWHR3-11.

MWHR3-9 contained one TCL semivolatile, pyrene, at 3 µg/l; however, it was also found in the method blank and therefore is considered a laboratory contaminant. No TCL semivolatiles were detected in the MS or MSD sample taken from this well. Several TICs found in this sample totaled 26 µg/l.

No pesticides or PCBs were detected in any of the groundwater samples from Area 3.



The total concentrations of all organics detected in the wells at Area 3 are summarized below:

	MWHR3-8	MWHR3-9	MWHR3-10	MWHR3-11
TCL volatiles	0	25	0	0
TIC volatiles	27	0	19	23
TCL semivolatiles	0	3	0	0
TIC semivolatiles	60	58	26	104
Pesticides/PCBs	0	0	0	0
Total	87	86	45	127

Only MWHR3-11 exceeded the groundwater standard of a total of 100 µg/l of POCs and UOCs.

In the upgradient well (MWHR3-8) only one metal, sodium at 38,500 µg/l, exceeded any standards, i.e., 20,000 µg/l. All of the metals found were within the range of typical natural groundwater (Ref. 27, Appendix A).

In the downgradient well along the southern boundary near Area 4, MWHR3-11, only iron at 589 µg/l exceeded the groundwater standard of 300 µg/l. All other metals were within the range of typical groundwater concentrations (Ref. 27, Appendix A).

MWHR3-9 and MWHR3-10, the two downgradient wells along the western boundary, contained 32,700 and 1850 µg/l, respectively, of iron, exceeding the groundwater standard. High iron is found in local wells in the bedrock (Ref. 34, Appendix A). Both wells also contained manganese above the groundwater standard of 300 µg/l, with MWHR3-9 having slightly more than MWHR3-10. MWHR3-9 had a sodium concentration of 56,400 µg/l, which exceeded the standard of 20,000 µg/l. With the exception of aluminum, concentrations of metals were higher in MWHR3-9 than in MWHR3-10. Aluminum was found at a high concentration, 927 µg/l, in MWHR3-10 and not detected in MWHR3-9. All other metals, with the exception of potassium in MWHR3-9, were found within the range of typical



groundwater (Ref. 27, Appendix A). The duplicate sample from MWHR3-9 was similar in composition to the original sample. No cyanide was detected in any of the wells at Area 3.

Hardness values increased from a low of 214 mg/l (hard water) in the upgradient well to 424 mg/l (very hard water) in the downgradient wells along the western boundary (Ref. 31, Appendix A). Other conventional parameters followed expected patterns, with MWHR3-9 having the highest conductivity and TDS values and MWHR3-8 the lowest, indicating that the groundwater is most likely affected by leachate.

4.6.6.4 *Area 5.* One upgradient and two downgradient monitoring wells were installed at Area 5. The data are presented in Table 4-5 and Figure 4-14 summarizes the results.

None of the wells in Area 5 contained any TCL volatiles. Some volatiles were detected in the soil gas points, and there are indications that some organics are found in the fill area, although not in the groundwater. All wells, however, contained small amounts of the TIC compound CDFM. CDFM was also detected in the method blank, indicating probable laboratory contamination.

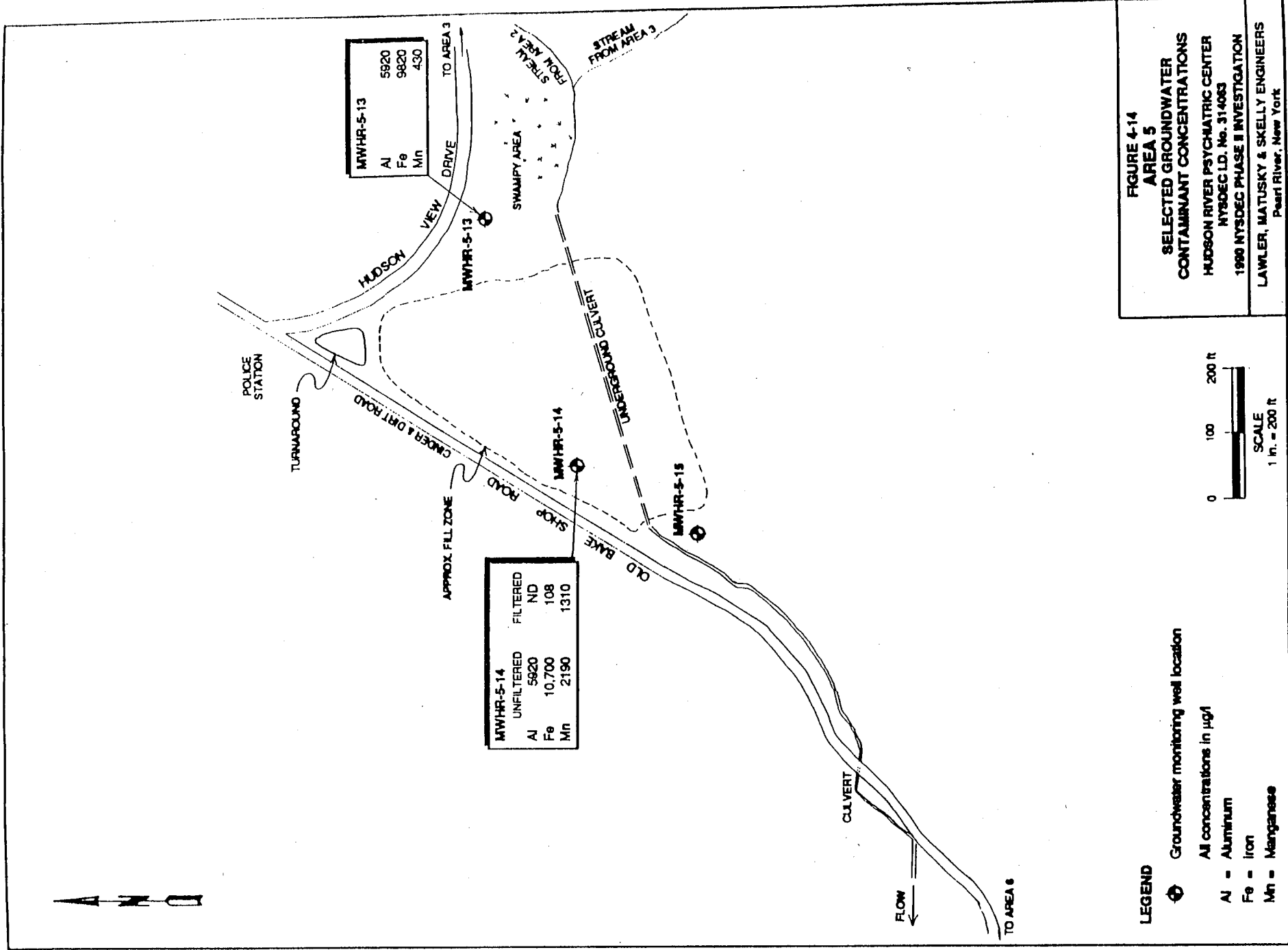
No semivolatile TCL compounds were detected in any of the wells at Area 5. An unknown TIC found in each of the samples was also found in the method blank, indicative of laboratory contamination. Another unknown was also detected in MWHR5-15 at 8 µg/l.

No pesticides or PCBs were detected in any of the samples collected from Area 5.

The total concentrations of all organics detected in the wells at Area 5 are summarized below:

	MWHR5-13	MWHR5-14	MWHR5-15
TCL volatiles	0	0	0
TIC volatiles	19	10	10
TCL semivolatiles	0	0	0
TIC semivolatiles	14	13	15
Pesticides/PCBs	0	0	0
Total	33	23	25







None of the wells exceeded the groundwater standard of a total of 100 $\mu\text{g/l}$ of POCs and UOCs.

Three metals - iron, manganese, and sodium - exceeded groundwater standards in upgradient well MWHR5-13. Other metals, except for aluminum and magnesium, were within the range of typical background groundwater. Aluminum at 5920 $\mu\text{g/l}$ was more than five times higher than that observed in ambient background (Ref. 27, Appendix A).

MWHR5-14, a downgradient well on the west side of the culvert that runs under Area 5, also had high iron, manganese, and sodium values exceeding the groundwater standard. The remaining metals detected, except aluminum, were within the range of background groundwater quality (Ref. 27, Appendix A). As in MWHR5-13, the aluminum found in MWHR5-14 was almost six times higher than background. The metallic content of both MWHR5-13 and MWHR5-14 was similar; it should be noted that both wells were located on the same side (west) of the culvert. MWHR5-14 was also filtered, with the manganese and sodium values remaining above groundwater standards. The iron content was reduced below the standard and the aluminum was reduced to none detected, indicating that both metals were in suspended form.

MWHR5-15 was installed as a downgradient well but was located on the east side of the culvert. Only the sodium value was higher than the groundwater standard. The metals found in MWHR5-15 were all less than those detected in the upgradient well, MWHR5-13. All data from MWHR5-15 were within the range for typical groundwater (Ref. 27, Appendix A). Cyanide was not detected in any of the wells at Area 5.

The hardness content of the groundwater decreased from 466 mg/l in the background well to 299 mg/l in the downgradient wells. The conductivity and TDS values were higher in the upgradient well than in either of the downgradient wells, although the quantities found were similar in MWHR5-13 and MWHR5-14. TSS values were also high in both MWHR5-13 and MWHR5-14, indicating the probable source of the high metallic content in both samples. COD and pH values were also similar in the three wells. Because there appears to be little



difference between upgradient and downgradient concentrations, the landfill does not seem to be leaching into the groundwater.

4.6.6.5 *Area 6*. Area 6 is located at the southern end of the property near a picnic pavilion. Three wells were drilled here: one upgradient and two downgradient. Table 4-5 summarizes the results and Figure 4-15 presents the data graphically.

No TCL volatiles were detected in any of the wells in Area 6. No volatiles were detected in the soil gas, substantiating this finding. Only one TIC, CDFM, was detected in all three wells and it was also found in the method blank, indicating probable laboratory contamination.

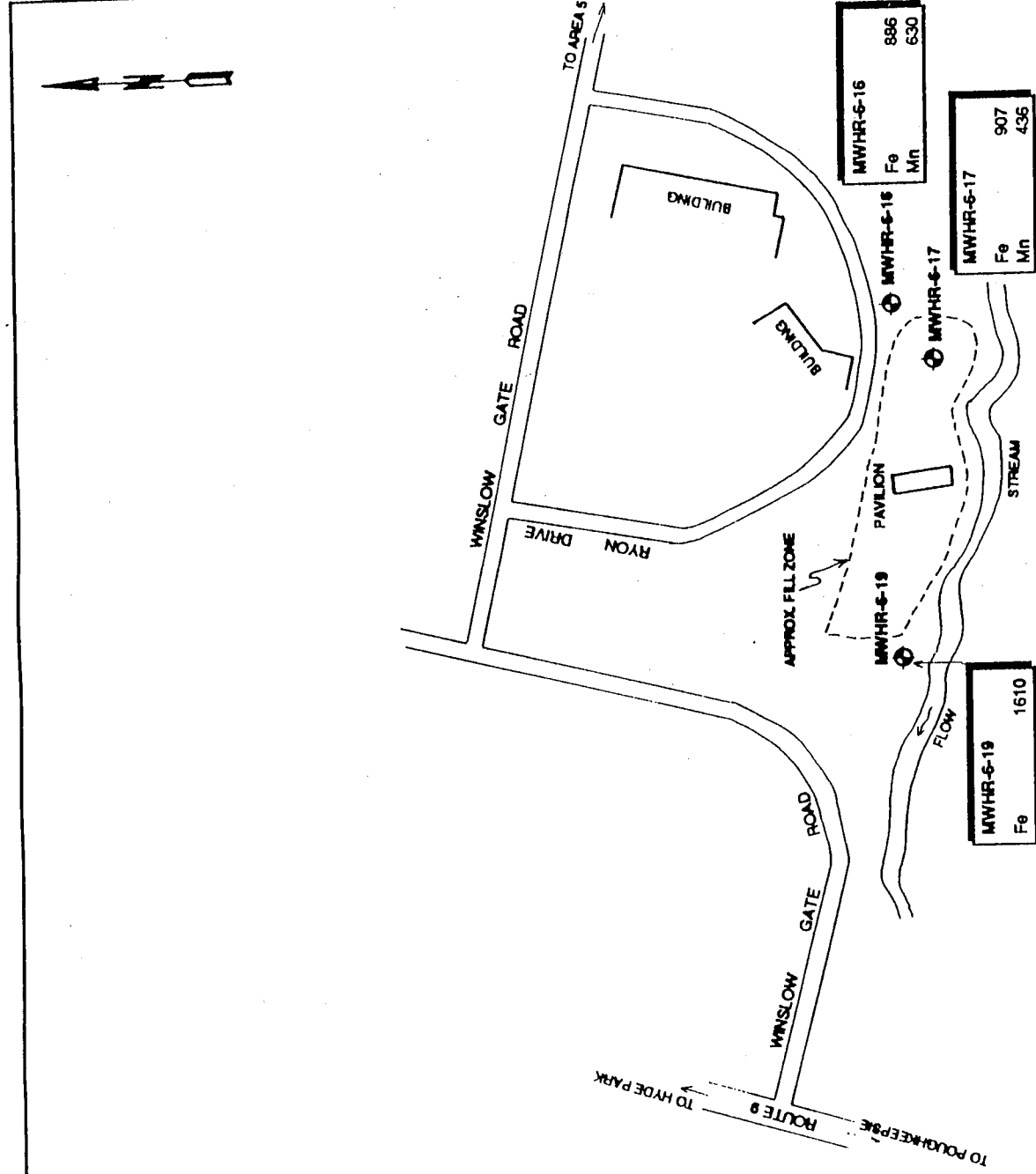
None of the wells in Area 6 contained any TCL semivolatiles. The TIC HMP was found at a concentration of 14 µg/l in upgradient well MWHR6-16 and 56 µg/l in downgradient well MWHR6-19. Other TICs totaling 84 and 56 µg/l were found in MWHR6-16 and MWHR6-17, respectively.

No pesticides or PCBs were detected in any of the monitoring wells at Area 6.

The total concentrations of all organics detected in the wells at Area 6 are summarized below:

	MWHR6-16	MWHR6-17	MWHR6-19
TCL volatiles	0	0	0
TIC volatiles	22	13	23
TCL semivolatiles	0	0	0
TIC semivolatiles	98	71	56
Pesticides/PCBs	0	0	0
Total	120	84	79





LEGEND

Groundwater monitoring well location

All concentrations in µg/l

Fe = Iron

Mn = Manganese

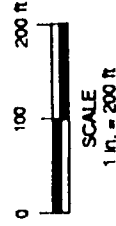


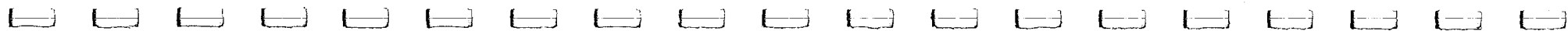
FIGURE 4-15
AREA 6

SELECTED GROUNDWATER CONTAMINANT CONCENTRATIONS

HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC LD, No. 314083

1980 NYSDEC PHASE II INVESTIGATION

LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York



Only upgradient well MWHR6-16 exceeded the groundwater standard of a total of 100 µg/l of POCs and UOCs.

The iron and manganese found in MWHR6-16 exceeded the groundwater standard of 300 µg/l for both. The concentrations for all metals found in this well were within the range for natural background groundwater (Ref. 27, Appendix A). MWHR6-17, the downgradient well near the picnic area, also had iron and manganese values that exceeded the standard. The concentrations were similar, and the total of both metals was lower than the values found in the upgradient well. All other metals found were also within the range for natural background groundwater (Ref. 27, Appendix A). Iron values in the downgradient well at the western end of the area, MWHR6-19, were almost twice as high as those in either of the other wells. The sodium concentration also exceeded the groundwater standard of 20,000 µg/l. All metals detected in the sample were within the range for natural groundwater (Ref. 27, Appendix A). Aluminum and barium were detected in this well at fairly high concentrations.

The hardness of the groundwater in the area averaged 319 mg/l for all three wells. This places the water in the very hard category (Ref. 31, Appendix A). None of the other conventional parameters analyzed varied significantly from upgradient to downgradient.

4.6.7 Surface Water/Sediment and Leachate Data

As described in Chapter 3, surface water and sediment samples were collected from each of the six areas investigated as part of the Phase II investigation. The revised work scope called for the collection of samples from each area on the site except Area 4. These data are presented in Tables 4-6 and 4-7 for the surface water and sediment, respectively. After completion of the sampling effort and review of the data, additional surface water and sediment samples were collected from Areas 4 and 6. These data are provided in Tables 4-8 and 4-9. Leachate samples collected from four areas on the site were analyzed for EP toxicity metals and, in two cases, EP toxicity organics. These data are provided in Table 4-10. As with the groundwater samples, the first number of the sample number indicates the area on the site and the second number is the sample number. Appendix I contains the raw data



1990 SURFACE WATER DATA SUMMARY
Hudson River Psychiatric Center NYSDEC I.D. No. 314063

All data in ug/l unless otherwise noted.

<	- Compound present below quantitation limit.
a	- Suspected aldel condensation product.
b	- Found in associated blanks.
!	- Estimated concentration; compound present below quantitation limit.
MS	- Matrix spike.
ND	- Not detected at analytical detection limit; see Appendix I for detection limit.
NR	- Not run.
NS	- No standard.
MSD	- Matrix spike duplicate.
NARR	- Narrative standard.



1990 SURFACE WATER DATA SUMMARY
Hudson River Psychiatric Center NYSDEC I.D. No. 314063

TABLE 4-6 (Page 2 of 2)

SAMPLE No.: SWHR- CLASS B	1-1	1-2	SW STD. (b)	NYSDEC CLASS B										NYSDEC CLASS D
				2-7	2-8	3-9	3-10	5-3	5-4	6-5	DUP.	6-6	SW STD. (g)	
Aluminum	ND	ND	100 (l)	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS
Antimony	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS
Arsenic	ND	ND	190	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS
Barium	ND	ND	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS
Beryllium	ND	ND	1100	ND	ND	ND	ND	ND	ND	ND	ND	ND	12	NS
Cadmium	ND	ND	2.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS
Calcium	74500	64000	NS	88600	99100	94200	93300	87500	93400	91100	87600	81600	3917	NS
Chromium	ND	ND	395	ND	ND	ND	ND	ND	ND	ND	ND	ND	45.2	NS
Cobalt	ND	ND	5.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	300	NS
Copper	ND	ND	23.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	291	NS
Iron	ND	ND	300	ND	283	ND	ND	ND	ND	ND	ND	ND	NS	NS
Lead	ND	ND	8.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS
Magnesium	14700	9090	NS	8700	13600	9840	11000	11700	11200	11200	10700	9900	NS	NS
Manganese	26.9 E	70.8 E	NS	123 E	183 E	ND E	328 E	137 E	145 E	174	170	187	0.20 GV	NS
Mercury	ND	ND	0.20 GV	ND	ND	ND	ND	ND	ND	ND	ND	ND	3924	NS
Nickel	ND	ND	129	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	NS
Potassium	ND	ND	NS	ND	4980 B	ND	ND	ND	ND	ND	ND	ND	NS	NS
Selenium	ND	ND	1.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	22.4	NS
Silver	ND	ND	0.1 (l)	ND	ND	ND	ND	ND	ND	ND	ND	58500	NS	NS
Sodium	100000	51400	NS	83700	60100	47500	42900	82700	80300	65700	64500	ND	20	NS
Thallium	ND	ND	8.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	190	NS
Vanadium	ND	ND	14	ND	ND	ND	ND	ND	ND	ND	ND	ND	733	NS
Zinc	ND	ND	30	ND	ND	ND	ND	ND	ND	ND	ND	ND	22	NS
Cyanide	ND	ND	5.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	22	NS

All data in ug/l.
 (b) - Based on a hardness of 220 mg/l.
 (g) - Based on a hardness of 270 mg/l.
 (i) - Ionic.
 B - Value is less than the contract-required detection limit but greater than the instrument detection limit.
 E - Value estimated due to interference.
 NS - No standard.
 ND - Not detected at analytical detection limit; see Appendix I for detection limit.
 GV - Guidance value.
 W - Post-digestion spike out of control limits; sample absorbance is less than 50% of spike absorbance.



4-33B1

1990 SEDIMENT DATA SUMMARY
Hudson River Psychiatric Center NYSDEC I.D. No. 314063

TABLE 4-7 (Page 1 of 4)

SAMPLE No.: SDHR-		1-1	1-2	2-7	2-8	3-9	3-10	5-3	5-4	6-5	6-6
VOLATILES											
Methylene chloride	ND	21 b	ND	ND	ND	ND	ND	20 b	4 b	9 b	12 b
Acetone	ND	ND	ND	ND	ND	ND	12 b	ND	ND	ND	45 b
Tentatively Identified Compounds											
Chlorodifluoromethane	50 b	54 b	83 b	210 b	68 b	91 b	24 b	55 b	36 b	NR	120 b

All data in ug/kg.
b - Found in associated blanks.
! - Estimated concentration; compound present below quantitation limit.
MS - Matrix spike.
ND - Not detected at analytical detection limit; see Appendix I for detection limit.
NR - Not run.
MSD - Matrix spike duplicate.

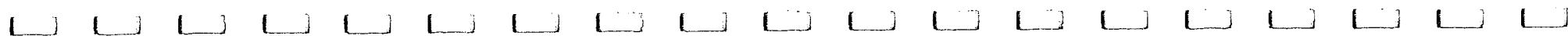


TABLE 4-7 (Page 2 of 4)
1990 SEDIMENT DATA SUMMARY
Hudson River Psychiatric Center NYSDEC I.D. No. 314063

SAMPLE No.: SDHR		1-1 RE	1-2 RE	2-7 RE	2-8 RE	3-9 RE
SEMIVOLATILES						
Phenanthrene	ND	ND	ND	ND	ND	820
Anthracene	ND	ND	ND	ND	ND	140
Di-n-butyl phthalate	1300 b	1000 b	1500 b	4000 b	1100 b	1000
Fluoranthene	ND	ND	ND	ND	ND	790
Pyrene	ND	ND	ND	ND	ND	220
Butyl benzyl phthalate	ND	ND	ND	980	ND	400
Benzo(a)anthracene	ND	ND	ND	ND	ND	440
Chrysene	ND	ND	ND	ND	ND	440
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND	440
Benzo(b)fluoranthene	ND	ND	ND	ND	ND	280
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	280
Benzo(a)pyrene	ND	ND	ND	ND	ND	390
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	200
Tentatively Identified Compounds						
Unknown	3580 b (4)	910 b (2)	22370 b (14)	135400 (14)	3740 b (6)	
Unknown alkane	ND	ND	14730 (4)	74900 (5)	2330 (2)	
Unknown trichlorobenzene	ND	ND	ND	ND	ND	
Hexadecanoic acid	ND	ND	510	3000	ND	
2-Pentanone, 4-hydroxy-4-met	9100 abj	5300 abj	6100 abj	ND	6200 abj	630
Benzo(e)pyrene	ND	ND	ND	ND	ND	
Octadecanoic acid	ND	ND	ND	ND	ND	
Mol. sulfur	ND	ND	ND	ND	ND	

SAMPLE No.: SDHR		3-10 RE	5-3	5-4 RE	6-5	6-5 MS	6-5 MSD	6-6
SEMIVOLATILES								
Acenaphthene	ND	ND	ND	ND	ND	ND	ND	340
Fluorene	ND	ND	ND	ND	ND	ND	ND	380
Phenanthrene	130	ND	ND	470	ND	ND	ND	4600
Anthracene	ND	ND	ND	ND	ND	ND	ND	730
Di-n-butyl phthalate	2500 b	ND	ND	970 b	ND	ND	ND	ND
Fluoranthene	200	390	570	ND	ND	ND	ND	5800
Pyrene	210	360	510	ND	ND	ND	ND	4800
Benzo(a)anthracene	ND	ND	ND	ND	ND	ND	ND	2100
Chrysene	140	ND	ND	ND	ND	ND	ND	2400
Benzo(b)fluoranthene	ND	ND	290	ND	ND	ND	ND	2000
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND	ND	1300
Benzo(a)pyrene	ND	ND	200	ND	ND	ND	ND	1900
Indeno(1,2,3-cd)pyrene	ND	ND	110	ND	ND	ND	ND	1100
Benzo(g,h,i)perylene	ND	ND	120	ND	ND	ND	ND	1600
Tentatively Identified Compounds								
Unknown	8240 b (8)	10220 b (10)	3520 b (8)	2690 (3)	ND	ND	ND	90900 (13)
Unknown alkane	10860 (4)	6800 (2)	830	540	ND	ND	ND	53100 (4)
Unknown aldehyde	ND	ND	ND	ND	ND	ND	ND	5200 (2)
Unknown trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND	ND	ND
Benzaldehyde	ND	ND	370 b	ND	ND	ND	ND	ND
2-Pentanone, 4-hydroxy-4-met	10000 abj	7500 abj	5100 abj	5300 abj	ND	ND	ND	3200
Benzo(e)pyrene	ND	ND	ND	ND	ND	ND	ND	ND

All data in ug/kg.
 i) - Number of unknown compounds in total.
 a - Suspected aldehyde condensation product.
 b - Found in associated blanks.
 g - Benzo(b) and benzo(k)fluoranthene have indistinguishable chromatograms.
 i) - Estimated concentration; compound present below quantitation limit.
 ND - Not detected at analytical detection limit.
 see Appendix I for detection limit.
 NR - Not run.
 RE - Extracted analyte.
 MSD - Matrix spike.
 MS - Matrix spike.
 ND - Not detected at analytical detection limit.
 see Appendix I for detection limit.
 NR - Not run.
 RE - Extracted analyte.
 MSD - Matrix spike duplicate.



TABLE 4-7 (Page 3 of 4)

All data in ug/kg.

d	• Concentration recovered from diluted sample.
x	• Derived from an instrument responses outside the calibration range.
y	• Compound present below adjusted contract-required detection limit.
DL	• Diluted sample analysis.
MS	• Matrix spike.
ND	• Not detected at analytical detection limit; see Appendix I for detection limit.
MSD	• Matrix spike duplicate.

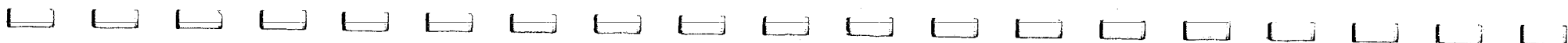
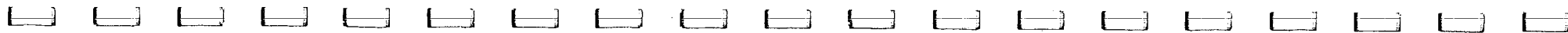


TABLE 4-7 (Page 4 of 4)
 1990 SEDIMENT DATA SUMMARY
 Hudson River Psychiatric Center NYSDEC I.D. No. 314063

SAMPLE No.:	SDHH									
	6-5	DUP	6-6	6-5	5-4	5-3	3-10	3-9	2-8	2-7
METALS										
Aluminum	9310 R	9990 R	15300 R	12700 R	6790 R	12200 R	9310	9480 R	6320 R	3890 R
Antimony	ND N	ND N	ND N	ND N	ND N	ND N	ND N	ND N	ND N	ND N
Arsenic	6.0 SA R N	5.5 SA R N	4.0 SA R N	4.7 B SA R	4.8 SA R N	19.2 SA R N	9.4	6.8 R N	6.3 SA R N	9.8 SA R N
Barium	ND	ND	53.1	169	36.7	192	76.8	92.4	49.7	24.1 B
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	2.3 R	3.4 R	3.1 R	9.9 R	3.7 R	10.3 R	4.0	4.0 R	4.4 R	1.9 B R
Calcium	915 B R	3760 R	3440 R	13600 R	3250 R	4410 R	3360	9180 R	41500 R	4730 R
Chromium	11.3 E R	11.8 E R	14.4 E R	15.7 E R	11.9 E R	21.0 E R	12.3	12.0 E R	10.1 E R	5.2 E R
Cobalt	ND	ND	ND	ND	8.7	17.3	ND	ND	ND	ND
Copper	20.0 R	23.6 R	16.4 R	62.5 R	51.7 R	90.2 R	26.0	25.1 R	24.9 R	12.0 R
Iron	19100 R	22500 R	20300 R	30100 R	29600 R	72600 R	32700	30800 R	39400 R	17700 R
Lead	11.2	21.2 SA	68.0 SA	255 SA	103 SA	217 SA	45.0 SA	19.0 SA	20.6 SA	21.3 SA
Magnesium	3350 R	5160 R	3350 R	2950 B R	3650 R	6120 R	5000	8160 R	25100 R	4070 R
Manganese	687 R	746 R	134 R	2870 R	818 R	4330 R	2520	2170 R	1340 R	429 R
Mercury	ND	ND	0.15 B	0.4 B	ND	ND	ND	0.05 B	ND	ND
Nickel	18.8 R	17.3 R	16.6 R	ND R	21.1 R	40.3 R	17.2	19.4 R	15.2 R	7.9 B R
Potassium	1030 B	1220 B	733 B	ND	ND	ND	ND	614 B	ND	ND
Selenium	ND W N	ND W N	ND W N	ND W N	ND W N	ND W N	ND W N	ND W N	ND W N	ND W N
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sodium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND	ND W	ND	ND	ND
Vanadium	17.0	18.7	28.0	ND	24.3	15.1	17.4	15.4	13.3	7.4 B
Zinc	75.1 R	98.4 R	107 R	1120 R	133 R	313 R	122	96.1 R	88.5 R	50.2 R
Cyanide	ND	ND	ND	ND	ND	1.2	ND	ND	ND	ND
Percent solids (%)	75.2	75.3	54.1	21.9	71.9	59.1	68.8	77.9	77.9	77.9

All data in mg/Kg.
 B - Value is less than the contract-required detection limit but greater than the instrument detection limit.
 E - Value estimated due to interference.
 N - Spiked sample recovery is not within control limits.
 R - Duplicate analysis not within control limits.
 W - Post-digestion spike out of control limits; sample absorbance is less than 50% of spike absorbance.
 ND - Not detected at analytical detection limit; see Appendix I for detection limit.
 SA - Value determined by the method of standard addition.



1990 ADDITIONAL SURFACE WATER SAMPLE DATA SUMMARY Hudson River Psychiatric Center NYSDEC I.D. No. 314063

TABLE 4-8

NYSDEC		PARAMETER		SWHR		SW STD. (h)	
CLASS D							
METALS							
NS	Aluminum	1130	ND	NS	Antimony	ND	NS
NS	Arsenic	ND	ND	360 (d)	NS	NS	NS
NS	Barium	205	ND	NS	Beryllium	ND	NS
16.1	Cadmium	6.0	123000	NS	Calcium	123000	NS
4845	Chromium	ND	ND	110 GV	Cobalt	ND	110 GV
57.7	Copper	ND	57800	ND	Iron	57800	300
404	Lead	12.3	10500	NS	Magnesium	10500	NS
NS	Manganese	1030	ND	0.2 GV	Mercury	ND	0.2 GV
4779	Nickel	ND	4590 B	NS	Potassium	4590 B	NS
NS	Selenium	ND W	ND	NS	Silver	ND	35
NS	Sodium	6700	ND W	NS	Thallium	ND W	20
190	Vanadium	ND	49.3	909	Zinc	ND	909
22	Cyanide	ND					

All data in ug/l.
 (d) - Dissolved.
 (h) - Hardness: 350 mg equivalent CaCO3/l.
 B - Value is less than the contract-required detection limit but greater than the instrument detection limit.
 W - Post-digestion spike out of control limits; sample absorbance is less than 50% of spike absorbance.
 GV - Guidance value.
 ND - Not detected at analytical detection limit; see Appendix I for detection limit.
 NS - No standard.

NYSDEC		PARAMETER		SWHR		SW STD.	
CLASS D							
VOLATILE ORGANICS							
1 b)	Methylene chloride	NS	NS	NS	Acetone	NS	NS
3	Benzene	NS	NS	NS	Chlorobenzene	NS	NS
3	Xylenes (total)	NS	NS	NS	Chlorobenzene	NS	NS
1	Tentatively Identified	NS	NS	NS	Chlorobenzene	NS	NS
7	Compounds	NS	NS	NS	Chlorobenzene	NS	NS
7	Unknown aromatic hydrocarbon	NS	NS	NS	Chlorobenzene	NS	NS
3	1,4-Dichlorobenzene	NS	NS	NS	Chlorobenzene	NS	NS
8	Naphthalene	NS	NS	NS	Chlorobenzene	NS	NS
8	Tentatively Identified	NS	NS	NS	Chlorobenzene	NS	NS
23	Compounds	NS	NS	NS	Chlorobenzene	NS	NS
24	Unknown aromatic hydrocarbon	NS	NS	NS	Chlorobenzene	NS	NS
12	Ethanol, 2-butoxy, phosphate	NS	NS	NS	Chlorobenzene	NS	NS
ND	PESTICIDES/PCBs	NS	NS	NS	Chlorobenzene	NS	NS
680	Conductivity (umhos/cm)	NS	NS	NS	Chlorobenzene	NS	NS
396	Total dissolved solids (ppm)	NS	NS	NS	Chlorobenzene	NS	NS
276	Total suspended solids (ppm)	NS	NS	NS	Chlorobenzene	NS	NS
80	Chemical oxygen demand (ppm)	NS	NS	NS	Chlorobenzene	NS	NS
6.5	pH (std. units)	NS	NS	NS	Chlorobenzene	NS	NS

All data in ug/l unless otherwise noted.
 b - Found in associated blanks.
 ND - Not detected at analytical detection limit; see Appendix I for detection limit.
 NS - No standard.
 NAR - Narrative standard.

U U

4-33DT

1990 ADDITIONAL SEDIMENT SAMPLE DATA SUMMARY

TABLE 4-9 (Page 1 of 2)

Hudson River Psychiatric Center NYSDEC I.D. No. 314063

PARAMETER		SDHR		TRIP	
SAMPLE No. SDHR		4-19E		RE	
VOLATILE ORGANICS (ug/kg)		4-19E		BLANK	
Methylene chloride	11 b	53 b	NR	2 b	(i)
Acetone	53 b	NR	NR	NR	NR
Benzene	53 b	NR	NR	NR	NR
Chlorobenzene	7 l	NR	NR	NR	NR
Tentatively Identified Compounds					
Unknown aromatic hydrocarbon	18 j	NR	NR	NR	NR
SEMIVOLATILES (ug/kg)					
Tentatively Identified Compounds					
Unknown	1500 b	2560 b	(3)	NR	NR
2-Pentanone,					
4-hydroxy-4-meth					
Unknown hexanedioic acid est	12000 ab	16000 ab	NR	NR	NR
Unknown aliphatic hydrocarbon	ND	1800 b	NR	NR	NR
	ND	2800 j	(2)	NR	NR
() - Number of unknown compounds in total.					
(i) - Trip blank data in ug/l.					
a - Suspected aldol condensation product.					
b - Found in associated blanks.					
j - Estimated concentration; compound present below quantitation limit.					
NR - Not detected at analytical detection limit; see Appendix I for detection limit.					
RE - Reextracted analysis.					

PARAMETER		SDHR		TRIP	
METALS (mg/kg)		4-19E		BLANK	
Aluminum	11100	NR	NR	NR	NR
Antimony	ND	NR	NR	NR	NR
Arsenic	4.6 SA	NR	NR	NR	NR
Barium	59.9	NR	NR	NR	NR
Beryllium	ND	NR	NR	NR	NR
Cadmium	2.1	NR	NR	NR	NR
Calcium	2850	NR	NR	NR	NR
Chromium	13.0	NR	NR	NR	NR
Cobalt	ND	NR	NR	NR	NR
Copper	22.9	NR	NR	NR	NR
Iron	18300	NR	NR	NR	NR
Lead	23.9 SA	NR	NR	NR	NR
Magnesium	4460	NR	NR	NR	NR
Manganese	104	NR	NR	NR	NR
Mercury	ND	NR	NR	NR	NR
Nickel	16.1	NR	NR	NR	NR
Potassium	ND	NR	NR	NR	NR
Selenium	ND W	NR	NR	NR	NR
Silver	ND	NR	NR	NR	NR
Sodium	ND	NR	NR	NR	NR
Thallium	ND	NR	NR	NR	NR
Vanadium	16.4	NR	NR	NR	NR
Zinc	100	NR	NR	NR	NR
Cyanide	ND	NR	NR	NR	NR

ND - Not detected at analytical detection limit;
 see Appendix I for detection limit.
 SA - Value determined by the method of standard addition.
 W - Post-digestion spike out of control limits; sample absorbance is less than 50% of spike absorbance.



1990 ADDITIONAL SEDIMENT SAMPLE DATA SUMMARY
Hudson River Psychiatric Center NYSDC I.D. No. 314063

TABLE 4-9 (Page 2 of 2)

PARAMETER	6-6E	6-11E	6-12E	6-13E	6-13F
SAMPLE No. SDHR-	4-19E	6-6E	DL	6-11E	DL
PESTICIDES (ug/kg)	ND	NR	NR	NR	NR
AROCLOR (ug/kg)	70.1	39.9	39.9	42.0	47.0
Percent solids (%)	ND	ND	ND	ND	ND
Aroclor 1248	ND	ND	4200 cx	4500 cd	ND
Aroclor 1260	ND	85,000 cx	140,000 cd	1,300 cx	1,400 cdy

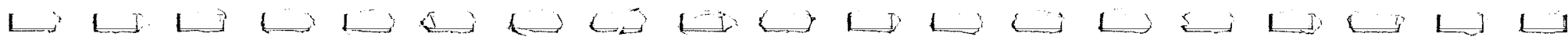
PARAMETER	6-14E	6-15E	6-16E	6-17E	6-17F
SAMPLE No. SDHR-	6-14E	6-15E	DL	6-16E	DL
PESTICIDES (ug/kg)	NR	NR	NR	NR	NR
AROCLOR (ug/kg)	47.6	68.8	47.3	44.2	45.1
Percent solids (%)	ND	ND	ND	ND	ND
Aroclor 1248	ND	ND	640 x	640 dy	360
Aroclor 1260	330,000 cx	3,700 cx	4,000 cdy	170	180 dy

c - Pesticide/PCB result confirmed by GC/MS analysis.
d - Concentration recovered from diluted sample.
x - Derived from an instrument response outside the calibration range.
y - Compound present below adjusted contract-required detection limit.
DL - Diluted sample analysis.
ND - Not detected at analytical detection limit; see Appendix I for detection limit.
NR - Not run.
MS - Matrix spike.
MSD - Matrix spike duplicate.



Hudson River Psychiatric Center NYSDEC I.D. No. 314063

> - Compound not detected at method detection limit.
NR - Not run.



reports and Appendix J the QA/QC report. Each area within the site is discussed separately. The appropriate surface water standard is provided on the table for comparison purposes.

4.6.7.1 *Area 1.* One upstream (SWHR1-1/SDHR1-1) and one downstream (SWHR1-2/SDHR1-2) surface water and sediment sample were collected and analyzed. One leachate seep sample, LHR1-1, was collected and analyzed for EP toxicity metals and organics; the organics were run because it was believed that pesticides and/or herbicides may have been used on the golf course in the past. The stream passing through the area is classified as a Class B surface water and the data were evaluated by comparing the results to those standards. Figure 4-16 presents the data collected from Area 1.

No TCL volatiles were detected in either of the surface water samples taken at Area 1. Only one TIC, CDFM, was detected in both samples; because it was also found in the method blank, it is a suspected laboratory contaminant. Only methylene chloride was found in the sediment sample collected from the downstream sample; because it was also found in the method blank and is a known laboratory contaminant, its presence may be unrelated to the site. CDFM was the only TIC detected in either sediment sample and is most likely a laboratory contaminant.

No TCL or TIC semivolatiles were detected in either surface water sample. The one TCL, di-n-butyl phthalate (DBP), detected in the sediment samples taken from Area 1 is most likely a laboratory contaminant because it was also found in the method blank. Several TICs found in the sediment samples were also found in the method blank, and their presence is probably due to laboratory contamination.

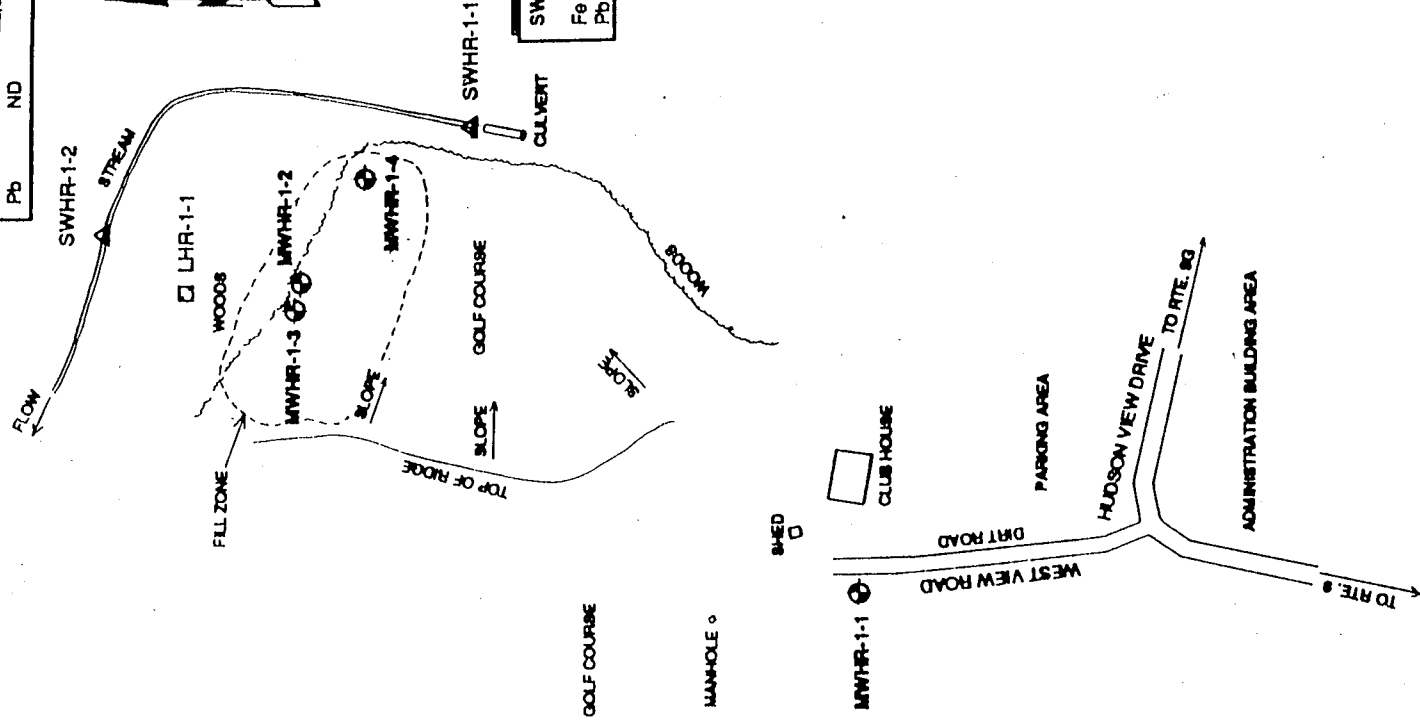
No pesticides or PCBs were detected in either the surface water or sediment from Area 1.

No metals were detected at levels exceeding the Class B surface water standards. It should be noted that the standard for certain metals is dependent on the hardness content of the water. The hardness value was calculated based on the average concentration of the calcium and magnesium in the Area 1 samples (Ref. 30, Appendix A). This hardness value (220 mg/l) was used to derive the standards for cadmium, chromium, copper, lead, and nickel. The iron



SW/SDHR-1-2			
Fe	SW	SD	
Pb	Z26	22,500	
	ND	21.2	

SW/SDHR-1-1			
Fe	SW	SD	
Pb	ND	19,100	
	ND	11.2	

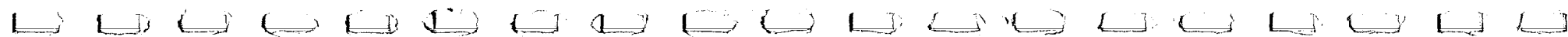


LEGEND

- ⊙ Groundwater monitoring well location
- △ Surface water/sediment sample location
- All water concentrations in $\mu\text{g/l}$
- All sediment concentrations in mg/kg
- Leachate - EP toxicity, metals and organics are < detection limit
- Fe = Iron
- Pb = Lead



FIGURE 4-16
AREA 1 SELECTED
SURFACE WATER/SEDIMENT AND LEACHATE
CONTAMINANT CONCENTRATIONS
 HUDSON RIVER PSYCHIATRIC CENTER
 NYSDOC LD, No. 314083
 1980 NYSDOC PHASE II INVESTIGATION
 LAWLER, MATUSKY & SKELLY ENGINEERS
 Pearl River, New York



and manganese values increased from upstream to downstream, indicating that leachate was entering the stream and affecting water quality (leachate had been observed flowing down the embankment to the stream). The sodium, magnesium, and calcium values were all lower in the downstream sample than in the upstream sample. Cyanide was not detected in either sample.

In the sediment samples acquired from Area 1, only the calcium data showed a significant increase in concentration from upstream to downstream; the downstream value was four times higher. The lead concentration was approximately twice as high in the downstream sample as it was in the upstream sample. For all other metals the difference was negligible. The data indicate that the landfill is not contributing significantly to the contamination of the sediments in the stream. Cyanide was not detected in either sediment sample.

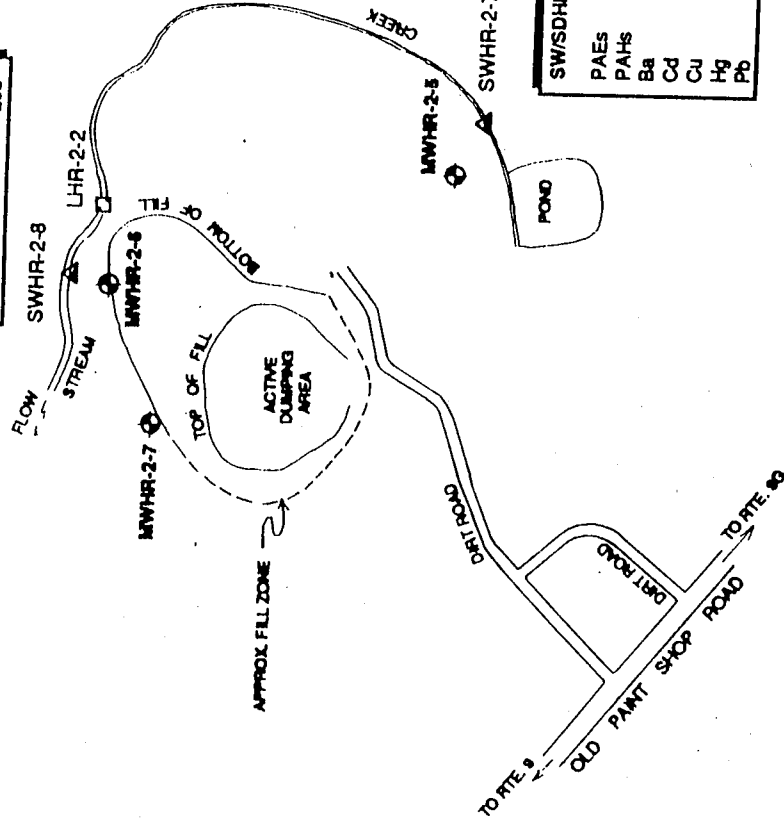
For the conventional parameters, all data from the upstream sample were higher in concentration than those from the downstream sample. Only the TDS value in SWHR1-1 exceeded the standard of 500 mg/l.

The leachate seep sample taken from Area 1 contained no metals or organics that failed the EPA toxicity standards.

4.6.7.2 *Area 2.* Two surface water samples, SWHR2-7 and SWHR2-8, and two sediment samples, SDHR2-7 and SDHR2-8, were taken from the stream that runs along the eastern and northern portion of the site; one sample, LHR2-2, was taken from the leachate that emanates from the fill area and enters the stream. The stream that passes by this area is a Class D surface water; the standards are provided in the summary data table (Table 4-6). The hardness value used in the calculation of some of the metals standards (cadmium, chromium, copper, lead, nickel, silver, and zinc) was based on the average concentration of calcium and magnesium in all the surface water samples taken from this stream, which flows through Areas 2, 3, 5, and 6 (Ref. 30, Appendix A). The hardness value used was 270 mg/l. Figure 4-17 presents the data in graphical form.



SW/SDHR-2-8	
SW	ND
PAEs	ND
PAHs	ND
Ba	ND
Cd	ND
Cu	ND
Hg	9.9
Pb	62.5
	0.4
	255

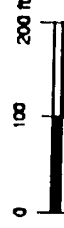


SW/SDHR-2-7	
SW	ND
PAEs	ND
PAHs	ND
Ba	ND
Cd	ND
Cu	ND
Hg	53.1
Pb	3.1
	16.4
	0.15
	68

LEGEND

- ⊕ Groundwater monitoring well location
- △ Surface water/sediment sample location
- All organics concentrations in µg/kg
- All metals concentrations in mg/kg
- Leachate - EP toxicity, metals and organics are < detection limit
- PAEs - Phthalate acid esters
- PAHs - Polycyclic aromatic hydrocarbons
- Ba - Barium
- Cd - Cadmium
- Cu - Copper
- Hg - Mercury
- Pb - Lead

NOTE: Concentrations do not include chemicals found in blank.



SCALE
1 in. = 200 ft

FIGURE 4-17
AREA 2 SELECTED
SURFACE WATER/SEDIMENT AND LEACHATE
CONTAMINANT CONCENTRATIONS
HUDSON RIVER PSYCHIATRIC CENTER
NYSDEC LD. No. 314003
1990 NYSDEC PHASE II INVESTIGATION
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York



No TCL volatiles and only one TIC, CDFM, were detected in either the upstream or downstream surface water or sediment samples. CDFM was also found in the method blank, most likely indicating laboratory contamination.

No TCL semivolatiles were detected in the surface water samples taken from Area 2. Only one TIC, HMP, was detected; it was also found in the method blank, indicating probable laboratory contamination. Three TCL semivolatiles were detected in upstream sediment sample SDHR2-7. One of these, DBP, was also found in the method blank and is a known laboratory contaminant. The other two - pyrene, a PAH, and butyl benzyl phthalate (BBP), a PAE - were found in below method detection limit (BMDL) quantities. These same three compounds were also found in downstream sediment sample SDHR2-8 at concentrations approximately four times higher than those found in the upstream sample. Also found was fluoranthene, another PAH, which was not detected in the upstream sample. TICs in the downstream sample were more than five times higher than in the upstream sample and were mostly unknowns.

No pesticides or PCBs were found in either of the surface water or sediment samples taken from Area 2.

Except for zinc and potassium, no significant difference was observed between the concentrations of metals in the upstream and downstream surface water samples. No data exceeded any of the Class D surface water standards. Of the metals detected in the sediment, barium, cadmium, copper, lead, and mercury were approximately three times greater in the downstream sample than in the upstream sample. The manganese and zinc were an order of magnitude greater in the downstream sediment sample than in the upstream sediment sample. Vanadium was found in the upstream sample but not the downstream sample. Cyanide was not found in either surface water or sediment sample.

None of the conventional parameters exceeded the surface water standards and there was no significant difference between the upstream and downstream samples in the TDS or conductivity values. The COD and TSS values were two to three times higher in the downstream than upstream sample, but the values were still low.



One leachate seep sample was collected at Area 2 and analyzed for EP toxicity metals. The results shown in Table 4-10 indicate that none of the metals exceeded the EPA EP toxicity standard.

4.6.7.3 *Area 3.* Area 3 is located near the ball field, and the stream running along its southern and western boundaries is classified D. The hardness value (270 mg/l) used to calculate the standards is the same as that used in Area 2. Two surface water samples, two sediment samples, and one leachate sample were collected from this area. The results are provided in Tables 4-6, 4-7, and 4-10, and the data are presented graphically in Figure 4-18.

No TCL volatile compounds were detected in either surface water samples or in the upstream sediment sample; only one TIC, CDFM, was detected. Because CDFM was also found in the method blank its presence is most likely due to laboratory contamination. Acetone was detected at BMDL levels in the downstream sediment sample. Although not found in the method blank associated with this sample, acetone is a common laboratory contaminant and is most likely present as a result.

No semivolatile TCL compounds were found in the surface water samples at Area 3. One TIC was detected; because it was also found in the method blank, its presence is probably due to laboratory contamination. The upstream sediment sample, SDHR3-9, contained 4740 µg/kg of PAHs and 1760 µg/kg of PAEs; one PAE, DBP, was also found in the method blank. Other than fluoranthene, all compounds were detected at BMDL levels. TIC SDHR3-10, contained far less TCL semivolatiles than the upstream sample. PAHs totaled only 680 µg/kg and all were at BMDL levels. PAEs (only one compound, DBP) were detected at a total concentration of 2500 µg/kg; DBP was also found in the method blank and is most likely present as a result of laboratory contamination. TICs at SDHR3-10 totaled 29,100 µg/kg and consisted mostly of unknowns.

No pesticides or PCBs were detected in either surface water sample collected from Area 3. Only one pesticide (4,4'-DDE) was detected in the sediment sample from the downstream location and at 45 µg/kg was below the adjusted contract required detection limit.



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Manganese and iron are the only two metals that showed increased concentrations between the upstream and downstream samples. The iron concentration of 881 $\mu\text{g/l}$ in downstream sample SWHR3-10 exceeded the Class D surface water standard of 300 $\mu\text{g/l}$. Neither manganese nor iron was detected in upstream sample SWHR3-9. Cyanide was not found in either sample. The metals concentrations in the sediments taken from downstream sample SDHR3-10 were approximately double those found in upstream sample SDHR3-9. These metals include aluminum, arsenic, barium, cadmium, chromium, cobalt, copper, lead, nickel, and zinc. The manganese and iron concentrations were more than three times higher in the downstream sample than in the upstream sample, a pattern similar to that of the surface water samples. Cyanide was also detected in the downstream sediment sample at a concentration of 1.2 mg/kg.

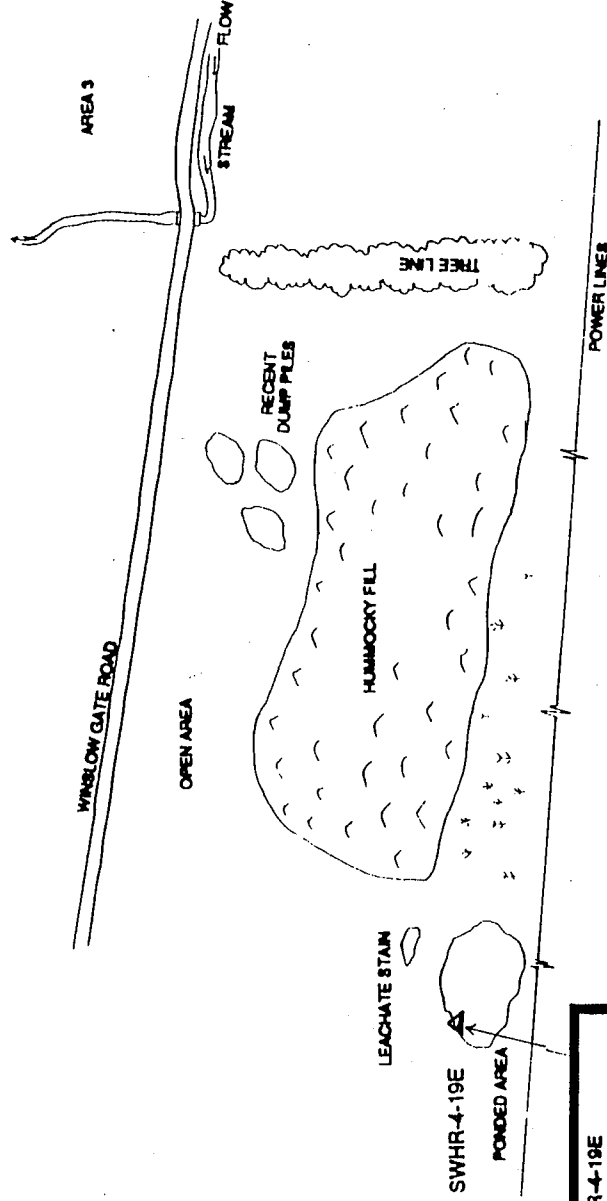
None of the conventional parameters analyzed in the surface water samples violated the Class D surface water standards.

One leachate sample, LHR3-3, was collected and analyzed for EP toxicity metals; none were detected.

4.6.7.4 Area 4. Area 4 was sampled during the resampling of Area 6. One surface water and one sediment sample were collected. The data are presented in Tables 4-8 and 4-9 and shown on Figure 4-19. Because the surface water was collected from a pond fairly close to the stream that runs along Area 3, it is evaluated as a Class D surface water. The hardness value used was 350 mg/l as calculated from the calcium and magnesium values (Ref. 30, Appendix A).

~~No~~volatile organics were detected above the surface water standards. Volatiles detected (but at BMDL levels) include methylene chloride, acetone, chlorobenzene, and xylene. Methylene chloride was also detected in the method blank, probably signifying laboratory contamination. Benzene was also detected, at 11 $\mu\text{g/l}$, but no Class D standard exists for benzene. Benzene at 5 $\mu\text{g/kg}$ and chlorobenzene at 7 $\mu\text{g/kg}$ were detected in the sediment sample collected from the same location. Methylene chloride and acetone were detected, but because they were

U U



SW/SDHR-4-19E		
SW	11	SD
Benz	11	5
1,4-DCB	3	ND
Naph	8	ND
Fe	57,800	18,300

LEGEND

▲ Surface water/sediment sample location

All water results in µg/l

All organic soil results in µg/kg

All metal soil results in mg/kg

Benz = Benzene

1,4-DCB = 1,4-Dichlorobenzene

Naph = Naphthalene

Fe = Iron

NOT TO SCALE

FIGURE 4-19

AREA 4 SELECTED

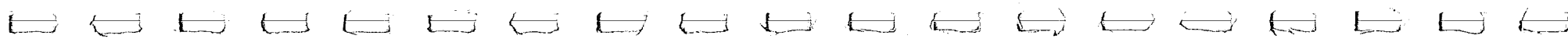
SURFACE WATER/SEDIMENT
CONTAMINANT CONCENTRATIONS

HUDSON RIVER PSYCHIATRIC CENTER

NYSDEC L.D. No. 314003

1990 NYSDEC PHASE II INVESTIGATION

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Pearl River, New York



also found in the method blank their presence is most likely due to laboratory contamination. All compounds except acetone were detected at BMDL levels. Only one TIC was detected in the surface water sample, an unknown aromatic hydrocarbon; the same compound was also detected in the sediment sample.

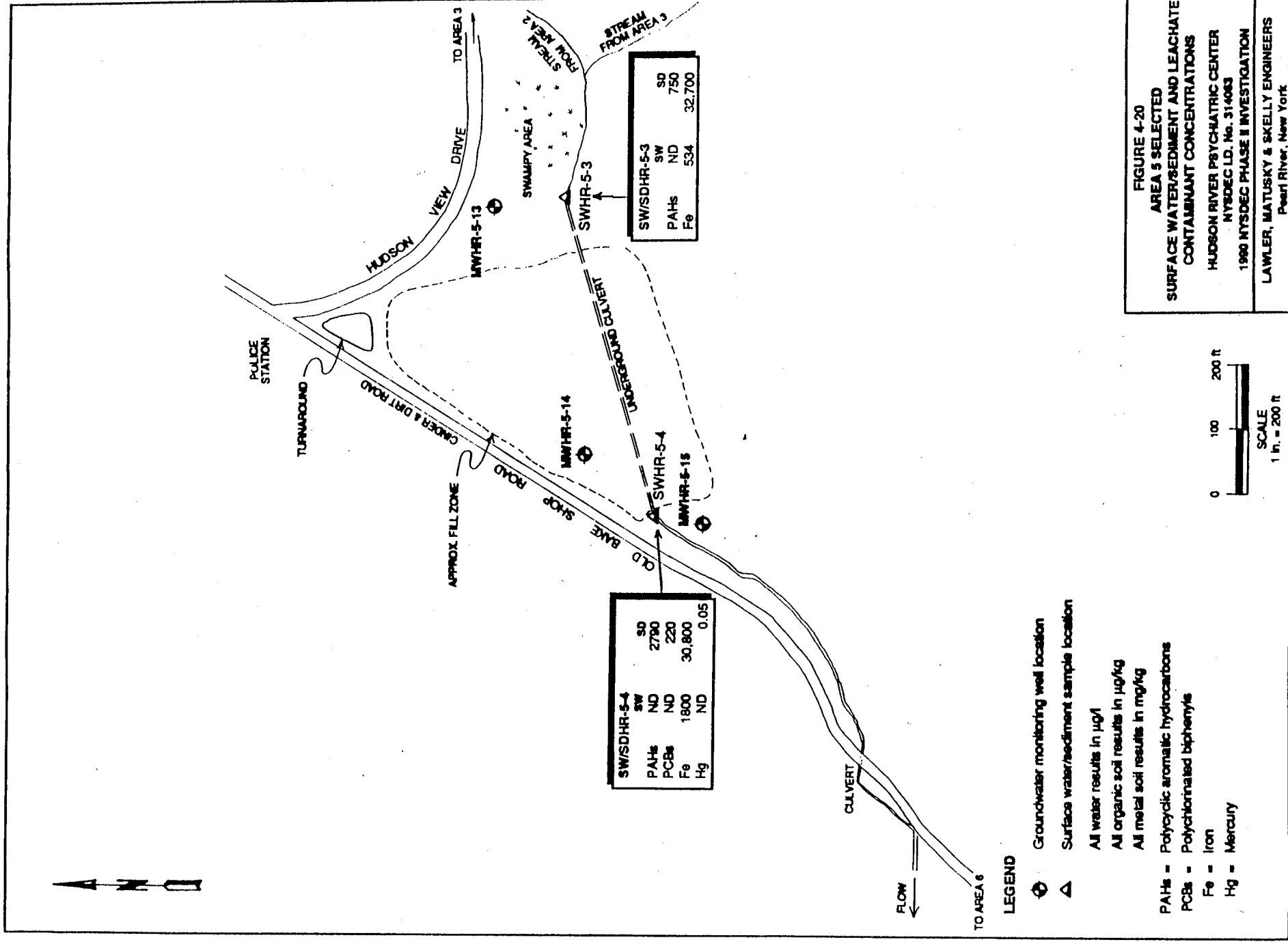
Two TCL semivolatiles, 1-4 dichlorobenzene and naphthalene, were detected in the surface water. No standards exist for either of the two compounds and both were detected at BMDL levels. No semivolatile TCL compounds were detected in the sediment. Three TICs were detected in the surface water samples and seven in the sediment samples. (Five of the seven semivolatile TICs were also detected in the method blank, indicating probable laboratory contamination.)

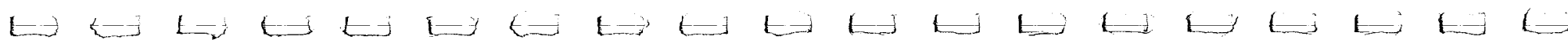
No pesticides or PCBs were detected in either the surface water or sediment sample collected at Area 4.

Metals were detected in the surface water sample collected from Area 4; only iron exceeded the Class D standard of 300 $\mu\text{g/l}$. The concentration, 57,800 $\mu\text{g/l}$, was more than 192 times higher than the standard. Iron was also high in the sediment, at 18300 mg/kg. The high concentration confirms the visible observation of the samples, which were reddish-brown, indicative of high iron. Aluminum, barium, cadmium, lead, and manganese were also found in fairly high concentrations in both the surface water and sediment. Cyanide was not detected in either sample.

4.6.7.5 Area 5. In Area 5, also known as the Avery Chapel site, the stream that runs through the fill area has been culverted and covered over. The upstream sample, SWHR5-3/SDHR5-3, was taken just before the stream enters the culvert. The stream above station SWHR5-3 splits; the left fork comes from Area 2, the right fork from Area 3 (Figure 4-20). The right fork also meanders along the eastern boundary of Area 5 before its confluence with the left fork. The downstream sample, SWHR5-4/SDHR5-4, was taken at the outlet of the culvert at the southwestern edge of the fill. The data are provided in Tables 4-6 and 4-7 and are summarized on Figure 4-20. Because no leachate seeps were observed, no samples were acquired.







There were no TCL volatiles and only one TIC, CDFM, detected in either surface water sample. The presence of CDFM is most likely the result of laboratory contamination as it was also detected in the method blank. Methylene chloride was found in both the upstream and downstream sediment samples; however, because it was also found in the method blank it is probably the result of laboratory contamination. CDFM was also detected as a TIC in both samples; its presence is also most likely the result of laboratory contamination because it was also found in the method blank.

There were no TCL semivolatiles and only one TIC, HMP, found in the surface water samples collected from Area 5. The TIC was also found in the method blank, indicating probable laboratory contamination. Two PAHs totaling 750 $\mu\text{g/kg}$ were found at BMDL in upstream sediment sample SDHR5-3. The downstream sediment sample had significantly higher PAHs, 2790 $\mu\text{g/kg}$, although all compounds were at below BMDL levels. One PAE, DBP, was also detected; however, because it was also found in the method blank its presence is probably the result of laboratory contamination. TICs were also found in both samples, with the upstream sample containing 24,520 $\mu\text{g/kg}$ and the downstream sample only 9820 $\mu\text{g/kg}$.

No pesticides or PCBs were detected in either surface water sample; only one PCB, Aroclor 1242, was detected in the downstream sediment sample, at 220 $\mu\text{g/kg}$. This value is far lower than NYSDEC's guidelines for hazardous sediments, 50,000 $\mu\text{g/kg}$ (Ref. 35, Appendix A), and even lower than NYSDEC's guideline for industrial waste, 5000 $\mu\text{g/kg}$ (Ref. 33, Appendix A).

Other than iron, none of the metals showed significant increases in concentration from upstream to downstream. The iron, however, tripled in concentration from upstream to downstream, but both values were over the standard of 300 $\mu\text{g/l}$. It is apparent that the culvert prevents the leaching of metals from the fill into the stream. The increase in iron content could be related to the construction of the culvert itself. The inlet and outlet ends of the pipe were made of concrete; it is not known whether the remainder of the culvert is made of cast iron, carbon steel, or some other combination of metals containing iron. At the entrance to the culvert is an iron grate installed to prevent clogging from branches and other debris. Most metals found in the sediments were lower in concentration in downstream

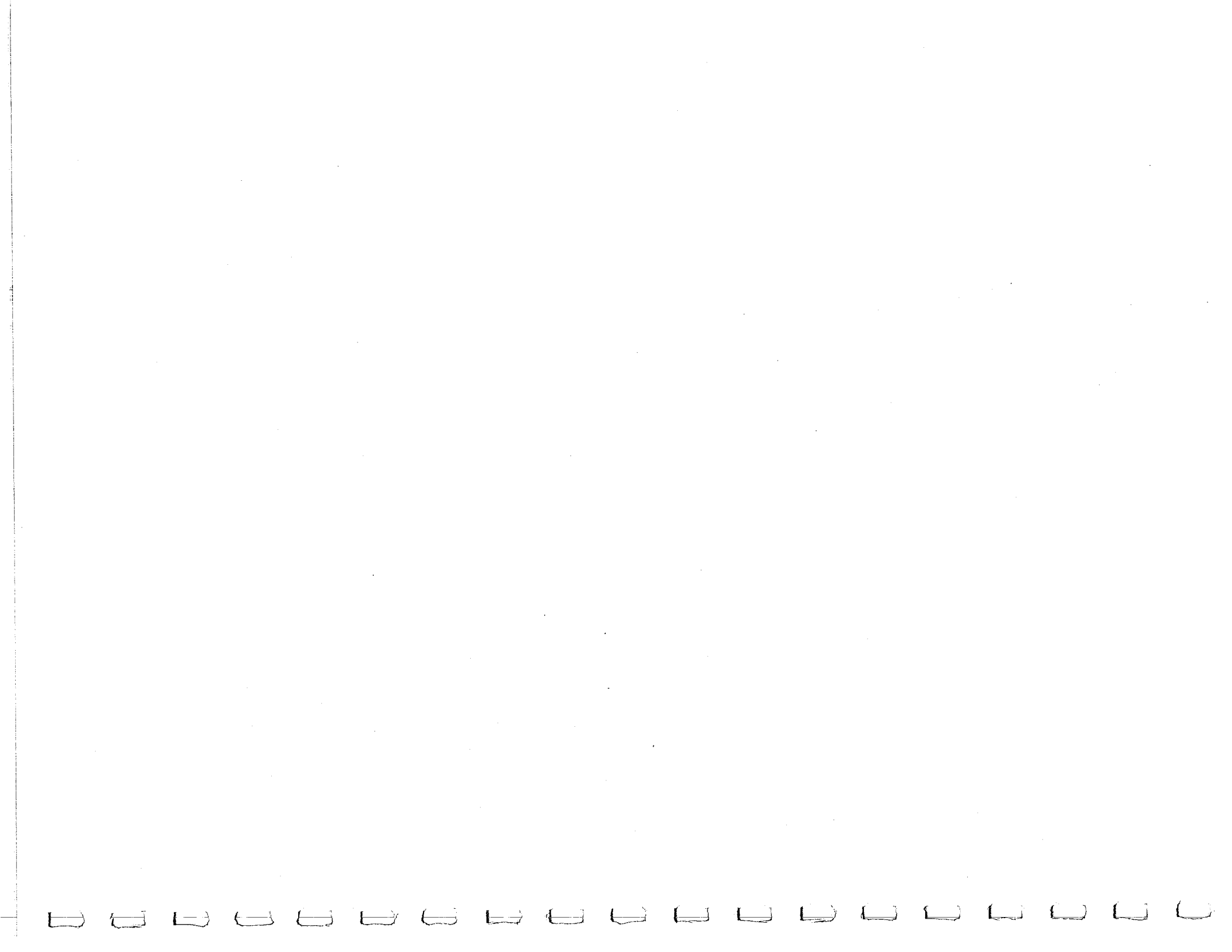


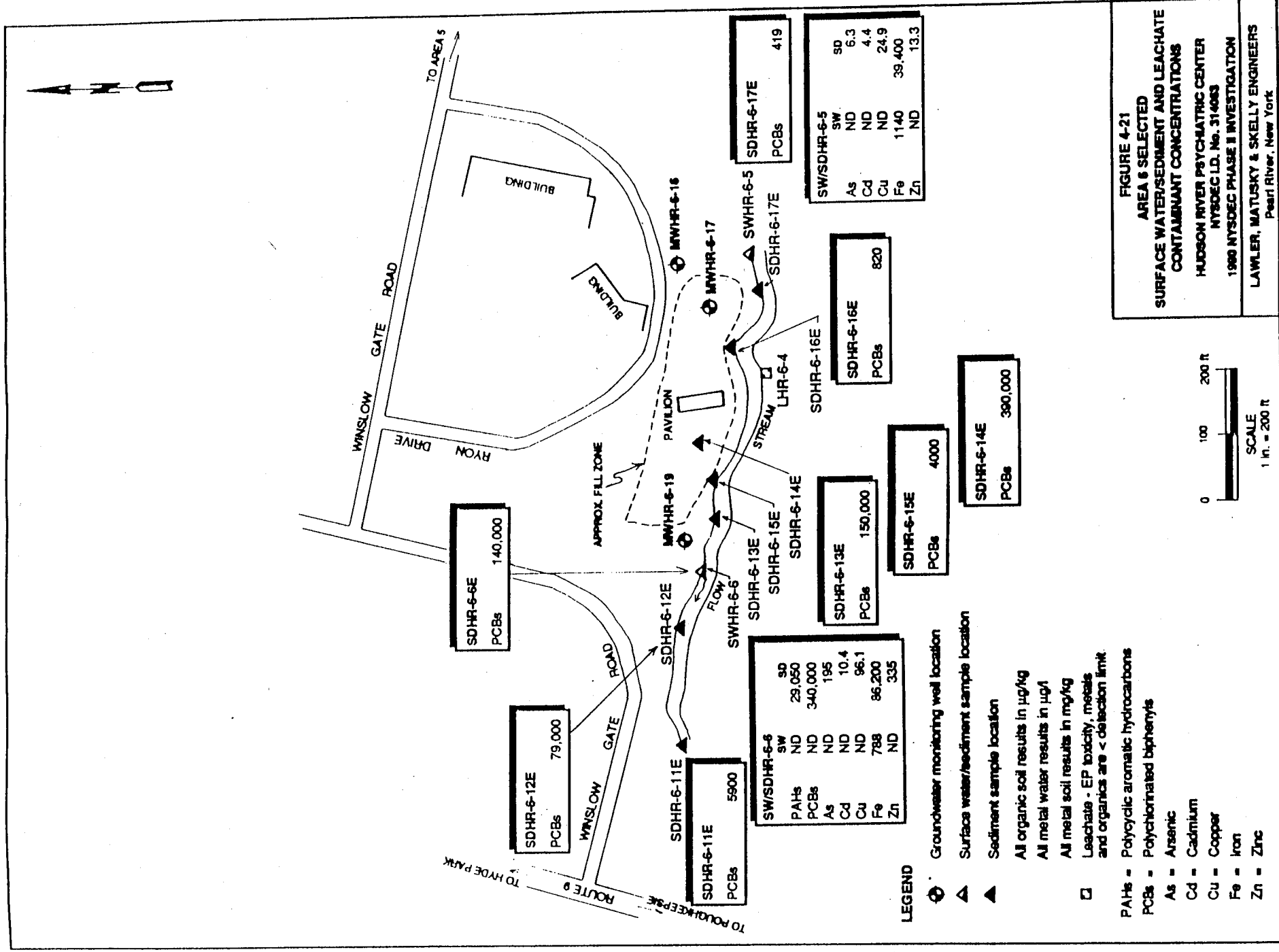
sample SDHR5-3 than in upstream sample SDHR5-4. This includes both iron and manganese, the two metals most likely to leach from landfill operations. Mercury was found at fairly low levels (0.05 mg/kg in the downstream sample) and was not detected in the upstream sample. Another drainage pipe enters the stream just to the left of the culvert and both of these pipes discharge to the area where the surface water and sediment sample was taken. It is not known where the smaller pipe drains or originates.

There were no unusual findings in any of the conventional parameters analyzed. Cyanide was also not detected in either the surface water or sediment samples.

4.6.7.6 Area 6. Two surface water samples, two sediment samples, and one leachate sample, were collected during the February 1990 sampling event. These data are presented in Tables 4-6, 4-7, and 4-10. As stated in Chapter 3, after receipt of the initial data and the finding of PCBs in the sediment, NYSDEC requested that additional sediment samples be collected and analyzed for PCBs only. On the basis of LMS' recommended work scope, eight additional sediment samples were collected on 3 May 1990 and were analyzed for PCBs using Method 8080. These data are provided in Table 4-9. All data are shown graphically on Figure 4-21. TCL volatiles were not detected in either upstream surface water sample SWHR6-5 or downstream surface water sample SWHR6-6. Only one TIC was detected; it was also found in the method blank, indicating laboratory contamination. Methylene chloride was detected in upstream sediment sample SDHR6-5, in the MS and MSD samples taken from the same location, and in downstream sediment sample SDHR6-6. Because methylene chloride was also found in the method blank, its presence is probably the result of laboratory contamination. Acetone was detected in the downstream sediment sample and in the method blank, indicative of laboratory contamination. One TIC, CDFM, was found in both sediment samples.

There were no TCL semivolatiles and only one TIC detected in both the upstream and downstream surface water samples. No TCL semivolatiles were found in the sediment sample from the upstream side of Area 6 (SDHR6-5) or the MS/MSD samples taken from this location. The downstream sediment sample contained significant quantities of semivolatiles,



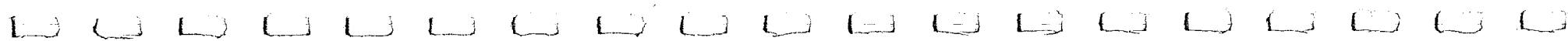


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including 29,050 µg/kg of PAHs. SDHR6-5 did, however, contain TICs totaling 8530 µg/kg; SDHR6-6 had 152,400 µg/kg of TICs, mostly unknowns.

No pesticides or PCBs were detected in either surface water sample or in the upstream sediment sample. No pesticides were detected in the downstream sediment sample; however, Aroclor 1260 was found in significant quantities in downstream sediment sample SDHR6-6. The finding of 340,000 µg/kg in the sample prompted a resampling of Area 6 and a more extensive sampling program to isolate the source. Aroclor 1260 was also found in the downstream sediment sample taken by NUS, but at a much lower concentration (1700 µg/kg). It should be noted that the NUS sample was taken much farther downstream than the LMS sample. The concentration of 340,000 µg/kg exceeds the NYSDEC guidelines of 50,000 µg/kg for hazardous sediments (Ref. 35, Appendix A).

In the May 1990 sediment sampling, sample SDHR6-6E was taken at the same location as sample SDHR6-6, taken in February 1990. The May sample found 140,000 µg/kg, which was less than half the February sample (see Table 4-9). Samples SDHR6-12E and -11E were collected downstream of SDHR6-6E, with SDHR6-11E located the farthest downstream, near Route 9 (see Figure 4-20). SDHR6-13E was collected about 85 ft upstream of SDHR6-6E. Sample SDHR6-13E contained concentrations of Aroclor 1260 similar to those at SDHR6-6E (150,000 µg/kg); SDHR6-12E and SDHR6-11E had decreasing quantities (79,000 and 1400 µg/kg, respectively). SDHR6-11E also had 4500 µg/kg of Aroclor 1248. Aroclors 1248 and 1260 were also found in the downstream sediment sample collected by NUS (see Section 4.5). Aroclor 1248 probably was not found in the other samples because the high dilution needed to quantify the Aroclor 1260 concentration would have diluted out the Aroclor 1248. A small creek entering the main stream west of the picnic shelter discharges from a concrete culvert that contains drainage from the area. The sample taken near the culvert (SDHR6-14E) had the highest quantity of PCBs (390,000 µg/kg of Aroclor 1260) of any of the samples collected in May 1990. However, sample SDHR6-14E is located near NUS station SED7, which also had very high PCBs. Another sample was taken in the small creek just prior to its confluence with the main stream. This sample, SDHR6-15E, had only 4000 µg/kg of Aroclor 1260. It is not known why the downstream sediment sample value is lower than the upstream sample. Upstream of the picnic shelter is a leachate seep that was also sampled; this sample, SDHR6-



16E, had 180 µg/kg of Aroclor 1260 and 640 µg/kg of Aroclor 1248. Sample SDHR6-17E was collected approximately 75 ft downstream of the February 1990 upstream sample, SDHR6-5. This sample contained only 360 µg/kg of Aroclor 1248 and 59 µg/kg of Aroclor 1260. Samples SDHR6-6E, -13E, and -14E exceed the NYSDEC guidelines of 50,000 µg/kg for hazardous sediments (Ref. 35, Appendix A).

All metals were in approximately the same concentration in the upstream and downstream surface water samples and in most cases were higher in the upstream sample. Iron was the only metal that exceeded the Class D surface water standard of 300 µg/l. Most of the metals found in the sediments increased in concentration in the downstream sample. These metals include arsenic, barium, cadmium, copper, iron, lead, manganese, vanadium, and zinc. Most metals increased from two to four times in concentration. No cyanide was detected in either the surface water or sediment samples.

None of the conventional parameters violated any standards, although the TDS value of 800 mg/l in the upstream sample was very high.

EP toxicity metals and organics were run on the leachate seep sample taken from Area 6. Organics were run because pesticides and herbicides may have been used at the site. The data shown on Table 4-10 indicate that none of the metals or organics exceeded EPA criteria.

4.6.8 Other Phase II Work

No additional work was conducted as part of this Phase II investigation.

4.7 CONCLUSIONS

The conclusions of the Phase II investigation are arranged by area and by sample matrix.



4.7.1 Area 1

Area 1 is located at the northwest end of the HRPC facility: a golf course is now located on top of the fill area. The fill material consisted mainly of municipal wastes from the City and Town of Poughkeepsie and institutional wastes from HRPC. Two surface water samples, two sediment samples, and one soil sample were collected by NUS during a previous investigation. During the Phase II investigation four monitoring wells were installed and sampled, and two surface water samples, two sediment samples, and one leachate sample were collected and analyzed.

4.7.1.1 Groundwater. The upgradient well, MWHR1-1, and two of the three downgradient wells, MWHR1-2 and MWHR1-3, contained no organic compounds that were not related to laboratory contamination. The downgradient well in the northeast corner of the fill area contained BTX, chlorobenzene, 1,4-DCB, and naphthalene; however, only the chlorobenzene and 1,4-DCB exceeded the groundwater standard of 5 $\mu\text{g/l}$, and only the benzene exceeded the groundwater standard of none detected. The naphthalene exceeded the guidance value of 10 $\mu\text{g/l}$. The contamination in MWHR1-4 is most likely the result of a release of gasoline or another type of fuel spill.

Metals in upgradient well MWHR1-1 were all within the range for typical groundwater; however, iron and sodium exceeded the groundwater standard. Filtering the sample from MWHR1-2 removed most of the metals from the sample, indicating that most were in suspended form. In the filtered sample only the cadmium and manganese exceeded the groundwater standards. Chromium and cadmium were detected at a concentration outside the range for typical groundwater. MWHR1-3 contained only sodium and iron above the drinking water standard, and none of the metals detected were outside the range for natural groundwater. MWHR1-4 had high iron and manganese values that violated the groundwater standard. Only the cadmium value was outside the range for ambient groundwater. In summary, with the exception of the cadmium in MWHR1-2, the metals found in the groundwater beneath Area 1 do not indicate the presence of hazardous waste and are typical of those found near any sanitary landfill. The source of the cadmium is unknown, but



because the concentration is so close to the groundwater standard it is not considered a problem.

4.7.1.2 *Surface Water.* The stream that runs along the northern boundary of Area 1 is classified as a Class B surface water. One upstream and one downstream sample were collected by NUS and LMS, although not necessarily in the same place. There were no organics detected that were not also found in the method blank, thus indicating laboratory contamination.

The downstream sample collected by NUS had aluminum and iron quantities exceeding the surface water standard; no metals in the samples collected for the Phase II investigation exceeded any standards. In both sets of data the iron and manganese concentrations increased from upstream to downstream, most likely because of leachate entering the stream from the fill area. Because the stream discharges into the Hudson River upstream of the intake for the City of Poughkeepsie, the leachate should be prevented from discharging into the stream.

4.7.1.3 *Leachate.* One leachate seep was sampled and analyzed for EP toxicity metals and organics as part of the Phase II investigation. None of the compounds were detected and therefore none of the EPA criteria were exceeded.

4.7.1.4 *Sediment.* No organic compounds were detected in the sediments collected during the Phase II investigation. In the NUS sediment samples, PAHs and dibenzofuran were found in the downstream sediment sample at concentrations four times greater than in the upstream sediment sample. Naphthalene and naphthalene-like substances were found in concentrations an order of magnitude higher in the downstream sample than in the upstream sample. All of these substances indicate the presence of coal tars and possibly diesel fuel. Although none of these substances were found in the Phase II sediments, the data indicate a potential source exists.

Metals in the upstream and downstream samples did not vary significantly in concentration between the NUS and LMS samples. The exceptions were the finding of antimony and



mercury in the NUS samples and not in the LMS samples, and the finding of cadmium in the LMS samples and not in the NUS samples. Concentrations of most metals did not vary significantly from upstream to downstream.

4.7.1.5 Shallow Soil. One shallow soil sample was collected by NUS; it contained no organic compounds. Metals were detected; however, with the exception of antimony, arsenic, cadmium, and mercury, concentrations were within the range for background soil. Of those metals, only mercury was far above the range (>32 times the high end of the range). Because mercury was found in both the soil and sediment in Area 1, there appears to be a mercury source. Although there is no evidence of medical waste disposal at the site, the mercury could be from illicit disposal.

4.7.2 Area 2

Area 2 is located in the northeastern corner of the property off Paint Shop Road. The records indicate that Area 2 received institutional waste only (from HRPC). Three wells were installed and sampled as part of the Phase II investigation, and two surface water samples, two sediment samples, and one leachate seep sample were taken as part of the investigation. No previous data exist on the site.

4.7.2.1 Groundwater. No organic compounds not also found in the method blank were detected in any of the monitoring well samples collected from Area 2. None of the wells contained significant quantities of metals, although the iron content in all three wells was above the groundwater standard. The iron in the upgradient well was higher than that in one of the downgradient wells. The downgradient monitoring well located farthest to the east had the highest metal content as well as manganese and sodium values above the groundwater standards. Since all metals were within the range for natural groundwater, with the possible exceptions of the iron and manganese, the landfill is not contributing any metallic contamination.

4.7.2.2 Surface Water. An upstream and a downstream sample were collected from the stream that runs along the eastern side of the landfill. The stream is classified as a Class D



surface water. Neither sample contained organic compounds not also found in the method blank. No metals were detected at levels exceeding any standards; with the exception of zinc, which was found in the downstream sample and not the upstream sample, none of the metals showed significant increases from upstream to downstream. This would indicate that the landfill does not affect the stream water quality to any great extent.

4.7.2.3 *Sediment.* No volatile organic compounds not also found in the method blank were detected in the sediments. In the semivolatile fraction, PAHs and PAEs were detected but at BMDL levels, with the downstream sample having slightly more than the upstream sample. Metals showed significant increases in content from upstream to downstream, particularly barium, cadmium, copper, lead, manganese, mercury, and zinc. With the exception of zinc, metals were not found in higher quantities in the downstream samples than in the upstream water samples. Since these metals were found in higher quantities in the downstream sediment sample than in the upstream sediment sample, the metals must be precipitating out of the water.

4.7.2.4 *Leachate.* One leachate sample was collected and analyzed for EP toxicity metals. The sample was not EP toxic by EPA criteria.

4.7.3 Area 3

Area 3, located near the ball field, reportedly received municipal waste from the City and Town of Poughkeepsie and institutional waste from HRPC. Four monitoring wells were installed and sampled at the site. Two surface water samples, two sediment samples, and one leachate seep sample were also collected and analyzed. No other data exist for this area.

4.7.3.1 *Groundwater.* Upgradient of the fill, the groundwater does not contain any TCL organics; small quantities of semivolatile TICs were detected. The downgradient well along the southern boundary and the one at the southwest corner also contained no TCL organics; several semivolatile TICs were detected, however. The monitoring well on the western side of the fill area had low quantities of TCL volatiles; only two, 1,2-DCE and benzene, exceeded any standards. Several TIC semivolatiles were detected that were not found in the method



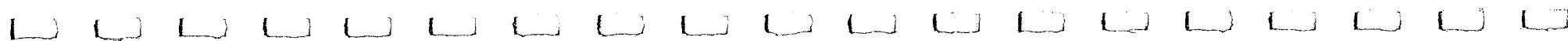
blank. The presence of volatiles in MWHR3-9 was confirmed by the detection of volatiles in the soil gas points near this well. Samples from the soil gas points nearest the other two downgradient wells did not indicate the presence of volatiles.

The metals followed a pattern similar to the organics in that the downgradient well along the western boundary, MWHR3-9, had the highest concentration of total metals. Iron, manganese, and sodium exceeded the groundwater standard in this well. Iron also exceeded the standard in the two other downgradient wells. Only sodium exceeded the standard in the upgradient well. Apparently there is some contamination in the groundwater at this site, but only on the western side.

4.7.3.2 Surface Water. The Class D surface water stream that runs along the western boundary of the area is a branch of the same stream that runs along Area 2. No organic compounds detected in either sample were not also found in the method blank. Of the metals detected, only iron and manganese showed increased concentrations from upstream to downstream, with the iron in the downstream sample exceeding the standard. Except for these two metals, the landfill does not appear to be contributing to the contamination of the surface water.

4.7.3.3 Sediment. There were no volatile organic compounds detected in the sediment samples collected from Area 3 that were not associated with laboratory contamination. In the semivolatile fraction the PAHs found in the upstream sediment sample exceeded those in the downstream sample by almost eight times. PAHs not found with dibenzofuran are usually associated with petroleum products or asphalt material. The upstream PAE concentration (those compounds not associated with the method blank) was 600 times greater than the downstream sample. PAEs are usually associated with plastics and plasticizers. TIC compounds were higher in concentration in the downstream sample than in the upstream sample. One pesticide was detected in the downstream sediment sample at a level below the adjusted contract-required detection limit.

The metals pattern was the reverse of the semivolatiles but similar to the surface water metals in that the downstream sediment contained more metals than the upstream sediment.

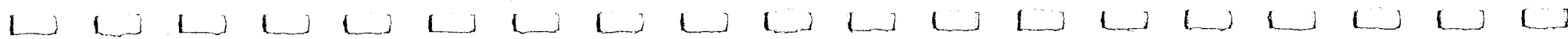


Increases were on the order of two times for most metals, with manganese and iron concentrations increasing three times. Of note was the finding of cyanide in the downstream sediment and not in the upstream sediment sample.

The upstream sediment sample was taken in the pool at the outlet of the culvert that runs under Winslow Gate Road. The upper portion of the stream runs along the southern side of the road before passing under it. Since the stream parallels the southern edge of the fill where leachate seeps were observed, the fill may be contaminating the stream above the upstream sample location and the semivolatiles usually associated with sediment may be settling out in the pool area. Although the downstream sediment sample is more contaminated with metals than the upstream sample, the latter does contain significant quantities of metals indicative of an upstream source. It is also apparent that the leachate seeps along the western boundary are contributing to the heavy metals contamination of the sediments.

4.7.3.4 Leachate. One leachate sample was collected and analyzed for EP toxicity metals. None were detected at a level above the EPA criteria.

4.7.3.5 Boring Soil. One soil sample was collected during the installation of the monitoring wells at Area 3. The volatiles data indicated the presence of possible gasoline contamination (evidenced by the finding of BTX in the sample), although the groundwater taken from this well, MWHR3-11, did not show any such contamination. In the semivolatile fraction PAHs, naphthalene-like substances, and PAEs were detected. The PAHs indicate the presence of a petroleum product and the naphthalene-like substances are generally indicative of diesel fuel. The boring log (Appendix F) for this well verifies that some petroleum product was observed in the split-spoon sample collected at this depth. The groundwater data again do not indicate the presence of any petroleum. 4-Methylphenol (para-cresol), also found in this sample, is generally used as a disinfectant. Since the soil sample from this well was collected from within the fill, the possible source of the 4-methylphenol is medical waste disposed of at the site. This is not at all surprising considering that the site is part of a hospital. Two PCBs, Aroclors 1242 and 1254, were detected in the soil sample taken from this well. The levels found (1000 µg/kg or less of each substance) are far less than the NYSDEC definition



of hazardous waste of >50,000 µg/kg and also less than cleanup levels used by EPA and NYSDEC of 10,000 to 25,000 µg/kg (Refs. 32 and 33, Appendix A).

The metals found in the soil were generally within the range for background soils, except for copper, magnesium, mercury, and zinc. Mercury is by far the highest metal detected relative to background soils; its concentration of 1.2 mg/kg was two orders of magnitude greater than the low end of the range for background soils. These metals were not detected at high levels (some were not detected at all) in the groundwater collected from this well; the metals contamination found in the soil is therefore not affecting the quality of the groundwater. This conclusion also applies to organic contamination, since the finding of chemicals in the soil does not coincide with the finding of the same chemicals in the groundwater. The well was screened in bedrock, with the groundwater source within the bedrock. The soil above the bedrock consists entirely of fill. The fill was not isolated from the bedrock during well construction and water flowing through the fill could conceivably enter the groundwater through the open hole in the bedrock. This apparently was not the case during the Phase II sampling. However, a snowstorm just prior to sampling placed a layer of snow on the ground. Because the weather remained seasonably cold during the period, excessive snow melt did not occur and therefore infiltration did not take place. If the well were resampled after a period of heavy rain, some of the organic compounds and metals found in the soil sample might find their way into the groundwater.

4.7.4 Area 4

The original work scope had located Area 4 directly to the south of Area 3. During the May 1990 sampling event, Area 4 was located to the southwest of Area 3. Area 4 reportedly received mostly C & D waste from HRPC and a small quantity of refuse from the Town of Poughkeepsie. In May 1990 one surface water sample, one sediment sample, and one shallow soil sample were collected and analyzed. No other data are available for the site.

4.7.4.1 *Surface Water.* No organic compounds were detected above the Class D surface water standards. Benzene, chlorobenzene, xylene, 1,2-dichlorobenzene, and naphthalene were all



found in the sample at low levels, possibly indicating a fuel spill. Iron was the only metal that exceeded the Class D surface water standards.

4.7.4.2 *Sediment.* The sediment sample collected from this site was similar to the surface water sample in that it also contained benzene and chlorobenzene. High iron was also observed.

4.7.4.3 *Shallow Soil.* The soil sample collected from Area 4 contained only PAEs, expected in any landfill. Metals were within the range for typical background soils, although the iron concentration was about twice that found in the sediment sample collected from Area 4.

4.7.5 Area 5

Area 5 is located at the junction of Hudson View Drive and Old Bake Shop Road. The streams that originate above Areas 2 and 3 join at the northeastern end of Area 5. The stream is culverted as it passes through the fill area of Area 5. This area received waste from the City and Town of Poughkeepsie and HRPC. Three monitoring wells were installed and sampled and two surface water and two sediment samples were collected and analyzed. In addition, NUS collected two surface water and two sediment samples from the area.

4.7.5.1 *Groundwater.* No TCL organic compounds not also found in the method blank were detected in any of the three groundwater samples. One TIC semivolatile compound was, however, detected in the downgradient well on the east side of the culvert. The other TICs detected were also found in the method blank.

The metals in the upgradient well (west of the culvert) and downgradient well (on the west side of the culvert) were similar in composition and quantity. In both wells iron, manganese, and sodium exceeded the groundwater standards. The high sodium content could be related to salting of the road in winter as both wells are fairly close to roads. Aluminum was also very high in both wells, exceeding background groundwater quality by more than six times. The similarity between the two wells indicates that the fill does not significantly affect the groundwater quality. The downgradient well on the east side of the culvert had much less



iron and manganese than the downgradient well on the west side. The sodium content was higher than the groundwater standard, but about half that found in either of the other two wells.

4.7.5.2 Surface Water. The stream that runs through Area 5 is a Class D surface water. No organic compounds not associated with laboratory contamination were detected in either the NUS or LMS surface water samples. The NUS and LMS data followed a similar pattern in that most metals did not increase significantly from upstream to downstream. The iron in both sets of data and the manganese in the NUS data did increase significantly, however. The iron in both downstream samples and the LMS upstream sample exceeded the surface water standard. Evidently the fill is not contributing to contamination of the surface water except for iron and manganese. The increase in iron and manganese could be associated with the culvert. The manganese and iron concentration in the upstream sample is also below the average concentration in the downstream samples from Areas 2 and 3, possibly indicating that there is no additional source between the two upstream fill areas and Area 5. This cannot be proved, however, without doing a mass balance, which requires flow data outside the scope of this investigation.

4.7.5.3 Sediment. In the sediment samples similar compounds, mostly PAHs, were detected in the data sets from both the upstream and the downstream samples. In the NUS data the upstream sample contained somewhat fewer PAHs than the downstream sediment sample; in the LMS data the downstream sample contained about three times as many PAHs. Because sediments can be scoured during heavy rainfalls and deposited elsewhere, the two sets of data cannot be compared easily. PCBs were also detected at low levels in the downstream Phase II sample. Several pesticides were detected in the NUS upstream and downstream sediment samples, with the concentration higher in the upstream sample.

The metals fraction in the NUS data showed a general increase in concentration from upstream to downstream, especially for aluminum, iron, manganese, and zinc. In the Phase II data, however, the opposite appeared to be the case, with most metals showing a decrease from upstream to downstream. Mercury was detected in the upstream NUS sediment sample and in both downstream sediment samples, indicative of a mercury source. Because of the



phenomenon described above (scouring), no definitive conclusion can be drawn regarding the differences in the two sets of samples. The upstream sediment sample at Area 5 followed a pattern similar to the surface water in that the concentration of iron and manganese was lower than the average concentration of the two metals found in the downstream sediment sample from Areas 2 and 3.

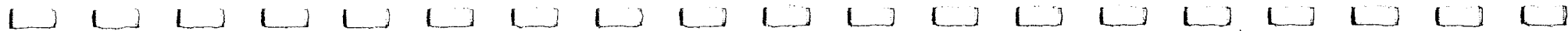
4.7.6 Area 6

Area 6 is located at the southwestern end of the property near Ryon Hall. Area 6 received wastes from HRPC and the City and Town of Poughkeepsie. During the Phase II investigation three monitoring wells were installed and sampled. Also, during the first round of sampling, two surface water samples, two sediment samples, and one leachate sample were collected and analyzed. During a second round of sampling eight additional sediment samples were collected and analyzed for PCBs. NUS also collected four surface water and four sediment samples.

4.7.6.1 *Groundwater.* No TCL organics detected in any of the groundwater samples collected from Area 6 were not also detected in the method blank. Several TIC semivolatiles were detected in the upgradient well and in one of the downgradient wells.

Iron increased slightly in concentration from the upgradient well to the first downgradient well and approximately doubled to the next downgradient well, indicating that iron is leaching out of the fill into the groundwater. Sodium, magnesium, aluminum, and barium also increased in the same manner as iron. Manganese, however, decreased from upgradient to downgradient. Because the highest sodium value was detected in the farthest downgradient well, which was also located closest to the road, the source of the sodium could be road salt.

4.7.6.2 *Surface Water.* The stream that runs by Area 6 is the same one that flows through Area 5 and is classified as a Class D surface water. The organic compounds detected in the up- and downstream samples were only those found in the method blank as well. Several pesticides were detected in a sample collected by NUS from a pond near Area 6. The upstream surface water samples contained similar metals at similar concentrations, as did the



two downstream samples. The major exception was the manganese concentration, which was at least twice as high in the Phase II data as in the NUS data. In general, for both sets of data, the upstream sample contained higher amounts of metals than the downstream sample, indicating that the landfill is not affecting the surface water quality significantly.

Even though the stream originates in Area 5, there does not appear to be any consistency between the data from the downstream location at Area 5 and the data from the upstream location at Area 6.

The pond sample collected by NUS had very high iron and copper, exceeding the Class D standard. Manganese was also high. Both the iron and manganese values contribute to the higher metals found in the downstream sampling by NUS. The small creek that drains into the stream contained lower quantities of metals than in any of the other samples collected by NUS.

4.7.6.3 Sediment. In the volatile organic fraction only one compound, chlorobenzene, not also found in the method blank was detected. This was found in the upstream sediment sample collected by NUS. In the semivolatile fraction neither upstream sample (collected by NUS or LMS) contained any compounds. However, in the downstream sediment sample, the Phase II sample contained PAHs an order of magnitude higher than the NUS sample. It should be noted that the NUS sample was collected farther downstream than the LMS sample. The pond and small creek sample collected by NUS had four to six times the amount of PAHs that the NUS downstream sample had, indicating that the source of the PAHs is from these two areas. In the pesticide/PCB fraction neither the upstream nor the downstream samples contained any pesticides; the upstream samples also contained no PCBs. In the downstream sediment samples the LMS sample contained more than 200 times the Aroclor 1260 as the NUS sample. Again, the NUS sample was located farther downstream than the LMS sample. The NUS sample also contained Aroclor 1248. The small creek sample collected by NUS found 1,700,000 µg/kg of Aroclor 1260; the pond sample contained none. The pond sample did have several pesticides in the sediment. Because of the high concentrations of PCBs found in the sediment, a second round of Phase II sediment sampling was conducted by LMS. These data show results similar to those collected by both NUS and



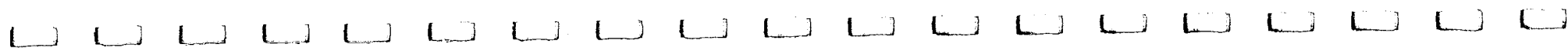
LMS. Decreasing concentrations of Aroclor 1260 were observed in the main part of the stream. The small creek sampled in 1987 by NUS had a high Aroclor 1260 concentration of 390,000 µg/kg in May 1990. At the confluence of the small creek with the stream, small quantities of both Aroclor 1260 and Aroclor 1248 were found. The latter was also found in the farthest downstream sample. Aroclor 1248 was not found in the other samples, and was most likely diluted out of the sample. Several of the samples exceeded the NYSDEC guidelines of 50,000 µg/kg for contaminated sediments (Ref. 35, Appendix A).

In both sets of data the arsenic, barium, copper, iron, lead, manganese, vanadium, and zinc concentrations increased significantly from upstream to downstream locations. The arsenic, barium, copper, iron, and manganese were higher in the LMS data; however, the lead, vanadium, and zinc concentrations were somewhat lower. In the NUS samples taken from the pond the above metals (with the exception of zinc) were all higher than or the same as the downstream NUS sample, indicating that the pond is the source of the increase observed in the metals from upstream to downstream. The above metals were all lower in concentration in the small creek sample than in the downstream sample, except for the vanadium and zinc data. The zinc in the small creek sample is the source of the zinc increase observed from upstream to downstream in the NUS data.

4.7.6.4 *Leachate*. One leachate sample was collected during the Phase II investigation and analyzed for EP toxicity metals and organics. None of the compounds exceeded any EPA criteria.

4.7.7 Summary of Conclusions

4.7.7.1 *Area 1*. None of the chemicals detected in Area 1 would lead to classification of the Area 1 site as hazardous. Leachate has been observed exiting from the embankment leading down to the stream. The leachate itself is not hazardous since it did not contain any compounds exceeding EP toxicity criteria. Although no other analyses were run on the leachate sample, it is logical to assume that the leachate contained iron and manganese (the leachate was reddish-brown and one of the wells in the fill contained high quantities of the two metals). The downstream surface water samples also contained higher iron and



manganese than the upstream samples. Although the sediment data do not show as great an increase, the soil sample acquired by NUS at a leachate seep contained very high quantities of these metals and the leachate is the obvious source. The source of the PAHs, dibenzofuran, and naphthalene-like substances in the downstream sediment sample taken by NUS is unknown as these compounds were not detected in the Phase II samples or in the soil sample taken by NUS from the leachate seep. It is believed that these chemicals are unrelated to the fill area. After the measures recommended in Section 4.8.1 are taken, the area should be delisted.

4.7.7.2 *Area 2.* As in Area 1, none of the chemicals found in the samples collected from Area 2 classify the area as hazardous. There were some violations of the drinking water standards, but since the closest drinking water well is 0.9 mile away from the site (Ref. 13, Appendix A), this is not a problem (especially as groundwater flow is to the west and the drinking water wells are located in the north). There is some metallic contamination of the surface water, but because the stream is a Class D surface water no violations of standards occurred (the stream may be reclassified as a Class C surface water in the future, which may change this conclusion [Ref. 36, Appendix A]). The leachate observed contains no chemicals exceeding the EP toxicity criteria and is therefore not hazardous. The site should be delisted after the measures recommended in Section 4.8.2 are taken.

4.7.7.3 *Area 3.* Area 3 shows some contamination of the groundwater on the western side of the fill area. The stream that flows along the southern and western sides of the fill is a Class D surface water. Although only iron was present in the downstream sample, at a concentration exceeding standards, this may change in the future if the stream is reclassified (to Class C). The sediment samples collected indicated an upstream source of PAHs and PAEs, possibly from the southern side of the fill above the sampling locations. The PAHs found were those generally associated with petroleum products or asphalt materials. The leachate sample showed no EP toxicity metals and the leachate is therefore not considered hazardous. A soil sample taken from the boring drilled along the southern side of the fill indicated the presence of a petroleum source and possibly evidence of medical waste disposal, although there is no documentation to confirm this. The area was used by HRPC as well as the City and Town of Poughkeepsie, and medical wastes could have been disposed of illicitly.



Because the bedrock aquifer is not isolated from the overburden by a confining layer, the source may be entering the groundwater along this area.

4.7.7.4 *Area 4.* Area 4 as described in the work scope shows no evidence of contamination. Area 4 as discovered in the site reconnaissance of May 1990 did indicate the presence of refuse material. Although the limited data do not indicate the presence of hazardous waste, further investigation is warranted.

4.7.7.5 *Area 5.* The contamination in Area 5 is not so significant that the site should be classified as hazardous. Some metals, PAH, and PCB contamination was observed, but not at significant levels. The site should be delisted after the recommendations in Section 4.8.5 have been followed.

4.7.7.6 *Area 6.* Area 6 has significant quantities of PCBs in the sediment. The concentrations exceed the NYSDEC guidelines of 50,000 µg/kg for hazardous sediments, and the site should therefore be considered hazardous. The sediment was also contaminated with PAHs, probably from a petroleum source or from asphalt (not unexpected as the site is near a parking lot and a major road traverses the site). Some metals contamination of the sediments, groundwater, and surface water was also found. Although only the iron standard is violated for the stream, this may change if the stream is reclassified from a Class D to a Class C surface water (Ref. 36, Appendix A).

4.8 RECOMMENDATIONS

Recommendations for the HRPC site are given below, by area.

4.8.1 Area 1

The fill area is already covered and grassed and used as a golf course and no additional work is recommended on the fill area itself. The leachate is discharging aluminum, iron, lead, and manganese into the stream, possibly violating the Class B surface water standards. Because the stream discharges to the Hudson River upstream of the HRPC and City of Poughkeepsie



intakes. it is recommended that the leachate be prevented from entering the surface water. One of the following courses of action will accomplish this objective:

- Pipe the stream from the bottom of the hill to the culvert that runs under Route 9.
- Collect the leachate by building a trench parallel to the stream into which the leachate can flow. Divert the leachate to a sump and treat it (remove the metals) before allowing it to discharge to the stream.

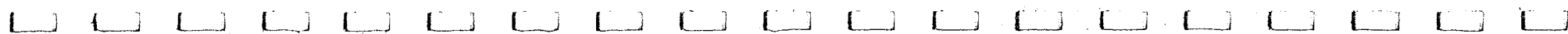
The recommendations above are similar to those provided by DCDOH in June 1967 (Ref. 16. Appendix A).

4.8.2 Area 2

The fill is considered nonhazardous and should be closed in accordance with NYSDEC regulation Part 360-2.15. In addition, the slope of the fill along the western side is very steep and should be regraded to a maximum of 33%. The remainder of the fill area should also be regraded. In addition, the debris on the western side of the fill is inadequately covered and must be covered by a minimum of 6 in. of topsoil after regrading and construction of the final layer of cover material. Other debris observed on the top of the fill area must be removed and disposed of properly. Once this is accomplished, the leachate emanating from the fill area will probably dissipate and no further measures will be needed to control it. However, if the leachate is still in evidence, control measures similar to those for Area 1 will have to be installed.

4.8.3 Area 3

Although the groundwater does not appear to be highly contaminated, the sediment from the stream that flows along the area does have some contamination. The soil from one of the borings indicated the fill material was contaminated. The groundwater in this well may become contaminated during wet weather, which should be confirmed by resampling after a rainstorm. Samples should be analyzed for TCL organics and inorganics. As it is reasonable to assume that the leachate may also contain these chemicals, leachate samples should be



collected from the following areas and analyzed for TCL organics and inorganics: the southern boundary upstream of the upstream surface water sampling location, at a leachate seep observed near the upstream surface water sampling location, and on the western side of the fill near MWHR3-9. After completion of the sampling program, additional work may be required, including diverting the leachate away from the stream.

4.8.4 Area 4

The Area 4 described originally by the work scope should not be investigated further; however, the area discovered by LMS and NYSDEC during the May sampling event requires an additional site reconnaissance to better define the extent of the fill. Locations for additional surface water/sediment and/or leachate samples should be investigated; two or more monitoring wells (one upgradient and one downgradient) should be installed and sampled for TCL organics and inorganics.

4.8.5 Area 5

Because the stream is already culverted and is not being affected by the fill, little needs to be done at this site. However, the culvert should be inspected periodically for leaks and blockages and appropriate repairs made. As no leachate was observed at the site, no leachate control measures are required.

4.8.6 Area 6

A focused feasibility study (FFS) is recommended for Area 6 to ascertain the extent of the PCB contamination. Because the PCBs detected apparently resulted from an "old spill" of PCBs, 40CFR761G would apparently guide the FSS, including the sampling program design. Consultation with the regional EPA in accordance with 40 CFR761.120(a)(1)(ii), (a)(3), and especially (c) appears to be appropriate. The source of the PCBs is predominantly the drainage ditch or small stream that enters the main stream near the picnic pavilion. The study would consist primarily of a detailed, statistically based sampling program that must be developed and executed to delineate the horizontal and vertical extent of the PCB



contamination. Samples of the sediment and soil surrounding the sediment should be taken and analyzed for PCBs. Shallow soil borings should also be drilled and split-spoon samples collected and analyzed for PCBs to delineate the vertical extent of PCB contamination. An additional objective of the sampling program would be to determine and locate the exact source of the PCB contamination, e.g., the spill or disposal area. An additional round of groundwater and surface water samples should also be collected and analyzed for PCBs to confirm their absence in the groundwater and surface water. After completion of the sampling portion of the investigation, a feasibility study (FS) should be done to evaluate the remedial alternatives available for the site. Once a remedial alternative is selected, a conceptual design should be developed.

Before the FFS begins, some initial remedial measures need to be undertaken to prevent contact of personnel with PCBs and to minimize tracking of PCBs from the area. This is especially important because of the nature of the facility (psychiatric center), the location of a major housing facility directly across from the site, and the patients' freedom to roam the site. The stream, ditch area, and soils containing the PCBs must be isolated from the rest of the site by fencing with appropriate posting.



REFERENCE NO. 4





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9 November 1993

File No. 659-010

Mr. William F. Sellner
Development Administrator
Facilities Development Corporation
44 Holland Ave.
Albany, NY 12208

Re: Hudson River Psychiatric Center
Inactive Hazardous Waste Site No. 6
Focus Feasibility Study
FDC Project No. 55382

Dear Mr. Sellner:

Lawler, Matusky & Skelly Engineers (LMS) is currently conducting a Focus Feasibility Study (FFS) to address PCB-contaminated sediments in the stream in Area 6 at the Hudson River Psychiatric Center (HRPC). Task 1 of the FFS is to conduct an investigation to determine the source of the PCB contamination. This task includes a review of all available historical files and aerial photographs of the site, an investigation of the storm drain line which discharges to the stream in Area 6, a site visit to identify potential source locations, and the collection of environmental samples for PCB analyses at the potential source locations. This letter report presents the results of the PCB Source Investigation conducted by LMS in August and September 1993.

1.0 FILE/AERIAL PHOTOGRAPH REVIEW

Historical aerial photographs of the site were obtained and examined to determine, to the extent possible, the approximate dates of waste disposal in Area 6 and/or the approximate



dates of modifications to site structures and topography. The following aerial photographs were ordered from the agencies listed:

<u>Date of Photograph:</u>	<u>Obtained From:</u>
6 June 1960	Agricultural Stabilization & Conservation Service Salt Lake City, UT
27 March 1968	Lockwood, Kessler & Bartlett, Inc. Syosset, NY
8 April 1970	Real Property Tax Service Poughkeepsie, NY
20 March 1980	Real Property Tax Service Poughkeepsie, NY
14 April 1990	Real Property Tax Service Poughkeepsie, NY

The aerial photographs were reviewed to determine the dates of landfilling of waste materials in Area 6. In all of the photographs extending back to 1960, the fill area appears to be completed. The picnic pavilion currently located to the southwest of Ryon Hall could be identified in each of the aerial photographs. HRPC personnel indicated that they believed the picnic pavilion has been present at this location since some time in the 1950's. Mr. Scott Bard of the Office of Mental Health (OMH) has reported to LMS that he has seen a photo of the site from the late 1940's or early 1950's which shows the picnic pavilion. This photo was not available for this report, but will be included in the final report. It is therefore likely that the fill was completed in Area 6 prior to 1950.

The stream passing through Area 6 was also examined in each of the historical aerial photographs to note changes in the stream course. The location of the stream was determined to be as follows for the given years:

- 1960: The stream followed approximately its present course through Area 6, then entered a culvert prior to passing underneath Route 9. After emerging from the culvert on the west side of Route 9, the stream followed a southwesterly direction to the Hudson River.
- 1968 and 1970: During these years, the stream followed approximately the same channel through Area 6. After re-emerging from the culvert under Route 9, the stream followed a southwest path to the Hudson River but



formed a long marshy area near the river. The water treatment plant was now present on the photographs.

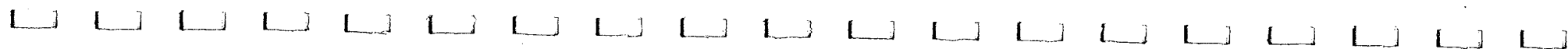
- 1980: By 1980, the path of the stream on the west side of Route 9 had been altered. The culvert was extended underneath a new bank built immediately adjacent to Route 9. The stream continued in a southwest direction to the marsh next to the treatment plant after emerging from the culvert.
- 1990: The culvert on the west side of Route 9 was again extended closer to the Hudson River due to the construction of the Marist College dormitory and athletic field facilities. The stream emerges from the culvert adjacent to the treatment plant and continues to the Hudson River.

In addition to reviewing the aerial photographs, all available historical files for the HRPC were requested, particularly those files related to the use and removal of PCB-containing transformers or records of transformer spills, fires, or explosions. HRPC personnel indicated that no such files were available or had been kept in the past. Several site photographs in the main administration building were reviewed, however, these photographs were determined to have been taken after 1973, as the new Rehabilitation Center built in 1973 can be seen in the photographs.

2.0 STORM DRAIN INVESTIGATION/SITE VISIT

LMS is currently completing a separate study of the storm drain line that discharges to Area 6 due to the identification of raw sewage in the effluent from the drain line at the concrete headwall. In order to determine which buildings or other areas discharge to the storm drain, the main trunk of the line was traced from the concrete headwall up to a manhole near the northeast corner of the Cheney Building. The storm drain flows west along the northern side of the Cheney Building, then turns to the south and flows past the west sides of the Cheney and Ryon Hall buildings before discharging to Area 6. A large number of laterals intersect this main line; it is believed that the majority of these laterals originate from building roof drains, floor drains, and catch basins.

Based on this investigation, it was determined that the Cheney and Ryon Hall buildings were the drainage areas of concern for the PCB Source Investigation. A site visit was subsequently



conducted by LMS personnel. Mr. Wally Pink, an electrician on the HRPC facilities staff, accompanied LMS personnel around site buildings and identified areas where PCB-containing electrical equipment (i.e., transformers, capacitors) were present in the past. To Mr. Pink's knowledge, all oil-filled transformers have been removed from the site. The majority of the transformers (e.g., those in the Ryon Hall and Cheney Buildings) were removed when the central power system for the HRPC was installed in the mid-1970's. A few transformers were removed as late as three or four years ago, however, these transformers would have been out of service since the central power system was installed. Most of the larger buildings on-site had an electrical vault in the basement where the transformers were located. There were no capacitors in the buildings other than individual ballasts for the fluorescent lighting.

There is only one known incident involving a transformer fire, spill, or explosion, according to current HRPC facilities personnel. During the mid-1960's, a transformer located in a below-ground manhole adjacent to the Staff 18 Building (the former director's residence) exploded, possibly as the result of flooding in the manhole. The methods used for cleanup are unknown. The transformer has since been removed from the manhole, which now contains only a concrete pad, electrical line cutouts, and fuse boxes. A drain in the southeast corner of the manhole was traced as far as possible; the drain line leaves the manhole to the south and then turns to the west. This line does not appear to connect with the storm drain line discharging to Area 6.

The vault rooms in the Ryon Hall, Cheney, Poucher Home, and Avery Home buildings were inspected. The Poucher Home and Avery Home buildings were included in the inspection along with Ryon Hall and Cheney Building as Mr. Pink indicated that these buildings were formerly on an electrical manhole system, in which electrical lines were conveyed through a series of manholes from the central powerhouse. The system terminated at a manhole outside Ryon Hall. Conduits branched off the main line and entered the transformer vault rooms for each building on the manhole system. The transformer vault rooms flooded on occasion; when flooding occurred, the water could flow through the electrical conduits back to the manhole system. Water in the manhole system then flowed towards Ryon Hall, and



could enter any of the downstream vault rooms. The electrical system manhole outside Ryon Hall overflowed frequently, according to Mr. Pink.

No transformers were present in any of the vault rooms inspected, however, the former locations of the transformers could be identified on concrete pads in each of the rooms. There was no visible staining in any of the vault rooms, with the exception of the Poucher Home vault room. Black stains were noted on the transformer pad in this room, and heavy black staining was observed on the hallway wall outside the vault room. Signs of flooding were also evident in several of the vault rooms. Floor drains were present in each of the vault rooms, although HRPC personnel were unsure of where the drains led. A drawing of the inside utilities for the Cheney Building was obtained in the Work Control Center offices at the HRPC. The drawing showed both 3-in. and 4-in. storm drain lines leading from the transformer vault room and an adjacent outside area, which also had a floor drain. The drawing did not show outside tie-ins for the lines, however, a plumber for the HRPC reviewing the drawings was relatively certain that the lines tied in with the storm drain line which continues around Cheney Building from the vault room location and runs south past Ryon Hall to Area 6.

LMS personnel also performed a walk-through of Area 6 during the site visit. The existing concrete headwall containing the storm drain outlet was inspected; a moderate flow was noted discharging from the drain line although it had not rained in the last several days. The two old concrete headwalls shown on an old piping drawing were also investigated. One of the headwalls consisted of a concrete block with no apparent outfall. Sections of broken clay pipe and other debris were present below the partially-buried concrete block. Although the outfall could not be seen, flowing water was present in a ditch running from this outfall to the stream. Evidence of the second old headwall could not be found, however, a ditch which appeared to have been dry for a long time was present in the approximate headwall location.

The stream flowing through Area 6 was followed down to the point where it enters the culvert under Route 9. The outlet location of the stream on the west side of Route 9 was investigated; the stream appears to be culverted under several parking lots and reemerges



at a location south of the new Marist College housing and athletic fields, adjacent to the Poughkeepsie Treatment Plant, and less than half a mile from the Hudson River.

3.0 WETLANDS DELINEATION SITE VISIT

In order to obtain a letter of concurrence from the U.S. Army Corps of Engineers (COE) that any remedial construction activities to be conducted in Area 6 fall under the Nationwide Permit 38 which allows for the cleanup of hazardous and toxic wastes in regulated wetlands, a delineation of the extent of the wetlands is required. A wetlands delineation site visit was conducted on 1 October 1993 as part of the PCB Source Investigation, as delineation of the wetlands cannot practically be conducted later than the beginning of October due to the seasonal nature of the vegetation. The wetland boundaries have been flagged and the area will subsequently be surveyed as part of Task 2 of the FFS.

4.0 SAMPLING AND ANALYSES

4.1 Chip Samples

A total of four concrete chip samples were collected at the HRPC and analyzed for PCBs. Three of the chip samples (HRCC-1 through -3) were obtained from the electrical vault rooms in the Ryon Hall, Cheney, and Poucher Home buildings. The concrete chip samples were collected from the floor of each of the vault rooms at locations adjacent to the floor drain on the side of the drain closest to the concrete pad where the transformers were previously located. In the Poucher Home vault room, the chip sample was obtained from the visibly-stained area of the concrete transformer pad. The fourth chip sample (HRCC-4) was collected from the concrete headwall in Area 6 immediately below the discharge point of the 24-in. clay storm drain line (Figure 1).

The analytical results for the chip samples are included in Table 1. The chip sample from the Cheney Building vault room (HRCC-2) contained 710 ppm PCBs, above the 500 ppm level for determination of high-concentration PCB spills. The chip samples obtained from the

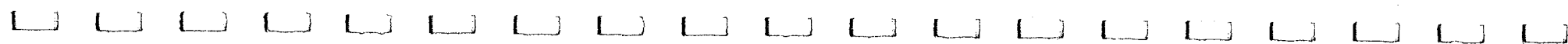
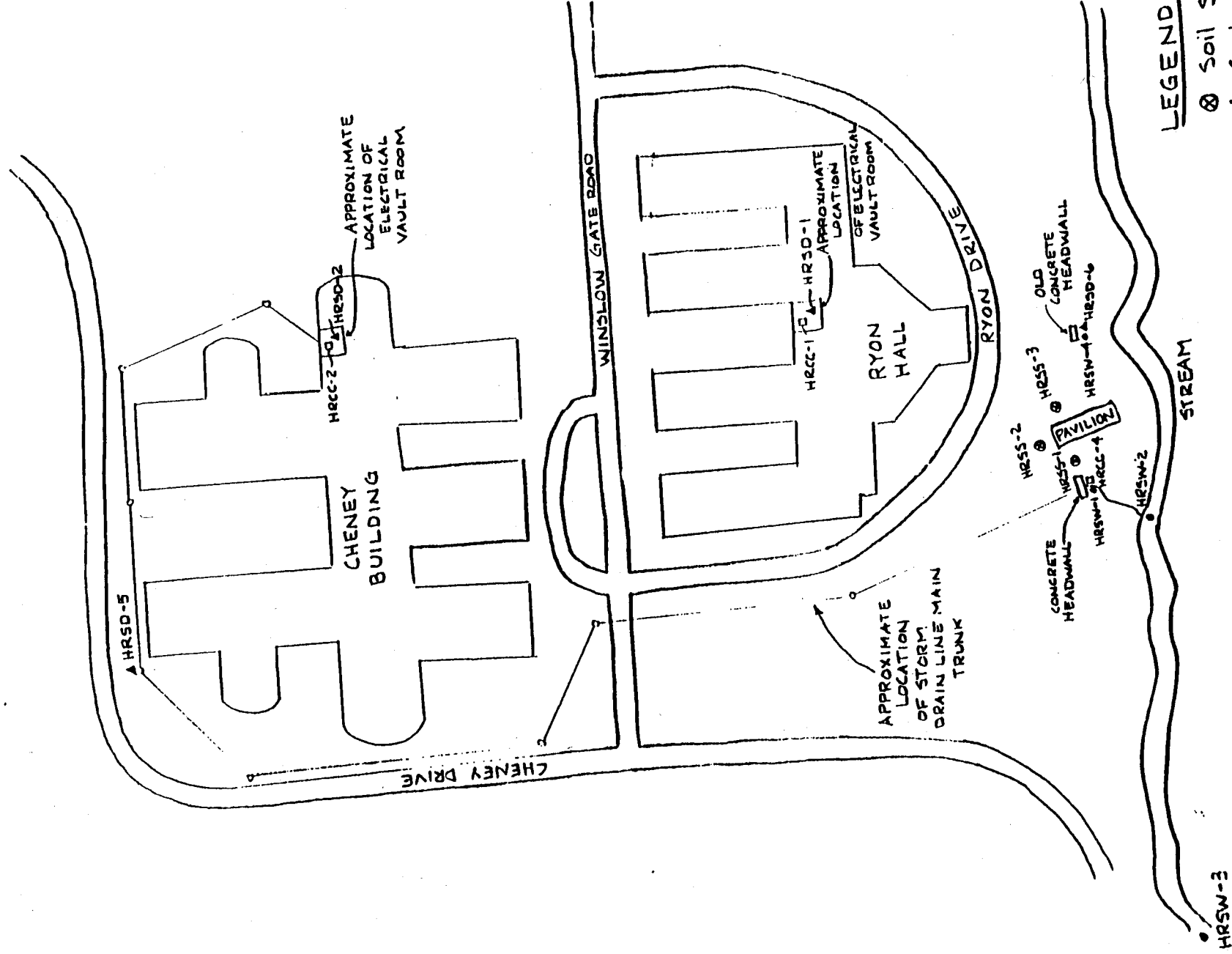


Figure 1
SAMPLING LOCATIONS



NOT TO SCALE



TABLE 1

PCB SOURCE INVESTIGATION DATA SUMMARY

Hudson River Psychiatric Center Area 6

MATRIX	SAMPLE NAME	SAMPLE LOCATION	PARAMETER	PRELIMINARY ANALYTICAL RESULTS
Chip	HRCC-1	Ryon Hall vault room	PCBs - Aroclor 1260*	0.78 ppm
	HRCC-2	Cheney Building vault room	PCBs - Aroclor 1260*	710 ppm
	HRCC-3	Poucher Home vault room	PCBs - Aroclor 1260*	0.40 ppm
	HRCC-4	Storm drain outfall	PCBs - Aroclor 1260*	0.32 ppm
Wipe	HRWS-1	Poucher Home wall	PCBs	ND
Sediment	HRSD-1	Ryon Hall vault floor drain	PCBs - Aroclor 1260*	12 ppm
			PAHs:	
			Acenaphthene	3,700 ppm
			Anthracene	5,300 ppm
			Benzo(a)anthracene	3,800 ppm
			Benzo(b)fluoranthene	1,800 ppm
			Benzo(k)fluoranthene	2,100 ppm
			Benzo(a)pyrene	1,400 ppm
			Chrysene	2,800 ppm
			Fluoranthene	9,100 ppm
			Fluorene	5,600 ppm
			Naphthalene	780 ppm
			Phenanthrene	15,000 ppm
			Pyrene	7,200 ppm
			PCBs - Aroclor 1260*	200,000 ppm
	HRSD-2	Cheney Building vault floor drain	PCBs	ND
	HRSD-3	Poucher Home vault floor drain	PCBs	ND
	HRSD-4	Staff 18 Building manhole	PCBs - Aroclor 1260*	33 ppm
	HRSD-5	Storm drain manhole	PCBs	ND
	HRSD-6	Below old concrete headwall	PCBs	ND
Water	HRSW-1	Storm drain outfall	PCBs	ND
			Total and free chlorine	ND
	HRSW-2	Confluence of creek and stream	PCBs - Aroclor 1260*	9.8 µg/l
	HRSW-3	Entrance of culvert under Rt. 9	PCBs - Aroclor 1260*	0.23 µg/l
	HRSW-4	Below old concrete headwall	PCBs	ND
Soil	HRSS-1	East of picnic pavilion	PCBs - Aroclor 1260*	1.4 ppm
	HRSS-IRS	Additional sample collected at HRSS-1 location	PCBs - Aroclor 1260*	0.14 ppm
	HRSS-2	In front of picnic pavilion	PCBs - Aroclor 1260*	0.44 ppm
	HRSS-2RE	Reanalyzed sample	PCBs - Aroclor 1260*	0.035 ppm
	HRSS-3	West of picnic pavilion	PCBs - Aroclor 1260*	0.62 ppm
	HRSS-3RE	Reanalyzed sample	PCBs - Aroclor 1260*	0.042 ppm

1 - All other PCB Aroclors analyzed for were not detected.

ND - Not detected.



Ryon Hall vault room and the Poucher Home vault room (HRCC-1 and -3) showed PCB concentrations of 0.78 ppm and 0.40 ppm, respectively. A concentration of 0.32 ppm PCBs was detected in the sample of the concrete taken immediately beneath the outfall of the storm drain which discharges to Area 6 (HRCC-4).

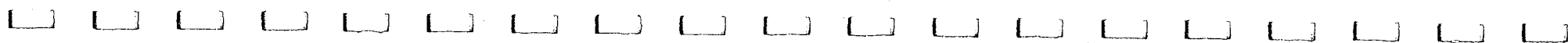
4.2 Wipe Sample

One wipe sample (HRWS-1) was taken from the visibly-stained portion of the wall in the hallway outside the electrical vault room in the Poucher Home building. The wipe sample was obtained by using a sterile gauze pad soaked with hexane to wipe an area outlined by a 10 cm by 10 cm template. The sample was analyzed for PCBs, however, no PCBs were detected.

4.3 Sediment Samples

A total of six sediment samples were collected at the site during the PCB Source Investigation. Three samples (HRSD-1 through -3) were collected of the sediments present in the floor drains in the Ryon Hall, Cheney Building, and Poucher Home electrical vault rooms. Sediment sample HRSD-4 was obtained from the concrete manhole adjacent to the Staff 18 Building; the location of a reported transformer explosion. A sample (HRSD-5) of the sediments deposited in a manhole in the storm drain line near the northwest corner of the Cheney Building was also collected, at the location shown on Figure 1. The sixth sediment sample location (HRSD-6) was immediately downstream of the old concrete bulkhead located to the southeast of the picnic pavilion.

During collection of the sediment sample from the floor drain in the Ryon Hall electrical vault room, a black, tar-like substance was observed in the drain. A sample of the tar was collected and submitted to the analytical laboratory for PCB as well as polynuclear aromatic hydrocarbon (PAH) analyses. (PAHs are common constituents of coal tars and other petroleum products). Mr. Wally Pink, the HRPC electrician who accompanied LMS personnel during sampling of areas within active buildings, mentioned that a similar substance

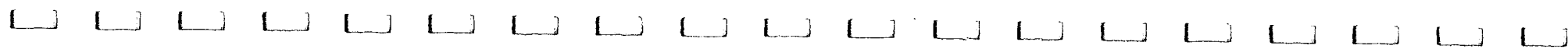


could be seen seeping through the floor in the hallway outside the Ryon Hall vault room. Mr. Pink indicated the location to the LMS sampling personnel, which was approximately 25 ft down the hallway from the vault room entrance. At this location, the tar-like substance was observed seeping out from the floor molding along the wall. At another location in the hallway approximately 10 ft from the vault room entrance in the opposite direction, the tar was also observed seeping up between the floor joints.

All sediment samples were analyzed for PCBs; the results are presented in Table 1. The sediment sample from the Ryon Hall floor drain (HRSD-1) contained 12 ppm PCBs. A total of 12 PAH compounds were also detected in this sediment sample, at concentrations ranging from 780 ppm (naphthalene) to 15,000 ppm (phenanthrene). An estimated concentration of 200,000 ppm PCBs was detected in the sediment sample from the Cheney Building vault room (HRSD-2). PCBs were also identified in the sediment sample obtained from a manhole in the storm drain line adjacent to the northwest corner of the Cheney Building (HRSD-5) at a concentration of 33 ppm. The sediment samples from the Poucher Home vault room and from the below-ground transformer vault located adjacent to the Staff 18 Building (HRSD-3 and -4) contained non-detectable levels of PCBs. PCBs were also not detected in sediment sample HRSD-6, obtained from immediately below the old concrete headwall to the southeast of the picnic pavilion.

4.4 Water Samples

A total of four surface water samples were collected from Area 6 at the locations shown on Figure 1 and analyzed for PCBs with a low-level detection limit (0.05 µg/l). One sample (HRSW-1) was collected of the effluent discharging from the storm drain at the concrete headwall. A second surface water sample (HRSW-2) was obtained at the point where the small creek originating from the storm drain joins the stream which flows through Area 6. The third surface water sample (HRSW-3) was taken where the stream enters the culvert downstream before passing under Route 9. The fourth surface water sample (HRSW-4) was collected immediately downstream of the old concrete bulkhead to the southeast of the picnic pavilion. Because the outfall is below-ground at this location, flowing water was not present.



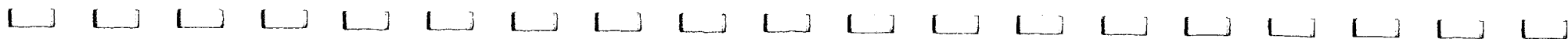
The water sample was collected by creating a small hole in the sediments and allowing water to collect in the depression until adequate volume was present for sample collection. The water sample (HRSW-1) collected of the effluent discharging from the existing concrete headwall was analyzed in the field for total and free chlorine to determine if a potable water source was responsible for a portion of the flow observed at this outfall.

No PCBs were detected in surface water sample HRSW-1 obtained from the storm drain outfall. Total and free chlorine were also not detected in this sample, as determined by a field test kit. PCBs were present in samples HRSW-2 and HRSW-3 taken from the stream in Area 6, at concentrations of 9.8 µg/l and 0.23 µg/l, respectively. The water sample obtained from immediately below the old concrete headwall (HRSW-4) did not contain detectable levels of PCBs.

4.5 Soil Samples

Three surface soil samples (HRSS-1 through -3) were collected from the areas adjacent to the picnic pavilion as shown on Figure 1. One sample was collected directly in front of the pavilion (i.e., north end) and one sample from either side of the pavilion near the front. These sampling locations were selected based on the potential for human contact with the soils by patients or staff using the picnic pavilion. Surface soil samples were obtained from the first 3 to 6 in. of the soil.

PCBs were detected in all three samples at concentrations ranging from 0.44 ppm to 1.4 ppm, as shown in Table 1. These three samples were analyzed following the samples with extremely high PCB concentrations (HRSD-2 and HRCC-2). As a result, the analytical detection limit for these samples was 300 µg/kg, substantially higher than the typical PCB detection limit. In order to determine if PCBs were actually present in the soil samples or if the concentrations detected were the result of carry-over from the previously analyzed high-level samples, samples HRSS-2 and HRSS-3 were reanalyzed (insufficient sample volume remained for the reanalysis of HRSS-1) approximately nine days later. The PCB



concentrations in the reanalyzed samples HRSS-2 and HRSS-3 were 0.035 ppm and 0.042 ppm, respectively.

Sample location HRSS-1 was resampled on 2 November 1993. A soil sample (HRSS-1RS) was collected as closely as possible to the original sampling location and submitted for PCB analyses. This sample showed a PCB concentration of 0.14 ppm; an order of magnitude less than the PCB level detected in HRSS-1.

5.0 CONCLUSIONS

The analytical results from the PCB Source Investigation indicate that two samples have PCB concentrations exceeding 50 ppm; the New York State regulatory level for identification of hazardous PCB wastes. These two samples were collected from the Cheney Building electrical vault room. The concrete chip sample taken from the floor in the vault room had a concentration of 710 ppm PCBs, while the sediment sample obtained from the floor drain had an estimated concentration of 200,000 ppm PCBs. These results indicate that a release of PCB-containing fluids occurred in the Cheney Building electrical vault room at some time in the past. The PCBs flowed or were washed into the floor drain. Due to the high concentrations detected (i.e., approximately 20% PCBs in the sediment sample collected from the floor drain), the release most likely occurred from a transformer(s). Typical transformer fluids (e.g., Askarel) contain 50 to 70% pure PCBs.

The sediment sample (HRSD-5) obtained from a manhole in the storm drain line near the northwest corner of the Cheney Building had a concentration of 33 ppm PCBs. The identification of PCBs in this sample confirms that the floor drain in the Cheney Building vault room leads to the storm drain line and that the PCBs were conveyed to the stream in Area 6 via this storm drain. The previous Phase II investigation of the site conducted by LMS indicated that the highest sediment sample PCB concentrations were found in the creek leading from the storm drain outfall to the stream.

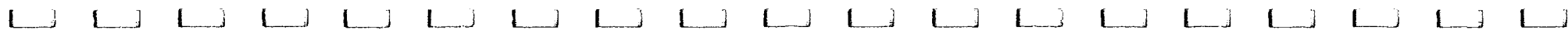


The concrete chip sample (HRCC-1) and the storm drain sediment sample (HRSD-1) from the Ryon Hall vault room indicate that low levels of PCBs are present on the concrete and in the floor drain sediments. The concentrations detected (0.78 ppm and 12 ppm, respectively) are below the New York State criteria of 50 ppm PCBs for identification of hazardous materials, although the sediment sample does exceed the NYSDEC recommended soil cleanup objective of 1 ppm PCBs. These concentrations may be the result of a small spill or leakage of PCBs from the transformers formerly present in the vault room, but do not appear to indicate that a large spill or other release occurred that would have resulted in substantial PCB contamination in the stream in Area 6.

The sediment sample obtained from the floor drain in the Ryon Hall vault room was analyzed for PAHs in addition to PCBs due to its tar-like consistency. High concentrations (i.e., up to 15,000 ppm, or 1.5%) of 12 different PAH compounds were detected in the sample, indicating that the sample is indeed a coal tar or other petroleum product. The source of the tar is unknown, however, as discussed above, a source of this material appears to exist underneath the Ryon Hall basement and is seeping through the floor in several locations.

The concrete chip sample (HRCC-3) from the Poucher Home vault room transformer pad showed low levels of PCB contamination, indicating that small spills of PCB-containing fluids may have occurred in the past. The sediment sample from the Poucher Home vault room floor drain (HRSD-3) as well as the wipe sample (HRWS-1) taken from the stained portion of the wall outside the room did not contain detectable levels of PCBs. The sediment sample from the below-grade manhole adjacent to the Staff 18 Building also did not contain detectable levels of PCBs. These locations do not appear to be sources of PCB contamination for the sediments in Area 6. The old concrete headwall located to the southeast of the picnic pavilion also does not appear to be a source of PCB contamination, as the sediment and surface water samples (HRSD-6 and HRSW-4) from this location did not show detectable levels of PCBs.

No PCBs were detected in the water discharging from the storm drain at the concrete headwall in Area 6, however, a chip sample collected from the concrete immediately below



the storm drain outfall (HRCC-4) contained low levels of PCBs, indicating that PCBs have discharged from the storm drain line in the past. PCBs were detected in the stream at the confluence with the storm drain outfall creek and at the entrance to the culvert under Route 9 at levels of 9.8 $\mu\text{g/l}$ and 0.23 $\mu\text{g/l}$, respectively. These concentrations are probably the result of PCB-contaminated suspended sediments from the stream or storm drain line present in the water samples.

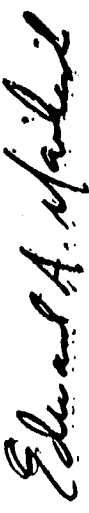
Low levels of PCBs were detected in all three of the soil samples collected around the picnic pavilion in Area 6. Only one of the samples had a PCB concentration exceeding the NYSDEC recommended soil cleanup objective of 1.0 ppm PCBs for surface soils; HRSS-1 had a concentration of 1.4 ppm PCBs. However, these samples were analyzed following the high-level samples obtained from the Cheney Building vault room and may have been elevated as a result of carry-over. The reanalysis of samples HRSS-2 and HRSS-3 showed PCB concentrations that were an order of magnitude less than the original concentrations, and substantially below the 1.0 ppm NYSDEC recommended soil cleanup level. Sample HRSS-1RS had a concentration of 0.14 ppm PCBs, also an order of magnitude less than that detected in the original sample and significantly below the NYSDEC recommended soil cleanup level of 1.0 ppm. The low levels of PCBs detected in the surface soils may be the result of tracking from the more highly contaminated sediments in the stream adjacent to this area.

Based on these results and the aerial photograph investigation which indicates that the landfill under the pavilion was completed prior to the early 1950's, i.e., prior to the widespread use of PCBs in electrical equipment, the soil around the pavilion is not the source of the PCB contamination in the stream sediments. In addition, the PCB concentrations detected in the surface soil samples are well below the NYSDEC recommended soil cleanup objective of 1.0 ppm PCBs, therefore, these soils may be considered clean and the fence may be moved to allow for use of the picnic pavilion. The fence should be repositioned to prevent access to the concrete headwall with the storm drain outfall and the stream itself.



Please feel free to contact me or Ms. Sara Handy if you have any questions regarding this report or the PCB Source Investigation.

Very truly yours,



Edward A. Malkish, P.E.
Project Manager

EAM/sah



REFERENCE NO. 5



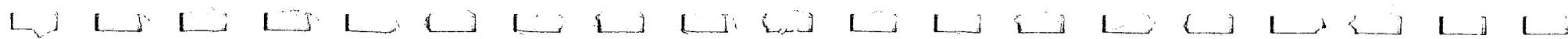
FIELD SAMPLING PLAN

HUDSON RIVER PSYCHIATRIC CENTER

**373 North Road
Poughkeepsie, New York**

**AREA 6 INTERIM REMEDIAL MEASURE
AND REMEDIAL INVESTIGATION/FEASIBILITY STUDY**

NYSDEC I.D. No. 314063



**HUDSON RIVER PSYCHIATRIC CENTER
AREA 6 INTERIM REMEDIAL MEASURE AND
REMEDIAL INVESTIGATION/FEASIBILITY STUDY**

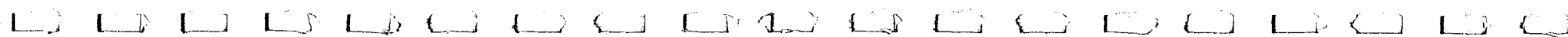
Field Sampling Plan

1.0 INTRODUCTION

The Hudson River Psychiatric Center (HRPC) is located in the Town of Poughkeepsie off Route 9 in Dutchess County, New York. The HRPC is owned by the State of New York and is an active psychiatric complex. The complex is bordered on the west by the Hudson River, Marist College, and Route 9; on the east by Route 9G and private residences; on the north by a residential area; and on the south by the Children's Home, private residences, and a manufacturing/storage facility. The complex consists of a number of buildings and large areas of undeveloped land.

Wastes generated by the HRPC were disposed of on-site for approximately 100 years in six separate disposal areas. The City and Town of Poughkeepsie also disposed of municipal wastes consisting of household garbage, commercial garbage, and construction and demolition debris in several of these disposal areas. On-site waste disposal was continued until 1973 or 1974. Lawler, Matusky & Skelly Engineers (LMS) conducted a Phase II investigation of the six disposal areas for the New York State Department of Environmental Conservation (NYSDEC). The Phase II investigation report completed in March 1991 concluded that five of the six areas (Areas 1 through 5) did not appear to contain hazardous wastes. In Area 6, however, hazardous levels of PCBs were detected in stream sediments.

Area 6, located near Ryon Hall in the southwest corner of the site, is bordered on the north by Ryon Drive, on the west by Winslow Gate Road, on the east by a parking lot, and on the south by an unnamed tributary to the Hudson River. The site is approximately 2 acres in size, and includes a picnic pavilion located on top of the covered fill material. The Phase II



investigation detected PCBs in sediment samples collected from the stream in Area 6 at concentrations ranging from 0.4 ppm to 390 ppm, which substantially exceeds the criteria of 50 ppm for determination of hazardous PCB wastes. The data were confirmed by a previous site investigation conducted by the NUS Corporation for EPA in 1987, which identified PCB contamination in the sediments at levels up to 1,700 ppm. High PCB concentrations (i.e., greater than 50 ppm) were found in the sediments from the drainage ditch (creek) that leads from the storm drain headwall to the stream in Area 6 and in the stream downstream of the confluence of the creek and stream. Groundwater, surface water, and leachate samples from the Area 6 investigation did not indicate the presence of PCB contamination in these media. The source of the PCB contamination therefore appeared to be the storm drain discharging to Area 6.

Based on the results of the Phase II investigation, the NYSDEC retained Area 6 on the Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 site. In a letter dated 28 April 1993, the NYSDEC informed the Office of Mental Health (OMH) of the decision to classify the site as a Class 2. The letter stated that further investigation of the site is needed to determine the extent of the PCB contamination and to evaluate appropriate remedial alternatives.

LMS has subsequently been retained by the Facilities Development Corporation (FDC) to perform a Remedial Investigation/Feasibility Study (RI/FS) for Area 6. The goal of the RI/FS is to develop a remedial plan for prevention of adverse impacts to human health and the environment from the PCB contamination present in the stream. A source investigation has previously been conducted as the first step in the RI/FS to determine the origin of the PCB contamination in Area 6. A letter report summarizing the results of the investigation was subsequently submitted to the FDC and NYSDEC. This investigation indicated that the source of the PCB contamination is a former transformer vault room located in the Cheney Building; sediments in the floor drain in this vault room contained approximately 20% PCBs. The floor drain appears to connect to the storm drain line which discharges at the concrete headwall in Area 6.



Because of the levels of PCBs detected and their location in the storm drain line, an Interim Remedial Measure (IRM) has been added to this study to investigate and remove any immediately hazardous conditions. The IRM will consist of field investigations to determine the extent of PCB contamination in the vault room and drain line and to assess the extent to which the contamination poses an immediate risk to human health and the environment. Plans and specifications will be prepared to remedy immediately hazardous conditions, if any are found. The IRM will be conducted prior to and/or concurrent with the RI field activities.

This Field Sampling Plan (FSP) outlines the field activities to be conducted by LMS as part of the IRM and RI/FS for Area 6. The FSP includes the number and location of proposed groundwater, sediment, chip, and wipe samples, sampling procedures, and analyses to be conducted. In addition to this FSP, LMS has prepared a Health and Safety Plan (HASP) and a Quality Assurance Project Plan (QAPjP) which apply to all field activities conducted as part of the IRM and RI/FS. The HASP will address appropriate levels of personal protective equipment for workers conducting the field investigation as well as air monitoring requirements and action levels. The QAPjP describes the quality assurance/quality control (QA/QC) requirements for the field investigation to ensure that the data obtained meets the project data quality objectives.

2.0 OBJECTIVES OF THE SAMPLING EFFORT

The IRM will be divided into two stages; the objective of the first stage is to collect the necessary data for the second stage, which is the preparation of plans and specifications for remediation of PCB contamination determined to be an immediate threat to human health and the environment. The first stage of the IRM will consist of the following field activities:

- An investigation to accurately map and characterize the storm drain system in the vicinity of Ryon Hall and Cheney Building. The routes and interconnections of the storm drain and in particular the connection of the Cheney Building vault room floor drain to the storm drain line will be traced.
- An investigation to determine the quantity and extent of PCB contamination of sediments within the storm drain. Sediment samples will be collected for analyses at a number of locations in the drain.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

- An investigation to determine if the pipeline itself is contaminated with PCBs. A series of wipe samples will be collected from the pipe and analyzed for PCBs.
- An investigation to determine the extent of contamination on the floor and walls in the Cheney Building vault room and the quantity of sediments in the floor drain. The walls and floors will be sampled with wipes and the sediment measured in the floor drain.

For the RI, sampling and analyses will be conducted to determine the horizontal and vertical extent of PCB contamination in the stream sediments as well as the depth of contamination. Groundwater sampling will be conducted to confirm the absence of PCBs as determined during the Phase II investigation of the site. Also as part of the RI, concrete cores and soil samples will be collected from the floor in the Cheney Building vault room.

3.0 SAMPLING PROCEDURES

3.1 IRM Investigations

3.1.1 Storm Drain Sediment Sampling. Approximately 10 sediment samples will be collected from the existing manholes along the storm drain line in order to determine the extent of sediment contamination. Sample locations will be selected based on the results of the storm drain survey and field observations. Sampling in manholes will be conducted in accordance with the Occupational Safety and Health Administration (OSHA) regulations concerning confined spaces. Sampling will be conducted without entering the manhole to the extent possible. Samples will be collected with stainless steel spoons or ladles. The samples will be placed in pre-cleaned jars and analyzed with a portable PCB soil extracting kit (Dtech field lab analysis kit). A new jar and spoon or ladle will be used for each sample collected to prevent cross-contamination.

3.1.2 Storm Drain Wipe Sampling. At each of the sediment sample locations, wipe samples will also be collected from the pipe. The samples will be collected on the bottom of the pipe just above the waterline. A 10 x 10 (100 cm²) cm template will be used to designate the wipe area. Hexane, an approved pesticide grade solvent, will be used for collection of the samples. Laboratory-supplied pads or 3 x 3-in. gauze pads soaked with approximately 15 to 20 ml of



hexane will be stroked once in the vertical and once in the horizontal direction throughout the template area. The gauze pad will be placed in a jar, the lid tightened, and the jar labeled with the sample date, time, and location.

3.1.3 Vault Room Wipe Sampling. Wipe samples will be collected from the Cheney Building vault room to determine the extent of surficial PCB contamination. The samples will be collected from the wall behind the old transformer rack in at least five locations and from approximately 15 locations from the floor, as shown on Figure 1. Hexane, an approved pesticide grade solvent, will be used for collection of the wipe samples. The wipe samples will be obtained using 3 x 3 in. laboratory-supplied or sterile gauze pads soaked with approximately 15 to 20 ml of hexane. A 10 x 10 cm template (100 cm²) will be used to delineate the wipe area. The entire area will be stroked once in the vertical and once in the horizontal direction. The gauze pad will be placed in a pre-cleaned, laboratory-provided glass jar and the lid tightened. The sample will be labelled with the sample location, date, and time.

3.1.4 Vault Room Sediment Sampling. A sediment sample will be collected from the floor drain outside the old vault room (Figure 1). The sample will be collected using a stainless steel spoon or ladle from the sediments found inside the floor drain. A description of the sediments will be noted on the sample log. The sample will be placed in a bottle for subsequent on-site analysis using the Dtech field analysis kit.

3.2 Remedial Investigation

3.2.1 Stream Sediment Sampling. Sediment samples will be collected throughout Area 6 as needed to fully delineate the extent of the PCB contamination. The sediment samples will be analyzed for PCBs using a mobile laboratory to allow for delineation of PCB contamination exceeding the established remedial action level during a single field mobilization. Sediment samples will be collected within the creek/stream and from both banks at the transect locations shown on Figure 2. Based on the mobile laboratory analytical results for the initial samples, additional samples will be collected either at further distances from the stream or further downstream within the stream bed. The objective is to find the boundaries



- W = Wipe samples on wall
- S = Sediment samples
- O = Wipe samples on floor

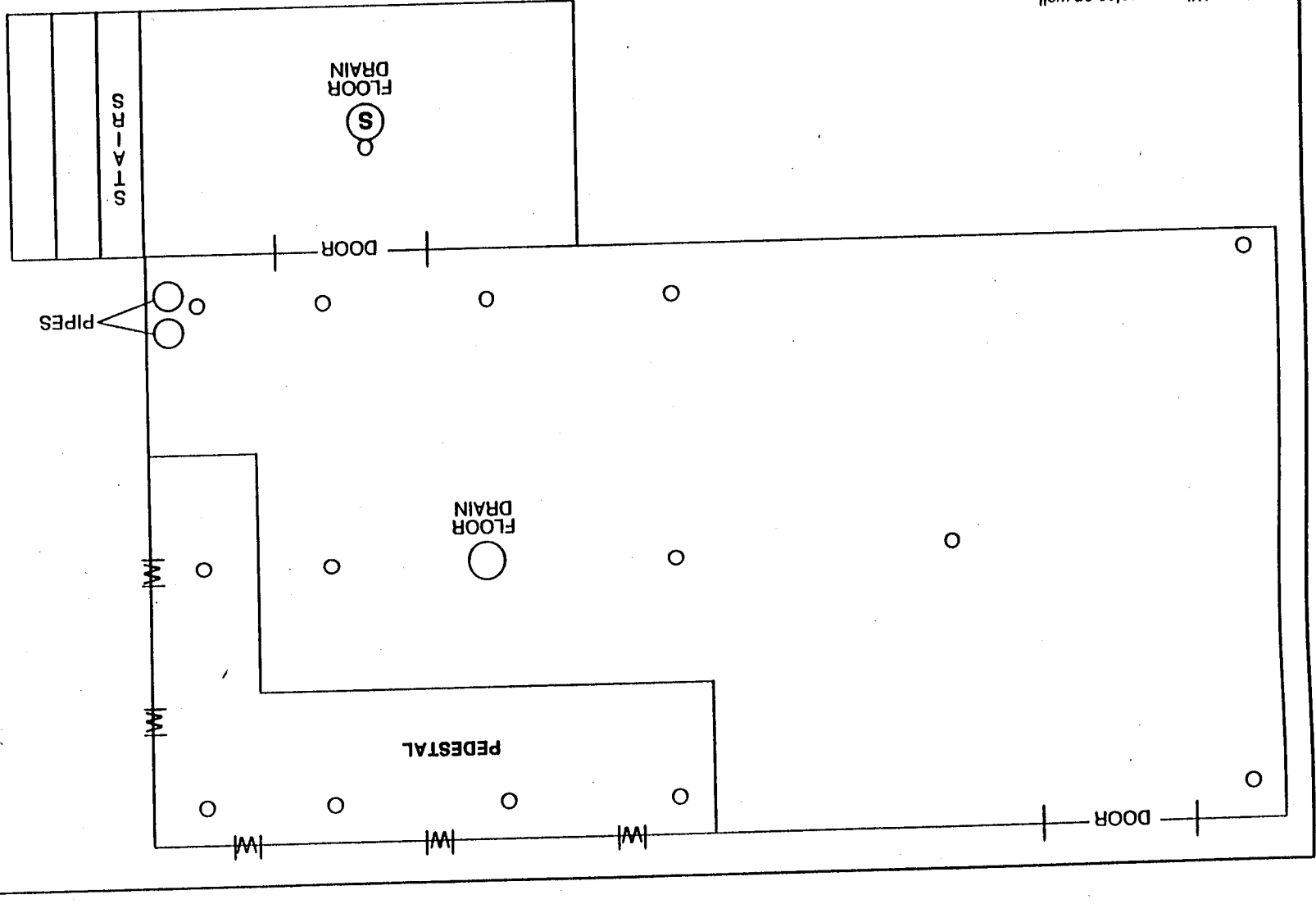
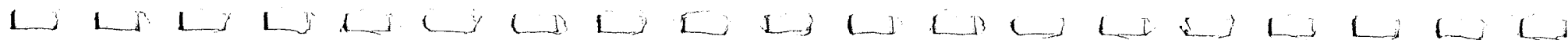


FIGURE 1
PROPOSED
CHENEY VAULT ROOM
SAMPLING LOCATIONS
HUDSON RIVER PSYCHIATRIC CENTER
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York

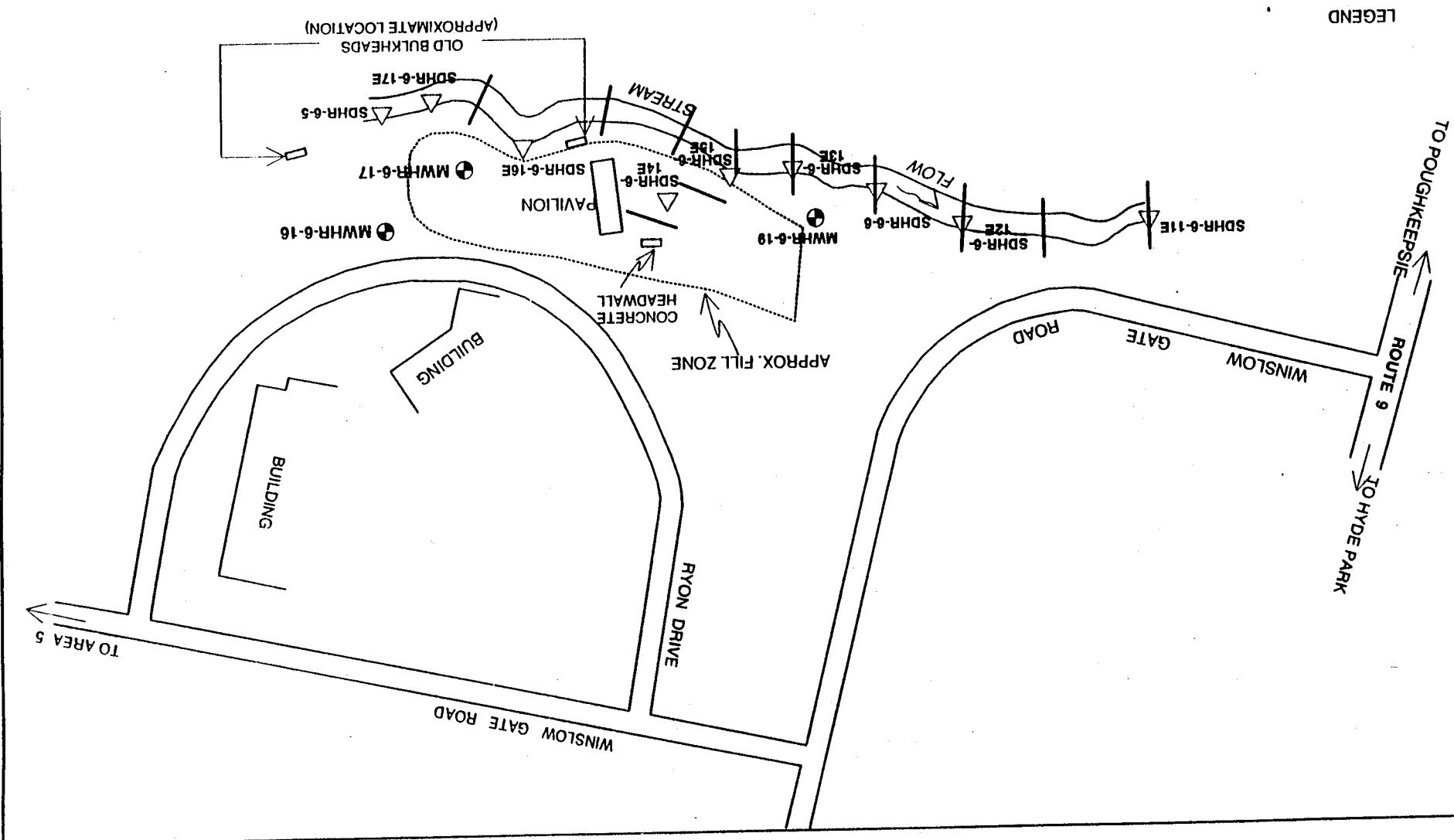
WASHINGTON 041



**PROPOSED SURFACE WATER/
SEDIMENT SAMPLING LOCATIONS**

FIGURE 2

HUDSON RIVER PSYCHIATRIC CENTER
LAWLER, MATUSKY & SKELLY ENGINEERS
Pearl River, New York



U U

where the PCB concentrations are less than the specified remedial action level (i.e., less than 5.0 mg/kg). A cutoff concentration of 1.0 mg/kg will be used to end the sampling along a transect. The majority of the sediment samples collected will be surficial samples, however, sediment cores will be taken at selected locations. Samples obtained from the cores will be analyzed and additional samples collected as needed to delineate the depth of the PCB contamination occurring in Area 6.

The mobile laboratory is capable of analyzing a maximum of 30 samples per day. To achieve the objectives of this investigation, it is anticipated that the mobile laboratory will be utilized at the site for one week, with the collection and analysis of 100 to 120 sediment samples. More or less samples may be collected depending on the identified extent of the PCB contamination. As a QA/QC measure, 10 sediment samples (i.e., approximately 10% of the total number of sediment samples) will be submitted to a fixed analytical laboratory for PCB and total organic carbon (TOC) analyses. TOC analyses are necessary for determining site-specific remedial action levels, as NYSDEC sediment cleanup criteria for PCBs are dependent on the TOC content of the sediments.

Sediment samples will be collected with laboratory-cleaned stainless steel spoons. Dedicated spoons will be used or spoons will be decontaminated between sample locations to prevent cross-contamination. Core samples will be collected using pre-cleaned acrylic tubes or a Ballcheck corer. Sediment samples will be collected in laboratory-cleaned bottles or vials and will be labeled with the sample date, time, and location.

3.2.2 Groundwater Sampling. Three groundwater monitoring wells were previously installed in Area 6 during the Phase II investigation of the site. An additional round of groundwater sampling is included in the RI field investigation. These samples will be analyzed for PCBs only to confirm the absence of PCBs in the groundwater.

Prior to sampling at each well, the initial static water level and well depth will be measured to within 0.01 ft using an electronic water level meter. The volume of water to be purged from the well prior to sampling will be calculated based on the borehole diameter and the height of the water column. Two methods of purging will be used, depending on the yield



of the well. The first method, generally used on poor-yielding wells, involves purging with a dedicated laboratory-cleaned PVC bailer. The second method, generally used on medium to high-yield wells, entails purging with a centrifugal pump, dedicated polyethylene tubing, and a foot valve.

Purging will begin at the bottom of the well to remove accumulated fines. The pumping rate will be adjusted to maintain a steady recovery and pumping volume. If steady state can be achieved and the silt has been removed from the bottom of the well, the intake of the tubing will be gradually raised to the top of the water column to ensure that the entire water column is purged. If the well purges dry before the calculated volume has been removed, the well will be allowed to recover and then purged again to ensure that the groundwater in the immediate area of the well has been removed. In general, a minimum of three borehole volumes will be purged from each well unless the well purges dry before this is accomplished. Turbidity, specific conductance, pH, and temperature will be measured at intervals during the purging with precalibrated instruments. The objective of the purging process is to ensure representative groundwater samples with turbidity values of 50 NTU or less so as to meet NYSDEC water clarity requirements for sample analysis.

After purging, the wells will be allowed to recover to at least 90% of the initial water column before sampling. Samples will be collected with dedicated laboratory-cleaned Teflon bailers from the top of the water column. Temperature, specific conductance, pH, and turbidity will be measured at the start and end of sampling. Field data will be recorded on each well sampling log. Samples will be placed in precleaned bottles or vials provided by the analytical laboratory. All sample bottles will be labeled with the site name, job number, sample identification, date, time, and parameters for analysis. Preservatives will be added to the samples in the field when appropriate.

3.2.3 Downstream Investigation. The Class D stream passing through Area 6 enters a culvert immediately downstream of the site prior to passing under Route 9. During the PCB source investigation, it was determined that the stream emerges from the culvert under Route 9 at a location south of the new Marist College housing and athletic fields, adjacent to the Poughkeepsie Treatment Plant, and less than half a mile from the Hudson River. One or two



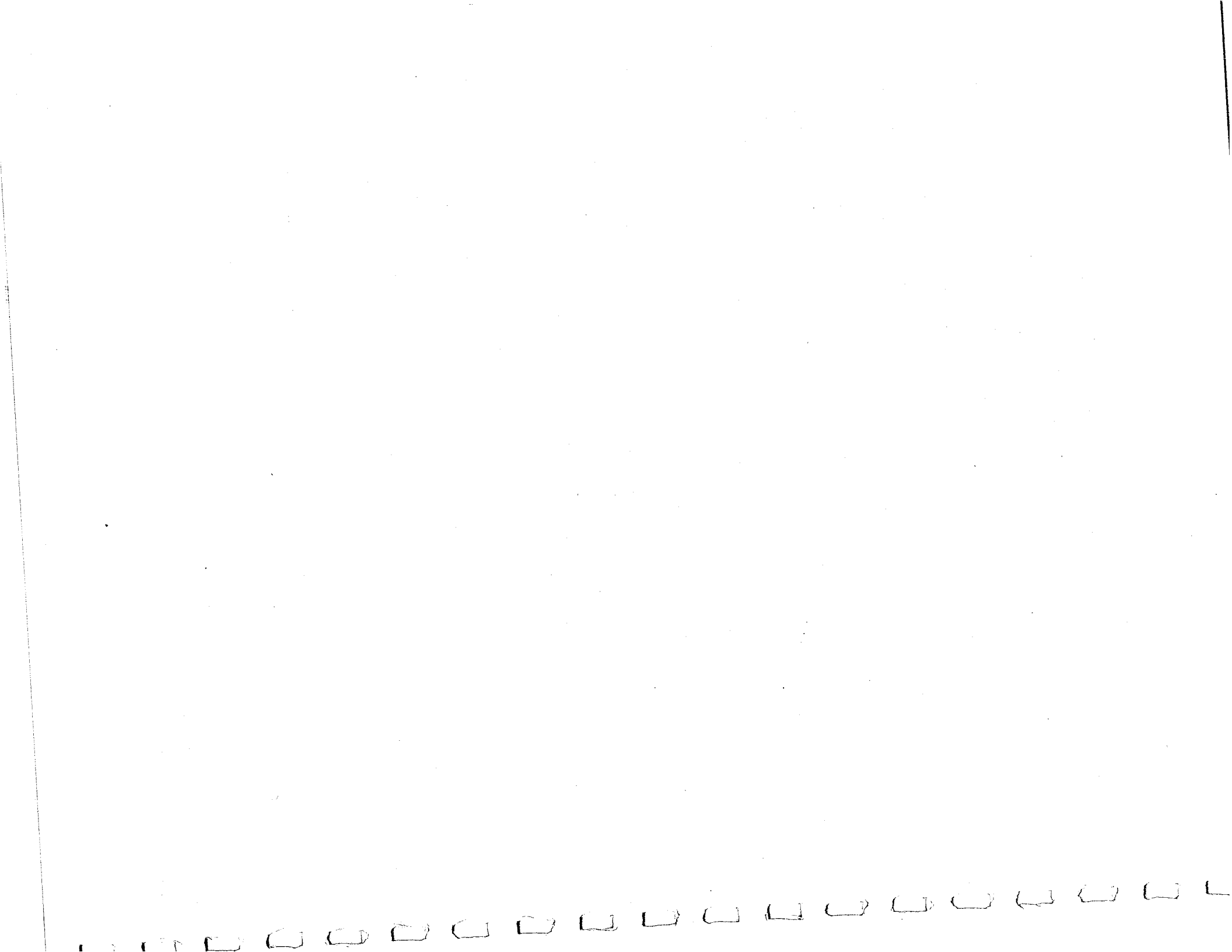
samples will be collected of the sediment immediately below the culvert outfall west of Route 9 and analyzed by the on-site mobile laboratory. The purpose of these samples is to ensure that PCB contamination is not present in the uncultivated section of this stream west of Route 9. Sediment sampling procedures to be used for collection of these samples are as discussed in Section 3.5.

3.2.4 Concrete Core Sampling in Vault Room. Core samples will be collected from the floor of the vault room to determine if PCBs have seeped into the concrete. A minimum of four cores will be taken from the concrete floor and divided into 2-in. segments using a permanent marker. Collected cores will be labeled with the sample date, time, and location, then transported to LMS' Nyack laboratory for subdividing prior to submission to an analytical laboratory for analyses.

During the coring process, any dust or water used will be collected in a wet-vac. The vacuum will include a garbage bag to contain the dust and water. After completing each core, the bag will be replaced. The old bag will be placed in a 55-gal drum. A dust/particulate meter (RAM-1) will be used to measure the amount of dust in the room. Level C personal protective equipment will be on hand in case particulate levels as measured by the RAM-1 required an upgrading in the level of protection (as indicated in the HASP).

Once the concrete core is removed, a soil sample will be collected of the material immediately beneath the floor. A stainless steel spoon will be used if the soil is loose. If sample collection cannot be accomplished in this manner, a slam bar will be used to loosen the material and a sample will be collected. After collection, the core hole will be replaced with cement and sealed.

The core samples will be subdivided under a laboratory hood at LMS' Nyack laboratory. Precleaned tools will be used to collect dust and chips from the specified intervals of the core. Any excess dust will be contained within the hood and properly disposed of. A wet-vac will be used in addition to the hood vent to collect excess water and dust. Once all the samples have been collected, the bottles will be labeled with sample date, time, and location and sent to the analytical laboratory.



4.0 ANALYSES

4.1 Soil, Storm, and Floor Drain Sediment Samples

The sediment samples collected from the storm drain line and from the floor drain outside the Cheney Building vault room will be analyzed using the Dtech portable PCB soil extracting kit. The purpose of using the field analysis kits is to determine qualitatively the presence and relative concentration range of PCBs in the samples. The approximate PCB concentration is determined by reading the resulting color of the extracted sample. Those samples containing PCBs will be labeled and sent to an outside laboratory for confirmatory analysis by gas chromatography (GC). The Dtech field test kit analyses also provide information for the fixed analytical laboratory concerning the relative concentration of PCBs in the samples, which allows the laboratory to dilute the samples appropriately prior to analysis and avoid overloading the GC.

4.2 Wipe Samples

The wipe samples collected from both the storm drain line and from the floor and walls of the Cheney Building vault room will be submitted to a fixed analytical laboratory for PCB analyses.

4.3 Stream Sediment Samples

All sediment samples collected from the stream in Area 6 will be analyzed for PCBs using an on-site mobile laboratory. The mobile laboratory proposed for use at the HRPC site consists of an HNu Systems Model 301 Gas Chromatograph with an electron capture detector. Sample extraction and analysis procedures will be conducted in accordance with "Field Measurement of PCBs in Soil and Sediment Using a Portable Gas Chromatograph" (Thomas M. Spittler, Ph.D., U.S. EPA Region I Laboratory, Lexington, MA, 1983). The mobile laboratory is capable of analyzing PCBs with a detection limit of 1 mg/kg (ppm).



As a QA/QC measure, 10 sediment samples (i.e., approximately 10% of the total number of sediment samples) will be submitted to a fixed analytical laboratory for confirmatory PCB analyses.

4.4 Groundwater and Concrete Core Samples

Groundwater and concrete core samples collected during the RI will be submitted to a fixed analytical laboratory for PCB analyses. The detection limit for the groundwater analyses will be sufficiently low to ensure that the groundwater standard for PCBs (0.1 µg/l) is not exceeded. Concrete core samples will be submitted to the analytical laboratory after sectioning at LMS' Nyack laboratory.

5.0 DECONTAMINATION

All equipment that comes into contact with potentially contaminated soils, sediments, or groundwater will be decontaminated prior to being removed from the site. In addition, sampling equipment will be decontaminated between sampling locations, or dedicated sampling equipment will be employed. Sampling equipment intended for re-use (i.e., non-dedicated) will be cleaned using a detergent scrub and will receive a final rinse with deionized/distilled water prior to collection of samples. Specific equipment and personnel decontamination procedures are included in the site-specific Health and Safety Plan (HASP).

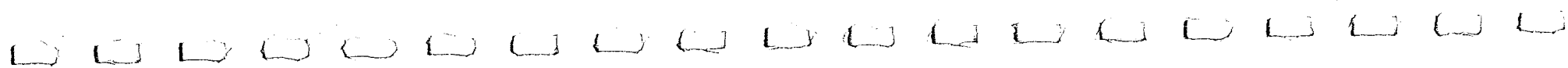
6.0 SAMPLE HANDLING

Following collection and labeling, all samples will be packed in iced coolers maintained at 4° C. Samples will be packed so as to avoid breakage during transport and to minimize cross-contamination. The samples will be shipped by overnight courier to the fixed analytical laboratory. Chain-of-custody protocols will be followed for all shipments of samples to the laboratory, and care will be taken to ensure that the sample holding times are not exceeded.



7.0 WASTE HANDLING AND DISPOSAL

Work derived wastes include disposable personal protective equipment (PPE), decontamination rinsewater, and general trash. Used PPE and other trash will be stored in appropriate trash bags on-site. Upon completion of the field activities, the trash generated will be transported back to LMS' Nyack Laboratory for proper disposal. Water and sediments generated from the decontamination of equipment and personnel will be collected and stored on-site in a staging area constructed for this purpose. The sediments will be allowed to settle out from the wastewater. At the completion of the field activities, samples of both the wastewater and the sediments will be analyzed using the mobile laboratory. If the levels of PCBs detected are below discharge standards, the water may be dumped out on site. The sediments will be retained on-site in the secured staging area until remediation of Area 6 is conducted, at which time the sediments will be combined with the other site wastes for off-site disposal.



REFERENCE NO. 6



MALCOLM PIRNIE, INC.

PROJECT NOTES

To:File

Date: July 19, 1995

From: Jin Ho Jang

Project #: 8003-414

Subject: Qualified Data

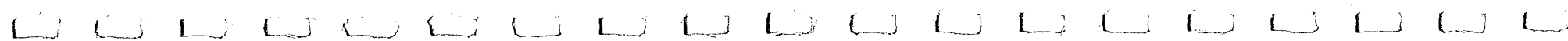
Site Name: Hudson River Psychiatric Center

The following addresses the usability of the qualified data associated with the 1991 New York State Department of Environmental Conservation (NYSDEC) Phase II Investigation at the Hudson River Psychiatric Center site. (Note: Only the data which was qualified will be addressed below.)

The concentration levels for Aroclor-1260 in the following release sediment samples SDHR6-6EDL, SDHR6-12EDL, SDHR6-13EDL, and SDHR6-14EDL were estimated with high bias values. The correction factor for Aroclor-1260 (soil matrix) is 10. The original concentration will be divided by the correction factor in order to obtain the correct concentration values. In the following pages, the estimated concentrations and the corrected concentrations can be seen.

The concentration levels for Aroclor-1248 in the following release sediment samples SDHR6-11EDL and SDHR6-16EDL were estimated with high bias values. The correction factor for Aroclor-1248 (soil matrix) is 10. The original concentration will again be divided by 10 to obtain the corrected concentration value. The results can be seen in the following pages.

For the background sample SDHR6-17, only Aroclor-1248 had a high bias estimated concentration value. For a bias background sample, the estimated concentration can be used without using a correction factor.



SITE NAME: HUDSON RIVER PSYCHIATRIC CENTER
PROJECT#: 8003-414
1990 SURFACE WATER/SEDIMENT SAMPLING

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SWHR3-10 WATER ug/L 1 --	SWHR3-9 WATER ug/L 1 --	SWHR2-8 WATER ug/L 1 --	SWHR2-7 WATER ug/L 1 --
Dieldrin	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND
Aroclor-1242	ND	ND	ND	ND
Aroclor-1248	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SWHR5-4 WATER ug/L 1 --	SWHR1-2 WATER ug/L 1 --	SWHR1-1 WATER ug/L 1 --	SWHR6-5 WATER ug/L 1 --
Dieldrin	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND
Aroclor-1242	ND	ND	ND	ND
Aroclor-1248	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SWHR6-6 WATER ug/L 1 --	SWHR5-3 WATER ug/L 1 --	SWHR4-19E WATER ug/L 1 --	SDHR3-10 SEDIMENT ug/kg 1 44
Dieldrin	ND	ND	ND	45 J
4,4'-DDE	ND	ND	ND	ND
Aroclor-1242	ND	ND	ND	ND
Aroclor-1248	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SDHR3-9 SEDIMENT ug/kg 1 24	SDHR2-8 SEDIMENT ug/kg 1 78	SDHR2-7 SEDIMENT ug/kg 1 41	SDHR5-4 SEDIMENT ug/kg 1 25
Dieldrin	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND
Aroclor-1242	ND	ND	ND	220
Aroclor-1248	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SDHR1-2 SEDIMENT ug/kg 1 23	SDHR1-1 SEDIMENT ug/kg 1 22	SDHR6-5 SEDIMENT ug/kg 1 19	SDHR6-6 SEDIMENT ug/kg 1 68
Dieldrin	ND	ND	ND	ND
4,4'-DDE	ND	ND	ND	ND
Aroclor-1242	ND	ND	ND	ND
Aroclor-1248	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	180000 E

NOTES:

ND - compound analyzed for but not detected
E - estimated value
J - estimated value, compound present
below CROL but above IDL
NR - analysis not required
Detection limits elevated if Dilution
Factor > 1 and/or percent moisture > 0%



SITE NAME: HUDSON RIVER PSYCHIATRIC CENTER
PROJECT #: 8003-414
1990 SURFACE WATER/SEDIMENT SAMPLING

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SDHR6-6 DL SEDIMENT ug/kg 100 68	SDHR5-3 SEDIMENT ug/kg 1 30	SDHR4-19E SEDIMENT ug/kg 1 30	SDHR4-18E SEDIMENT ug/kg 1 38
Dieldrin				
4,4'-DDE	ND	ND	ND	ND
Aroclor-1242	ND	ND	ND	ND
Aroclor-1248	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND
	340000 E	ND	ND	ND

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SDHR6-6E SEDIMENT ug/kg 100 60	SDHR6-6E DL SEDIMENT ug/kg 1000 60	SDHR6-11E SEDIMENT ug/kg 2 58	SDHR6-11E DL SEDIMENT ug/kg 20 58
Dieldrin				
4,4'-DDE	NR	NR	NR	NR
Aroclor-1242	NR	NR	NR	NR
Aroclor-1248	ND	ND	ND	ND
Aroclor-1260	ND	ND	4200 E	4500 E
	35000 E	140000 E	1300 E	1400 J

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SDHR6-12E SEDIMENT ug/kg 50 66	SDHR6-12E DL SEDIMENT ug/kg 500 66	SDHR6-13E SEDIMENT ug/kg 100 53	SDHR6-13E DL SEDIMENT ug/kg 1000 53
Dieldrin				
4,4'-DDE	NR	NR	NR	NR
Aroclor-1242	NR	NR	NR	NR
Aroclor-1248	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND
	74000 E	79000 E	100000 E	150000 E

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SDHR6-14E SEDIMENT ug/kg 200 52	SDHR6-14E DL SEDIMENT ug/kg 2000 52	SDHR6-15E SEDIMENT ug/kg 10 31	SDHR6-15E DL SEDIMENT ug/kg 100 31
Dieldrin				
4,4'-DDE	NR	NR	NR	NR
Aroclor-1242	NR	NR	NR	NR
Aroclor-1248	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND
	330000 E	390000 E	3700 E	4000 J

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SDHR6-16E SEDIMENT ug/kg 1 53	SDHR6-16E DL SEDIMENT ug/kg 10 53	SDHR6-17E SEDIMENT ug/kg 1 56
Dieldrin			
4,4'-DDE	NR	NR	NR
Aroclor-1242	NR	NR	NR
Aroclor-1248	ND	ND	ND
Aroclor-1260	640 E	640 E	360 E
	170 E	180 J	59 J

NOTES:

ND - compound analyzed for but not detected

E - estimated value

J - estimated value, compound present below CRQL but above IDL

NR - analysis not required

Detection limits elevated if Dilution

Factor >1 and/or percent moisture >0%



SITE NAME: HUDSON RIVER PSYCHIATRIC CENTER
PROJECT #: 8003-414
1990 SURFACE WATER/SEDIMENT SAMPLING

CORRECTED CONCENTRATION VALUES

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SDHR6-8EDL SEDIMENT ug/kg 1000 60	SDHR6-12EDL SEDIMENT ug/kg 500 66	SDHR6-13EDL SEDIMENT ug/kg 1000 53	SDHR6-14EDL SEDIMENT ug/kg 2000 52
Dieldrin	NR	NR	NR	NR
4,4'-DDE	NR	NR	NR	NR
Aroclor-1242	NR	NR	NR	NR
Aroclor-1248	ND	ND	ND	ND
Aroclor-1260	ND	ND	ND	ND
	14000	7900	15000	39000

AROCLOR-1260

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SDHR6-11EDL SEDIMENT ug/kg 20 58	SDHR6-16EDL SEDIMENT ug/kg 10 53
Dieldrin	NR	NR
4,4'-DDE	NR	NR
Aroclor-1242	NR	NR
Aroclor-1248	ND	ND
Aroclor-1260	450 1400 J	64 180 J

AROCLOR-1248

PESTICIDE/PCBs

Sample ID No. Matrix Units Dilution Factor Percent Moisture	SDHR6-17E SEDIMENT ug/kg 1 56
Dieldrin	NR
4,4'-DDE	NR
Aroclor-1242	NR
Aroclor-1248	ND
Aroclor-1260	360 59 J

BACKGROUND SAMPLE

NOTES:

ND - compound analyzed for but not detected
E - estimated value
J - estimated value, compound present
below CRQL but above IDL
NR - analysis not required
Detection limits elevated if Dilution
Factor >1 and/or percent moisture >0%





UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

AUG 4 1994

MEMORANDUM

SUBJECT: Distribution of the "Using Qualified Data to Document an Observed Release" Factsheet

FROM: Steve Caldwell, Acting Chief
Site Assessment Branch

TO: Site Assessment Section Chiefs
Regions I - X

Please find enclosed the draft factsheet "Using Qualified Data to Document an Observed Release". The factsheet provides guidance and methodology on how to use J-qualified data for documenting an observed release with the HRS.

This factsheet is being distributed to you as interim guidance. The approach presented in the factsheet is effective immediately and can be cited in HRS documentation records. We will be evaluating the data usability methodology after a year and will adjust as necessary.

If you have any questions or issues concerning the factsheet, please call Yolanda Ting of my staff at (703) 603-8835.

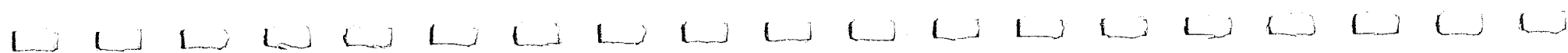
Attachment

cc: Regional NPL Coordinator
Headquarters Regional Coordinator
Dyncorp Viar

Double copy to:
Eugene Helms
Elgin B. W.
Cathy M. A.K.
Ilvian
Walter
Buddy
Dennis
Tyannish
Joe
Diane Carlin
Amy
Rob Roese
Tapan Basu
Edison
Pouch

OFFICE OF
SOLID WASTE AND EMERGENCY
RESPONSE







United States
Environmental Protection
Agency

Office of
Solid Waste and
Emergency Response
Directive 9285.7-14FS
PB94-963311
EPA/540/F-94/028
July 1994

Using Qualified Data to Document an Observed Release

Office of Emergency and Remedial Response
Hazardous Site Evaluation Division (5204G)

Quick Reference Fact Sheet

Abstract

Data validation checks the accuracy of analytical data, and qualifies results that fall outside performance criteria of the Contract Laboratory Program (CLP). Results qualified with a "J" are estimated concentrations that may be biased, but may be used to determine an observed release in Hazard Ranking System (HRS) evaluation. This fact sheet explains the conditions for use of "J"-qualified data, and introduces factors which compensate for variability and enable their use in HRS evaluation.

Why Qualify Data?

Chemical concentration data for environmental decision-making are generated using analytical methods. EPA analytical chemistry methods are designed to provide the definitive analyte identification and quantitation needed to establish an observed release under the Hazard Ranking System (HRS). Routine operational variations in sampling and analysis inevitably introduce a degree of error into the analytical data. Data validation checks the usability of the analytical data for HRS evaluation and identifies the error (bias) present. The validation process qualifies the biased data. Certain types of qualified data for release and background samples may be used to determine an observed release.

EPA Data Qualifiers

EPA analytical methods (e.g., SW-846 and Contract Laboratory Program [CLP]) introduce a number of Quality Assurance/Quality Control (QA/QC) mechanisms during the course of sample analysis to measure qualitative and quantitative accuracy.^{3,4,9} Such mechanisms include matrix spikes, matrix spike duplicates, laboratory control samples, surrogates, blanks, laboratory duplicates, and quarterly blind performance evaluation (PE) samples. Surrogates and spikes are chemically similar to the analytes of interest and thus behave similarly during the analytical process. They are introduced or "spiked"

at a known concentration into the field samples before analysis. Comparison of the known concentrations of the surrogates and spikes with their analytical results measures accuracy, and may indicate bias caused by interferences from the sample medium (matrix effect).^{1,2,9} Laboratory control samples contain known concentrations of target analytes and are analyzed in the same batch as field samples. Their results are used to measure laboratory accuracy. Blanks are analyzed to detect any extraneous contamination introduced either in the field or in the laboratory. Laboratory duplicates consist of one sample that undergoes two separate analyses; the results are compared to determine laboratory precision. Quarterly blind PE samples also evaluate lab precision.

CLP and other EPA analytical methods include specifications for acceptable identification, and minimum and maximum percent recovery of the target analytes and QA/QC compounds. Data are validated according to guidelines which set performance criteria for instrument calibration, analyte identification, and identification and recovery of the QA/QC compounds.^{3,4,9} The *National Functional Guidelines for Data Review* used in EPA validation were designed for data generated under the CLP organic and inorganic analytical protocols.^{1,2,3,4} The guidelines do not preclude the validation of field and non-CLP data; many EPA Regions have adapted the *National Functional Guidelines for Data Review* to validate non-CLP data. Data which do not meet the

DR A E T



Qualified Data and Direction of Bias

Qualified data may be used when it can be demonstrated that the data meet the HRS rule for determining an observed release despite the bias in the reported concentrations. This condition depends on the direction of bias: low bias data may be used for release samples, and high bias data may be used for background samples. Low bias release samples are underestimates of true concentration. Underestimated release concentrations that still meet the HRS criteria (e.g., they are still three times background level) clearly establish an observed release. High bias background samples are overestimates of background level. If the concentration of unbiased release samples still significantly exceeds an overestimated background level according to HRS criteria, an observed release is clearly established. Similarly, an observed release is established when low bias release concentrations significantly exceed high bias background concentrations according to the HRS criteria.

These scenarios show that low bias "J"-qualified data may be used for release samples at their reported concentrations, and that high bias "J"-qualified data may be used for background samples at their reported concentrations.

High bias release samples may not be used at their reported concentrations because they are an overestimate of true concentration; the true concentration might be less than the HRS criteria for an observed release. The reported concentration for low bias background concentrations may not be compared to release samples because it is most likely an underestimate of background level; the release sample concentration might not significantly exceed the background concentration. However, high bias release data and low bias background data may be used with factors which compensate for the variability in the data. The factors will enable these types of biased data to meet HRS criteria for determining an observed release.

Factors for Biased Data: Tables 1 through 4 (pages 6-13) present analyte-specific factors to address the uncertainty when determining an observed release using high bias release data and low bias background data. The factors are derived from percent recoveries of matrix spikes, surrogates, and laboratory control samples in the CLP Analytical Results Database (CARD) from January 1993 to March 1994.

The range of CARD data for each analyte includes 95 percent of all percent recoveries. Discarding outliers left 95 percent of the CARD data available for calculating factors. The factors are ratios of percent recovery values at the 97.5 and 2.5 percentiles. The ratios generally show a consistent pattern.

An attempt to "convert" a biased value to its true concentration is not recommended because the CARD data do not differentiate and quantify individual sources of variation. The factors are applied as "safety factors" to ensure that biased data can be used to meet HRS criteria for determining an observed release. Dividing a high bias value by a factor effectively deflates it from the high end of the range to the low end (low bias value). Multiplying a low bias value by the factor effectively inflates it to a high bias value. Use of the ratio of percentiles is a "worst-case" assumption that the data are biased by the extent of the range of CARD data considered. The factors either inflate the values to the high end of the range, or deflate the data to the low end, and thus compensate for the apparent variability when comparing a high bias value to a low bias value (see Exhibit 1).

Factors have been selected for all analytes in the CLP Target Compound List (organic analytes) and Target Analyte List (inorganic analytes). Some organic factors were derived from matrix spike percent recoveries, and some from surrogate percent recoveries, depending on availability of data. When both matrix spike and surrogate data were available for the same compound, the larger value (representing more extreme high and low percent recoveries) was used. Laboratory control samples were used to calculate some of the inorganic factors. A default factor of 10 was used for analytes when percent recovery data were unavailable.

Application of the Factors: Exhibit 1 shows how to apply the factors to "J" qualified data. High bias background data, low bias release data, and unbiased data may be used at their reported concentrations. Multiply low bias background sample data by the analyte-specific factor to bring them to their new value. The new background value effectively becomes a high bias value that may be used to determine an observed release. Divide high bias release sample data by the analyte-specific factor to bring them to their new value. The new release sample value effectively becomes a low bias result that may be used



New release sample value:

$$(100 \text{ } \mu\text{g/kg}) \div (1.8) = 56 \text{ } \mu\text{g/kg (J) low bias}$$

New background sample value:

$$(10 \text{ } \mu\text{g/kg}) \times (1.8) = 18 \text{ } \mu\text{g/kg (J) high bias}$$

The new release sample concentration is three times the new background concentration, so an observed release is established, provided all other HRS criteria are met.

Documentation Requirements for Use of Qualified Data: When using "J"-qualified data to determine an observed release, include the "J"-qualifier commentary from the data validation report in the HRS package. This step will ensure that the direction of bias is documented.

Use of Other Factors: EPA Regions may substitute higher factor values other than the ones in this fact sheet on a case-by-case basis when technically justified. For example, other factors may be applied to conform with site-specific Data Quality Objectives (DQOs) or with Regional Standard Operating Procedures (SOPs).¹⁰

Detection Limit Restrictions: Factors may only be applied to "J" data with concentrations above the CLP Contract Required Quantitation Limit (CRQL) or Contract Required Detection Limit (CRDL). "J"-qualified data with concentrations below CLP detection limits cannot be used to document an observed release.

Use of "UJ"-Qualified Data

A combination of the "U" and "J" qualifiers indicates that the reported value may not accurately represent

the concentration necessary to detect the analyte in the sample. Under limited conditions, "UJ" data can be used to represent background when determining an observed release. These conditions include instances when there is confidence that the background concentration has not been detected and the sample measurement that establishes the observed release equals or exceeds the SQL or other appropriate detection limit. This reasoning is based on the presence of a high bias in the background sample. Thus, UJ data can be used only when all of the following conditions apply:

- The "UJ" value applies to the background sample and represents the detection limit,
- The "UJ" value is biased high, and
- The release sample concentration exceeds the SQL (or applicable detection limit) and is unbiased or biased low.

Summary

Data validation checks the usability of analytical data and identifies certain errors (bias). "J"-qualified data identify that analytes are present, but the reported values represent estimated concentrations associated with bias. Low bias release data and high bias background data may be used at the reported values. High bias release data and low bias background data may not be used at their reported concentrations because they do not establish an observed release with certainty. Application of factors introduced in this fact sheet compensate for this uncertainty, and enable "J" data to be used to determine an observed release.



Table 1: Factors for Volatile Organic Analytes (continued)

VOLATILE ORGANIC ANALYTES	SOIL MATRIX		WATER MATRIX	
	Number of CARD Samples Reviewed	Factor	Number of CARD Samples Reviewed	Factor
CARBON TETRACHLORIDE	--	10.0	--	10.0
CHLOROBENZENE	2058	1.6	1480	1.4
CHLOROETHANE	11144	1.4	9179	1.3
CHLOROFORM	11144	1.4	9179	1.3
CHLOROMETHANE	11144	1.4	9179	1.3
CIS-1,3-DICHLOROPROPENE	--	10.0	--	10.0
DIBROMOCHLOROMETHANE	--	10.0	--	10.0
ETHYLBENZENE	11144	1.5	9180	1.2
METHYLENE CHLORIDE	11144	1.4	9179	1.3
STYRENE	11144	1.5	9180	1.3
TETRACHLOROETHENE	11144	1.5	9180	1.2
TOLUENE	2029	2.0	1468	1.4
TRANS-1,3-DICHLOROPROPENE	--	10.0	--	10.0
TRICHLOROETHENE	2046	1.8	1452	1.5
VINYL CHLORIDE	11144	1.4	9179	1.3
XYLENE (TOTAL)	11144	1.5	9180	1.2



Table 2: Factors for Semivolatile Organic Analytes (continued)

SEMIVOLATILE ORGANIC ANALYTES	SOIL MATRIX		WATER MATRIX	
	Number of CARD Samples Reviewed	Factor	Number of CARD Samples Reviewed	Factor
4-NITROANILINE	11889	8.9	7952	3.6
4-NITROPHENOL	1905	4.8	1368	4.5
ACENAPHTHENE	1965	3.1	1361	3.0
ACENAPHTHYLENE	11889	8.9	7952	3.6
ANTHRACENE	--	10.0	--	10.0
BENZO(A)ANTHRACENE	11898	4.3	7951	6.0
BENZO(A)PYRENE	--	10.0	--	10.0
BENZO(B)FLUORANTHENE	--	10.0	--	10.0
BENZO(G,H,I)PERYLENE	--	10.0	--	10.0
BENZO(K)FLUORANTHENE	--	10.0	--	10.0
BIS(2-CHLOROETHOXY)METHANE	11896	4.0	7949	2.5
BIS(2-CHLOROETHYL)ETHER	11899	3.8	7951	4.0
BIS(2-ETHYLHEXYL)PHTHALATE	11898	4.3	7951	6.0
BUTYLBENZYLPHTHALATE	11898	4.3	7951	6.0
CARBAZOLE	--	10.0	--	10.0
CHRYSENE	11898	4.3	7951	6.0
DI-N-BUTYLPHTHALATE	--	10.0	--	10.0
DI-N-OCTYLPHTHALATE	--	10.0	--	10.0
DIBENZ(A,H)ANTHRACENE	11889	8.9	7952	3.6
DIBENZOFURAN	11889	8.9	7952	3.6
DIETHYLPHTHALATE	11889	8.9	7952	3.6
DIMETHYLPHTHALATE	11889	8.9	7952	3.6
FLUORANTHENE	--	10.0	--	10.0
FLUORENE	11889	8.9	7952	3.6
HEXACHLOROBENZENE	--	10.0	--	10.0
HEXACHLOROBUTADIENE	11896	4.0	7949	2.5
HEXACHLOROCYCLOPENTADIENE	11889	8.9	7952	3.6



Table 3: Factors for Pesticide/PCB Analytes

PESTICIDE/PCB ANALYTES	SOIL MATRIX		WATER MATRIX	
	Number of CARD Samples Reviewed	Factor	Number of CARD Samples Reviewed	Factor
4,4'-DDD	--	10.0	--	10.0
4,4'-DDE	--	10.0	--	10.0
4,4'-DDT	1801	7.4	1353	4.6
ALDRIN	1870	7.9	1350	4.8
ALPHA-BHC	--	10.0	--	10.0
ALPHA-CHLORDANE	--	10.0	--	10.0
AROCWOR-1016	--	10.0	23305	8.7
AROCWOR-1221	--	10.0	23305	8.7
AROCWOR-1232	--	10.0	23305	8.7
AROCWOR-1242	--	10.0	23305	8.7
AROCWOR-1248	--	10.0	23305	8.7
AROCWOR-1254	--	10.0	23305	8.7
AROCWOR-1260	--	10.0	23305	8.7
BETA-BHC	--	10.0	--	10.0
DELTA-BHC	--	10.0	--	10.0
DIELDRIN	1886	6.2	1350	2.8

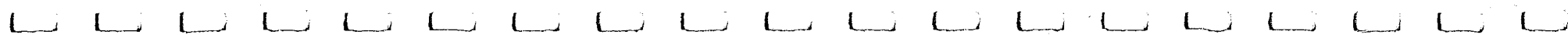


Table 4: Factors for Inorganic Analytes

INORGANIC ANALYTES	SOIL MATRIX		WATER MATRIX	
	Number of CARD Samples Reviewed	Factor	Number of CARD Samples Reviewed	Factor
ALUMINUM	1147	1.5	1686	1.2
ANTIMONY	1153	1.8	1688	1.2
ARSENIC	1208	1.6	1701	1.2
BARIUM	1149	3.3	1686	1.1
BERYLLIUM	1150	1.2	1686	1.2
CADMIUM	1148	1.3	1685	1.2
CALCIUM	1163	1.2	1685	1.1
CHROMIUM	1148	1.2	1686	1.2
COBALT	1153	1.2	1685	1.2
COPPER	1154	1.1	1683	1.2
CYANIDE	884	1.4	--	10.0
IRON	1149	1.2	1687	1.2
LEAD	1331	1.3	1727	1.2
MAGNESIUM	1143	1.2	1686	1.1
MANGANESE	1151	1.2	1685	1.2
MERCURY	1563	1.7	--	10.0
NICKEL	1150	1.2	1685	1.2
POTASSIUM	--	10.0	--	10.0
SELENIUM	1190	2.3	1695	1.3
SILVER	1152	1.6	1684	1.3
SODIUM	--	10.0	--	10.0
THALLIUM	1197	1.7	1691	1.2
VANADIUM	1152	1.2	1685	1.1
ZINC	1154	1.3	1689	1.2



REFERENCE NO. 7



MALCOLM PIRNIE, INC.

PROJECT NOTES

To: File

Date: 9/18/95

From: Jin Ho Jang

Project #: 8003-414

Subject: Data Validation

Site Name: Hudson River Psychiatric Center

A data validation was performed by Malcolm Pirnie, Inc. for the 1993 LMS Focus Feasibility Study. The data in the following pages were qualified as being usable in evaluating the site. The data was used to characterize the source of the PCB contamination from the Cheney and Ryon Hall Buildings.



SITE NAME: Hudson River Psychiatric Center
 PROJECT#: 8003-414
 SAMPLING DATE: 9/10/95
 LAB NAME: Tighe & Bond

PCBs Sample ID No.	Matrix	Units	Percent Solids										
				PCB-1016	PCB-1221	PCB-1232	PCB-1242	PCB-1248	PCB-1254	PCB-1260			
HRSW-1	WATER	ug/L	--	9.8	0.23								
HRSW-2	WATER	ug/L	--										
HRSW-3	WATER	ug/L	--										
HRSW-4	WATER	ug/L	--										
HRWS-1	WIPE	ug/L	--										
HRSS-1	SOIL	ug/kg	81.9										
HRSS-2	SOIL	ug/kg	88.7										
HRSS-3	SOIL	ug/kg	86										
HRCC-1	CONCRETE	ug/kg	97.7										
HRCC-2	CONCRETE	ug/kg	98.6										
PCBs Sample ID No.	Matrix	Units	Percent Solids										
				PCB-1016	PCB-1221	PCB-1232	PCB-1242	PCB-1248	PCB-1254	PCB-1260			
HRCC-3	CONCRETE	ug/kg	96.9										
HRCC-4	CONCRETE	ug/kg	83										
HRSD-1	SEDIMENT	ug/kg	**										
HRSD-2	SEDIMENT	ug/kg	70.5										
HRSD-3	SEDIMENT	ug/kg	97.3										
HRSD-4	SEDIMENT	ug/kg	51.4										
HRSD-5	SEDIMENT	ug/kg	80.4										
HRSD-6	SEDIMENT	mg/kg	29.3										
FIELD BLANK	WATER	ug/L	--										
				710000 E	780	620	440	1400					
				33000 E									

NOTES:
 ** due to the tar-like consistency of the sample, results were reported on a wet weight basis.
 Blank Space - compound analyzed for but not detected
 E - estimated value



**MALCOLM
PIRNIE**

INTEROFFICE CORRESPONDENCE

To: Jin Ho Jang

Date: August 12, 1992

From: Valerie Smith

Re: Hudson River Psychiatric Data Validation

The following is a summary of the data validation performed on analytical results submitted by Tighe & Bond Environmental Laboratory produced from samples collected at the Hudson River Psychiatric Center site on collected on 9/10/95.

This summary addresses all PCB Target Compound List (TCL) chemicals as specified in the U.S. EPA Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Analysis, March 1990.

The U.S. EPA CLP SOW for Organic Analysis and the National Functional Guidelines for Organic Data Review have been applied to evaluate and assess the above mentioned data. The parameters under review are:

**Sample Holding Time
Blank Contamination
Compound Identification**

The rationale for the qualification of the data is as follows:

Holding Times - The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization etc. If the specified holding time is exceeded, the data may not be valid. The holding time criteria for this data set has been met.

Blank Contamination - Method blanks are prepared to identify any contamination that may have been introduced into the samples during sample preparation. Method blanks measure laboratory contamination. If the concentration of the analyte is less than 5 times the blank contaminant level (10 times for common laboratory contaminants), the analytes are qualified as non-detected "U". There was no blank contamination that exceeded the above mentioned criteria.



Compound Identification - TCL compounds are identified from a comparison of standard and sample component relative retention times (RRT). GC/MS Confirmation is required if the concentration of a compound exceeds 10 ng/L in the final sample extract. No GC/MS Confirmation was performed on the samples/analytes listed below. Therefore, these results should be considered "usable at estimated levels":.

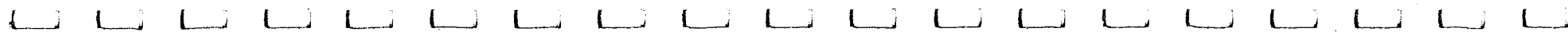
<u>Sample #</u>	<u>Analyte</u>
HRCC-2	PCB-1260
HRSD-1	PCB-1260
HRSD-2	PCB-1260
HRSD-5	PCB-1260

OVERALL ASSESSMENT

The data generated by Tighe & Bond Environmental Laboratory pertaining to this data set is to be considered as "usable" or "usable at estimated levels". "Usable at estimated levels" indicates the numerical value detected by the laboratory is an approximate concentration of the analyte in the sample.



REFERENCE NO. 8



MALCOLM PIRNIE, INC.

PROJECT NOTES

To: File

Date: 9/18/95

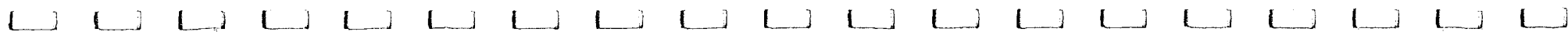
From: Jin Ho Jang

Project #: 8003-414

Subject: Sensitive Environment

Site Name: Hudson River Psychiatric Center

Information from the New York State Department of Environmental Conservation Wildlife Resources Center indicates that there are six State Threatened/Endangered Species within four miles of the Hudson River Psychiatric Center Site. One state endangered specie has been identified along the surface water pathway. The site is located within or adjacent to a designated Significant Coastal Fish and Wildlife habitat. No terrestrial sensitive environments have been identified within 200 feet of the site.



NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Wildlife Resources Center
700 Troy-Schenectady Road
Latham, NY 12110-2400

(518) 733-3932

March 14, 1995

Jin Ho Jang
Malcolm Pirnie, Inc
104 Interchange Plaza
Cranbury, New Jersey 08512-9543

Dear Mr. Jang:

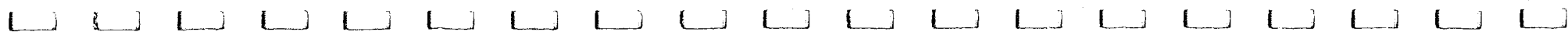
We have reviewed the New York Natural Heritage Program files with respect to your recent request for biological information concerning the Environmental Protection Agency Hazard Waste Investigation. Site: HUDSON RIVER PSYCHIATRIC CENTER, as listed on your enclosed map, located in the Town of Poughkeepsie, Dutchess County, New York State.

Enclosed is a computer printout covering the area you requested to be reviewed by our staff. The information contained in this report is considered sensitive and may not be released to the public without permission from the New York Natural Heritage Program.

Your project location is within or adjacent to a designated Significant Coastal Fish and Wildlife Habitat. This habitat is part of New York State's Coastal Management Program (CMP), which is administered by the NYS Department of State (DOS). Projects which may impact the habitat are reviewed by DOS for consistency with the CMP. For more information regarding this designated habitat and applicable consistency review requirements, please contact:

Greg Capobianco or Steven C. Resler - (518) 474-6000
NYS Department of State
Division of Coastal Resources and Waterfront Revitalization
162 Washington Avenue, Albany, NY 12231

Our files are continually growing as new habitats and occurrences of rare species and communities are discovered. In most cases, site-specific or comprehensive surveys for plant and animal occurrences have not been conducted. For these reasons, we can only provide data which have been assembled from our files. We cannot provide a definitive statement on the presence or absence of species, habitats or natural communities. This information should not be substituted for on-site surveys that may be required for environmental assessment.



NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Wildlife Resources Center

700 Troy-Schenectady Road

Latham, NY 12110-2400



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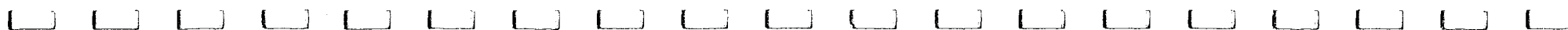
This response applies only to known occurrences of rare animals, plants and natural communities and/or significant wildlife habitats. You should contact our regional office, Division of Regulatory Affairs, at the address enclosed for information regarding any regulated areas or permits that may be required (e.g., regulated wetlands) under State Law.

If this proposed project is still active one year from now we recommend that you contact us again so that we can update this response.

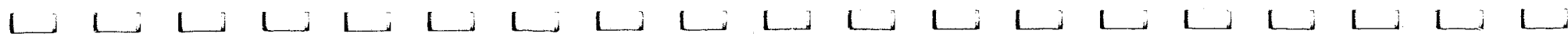
Sincerely,
Information Services
New York Natural Heritage Program

Encs.

cc: Reg. 3, Wildlife Mgr.
Reg. 3, Fisheries Mgr.
Peter Nye, ESU, Delmar
Dean Bouton, Fisheries



REFERENCE NO. 9



MALCOLM PIRNIE, INC.

PROJECT NOTES

To: File	Date: 9/15/95
From: Jin Ho Jang	Project #: 8003-414
Subject: Groundwater Apportionment	Site Name: Hudson River Psychiatric Center

Harbour Hills Water District - The Harbour Hills Water District (HHWD) operates two wells located on Lawrence Drive. Well 1 is approximately 12 feet deep and pumps at a rate of 105 gallons per minute (gpm). Well 2 is approximately 90 feet deep. Due to high concentrations of iron in Well 2, Well 1 has been predominantly used. The number of residents per household for Dutchess County, New York is 2.69. The HHWD has 247 service connections. Since Well 1 is predominantly used all of the population will be apportioned to this well.

WELL	POPULATION	RING DISTANCE
HHWD Well No. 1	664	2 - 3 miles
HHWD Well No. 2	--	2 - 3 miles

GWD TOTAL POPULATION: 664

Greenfields Water District - The Greenfields Water District (GWD) operates four wells (Well 9, Well 10, Well 11, Well 12) and are located on Cream Street in Hyde Park. The wells are approximately 300 feet deep and are bedrock wells. Well No. 9 pumps at 70 gpm, Well No. 10 pumps at 20 gpm, Well No. 11 pumps at 90 gpm, and Well No. 12 pumps at 50 gpm. The GWD serves 280 connections. The total number of residents serve by the GWD is 753. Since none of the four wells pumps greater than 40% of the daily output, population apportionment will be divided equally for the four wells ($753/4 = 188$).

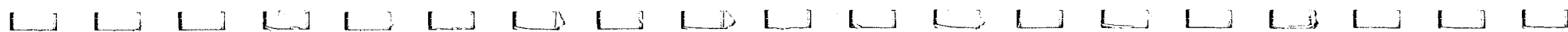
WELL	PUMPAGE	% PUMPAGE	POPULATION	RING DISTANCE
GWD Well No. 9	70 gpm	30	188	2 - 3 miles
GWD Well No. 10	20 gpm	9	188	2 - 3 miles
GWD Well No. 11	90 gpm	39	189	2 - 3 miles
GWD Well No. 12	50 gpm	22	188	2 - 3 miles
TOTAL	230 gpm	100	753	

THE TOTAL NUMBER OF PEOPLE DRINKING FROM GROUNDWATER WITHIN A FOUR MILE RADIUS OF THE HUDSON RIVER PSYCHIATRIC CENTER SITE IS:

HHWD	664
GWD	<u>753</u>
TOTAL	1,417

THE POPULATION APPORTIONMENT WITHIN A FOUR MILE RADIUS OF THE SITE IS AS FOLLOWS:

RING	POPULATION	RING	POPULATION
0 - 0.25 mile	0	1 - 2 miles	0
0.25 - 0.5 mile	0	2 - 3 miles	1,417
0.5 - 1 mile	0	3 - 4 miles	<u>0</u>
TOTAL			1,417



ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: May 5, 1995

Time: 12:55 AM PM

Incoming Call

From: Jim Reilly (914) 229-7038
Affiliation: Greenfields Water District (Superintendent) Telephone No.

Malcolm Pirnie Staff: Jin Ho Jang *JHJ* (609) 860-0100
Telephone No.

Summary of Conversation:

Mr. Reilly returned my phone call inquiring information on the Greenfields potable water system. Mr. Reilly stated that Greenfields operates four wells (9, 10, 11, 12). These wells are located on Cream St. in Hyde Park. Wells 9, 10, 11 are located approximately 200 feet from the pumphouse and Well No. 12 is approximately 1,200 feet from the pumphouse. The wells are approximately 300 feet deep and are bedrock wells. Mr. Reilly did state that Greenfields is adjacent to the Hoosic aquifer. Well No. 9 pumps 70 gallons per minute (gpm), Well No. 10 pumps 20 gpm, Well No. 11 pumps 90 gpm, and Well No. 12 pumps 50 gpm. The total daily pumpage for Greenfields is approximately 70,000 to 80,000 gpm. Greenfields water district serves 280 connections. Mr. Reilly also stated that there are three other water districts in Hyde Park, Harboured Hills, Hyde Park Fire and Water District, and Quaker Hill Estates.

U N I T E D N A T I O N S

ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: April 25, 1995

Time: 1:00 AM ☐ PM ☐

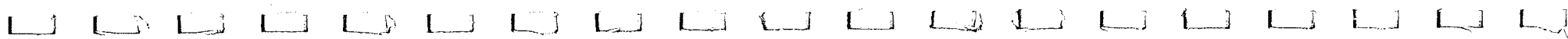
Incoming Call

From: Richard Cain (914) 229-7410
Affiliation: Harbour Hills Water District Plant Operator Telephone No.

Malcolm Pirnie Staff: Jin Ho Jang JHJ (609) 860-0100
Telephone No.

Summary of Conversation:

Mr. Cain returned my phone call regarding the Harbour Hills Water District (HHWD). HHWD is a district with the Township of Hyde Park. HHWD is supplied by two wells located on Lawrence Drive. Well 1 is approximately 12 feet deep and pumps at a rate of 105 gallons per minute. Well 2 is approximately 90 feet deep, but the pump is set at 12 feet. There have been a lot of iron problems with the groundwater so Well 1 has been predominantly used. Mr. Cain was not sure if there was a specific aquifer name from where HHWD receives groundwater, but did state that Crum Elbow Creek is near the location of the wells. HHWD serves 247 water connections and the system is interconnected. The average pumpage is 50,000-52,000 gallons per day.



ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: May 9, 1995

Time: 11:00 AM PM

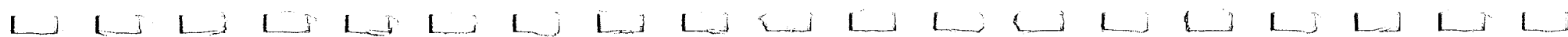
Outgoing Call

To: Jerry Gillneck (914) 229-2524
Affiliation: Hyde Park Fire & Water District (Plant Superintendent) Telephone No.

Malcolm Pirnie Staff: Jin Ho Jang (609) 860-0100
Telephone No.

Summary of Conversation:

I phoned Mr. Gillneck to obtain municipal water information for the Hyde Park Fire and Water District (HPF&WD). Mr. Gillneck stated that HPF&WD is supplied by a surface water intake located at Roger Point Boat Club located on the Hudson River. The intake is approximately six to seven miles north of the Mid-Hudson Bridge. The intake is located approximately 150 feet from shore. The average flowrate at the intake is approximately 500,000 gallons per day. HPF&WD serves 1,300 connections. The water is treated by a convention water treatment plant.



ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: April 25, 1995

Time: 10:40 AM ~~X~~ PM

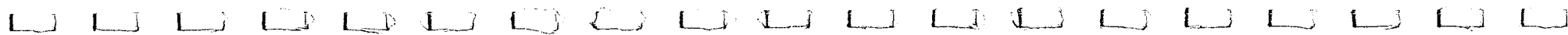
Outgoing Call

To: Dick Bolk (914) 431-1644
Affiliation: Dutchess County Health Dept. Public Health Engineer
Telephone No.

Malcolm Pirnie Staff: Jin Ho Jang ^{JHJ} (609) 860-0100
Telephone No.

Summary of Conversation:

I phoned Mr. Bolk to inquire about municipal water districts in the Hyde Park area. Mr. Bolk stated that there are two significant public water districts that would be in range of the four mile radius of the Hudson River Psychiatric Center. The Greenfields well water supply, which is operated by Standard Water and The Harbour Hills water district. Mr. Bolk informed me the persons in charge of the these water districts and to call them for additional information.



ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: April 25, 1995

Time: 9:50 AM ☒ PM ☐

Outgoing Call

To: Scott Chase (914) 485-9681
Affiliation: Dutchess County Water and Wastewater Agency (Director) Telephone No.

Malcolm Pirnie Staff: Jin Ho Jang 5143 (609) 860-0100
Telephone No.

Summary of Conversation:

I phoned Mr. Chase to obtain municipal water information for the Town of Hyde Park. Mr. Chase stated that he did not have specific information, but did know that Hyde Park is divided into five water districts. Two of the districts are on surface water intakes and the other three are on groundwater. Mr. Chase referred me to the Dutchess County Health Department for additional information. He stated he will send me a map showing the locations of the five water districts. Mr. Chase also stated that there was a condominium complex (approximately 150 units) developed approximately 1/2 mile northwest of the site.

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ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: May 10, 1995

Time: 11:00 AM ☒ PM

Incoming Call

From: Fred Androlls (914) 462-6535
Affiliation: Town of Poughkeepsie Water Superintendent Telephone No.

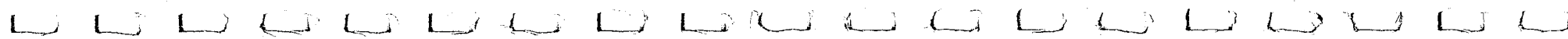
Malcolm Pirnie Staff: Jin Ho Jang (609) 860-0100
JHJ Telephone No.

Summary of Conversation:

Mr. Androlls returned my phone call to supply information about municipal water use for the Town of Poughkeepsie (TP). Mr. Androlls stated that TP buys its water from the City of Poughkeepsie who in turn have two surface water intakes located in the Hudson River. Mr. Androlls stated that the figures given by the water superintendent for the City of Poughkeepsie is correct and that the population numbers given would include the residents of TP. Mr. Androlls stated that TP does have three wells used on an emergency basis, but is basically used as reserves. These three wells are located near Wappinger Creek and would fall in the 3-4 mile range of the site. These three wells pump approximately 2 million gallons per day when used.

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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18



MALCOLM PIRNIE, INC.		PROJECT NOTES	
To: File		Date: 9/18/95	
From: Jin Ho Jang		Project #: 8003-414	
Subject: Surface Water Population Apportionment		Site Name: Hudson River Psychiatric Center	
Two major water districts with potable water supply by surface water intakes include the Town and City of Poughkeepsie and the Town of Lloyd. These two municipalities have intakes located on the Hudson River, downstream of the Hudson River Psychiatric Center Site (HRPC). The City and Town of Poughkeepsie average a daily discharge of 11 million gallons per day (mgd) and serves approximately 85,000 people. The Town of Lloyd has 1,300 connections. The population per household for Dutchess County, New York is 2,69 persons/household. Therefore, the Town of Lloyd Water Department serves 3,497 people on surface water.			



**ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT**

File No. 8003-414

Date: April 24, 1995

Time: 3:00 AM PM

Outgoing Call

To: Mr. John Jankiewicz (914) 691-2400

Affiliation: Town of Lloyd Water and Sewer Administration

Malcolm Pirnie Staff: Jin Ho Jang J.H.J

(609) 860-0100
Telephone No.

Summary of Conversation:

I phoned Mr. Jankiewicz to inquire about the municipal water system for the town of Lloyd. Mr. Jankiewicz stated that Lloyd is on surface water intakes. There are two surface water intakes, one located approximately one mile north of the Mid-Hudson Bridge in the Hudson River and the other located in the Illinois Mountains (elevation 1,100 feet). The Illinois Mountain reservoir is located approximately 2-4 miles from the Hudson River Psychiatric Center. The two surface water intakes are alternated annually. The Hudson River intake is in operation from July to December and the Illinois Mountain intake is in operation from January to June. Each intake supplies 100% of the population. There is a water supply demand of 600,000 gallons per day (gpd) daily. The maximum capacity of the intakes is 1 million gallons per day. There are 1,300 connections being serviced by these intakes. All systems are interconnected. The water is treated by a upflow mixed media filtration system and is chlorinated before distribution. The water is tested on a regular basis dependent on the parameter being tested.



ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: April 25, 1995

Time: 9:20 AM ☐ PM ☐

Outgoing Call

To: Doug Fairbanks (914) 451-4173
Telephone No.

Affiliation: City of Poughkeepsie Water Plant Manager

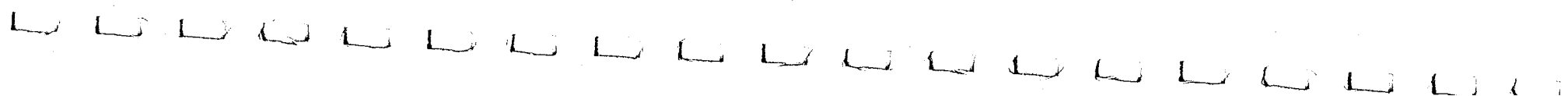
Malcolm Pirnie Staff: Jin Ho Jang (609) 860-0100
Telephone No.

Summary of Conversation:

I phoned Mr. Fairbanks to obtain municipal water information for the City of Poughkeepsie. Mr. Fairbanks stated that the city has two surface water intakes located in the Hudson River. They are located approximately 1/2 mile north of the Mid-Hudson Bridge, near mile marker 70 and the railroad bridge. There is a main intake and a backup intake at this location. The main intake is a 36 inch diameter and the backup is a 24 inch pipe. These two intakes are located approximately 1,000 feet from shore. The City averages approximately 11 million gallons per day (MGD) and the maximum legal capacity is 16 MGD. The city serves a population of 85,000 people and sells some of its water to the Town of Poughkeepsie. All piping is interconnected between the City and the Town of Poughkeepsie. The water is treated by a conventional water treatment plant prior to distribution. The water is tested on different frequencies depending on the parameters being tested for.



REFERENCE NO. 11



MALCOLM PIRNIE, INC.

PROJECT NOTES

To: File	Date: September 18, 1995	
From: Jin Ho Jang	Project #: 8003-414	
Subject: Four-mile Radius Populations	Site Name: Hudson River Psychiatric Center	
Population estimation within four miles of the Hudson River Psychiatric Center Site was accomplished using the Topologically Integrated Geographic Encoding and Referencing (TIGER) data base. The results of the data base analysis is shown in the table below.		
RING (MILES)	POPULATION	
0 - ¼	296	
¼ - ½	953	
½ - 1	3,717	
1 - 2	15,530	
2 - 3	27,787	
3 - 4	18,903	
TOTAL POPULATION WITHIN 4 MILES:		67,186



FROST ASSOCIATES

P.O.Box 495, Essex, Connecticut 06426
(203) 767-7644 FAX (203) 767-1971

February 22, 1995

To: Malcolm Pirnie Inc
104 Interchange Plaza
Cranbury, New Jersey 08512-8543

Attn: Lilli Gonzalez

Fr: Frost Associates
P.O. Box 495
Essex, Conn 06426

Tel: (203) 767-1254
Fax: (203) 767-7069

Sub: Hudson River Psychiatric
Poughkeepsie, NY

CERCLIS:

Job: 8003-414-701

Site Longitude: 73-55-10 73.919441
Site Latitude : 41-43-56 41.732220

The CENTRACTS report below identifies the population, households, and private water wells of each Block Group that lies within, or partially within, the 4, 3, 2, 1, .5, and .25, mile "rings" of the latitude and longitude coordinates above. CENTRACTS may have up to ten radii of any length. 1000 block groups, and 15000 block group sides.

CENTRACTS uses the 1990 Block Group population and Block Group house count data found in the Census Bureau's 1990 STF-1A files. The sources of water supply data are from the Bureau's 1990 STF-3A files. The boundary line coordinates of the Block Groups were extracted from the Census Bureau's 1990 TIGER/Line Files.

CENTRACTS reports are created with programs written by Frost Associates, P.O. Box 495, Essex, Conn. The code was written using Microsoft's Quick-Basic Ver. 4.5.

Latitude and Longitude coordinates identifying a site are entered in degrees and decimal degrees. One or more county files holding Block Group boundary lines are selected for use by CENTRACTS by determining whether the site coordinates fall within the minimum and maximum Lat/Lon coordinates of each county in the state.

Each Block Group line segment has Lat/Lon coordinates representing the "From" and "To" ends of that line. All coordinates from the selected county files are read and converted from degrees, decimal degrees to X\Y miles from the site location. Each line segment is then examined whether it lies within or partially within the maximum ring from the site.

The unique Block Group ID numbers of each line segment that lie within the maximum ring are retained. All Block Group boundary lines matching the Block Group numbers are then extracted from the respective county files to obtain all sides of the included Block Groups. Boundary records are then sorted in adjacent side order to determine the shape and area of each Block Group polygon.

A method to solve for the area of a polygon is to take one-half the sum of the pro-



ducts, obtained by multiplying each X-coordinate by the difference between the adjacent Y-coordinates. For a polygon with coordinates at adjacent angles A, B, C, D, and E. The formula can be expressed:

$$\text{Area} = 1/2\{Xa(Ye-Yb) + Xb(Ya-Yb) + Xc(Yb-Yd) + Xd(Yc-Ye) + Xe(Yd-Ya)\}$$

For each ring, the selected Block Groups will be inside, outside, or intersected by the ring. When a polygon is intersected, the partial Block Group area within that ring is calculated using the method described below.

When a ring intersects a Block Group, the intersect points are solved and plotted at the points where the ring enters and exits the shape. The chord line, a line within the circle connecting the intersect points is determined. This chord line is used to calculate the segment area, the half moon shape between the chord line and the ring, and the sub-polygon created by the chord line and the Block Group boundaries that lie outside the ring.

The segment area is subtracted from the sub-polygon area to determine the area of the sub-polygon outside the ring. The area outside the ring is then subtracted from the area of the entire polygon to arrive at the inside area. This inside area is then divided by the tract's total area to determine the percentage of area within the ring. This process is repeated for each block group that is intersected by one of the rings. The total area, partial area, and percentage of partial area of those block groups within, or partially within a ring, are held in memory for the report.

On occasion, the algorithm described above is unable to determine the area of the partial area. Within the report program is a "Paint" routine which allows an enclosed shape to be highlighted. Another routine calculates the percentage of highlighted screen pixels to the pixels within the polygon. A manual entry is allowed. Both the "Paint" method and manual entry method override the calculated method.

CENTRACTS lists, starting on page 4, all Block Groups in State, County, Census Tract, and Block Group ID order that lie within, or partially within, the maximum ring. Each Block Group is identified by a City or Town name and by the Block Group's State, County, Tract and Block Group ID number. Following is the Block Group's 1990 population and house count extracted from the Census Bureau's 1990 STF-1A files.

The next four columns display water source data from the 1990 STF-3A files. The first column is "Units with Public system or private company source of water", followed by "Units with individual well, Drilled, source of water"; "Units with individual well, Dug, source of water" and "Units with Other source of water".

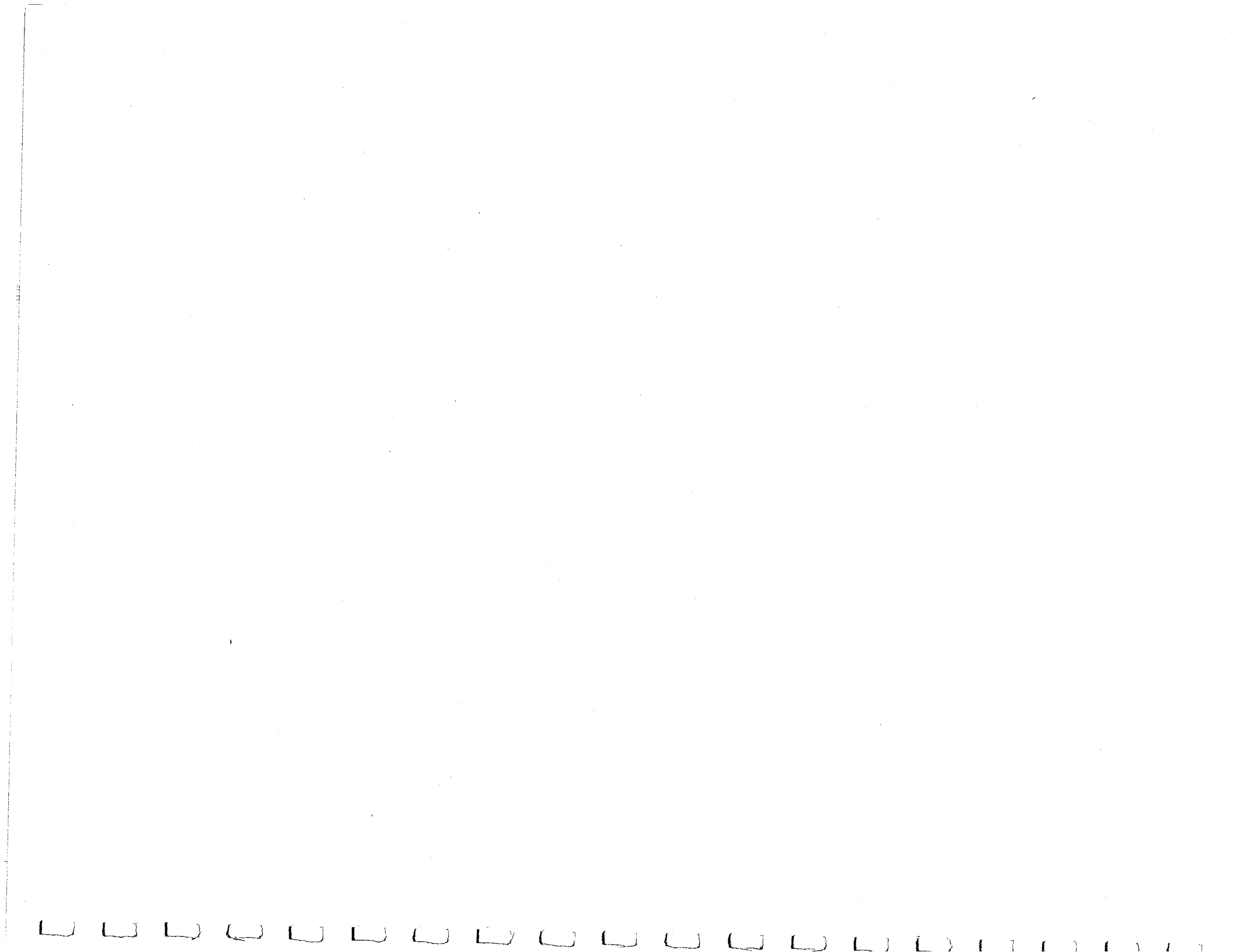
For each ring, CENTRACTS then shows the Block Groups that are within that ring, the Block Group's total area in square miles, the partial area of the Block Group within that ring, and the partial percentage within the ring. The areas of the included Block Group and the partial areas are then totaled.

The last section tallies the demographic data within each ring. The percentage of area for each Block Group is multiplied times the census data for that Block Group and totaled for all Block Group's within the ring. Ring totals are then determined by subtracting the three mile data from the four mile, the two mile from the three mile, one from the two, etc... Population on private wells is calculated using the formula: ((Drilled + Dug Wells) / Households) * Population



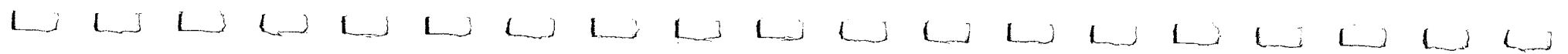
Hudson River Psychiatric
Poughkeepsie, NY

No.	City	Block Group ID	Blk Grp People	House Holds	Public		Drilled		Dug		Other
					Water	Wells	Wells	Wells	Wells	Wells	
1	Hyde Park	36027 0702	3	1007	412	6	20	0	20	0	0
2	Hyde Park	36027 0702	4	1073	353	0	48	0	48	0	0
3	Hyde Park	36027 0702	9	566	263	0	57	0	57	0	0
4	Hyde Park	36027 0703	1	1802	223	21	365	0	365	0	0
5	Hyde Park	36027 0703	2	860	174	36	162	0	162	0	0
6	Hyde Park	36027 0703	3	634	288	0	72	12	72	12	0
7	Hyde Park	36027 0703	9	2745	294	43	517	0	517	0	0
8	Hyde Park	36027 0704	1	941	40	6	316	0	316	0	0
9	Hyde Park	36027 0704	2	1451	138	35	365	0	365	0	0
10	Hyde Park	36027 0704	9	1594	225	6	88	0	88	0	0
11	Poughkeepsie	36027 1401	1	1905	732	0	57	5	57	5	0
12	Poughkeepsie	36027 1402	1	2756	413	0	0	0	0	0	0
13	Poughkeepsie	36027 1402	2	1943	50	0	7	0	7	0	0
14	Poughkeepsie	36027 1402	4	2529	536	9	193	0	193	0	0
15	Poughkeepsie	36027 1402	9	726	1034	0	81	0	81	0	0
16	Poughkeepsie	36027 1402	9	197	236	0	40	0	40	0	0
17	Poughkeepsie	36027 1403	1	1276	125	0	24	0	24	0	0
18	Poughkeepsie	36027 1403	2	945	546	0	17	0	17	0	0
19	Poughkeepsie	36027 1403	3	1355	462	0	0	0	0	0	0
20	Poughkeepsie	36027 1403	4	1384	604	0	0	13	0	13	0
21	Poughkeepsie	36027 1403	5	923	743	0	0	0	0	0	0
22	Poughkeepsie	36027 1403	6	1047	450	0	34	0	34	0	0
23	Poughkeepsie	36027 1404	1	313	305	20	44	0	44	0	0
24	Poughkeepsie	36027 1404	9	1617	83	0	38	0	38	0	0
25	Poughkeepsie	36027 1405	9	860	844	0	8	0	8	0	0
26	Poughkeepsie	36027 2201	1	860	381	0	0	0	0	0	0
27	Poughkeepsie	36027 2201	2	437	192	0	0	0	0	0	0
28	Poughkeepsie	36027 2201	3	1181	603	0	0	0	0	0	0
29	Poughkeepsie	36027 2201	4	565	372	0	0	0	0	0	0
30	Poughkeepsie	36027 2201	5	585	348	0	0	0	0	0	0
31	Poughkeepsie	36027 2201	6	735	300	0	0	0	0	0	0
32	Poughkeepsie	36027 2201	7	11	0	0	0	0	0	0	0
33	Poughkeepsie	36027 2202	1	873	277	0	0	0	0	0	0
34	Poughkeepsie	36027 2202	2	580	272	0	0	0	0	0	0
35	Poughkeepsie	36027 2202	3	927	356	0	0	0	0	0	0
36	Poughkeepsie	36027 2203	1	465	305	0	0	0	0	0	0
37	Poughkeepsie	36027 2203	2	553	175	0	0	11	0	11	0
38	Poughkeepsie	36027 2204	1	414	223	0	0	0	0	0	0
39	Poughkeepsie	36027 2204	3	427	263	0	0	0	0	0	0
40	Poughkeepsie	36027 2204	4	1067	602	0	0	0	0	0	0
41	Poughkeepsie	36027 2205	1	403	183	0	0	0	0	0	0
42	Poughkeepsie	36027 2205	2	513	216	0	0	0	0	0	0
43	Poughkeepsie	36027 2205	3	918	321	0	0	21	0	21	0
44	Poughkeepsie	36027 2205	4	923	330	0	0	0	0	0	0
45	Poughkeepsie	36027 2205	5	901	347	0	0	0	0	0	0
46	Poughkeepsie	36027 2206	1	325	123	0	0	0	0	0	0
47	Poughkeepsie	36027 2206	2	971	514	0	0	0	0	0	0
48	Poughkeepsie	36027 2206	3	988	428	0	0	0	0	0	0
49	Poughkeepsie	36027 2207	1	1020	409	0	0	0	0	0	0
50	Poughkeepsie	36027 2207	2	1002	405	0	0	0	0	0	0
51	Poughkeepsie	36027 2207	3	16	8	0	0	0	0	0	0
52	Poughkeepsie	36027 2207	4	352	229	0	0	0	0	0	0
53	Poughkeepsie	36027 2208	1	1034	489	0	0	0	0	0	0
54	Poughkeepsie	36027 2208	2	509	212	0	0	0	0	0	0
55	Poughkeepsie	36027 2208	3	791	390	0	0	0	0	0	0



Hudson River Psychiatric
Poughkeepsie, NY

56	Poughkeepsie	36027	2208	4	1280	598	629	0	0	0
57	Poughkeepsie	36027	2209	1	648	299	286	0	0	0
58	Poughkeepsie	36027	2209	2	991	435	431	0	0	0
59	Poughkeepsie	36027	2209	3	1169	510	527	0	0	0
60	Poughkeepsie	36027	2210	1	936	411	435	0	4	0
61	Poughkeepsie	36027	2210	2	1043	427	436	0	0	0
62	Poughkeepsie	36027	2210	3	1250	618	570	0	0	0
63	Poughkeepsie	36027	2210	4	1181	478	489	0	0	0
64	Poughkeepsie	36027	4100	1	2489	166	148	0	0	0
65	Hyde Park	36027	6300	1	73	29	16	17	5	0
66	Hyde Park	36027	6300	9	958	44	51	0	0	0
67	Hyde Park	36027	0701014	2100	765	765	435	12	337	0
68	Hyde Park	36027	0701021	3358	1264	1264	370	139	724	0
69	La Grange	36027	0801029	3780	1278	1278	155	28	1095	0
70	Pleasant Valley	36027	1300013	983	439	439	31	22	369	0
71	Pleasant Valley	36027	1300021	1646	593	593	13	38	521	0
72	Pleasant Valley	36027	1300022	1469	632	632	252	16	313	7
73	Esopus	36111	9526	2	1333	460	49	47	349	10
74	Lloyd	36111	9536	1	1066	449	288	6	132	6
75	Lloyd	36111	9536	2	2054	807	726	3	97	0
76	Lloyd	36111	9536	3	335	129	103	9	10	0
77	Lloyd	36111	9536	4	1039	363	341	0	26	0
78	Marlborough	36111	9537	1	1600	576	31	55	478	0
79	Marlborough	36111	9537	3	787	297	45	7	241	0
80	Marlborough	36111	9537	4	991	420	114	31	282	0
Totals:				86701	34126	25817	612	7536	85	



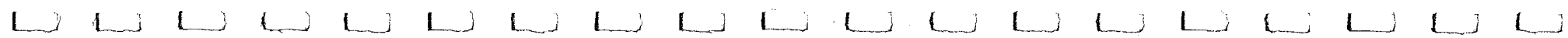
Hudson River Psychiatric
Poughkeepsie, NY

City	Census Tract ID	Tract People	House Count	Public Water	Drilled Wells	Dug Wells	Other Wells
Esopus	36111 9526 2	1333	460	49	47	349	10
	Sub Totals:	1333	460	49	47	349	10
Hyde Park	36027 0702 4	1073	400	353	0	48	0
Hyde Park	36027 0702 3	1007	431	412	6	20	0
Hyde Park	36027 0703 1	1802	625	223	21	365	0
Hyde Park	36027 0703 2	860	361	174	36	162	0
Hyde Park	36027 0703 3	634	353	288	0	72	12
Hyde Park	36027 0703 9	2745	899	294	43	517	0
Hyde Park	36027 0704 1	941	356	40	6	316	0
Hyde Park	36027 0704 2	1451	593	138	35	365	0
Hyde Park	36027 0704 9	1594	283	225	6	88	0
Hyde Park	36027 6300 9	958	44	51	0	0	0
Hyde Park	36027 0701014	2100	765	435	12	337	0
Hyde Park	36027 0702 9	566	297	263	0	57	0
Hyde Park	36027 0701021	3358	1264	370	139	724	0
Hyde Park	36027 6300 1	73	29	16	17	5	0
	Sub Totals:	19162	6700	3282	321	3076	12
La Grange	36027 0801029	3780	1278	155	28	1095	0
	Sub Totals:	3780	1278	155	28	1095	0
Lloyd	36111 9536 4	1039	363	341	0	26	0
Lloyd	36111 9536 3	335	129	103	9	10	0
Lloyd	36111 9536 1	1066	449	288	6	132	6
Lloyd	36111 9536 2	2054	807	726	3	97	0
	Sub Totals:	4494	1748	1458	18	265	6
Marlborough	36111 9537 1	1600	576	31	55	478	0
Marlborough	36111 9537 3	787	297	45	7	241	0
Marlborough	36111 9537 4	991	420	114	31	282	0
	Sub Totals:	3378	1293	190	93	1001	0
Pleasant Valley	36027 1300022	1469	632	252	16	313	7
Pleasant Valley	36027 1300021	1646	593	13	38	521	0
Pleasant Valley	36027 1300013	983	439	31	22	369	0
	Sub Totals:	4098	1664	296	76	1203	7
Poughkeepsie	36027 1403 6	923	464	450	0	34	0
Poughkeepsie	36027 1403 5	1384	696	743	0	0	0
Poughkeepsie	36027 1404 9	313	128	83	0	38	0
Poughkeepsie	36027 1404 1	1047	404	305	20	44	0
Poughkeepsie	36027 1401 1	1905	779	732	0	57	5
Poughkeepsie	36027 1401 2	2756	401	413	0	0	0
Poughkeepsie	36027 1402 1	207	72	50	0	7	0
Poughkeepsie	36027 1402 2	1943	707	536	9	193	0
Poughkeepsie	36027 1402 4	2529	1160	1034	0	81	0
Poughkeepsie	36027 1402 9	726	302	236	0	40	0
Poughkeepsie	36027 1403 1	197	116	125	0	24	0
Poughkeepsie	36027 1403 2	1276	569	546	0	17	0

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Hudson River Psychiatric
Poughkeepsie, NY

Poughkeepsie	36027	1403	3	945	458	462	0	0	0	0
Poughkeepsie	36027	1403	4	1355	584	604	0	0	0	13
Poughkeepsie	36027	2205	1	403	166	183	0	0	0	0
Poughkeepsie	36027	2205	2	513	232	216	0	0	0	0
Poughkeepsie	36027	2205	3	918	345	321	0	0	0	21
Poughkeepsie	36027	2205	4	923	349	330	0	0	0	0
Poughkeepsie	36027	2205	5	901	343	347	0	0	0	0
Poughkeepsie	36027	2206	1	325	128	123	0	0	0	0
Poughkeepsie	36027	2206	2	971	532	514	0	0	0	0
Poughkeepsie	36027	2206	3	988	429	428	0	0	0	0
Poughkeepsie	36027	2207	1	1020	398	409	0	0	0	0
Poughkeepsie	36027	2207	2	1002	413	405	0	0	0	0
Poughkeepsie	36027	2207	3	16	8	8	0	0	0	0
Poughkeepsie	36027	2207	4	352	208	229	0	0	0	0
Poughkeepsie	36027	2208	1	1034	503	489	0	0	0	0
Poughkeepsie	36027	2208	2	509	219	212	0	0	0	0
Poughkeepsie	36027	2208	3	791	400	390	0	0	0	0
Poughkeepsie	36027	2208	4	1280	598	629	0	0	0	0
Poughkeepsie	36027	2209	1	648	299	286	0	0	0	0
Poughkeepsie	36027	2209	2	991	435	431	0	0	0	0
Poughkeepsie	36027	2209	3	1169	510	527	0	0	0	0
Poughkeepsie	36027	2210	1	936	411	435	0	0	0	0
Poughkeepsie	36027	2210	2	1043	427	436	0	0	4	0
Poughkeepsie	36027	2210	3	1250	618	570	0	0	0	0
Poughkeepsie	36027	2210	4	1181	478	489	0	0	0	0
Poughkeepsie	36027	4100	1	2489	166	148	0	0	0	0
Poughkeepsie	36027	1405	9	1617	865	844	0	0	8	0
Poughkeepsie	36027	2201	1	860	366	381	0	0	0	0
Poughkeepsie	36027	2201	2	437	202	192	0	0	0	0
Poughkeepsie	36027	2201	3	1181	607	603	0	0	0	0
Poughkeepsie	36027	2201	4	565	364	372	0	0	0	0
Poughkeepsie	36027	2201	5	585	357	348	0	0	0	0
Poughkeepsie	36027	2201	6	735	317	300	0	0	0	0
Poughkeepsie	36027	2201	7	11	4	0	0	0	0	0
Poughkeepsie	36027	2202	1	873	239	277	0	0	0	0
Poughkeepsie	36027	2202	2	580	251	272	0	0	0	0
Poughkeepsie	36027	2202	3	927	394	356	0	0	0	0
Poughkeepsie	36027	2203	1	465	288	305	0	0	0	0
Poughkeepsie	36027	2203	2	553	226	175	0	0	0	11
Poughkeepsie	36027	2204	1	414	215	223	0	0	0	0
Poughkeepsie	36027	2204	3	427	269	263	0	0	0	0
Poughkeepsie	36027	2204	4	1067	564	602	0	0	0	0
Sub Totals:				50456	20983	20387	29	547	50	



Hudson River Psychiatric
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For Radius of 4 Mi., Circle Area = 50.265482

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
1	Hyde Park	36027 7023	0.459448	0.287386	62.55
2	Hyde Park	36027 7024	1.495057	1.424117	95.26
3	Hyde Park	36027 7029	0.899168	0.898914	99.97
4	Hyde Park	36027 7031	1.430354	1.430354	100.00
5	Hyde Park	36027 7032	0.941449	0.941449	100.00
6	Hyde Park	36027 7033	0.294242	0.293518	99.75
7	Hyde Park	36027 7039	5.881292	4.963089	84.39
8	Hyde Park	36027 7041	1.233165	1.233165	100.00
9	Hyde Park	36027 7042	0.989242	0.989242	100.00
10	Hyde Park	36027 7049	2.866168	2.866168	100.00
11	Poughkeepsie	36027 14011	0.848853	0.848853	100.00
12	Poughkeepsie	36027 14012	1.319483	1.319483	100.00
13	Poughkeepsie	36027 14021	0.124525	0.124525	100.00
14	Poughkeepsie	36027 14022	1.771759	1.759486	99.31
15	Poughkeepsie	36027 14024	2.013684	1.974234	98.04
16	Poughkeepsie	36027 14029	2.891080	2.891080	100.00
17	Poughkeepsie	36027 14031	0.089760	0.089760	100.00
18	Poughkeepsie	36027 14032	0.604991	0.604991	100.00
19	Poughkeepsie	36027 14033	0.227373	0.227373	100.00
20	Poughkeepsie	36027 14034	0.262033	0.262033	100.00
21	Poughkeepsie	36027 14035	0.228686	0.228686	100.00
22	Poughkeepsie	36027 14036	0.295009	0.295009	100.00
23	Poughkeepsie	36027 14041	0.916845	0.272352	29.71
24	Poughkeepsie	36027 14049	1.228267	0.009755	0.79
25	Poughkeepsie	36027 14059	2.347047	0.675245	28.77
26	Poughkeepsie	36027 22011	0.099213	0.099213	100.00
27	Poughkeepsie	36027 22012	0.048597	0.048597	100.00
28	Poughkeepsie	36027 22013	0.072157	0.072157	100.00
29	Poughkeepsie	36027 22014	0.047771	0.047771	100.00
30	Poughkeepsie	36027 22015	0.048394	0.048394	100.00
31	Poughkeepsie	36027 22016	0.135788	0.135788	100.00
32	Poughkeepsie	36027 22017	0.212974	0.212974	100.00
33	Poughkeepsie	36027 22021	0.112337	0.112337	100.00
34	Poughkeepsie	36027 22022	0.069658	0.069658	100.00
35	Poughkeepsie	36027 22023	0.133123	0.133123	100.00
36	Poughkeepsie	36027 22031	0.156567	0.156567	100.00
37	Poughkeepsie	36027 22032	0.319925	0.319925	100.00
38	Poughkeepsie	36027 22032	0.070828	0.070828	100.00
39	Poughkeepsie	36027 22041	0.101819	0.101819	100.00
40	Poughkeepsie	36027 22043	0.082439	0.082439	100.00
41	Poughkeepsie	36027 22044	0.033309	0.033309	100.00
42	Poughkeepsie	36027 22051	0.039616	0.039616	100.00
43	Poughkeepsie	36027 22052	0.040716	0.040716	100.00
44	Poughkeepsie	36027 22053	0.070216	0.070216	100.00
45	Poughkeepsie	36027 22054	0.064338	0.064338	100.00
46	Poughkeepsie	36027 22055	0.071408	0.071408	100.00
47	Poughkeepsie	36027 22061	0.073508	0.071408	100.00
48	Poughkeepsie	36027 22062	0.077375	0.073508	100.00
49	Poughkeepsie	36027 22063	0.072403	0.077375	100.00
50	Poughkeepsie	36027 22071	0.189347	0.072403	100.00
51	Poughkeepsie	36027 22072	0.446095	0.189347	100.00
52	Poughkeepsie	36027 22073	0.102326	0.446095	100.00
53	Poughkeepsie	36027 22074	0.133012	0.102326	100.00
		36027 22081	0.133012	0.133012	100.00



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54 Poughkeepsie	36027 22082	0.132043	0.132043	100.00
55 Poughkeepsie	36027 22083	0.330353	0.330353	100.00
56 Poughkeepsie	36027 22084	0.153904	0.153904	100.00
57 Poughkeepsie	36027 22091	0.075783	0.075783	100.00
58 Poughkeepsie	36027 22092	0.124641	0.124641	100.00
59 Poughkeepsie	36027 22093	0.071031	0.071031	100.00
60 Poughkeepsie	36027 22101	0.167654	0.167654	100.00
61 Poughkeepsie	36027 22102	0.207384	0.207384	100.00
62 Poughkeepsie	36027 22103	0.647027	0.405999	62.75
63 Poughkeepsie	36027 22104	0.488810	0.366231	74.92
64 Poughkeepsie	36027 41001	0.629252	0.629252	100.00
65 Hyde Park	36027 63001	0.103058	0.103058	100.00
66 Marlborough	36111 95374	3.265460	1.745675	53.46
67 Hyde Park	36027 701014	6.181722	0.010692	0.17
68 Hyde Park	36027 701021	7.796056	0.158425	2.03
69 La Grange	36027 801029	9.779462	0.704017	7.20
70 Pleasant Valley	36027 1300013	2.471275	0.777119	31.45
71 Pleasant Valley	36027 1300021	9.351748	0.421984	4.51
72 Pleasant Valley	36027 1300022	3.859291	0.020157	0.52
73 Esopus	36111 95262	14.955076	0.875576	5.85
74 Lloyd	36111 95361	1.777281	1.777281	100.00
75 Lloyd	36111 95362	1.398022	1.398022	100.00
76 Lloyd	36111 95363	0.303974	0.303974	100.00
77 Lloyd	36111 95364	1.428237	1.395731	97.72
78 Marlborough	36111 95371	10.476380	4.828292	46.09
79 Marlborough	36111 95373	5.078860	2.312712	45.54
80 Hyde Park	36027 63009	0.732941	0.732941	100.00
Totals:		116.770966	50.265461	

For Radius of 3 Mi., Circle Area = 28.274334

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
2	Hyde Park	36027 7024	1.495057	0.367870	24.61
3	Hyde Park	36027 7029	0.899168	0.423160	47.06
4	Hyde Park	36027 7031	1.430354	0.896564	62.68
5	Hyde Park	36027 7032	0.941449	0.282137	29.97
7	Hyde Park	36027 7039	5.881292	2.489196	42.32
8	Hyde Park	36027 7041	1.233165	1.233165	100.00
9	Hyde Park	36027 7042	0.989242	0.989242	100.00
10	Hyde Park	36027 7049	2.866168	2.866168	100.00
11	Poughkeepsie	36027 14011	0.848853	0.848853	100.00
12	Poughkeepsie	36027 14012	1.319483	1.319483	100.00
13	Poughkeepsie	36027 14021	0.124525	0.124525	100.00
14	Poughkeepsie	36027 14022	1.771759	0.242126	13.67
15	Poughkeepsie	36027 14024	2.013684	0.981094	48.72
16	Poughkeepsie	36027 14029	2.891080	2.699820	93.38
17	Poughkeepsie	36027 14031	0.089760	0.089760	100.00
18	Poughkeepsie	36027 14032	0.604991	0.604991	100.00
19	Poughkeepsie	36027 14033	0.227373	0.227373	100.00
20	Poughkeepsie	36027 14034	0.262033	0.262033	100.00
21	Poughkeepsie	36027 14035	0.228686	0.191914	83.92
22	Poughkeepsie	36027 14036	0.295009	0.107852	36.56
26	Poughkeepsie	36027 22011	0.099213	0.099213	100.00
27	Poughkeepsie	36027 22012	0.048597	0.048597	100.00
28	Poughkeepsie	36027 22013	0.072157	0.072157	100.00
29	Poughkeepsie	36027 22014	0.047771	0.047771	100.00

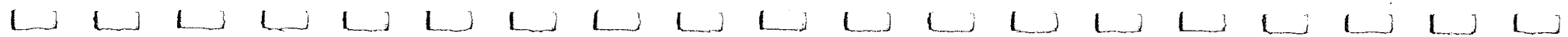


Hudson River Psychiatric
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30	Poughkeepsie	36027	22015	0.048394	0.048394	100.00
31	Poughkeepsie	36027	22016	0.135788	0.135788	100.00
32	Poughkeepsie	36027	22017	0.212974	0.212974	100.00
33	Poughkeepsie	36027	22021	0.112337	0.112337	100.00
34	Poughkeepsie	36027	22022	0.069658	0.069658	100.00
35	Poughkeepsie	36027	22023	0.133123	0.133123	100.00
36	Poughkeepsie	36027	22031	0.156567	0.156567	100.00
37	Poughkeepsie	36027	22032	0.319925	0.319925	100.00
38	Poughkeepsie	36027	22041	0.070828	0.070828	100.00
39	Poughkeepsie	36027	22043	0.101819	0.101819	100.00
40	Poughkeepsie	36027	22044	0.082439	0.082439	100.00
41	Poughkeepsie	36027	22051	0.033309	0.033309	100.00
42	Poughkeepsie	36027	22052	0.039616	0.039616	100.00
43	Poughkeepsie	36027	22053	0.040716	0.040716	100.00
44	Poughkeepsie	36027	22054	0.070216	0.070216	100.00
45	Poughkeepsie	36027	22055	0.064338	0.064338	100.00
46	Poughkeepsie	36027	22061	0.071408	0.071408	100.00
47	Poughkeepsie	36027	22062	0.073508	0.073508	100.00
48	Poughkeepsie	36027	22063	0.077375	0.077375	100.00
49	Poughkeepsie	36027	22071	0.072403	0.072403	100.00
50	Poughkeepsie	36027	22072	0.189347	0.177029	93.49
51	Poughkeepsie	36027	22073	0.446095	0.239096	53.60
52	Poughkeepsie	36027	22074	0.102326	0.102326	100.00
53	Poughkeepsie	36027	22081	0.133012	0.133012	100.00
54	Poughkeepsie	36027	22082	0.132043	0.079289	60.05
55	Poughkeepsie	36027	22083	0.330353	0.093824	28.40
56	Poughkeepsie	36027	22084	0.153904	0.128719	83.64
57	Poughkeepsie	36027	22091	0.075783	0.075783	100.00
58	Poughkeepsie	36027	22092	0.124641	0.124641	100.00
59	Poughkeepsie	36027	22093	0.071031	0.071031	100.00
60	Poughkeepsie	36027	22101	0.167654	0.099863	59.56
61	Poughkeepsie	36027	22102	0.207384	0.002453	1.18
64	Poughkeepsie	36027	41001	0.629252	0.009701	1.54
65	Hyde Park	36027	63001	0.103058	0.103058	100.00
66	Marlborough	36111	95374	3.265460	0.312371	9.57
73	Esopus	36111	95262	14.955076	0.056409	0.38
74	Lloyd	36111	95361	1.777281	1.777281	100.00
75	Lloyd	36111	95362	1.398022	1.311626	93.82
76	Lloyd	36111	95363	0.303974	0.015769	5.19
77	Lloyd	36111	95364	1.428237	0.496730	34.78
78	Marlborough	36111	95371	10.476380	2.666621	25.45
79	Marlborough	36111	95373	5.078860	0.017652	0.35
80	Hyde Park	36027	63009	0.732941	0.732941	100.00
Totals:				70.949730	28.329033	=====

For Radius of 2 Mi., Circle Area = 12.566371

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
7	Hyde Park	36027 7039	5.881292	0.647243	11.01
8	Hyde Park	36027 7041	1.233165	0.756292	61.33
9	Hyde Park	36027 7042	0.989242	0.989242	100.00
10	Hyde Park	36027 7049	2.866168	1.970767	68.76
11	Poughkeepsie	36027 14011	0.848853	0.848853	100.00
12	Poughkeepsie	36027 14012	1.319483	1.319483	100.00
13	Poughkeepsie	36027 14021	0.124525	0.124525	100.00
16	Poughkeepsie	36027 14029	2.891080	1.487430	51.45



Hudson River Psychiatric
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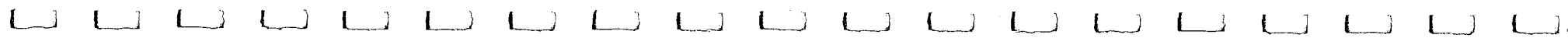
17 Poughkeepsie	36027 14031	0.089760	0.089760	100.00
18 Poughkeepsie	36027 14032	0.604991	0.103730	17.15
19 Poughkeepsie	36027 14033	0.227373	0.192257	84.56
20 Poughkeepsie	36027 14034	0.262033	0.001299	0.50
26 Poughkeepsie	36027 22011	0.099213	0.099213	100.00
27 Poughkeepsie	36027 22012	0.048597	0.048597	100.00
28 Poughkeepsie	36027 22013	0.072157	0.072157	100.00
29 Poughkeepsie	36027 22014	0.047771	0.044949	94.09
30 Poughkeepsie	36027 22015	0.048394	0.002712	5.60
31 Poughkeepsie	36027 22016	0.135788	0.018434	13.58
32 Poughkeepsie	36027 22017	0.212974	0.145045	68.10
33 Poughkeepsie	36027 22021	0.112337	0.112337	100.00
34 Poughkeepsie	36027 22022	0.069658	0.069658	100.00
35 Poughkeepsie	36027 22023	0.133123	0.133123	100.00
36 Poughkeepsie	36027 22031	0.156567	0.156567	100.00
37 Poughkeepsie	36027 22032	0.319925	0.319925	100.00
38 Poughkeepsie	36027 22041	0.070828	0.068443	96.63
39 Poughkeepsie	36027 22043	0.101819	0.032289	31.71
41 Poughkeepsie	36027 22051	0.033309	0.033309	100.00
42 Poughkeepsie	36027 22052	0.039616	0.039616	100.00
43 Poughkeepsie	36027 22053	0.040716	0.030746	75.51
44 Poughkeepsie	36027 22054	0.070216	0.009953	14.18
46 Poughkeepsie	36027 22061	0.071408	0.032399	45.37
47 Poughkeepsie	36027 22062	0.073508	0.000878	1.19
65 Hyde Park	36027 63001	0.103058	0.103058	100.00
74 Lloyd	36111 95361	1.777281	0.738756	41.57
78 Marlborough	36111 95371	10.476380	0.990402	9.45
80 Hyde Park	36027 63009	0.732941	0.732941	100.00
Totals:		32.385551	12.566393	

For Radius of 1 Mi., Circle Area = 3.141593

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
8 Hyde Park		36027 7041	1.233165	0.001837	0.15
9 Hyde Park		36027 7042	0.989242	0.593568	60.00
10 Hyde Park		36027 7049	2.866168	0.397951	13.88
11 Poughkeepsie		36027 14011	0.848853	0.620125	73.05
12 Poughkeepsie		36027 14012	1.319483	0.666846	50.54
13 Poughkeepsie		36027 14021	0.124525	0.069986	56.20
65 Hyde Park		36027 63001	0.103058	0.103058	100.00
80 Hyde Park		36027 63009	0.732941	0.688221	93.90
Totals:			8.217436	3.141593	

For Radius of .5 Mi., Circle Area = 0.785398

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
9 Hyde Park		36027 7042	0.989242	0.093993	9.50
11 Poughkeepsie		36027 14011	0.848853	0.159737	18.82
12 Poughkeepsie		36027 14012	1.319483	0.132061	10.01
65 Hyde Park		36027 63001	0.103058	0.075281	73.05
80 Hyde Park		36027 63009	0.732941	0.324326	44.25



=====
Totals: 3.993578 0.785398

For Radius of .25 Mi., Circle Area = 0.196350

No.	City	Block Group ID	Total Area	Partial Area	% Within Radius
11	Poughkeepsie	36027 14011	0.848853	0.017822	2.10
12	Poughkeepsie	36027 14012	1.319483	0.029530	2.24
80	Hyde Park	36027 63009	0.732941	0.148997	20.33
Totals:			2.901278	0.196350	



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Site Data
=====

Population: 67187.59
Households: 26606.50
Drilled Wells: 255.36
Dug Wells: 3395.01
Other Water Sources: 68.59

=====
Partial (RING) data
=====

----- Within Ring: 4 Mile(s) and 3 Mile(s) -----

Population: 18903.53
Households: 7049.63
Drilled Wells: 121.53
Dug Wells: 1479.85
Other Wells: 12.55

** Population On Private Wells: 4294.09

----- Within Ring: 3 Mile(s) and 2 Mile(s) -----

Population: 27787.14
Households: 12080.08
Drilled Wells: 61.60
Dug Wells: 1022.40
Other Wells: 21.62

** Population On Private Wells: 2493.46

----- Within Ring: 2 Mile(s) and 1 Mile(s) -----

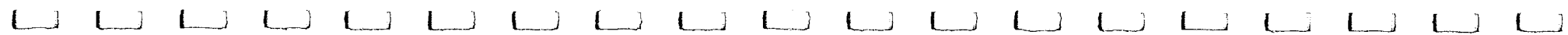
Population: 15530.15
Households: 6198.62
Drilled Wells: 33.39
Dug Wells: 610.48
Other Wells: 30.76

** Population On Private Wells: 1613.17

----- Within Ring: 1 Mile(s) and .5 Mile(s) -----

Population: 3717.34
Households: 994.45
Drilled Wells: 23.10
Dug Wells: 233.21
Other Wells: 2.71

** Population On Private Wells: 958.12



----- Within Ring: .5 Mile(s) and .25 Mile(s) -----

Population:	953.00
Households:	249.45
Drilled Wells:	15.74
Dug Wells:	47.86
Other Wells:	0.84

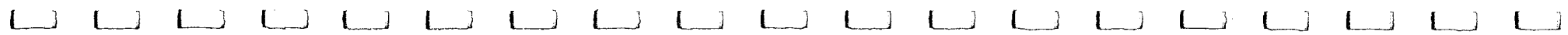
** Population On Private Wells: 243.00

----- Within Ring: .25 Mile(s) and 0 Mile(s) -----

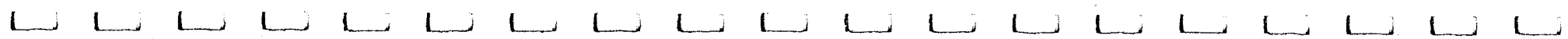
Population:	296.42
Households:	34.27
Drilled Wells:	0.00
Dug Wells:	1.20
Other Wells:	0.10

** Population On Private Wells: 10.35

** Total Population On Private Wells: 9612.20
February 22, 1995



REFERENCE NO. 12



MALCOLM PIRNIE, INC.		PROJECT NOTES	
To: File		Date: 9/18/95	
From: Jin Ho Jang		Project #: 8003-414	
Subject: Hudson River Basin Flowrate		Site Name: Hudson River Psychiatric Center	
The discharge rate for the Hudson River Basin near Poughkeepsie is not given in the Water Resources Data New York Manual (1990) due to the tidal influence in the area. A drainage area of 11,700 miles² is given. An average of discharge of 13,700 cfs (feet cubed/second) is given for the Hudson River Basin at Green Island which is upstream of the Poughkeepsie area. Since the average discharge at Green Island is between 10,000 to 100,000, it will be assumed that the discharge near the Poughkeepsie area will also be between 10,000 to 100,000 cfs.			





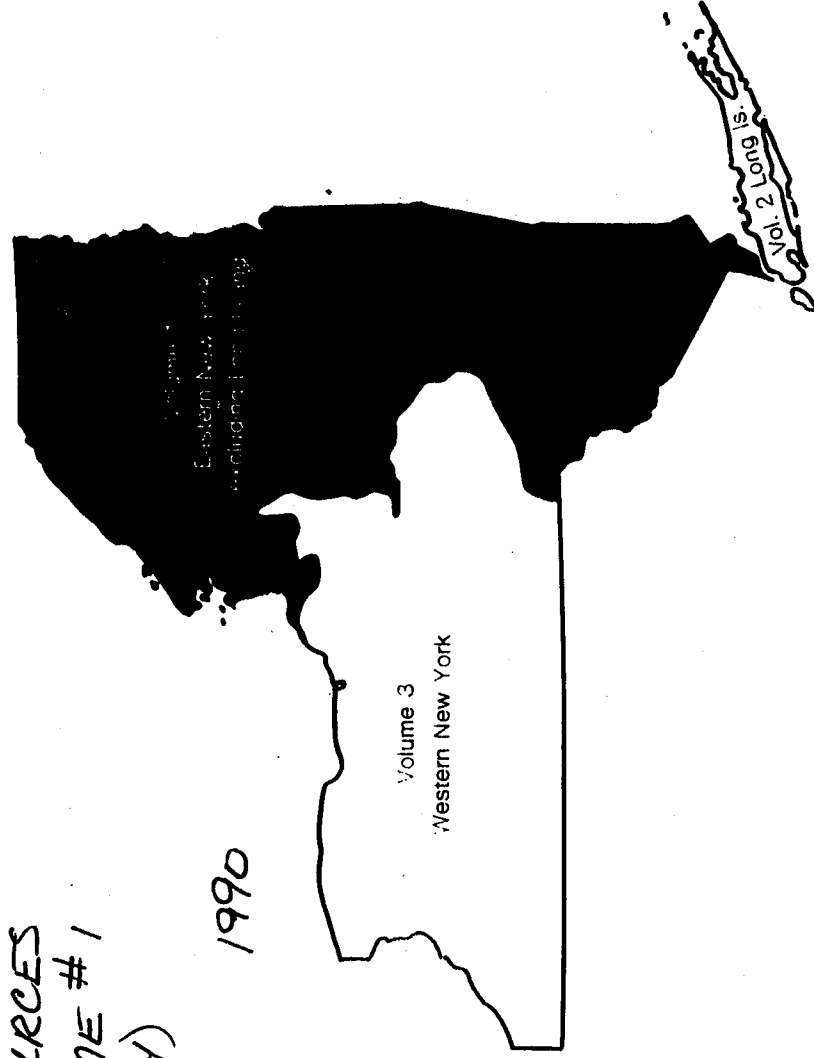
Water Resources Data New York Water Year 1990

Volume 1. Eastern New York excluding
Long Island

WATER RESOURCES
DATA - VOLUME #1
(EASTERN NY)

MANUAL 8A.

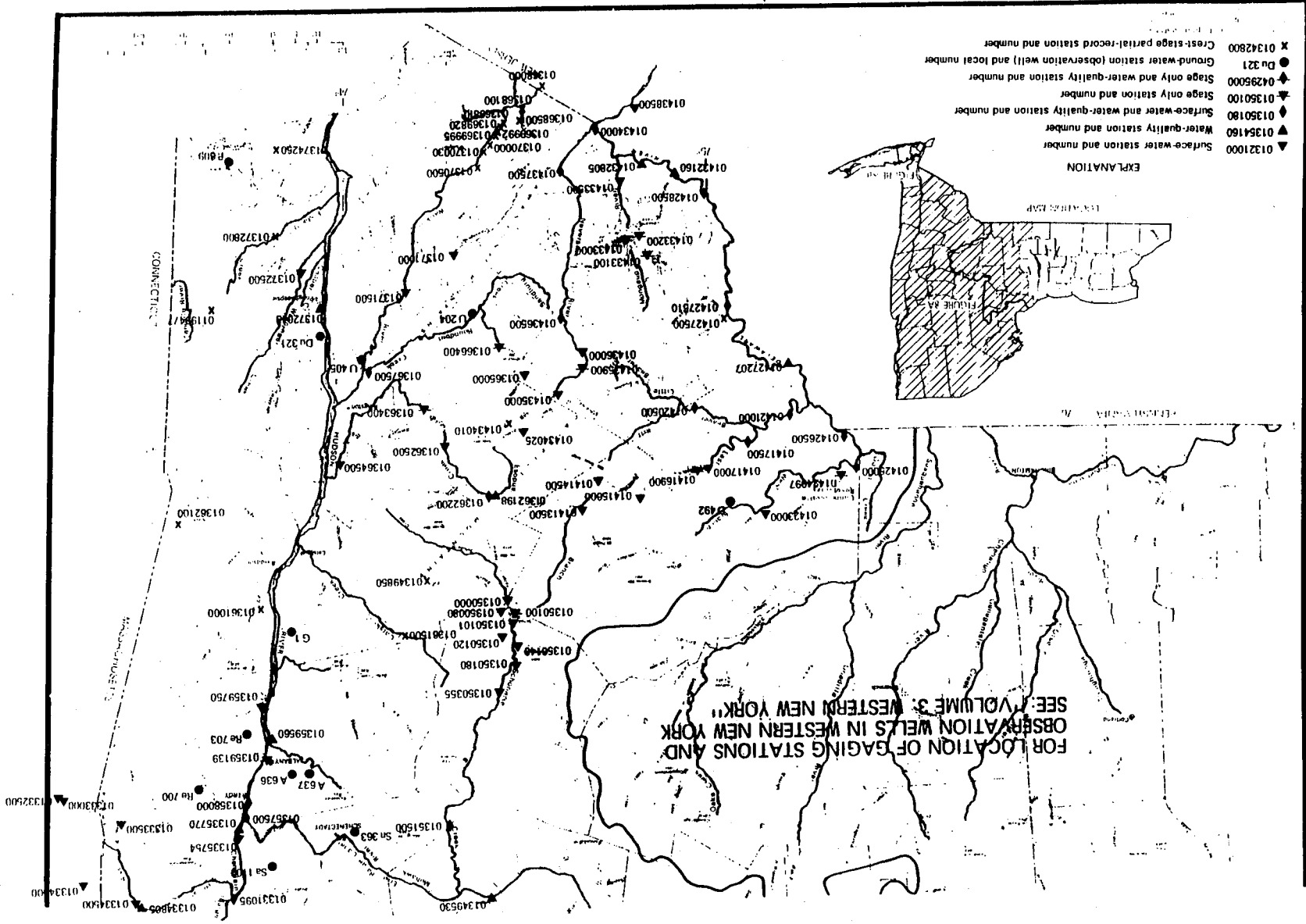
1990



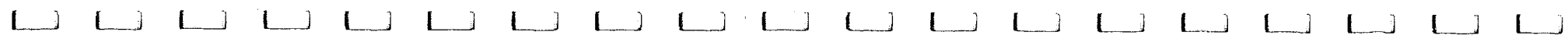
U.S. GEOLOGICAL SURVEY WATER-DATA REPORT NY-90-1
Prepared in cooperation with the State of New York
and with other agencies



FIGURE 8A -- LOCATION OF GAGING STATIONS AND OBSERVATION WELLS







HUDSON RIVER BASIN

01372043 HUDSON RIVER NEAR POUGHKEEPSIE, NY

LOCATION.--Lat 41°43'18", long 73°56'28", Dutchess County, Hydrologic Unit 02020008, at city pumping station on east bank, adjacent (north) to Marist College, 0.5 mi north of Poughkeepsie, and 1.3 mi upstream from Mid-Hudson Bridge.

DRAINAGE AREA.--11,700 mi².

PERIOD OF RECORD.--Water years 1969-75, 1981, June 1988 to current year.

CHEMICAL DATA: 1969 (c), 1970-71 (d), 1972 (b), 1973-75 (e), 1988 (a), 1989-90 (b).

MINOR ELEMENTS DATA: 1969 (c), 1970-71 (d), 1972 (b), 1973-75 (d), 1988 (a), 1989-90 (b).

RADIOCHEMICAL DATA: 1974 (a), 1975 (d).

ORGANIC DATA: 1975 (a), 1981 (b).

NUTRIENT DATA: 1969 (c), 1970-71 (d), 1972 (b), 1973-75 (d), 1988 (a).

BIOLOGICAL DATA: 1973-75 (d).

SEDIMENT DATA: 1973 (a), 1974 (b), 1975, 1988 (a), 1989-90 (b).

REMARKS.--Water-quality samples were collected by personnel of the New York State Department of Environmental Conservation, and were analyzed in USGS laboratories.

WATER QUALITY DATA, WATER YEAR OCTOBER 1989 TO SEPTEMBER 1990

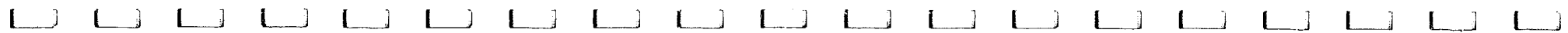
DATE	TIME	SPE- CIFIC CON- DUCT- ANCE (US/CM)	PH (STAND- ARD UNITS)	TEMPER- ATURE WATER (DEG C)	BARO- METRIC PRES- SURE (MM OF HG)	OXYGEN, DIS- SOLVED (PER- CENT SATUR- ATION)	HARD- NESS TOTAL (MG/L AS CaCO3)	CALCIUM DIS- SOLVED (MG/L AS Ca)
OCT 16...	1600	238	--	17.0	760	--	79	24
APR 19...	1300	90	7.2	9.0	780	11.2	95	--
MAY 09...	1300	175	6.8	16.0	757	9.6	98	--
JUN 18...	1500	170	7.2	21.0	--	8.3	--	--
AUG 28...	1300	211	7.5	24.5	756	6.9	83	--

DATE	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	ALKA- LINITY LAB (MG/L AS CaCO3)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	ALUM- INUM, TOTAL RECOV- ERABLE (UG/L AS AL)
OCT 16...	4.7	11	1.4	60	21	17	0.10	530
APR 19...	--	--	--	--	--	--	--	1300
MAY 09...	--	--	--	--	--	--	--	1200
JUN 18...	--	--	--	--	--	--	--	1600
AUG 28...	--	--	--	--	--	--	--	820

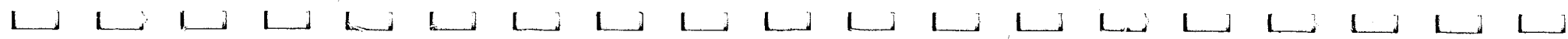
DATE	CADMIUM TOTAL RECOV- ERABLE (UG/L AS CD)	COPPER, TOTAL RECOV- ERABLE (UG/L AS CU)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	LEAD, TOTAL RECOV- ERABLE (UG/L AS PB)	MANGA- NESE, TOTAL RECOV- ERABLE (UG/L AS MN)	MERCURY TOTAL RECOV- ERABLE (UG/L AS HG)	NICKEL, TOTAL RECOV- ERABLE (UG/L AS NI)	ZINC, TOTAL RECOV- ERABLE (UG/L AS ZN)
OCT 16...	<1	12	920	3	70	<0.10	2	<10
APR 19...	<1	13	2700	4	70	<0.10	3	20
MAY 09...	<1	10	2000	4	120	0.10	3	20
JUN 18...	<1	12	2700	5	260	<0.10	3	10
AUG 28...	<1	17	1300	4	90	<0.10	4	<10

SUSPENDED SEDIMENT DISCHARGE, WATER YEAR OCTOBER 1989 TO SEPTEMBER 1990

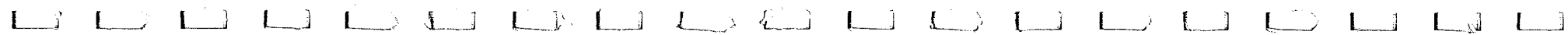
DATE	TIME	SEDI- MENT, SUS- PENDED (MG/L)
OCT 16...	1600	29
APR 19...	1300	42
MAY 09...	1300	50
JUN 18...	1500	83
AUG 28...	1300	44



REFERENCE NO. 13



MALCOLM PIRNIE, INC.		PROJECT NOTES	
To: File	Date: 9/18/95		
From: Jin Ho Jang	Project #: 8003-414		
Subject: Wetland Frontage	Site Name: Hudson River Psychiatric Center		
The 15-mile surface water pathway map was used to determine wetland frontage along the two unnamed tributaries on site and along the Hudson River. The wetland frontage along the two unnamed tributaries on site is: 650 feet (0.123 mile) The wetland frontage along the Hudson River is: 2,687 feet (0.51 mile)			



REFERENCE NO. 14



MALCOLM PIRNIE, INC.		PROJECT NOTES	
To: File		Date: 9/21/95	
From: Jin Ho Jang		Project #: 8003-414	
Subject: Wellhead Protection Area		Site Name: Hudson River Psychiatric Center	
The Potential Yields of Wells in Unconsolidated Aquifer in Upstate New York-- Hudson Mohawk Sheet was used to determine that the Hudson River Psychiatric Center is within four-miles of a wellhead protection area.			

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

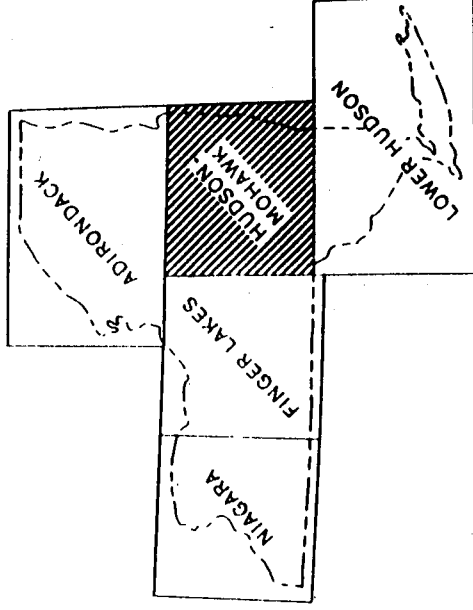
UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

POTENTIAL YIELDS OF WELLS IN UNCONSOLIDATED AQUIFERS IN UPSTATE NEW YORK--HUDSON-MOHAWK SHEET

By

Edward F. Bugliosi, Ruth A. Trudell, and George D. Casey



WATER-RESOURCES INVESTIGATIONS REPORT 87-4275



Prepared in cooperation with the

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Albany, New York
1988

U U U U U U U U U U U U U U U U U U

3. Randall, A. D., 1972, Records of wells and test borings in the Susquenanna River basin, New York: New York State Department of Environmental Conservation Bulletin 69, 92 p.
9. Reynolds, R. J., 1985, Hydrogeology of the Clifton Park area, Saratoga County, New York: U.S. Geological Survey Water Resources Investigations Report 84-4032, 6 sheets, scale 1:24,000.
10. Snavely, D. S., 1983, Ground-water appraisal of the Pine Bush area, Albany, New York: U.S. Geological Survey Water Resources Investigation Report 82-4000, 47 p.

EXPLANATION

POTENTIAL YIELD OF WATER TO WELLS IN UNCONSOLIDATED AQUIFERS

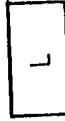


UNCONFINED AQUIFERS, 10 to 100 GALLONS PER MINUTE--Sand and gravel with saturated zone generally less than 10 ft thick, or thicker but with less permeable silty sand and gravel. Yields in areas adjacent to streams may exceed 100 gal/min through pumping-induced infiltration, but these areas are too small to show at this scale.

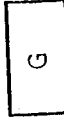


UNCONFINED AQUIFERS, MORE THAN 100 GALLONS PER MINUTE--Sand and gravel of high transmissivity and with saturated thickness greater than 10 ft. Many such areas are associated with surface-water sources that can provide additional water pumping-induced recharge.

AQUIFER OF UNKNOWN POTENTIAL--Areas of sand or sand and gravel for which little or no well data are on file to determine yield potential. Letter symbols, explained below, indicate the type of deposit.



Lacustrine or eolian--Fine to medium sand that probably yields less than 10 gal/min.



Kame, kame terrace, kame moraine, outwash, or alluvium--Sand and gravel of unknown thickness or saturation. Yield potential is greater where streams are present.

-- BURIED CHANNEL--Stratified drift of unknown saturated thickness and yield potential and overlain by other unconsolidated deposits.



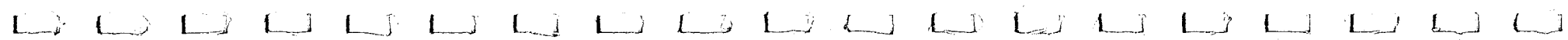
PRIMARY WATER-SUPPLY AQUIFER--A highly productive aquifer that is being used as a source of water supply by major public-supply systems. Number indicates name of aquifer area (see key below) and report number in list of related publications. Reports and maps cited describe these aquifers in detail.

Primary aquifer
number

Aquifer area

1
9

Schenectady
Clifton Park - Halfmoon area





U U U U U U U U U U U U U U U U U U

REFERENCE NO. 15

U U

MALCOLM PIRNIE, INC.		PROJECT NOTES	
To: File	Date: September 21, 1995		
From: Jin Ho Jang	Project #: 8003-414		
Subject: Four-mile Wetland Acreage	Site Name: Hudson River Psychiatric Center		
The wetland acreage within four-miles of the site was calculated using the four-mile vicinity map. National Wetlands Institute Maps were not available for this general area. The apportionment is as follows:			
RING (MILES)	ACREAGE		
0 - ¼	5		
¼ - ½	21		
½ - 1	4		
1 - 2	314		
2 - 3	387		
3 - 4	892		
TOTAL WETLAND ACREAGE WITHIN 4 MILES:		1,623	

U U

REFERENCE NO. 16



MALCOLM PIRNIE, INC.		PROJECT NOTES	
To: File		Date: 9/21/95	
From: Jin Ho Jang		Project #: 8003-414	
Subject: Future Remedial Actions for HRPC		Site Name: Hudson River Psychiatric Center	
During telephone conversations with the site manager for the HRPC from LMS Engineers, it was stated that additional remedial actions were planned for the site. In 1993, a Focus Feasibility Study was performed to assess where the PCBs were coming from in the vicinity of landfill Area 6. It was discovered during this investigation that the vault room in the Cheney Building was the source of the PCB contamination. It was also discovered that a Removal Action of the contaminated PCBs and a Remedial Investigation/Feasibility Study has been planned for Area 6. The scope of this work was to dispose of PCB contaminated sediments and identify the extent of PCB contamination before an RI/FS can be performed.			

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ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: May 10, 1995

Time: 2:00 AM ☐ PM ☒

Outgoing Call

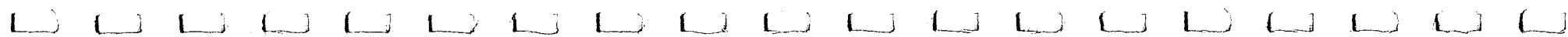
To:	<u>Ed Makish</u> <i>JMS</i>	<u>(914) 735-8300</u>
Affiliation:	<u>Lawler, Matusky & Skelly Eng.</u>	Telephone No.

Malcolm Pirnie Staff:	<u>Jin Ho Jang</u>	<u>(609) 860-0100</u>
		Telephone No.

Summary of Conversation:

I phoned Mr. Makish to obtain information on the Hudson River Psychiatric Center (HRPC) site and in particular information about Area 6. Mr. Makish stated that further actions have been implemented in this area and that the source of the PCBs found in previous sampling events was due to transformers discovered in a vault room located in the Cheyney building. This vault room contained approximately 20% PCBs in the floor drains, and the storm drains leading from this room is connected to an outfall leading to the wetland adjacent to the fill area in Landfill 6. The HRPC along with Facility Development Corporation, has agreed to a consent order with New York State and remedial action has been planned for the site. An Interim Removal Action and Remedial Investigation/Feasibility Study has been contracted, but the actual work has not commenced due to freezing of the contract.

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ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: September 12, 1995

Time: 9:10 AM ☒ PM ☐

Outgoing Call

To: Ed Makish (914) 735-8300
Affiliation: LMS Engineering Telephone No.

Malcolm Pirnie Staff: Jin Ho Jang (609) 860-0100
Telephone No.

Summary of Conversation:

I phoned Mr. Makish to inquire about the current plans for remediation of the Hudson River Psychiatric Center site (HRPC). Mr. Makish stated that the contract authorizing removal of the PCBs from the source has been incorporated and should begin on September 13, 1995. Plans for the removal are to remove a 40 - foot section of storm drainage piping from near Cheney Hall, jet cleaning the storm drainage pipes from the first manhole to the outfall. Excavation of the storm sewers is expected to start tomorrow. Sediment has been sampled for disposal from the existing manholes. This sampling event depicted that release of PCBs still exists as high concentrations of PCBs were detected. The removal action is expected to be finished in early October and the RI/FS for the adjacent stream will be conducted by LMS Engineering in November.

U U U U U U U U U U U U U U U U U U

REFERENCE NO. 17



ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: May 9, 1995

Time: 9:55 AM ☐ PM ☐

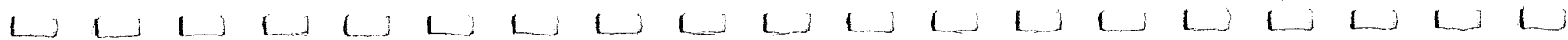
Outgoing Call

To: Ron Pierce (914) 256-3000
Affiliation: NYSDEC Senior Aquatic Biologist Telephone No.

Malcolm Pirnie Staff: Jin Ho Jang ³¹³ (609) 860-0100
Telephone No.

Summary of Conversation:

I phoned Mr. Pierce to obtain the stream classification and fishery information for the Hudson River Psychiatric Center. Mr. Pierce stated that the Hudson River is a Class A stream. He also stated that the river supports a fishery consisting of striped bass, large and small mouth bass, shad, herring, smelt and white perch on a recreational basis. Mr. Pierce did not know the flowrate of the Hudson River in the area.



REFERENCE NO. 18



ARCS II CONTRACT 68-W9-0051
MALCOLM PIRNIE, INC.
RECORD OF TELEPHONE CONVERSATION/AGREEMENT

File No. 8003-414

Date: May 15, 1995

Time: 1:00 AM ☐ PM ☐

Incoming Call

From: Steve Albamont (914) 452-8000
Affiliation: Hudson River Psychiatric Center Telephone No.

Malcolm Pirnie Staff: Jin Ho Jang (609) 860-0100
Telephone No.

Summary of Conversation:

Mr. Albamont returned my phone call requesting the number of workers employed by the Hudson River Psychiatric Center. Mr. Albamont stated that there are 966 current employees working at the facility. I also inquired about the number of people using the athletic field, but Mr. Albamont was not familiar and referred me to Alex Walsh (human resources) for further information.

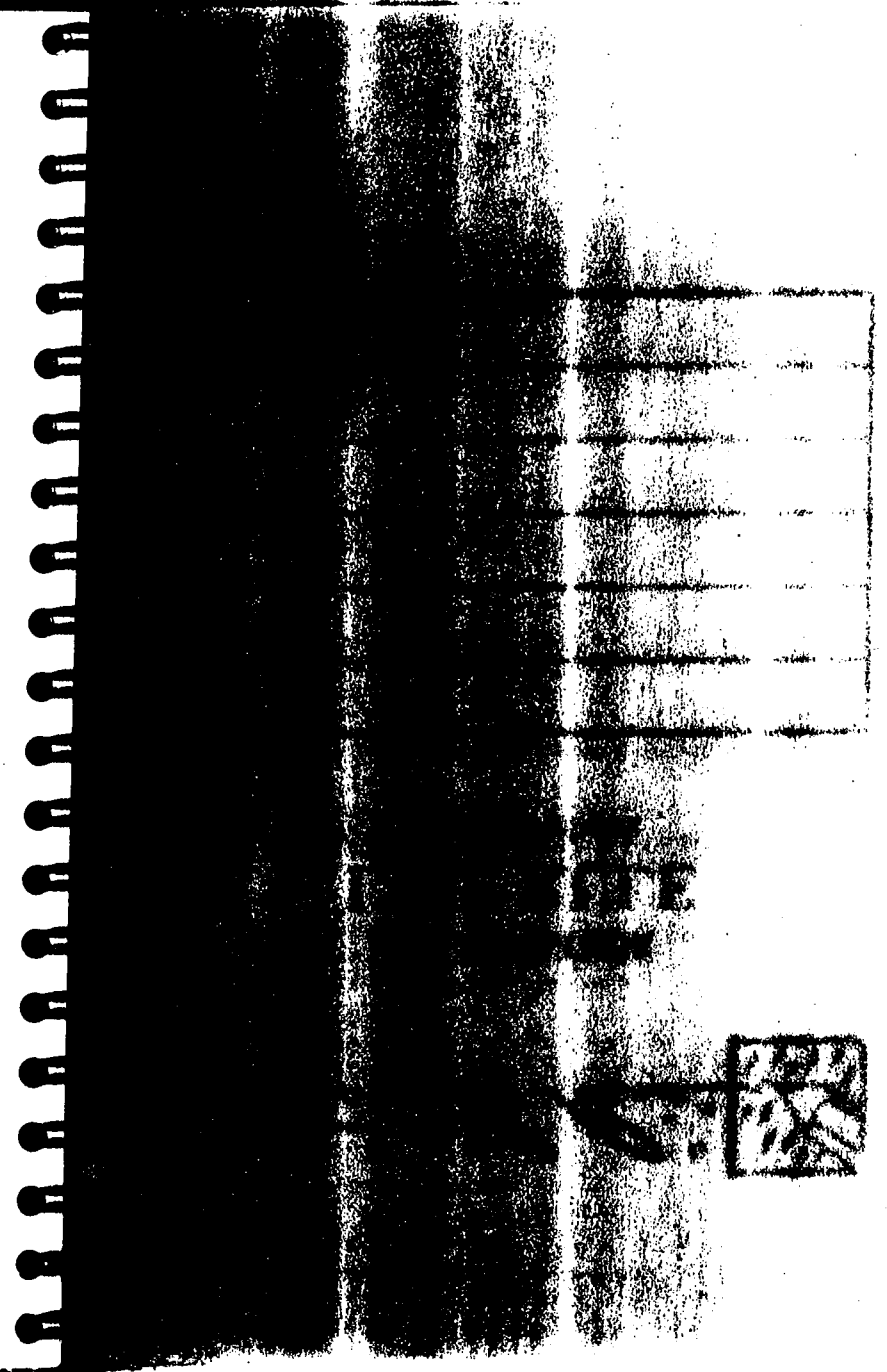


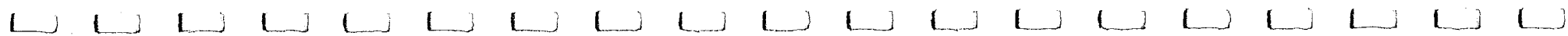
REFERENCE NO. 19

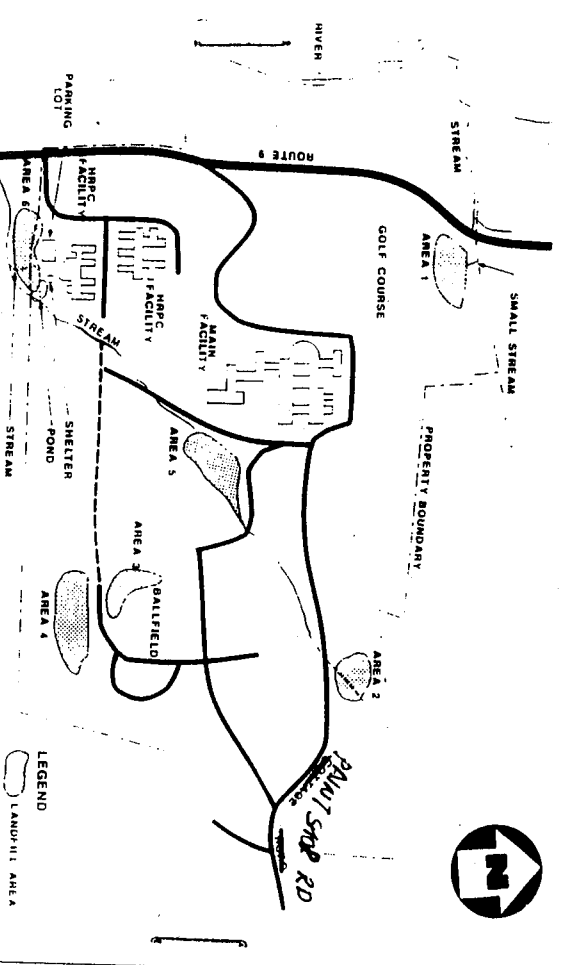


4/6/15 4/16

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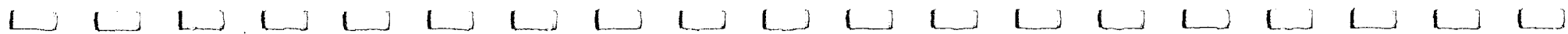




EYE
Z: Exclusion Zone
RZ: Contaminant Reaction Zone
Z: Safe Zone

SITE LOCATION MAP
HUDSON RIVER PSYCHIATRIC CENTER
POUGHKEEPSIE, DUTCHESS COUNTY, NY
MAICOM
PIRRIE
DATE: 6 APR 1995
FIGURE 2

4 96 4
4/6/15



HUDSON RIVER PSYCHIATRIC CENTER 8003-4114

3

HUDSON RIVER PSYCHIATRIC CENTER RECORD (HRS)

APRIL 6, 1995

10:30 ARRIVE AT SITE

CLAVE JOSEPH COLLEY A CALL (HRS) ANSWER

MR. STEFFY ANSWERED AND STATED

FROM HPI THE LANDFILL AREAS

SITE. ARRIVE AT 1300HRS 4114-1114

A FIRE DEPT.

10:10 MEET OFFICE CODE WHO WERE SITTING

LO. ATIONS OF LANDFILLS.

11:10-11:40 OFFICE CODE STATED HPI ARE APPROXIMATE

LOCATIONS OF THE SIX LANDFILL AREAS.

11:50

CLAVE BROWN APPROVED LOCATION OF SITE

MEETING

HPI PERSONNEL ON SITE

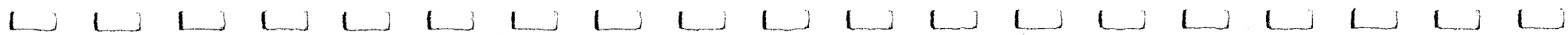
JIM TO BAK

LISA GREGG

CLAVE BROWN

WALKER SEVEN POINTS 11:50

4-46-4 4/6/95



HUDSON RIVER PSYCHIATRIC CENTER 8003-414 4

1201 ARRIVE AT PSYCHIATRIC CENTER 8003-414

IS APPROXIMATELY 1500 FEET EAST OF BUILDING

41 ROAD AND ROAD 1000 AND 1000

AREA COVERED BY TELEPHONE

2. COVERED BY TELEPHONE FROM 1000 TO 1000

1000 TO 1000

1000 TO 1000

TO THE EAST

1201 11/15

1000 TO 1000

1000 TO 1000

1202 2P/25

1000 TO 1000

1000 TO 1000

1000 TO 1000

1210 ARRIVE AT LANDFILL AREA 3, BELMONT

1000 TO 1000

1000 TO 1000

1000 TO 1000

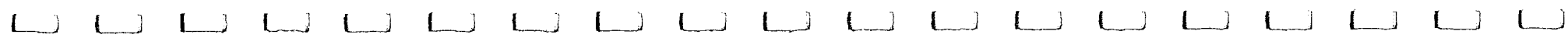
1000 TO 1000

1000 TO 1000

1000 TO 1000

4/6/95

4 ml 4



Hudson River Psychiatric Center 3703-414

With Vehicle For Approximately 2 1/2 to 3 miles
Most covered ponds water could be seen
near areas of dam. A small tributary
is also near the river area with
small dam. From official road started
just this tributary area with adjacent
small tributary and adjacent areas
to the Hudson River.

It starts in area of the property
property towards covered area
the flow is from south to north

3/7/55

Picture of the covered tributary
from private property to hospital
property.

He was also looking at, associated
pictures can be seen in this area
about 70 state covered area

4/7/55

Picture of the covered tributary area
tributary of covered area.

4/7/55



3

Plutarch, *De Iside et Osiride*, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 497, 498, 499, 500, 501, 502, 503, 504, 505, 506, 507, 508, 509, 510, 511, 512, 513, 514, 515, 516, 517, 518, 519, 520, 521, 522, 523, 524, 525, 526, 527, 528, 529, 530, 531, 532, 533, 534, 535, 536, 537, 538, 539, 540, 541, 542, 543, 544, 545, 546, 547, 548, 549, 550, 551, 552, 553, 554, 555, 556, 557, 558, 559, 560, 561, 562, 563, 564, 565, 566, 567, 568, 569, 570, 571, 572, 573, 574, 575, 576, 577, 578, 579, 580, 581, 582, 583, 584, 585, 586, 587, 588, 589, 590, 591, 592, 593, 594, 595, 596, 597, 598, 599, 600, 601, 602, 603, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 619, 620, 621, 622, 623, 624, 625, 626, 627, 628, 629, 630, 631, 632, 633, 634, 635, 636, 637, 638, 639, 640, 641, 642, 643, 644, 645, 646, 647, 648, 649, 650, 651, 652, 653, 654, 655, 656, 657, 658, 659, 660, 661, 662, 663, 664, 665, 666, 667, 668, 669, 670, 671, 672, 673, 674, 675, 676, 677, 678, 679, 680, 681, 682, 683, 684, 685, 686, 687, 688, 689, 690, 691, 692, 693, 694, 695, 696, 697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847,

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THE UNIVERSITY OF CHICAGO

15. *Staph. aureus* 136/144, 150/158

TECHNICAL THE UNIVERSITY OF

100 1/2 8 7 1 1/2 100

DATE RECEIVED BY THE STATE ARCHIVES

44 FEB 1971

1990-1991 1992-1993 1994-1995 1996-1997 1998-1999

22 364 0 000000 0000000000 000

7. *Handwritten:* 2000

LANDFILL AREA # 15 NOT RECORDED BY

TWO (JULY) OF THE # INITIAL AND

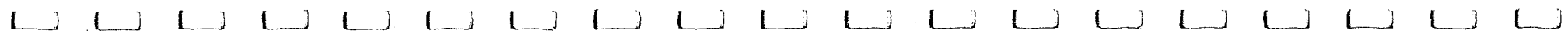
IS PRIVATE PROPERTY MIA DID NOT HAVE

Access to this Area. 21 Area 1

SHOULD BE 7 11 11 (1) SOMEWHAT 10 10 10

Pilot (Boyd) Flight Lt. AUSA 3

4/6/95



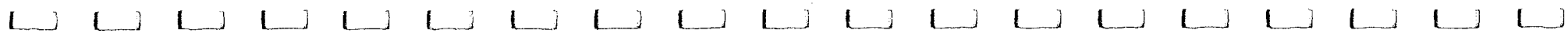
HUDSON RIVER FISHING CENTER 2003 4/24 7

1250 ARRIVE AT NEAR LT AREA 4
FROM TOP OF HILL BEHIND BUILDING
BACKSTOP MONITORING WELL AND IN
SCEN (WOODS) (WOODS) (WOODS)
HEAVILY WOODED & VEGETATED

1251 71/75
Picture of monitoring well area
TOWARD LT AREA 4.

1255 ARRIVE AT LT AREA 5. THIS AREA
IS ACTIVE AND STILL USED BY THE
FACILITY TO DUMP WOOD CUTTINGS
AND CONSTRUCTION DEBRIS. PEBBLES
IS HEAVILY VISIBLE. THIS LOCATION
OFF OF DIRT RD OFF PAINT SHOP RD.

1258 81/85
Picture of pebbles in LT AREA 5
ARRIVE AT LIBRARY MONITORING
OF LT AREA 5. EARLY MORNING
OFFICE (SEE DAYS THIS MONITORING)
DIES NOT WET UP.
4/6/95





HUBBARD RIVER PICTURE - 8x11 1/2

POUNDED WATER AND DE STICK IN THE MOUNTAIN

MOVABLE REFUSE AND BE STICK IN THE MOUNTAIN

TRAVELERS A POUND WAS TAKEN

THE POUNDED WATER WAS TAKEN BETWEEN

THE MOUNTAIN COLOR. THE WATER IS TAKEN

TRAVELERS

12/12

17/12/12 12/12/12

12/12/12

PICTURE OF POUNDED WATER

TRAVELERS

A POUNDED WATER

TRAVELERS

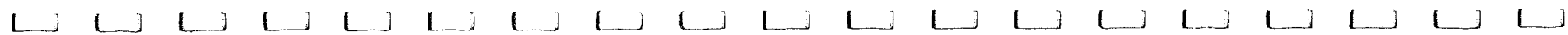
TRAVELERS

TRAVELERS

TRAVELERS

TRAVELERS

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1/12/15



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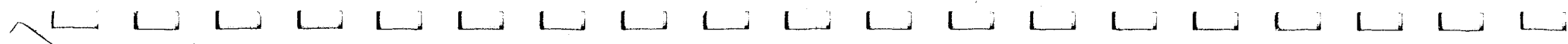
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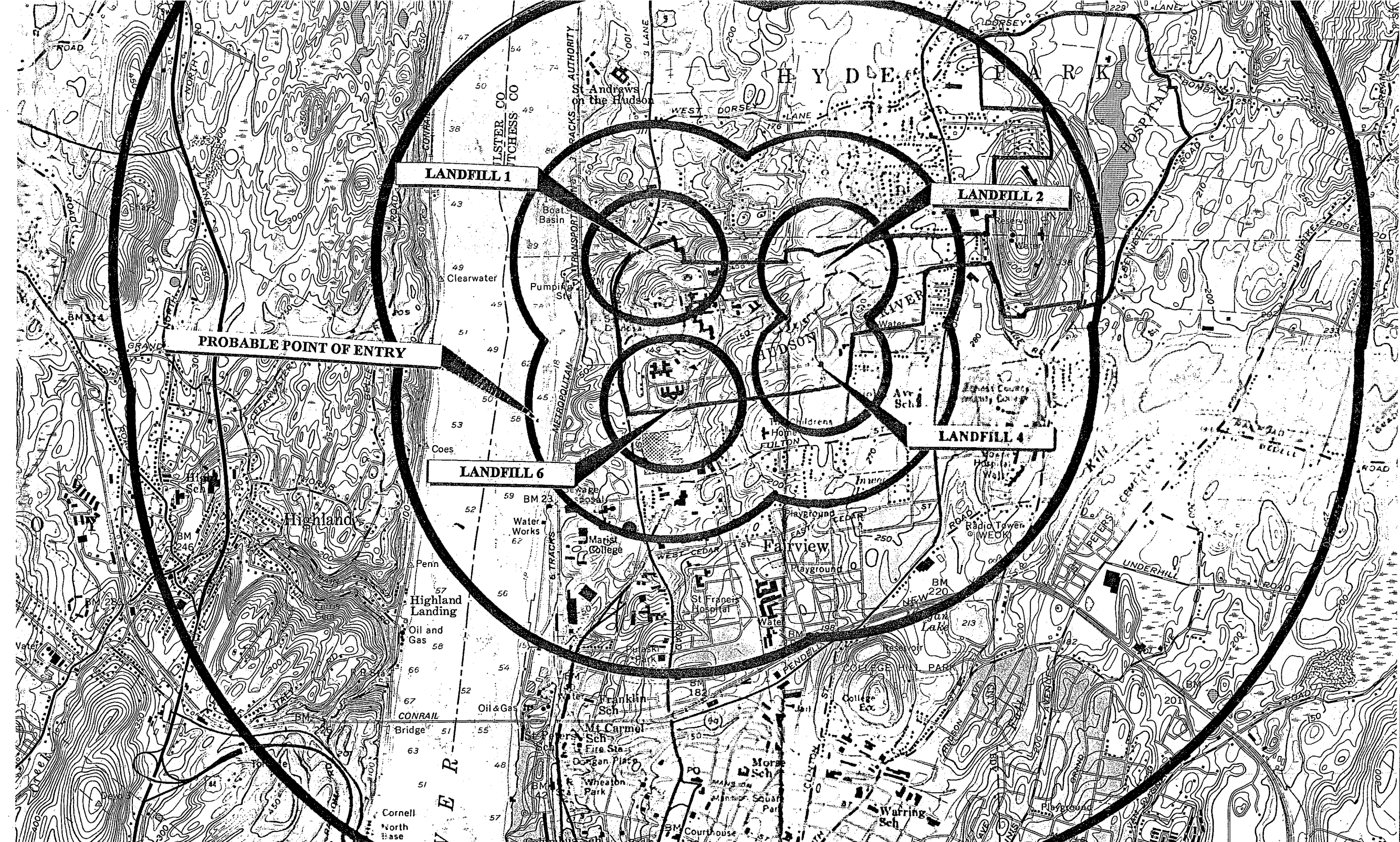
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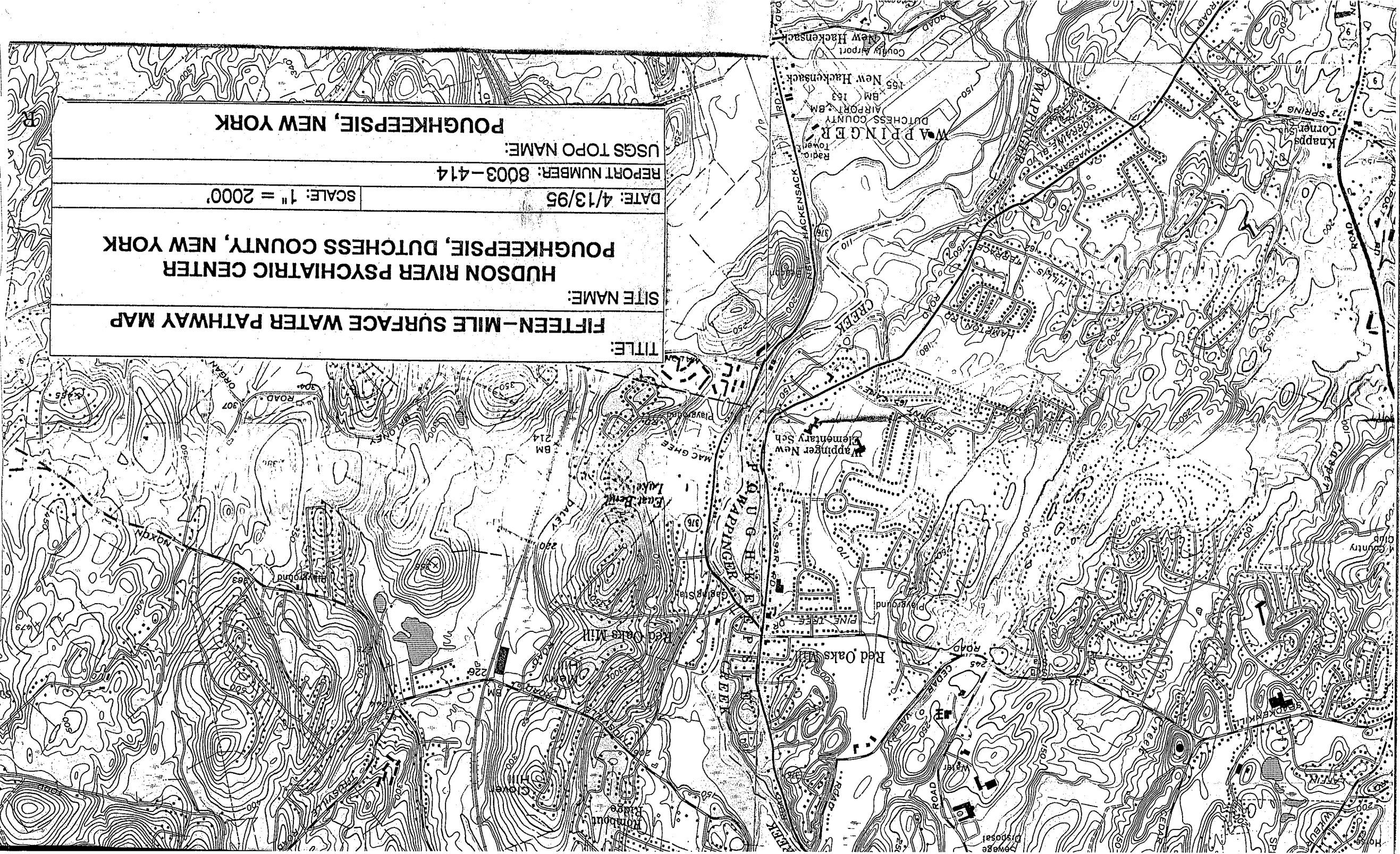
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REFERENCE NO. 21





TITLE:
FIFTEEN-MILE SURFACE WATER PATHWAY MAP

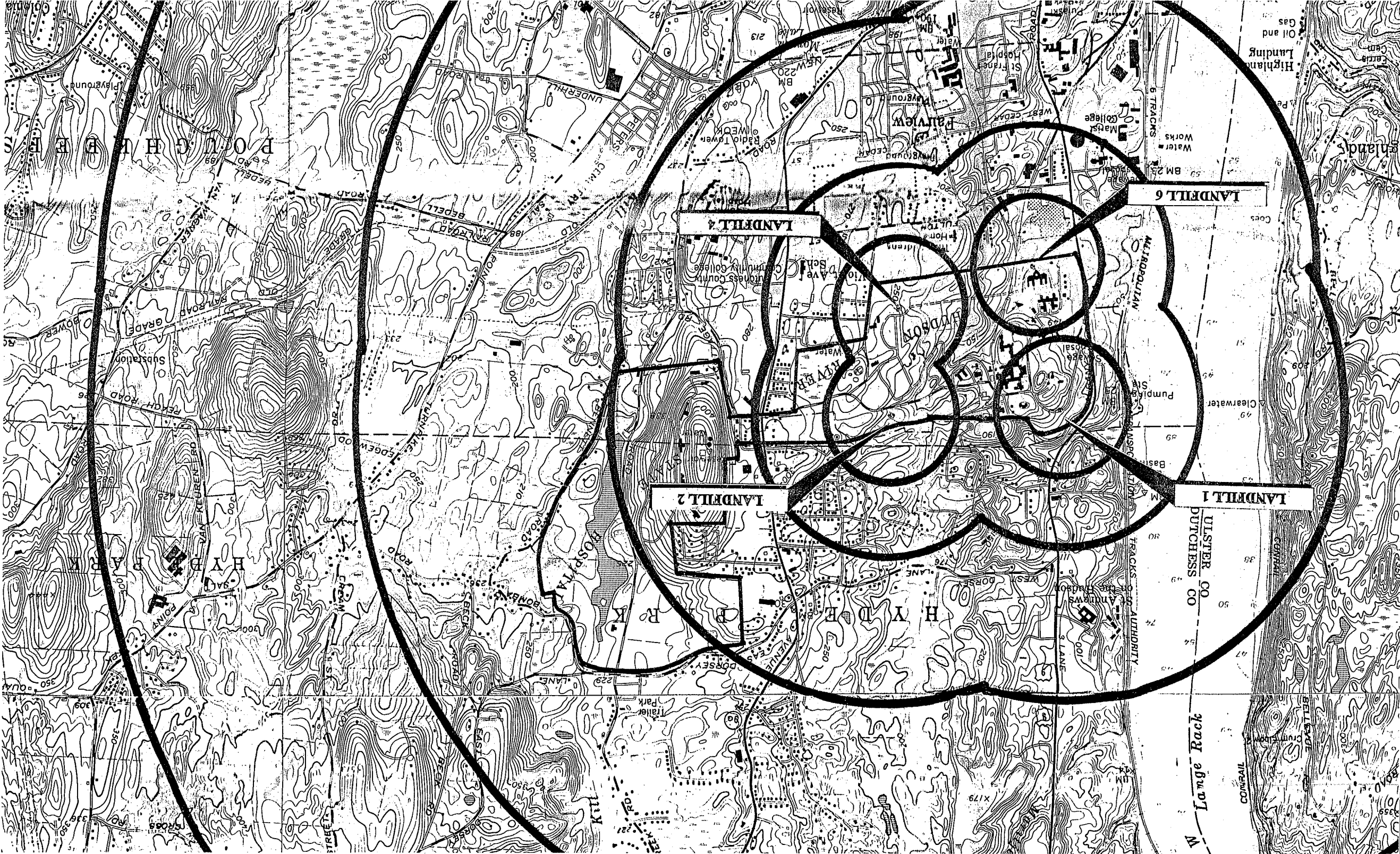
SITE NAME:
HUDSON RIVER PSYCHIATRIC CENTER
POUGHKEEPSIE, DUTCHESS COUNTY, NEW YORK

DATE: 4/13/95
SCALE: 1" = 2000'

REPORT NUMBER: 8003-414

USGS TOPO NAME:

POUGHKEEPSIE, NEW YORK



Lange Rack

ULSTER CO
DUTCHESS CO

LANDFILL 6

LANDFILL 1

LANDFILL 2

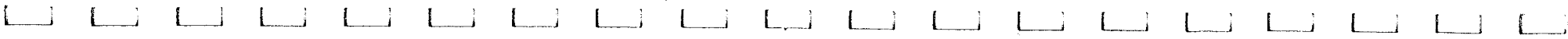
LANDFILL 3

LANDFILL 4

REFERENCE NO. 22



ATTACHMENT 3



[illegible]

Review of Analytical Data

if previous analytical data are available, they should be reviewed for information which supports the design of the sampling and analysis program, tests site hypotheses, and documents the site score. The SI investigator should review all previous analytical data. While analytical data collected for other purposes may not meet SI objectives, site-specific analytical data are generally helpful in better understanding the nature of the problem at the site, regardless of data sources or data quality. The depth of the review depends on the overall quality and quantity of data, the intended use of the data, and whether they are representative of current site conditions and comparable to SI data. Determining whether available data can be applied as SI-generated data requires the professional judgement of an experienced reviewer. Both validated and non-validated analytical data may be available. Previous SI data will be validated and of CLP-quality. Non-validated data may contain false positives and false negatives, as well as quantitation, transcription, and calculation errors. If data of unknown or questionable quality are used for decision-making, the investigator should review all available information to assess the level of certainty associated with the data. If these data are used for HRS documentation, data validation will be necessary. The investigator should be able to determine the general quality of the data set by reviewing QC data for evaluation under the Superfund Program.

