FINAL ~~DRAFT~~ TECHNICAL MEMORANDUM

PHASE II BASELINE ECOLOGICAL ASSESSMENT
SUMMARY OF RESULTS
KANE AND LOMBARD SUPERFUND SITE
BALTIMORE, MARYLAND

VOLUME 1 OF 3

Prepared For

American Telephone and Telegraph Company
Baltimore Gas and Electric Company
Browning-Ferris, Inc.
General Motors Corporation

By

Harding Lawson Associates
Philadelphia, Pennsylvania

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Final [redacted] Technical Memorandum
Phase II Baseline Ecological Assessment
Summary of Results
Kane & Lombard Superfund Site
Baltimore, Maryland

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EXECUTIVE SUMMARY

This Technical Memorandum presents the results of the Phase II Baseline Ecological Assessment (Phase II Assessment) of the Kane and Lombard Superfund Site OU-2 Study Area (OU-2 Study Area) located in Baltimore, Maryland. A site location map is presented in Figure 1. The Baseline Ecological Assessment was developed pursuant to the terms of the Administrative Order on Consent for Remedial Investigation/Feasibility Study, Operable Unit No. 2, Docket No. III-93-21-DC, July 22, 1993, and in accordance with the *Study Area Remedial Investigation and Feasibility Study, Operable Unit 2 (OU2), Baltimore, Maryland, Project Work Plan* (Work Plan) (Harding Lawson Associates [HLA], March 21, 1994).

Phase II of the Baseline Ecological Assessment included the following tasks:

- Delineation of the Phase II Ecological Assessment Area (Phase II EAA) (Section 3.0).
- An inventory of environmental resources within the Phase II EAA (Appendix A).
- Analysis of surface water, sediment, and soil samples collected from the Phase II EAA as described in the *Phase II Ecological Assessment Sampling Plan* (Sampling Plan) (HLA, August 30, 1994) and modified by the US Environmental Protection Agency (EPA)(EPA, September 19,1994) (Appendix B).
- A formal delineation of wetland habitats within the Phase II EAA (Appendix C) and a reconnaissance of upland, and manmade habitats within the Phase II EAA (Appendix A, Section 3.0).
- Characterization of the stormwater management system associated with the OU-2 Study Area (Volume 2, Appendix F).
- Evaluation of potential exposure pathways and exposure points based on the findings of the Phase II Assessment activities (Section 5.0).

ASSESSMENT AREA

Three areas of primary interest to the Phase II Assessment are referred to in this Technical Memorandum:

- the Superfund Site
- the OU-2 Study Area
- the Phase II EAA

As described in Section 2.0, the Superfund Site is a fenced area encompassing approximately 9.7 acres on the south side of East Lombard Street (Figure 1).

The OU-2 Study Area is approximately 40 acres in size and includes the Superfund Site and areas north, east and west of the Superfund Site which have been identified in the Consent Order as being part of the original landfill operations (Figure 1). The OU-2 Study Area includes portions of the Roadway Express Inc. property west of the Superfund Site fence, the PICORP property across East Lombard Street to the north, the Patterson High School athletic fields east of the Superfund Site, and additional properties adjacent to the east of the PICORP facility and the Patterson High School athletic fields.

As described in Section 3.0 of this report, the Phase II EAA is approximately 52 acres in size and was developed based on the findings of the Phase I Baseline Ecological Assessment (Phase I Assessment). The Phase II EAA provides boundaries for the evaluation of potential chemical sources within the OU-2 Study Area (Section 2.0) and to identify potential pathways into the environment (Figure 2).

The southern portion of the Phase II EAA encompasses both the Superfund Site and the OU-2 Study Area. The northern portion of the Phase II EAA includes the underground portion of the local stormwater drainage system associated with the OU-2 Study Area and the area of Herring Run adjacent to the terminus of the stormwater drainage system.

ENVIRONMENTAL RESOURCES INVENTORY

The Environmental Resources Inventory (ERI) presented in Appendix A was conducted to provide the necessary environmental resources data for the Baseline Ecological Assessment. The ERI included the identification of the following resources for evaluation:

- Surface Water Resources (wetlands, floodplains, streams and the stormwater drainage system)
- Habitats
- Species of Concern
- Geology and Hydrogeology
- Soils
- Topography
- Land Use

ENVIRONMENTAL MEDIA SAMPLING

Appendix B presents a summary of the analytical results from Fall 1994 environmental media sampling within the Phase II EAA. This sampling program was designed to provide supplemental baseline chemical data for surface water, bottom sediments, and wetland soils. These data were collected and analyzed to characterize and quantify constituents related to the OU-2 Study Area that may be present in or discharged to the potential pathways associated with the Phase II EAA (Appendix A, Section 2.6). The analytical data obtained from this sampling program were evaluated to develop the Phase III EAA presented in Section 6.0. The sampling locations are shown in Figure 3.

STORMWATER DRAINAGE SYSTEM SURVEY

This investigation included a video survey of the accessible portions of the underground stormwater drainage system associated with the Kane and Lombard Superfund Site and OU-2 Study Area, a field reconnaissance of the aboveground stormwater drainage system, and a review of City of Baltimore stormwater drainage plans.

The purpose of the stormwater drainage system investigation was to characterize the potential stormwater drainage system pathways associated with the Phase II EAA. The field reconnaissance identified drainage swales and several drainage structures not identified on City of Baltimore stormwater drainage plans. The video survey objectives were:

- To verify the accuracy of the stormwater drainage system identified on City of Baltimore stormwater drainage plans;
- To evaluate the condition of the underground stormwater drainage pipelines and culverts;
- To identify potential breaks or separations where groundwater may be entering or stormwater may be exiting the system; and
- To identify connections or sources discharging to the stormwater drainage system and contributing to the resulting overall discharge.

A detailed map showing the stormwater drainage system, as defined by this investigation, is presented in Volume 2, Appendix F, Figure F-6.

PHASE II ASSESSMENT EVALUATION AND CONCLUSIONS

Potential Exposure Pathways

The Phase I Assessment identified two potential pathways for OU-2 Study Area-related chemicals to be released to the environment: (1) ongoing and historical direct leaching and erosion of landfill constituents from the PICORP property and the Superfund Site; and (2) transport of landfill constituents from the PICORP property and residual components from the Superfund Site via the local stormwater drainage system. Based on the findings of the Phase I Assessment, an investigation of these potential exposure pathways was implemented in Phase II.

The findings of the Phase II Assessment identified runoff, erosion, seeps and leachate pathways into the wetlands within the OU-2 Study Area. The review of analytical results in Section 4.2.1 identified constituents in the wetlands adjacent to the west of the Superfund Site which were also present on the Superfund Site prior to remediation of the Superfund Site. Historical pathways that may have been present prior to remediation of the Superfund Site have been eliminated by the remediation activities. The receptor areas associated with these pathways are contained entirely within the boundaries of the OU-2 Study Area.

It should be noted that since the soil, sediment and surface water samples were collected from the wetlands on the Roadway Corp. property, adjacent to the west of the Superfund Site, HLA has observed and documented (Appendix C) heavy equipment excavating and removing the surface soils from a large portion of this wetland area.

Based on the results of the Phase II EAA environmental media analytical results (Section 4.2.1 and Appendix B), the stormwater drainage system survey (Section 4.2.3), and identification of other potential sources (Section 4.2.4), HLA identified several factors which indicate that under flow conditions prevailing during the time when field work was conducted, the stormwater drainage system was not transporting OU-2 Study Area-related constituents to Herring Run. While it is possible that transport of sediments and soils may potentially occur under extreme flow conditions, the relatively low chemical concentrations detected in the sediments and soils indicate that any such transport from the OU-2 Study Area would be unlikely to include detectable concentrations of substances of concern due to the substantial dilution which would occur. The important factors leading to this conclusion include:

- No VOCs and only one SVOC were detected in water samples collected from the stormwater drainage pathway downgradient of the OU-2 Study Area (sample locations EA10 and EA11). The one SVOC detected downgradient of the OU-2 Study Area was diethylphthalate at sample location EA10 at an estimated concentration of 1 μg/L. Diethylphthalate was also detected at sample location EA5, located within the stormwater drainage pathway upgradient of the PICORP facility at an estimated concentration of 5 μg/L.

- With one exception (potassium), water samples collected at sample location EA5, upgradient of the PICORP facility, had higher concentrations of all detected metals than those detected in water samples from sample locations EA10 and EA11 downgradient of the OU-2 Study Area. Sample location EA10 had an estimated potassium concentration of 7,600 μg/L and sample location EA5 had an estimated potassium concentration of 7,540 μg/L, a difference of less than 0.4 %.

- Because of the many sinks and traps identified within the stormwater drainage system and based on available data, it is unlikely that chemicals in sediments and soils defined as related to the OU-2 Study Area would be identified in the stormwater drainage system flow at Herring Run under flow conditions prevailing during the time when field work was conducted.

- As described in Appendix F (Volume 2) and in Section 4.2, the ability to define the stormwater drainage system as a transport mechanism for OU-2 Study Area-related components to Herring Run is complicated by numerous and potentially significant sources of stormwater and chemicals not related to the OU-2 Study Area.

Other Potential Sources

There is evidence that some of the chemicals detected in the wetlands north of the PICORP facility may be contributed by sources outside of the OU-2 Study Area (Section 4.2.4). This evidence includes:

- SVOCs, metals, pesticides and herbicides were detected in water and sediment collected from the stormwater drainage system upgradient (south) of the PICORP facility (sample location EA5).

- SVOCs, metals, pesticides, and herbicides detected in water, soil and sediment samples collected from the OU-2 Study Area were also detected in a wetland area upgradient (west) of the OU-2 Study Area (sample location EA2).

- Runoff from the Conrail Orangeville Railroad Yard (Conrail Yard) flows into the wetlands adjacent to the PICORP facility. The Conrail Yard is listed by the MDE and EPA under the CERCLIS, State Priority List as a potential source of PCB compounds. Spills of materials which appear to be petroleum products were observed on the Conrail Yard property adjacent to the wetlands on more than one occasion. In addition, stained soils and petroleum product were observed by HLA personnel in the wetlands adjacent to the Conrail Yard north of the PICORP facility. Deteriorated drums were identified in the wetlands on the PICORP property. The drums which still had labels had contained petroleum products similar to those observed being used at the Conrail Yard adjacent to the north.

Historical Pathways

There is evidence that prior to remediation there may have been pathways from the Superfund Site to the east and to the west. These two pathways, described in Section 4.2.3 and listed below, were eliminated by remediation activities:

- An intermittent stream and a drainage culvert are shown prior to remediation activities on the eastern portion of the Superfund Site in City of Baltimore stormwater drainage maps (Figure 4).

- Topography of the Superfund Site area indicates that runoff from the western portion of the Superfund Site flowed into the wetlands adjacent to the west of the Superfund Site. This pathway has been eliminated by remediation of the Superfund Site. As described below, there is some evidence that residual components from this pathway may be present in the adjacent wetlands.

Potential Exposure Points

The Phase I Technical Memorandum (HLA, August 30, 1994) identified three potential ecological exposure points related to the OU-2 Study Area: the wetlands adjacent to the west of the Superfund Site, wetlands adjacent to the west and north of the PICORP facility, and Herring Run.

Based on the findings of the Phase I Assessment and the additional Phase II Assessment data described in this technical memorandum, Herring Run is no longer assumed to be a potential ecological receptor of definable concentrations of components related to the OU-2 Study Area.

Analytical results from samples collected in the wetlands on the Roadway Corp. property on the western side of the Superfund Site (Appendix B, sample locations EA1 and EA2)) indicate that these wetlands may contain some residual components associated with the Superfund Site prior to cleanup and capping of the Superfund Site.

Components assumed to be related to historical landfilling operations on the PICORP property have been detected in the wetlands adjacent to that facility. Review of historical aerial photographs indicate that contaminated soils or materials may also have been disposed of directly into this area during landfill operations. HLA field personnel have identified visual evidence of soil erosion, runoff, and seepage from the landfill mound into these wetlands.

PHASE III RECOMMENDATIONS

Based on the findings of the Phase II Baseline Ecological Assessment (Section 4.0) the Phase III EAA described below is recommended to provide boundaries for any future ecological assessments which may be required for remediation or permitting. The Phase III EAA is described in Section 6.0.

Phase III Ecological Assessment Area

Herring Run and the Phase II EAA stormwater drainage system north of the OU-2 Study Area should be removed from further investigations of potential ecological impacts associated with the OU-2 Study Area. The boundary of the proposed Phase III Ecological Assessment Area (Phase III EAA) is presented in Figure 7. The recommended Phase III boundary is based on the following findings:

- No components obviously related to the OU-2 Study Area were identified in water samples collected in the stormwater drainage system downgradient of the OU-2 Study Area (Section 4.2.1 and Appendix B).

- The stormwater drainage chemical transport mechanism from the OU-2 Study Area to Herring Run is diluted and broken by numerous and potentially significant stormwater and chemical sources not related to the OU-2 Study Area and by numerous sediment sinks and traps (Section 4.2.3 and Appendix F, Volume 2).

- Analytical results from the water samples collected by Weston Inc. from Herring Run, both upgradient and downgradient of the Phase II stormwater drainage system discharge point, did not identify any components related to the OU-2 Study Area (Weston, 1986)(Appendix B).

- The additional influences from waste sites and waste materials in local industrial fill soils (Appendix A, Section 8.2) identified in the Phase I Assessment adjacent to Herring Run would make any assessment of single source-related impacts in Herring Run technically impractical.

KANE AND LOMBARD SUPERFUND SITE OU-2 STUDY AREA
PHASE II BASELINE ECOLOGICAL ASSESSMENT

1.0 INTRODUCTION

This Technical Memorandum presents the results of the Phase II Baseline Ecological Assessment (Phase II Assessment) for the Kane and Lombard Superfund Site (Superfund Site) and OU-2 Study Area located in the City of Baltimore, Maryland. A site location map is presented in Figure 1. The Baseline Ecological Assessment was developed pursuant to the terms of the Administrative Order on Consent for Remedial Investigation/Feasibility Study, Operable Unit No. 2, Docket No. III-93-21-DC, July 22, 1993 and in accordance with the *Remedial Investigation and Feasibility Study, Operable Unit 2 (OU-2), Baltimore, Maryland, Project Work Plan (Work Plan)* (Harding Lawson Associates [HLA], March 21, 1994).

Assessment Areas

Three areas of primary interest to the Ecological Assessment are referred to in this Technical Memorandum:

- the Superfund Site
- the OU-2 Study Area
- the Phase II EAA

As described in Section 2.0, the Superfund Site is a fenced area encompassing approximately 9.7 acres on the south side of East Lombard Street (Figure 1).

The OU-2 Study Area is approximately 40 acres in size and includes the Superfund Site and areas north, east and west of the Superfund Site which have been identified in the Consent Order as being part of the original landfill operations (Figure 1). The OU-2 Study Area includes portions of the Roadway Express Inc. property west of the Superfund Site fence, the PICORP property across East Lombard Street to the north, the Patterson High School athletic fields east of the Superfund Site, and additional properties adjacent to the east of the PICORP facility and the Patterson High School athletic fields.

As described in Section 3.0 of this report, the Phase II EAA is approximately 52 acres in size and was developed based on the findings of the Phase I Baseline Ecological Assessment (Phase I Assessment) to provide boundaries for the evaluation of potential chemical sources within the OU-2 Study Area and potential pathways into the environment. The southern portion of the Phase II EAA encompasses both the Superfund Site and the OU-2 Study Area. The northern portion of the Phase II EAA includes the underground portion of the local stormwater drainage system associated with the OU-2 Study Area and the area of Herring Run adjacent to the terminus of the stormwater drainage system.

Phase II Baseline Ecological Assessment Scope of Work

A description of the OU-2 Study Area and an outline of the historical activities within the OU-2 Study Area are presented in Section 2.0. The findings of the Phase I Baseline Eçological Assessment are presented in the *Final Draft Technical Memorandum, Phase I Baseline Ecological Assessment Summary of Results* (HLA, August 30, 1994) (Phase I Assessment). The Phase I Assessment was reviewed by the US Environmental Protection Agency (EPA) and approved with conditions in a letter dated September 19, 1994. The EPA's conditions were addressed in the implementation of the Phase II Assessment activities described in this Technical Memorandum. The Phase II Assessment activities included the following tasks:

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- Delineation of the Phase II Ecological Assessment Area (Phase II EAA) (Section 3.0)
- Characterization of the stormwater management system associated with the OU-2 Study Area (Section 4.2.3)
- Sampling of surface water, sediment, and soil from the Phase II EAA as described in the *Phase II Ecological Assessment Sampling Plan* (Sampling Plan) (HLA, August 30, 1994) and modified by the EPA (EPA September 19,1994)(Section 4.2.1)
- A reconnaissance of upland and manmade habitats, and a formal delineation of wetland habitats within the Phase II EAA (Section 4.1)
- Evaluation of potential exposure pathways and exposure points based on the findings of the Phase II Assessment activities (Section 4.2)

Based on the findings of the Phase I and Phase II investigation, HLA provides recommendations associated with any potential Phase III activities in Section 6.0 of this report.

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2.0 KANE AND LOMBARD SUPERFUND SITE OU-2 STUDY AREA

2.1 Location and Setting

The Study Area occupies approximately 40 acres near the intersection of Kane and Lombard Streets in the Orangeville Section of Baltimore, Maryland. The Study Area consists of the Kane and Lombard Superfund Site located south of Lombard Street and adjacent land to the north and west. Figure 1 shows the Study Area location and its relation to the Superfund Site. The Superfund Site occupies approximately 9.7 acres of the Study Area south of Lombard Street. The Superfund Site is undeveloped and fenced. PICORP, a shipping container repair company, occupies most of the Study Area to the north of Lombard Street. Smaller portions of the Study Area also extend onto an undeveloped portion of the Roadway Express (Roadway) property to the west, a portion of the Conrail property to the north, and several small properties to the east of PICORP.

The Study Area is generally bordered by a Conrail Orangeville Railroad Yard (Conrail Yard) to the north, North Point Boulevard to the northeast; Patterson High School to the south; recreational fields and Kane Street to the east; and a Roadway trucking terminal to the west. Land use in the vicinity of the Study Area is primarily industrial and commercial with some residential uses. The Johns Hopkins Bayview Medical Center is located approximately one-quarter mile southwest of the Study Area and residential properties are located approximately one-third mile south and southeast of the Study Area.

2.2 OU-2 Study Area History

2.2.1 US Environmental Protection Agency's History of OU-2 Study Area Use

A history of the use of the Superfund Site and vicinity summarized below, including the OU-2 Study Area, was developed by HLA, Roy F. Weston, Inc. (Weston Inc.) and the EPA Environmental Photographic Interpretation Center based on review of historical aerial photographs and topographic maps (Weston Inc., 1987, Weston Inc, 1986, and EPA, 1984).

The OU-2 Study Area was primarily undeveloped and vegetated in 1938. The northeastern portion appears to have been farmed. Several buildings may have been located in this area. Based on historical topographic maps, up to 10 feet of fill was emplaced over much of the OU-2 Study Area between 1922 and 1968. Much of this filling activity may have occurred during the early 1930s in conjunction with nearby construction and demolition activities (Weston Inc, 1987).

A disturbed area was present in the northeastern portion of the OU-2 Study Area by 1947. By 1950, this area had expanded to approximately 10 acres, part of which was located adjacent to the OU-2 Study Area, and may have been related to a brick-making operation reported to have been located in the area (Weston Inc., 1987). The disturbed area appears to have been filled by 1959. During this period, the remainder of the OU-2 Study Area remained undeveloped and vegetated.

From at least 1966 to 1983, much of the OU-2 Study Area was used for disposal and burning of a variety of wastes, including hazardous materials (EPA, 1993). A number of citations for illegal burning were issued between 1967 and 1984, following a prohibition on burning by the City of Baltimore in 1967 (Weston Inc., 1987).

A disturbed area, apparently associated with the disposal practices, appears on part of the northern portion of the OU-2 Study Area and the northern one-fourth of the Superfund Site, shown on a 1966 aerial photograph. The area is also shown, but smaller, on a 1964 aerial photograph (EPA, 1984). By 1968 or 1969, the disturbed area had expanded to cover approximately the northern two-thirds of the Superfund Site and most of the OU-2 Study Area north of the Superfund Site. Aerial photos dated 1964, 1968, and 1970 showed pits, drums, and areas of standing liquid present in the disturbed areas (EPA, 1984). By 1971, much of the disturbed area had been filled and construction of Interstate 95 was underway. The filling activities may have been associated with construction of nearby roads (Weston Inc., 1986). Material used as fill may have included construction debris, domestic wastes, and hazardous materials (Dynamac, 1991). The volume of debris, contaminated fill, and soil at the Superfund Site was estimated to be approximately 100,000 cubic yards (Weston Inc., 1987).

As described in Section 2.1, the PICORP property is located north of the Superfund Site directly across East Lombard Street. The property is currently utilized for the storage and maintenance of shipping containers. Solid and liquid wastes were reportedly disposed of at this facility as part of the landfill operations described above (Weston Inc., February 27, 1987). Analysis of surface soil, surface water, sediments, subsurface soil, and groundwater samples collected from this property by HLA and others identified a range of chemicals assumed to be related to the landfilling activities (Appendix B).

From 1971 to 1984, the Superfund Site was used for surface disposal of construction debris, industrial waste, household waste, and hazardous materials (Weston Inc., 1987). Drums were also observed in the OU-2 Study Area north of the Superfund Site by Maryland inspectors in 1980. The PICORP facility was constructed north of the Superfund Site between 1979 and 1982.

2.2.2 History of OU-2 Study Area Investigation and Remediation

In 1980, the State of Maryland discovered several hundred drums on the Superfund Site as well as on the northern portion of the OU-2 Study Area. In 1982, two monitoring wells were installed by the Maryland Department of the Environment (MDE), then referred to as the Maryland Department of Health and Mental Hygiene, on what is now the Superfund Site. A third well was installed in 1984. Following a series of unsuccessful attempts to compel cleanup by the owner of the Superfund Site, the state requested assistance from the EPA under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (Dynamac, 1991). The site was listed on the National Priorities List (NPL) in October 1984.

The chronology of remedial activities associated with the Superfund Site to date includes:

- Removal action in 1984 prior to the NPL listing (EPA, 1984)
- Operable Unit 1 (OU-1) RI/FS and associated remediation activities that addressed soil, waste materials, and the groundwater of the first water-bearing zone associated with the Superfund Site (Weston Inc., 1987)
- The ongoing OU-2 RI/FS addressing the second water-bearing zone within the OU-2 Study Area (Harding Lawson Associates, March 21, 1994)

Superfund Site Removal Action and OU-1 Remediation

In May 1984, the EPA authorized waste and soil removal activities at the Superfund Site that were implemented in June 1984. During this action, 1,163 drums and the upper six inches of soil from beneath the drums were removed from the Superfund Site. A total of 822 drums were classified as Resource Conservation and Recovery Act (RCRA) empty. Substances found in the remaining drums included benzene, toluene, ethylbenzene, xylenes (BTEX), naphthalene, other polynuclear aromatic hydrocarbons (PAHs), phthalates, polychlorinated biphenyls (PCBs), cyanide, and metals. After removal of the drums and soil, a slurry wall and a multilayer cap were installed around the Superfund Site in 1990 as part of remedial activities associated with Operable Unit 1 (OU-1) and the area was revegetated (Harding Lawson Associates, March 21, 1994).

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3.0 PHASE II BASELINE ECOLOGICAL ASSESSMENT AREA

The Phase II EAA presented in Figure 2 was established based the findings of the Phase I Baseline Ecological Assessment (HLA, August 1994). Analysis of the data presented in the Phase I Baseline Ecological Assessment indicated that the area of potential detectable environmental influence related to the OU-2 Study Area was considerably smaller than the Phase I EAA and identified conditions that justified the smaller Phase II EAA boundary. The Phase II EAA totals approximately 52 acres, encompassing the 40-acre OU-2 Study Area, habitat in the immediate vicinity of the OU-2 Study Area, and the stormwater drainage system directly associated with the OU-2 Study Area.

Based on the information presented below it was concluded in the Phase I Technical Memorandum that it would not be possible to characterize the shallow groundwater as a pathway to Herring Run (if one existed) or to evaluate potential OU-2 Study Area-related impacts to Herring Run outside of a direct exposure point.

- Non-continuous shallow groundwater flow - HLA's March, 1994, Technical Memorandum (HLA, March 21, 1994)) presents evidence that the shallow ground water (first water bearing zone) system is non-continuous from the OU-2 Study Area to Herring Run.

- Interference from "Made Land" contaminants in shallow groundwater - Any shallow groundwater from the OU-2 Study Area discharging into Herring Run would have to pass through substantial volumes of fill material unrelated to the OU-2 Study Area and characterized by the US Department of Agriculture Soil Conservation Service (SCS) as "Made Land (Ma)...made from industrial wastes, mostly slag and cinders. Other areas consist of spoil material from excavations, or hydraulic fill from harbor or channel deepening. Some industrial wastes, incinerator ash, and miscellaneous solid garbage wastes have been covered by hydraulic fill, especially in areas that were originally tidal marshes."

- Interference from potential leachate, groundwater, and runoff discharges originating from nearby unsecured industrial waste landfills - Review of records of other properties of potential environmental concern within or adjacent to the Phase I EAA indicate that there are at least four potentially unsecured industrial waste landfills adjacent to Herring Run (Colgate Pay Dump, 68th Street Dump, Bowley's Lane Landfill, and Industrial Enterprises Landfill). Review of the records available for these sites indicates that there is potential for these sites to be currently discharging leachate, contaminated groundwater and runoff to Herring Run. In addition, several other sites in or adjacent to the Phase I EAA with potential discharges to Herring Run were identified. Discharges from these sources could make an investigation of potential impacts to Herring Run related to the OU-2 Study Area technically impractical.

To reflect these findings, the Phase II EAA (Figure 2) was developed to encompass the following areas: the OU-2 Study Area (including the Superfund Site, portions of the Roadway Express Inc. property west of the Superfund Site fence and the PICORP property), the underground portions of the stormwater drainage system associated with the OU-2 Study Area beginning on the Patterson High School athletic fields adjacent to the eastern side of the Superfund Site and ending at Herring Run to the North. The extreme northern portion of the Phase II EAA encompasses a segment of Herring Run where the stormwater drainage system associated with the OU-2 Study Area terminates.

4.0 PHASE II BASELINE ECOLOGICAL ASSESSMENT SUMMARY OF FINDINGS

The findings of the Phase II Assessment, summarized below, are based on a review and analysis of the Phase II EAA Environmental Resource Inventory (Appendix A), analysis of the analytical results of the environmental media sampling (Appendix B), the stormwater drainage system investigation and video survey (Appendix F, Volume 2), the results of the habitat reconnaissance (Appendix A, Section 3.0), and formal wetlands delineation (Appendix C). The Phase II Assessment activities described below were designed to investigate environmental conditions within the Phase II EAA boundary and evaluate the viability of potential contaminant pathways identified in Phase I.

4.1 General Environmental Conditions

Phase II Assessment activities included the identification of habitat types and boundaries within and adjacent to the Phase II EAA (Appendix A, Section 3.0) (Figure 2). Upland habitat types were identified and delineated using aerial photographs and a limited field reconnaissance. Wetland habitats were delineated and surveyed in accordance with formal regulatory guidance (Appendix C). The major habitat types found within the Phase II EAA include: urban and built-up land, wetlands, rangeland, and forest land. An outline of the habitats identified within the Phase II EAA is presented below.

Urban and Built-Up Land

Urban and built-up land is the dominant land use/habitat type identified within the Phase II EAA. Approximately 34 acres of the Phase II EAA are occupied by urban and built-up land. Urban and built-up lands include properties involving intensive human use, with much of the land covered by structures or impervious surfaces. The following urban and built-up land-use types were identified within the Phase II EAA:

- Light Industrial - Includes the PICORP facility and properties overlying the stormwater drainage system near Herring Run

- Transportation, Communications, and Utilities - Corridor-type land uses, including East Lombard Street, North Point Boulevard, the Conrail Yard, Amtrack railroad lines, and Quad Avenue

- Commercial and Services - Commercial and services land use was identified at two locations within the Phase II EAA: the automobile impoundment yard adjacent to the south of Herring Run and the photographic finishing facility on the northwest corner of the intersection at Kane and East Lombard Streets

Wetlands

Approximately 4 acres of wetland habitats were delineated within the Phase II EAA. The wetland delineation report (Appendix C) made no distinction between regulated or non-regulated wetlands. The delineated wetland areas had documented wetland habitat functions. Of the total area of wetlands within the Phase II EAA, the following subsystems were identified and classified using Cowardin, *et al.*, 1979:

- Palustrine Emergent (PEM) - Palustrine ecological system dominated mostly by perennial plants, characterized by erect, rooted, herbaceous hydrophytes. Within the Phase II EAA a majority of this habitat type is dominated by a dense monoculture of *Phragmites australis* (Reed Grass). Approximately 1.5 acres of this habitat type were delineated to the north of the PICORP facility and to the west of the Superfund Site.

  As discussed in Appendix C, HLA field personnel documented excavation activities in the PEM wetlands adjacent to the west of the Superfund Site in January 1995. Vegetation and topsoil were removed in the eastern part of this wetland area by these activities. The purpose of this activity is unknown.

- Riverine Intermittent Streambed (R4SB) - Exists to the west and north of the PICORP facility. This habitat type defines much of the stormwater surface drainage system within the OU-2 Study Area.

Three riverine wetland habitat types were identified in association with Herring Run. These habitat types were identified using National Wetlands Inventory (NWI) maps, aerial photographs, and a limited field reconnaissance of the area of Herring Run within the Phase II EAA. They are:

- Riverine Lower Perennial Unconsolidated Bottom Permanent (R2UB1/2/3/H) - The Herring Run stream channel within the Phase II EAA with a permanent flow.

- Riverine Lower Perennial Beach/Bar Intermittently Flooded (R2BBJ) - Nearly permanently flooded and exposed only during drought.

- Riverine Lower Perennial Beach/Bar Intermittently Seasonal (R2BB1/2C) - Usually inundated during growing season and dry by end of growing season. Substrate of gravel and sand. At Herring Run, the herbaceous vegetation observed during the field reconnaissance in November 1994 had been severely disturbed by stream flooding.

Rangeland

Rangeland consists of upland, nonforested open space dominated by either herbaceous or shrub vegetation. Approximately 14 acres of the Phase II EAA are occupied by rangeland. The rangeland types identified within the Phase II EAA are presented below:

- Herbaceous Rangeland dominated by grasses and forbs. This habitat type occurs on the Superfund Site, on uplands west of the Superfund Site, and upland areas on and west of the PICORP property. Vegetation species identified include among others, *Solidago* spp. (goldenrod species), *Vicia cracca* (cow vetch), *Glecoma hederacea* (ground ivy) and *Panicum spp.* (panic grass species). The grass on the Superfund Site are dominated by a mix of commercial species planted upon completion of remediation activities. The Superfund Site is mowed regularly during the growing season.

- Mixed Rangeland consisting of a mixture of herbaceous and shrub and brush rangeland species. This habitat type is found west and along the northern slope of the PICORP property. Species identified include *Ailanthus altissima* (tree-of-heaven), *Elaeagnus angustifolia* (Russian olive), *Prunus serotina* (black cherry), and *Solidago* spp.

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Forest Land

Forest land is defined as areas of open space dominated by tree species over 16-ft in height. Forest land dominated by deciduous trees occupies approximately 0.3 acre of the Phase II EAA. This habitat type is found on the hillside south of the Superfund Site, north of the PICORP facility and in some small linear corridors between properties. Species identified include *Quercus rubra* (red oak), *Quercus alba* (white oak), and *Sassafras albidum* (sassafras).

Subterranean Habitat (Caves)

As part of the Phase II EAA habitat survey, HLA examined the results of the video survey of the underground pipeline portion of the stormwater drainage system (Section 4.2.3 and Appendix F, Volume 2) for indications that portions of these pipelines may be functioning as cave habitats. No individuals, nests, scat, tracks or other evidence of vertebrate species utilizing any portion of the stormwater drainage system, including the 5-ft by 10-ft culvert at Herring Run (Figure 2), were observed. Spiders and some flying invertebrate species were observed in the drainage way. Because of the regular flooding and associated intense flow inside the drainage system, including evidence that on occasion portions of the drainage system flood to the ceiling, these areas are not likely to be functioning as cave habitats for other than occasional transient individuals.

4.2 Exposure Pathway Investigation

The Phase I Assessment identified two potential pathways for OU-2 Study Area-related chemicals to be released to the environment: (1) ongoing and historical direct leaching and erosion of landfill materials from the PICORP facility and the Superfund Site and (2) transport of landfill constituents from the PICORP facility and residual constituents from the Superfund Site via the local stormwater drainage system. Based on these findings, an investigation of the potential exposure pathways was implemented in Phase II.

4.2.1 Analysis of Environmental Media

Based on the findings of the Phase I Assessment, Phase II Assessment environmental media sampling was conducted by HLA in October and November of 1994. The 11 sample locations and sampling methodologies were presented in the Phase I Assessment *Environmental Media Sampling Plan* as approved with modifications by the EPA in its approval letter dated September 19, 1994. The Phase II environmental media sample locations are presented in Figure 3. Soil, surface water, and sediment samples were collected at each location if that media was present.

A summary of the analytical results is presented in Appendix B. The validated laboratory data is presented in Appendix G (Volume 3).

Summary of Findings

The findings of the Phase II Assessment identified runoff, erosion, seeps and leachate pathways into the wetlands within the OU-2 Study Area. The review of analytical results (Appendix B) identified constituents in the wetlands adjacent to the west of the Superfund Site which were also present on the Superfund Site prior to remediation of the Superfund Site. Historical pathways that may have been present prior to remediation of the Superfund Site have been eliminated by the remediation activities. The receptor areas associated with these pathways are contained entirely within the boundaries of the OU-2 Study Area.

It should be noted that since the soil, sediment and surface water samples were collected from the wetlands on a portion of the Roadway Corp. property, west of the Superfund Site fence, HLA has observed and documented (Appendix C) heavy equipment excavating and removing the surface soils from a large portion of this wetland area.

Based on the results of the Phase II EAA environmental media analytical results presented below, the stormwater drainage system survey (Section 4.2.3), and identification of other potential sources (Section 4.2.4), HLA identified several factors which indicate that the stormwater drainage system is not likely to be transporting OU-2 Study Area-related constituents at detectable concentrations of concern to Herring Run under flow conditions prevailing during the time when field work was conducted. An evaluation of the environmental media sampling results (Appendix B) identified the following information:

- No VOCs and only one SVOC were detected in water samples collected from the stormwater drainage pathway downgradient of the OU-2 Study Area (sample locations EA10 and EA11). The one SVOC detected downgradient of the OU-2 Study Area was diethylphthalate at sample location EA10 at an estimated concentration of 1 μg/L. Diethylphthalate was also detected at sample location EA5, located within the stormwater drainage pathway upgradient of the PICORP facility at an estimated concentration of 5 μg/L.

- Water samples collected from sample location EA5, located on East Lombard Street in the stormwater drainage system upgradient of the PICORP facility, had higher reported concentrations of calcium (118,000 μg/L), magnesium (18,200 μg/L), manganese (715 μg/L), nickel (95 μg/L), selenium (16 μg/L) and sodium (44,600 μg/L) than water samples collected downgradient.

- With one exception (potassium), water samples collected at sample location EA5, upgradient of the PICORP facility, had higher concentrations of all detected metals than those detected in water samples from sample locations EA10 and EA11 downgradient of the OU-2 Study Area. Sample location EA10 had an estimated potassium concentration of 7,600 μg/L and sample location EA5 had an estimated potassium concentration of 7,540 μg/L, a difference of less than 0.4%.

- HLA sampling location EA5 was located at the bottom of the manhole on East Lombard Street. This location is upgradient of the PICORP facility in the stormwater drainage system flowing from the south. Sampling location EA4 is located within the same stormwater pathway downgradient of EA5 and the PICORP facility (Figure 3). Eighteen SVOCs were detected in sediments at sampling location EA5. Sixteen SVOCs were detected in sediments at sample location EA4. All 16 SVOCs detected at sample location EA4 were detected at sample location EA5. Four of the SVOCs detected at sample location EA5 had higher estimated concentrations than the same compounds detected at sample location EA4.

- Some of the same compounds detected at HLA sampling location EA2, considered to be upgradient (west) of the OU-2 Study Area, were also detected at sample locations in the aboveground drainage paths downgradient of the Superfund Site and adjacent to the PICORP facility.

- The highest concentrations and largest variety of pesticide compounds were identified at sample locations EA7 and EA8.

- The highest concentrations and the greatest number of VOCs, SVOCs, and metals in all media were confined to sample locations EA4, EA7, and EA8.

- The highest total VOC concentration was detected in water samples from sample location EA4. Reported results for EA4 detected eight VOCs with estimated concentrations ranging between 0.4 μg/L and 110 μg/L. The total estimated concentration of VOCs reported for sample location EA4 is 119.6 μg/L. Of this total, 115 μg/L was comprised of methylene chloride and acetone.

- The distribution of detected VOCs indicates that the stormwater drainage system within the OU-2 Study Area may be receiving VOCs from some source under the PICORP facility.

4.2.2 Previous Sampling Events

As part of the Phase II Baseline Ecological Assessment HLA also evaluated the results of the sampling events listed below which were previously conducted in association with the investigation of the Superfund Site. A summary of the analytical results from these investigations is presented in Appendix B.

- 1985 Maryland Waste Management Administration (MWMA) report titled, *A Preliminary Assessment of PICORP, Inc., Baltimore, Maryland.* Sampling by the MWMA was limited to three samples (one soil sample and two "sludge" samples from drums) collected on the north side of the PICORP facility. The MWMA report was included in a May 14, 1991, report from the EPA titled *Site Inspection of PICORP, Incorporated, Document No. R585-11-0-23* (EPA, May 14, 1991).

- EPA's 1991 investigation of the PICORP facility (EPA, May 14, 1991). Samples were collected for this event from 11 locations around the PICORP facility.

- Soil and the drum contents sampled on the Superfund Site in May 1984, prior to remediation activities on the Superfund Site. During the remediation action, which began in June 1984, 1,163 drums and the upper six inches of soil from beneath the drums were removed from the Superfund Site. The results of this investigation are presented in (Weston Inc., 1987) *Remedial Investigation Report for the Kane and Lombard Site, Baltimore, Maryland.*

- From June 1986 to September 1986, Weston Inc. collected surface water samples at three locations in Herring Run: one location in a tributary to Herring Run and two locations in the wetlands in the northeast corner of the PICORP property. As discussed in Appendix B, three of the locations sampled by Weston Inc. were upstream of HLA's Phase I Assessment environmental media sampling location EA11, located at the 5-ft by 10 ft box culvert that discharges into Herring Run, and the fourth sampling location was downstream of HLA's sampling location EA11, just east of Route 95. The results of this investigation are presented in (Weston Inc., 1987) *Remedial Investigation Report for the Kane and Lombard Site, Baltimore, Maryland.*

Review of the analytical results from the events described above indicate that the findings of the earlier sampling events support the findings of the Fall 1994 sampling discussed earlier. A summary of findings based on HLA's review of these sampling results is presented below.

- In general, the analytical results from environmental media collected during EPA's 1991 investigation of the PICORP property are comparable to the analytical results obtained by HLA from similar locations.

- In EPA's 1991 investigation of the PICORP property, 110 $\mu g/L$ of vinyl chloride was detected in a surface water sample collected at EPA sample location SW-4. EPA's sample location SW-4 corresponds with HLA's 1994 sample location EA4 located in an excavated catch basin on the northern side of the PICORP property. This catch basin receives flow from the south via a stormwater drainage pipe installed under the PICORP facility. Vinyl chloride was also detected in surface water samples collected in 1986 by Weston Inc. from the wetlands in the northeastern corner of the PICORP property. Vinyl chloride is an extremely volatile compound which has been detected in the OU-1 and OU-2 groundwater plumes. The relatively high concentration of vinyl chloride detected by the EPA and Weston Inc. and the undetected result from the HLA 1994 sampling round may suggest an intermittent discharge of groundwater to the stormwater drainage system and the wetlands on the north side of the PICORP facility.

- Analytical results from sampling location EA1, located in the wetlands adjacent to the west of the Superfund Site, identified some components that were also identified on the Superfund Site in samples collected in May 1984 prior to the completion of remediation. Similar compounds included PCB, PAH, and phthalate compounds. As discussed earlier in Section 4.2, the review of analytical results indicates that these components may be residuals from a pathway that was eliminated by remediation activities.

- Analytical results from water samples collected in Herring Run by Weston Inc. between June and September 1986, did not identify OU-2 Study Area-related compounds in any of the four samples collected. Two samples collected from Herring Run and the one sample collected in the unnamed tributary by Weston Inc. were located upstream from HLA's 1994 sample location EA11 (Figure 3). The samples collected by Weston Inc. upgradient of HLA sample location EA11 had higher or similar concentrations of identified compounds than the one sample collected by Weston Inc. in Herring Run downstream of HLA sample location EA11.

4.2.3 Stormwater Drainage System Investigation

Based on the findings of the Phase I Assessment, an investigation of the stormwater drainage system was conducted in November 1994. This investigation included a video survey of the accessible portions of the underground stormwater drainage system associated with the Kane and Lombard Superfund Site and the OU-2 Study Area, a field reconnaissance of the aboveground stormwater drainage pathways, and a review of City of Baltimore stormwater drainage plans.

A map showing the stormwater drainage system based on this investigation is presented in Figure 4. More detailed summaries of the findings of the stormwater drainage system investigation are presented in Appendix A, Section 2.6 and Appendix F (Volume 2) of this Technical Memorandum.

The stormwater drainage system investigation identified the following:

Aboveground Stormwater Drainage System

- Stormwater associated with the Superfund Site and OU-2 Study Area drains towards the northeast through a regional system of drainage swales and underground pipelines and culverts eventually discharging into Herring Run.

- Runoff from the Superfund Site generally drains to the east with some drainage to the west.

- Runoff from the Superfund Site to the east is controlled by a swale lined with riprap and channeled into an underground stormwater drainage pipe in the northeast corner of the Superfund Site (Figure 4). The stormwater drainage pipes channel the runoff to the north under East Lombard Street and then under the PICORP facility.

- Runoff from the western portion of the Superfund Site flows west into the adjacent wetlands. Runoff flowing into these wetlands is channeled through a drainage swale to the north across Lombard Street and then to the east along the northern side of the PICORP facility.

- The eastern and western runoff flow paths from the Superfund Site connect at a point on the northern side of the PICORP facility in a depression that functions as a catch basin (Figure 4). From this catch basin, the stormwater drains north under the Conrail Yard via a single underground stormwater pipe.

- As shown on Figure 4, stormwater runoff on the northern side of the PICORP facility is divided into eastern and western drainage areas.

  - The western stormwater area receives drainage from the western and the southern portions of the PICORP facility. The western drainage area collects stormwater in an excavated depression and drains it to the north via and single underground stormwater pipe system.

  - The eastern stormwater drainage area has a bermed area that acts as a retention basin and a system of drainage pipes and drainage swales which channel all of the stormwater from this area into a single drainage swale in the northeast corner of the property. The drainage swale channels stormwater along the western side of North Point Boulevard to a point where the swale discharges to a stormwater drain. The pipe from this stormwater drain then channels the runoff west into a manhole on North Point Boulevard (Figure 4).

- As shown in Figure F-6 and Photograph F-16 (Appendix F, Volume 2), an open, concrete-lined channel is located on the northern side of the Conrail Yard where the stormwater pipeline running south from the PICORP facility exits from under the Conrail Yard. This channel is a approximately 10-ft wide and 20-ft long. The channel also receives drainage from the west via a drainage swale which drainsan area adjacent to the Conrail Yard. A pipeline that appears to capture and discharge stormwater from the Conrail Yard was observed discharging to this drainage swale area. The northern (downgradient) end of this channel discharges to an underground concrete pipe that channels the stormwater north towards North Point Boulevard and Herring Run.

Underground Stormwater Drainage System

- A manhole on North Point Boulevard receives drainage from the Superfund Site and both the western and eastern drainage areas in the northern portion of the OU-2 Study Area (Figure 4).

- A constant flow of water was observed in the entire observed length of the underground pipeline portion of the stormwater drainage system. The flow originates an unknown distance south (upgradient) of the Phase II EAA and continues to Herring Run. This flow has been observed by HLA personnel in all seasons, and during dry periods.

- The City of Baltimore stormwater drainage system maps (Figure 5) identified a short length of intermittent stream (approximately 100-ft long) that no longer exists, running from the west to the east across the Superfund Site property. The map shows this intermittent stream draining into a pipe in the northeastern area of the Superfund site. The map shows the drain pipe connecting to another pipe under the PICORP property to the northeast. This drainage pipe may have been replaced by the pipe now capturing runoff from the eastern side of the Superfund Site (Figure 4).

- As shown on Figure 5, the City of Baltimore stormwater drainage system maps identified historical stream channels near the present stormwater pipeline pathway. Of particular note was the curve observed in the pipeline under the PICORP facility, which closely matched the curve in the mapped stream. Based on this observation and the observed flow described above, it is believed that the stormwater pipeline located east of the Superfund Site carries the flow from the mapped historical stream to Herring Run.

- Much of the stormwater pipeline running north/south under the PICORP facility is separated at its joints. Flow through this portion of the pipeline has apparently eroded soil and fill from around the joints.

- Erosion at the separated joints in the stormwater pipeline on the northern side of the PICORP property appears to have created sinkholes exposing the pipeline at two locations. One of these sinkholes is the proposed environmental media sampling location EA6 as described in the *Environmental Media Sampling Summary of Results* report (Appendix B).

- As shown on Figure 4, service connections and manholes were observed connected to the main stormwater pipeline under the PICORP facility. No manhole or stormwater drains have been observed at the surface on the PICORP facility.

Potential discharge sources to the stormwater drainage system within the Phase II EAA are described below.

4.2.4 Additional Environmental Concerns

As outlined below and shown in Figure 6, several potential sources of runoff and/or chemicals to the Phase II EAA ecosystems and the associated stormwater drainage system unrelated to the Superfund Site were identified within or adjacent to the Phase II EAA. A detailed discussion of these potential sources is presented in Appendix A, Section 8.0. The sites described below and additional potential discharge sources to Herring Run, both upstream and downstream of the Phase II EAA, are discussed in the Phase I Technical Memorandum (HLA, August 30, 1994).

Waste Disposal Sites

The Colgate Pay Dump is the only known waste disposal site associated with the Phase II EAA other than the landfill associated with the OU-2 Study area. This site is an unsecured former commercial and industrial landfill located along the northern slope of Herring Run and the northern boundary of the Phase II EAA. The landfill was operated between 1949 and 1971 and is currently undeveloped (Maryland Hazardous and Solid Waste Management Administration, 1989).

Industrial Sites

Conrail Orangeville Yard - The site is located just north of the Phase II Ecological Assessment Area and is listed on the CERCLIS state cleanup list as having potential PCB contamination (Vista National Radius Profile, 1994). Runoff from the area of the Conrail Yard north of the OU-2 Study Area drains into the eastern and western stormwater drainage areas within the OU-2 Study Area adjacent to the PICORP facility.

RCRA Facilities

The three sites listed below are identified by the Vista National Radius Profile, 1994, as handling, storing, or generating regulated hazardous materials under the Resource Conservation and Recovery Act (RCRA).

- Roadway Express Inc.
- Contract Applications Inc.
- International Petroleum Inc.

Underground Storage Tanks

International Petroleum Corp. and Roadway Express Inc. facility are both located west of the Superfund site fence. These facilities are both listed as having Underground Storage Tanks (UST)s for diesel and heating oil. The Roadway Express facility is also listed as having a UST for gasoline (Vista National Radius Profile, 1994)

During Phase II Assessment field activities, HLA noted a fill pipe for an underground storage tank on the Roadway Express Inc. facility. This fill pipe is located at the top of a slope adjacent to the wetlands that also receive drainage from the Superfund Site. No visible evidence of spills or leaks related to this fill pipe were observed. A tanker truck labeled "diesel" was observed by HLA field personnel accessing this fill pipe on June 28, 1994.

Stormwater Drainage System

As discussed earlier (Section 4.2.3) and shown in Figure 6, many contributing sources to the Phase II EAA stormwater drainage system were identified during the video survey (Volume 2, Appendix F). These include:

- An open surface drain connected to the stormwater pipe discharging to Herring Run is located within the auto impoundment yard operated by the City of Baltimore adjacent to Herring Run. The majority of the automobiles in this yard are in poor or junk condition.

- As shown in Figure 3 and described in Section 4.2.1, environmental media sample location EA2 is located in an intermittent stream that drains into the stormwater swale adjacent to the north and west of the PICORP facility. This location is upgradient of the Superfund Site and the PICORP facility. Several chemicals detected in samples from sample location EA2 were also detected in the wetlands adjacent to the PICORP facility and downgradient of sample location EA2.

- As shown in Figure 3 and described in Section 4.2.1, the analysis of the water and sediment samples collected upgradient (south) of the PICORP facility at the bottom of the manhole on East Lombard Street (location EA5) indicates that there is a source of metals and SVOC compounds discharging to the stormwater drainage system south (upgradient) of sample location EA5. Although sample location EA5 lies downgradient of a portion of the Study Area, the stormwater video survey found no evidence of breaks, leakage, or inlets into the stormwater drainage system within the Study Area upgradient of sample location EA5 that would allow contaminated soils or groundwater related to the OU-2 Study Area to enter the stormwater drainage system. Potential sources of the metals and SVOC compounds into the stormwater drainage system upgradient of sample location EA5 include runoff from Kane and Lombard Streets and possible discharges to the stormwater system upgradient of the OU-2 Study Area.

- A pipe located on the north side of the Conrail Yard (Volume 2, Appendix F, Figure F-6) appears to discharge stormwater runoff from drains between the railroad tracks northward into the adjacent drainage ditch. The drainage ditch flows to the east and discharges to the stormwater drainage system identified within the Phase II Ecological Assessment Area.

Observed Discharge Events

HLA field personnel observed the discharge events described below during field activities associated with the investigation of the Phase II EAA stormwater drainage system.

- On March 10, 1994, HLA field personnel observed an MDE Spill Response Team responding to an incident west of the Superfund Site. The activities observed included the placement of sorbent pads into drainage ditches north and west of the Superfund Site. The Spill Team's activities were centered around the International Petroleum facility adjacent to the west side of the Roadway Express Inc. property. A strong diesel-like petroleum smell was noted by HLA personnel throughout the OU-2 Study Area. The Spill Report obtained from the MDE indicates that approximately 15 gallons of a used motor oil/water mixture was released the previous night from a truck in the parking lot of the International Petroleum property. According to MDE records, the spill was contained outside the Phase II EAA. The Spill Report is included as Appendix E.

- On October 20, 1994, HLA field personnel working in the area of the excavated catch basin on the north side of the PICORP property (sample location EA4, Figure 3) noted a sudden marked increase in the flow from the stormwater pipeline entering the catch basin from the south. The increased flow was approximately 6-in. deeper than the base flow of less than one inch observed several minutes earlier. The additional flow decreased steadily over a period of approximately 30 minutes. There was no rain at the time and rainshowers in the area had ended approximately four hours before this event was observed.

- On November 3, 1994, while sampling water discharging from the 5-ft by 10-ft stormwater box culvert at Herring Run (sample location EA11, Figure 3), HLA field personnel noted a sudden and marked increase in the flow from this pipe. The base flow observed a few minutes earlier was less than one inch deep and approximately 3 feet wide. The increased flow was approximately 2-in. deep and 8-ft wide. The weather was sunny and no rain was noted in the area. A distinct odor resembling chlorine was noted in association with this discharge. A small fish (approximately 3-in. long) was washed from the pipe with this discharge.

- Review of the stormwater drainage system video tape (Appendix F, Volume 2) identified liquids discharging from manholes on the Conrail Yard and from a 24-in. service connected at one of these manhole locations. There had been no rain the day of this observation.

- During wetlands delineation activities on December 2, 1994, HLA personnel identified two 24-in. concrete pipes discharging from the Roadway Express Inc. facility into the adjacent wetlands. The pipes are located on the north side of the Roadway facility, east of the facility's parking lot. The observed discharges from these pipes were small and amounted to a constant trickle. There had been heavy rains the previous day, but there was no rain the day of this observation. No unusual odors were associated with these discharges.

Other Potential Sources

- A drum storage area and an aboveground storage tank associated with the Conrail Yard were located between 50-ft and 150-ft upgradient of sampling locations EA8 and EA9. The drum storage area and the aboveground storage tank were located adjacent to the intermittent drainage swale in which sampling locations EA8 and EA9 are located. Runoff from these storage areas discharges to the intermittent drainage swale.

  Evidence of leaks and/or spills (black stained soil and free product on the ground and on standing water in the adjacent drainage swale) was noted from these sources prior to and during sampling activities. HLA field personnel observed burning of materials in drums near the drainage swale on October 21, 1994. HLA field personnel also observed Conrail personnel removing the drums and covering the stained soil with crushed stone on November 2, 1994.

- During post sampling surveying activities on January 3, 1995, HLA personnel observed a spill of petroleum product on the entrance driveway to the Conrail Yard near North Point Boulevard. The spill was approximately 20-ft^2 and appeared to be related to oil drained from a nearby backhoe. Runoff from this spill area discharges to the adjacent drainage swale at a point just upgradient of sample location EA9. As discussed in Section 4.2.3, this drainage swale discharges to the local stormwater management system that terminates at Herring Run.

- As discussed in Appendix A Section 8.0, the Conrail Yard adjacent to the north of the PICORP facility is listed on the CERCLIS State Priority List (SPL), which lists rail yards that have been identified by the EPA as having potential PCB-contamination (Vista National Radius Profile, 1994).

- As described in the Phase I Technical Memorandum (HLA, August 30, 1994) as part of the ongoing hydrogeological investigation, HLA has installed shallow monitoring wells to evaluate the existence and extent of the first water-bearing zone groundwater between the Superfund Site and Herring Run. HLA has concluded that the first water bearing zone, found above the Arundel Clay formation (Appendix A, Figure A-8), is discontinuous and, where found, is located primarily in artificial fill. As described below the artificial fill in this area is dominated by waste materials of industrial origin.

The fill material used for the Quad Avenue industrial area is described by the US Soil Conservation Service (SCS) as:

> "Made Land (Ma)...made from industrial wastes, mostly slag and cinders. Other areas consist of spoil material from excavations, or hydraulic fill from harbor or channel deepening. Some industrial wastes, incinerator ash, and miscellaneous solid garbage wastes have been covered by hydraulic fill, especially in areas that were originally tidal marshes" (US Department of Agriculture, SCS, 1976) (Appendix A, Section 6.0).

5.0 CONCLUSIONS

Potential Exposure Pathway

Based on the results of the Phase II EAA environmental media analytical results (Section 4.2.1), the stormwater drainage system survey (Section 4.2.3), and identification of other potential sources (Section 4.2.4), HLA identified several factors which indicate that under flow conditions prevailing during the time when field work was conducted, the stormwater drainage system was not transporting OU-2 Study Area-related constituents to Herring Run. While it is possible that transport of sediments and soil may potentially occur under extreme flow conditions, the relatively low concentrations detected in the sediments and soil indicate that any such transport from the OU-2 Study Area would be unlikely to include detectable concentrations of substances of concern due to the substantial dilution which would occur.

The findings of the Phase II Assessment identified runoff, erosion, seeps and leachate pathways into the wetlands within the OU-2 Study Area. The receptor areas associated with these pathways are contained entirely within the boundaries of the OU-2 Study Area.

There is evidence that prior to remediation there may have been pathways from the Superfund Site to the east and to the west via surface runoff. These two pathways (Section 4.3) were eliminated by remediation activities at the Superfund Site. The review of analytical results in Section 4.2.1 indicate that there may be residual constituents in the wetlands adjacent to the west of the Superfund Site from the runoff pathway which was eliminated by remediation.

There is evidence that some of the chemicals detected in the wetlands in the western and northern portions of the OU-2 Study Area PICORP may be contributed by other sources outside of the OU-2 Study Area (Section 4.2.4).

Potential Exposure Points

The Phase I Technical Memorandum (HLA, August 30, 1994) identified three potential ecological exposure points related to the OU-2 Study Area: the wetlands adjacent to the west of the Superfund Site, wetlands adjacent to the west and north of the PICORP facility, and Herring Run.

Based on the findings of the Phase II Assessment, Herring Run is no longer assumed to be a potential ecological receptor of definable concentrations of components related to the OU-2 Study Area.

Garbage, debris, and empty drums, assumed to be related to historic landfilling operations on the PICORP property occupying the northern portion of the OU-2 Study Area, have been detected in the adjacent wetlands. Review of historical aerial photographs indicate that contaminated soils or constituents may also have been disposed of directly into this area during landfill operations. HLA field personnel have also observed visible evidence of soil erosion, runoff, and seepage from the landfill mound into the adjacent wetlands.

6.0 PHASE III RECOMMENDATIONS

Based on the findings of the Phase II Baseline Ecological Assessment (Section 4.0) the Phase III EAA described below is recommended to provide boundaries for any future ecological assessments which may be required for remediation or permitting.

Phase III Ecological Assessment Area

Herring Run and the Phase II EAA stormwater drainage system north of the OU-2 Study Area should be removed from further investigations of potential ecological impacts associated with the OU-2 Study Area. The boundary of the proposed Phase III Ecological Assessment Area (Phase III EAA) is presented in Figure 7. The recommended Phase III boundary is based on the following findings:

- No compounds obviously related to the OU-2 Study Area were identified in water samples collected in the stormwater drainage system downgradient of the OU-2 Study Area (Section 4.2.1 and Appendix B).

- The stormwater drainage chemical transport mechanism from the OU-2 Study Area to Herring Run is diluted and broken by numerous and potentially significant stormwater and chemical sources not related to the OU-2 Study Area and by numerous sediment sinks and traps (Section 4.2.3 and Appendix F, Volume 2).

- Analytical results from the water samples collected by Weston Inc. from Herring Run both upgradient and downgradient of the Phase II stormwater drainage system discharge point, did not identify any site-related compounds (Weston, 1986)(Appendix B).

- The additional influences from waste sites and waste materials in local industrial fill soils (Appendix A, Section 8.2) identified in the Phase I Assessment adjacent to Herring Run, would make any assessment of source-related impacts in Herring Run technically impractical.

7.0 REFERENCES

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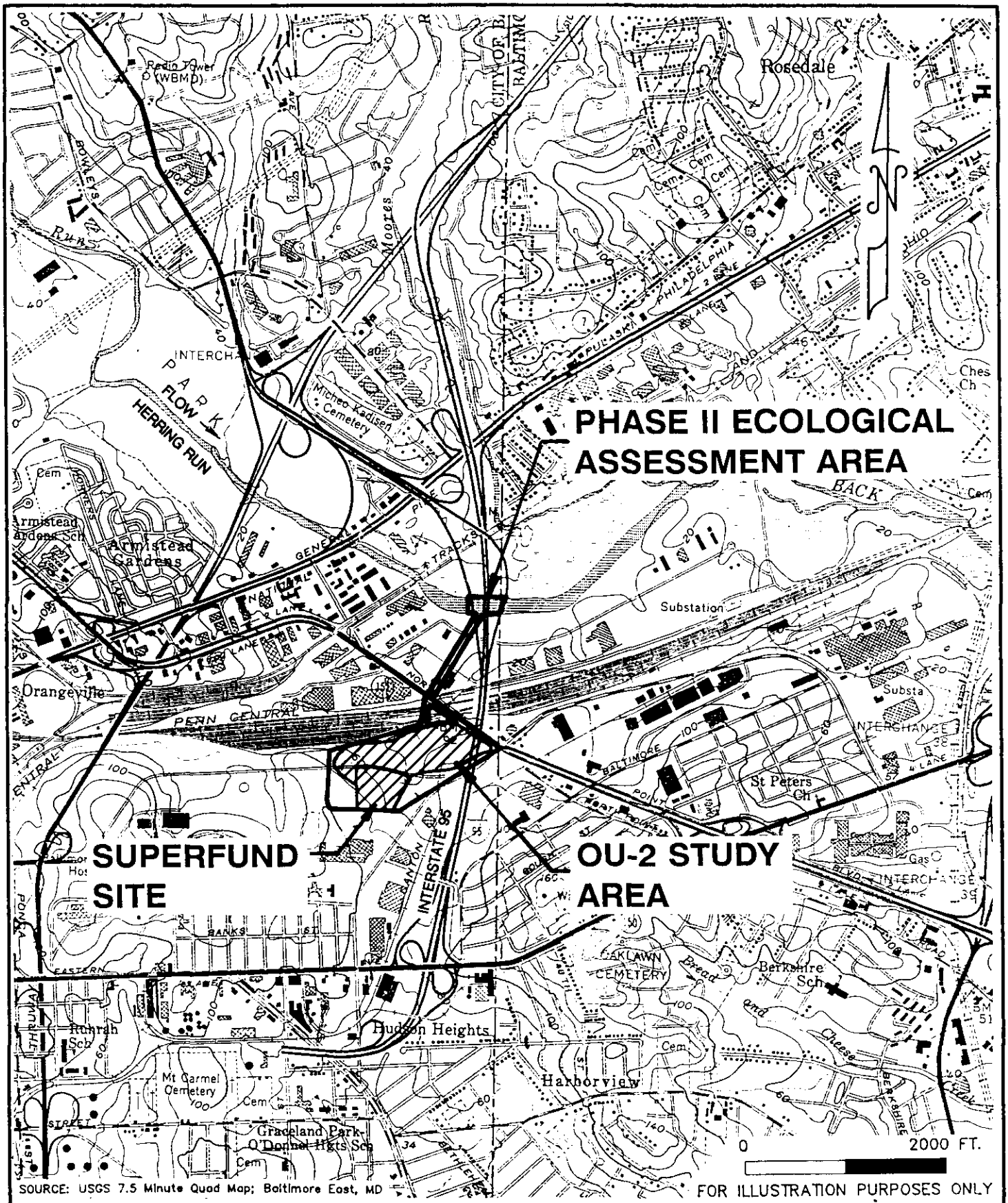

SOURCE: USGS 7.5 Minute Quad Map; Baltimore East, MD

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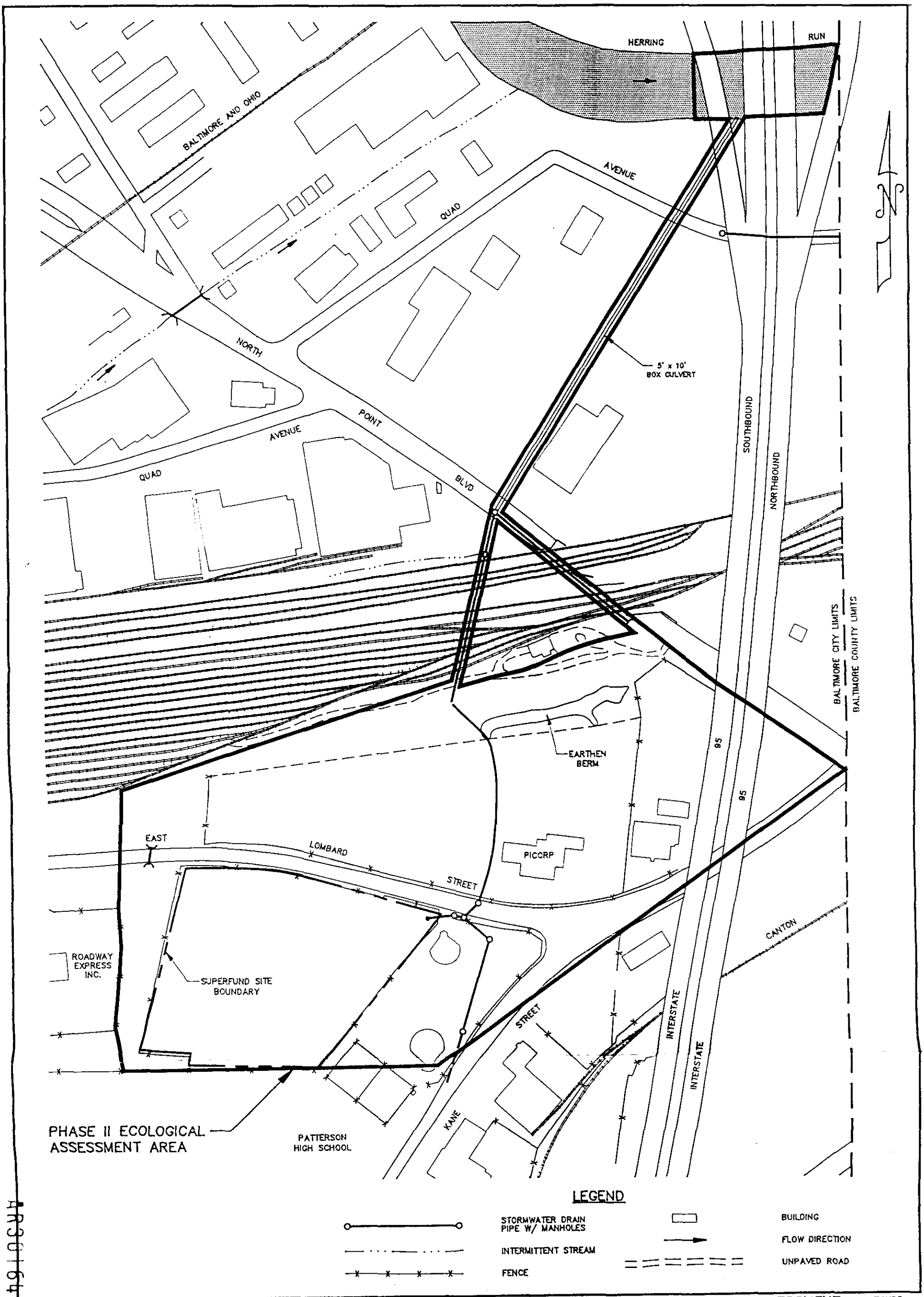
SITE LOCATION & PHASE II ENVIRONMENTAL ASSESSMENT AREA BOUNDARY MAP

FIGURE 1

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED NO.
JSW	27654.3.4.2.1		S-BASE	3/14/93	

AR300642



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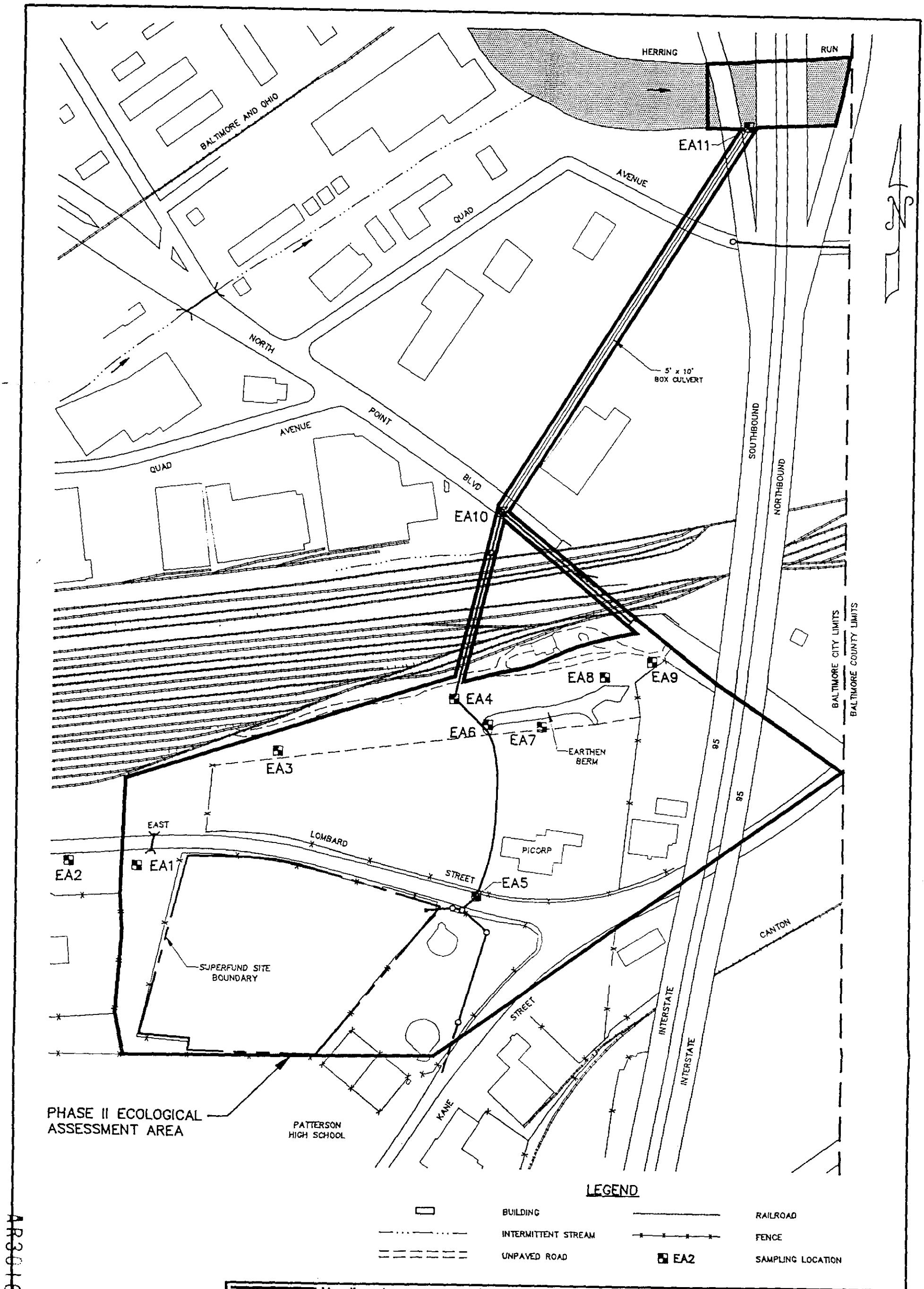
PHASE II ECOLOGICAL ASSESSMENT AREA

KANE AND LOMBARD STREETS
BALTIMORE, MARYLAND

FIGURE
2

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		EAA2SITE	3/14/95	

HRS01643



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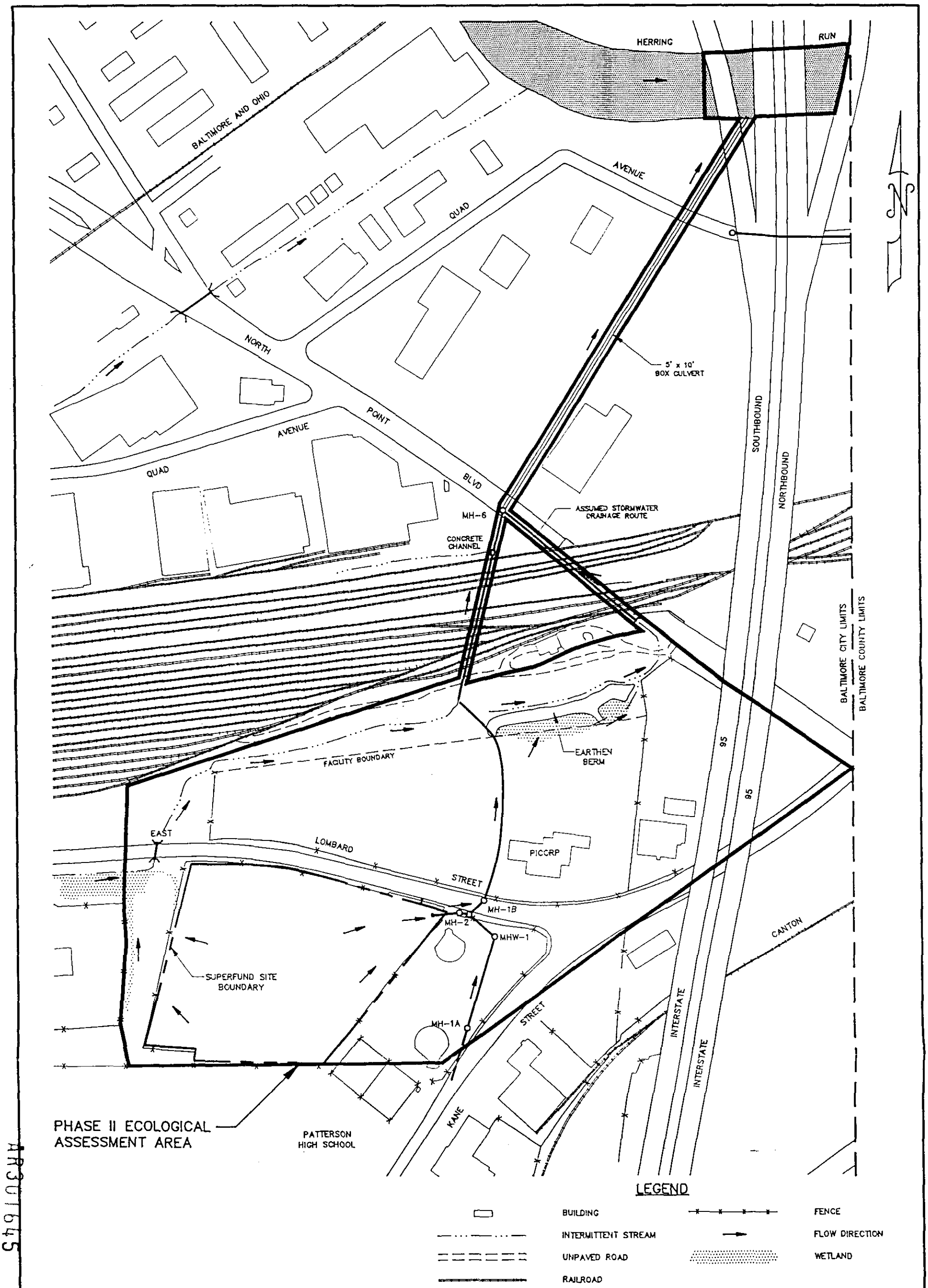
PHASE II EAA SAMPLING LOCATIONS
OCTOBER/NOVEMBER 1994

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE
3

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		EAA2SAMP	3/14/95	

AR301644



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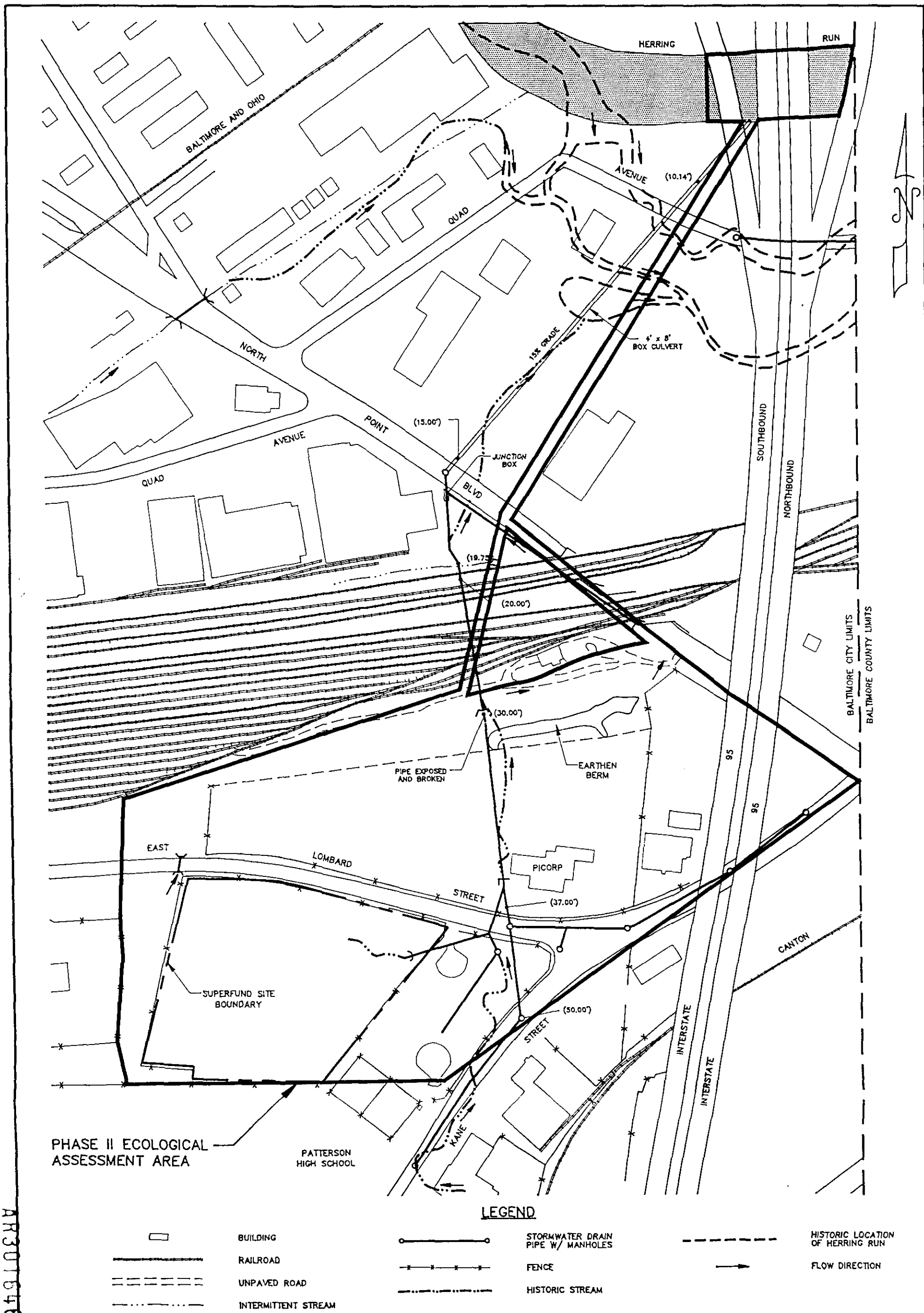
GENERALIZED STORMWATER DRAINAGE SYSTEM

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE 4

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2DRN	3/14/95	

AR301645



NOTE: CITY OF BALTIMORE DEPARTMENT OF PUBLIC WORKS BUREAU OF SEWERS & STORMWATER MAPPING 1927–1959 WITH UNDATED REVISIONS

0 300 600 FT.

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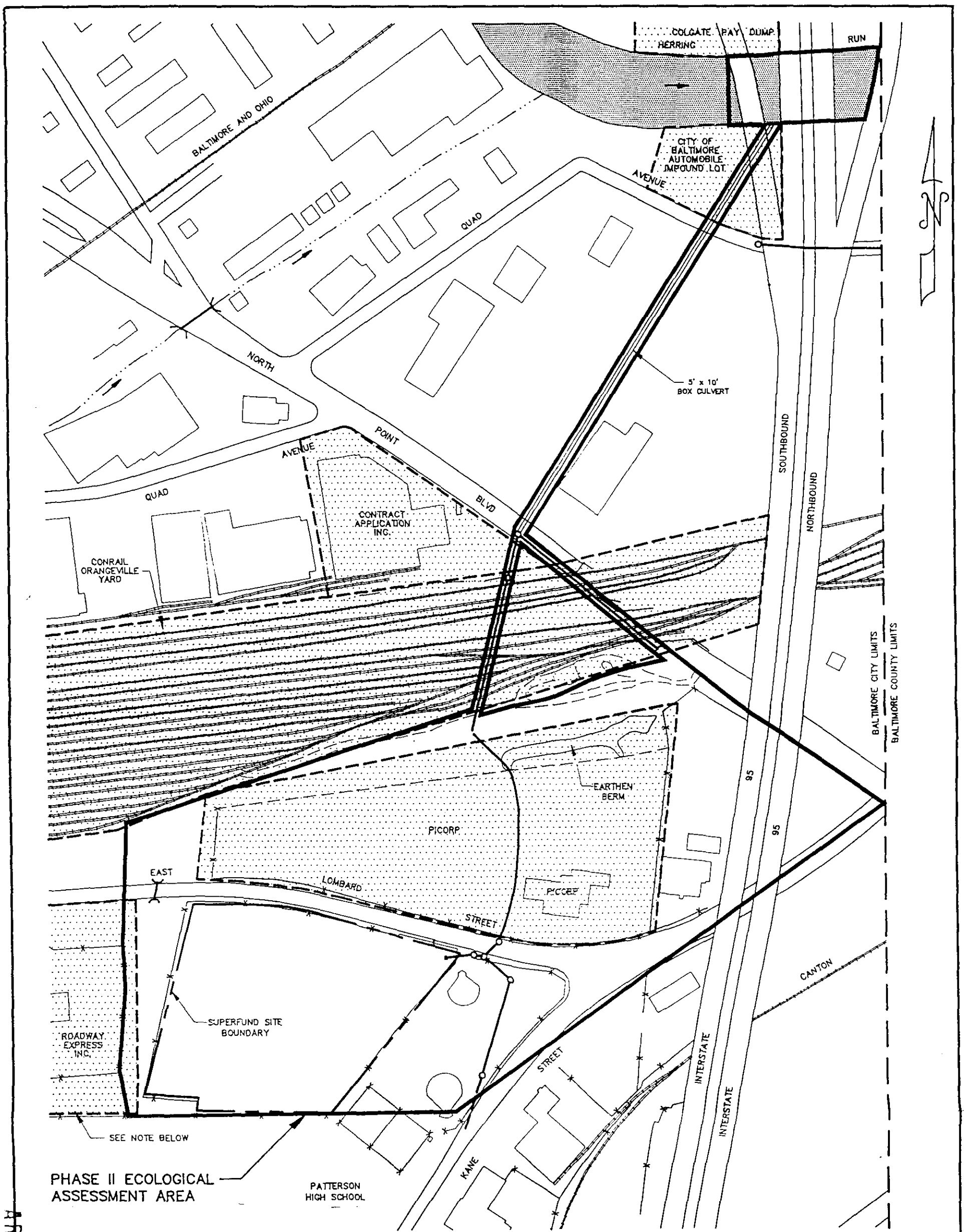
STORMWATER DRAINAGE SYSTEM AS MAPPED BY THE CITY OF BALTIMORE

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE 5

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2DRN2	3/14/95	

AR301646



NOTE: INTERNATIONAL PETROLEUM, INC. ADJACENT TO WEST OF ROADWAY EXPRESS INC. AND CONSIDERED POTENTIAL SOURCE SITE.

SOURCE: SEE APPENDIX A, SECTION 8.4

0 300 600 FT.

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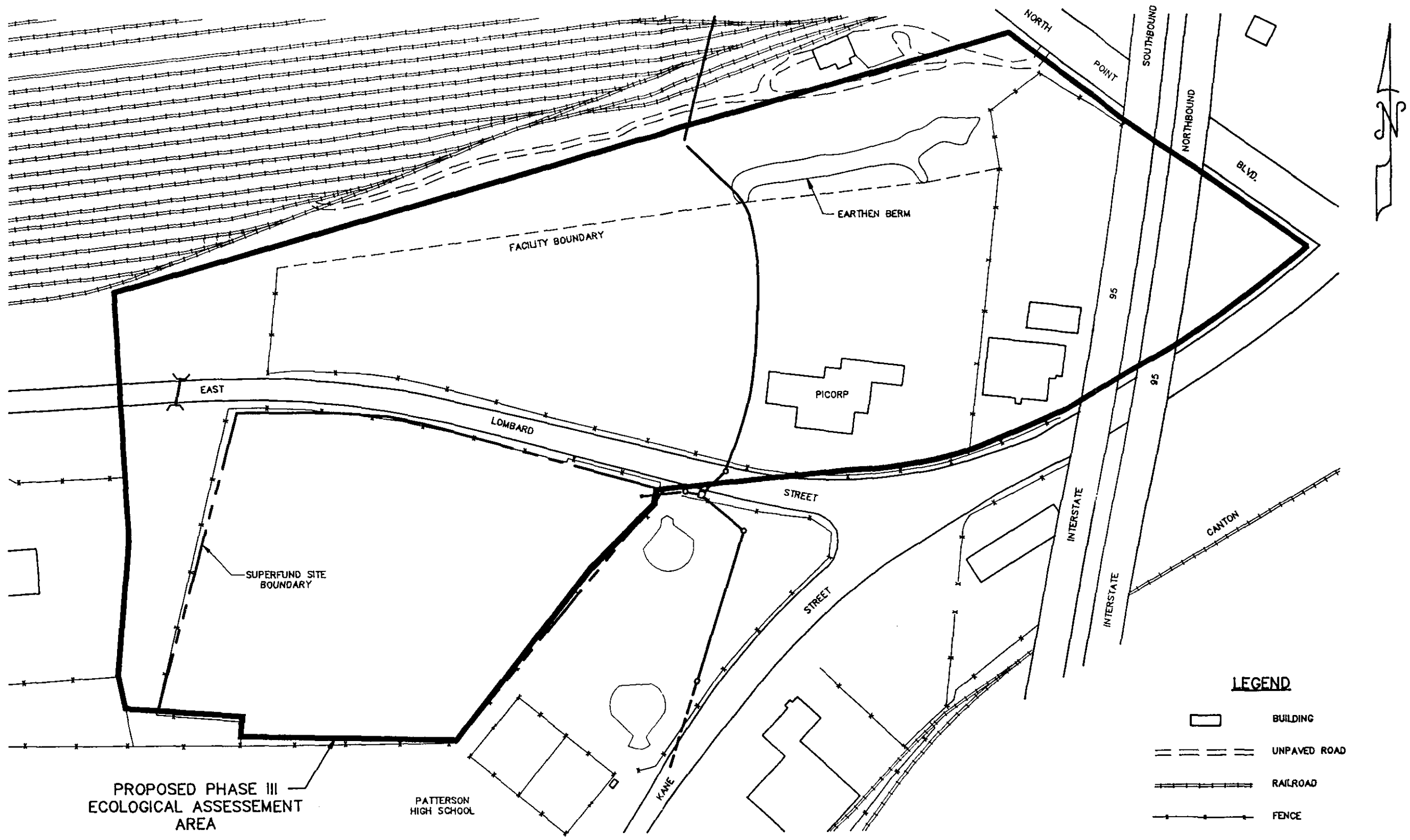
SITES OF POTENTIAL ENVIRONMENTAL CONCERN

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE 6

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2DUMP	3/14/95	

AR301647



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PROPOSED PHASE III ECOLOGICAL ASSESSMENT AREA

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE 7

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED NO.
JSW	27654.3.4.2.1		EAA3SITE	3/8/95	

AR301648

APPENDIX A

ENVIRONMENTAL RESOURCES INVENTORY

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APPENDIX A
KANE AND LOMBARD PHASE II ENVIRONMENTAL RESOURCES INVENTORY

1.0 INTRODUCTION

The inventory of environmental resources within the Phase II Ecological Assessment Area (Phase II EAA), including the Kane and Lombard OU-2 Study Area (Study Area), was developed to support and provide data for the Phase II Baseline Ecological Assessment (Phase II Assessment). The Phase II EAA is described in Section 3.0 of the Phase II Assessment Report. The Environmental Resources Inventory (ERI) of the Phase II EAA evaluated the following environmental resources:

- Surface Water Resources (Wetlands, Floodplains, Streams, and the Stormwater Drainage System)
- Habitats
- Species of Concern
- Geology and Hydrogeology
- Soils
- Topography
- Land Use

The ERI presented in the following sections of this appendix utilized existing literature materials such as aerial photography, wetlands mapping, soils mapping for Baltimore County, Maryland, floodplain mapping, existing water resources data, topographic quadrangles, municipal stormwater drainage system plans, state and federal lists of species of potential concern, and municipal zoning and tax maps and records. In addition to the literature review, HLA conducted a formal wetlands delineation, a habitat field evaluation, and other limited field reconnaissance activities to confirm and supplement the findings of the literature review.

2.0 SURFACE WATER RESOURCES

2.1 Wetlands

Wetlands are recognized as having a number of functions essential to the ecological balance of an area, as well as functions considered important to public health and welfare. As part of the Phase II Assessment activities, HLA preformed a formal delineation of wetlands within the Phase II Baseline EAA. The results of this delineation are presented in Appendix C. Review of the wetlands delineation results, aerial photographs, and US Fish and Wildlife Service (FWS) National Wetlands Inventory (NWI) mapping identified five wetland types totaling approximately 4 acres of the Phase II EAA. Wetland habitat types were classified in accordance with *Classification of Wetlands and Deepwater Habitats* by Cowardin *et al.*, 1979.

Of the five wetland habitat types identified, one is palustrine and four are riverine. The surveyed wetland delineation boundaries, and the Herring Run wetland areas, are presented in Figure A-1. The characteristics of these wetland areas are summarized in Table A-1, The identified wetland habitat types are listed below:

- Palustrine Emergent (PEM)
- Riverine Intermittent Streambed (R4SB)
- Riverine Lower Perennial Unconsolidated Bottom Permanent (R2UB1/2/3/H)
- Riverine Lower Perennial Beach/Bar Intermittently Seasonal (R2BB1/2C)
- Riverine Lower Perennial Beach/Bar Intermittently Flooded (R2BBJ)

A detailed summary of wetland habitat types within the Phase II EAA is presented in Section 3.0 of this appendix.

2.2 Wetland Buffer Areas

Nontidal wetland buffer areas are described by the State of Maryland as a "*regulated area, 25 feet in width, surrounding a nontidal wetland, measured from the outer edge of the nontidal wetland*" (Code of Maryland Regulations 08.05.04, Non-Tidal Wetlands). A regulated activity, as defined by Code of Maryland Regulations (COMAR) 08.05.04, may not be conducted within a wetland buffer or expanded wetland buffer without a permit or a letter of exemption. An expanded buffer extends 100 feet from the edge of a wetland boundary and applies to nontidal wetlands of Special State Concern and nontidal wetlands with adjacent areas containing steep slopes or highly erodable soils. It is unlikely that any of the identified wetlands areas, with the possible exception of Herring Run, would be considered of "Special State Concern" given their small size and degraded ecological function resulting from the intense urban land-use adjacent to these wetlands areas.

2.3 Floodplains

The 100-year floodplain is frequently defined by state or local regulations and the National Flood Insurance Program to include all land within reach of a flood with a probability of occurring in any given year of one percent; this is also referred to as the base flood. Land within reach of a flood having a 0.2 percent chance of occurring in a given year is referred to as the 500-year floodplain (Kusler and Platt, 1988). Floodplains occur in areas along or adjacent to a stream or a body of water that are capable of storing or conveying floodwater.

The 100-year floodplain for the area within the vicinity of the Phase II EAA as mapped by the Federal Emergency Management Agency (FEMA) is presented in Figure A-2. The floodplain mapping for the area within the Phase II EAA was performed in Baltimore in 1988, after the channelization of Herring Run.

A review of the floodplain mapping and field observations made at Herring Run indicate that a 100-year flood event and perhaps regular seasonal flooding may flow upgradient into the box culvert discharge pipe at Herring Run (Figure A-2). This box culvert is elevated approximately one foot above the flow stage observed in Herring Run in clear weather. Floodwaters moving into the stormwater drainage system may possibly temporarily prevent discharge from the northern sections of this stormwater drainage system.

2.4 Streams

Streams were identified using a combination of a formal wetlands delineation, aerial photography, FWS and NWI mapping, Maryland Nontidal Wetlands Guidance Mapping, United States Geological Survey (USGS) topographic quadrangles and field observations. This investigation identified one perennial stream (Herring Run), one possible perennial stream channeled underground by the stormwater drainage system, and two unnamed intermittent streams within the Phase II EAA. The possible underground perennial stream and the two unnamed intermittent streams are discussed in detail in Section 2.6 and Appendix F (Stormwater Drainage System Investigation) and in Section 3.2 and Appendix C (Wetlands). The surface streams mapped within the Phase II EAA and their flow directions are presented in Figure A-3.

Herring Run flows from west to east through the very northern portion of the Phase II EAA. Within the Phase II EAA, the Herring Run channel is approximately 60 feet wide, two to three feet deep, and has a sand and gravel substrate with occurrences of clay. The present channel of Herring Run was created by a state and county channelization project prior to 1972 (HLA, August 30, 1994). The original path of Herring Run, prior to channelization, consisted of a series of channels winding through the Quad Avenue area. Figure A-4 shows the approximate path of Herring Run prior to channelization.

2.5 Water Quality-Designated Uses

The Maryland Department of the Environment (MDE) defines water quality-designated uses (designated use) as "*those uses specified in the State's water quality standards for each water body or segment whether or not the uses are being attained*" (COMAR 26.08.01, General). The designated use assigned to each body of water is the basis for the protection of water quality. Where attainable, the waters of the state are protected for the basic uses of water contact recreation, fishing, protection of aquatic life and wildlife, and agricultural and industrial water supply. The determination of the designated use of a water body includes factors such as existing conditions, and potential uses that may be made possible by anticipated improvements in water quality. The actual use of surface water is not limited to the designated use assigned to that area. Any reasonable and lawful use is permitted provided that the surface water quality is not adversely affected by the use (COMAR 26.08.02, Water Quality). Herring Run is the only water body within the Phase II EAA subject to these water quality designations. Don Elmore of the MDE Water Resources Management Division informed HLA of the assigned designated uses for Herring Run in the vicinity of the Phase II EAA. These designated uses are described below and shown in Figure A-3.

The area of Herring Run east of the Interstate 95 bridge is designated as Use II, shellfish harvesting waters. This use designation includes waters where shellfish are propagated, stored, or gathered for marketing purposes; and, actual or potential areas for the harvesting of oysters, soft shell clams, and brackish water clams. The limited field reconnaissances conducted in June 1994 and December 1994 identified this section of Herring Run as an unlikely area for harvesting shellfish and observed no such activities. Salinity measurements taken with a refractometer within this section of Herring Run during the field reconnaissance in June 1994 measured zero parts per thousand. In addition, no indicators of tidal influence or brackish water organisms were identified. It is unlikely that any commercially important shellfish exist or could exist within the Phase II EAA portion of Herring Run.

Upstream of the Interstate 95 bridge, the portion of Herring Run within the Phase II EAA is designated as Use IV, recreational trout waters. This use designation includes cold or warm waters that have the potential for, or are capable of, holding or supporting adult trout for put-and-take fishing and managed as a special fishery by periodic stocking and seasonal catching.

2.6 Stormwater Drainage System

Based on the findings of the Phase I Baseline Ecological Assessment, HLA conducted an investigation of the stormwater drainage system in November 1994. This investigation included a video survey of the accessible portions of the underground stormwater drainage system associated with the Kane and Lombard Superfund Site and OU-2 Study Area, a field reconnaissance of the aboveground stormwater drainage system, and a review of the City of Baltimore stormwater drainage plans.

A map showing the stormwater drainage system, as defined by this investigation, is presented in Figure A-5. A more detailed summary of the findings of the stormwater drainage system investigation, including a copy of the video tape showing the accessible underground portion of the stormwater drainage system is presented in Appendix F (Volume 2) of this Technical Memorandum.

2.6.1 Surface Water

Surface water drainage within the Phase II EAA generally flows from southwest to northeast into Herring Run. Herring Run flows from west to east at the northern boundary of the Phase II EAA. Surface water drainage patterns within the Phase II EAA are controlled primarily by topography and manmade structures such as roads, parking lots, railroads, and the stormwater drainage system (Section 2.6).

There are two surface water drainage routes in the Phase II EAA. The first route begins in the wetlands area adjacent to the west of the Superfund Site. These wetlands receive runoff from the Superfund Site, the Roadway facility, the hillside to the south, and East Lombard Street. Water is collected in an intermittent stream channel and flows northward through a culvert under East Lombard Street (Figure A-5). From the discharge point on the north side of East Lombard street, stormwater flows through a channel along the western and northern edge of the PICORP property. This channel receives additional runoff from a vacant area to the west, from the western portion of the PICORP facility, and from the Conrail Yard. This intermittent stream channel discharges to an excavated stormwater catch basin on the north side of the PICORP facility and is channeled into an underground stormwater pipe with a northern flow under the Conrail Yard and terminating at Herring Run (Figure A-5).

The second surface water drainage route begins in the bermed wetland area along the northern slope of the PICORP facility. Water in the bermed wetland flows east through a manmade corrugated pipe and into an intermittent stream channel. The water then flows through a culvert under the Conrail Yard driveway and into a stormwater drain adjacent to North Point Boulevard.

2.6.2 Pipeline Drainage

Drainage from the Superfund Site and areas to the south of the OU-2 Study Area is controlled primarily by a system of underground stormwater drainage pipes. This system drains to the north through underground pipelines and culverts terminating at a single point on Herring Run. According to Chin Lee of the City's Stormwater Engineering Department, this stormwater pipeline system south of North Point Boulevard is owned by Conrail and installed as part of the Conrail Yard construction. North of PICORP, this stormwater system also receives the surface water drainage described in Section 2.6.1 above.

The original regional stormwater drainage system associated with the Phase II EAA was mapped using stormwater drainage plans obtained from the City's Department of Public Works, Bureau of Sewers, dated 1926, 1956, 1957, and 1959. The plans from the City also included several revisions that are undated. The historical Herring Run channel and other historical stream channels mapped by the City are shown in Figure A-6.

As shown on Figure A-6, the City stormwater drainage system maps identified historical stream channels that match very closely to the present stormwater pipeline route. Of particular note was the curve observed in the pipeline under the PICORP facility which matched closely to the curve in the mapped stream. A constant flow of water was observed in the entire length of the underground pipeline portion of the stormwater drainage system. The flow originates an unknown distance south (upgradient) of the Superfund Site and continues to Herring Run. This flow has been observed in all seasons even during dry periods after several days without precipitation. Based on these findings, it is assumed that the stormwater pipeline system east of the Superfund Site channeled the flow from the historical streams mapped by the City.

As shown on Figure A-5, the underground stormwater drainage system associated with the Phase II EAA originates to the south, outside the Phase II EAA boundary. The stormwater drainage system enters the Phase II EAA east of the Superfund Site heading north under the Patterson High School ball fields and stormwater flows into a chamber east of the Superfund Site. The drain in the northeast corner of the Superfund Site is connected by a pipe to this chamber also.

From the chamber, the stormwater drainage system runs north under East Lombard Street and continues north under the PICORP facility. Under the PICORP facility, two manholes and several service pipe entrances were observed by the video survey. Many of the joints in the pipe are separated and soil erosion from around these joints is evident. At some locations, flow from the stormwater system was observed exiting the system through these separated joints.

The stormwater system is open just south of the Conrail Yard where drainage from the pipe meets with surface water drainage from the west of the PICORP facility in an excavated catch basin. From this catch basin, the flow enters another pipe and flows north under the Conrail Yard. The flow exits on the northern side of the Conrail Yard to an open concrete-lined channel for approximately 20 feet and then re-enters the underground pipeline system flowing northeast towards North Point Boulevard.

The underground stormwater drainage system flows northeast under North Point Boulevard. At the manhole on North Point Boulevard, a connection from the east discharges the flow from the eastern portion of the PICORP property as described earlier. From North Point Boulevard, the flow continues north into a 5-ft by 10-ft box culvert which flows to the system's terminus at Herring Run.

3.0 HABITATS

As requested by the EPA in response to the findings of the Phase I Baseline Ecological Assessment Report (HLA, August 30, 1994), HLA performed a habitat evaluation of the Phase II EAA. Habitat types within the Phase II EAA were determined based on the formal wetlands delineation (presented in Appendix C), reviewing aerial photographs, and conducting a visual field reconnaissance of upland habitats within the Phase II EAA. Wetland habitats were classified according to *Classification of Wetlands and Deepwater Habitats* by Cowardin *et al.*, 1979, and upland habitats were classified according to *A Land Use and Land Cover Classification System for Use with Remote Sensor Data* by Anderson *et al.*, 1976.

The formal wetlands delineation and visual field reconnaissance were performed on November 16 and 17 and December 1 and 2, 1994. Habitat types are described below. Habitat boundaries are presented in Figure A-7. The habitat types and their characteristics are summarized in Table A-2.

The major habitat types identified within the Phase II EAA include:

- Urban and Built-Up Land
- Wetlands
- Rangeland
- Forest Land

As requested by the EPA an evaluation of subterranean (cave) habitats was conducted for underground portions of the stormwater drainage system associated with the Phase II EAA. As is discussed in Section 3.4, no evidence was identified to indicate that these areas were functioning as cave habitats.

3.1 Urban and Built-Up Land

A majority (approximately 34 acres (65%)) of the Phase II EAA is occupied by urban and built-up land. Urban and built-up land is defined as areas of intensive use with much of the land covered by structures or impervious surfaces. Three types of urban and built-up land were identified within the Phase II EAA: light industrial; transportation, communications and utilities; and commercial and services. Eastern gray squirrels (*Scirpus carolinensis*) and Rock Doves (*Columba livia*) are species which have adapted well to this habitat. A more detailed discussion of urban and built-up land is presented in Section 8.0.

3.2 Wetland Habitats

Wetland habitats are recognized as having a number of functions essential to the ecology of an area, as well as functions considered important to public health and welfare. A formal wetlands delineation was conducted within the Phase II EAA. This delineation included surveying the wetlands boundaries. Because of the deep, well-defined Herring Run channel and the limitations of working within this channel, the wetland boundaries associated with Herring Run were delineated by a review of NWI mapping, aerial photographs, and field observations. The results of the wetlands delineation are presented in Appendix C.

The wetlands delineation identified approximately 4 acres of wetlands within the Phase II EAA. The NWI mapping designates two riverine wetland habitats at Herring Run within the Phase II EAA. In addition, HLA field observations identified a third riverine wetland habitat associated with Herring Run and an intermittent stream channel to the north and west of the PICORP facility. Palustrine wetland habitats were identified adjacent to the PICORP facility and the Superfund Site. The wetland habitat types identified within the Phase II EAA are described below.

3.2.1 Palustrine

Palustrine wetland habitat types are described as nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 parts per thousand. This includes wetlands lacking such vegetation but with the following four characteristics: less than 20 acres in size; active wave-formed or bedrock shoreline features lacking; water depth in the deepest part of basin less than six feet at low water; and salinity due to ocean-derived salts less than 0.5 parts per thousand. The palustrine ecological system is bound by either uplands or another wetland system. Palustrine wetlands can be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; or on slopes (Cowardin *et al.*,1979). The palustrine wetland areas within the Phase II EAA are shown in Figure A-7.

The only palustrine wetland type identified within the Phase II EAA was Palustrine Emergent (PEM). PEM wetlands consist of a palustrine ecological system usually dominated by perennial plants, characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. Vegetation is present for most of the growing season in most years (Cowardin *et al.*,1979).

PEM wetlands are found adjacent to the northern slope and the western side of the PICORP facility. PEM wetlands were also identified adjacent to the west side of the Superfund Site. PEM wetlands comprise approximately 1.5 acres and 3 percent of the Phase II EAA land area.

The PEM wetlands in the Phase II EAA are generally dominated by *Phragmites australis* (reed grass), which forms a dense monoculture throughout much of the PEM wetlands. Some of the other plant species identified in the PEM wetlands are: *Viburnum dentatum* (Southern arrowwood), *Typha angustifolia* (narrow-leaved cattail), *Typha latifolia* (common cattail), *Salix nigra* (black willow), *Carex* spp. (rush species), and *Vitis riparia* (riverbank grape).

3.2.2 Riverine

Riverine wetland ecological systems include all wetlands and deepwater habitats contained within a channel with a salinity less than 0.5 parts per thousand. The riverine system is bound by uplands on the landward side or by wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. The riverine system terminates at the downstream point where the concentration of ocean-derived salts in the water exceeds 0.5 parts per thousand during the period of annual average low flow, or where the channel enters a lake. Riverine wetland systems terminate upstream where tributary streams originate, or where the channel leaves a lake (Cowardin *et al.*,1979). The riverine wetlands within the Phase II EAA are shown in Figure A-7.

3.2.2.1 Riverine Intermittent Streambed (R4SB)

R4SB wetlands consist of a riverine ecological system where the channel contains flowing water for only part of the year. When water is not flowing in the channel, it may remain in isolated pools or surface water may be absent (Cowardin *et al.*, 1979).

R4SB wetlands occur adjacent to north and west of the PICORP facility where an intermittent stream channels flow into the stormwater drainage system. This wetland type makes up approximately 0.5 acre or 1 percent of the Phase II EAA land area. The vegetation in this wetland was dominated by *Phragmites australis*.

3.2.2.2 Riverine Lower Perennial Unconsolidated Bottom Permanent (R2UB1/2/3/H)

R2UB1/2/3/H wetlands consist of a riverine ecological system with a low gradient and a slow water velocity. These wetland areas remain flooded throughout the year in all years.

The portion of the Herring Run stream channel defines this wetland habitat type. R2UB1/2/3/H wetlands make up approximately 1 acre or 2 percent of the Phase II EAA land area. Based on observations of the Herring Run channel in various weather conditions and in all seasons, the permanent flow channel averages approximately 20 feet wide and 1 to 3 feet deep in the Phase II EAA. The substrate within the R2UB1/2/3/H wetland is a mix of sand, gravel, mud, and exposed clay.

3.2.2.3 Riverine Lower Perennial Beach/Bar Intermittently Seasonal (R2BB1/2C)

R2BBC wetlands consist of a riverine ecological system where the gradient is low and water velocity is slow, there is no tidal influence, and some water flows throughout the year. This type of wetland is inundated most years for two weeks or more during the growing season, and usually dry by the end of the growing season. The substrate consists mainly of sand and mud. Oxygen deficits may sometimes occur. The fauna is composed mostly of species that reach their maximum abundance in still water and true planktonic organisms are common. The floodplain is well developed (Cowardin *et al.*,1979).

Within the Phase II EAA, this wetland type is only associated with Herring Run. R2BBC wetlands make up approximately 0.5 acre or 1 percent of the Phase II EAA land area.

The vegetation along the banks of Herring Run is dominated by herbaceous species during the growing season. The vegetation within this wetland habitat had been severely disturbed by recent flooding at the time of HLA's formal wetlands delineation.

3.2.2.4 Riverine Lower Perennial Beach/Bar Intermittently Flooded (R2BBJ)

R2BBJ wetlands consist of a riverine ecological system where the gradient is low and water velocity is slow, there is no tidal influence, and some water flows throughout the year. This type of wetland is nearly permanently flooded and exposed only during drought conditions. The substrate consists mainly of sand and mud. Oxygen deficits may sometimes occur. The fauna is composed mostly of species that reach their maximum abundance in still water and true planktonic organisms are common. The floodplain is well developed (Cowardin *et al.*, 1979).

Within the Phase II EAA, R2BBJ wetlands are only associated with Herring Run. This wetland type makes up approximately 0.5 acre or 1 percent of the Phase II EAA land area.

3.3 Upland Habitats

3.3.1 Rangeland

For the purposes of this evaluation, vacant urban properties dominated by herbaceous vegetation have been classified as rangeland. Rangeland is defined by Anderson *et al.* as land where the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs and where natural herbivory was an important influence in its precivilization state. Rangelands also include areas that have been or may be seeded with introduced or domesticated plant species (Anderson *et al.*, 1976). There are two types of rangeland that exist within the Phase II EAA and together they make up approximately 14 acres and 27 percent of the total Phase II EAA land area.

3.3.1.1 Herbaceous Rangeland

Herbaceous rangeland encompasses lands dominated by naturally occurring grasses and forbs as well as those areas of rangeland that have been modified to include grasses and forbs as their principal cover (Anderson *et al.*, 1976). Within the Phase II EAA herbaceous rangeland occupies a majority of the Superfund Site, the upland areas adjacent to the west of the Superfund Site, and some upland areas to the west of PICORP. Herbaceous rangeland makes up approximately 13 acres and 25 percent of the total Phase II EAA land area.

The following dominant species were identified within the herbaceous rangeland habitats of the Phase II EAA: *Rubus alleghaniensis* (blackberry), *Robinia pseudo-acacia* (black locust), *Solidago* spp. (goldenrod species), *Quercus prinus* (chestnut oak), *Quercus palustris* (pin oak), *Vicia cracca* (cow vetch), *Poa pratensis* (Kentucky blue-grass), *Graminae* spp. (grass species), *Glecoma hederacea* (ground ivy), *Allium canadense* (wild garlic), *Toxicodendron radicans* (poison ivy), *Lonicera japonica* (Japanese honeysuckle), and *Phytolacca americana* (pokeweed).

3.3.1.2 Mixed Rangeland

Mixed rangeland occurs when more than one-third intermixture of either herbaceous or shrub and brush rangeland species occur in a specific area (Anderson *et al.*, 1976). Mixed rangeland occurs in the upland area to the west of PICORP, along the slope north of PICORP, along the berm north of PICORP, and adjacent to Herring Run. Mixed rangeland habitat covers approximately 1 acre or 2 percent of the total Phase II EAA land area.

The field reconnaissance associated with the habitat evaluation identified the following dominant species within the mixed rangeland habitat of the Phase II EAA: *Ailanthus altissima* (tree-of-heaven), *Elaeagnus angustifolia* (Russian olive), *Liquidambar styraciflua* (sweetgum), *Lonicera japonica* (Japanese honeysuckle), *Lonicera tatarica* (tartarian honeysuckle), *Platanus occidentalis* (sycamore), *Prunus serotina* (Black Cherry), *Populus grandidentata* (bigtooth aspen), *Rhus copallina* (winged sumac), *Robinia pseudo-acacia* (black locust), *Salix fragilis* (crack willow), *Rosa multiflora* (multiflora rose), *Rubus alleghaniensis* (blackberry), *Solidago* spp. (goldenrod species), *Toxicodendron radicans* (poison ivy), and *Yucca filamentosa* (yucca).

3.3.2 Forest Land

Forest land is described as an area with a tree-crown density of 10 percent or more that is stocked with trees capable of producing timber or other wood products and that exerts and influences the climate or water regime (Anderson *et al.*, 1976). Because the area described below is only a small fragment of a forest, HLA has modified this definition to include tree dominated areas large enough to provide habitat. As described below the forest land within the Phase II EAA is dominated by deciduous trees.

Deciduous forest land includes all forested areas having a predominance of trees that lose their leaves at the end of the frost-free season or at the beginning of a dry season (Anderson *et al.*, 1976). Deciduous forest land occurs along the border between the Superfund Site and the Patterson High School property. This deciduous forest land covers approximately 0.3 acres or 0.6 percent of the total Phase II EAA land area.

The deciduous forest land habitat was dominated by the following species: *Quercus rubra* (red oak), *Quercus alba* (white oak), *Lonicera japonica*, *Liquidambar styraciflua*, *Sassafras albidum* (sassafras), *Smilax rotundifolia* (common greenbrier), *Prunus serotina*, *Rubus alleghaniensis*, *Betula papyrifera* (paper birch), and *Toxicodendron radicans*.

3.4 Subterranean (Caves)

In response to concerns of the EPA, two underground portions of the stormwater drainage system associated with the Phase II EAA were evaluated for evidence of cave habitat functions. The first was the underground stormwater drainage system open on the north side of the Conrail Yard where a 6-ft high by 4-ft wide stone culvert channels flow from the Conrail Yard to the south. The second area was the underground 5-ft high by 10-ft wide stormwater drain which is open at Herring Run and channels flow from the south. The video survey of the underground portion of the local stormwater drainage system (Appendix F) included these two areas.

Review of the stormwater drainage system videotape identified no individuals, nests, scat, tracks or other evidence of vertebrate species utilizing any portion of the stormwater drainage system. Spiders and some flying invertebrate species such as gnats were observed in the drainage way. Because of the regular flooding and associated intense flow inside the drainage system, including evidence that on occasion portions of the drainage system flood to the ceiling, these areas are not likely to be functioning as cave habitat for other than occasional transient individuals.

3.5 Observed Animal Species

The species listed below were noted during field work within the Phase II EAA. Formal investigations or special observation techniques were not employed to identify animal species. Animal species observed within or near the Phase II EAA included:

OU-2 Study Area

Eastern cottontail rabbit (*Sylvilagus floridanus*); woodchuck *(Marmota monax)*; domestic dog *(Canidae family)*; gray squirrel *(Sciurus carolinensis)*; fish crows *(Corvus ossifragus)*; American crows *(Corvus brachyrhynchos)*; northern harrier *(Circus cyaneus)*; downy woodpecker pair *(Picoides villosus)*; mourning doves *(Zenaida macrovra)*; Carolina wren *(Thyrothorus ludovicianus)*; northern cardinal *(Cardinalis cardinalis)*; and song sparrows *(Melospiza melodia)*.

Herring Run

The species listed below were observed during field work conducted for the Phase I Baseline Ecological Assessment (HLA, August 30, 1994).

Numerous small fish were observed within the length of Herring Run within the Phase I EAA, ranging in size from approximately one inch to four inches. Based on size and behavior, it is estimated that as many as five species may have been represented.

Other species observed included: numerous tadpoles ranging in size from approximately 0.5 inches (pools) to two inches (stream); northern water snake *(Natrix sipedon)*; fish crows *(Corvus ossifragus)*; belted king fisher *(Ceryle alcyon)*; killdeer *(Charadrius vociferus)*; mallard duck pair *(Anas platyrhynchos)*; herring gull *(Larus argentatus)*; and laughing gull *(Larus atricilla)*.

4.0 SPECIES OF CONCERN

To identify potential species of concern within the Phase II EAA, HLA used a combination of the state and federal lists of rare, threatened, and endangered plants and animals, a Maryland Fish, Heritage and Wildlife Administration (MFHWA) records search, and a limited field reconnaissance of the Phase II EAA.

The state and federal lists of rare, threatened, and endangered plants and animals of Maryland are provided in Appendix D. The lists cover species of concern for the entire State of Maryland. They are not applicable to a specific area and do not indicate habitat type utilized by the species of concern. Inclusion of lists do not indicate the presence of the species of concern within the Phase II EAA.

In July 1994 the MFHWA was contacted for a records search of rare, threatened, or endangered plants or animals which may have been reported within the Phase I EAA. The Phase II EAA is contained entirely within the Phase I EAA. The MFHWA had no record of federal or state rare, threatened, or endangered plants or animals existing or utilizing the habitat within the Phase I EAA (Appendix D).

Field reconnaissance conducted in June, November, and December 1994 did not identify any habitat within the Phase II EAA considered to be suited to support rare, threatened, or endangered species populations. The probability that species listed as being of concern are present within or utilize the Phase II EAA as an important part of their migration, feeding, or breeding area is believed to be low. The intense urbanization and human activity within the Phase II EAA (Section 8.0), including the alteration or destruction of habitats by filling and construction related to development and the channelization of Herring Run, would likely have eliminated any native populations of species of concern from the area. In addition, this urbanization does not create favorable conditions for sensitive species to reestablish themselves. A formal field survey of threatened and endangered species was not conducted as part of this project.

5.0 GEOLOGY AND HYDROGEOLOGY

5.1 Regional Geology and Hydrogeology

The Phase II EAA is located in the Atlantic Coastal Plain Physiographic Province, near the Fall Line that separates the Coastal Plain from the Piedmont Plateau. A 1979 regional surficial geologic map developed by the Maryland Geologic Survey is presented in Figure A-8. This geologic map identifies a majority of the area within the Phase II EAA north of the Superfund Site as being overlain by "Artificial Fill". This artificial fill is described by the Maryland Geologic Survey as "...heterogeneous materials such as rock, unconsolidated sediment, slag, refuse, and dredge spoil. The thickness ranges from 1 to 25 feet." Further discussion of this fill material is presented in Section 6.0. A regional geologic cross section based on this map is presented in Figure A-9.

The Coastal Plain consists of Cretaceous Age and younger sediments that form a series of wedge-shaped formations that dip and thicken to the southeast. The sediments are unconformably underlain by Precambrian Age crystalline bedrock. The bedrock consists primarily of granite, schist, gabbro, diorite, gneiss and marble (Otton, 1955). In many areas the upper portions of the bedrock have decomposed to a clayey material which retains many of the structural features of the original rock (saprolite).

In the vicinity of the Phase II EAA, the upper surface of the crystalline bedrock dips to the southeast and is unconformably overlain by Cretaceous Age sediments of the Potomac Group. The lowest member of the Potomac Group is the Lower Cretaceous Age Patuxent Formation. The Patuxent consists of discontinuous layers of sands, clays, sandy clays, and arkosic sands. According to Bennett and Meyer (1952), the Patuxent ranges from approximately 100 to 300 feet in thickness in the Baltimore area. This unity is approximately 1,200 feet thick in the Curtis Bay District of Baltimore, approximately six to seven miles south of the Superfund Site (Otton, 1955).

The Patuxent Formation is overlain by the Arundel clay, which is exposed in the vicinity of the Superfund Site. The contact between the Patuxent Formation and the Arundel clay can be difficult to distinguish because the boundary is gradational and the upper part of the Patuxent consists largely of clay similar to the Arundel. The Arundel clay consists chiefly of firm clay and sandy clay containing interbedded layers of ironstone and nodules of iron carbonate. Colors vary from red to purplish red to grayish white to yellowish gray (Otton, 1955). Small lenses of sand and gravel have been identified in drilling logs; however, the Arundel clay is not known to be used as a source of water. The Arundel clay has been mined in this region for brick manufacturing.

In the vicinity of the Phase II EAA, the Arundel clay is overlain by the clay facies of the Patapsco Formation. The Patapsco is the upper member of the Potomac Group. The Patapsco Formation is highly variable, consisting of red, gray, grayish yellow, and brown kaolinitic clays interbedded with sand and sandy gravel. Ironstone layers and bands are common, but most of them are not more than a few feet thick and are of variable extent and nature (Otton, 1955).

Groundwater in the bedrock occurs in secondary features such as joints, fractures, and foliations. According to Otton (1955), the secondary features tend to disappear at depths greater than a few hundred feet. Where it is overlain by a significant water bearing unit, the bedrock is typically not developed as a groundwater supply.

The water-bearing properties of the Patuxent Formation vary throughout the state. In general, it is most productive in the vicinity of Baltimore, where wells have been reported to yield up to 900 gallons per minute and many of the industrial wells yield from 400 to 600 gallons per minute (Otton, 1955). Otton reported in 1955 that in the Curtis Bay District, approximately six to seven miles to the south, "the Patuxent formation is extensively utilized as a source of large industrial groundwater supplies". The formation is less productive in the southern and eastern parts of the state.

According to the 1979 geologic map (Reinhardt and Crowley), the Patuxent Formation is exposed in a relatively broad band to the north and west of the site. The exposed area may function as a recharge zone for the Patuxent Formation beneath the site.

The Arundel clay and the lay facies of the Patapsco are not regarded as water-bearing formations. In other portions of the state, the Arundel clay functions as an aquitard between the Patuxent Formation and the sand facies of the overlying Patapsco Formation.

5.2 Local Hydrogeology

Approximately 1 to 25 feet of fill overlies much of the OU-2 Study Area. The fill is underlain by silts and clays of the Arundel clay. The clays of the overlying Patapsco Formation may also be present. The first water-bearing zone exists near the boundary between the fill and underlying silts and clays. Groundwater flow direction in this first water-bearing zone is generally from southwest to northeast, based on data from the Superfund Site prior to installation of the slurry wall. However, groundwater movement in the first water-bearing zone appears to have been altered by installation of a cap and slurry wall at the Superfund Site.

The Arundel clay is underlain by the Patuxent Formation. The Patuxent consists of layers of sand and sandy gravel separated by aquitards of relatively low permeability silts and silty clays. The second water bearing zone identified in the vicinity of the Superfund Site occurs in the upper Patuxent, just beneath the Arundel clay. Available data indicate that groundwater flow direction in this unit is complex in the vicinity of the Superfund Site, with components to the north, south, and east.

The third water-bearing zone is separated from the second by an aquitard consisting of approximately 22 to 42 feet of silty clay beneath the Superfund Site. Groundwater flow direction in the third zone is to the southeast. This is consistent with regional groundwater flow.

6.0 SOILS

The soils within the boundaries of Baltimore City, have not yet been mapped by the US Department of Agriculture, Soil Conservation Service (SCS). Using the general soils map in the *Soil Survey of Baltimore County* (SCS, 1976) the soils types located in the adjacent areas of Baltimore County were qualitatively extrapolated to determine which soils would likely be found in the portion of the Phase II EAA. These soil types are summarized in Table A-3. The limited field reconnaissance and the geologic map of the Baltimore East Quadrangle identified the majority of the soil type within the Phase II EAA as artificial fill.

6.1 Soil Types

The SCS identified the following soils within the adjacent areas of Baltimore County.

6.1.1 Alluvial land (Av)

Alluvial land consists of soil material washed from uplands and deposited on floodplains. This deposition has been especially rapid along streams that drain urban and suburban areas and discharge into tidal waters. The materials that make up alluvial land are mostly sandy because much of the finer material has been carried into stream estuaries. Generally, this land is poorly drained to very poorly drained. Most of the soil is flooded at least twice a year. Urban areas flood more frequently whereas wooded areas flood less frequently (Soil Conservation Service, 1976). The SCS lists alluvial land as a hydric soil.

6.1.2 Made Land (Ma)

Made land consists of land areas that have been created by man. Made land is mapped in Baltimore County just east of the Phase II EAA. As shown on Figure A-8, the regional geological map identifies a majority of the Phase II EAA north of the Superfund Site as "Artificial Fill". The Maryland Geologic Survey defined the artificial fill in this area, "... heterogeneous materials such as rock, unconsolidated sediment, slag, refuse, and dredge spoil. The thickness ranges from 1 to 25 feet." It is assumed that this artificial fill is a continuation of the adjacent made land soils mapped by the SCS in Baltimore County.

Made land is defined as:

"Made Land (Ma)...made from industrial wastes, mostly slag and cinders. Other areas consist of spoil material from excavations, or hydraulic fill from harbor or channel deepening. Some industrial wastes, incinerator ash, and miscellaneous solid garbage wastes have been covered by hydraulic fill, especially in areas that were originally tidal marshes" (SCS, 1976).

Large areas of the made land soils have been used for industrial sites, railroad yards, airports, parking lots, and miscellaneous buildings, including some homes. This land is so variable in nature that onsite investigation is needed to determine suitabilities and limitations for proposed use (SCS, 1976).

6.1.3 Loamy and Clayey Land

Loamy and clayey land consists mainly of nearly level to steep, very old clay deposits overlain by more recent deposits of sandy loam, loam, or silt loam on the upper part of the Coastal Plain. There is a wide range of variability in the thickness and texture of the mantle, and in the depth to and color of the clay. In some areas, the surface loamy mantle contains some smooth gravel as much as two inches in diameter or fragments of ironstone may be present where the mantle is sandy loam (SCS, 1976).

The loamy mantle varies in color from gray to yellow and brown to almost red. It ranges from nearly absent to several feet in thickness. It rests abruptly over clay, but is not related in any way to the clay. In places, the clay is slightly sandy. The clay can be of almost any color or mixture of colors. The clay can be almost at the surface or exposed if the mantle has been removed by erosion or other means, or it can be deeply covered by loamy material (SCS, 1976).

The clay is very plastic and sticky and characterized by poor stability. The clay frequently slides, slumps, or flows down the surface of cuts onto roads or other areas below it, and stability is even poorer where the clay has been disturbed by land-leveling or by filling (Soil Conservation Service, 1976).

Loamy and clayey land is well drained and the depth to high water table is greater than five feet. The permeability ranges from less than 0.20 to 6.3 inches per hour and the pH ranges from 4.0 to 5.0 (SCS, 1976). This soil type is predicted to be present in the lower central portion of the Phase II EAA (Figure A-8).

7.0 TOPOGRAPHY

Relief in the Phase II EAA is approximately 80 feet with a generally level to gently sloping topography, except in the southwest corner where steep slopes are encountered. Elevations range from a high of approximately 100 feet above mean sea level (MSL) in the southwestern corner of the Phase II EAA to a low of approximately 20 feet along Herring Run. The general slope of the Phase II EAA is approximately 3.8 percent to the northeast with a peak of about 95 feet in the most southwestern tip of the Phase II EAA. A topographic map is presented in Figure A-11.

The topographic contours shown on Figure A-11 are based on the USGS Baltimore East 7.5-minute quadrangle dated 1953 and photo-revised in 1966 and 1974. The contours shown in Figure A-11 may not represent currently existing conditions within the Phase II EAA due to filling and construction activities associated with urban development.

8.0 LAND USE

8.1 Land Use Types

Approximately 34 acres or 65 percent of the Phase II EAA was identified as urban and built-up land. Urban and built-up land use types that occur within the Phase II EAA are presented in Figure A-12 and include:

- Light Industrial
- Transportation, Communications, and Utilities
- Commercial and Services

Open Space (Section 8.1.4) is the only land use type other than urban and built-up identified within the Phase II EAA.

Using the list of property owners and the property boundary maps developed by the City of Baltimore, HLA developed a property boundary map for the Phase II EAA, which is presented in Figure A-13. Table A-4 lists the property owners and the location of the property within the Phase II EAA.

8.1.1 Light Industrial

Light industrial generally focuses on design, assembly, finishing, processing, and packaging of products (Anderson *et al.*, 1976). Light industrial land occurs in the Phase II EAA at the PICORP property and the land adjacent to the east of the PICORP property between Kane Street and North Point Boulevard. In addition, several properties between North Point Boulevard and Herring Run that overlie the storm water drainpipe, and may possibly be contributing effluent to the system, can be considered light industrial areas. Industrial land use areas comprise approximately 26 acres or 50 percent of the Phase II EAA.

8.1.2 Transportation, Communications, and Utilities

Transportation, communications, and utilities, to some degree, occur within all of the urban and built-up categories. Land types in this category include highways, railways, and areas associated with these uses. Communication and utilities areas such as those involved in processing, treatment, and transportation of water, gas, oil, and electricity and areas used for airwaves communications are also included (Anderson *et al.*, 1976). This land use within the Phase II EAA includes the Conrail Yard, Interstate 95, and other smaller roads and railways. This area comprises approximately 7 acres or 13 percent of the of the Phase II EAA.

8.1.3 Commercial and Services

Commercial and services areas are those used predominantly for the sale of products and services (Anderson *et al.*, 1976). Although not directly part of the Phase II EAA, the automobile junkyard adjacent to the south of Herring Run and overlying the stormwater drainage system can be considered commercial and services, and there is indication that there is at least one manhole in the junkyard that leads into the stormwater drainage system. Commercial and services land comprises approximately 1 acre or 2 percent of the Phase II EAA.

8.1.4 Open Space

Open space within the Phase II EAA includes fields, wetlands, recreational fields, lawns, and the Superfund Site. Approximately 18 acres or 35 percent of the Phase II EAA is occupied by open space land use.

8.2 Sites Of Potential Environmental Concern

8.2.1 OU-2 Study Area

As discussed in the Phase II Assessment Report (Section 2.0) the OU-2 Study Area is approximately 40 acres in size and includes the Superfund Site and areas north, east and west of the Superfund Site which have been identified in the Consent Order as being part of the original landfill operations (Figure A-12). The OU-2 Study Area includes portions of the Roadway Express Inc. property west of the Superfund Site fence, the PICORP property across East Lombard Street to the north, the Patterson High School athletic fields east of the Superfund Site, and additional properties adjacent to the east of the PICORP facility and the Patterson High School athletic fields.

PICORP

The PICORP property is located at 6508 East Lombard Street in Baltimore, Maryland, and occupies approximately 17 acres of land entirely within the OU-2 Study area. This area was the principal area of the Kane and Lombard landfill. The site is currently utilized for the storage and maintenance of shipping containers (NUS Corporation, 1991).

The results of previous sampling at the site revealed the presence of heavy metals, polynuclear aromatic hydrocarbons (PAHs), organics, chlorinated organics, and pesticides. NUS identified several areas of dumping located on the northern slope of the property. The materials identified include rusted drums, construction-type wastes and tires (NUS Corporation, 1991).

Surface drainage at the site is generally from the south to the north into unnamed intermittent stream B (Figure A-3), located at the bottom of the embankment between the site and the Conrail Yard. The roughly rectangular, bermed area near the base of the embankment was reportedly constructed to control runoff (Figure A-5). Herring Run is located approximately 1,800 feet northeast of the northeastern corner of the site.

Roadway Express Inc.

Roadway Express Inc. is located along East Lombard Street in the western portion of the OU-2 Study Area. The site is listed as RCRA Small Generator that produces less than 100 kg/month of non-acutely hazardous waste. The site is also listed as having three USTs containing diesel, gasoline, and heating oil (Vista National Radius Profile, 1994).

8.2.2 Other Sites

Four sites not known to be related to the historical landfill operations within the OU-2 Study Area which are within or in the vicinity of the Phase II EAA have been identified as being of potential environmental concern. The approximate locations of these sites are presented in Figure A-14 and they include:

- Colgate Pay Dump
- Contract Applications Inc.
- Conrail Orangeville Yard
- International Petroleum Corp.

Colgate Pay Dump

The Colgate Pay Dump, located on the north shore of Herring Run, straddles the Baltimore City/Baltimore County line and is bisected by Interstate 95. The site is approximately 50 acres in size. The property was used as a dump between 1949 and 1971. Beginning in 1971, approximately 200,000 cubic yards of refuse was removed and consolidated into five separate mounds onsite in order to construct the Interstate 95 interchange. An additional 40,000 cubic yards of commercial waste from the Bay View area of Baltimore were placed in the Colgate Pay Dump mounds (Maryland Hazardous and Solid Waste Management Administration, 1989).

The Colgate Pay Dump was a commercial and industrial dump that accepted loads of rubbish, debris, metal and glass scraps, paper, wood, brush, plastics, rags, and tires. The dump also accepted loads of highly combustible materials, industrial wastes, dumped acids, alkaline solids, and caustic soda. Pesticides and rodenticides were applied, but there is no information on quantity and method of disposal or application. Underground fires, open burning, foul odors, surface outbreaks of leachate, and underground gas pockets were reported to be problems at the dump (Maryland Hazardous and Solid Waste Management Administration, 1989). The limited field reconnaissance conducted by HLA in June 1994 identified severe erosion of the landfill mound along the northern bank of Herring Run and trash and debris protruding from the banks.

The Maryland Department of the Environment/Hazardous and Solid Waste Management Administration (MDE/HSWMA) was contracted to do a Site Investigation (SI) on the Colgate Pay Dump under EPA Contract No. MD88-0526-0408. On March 29, 1985 MDE/HSWMA conducted a Preliminary Assessment for the SI that was performed in September 1988. Debris and drums were observed protruding from the mounds during the SI. Erosion of the mounds due to four-wheel drive vehicles was found to be serious; several ruts and trenches have eroded the slopes on the south side of the mounds near the banks of Herring Run. The site was recommended for NFRAP under CERCLA since it did not meet the Hazardous Ranking System cutoff as a Superfund Site (Maryland Hazardous and Solid Waste Management Administration, 1989).

Three wells were installed by the MDE in September 1988, and groundwater and soil samples were taken that same month. Laboratory results indicated the presence of metals, particularly heavy metals, in the groundwater and soils. SVOCs, PAHs, and PCBs are also indicated as being of concern. However, MDE reports concern over the validity of the data (Maryland Hazardous and Solid Waste Management Administration, 1989).

Deep groundwater is assumed to flow to the East, while shallow groundwater flows south toward Herring Run. Colgate Pay Dump is located within the 100-year floodplain of Herring Run. Surface water runoff is generally to the south, discharging directly into Herring Run. Concerns include freshwater wetlands in excess of 5 acres at the edge of the site and coastal wetlands in excess of 5 acres approximately 400 feet from the site (Maryland Hazardous and Solid Waste Management Administration, 1989).

Contract Applications Inc.

Contract Applications Inc. is located along North Point Boulevard just north of the Conrail Yard. The site is listed as a RCRA Large Generator site that generates at least 1000 kg/month of non-acutely hazardous waste or 1 kg/month of acutely hazardous waste (Vista National Radius Profile, 1994).

Conrail Orangeville Yard

The Conrail Yard is located in the western portion of the Phase II EAA just north of the OU-2 Study Area. The railroad tracks run east/west through the Phase II EAA. The site is listed on CERCLIS State Priority List, which lists railyards that have been identified by EPA as having potential PCB contamination (Vista National Radius Profile, 1994).

A drum storage area and an above ground storage tank associated with the Conrail Yard were located along the southern edge of the Conrail driveway, immediately adjacent to the intermittent drainage swale in which sampling locations EA8 and EA9 are located (see Appendix B). Runoff from these storage areas discharges to the intermittent drainage swale. Evidence of leakage and/or spillage (black stained soil and free product on the ground and on standing water in the adjacent drainage swale) was noted from these sources prior to and during HLA sampling activities. HLA field personnel observed Conrail personnel removing the drums and covering the stained soil with crushed stone on October 21, 1994. In addition, HLA field personnel observed the burning of materials in drums near the drainage swale on October 21, 1994.

During surveying activities on January 3, 1995, HLA field personnel observed a spill of petroleum product on the entrance driveway to the Conrail Yard near North Point Boulevard. The spill was approximately 20 square feet and appeared to be related to oil drained from a nearby backhoe. Runoff from this spill area would discharge to the adjacent drainage swale at a point just upgradient of sample location EA9 (see Appendix B). As discussed in Section 2.6, this drainage swale discharges to the local stormwater management system which terminates at Herring Run.

International Petroleum Inc.

International Petroleum Corp. is located along East Lombard Street west of the OU-2 Study Area. The site is listed as having two USTs containing diesel and heating oil (Vista National Radius Profile, 1994). As discussed in Section 8.3, this site has had at least one recent petroleum release.

8.3 Observed Discharge Events

HLA field personnel observed the discharge events described below within the Phase II EAA stormwater drainage system.

- On March 10, 1994, HLA field personnel observed an MDE Spill Response Team responding to an incident west of the Superfund Site. The activities observed included the placement of sorbent pads and a boom into drainage ditches. The Spill Team's activities appeared to be centered around the Roadway facility adjacent to the west side of the Superfund Site. HLA field personnel noted that there was a strong diesel-like petroleum smell throughout the OU-2 Study Area on this day. The Spill Report obtained from the MDE states that approximately 15 gallons of water mixed with used motor oil were spilled the previous night in the parking lot of International Petroleum Corporation from an open valve on a truck. According to MDE records, the spill was contained outside the Phase II EAA. The spill report is presented in Appendix E.

- On October 20, 1994, HLA field personnel working in the area of the open excavated catch basin on the north side of the PICORP property (Appendix F, Volume 2) noted a sudden and marked increase in the flow from the stormwater pipeline entering the catch basin from the south. The increased flow was approximately six inches deeper than the base flow of less than one inch observed several minutes earlier. The increased flow decreased steadily over a period of approximately 30 minutes. There was no rain occurring at the time and all rainshowers in the area had ended at least four hours prior to this observed event.

- On November 3, 1994, while sampling water discharging from the five foot by ten foot stormwater pipe at Herring Run, a sudden and marked increase in the flow from this pipe was noted. The base flow observed a few minutes earlier was less than one inch deep and approximately three feet wide. The increased flow was approximately two inches deep and eight feet wide. The weather was sunny and rain was not noted in the area. Also, a distinct odor resembling that of chlorine was noted in association with this discharge. A small fish (approximately three inches long) was washed from the pipe with this increased discharge.

- As described in Section 2.6, the stormwater drainage system video survey identified liquids discharging from manholes on the Conrail Yard and from a 24 inch service pipe connected into one of these manhole chambers. There had been no rain the day of this observation.

- During Phase II Assessment wetland delineation activities on December 2, 1994, HLA personnel identified two 24 inch concrete pipes discharging from the Roadway Express facility into the adjacent wetlands. The pipes are located on the north side of the Roadway facility, east of the facility's parking lot. Although the discharges from these pipes were small (trickle), there had been no rain the day of this observation.

9.0 REFERENCES

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TABLE A-1
WETLAND TYPES WITHIN
THE PHASE II EAA

Wetland Habitat Type	Mapping Symbol	Approximate Acres	Percent of Total Phase II EAA	Ecological System
Palustrine Emergent	PEM	1.5	3	Palustrine
Riverine Intermittent Streambed	R4SB	0.5	1	Riverine
Riverine Lower Perennial Unconsolidated Bottom Permanent	R2UB1/2/3/H	1.0	2	Riverine
Riverine Lower Perennial Beach/ Bar Intermittently Seasonal	R2BB1/2C	0.5	1	Riverine
Riverine Lower Perennial Beach/ Bar Intermittently Flooded	R2BBJ	0.5	1	Riverine

AR301680

TABLE A-2
HABITAT TYPES WITHIN
THE PHASE II EAA

Habitat Type	Acres Present Within Phase II EAA	Percent of Total Phase II EAA
Urban and Built-Up (total)	34	65
light industrial	26	50
transportation, communication, and utilities	7	13
commercial and services	1	2
Wetlands (total)	4	8
palustrine emergent	1.5	3
riverine intermittent streambed	0.5	1
riverine lower perennial unconsolidated bottom permanent	1	2
riverine lower perennial beach/bar intermittently seasonal	0.5	1
riverine lower perennial beach/bar intermittently flooded	0.5	1
Rangeland (total)	14	27
herbaceous	13	25
mixed	1	2
Forest Land (total)	0.3	<1
deciduous	0.3	<1

NOTE:
All acreages and percentages are approximate

AR301681

TABLE A-3
PROBABLE SOIL TYPES
WITHIN THE PHASE II EAA

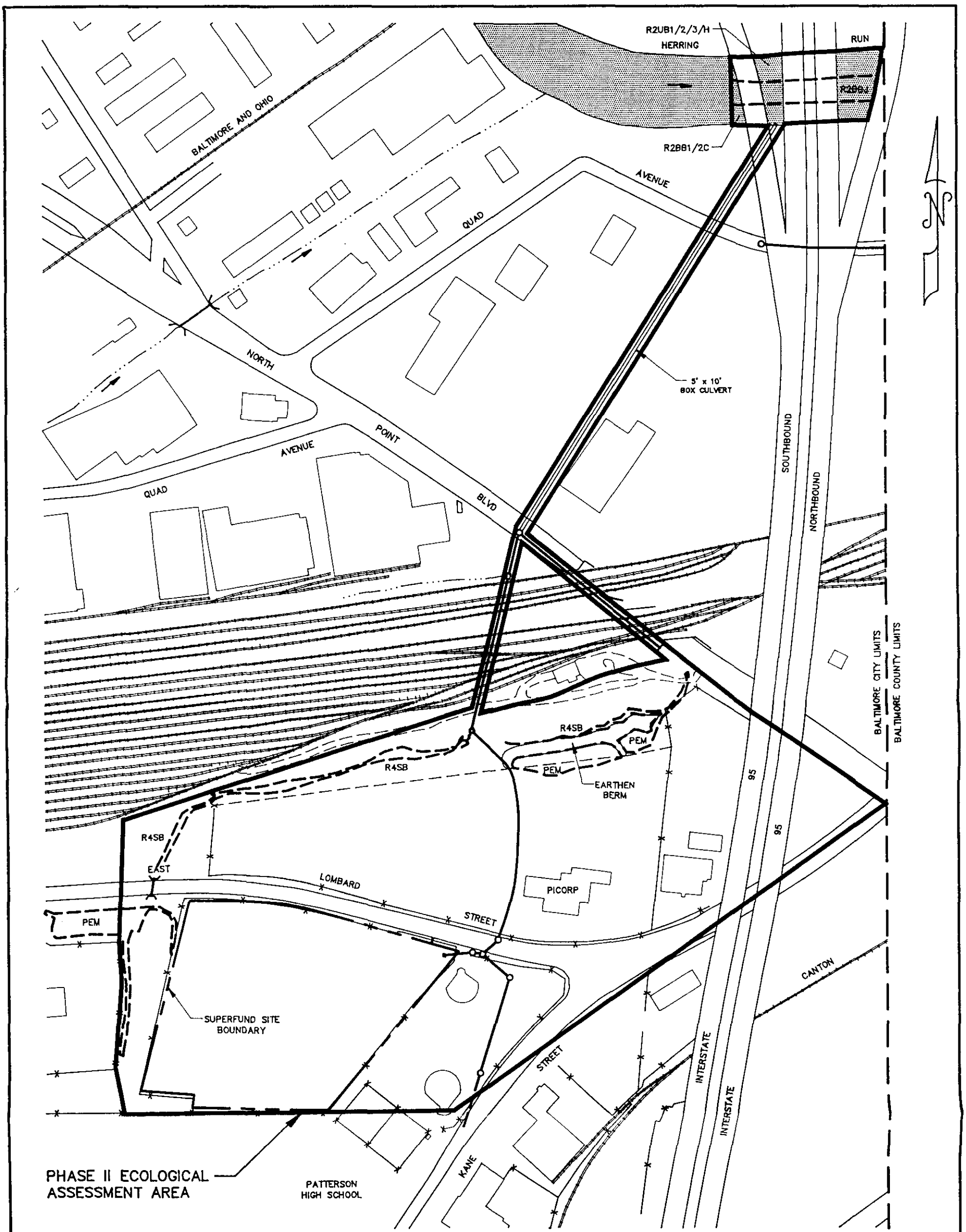
Soil Name	Soil Mapping Symbol	Drainage Description	Permeability (inches per hour)	Depth to Seasonal High Water	pH	Hydric Soils	Location of Hydric Soils
Alluvial Land	Av	poor to very poor	***	Low	NA	Yes	floodplains
Loamy and Clayey Land	***	well	0.2-2.0	>5	4.0-5.0	No	NA
Made Land	Ma	NA	NA	NA	NA	No	NA

Notes:
NA Not applicable
*** Information not available

TAE A-4
PROPERTY OWNERS WITHIN THE
AREA OF THE PHASE II EAA

Lot Number ID	Location	Property Owner	Municipal Code	Purchase Date	Approximate Acres
(26-18-6235A-ID#)					
1/3	317 North Point Boulevard	Goetzinger, Henry R. & Mabel M.	CWM 4170-466	3/31/82	2.26
4	NES North Point Boulevard	Industrial Enterprises Inc.	9803-83	5/26/55	2.48
5	501 North Point Boulevard	North Point Associates	SEB 1654-161	3/29/88	6.87
6/6a	6631 Quad Avenue	Sky Properties Partnership	SEB 2045-357	3/30/89	6.25
7	6701 Quad Avenue	Barnes Truck Line, Inc.	RHB 2366-58	5/2/68	4.64
8	6715 Quad Avenue	Louis J. Grasmick Lumber Co., Inc.	WA 3956-72	9/25/80	11.16
9	Between N. Point Blvd. & I 95	P.B. & W.R.R. Co.	NA	NA	5.92
10	Rear-6715 Quad Avenue	State of Maryland	WA 3713-428	1/17/79	0.46
11	50 Kane Street	Register Photo Services, Inc.	RHB 3597-819	4/11/78	1.82
11a	320 North Point Boulevard	320 North Point Boulevard	SEB 2033-156	3/16/89	6.38
(26-18-6235B-ID#)					
10	Rear-Quad Avenue	NA	NA	NA	19.36
17	6700 Quad Avenue	Bonnett, William R. & Regina V.	SEB 24098-518	3/8/90	2.05
18/19	6716 Quad Avenue	Tranovich, Stephen R. & Marie C.	SEB 2190-142	8/9/89	4.01
(26-18-6235-ID#)					
1H	North Point Boulevard	Baltimore & Ohio Railroad	NA	NA	3.79
1/8	801/823 North Point Boulevard	Meisel and Cohen Properties	RHB 3260-806	8/14/77	10.52
9	6709 Pulaski Highway	Mayor & City Council	RHB 2504-351	4/22/69	5.69
16	6608/6616 Quad Avenue	NA	NA	NA	1.02
17	6620 Quad Avenue	McCarney, Dennis R. & Margaret A.	SEB 2680-55	11/27/90	3.87
18	6624/6630 Quad Avenue	Yellot, Ann Lux Benet (etal)	WA 3978-533	11/18/80	1.14
19	6640 Quad Avenue	6640 Quad Avenue, Inc.	SEB 2148-567	6/30/89	2.35
20	701 North Point Boulevard	Mayor & City Council	MLP 9332-26	11/16/53	1.80
21/22	719 North Point Boulevard	Painter, Charles F.	RHB 3054-523	8/21/73	2.96
23/24	721/723 North Point Boulevard	Painter, Charles F.	RHB 2535-490	6/27/69	6.85
(26-17-6333-ID#)					
5c	400/402 North Point Boulevard	P.B. & W.R.R. Co.	MLP 6375-563	10/10/42	1.82
5d	406 North Point Boulevard	P.B. & W.R.R. Co.	NA	NA	0.68
19	East Lombard Street	P.B. & W.R.R. Co.	NA	NA	16.69
19a	6001 East Lombard Street	Mayor & City Council	SEB 1084-400	12/1/86	5.33
20	East Lombard Street	NA	NA	NA	2.28
21/25	East Lombard Street	NA	NA	NA	8.40
26/27	6500 East Lombard Street	Picorp Baltimore Realty Development Co.	WA 4024-224	3/11/81	16.39
28	100 Kane Street	Mayor & City Council (Patterson High School)	MLP 8694-203	1/29/52	5.98
(26-18-6242E-ID#)					
1i	6501 Erdman Avenue	Enviro-Industries, Inc.	SEB 3774-434	7/13/93	3.26
1J/1K	North Point Boulevard	NA	NA	NA	2.14
2	700 North Point Boulevard	Obrecht, P. Frederick	9911-440	9/20/55	1.83
3/3a	Between N. Point & Erdman Ave.	NA	NA	NA	0.15
3b	660 North Point Boulevard	Obrecht, P. Frederick	JFC 2344-619	3/7/68	0.23
3c	650 North Point Boulevard	Obrecht, P. Frederick	9911-440	9/20/55	0.89
3d	500 North Point Boulevard	500 North Point Road Associates	SEB 3535-38	1/21/93	5.30
3e	North Point Boulevard	NA	NA	NA	1.05
5	6401 Quad Avenue	Berlin Associates	CWM 4160-487	3/1/82	1.14
6	6501 Quad Avenue	Obrecht, P. Frederick	10253-331	10/16/56	2.05
7/8	6519 Quad Avenue	Quad Avenue Limited Partnership	SEB 858-309	4/28/86	3.53
10	North Point Boulevard	NA	NA	NA	0.07

Appendix A



WETLANDS LEGEND

R2BB1/2C	RIVERINE LOWER PERENNIAL BEACH /BAR INTERMITTENTLY SEASONAL	PEM	PALUSTRINE EMERGENT
R2BBJ	RIVERINE LOWER PERENNIAL BEACH /BAR INTERMITTENTLY FLOODED	R4SB	RIVERINE INTERMITTENT STREAMBED
R2UB1/2/3/H	RIVERINE LOWER PERENNIAL UNCONSOLIDATED BOTTOM PERMANENT		

LEGEND

	BUILDING		RAILROAD
	INTERMITTENT STREAM		FENCE
	UNPAVED ROAD	PEM	WETLAND DIVIDE AND DESIGNATION

0 300 600 FT.

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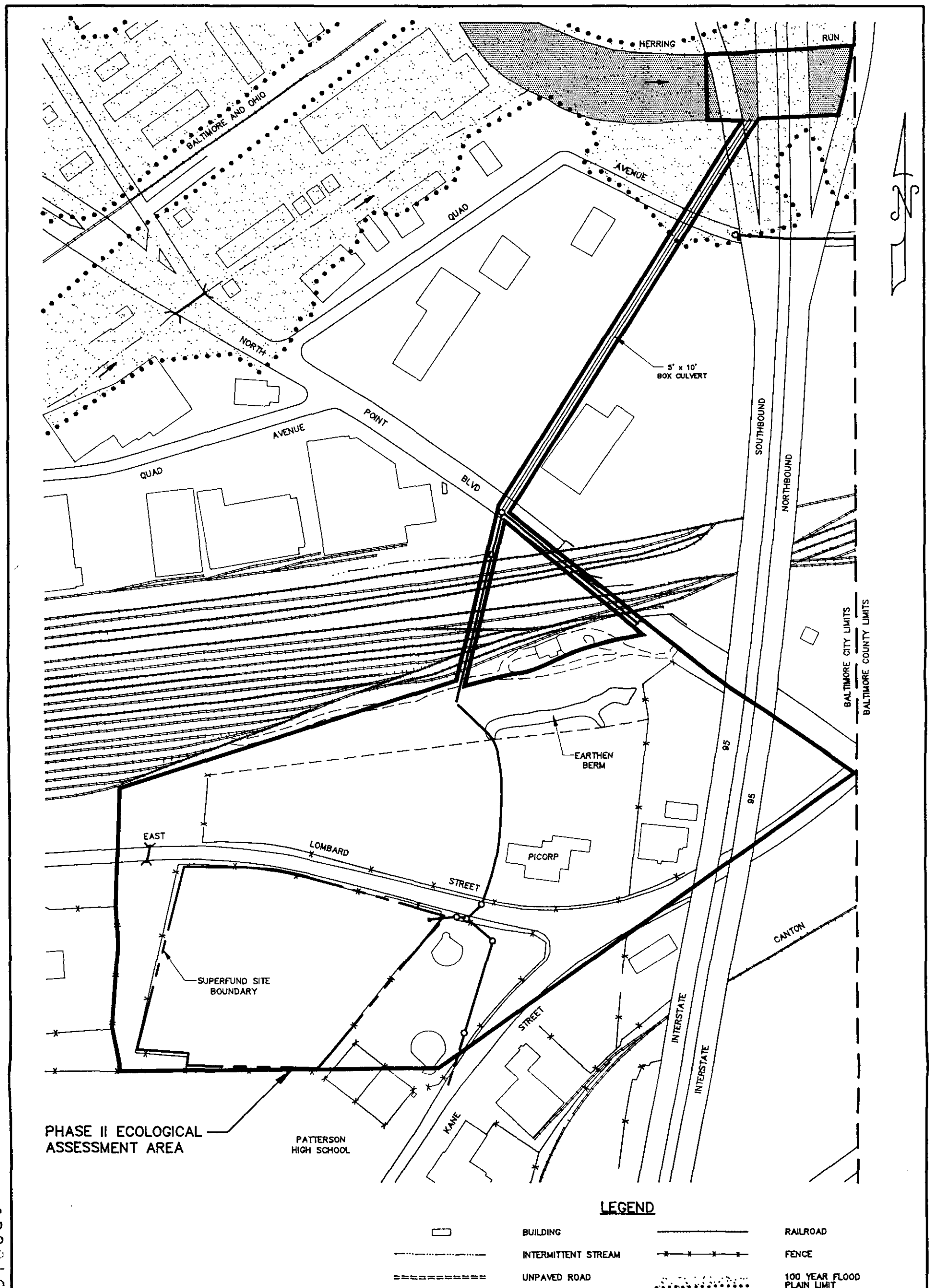
WETLANDS BOUNDARIES MAP

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE
A-1

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2WET	3/14/95	

AR301685



SOURCE: FEDERAL EMERGENCY MANAGEMENT AGENCY FLOOD INSURANCE RATE MAPS

0 300 600 FT.

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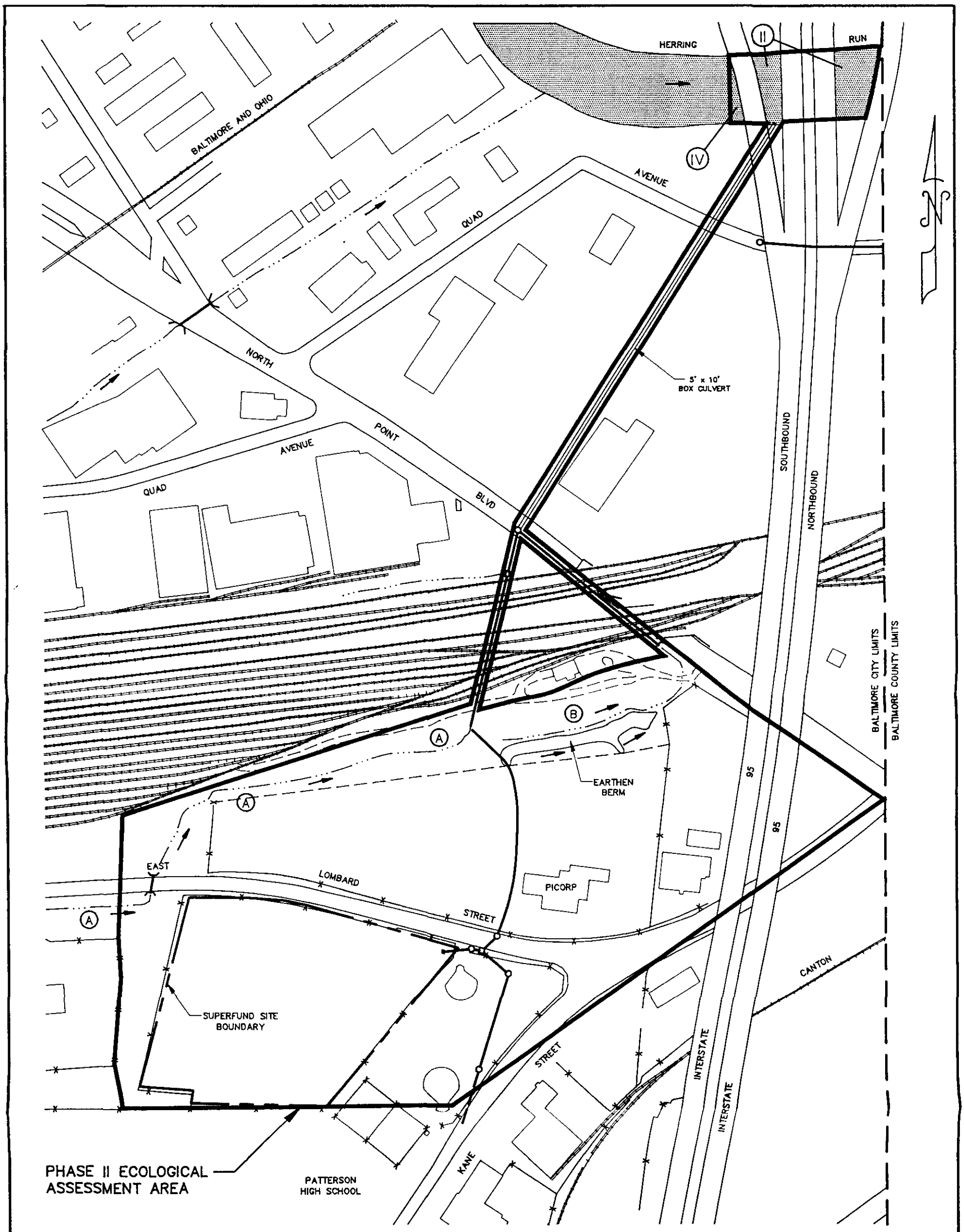
100 YEAR FLOODPLAIN MAP

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE
A-2

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		EAA2FLD	3/14/95	

AR301686



LEGEND

▭	BUILDING	═══	RAILROAD	Ⓑ	UNNAMED INTERMITTENT STREAM 2
—·—·—	INTERMITTENT STREAM	×—×—×	FENCE	(II)	SHELLFISH HARVESTING WATERS
= = = =	UNPAVED ROAD	Ⓐ	UNNAMED INTERMITTENT STREAM 1	(IV)	RECREATIONAL TROUT WATERS

SOURCE: DESIGNATED WATER USES: CODES OF MARYLAND REGULATIONS 26.08.02, WATER QUALITY

0 300 600 FT.

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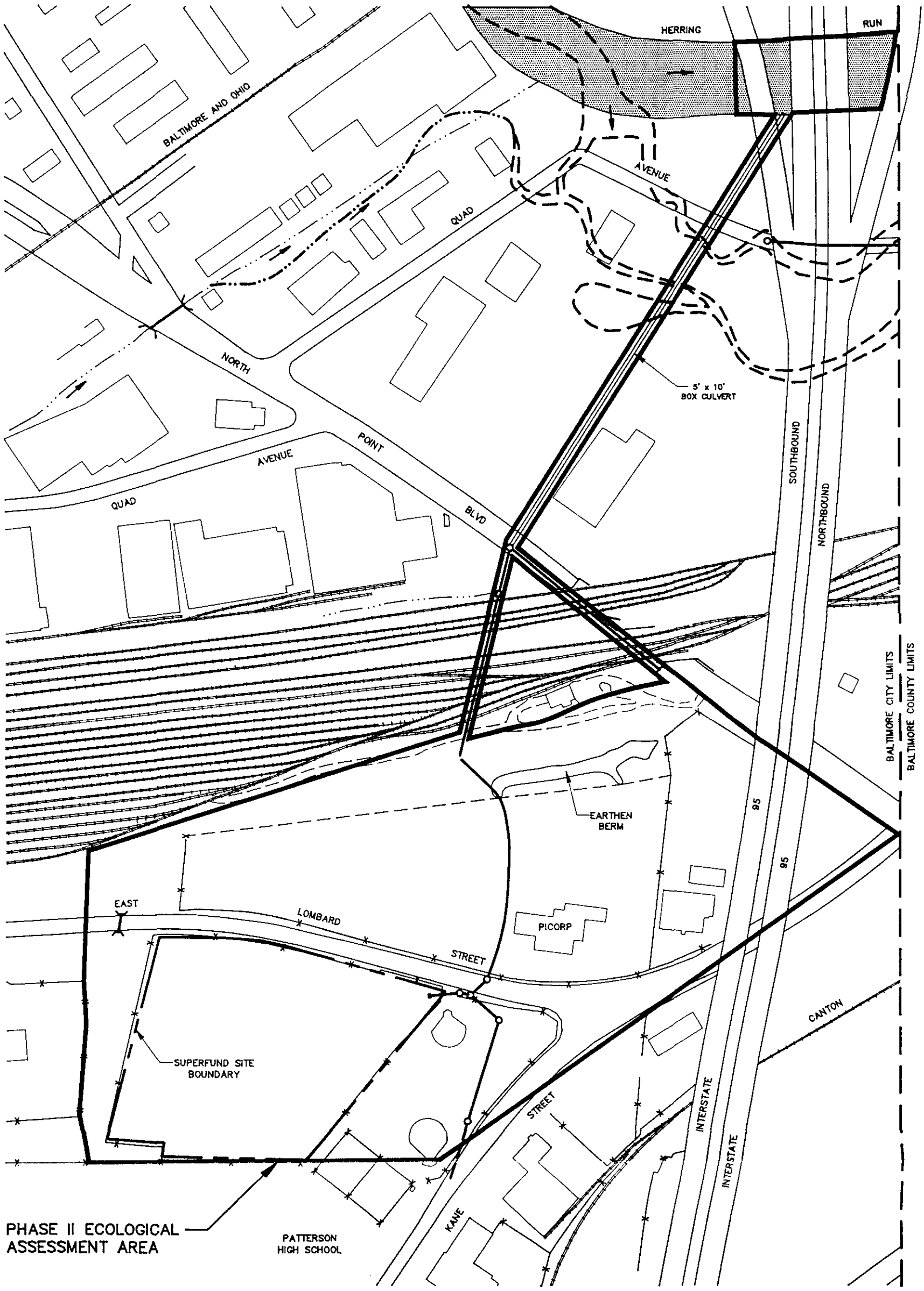
WATERWAYS AND DESIGNATED WATER USES MAP

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE A-3

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		EAA2STRM	3/14/95	

AR301687



LEGEND

▭	BUILDING	—×—×—×—	FENCE
—···—···—	INTERMITTENT STREAM	——··——	HISTORIC STREAM
= = = = = =	UNPAVED ROAD	— — —	HISTORIC CHANNEL LOCATION OF HERRING RUN & ASSOCIATED WATERWAYS
———	RAILROAD		

SOURCE: CITY OF BALTIMORE DEPARTMENT PUBLIC WORKS BUREAU OF SEWERS AND STORMWATER MAPPING 1927–1959 WITH UPDATED REVISIONS

0 300 600 FT.

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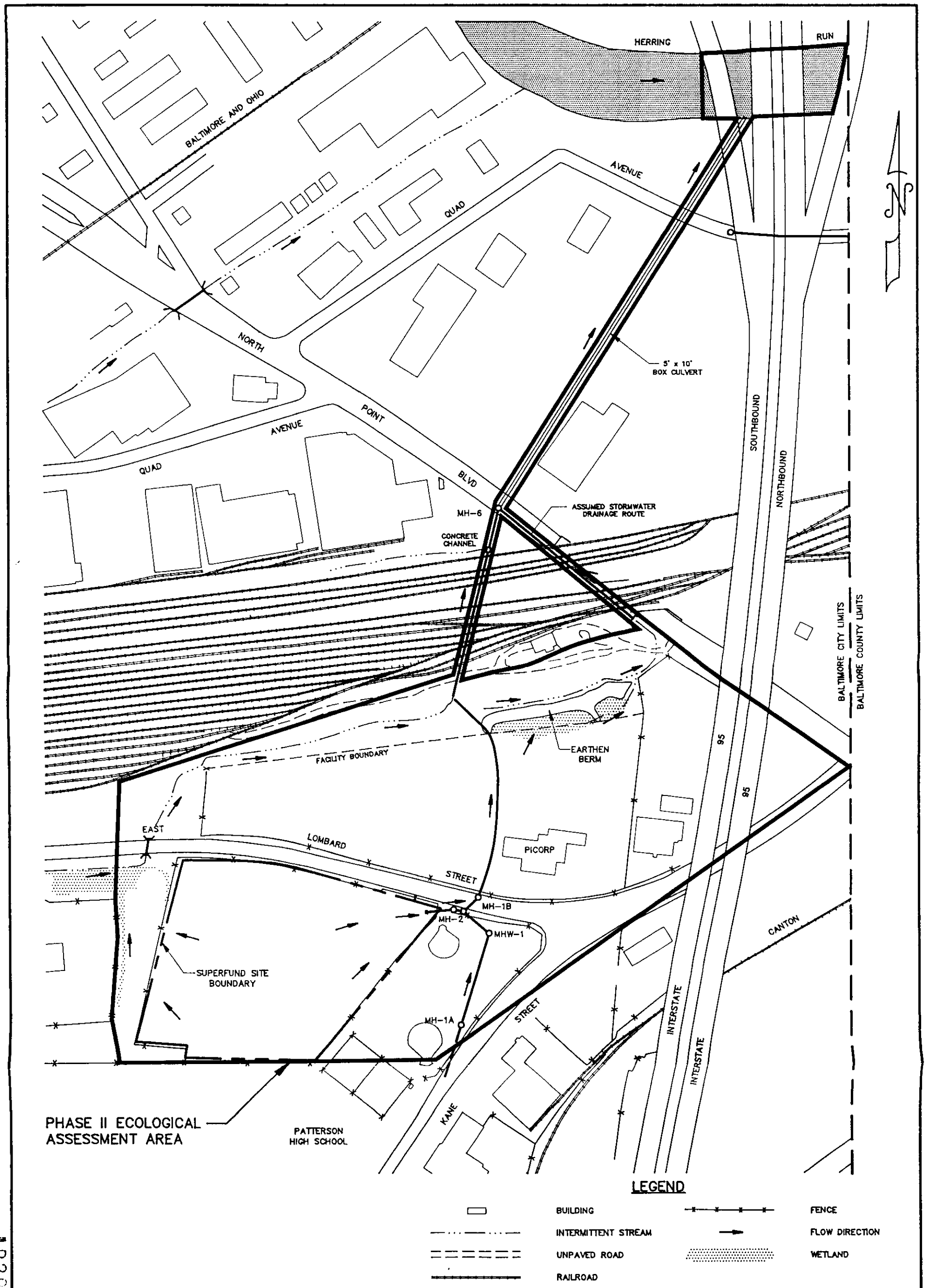
HERRING RUN PRIOR TO CHANNELIZATION

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE A-4

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		EAA2HERR	3/14/95	



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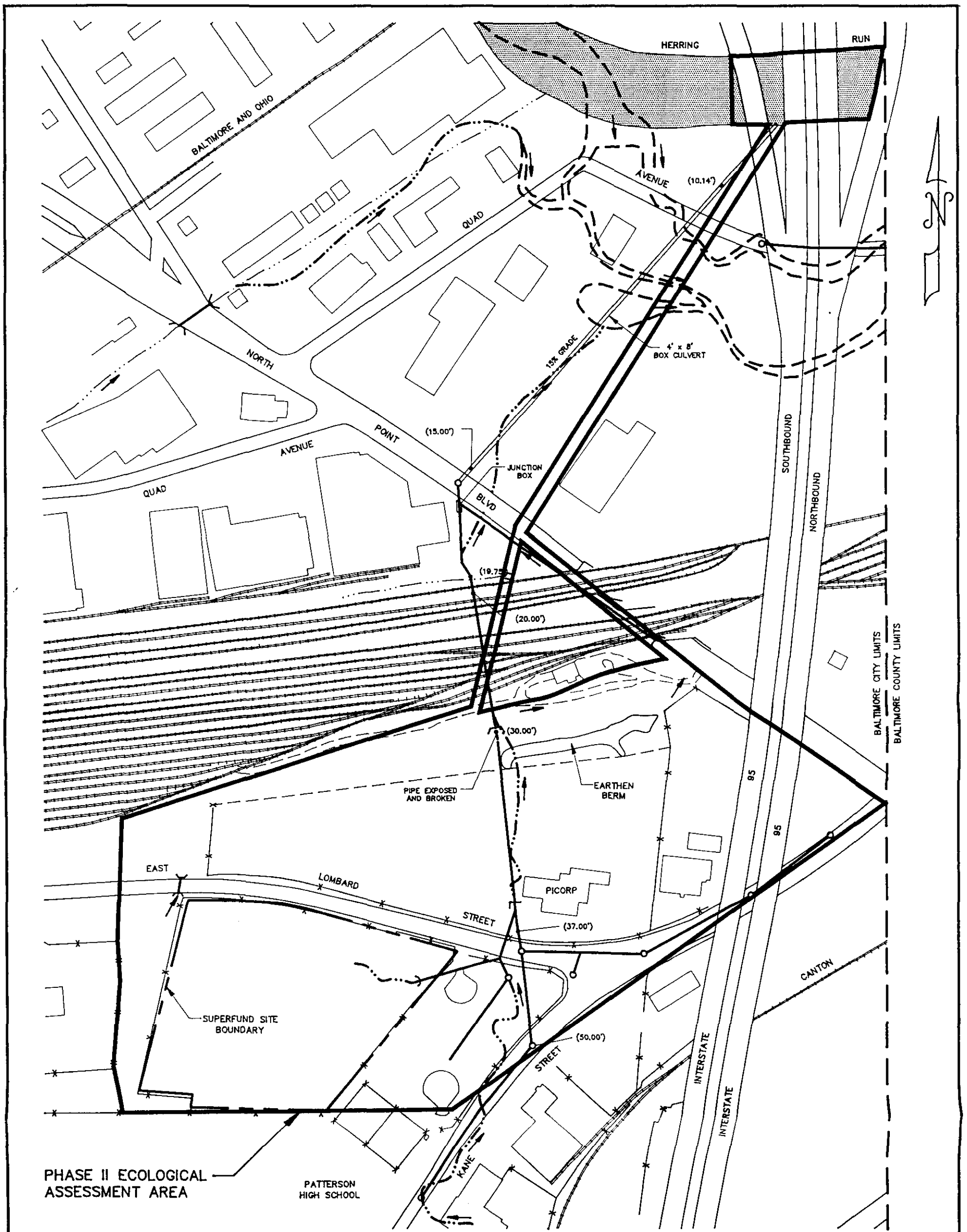
GENERALIZED STORMWATER DRAINAGE SYSTEM

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE
A-5

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2DRN	3/14/95	

AR301689



NOTE: CITY OF BALTIMORE DEPARTMENT OF PUBLIC WORKS BUREAU OF SEWERS & STORMWATER MAPPING 1927-1959 WITH UNDATED REVISIONS

0 300 600 FT.

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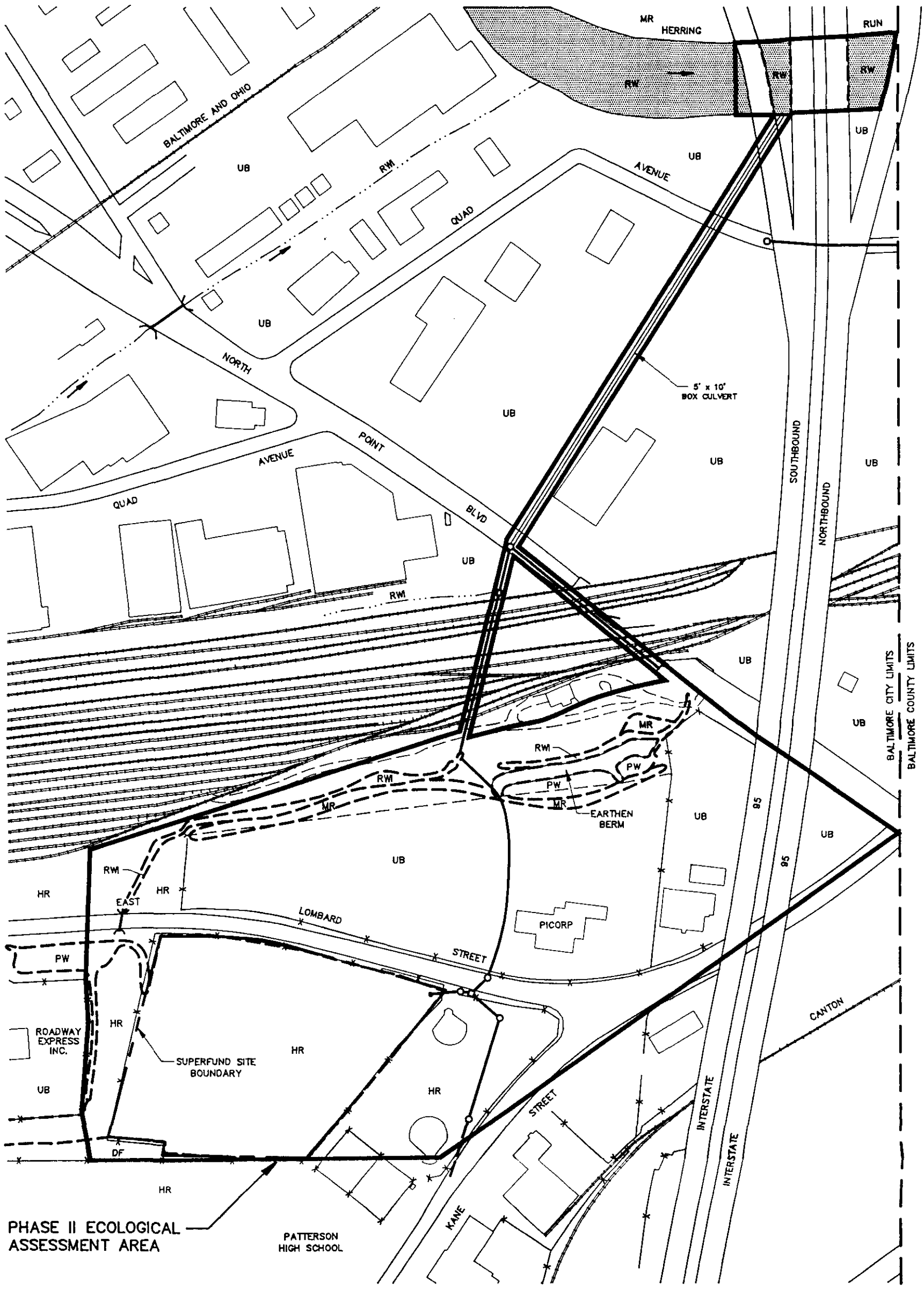
STORMWATER DRAINAGE SYSTEM AS MAPPED BY THE CITY OF BALTIMORE

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE A-6

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2DRN2	3/14/95	

AR301690



HABITAT LEGEND

DF	DECIDUOUS FOREST	PW	PALUSTRINE WETLANDS
HR	HERBACEOUS RANGELAND	RWI	RIVERINE WETLANDS INTERMITENT
MR	MIXED RANGELAND	UB	URBAN AND BUILT-UP

LEGEND

▭	BUILDING	———	RAILROAD
—·—·—	INTERMITTENT STREAM	—×—×—	FENCE
==========	UNPAVED ROAD	— — DFL — —	HABITAT DIVIDE AND DESIGNATION

0 300 600 FT.

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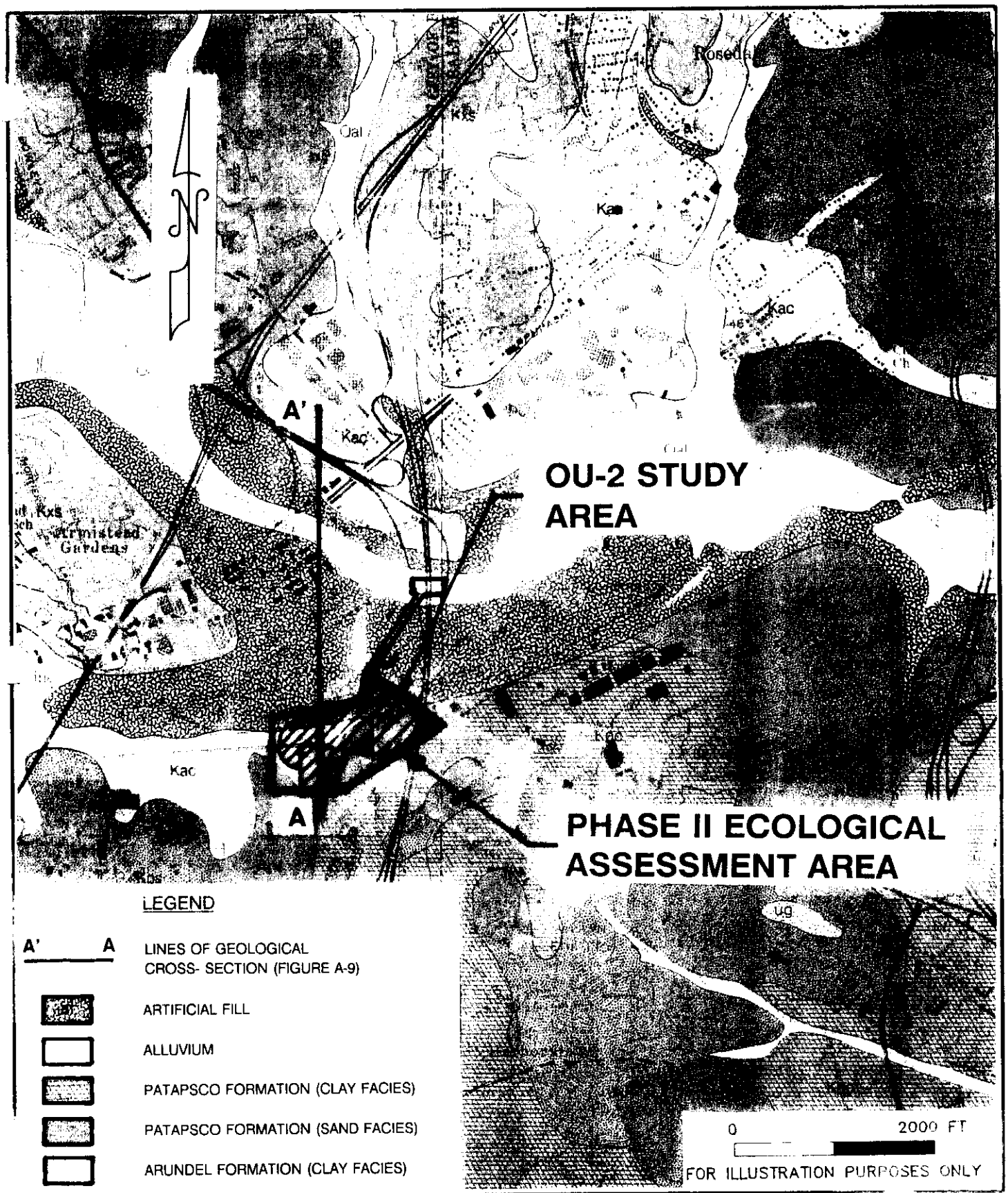
GENERALIZED HABITAT MAP

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE
A-7

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		EAA2HAB	3/14/95	

AR301691



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REGIONAL GEOLOGICAL MAP

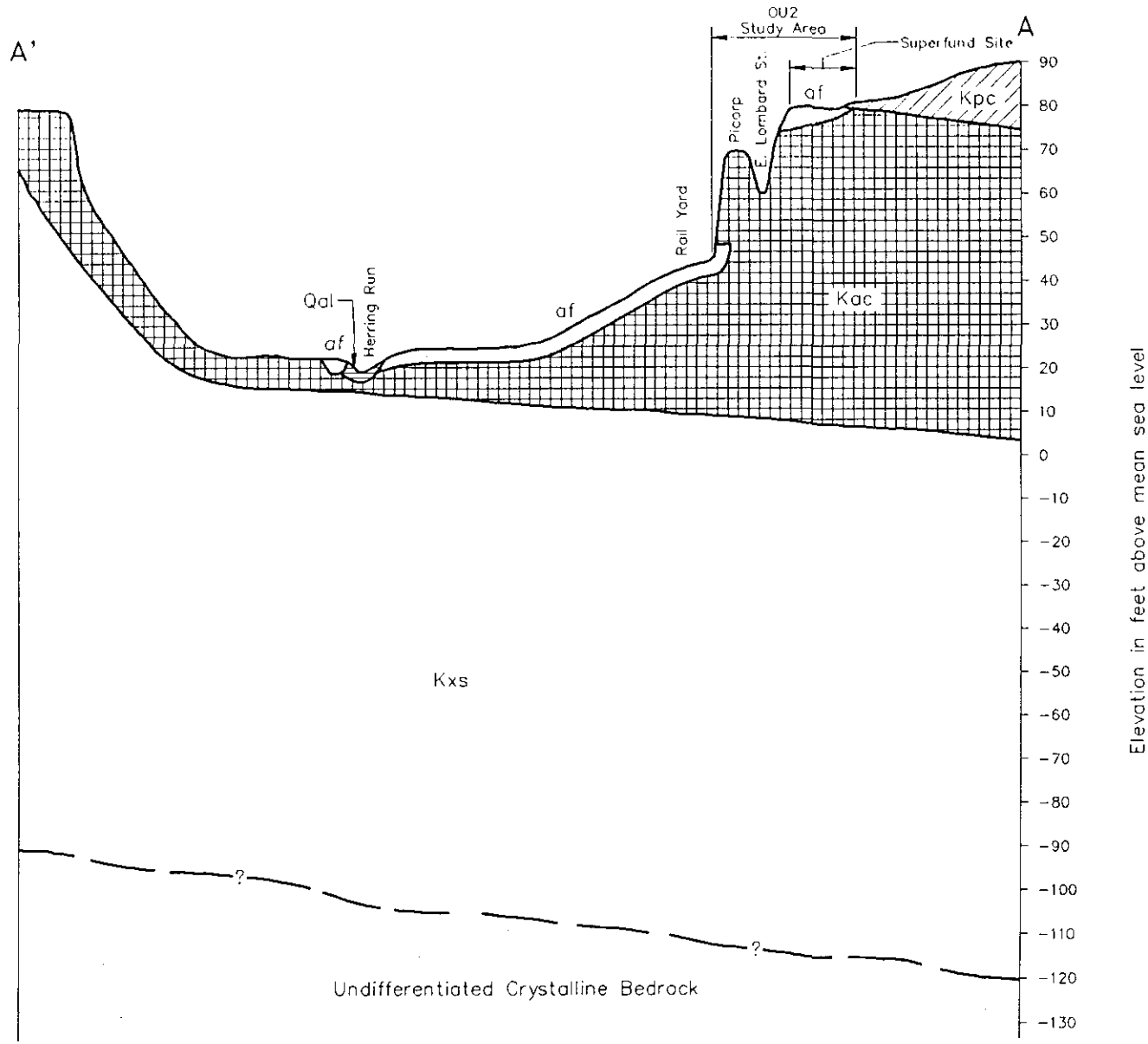
KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE A-8

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.03.4		S-BASE	7/29/94	

AR301692

SOURCE: Geological Map of the Baltimore East Quad, Maryland (1979) by J. Reinhardt & W.P. Crowley



LEGEND

- af; Artificial Fill
- Qal; Alluvial Deposits
- Kpc; Patapsco Formation (Clay Facies)
- Kac; Arundel Clay
- Kxs; Patuxent Formation
- Bedrock

NOT TO SCALE

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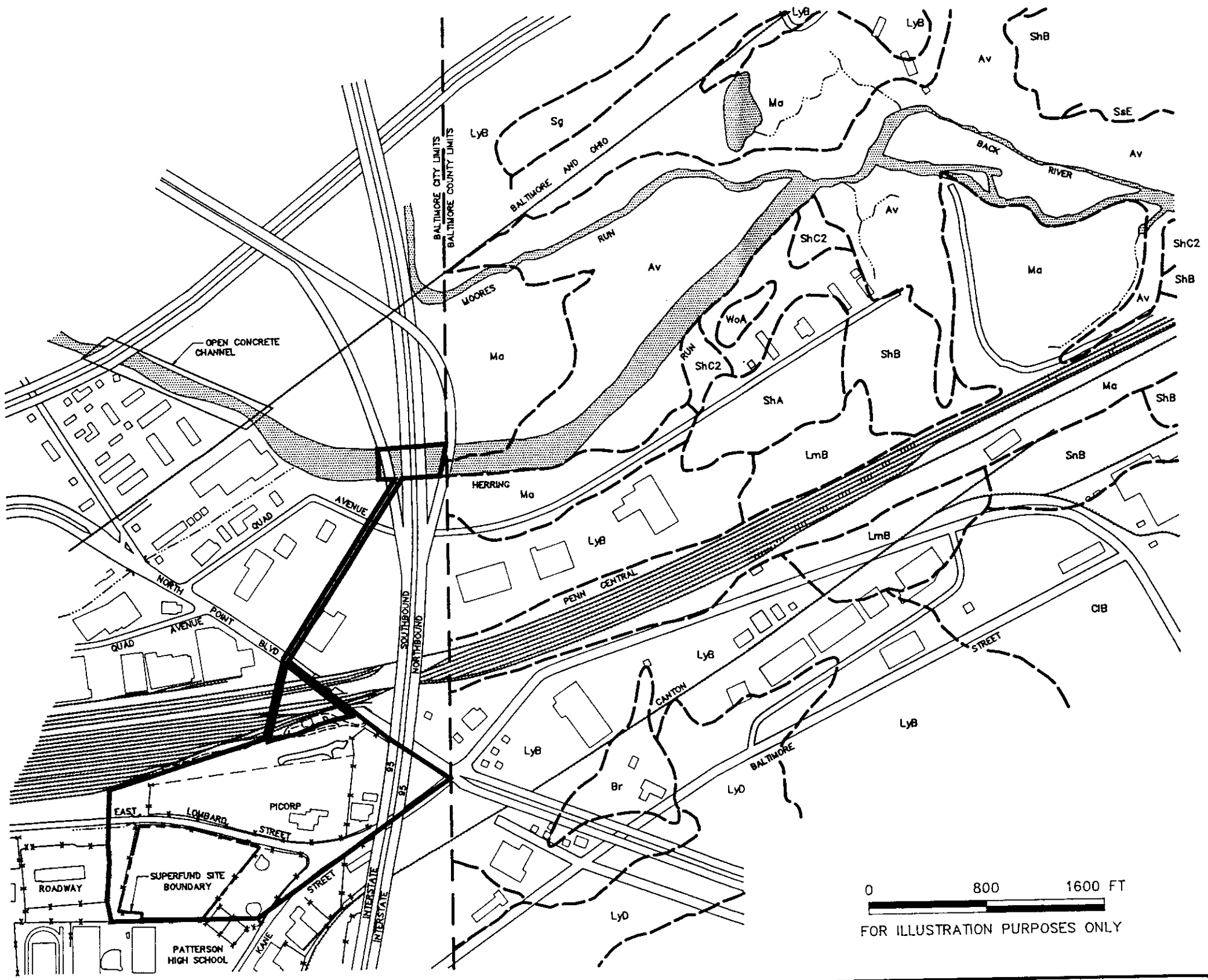
REGIONAL GEOLOGICAL CROSS-SECTION

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE A-9

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		23573A05	3/10/95	

ARS01693



N

LEGEND

- BUILDING
- INTERMITTENT STREAM
- UNPAVED ROAD
- RAILROAD
- FENCE
- SURFACE WATER
- Ma — SOIL DIVIDE AND DESIGNATION

0 800 1600 FT

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SOILS LEGEND

Av	ALLUVIAL LAND
Br	BARCLAY SILT LOAM
ClB	CHILLUM–URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES
LmB	LENOIR SILT LOAM, 0 TO 5 PERCENT SLOPES
LyB	LOAMY AND CLAYEY LAND, 0 TO 5 PERCENT SLOPES
LyD	LOAMY AND CLAYEY LAND, 5 TO 15 PERCENT SLOPES
Ma	MADE LAND
Sg	SAND AND GRAVEL PITS
ShA	SASSAFRAS SANDY LOAM, 0 TO 2 PERCENT SLOPES
ShB	SASSAFRAS SANDY LOAM, 2 TO 5 PERCENT SLOPES
ShC2	SASSAFRAS SANDY LOAM, 5 TO 10 PERCENT SLOPES, MODERATELY ERODED
SnB	SASSAFRAS–URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES
SsE	SASSAFRAS AND JOPPA SOILS, 15 TO 30 PERCENT SLOPES
WoA	WOODSTOWN LOAM, 0 TO 2 PERCENT SLOPES

SOURCE SOIL CONSERVATION SERVICE SOIL SURVEY FOR BALTIMORE COUNTY.
SCS SOIL SURVEY MAPPING HAS NOT BEEN DONE FOR THE CITY OF BALTIMORE.

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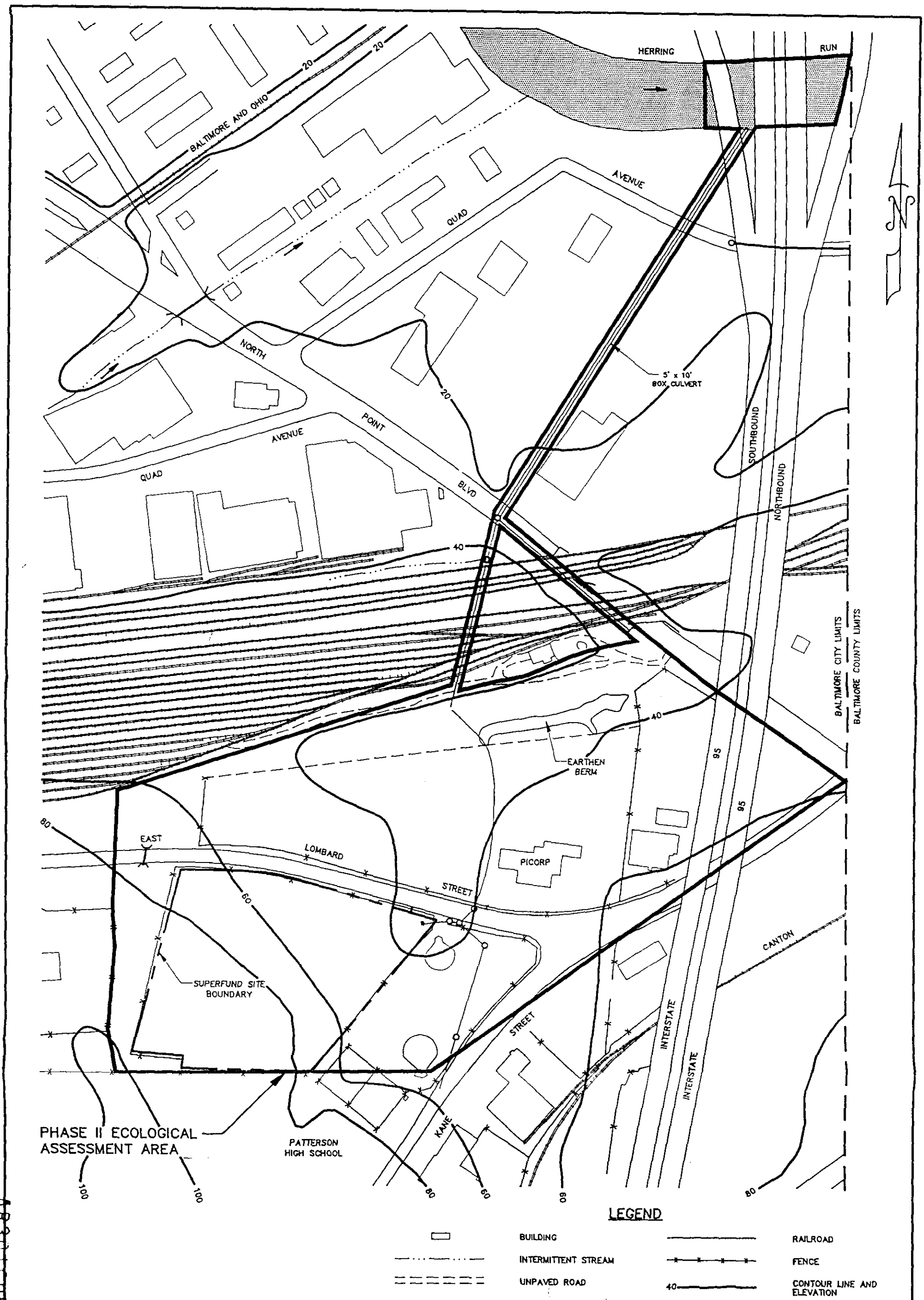
SOILS MAP

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE A-10

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.03.4.1		EAA2SOIL	3/14/95	

AR301694



SOURCE: USGS 7.5 MINUTE QUAD MAP, BALTIMORE EAST, MD, DATE 1974

0 300 600 FT.

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TOPOGRAPHIC MAP

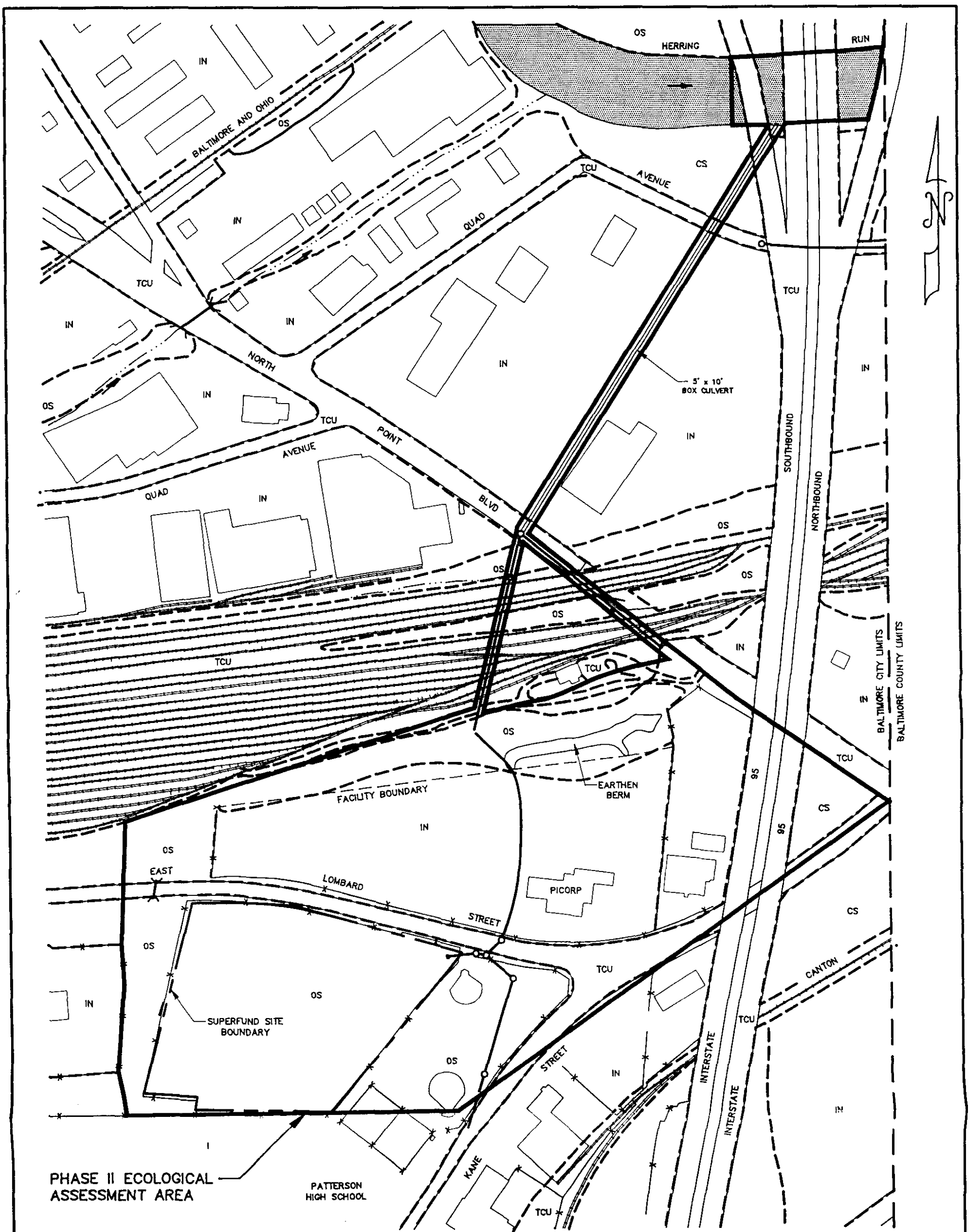
KANE AND LOMBARD STREET
BALTIMORE, MARYLAND

FIGURE

A-11

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		EAA2TOPO	1/17/95	

AR301695



LAND USE LEGEND

CS	COMMERCIAL AND SERVICES	OS	OPEN SPACE
IN	INDUSTRIAL	R	RESIDENTIAL
TCU	TRANSPORTATION, COMMUNICATIONS AND UTILITIES	MU	MIXED URBAN & BUILT-UP LAND
I	INSTITUTION		

LEGEND

BUILDING	RAILROAD
INTERMITTENT STREAM	FENCE
UNPAVED ROAD	APPROX. LAND USE DIVIDE & DESIGNATION

0 300 600 FT.

FOR ILLUSTRATION PURPOSES ONLY

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Engineering and Environmental Services
131 North Third Street
Phiaidelphia, PA 19106
215-642-1570

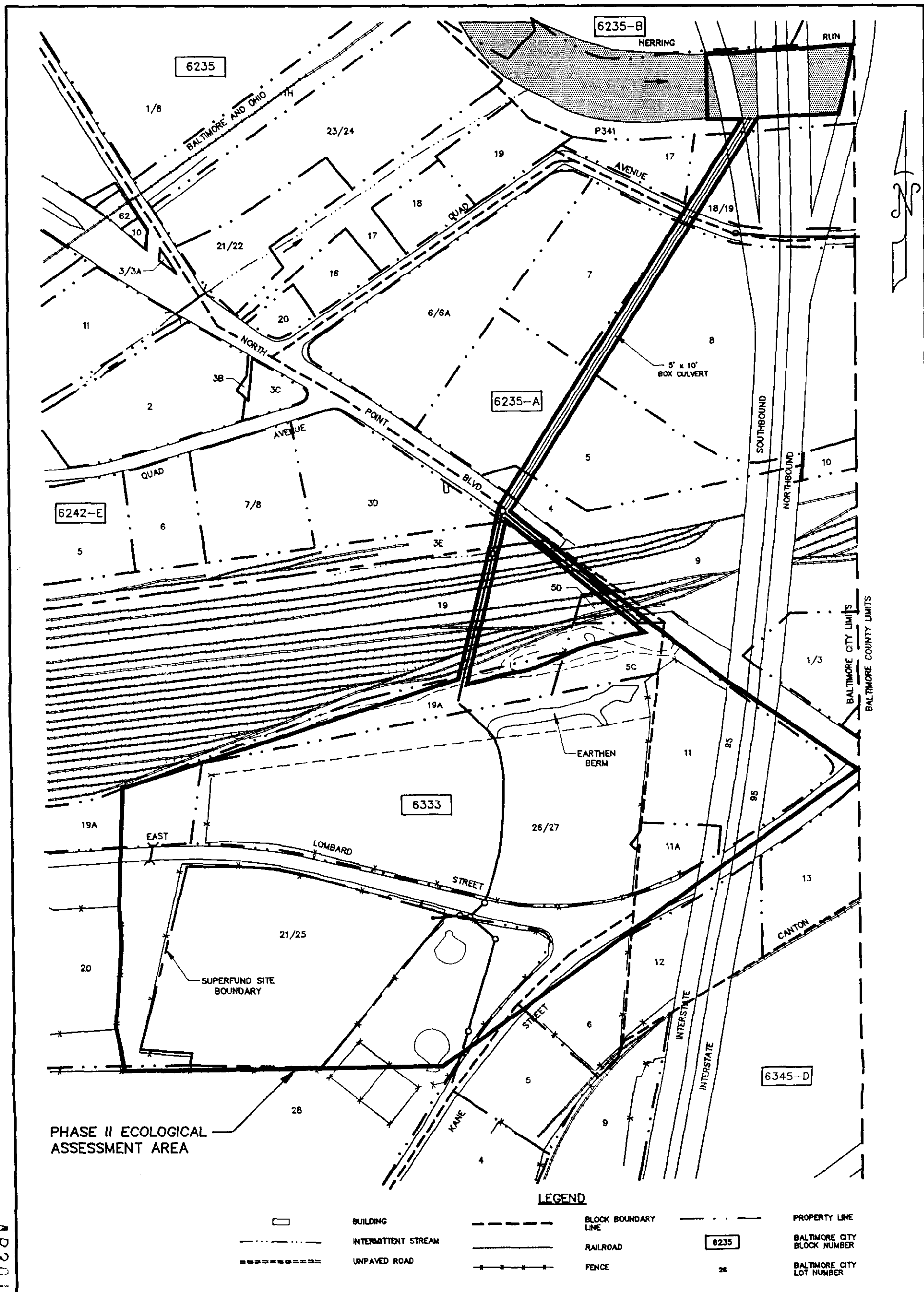
LAND USE MAP

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE A-12

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2LAND	3/14/95	

AR301696



SOURCE: MARYLAND DEAPRTMENT OF ASSESSMENT AND TAXATION, BALTIMORE COUNTY TAX MAPS; CITY OF BALTIMORE, DEPARTMENT OF PUBLIC WORKS PROPERTY MAP. PROPERTY OWNERS AND PROPERTY INFORMATION ARE PRESENTED IN TABLE A-4

0 300 600 FT.

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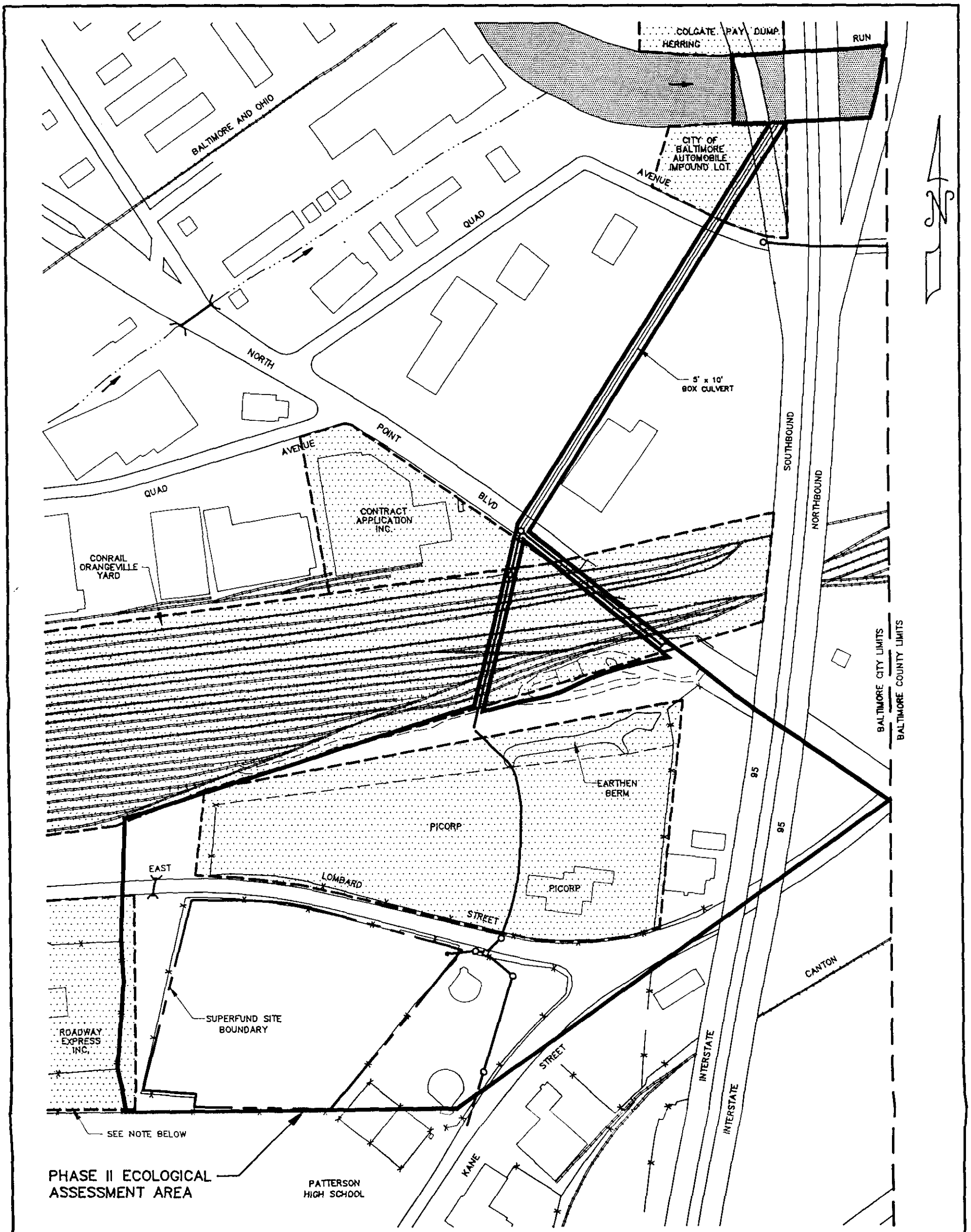
PROPERTY BOUNDARY MAP

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE A-13

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		EAA2PROP	3/14/95	

AR301697



NOTE: INTERNATIONAL PETROLEUM, INC. ADJACENT TO WEST OF ROADWAY EXPRESS INC. AND CONSIDERED POTENTIAL SOURCE SITE.

SOURCE: SEE APPENDIX A, SECTION 8.4

0 300 600 FT.

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Philadelphia, PA 19106
215-627-4505

SITES OF POTENTIAL ENVIRONMENTAL CONCERN

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE A-14

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2DUMP	3/14/95	

APPENDIX B

ENVIRONMENTAL MEDIA SAMPLING SUMMARY OF RESULTS

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APPENDIX B
KANE AND LOMBARD SUPERFUND SITE
PHASE II ECOLOGICAL ASSESSMENT AREA SAMPLING RESULTS REPORT

1.0 INTRODUCTION

This appendix presents a summary of the analytical results from Fall 1994 environmental media sampling within the Kane and Lombard Superfund Site Phase II Ecological Assessment Area (Phase II EAA).

1.1 Purpose and Scope

This sampling program was designed to provide supplemental baseline chemical data for surface water, bottom sediments, and wetland soils. These data were collected and analyzed to characterize and quantify potential chemicals related to the OU-2 Study Area that may be present in or being discharged to the identified pathways associated with the Phase II EAA. The Fall 1994 Phase II Ecological Assessment sampling results were evaluated along with results from the sampling events listed below to develop the conclusions and recommendations presented in the Phase II Assessment Report (Sections 5.0 and 6.0). The sampling locations are described in Section 2.0 and shown in Figure B-1.

1.2 History of Sampling Activities

In addition to the summary of results for the Phase II Ecological Assessment Sampling, this appendix presents a summary of analytical results from previous sampling events associated with the OU-2 Study Area investigation. Tables B-14 through B-19 and Figures B-2 through B-4, located in Attachment B-1 to this appendix, summarize the results of these previous sampling activities.

- Sampling results of soil and drum contents in May 1984, prior to remediation activities on the Superfund Site. During the remediation action, 1,163 drums and the upper six inches of soil from beneath the drums were removed from the Superfund Site (Weston Inc., 1987) *Remedial Investigation Report for the Kane and Lombard Site, Baltimore, Maryland.*

- Sampling results from the 1985 Maryland Waste Management Administration (MWMA) report titled *A Preliminary Assessment of PICORP, Inc., Baltimore, Maryland.* The sampling by the MWMA was limited to three samples (one soil sample and two "sludge" samples from drums) collected on the north side of the PICORP facility. The MWMA report was included in a May 14, 1991, report from the EPA titled *Site Inspection of PICORP, Incorporated, Document No. R585-11-0-23* (EPA, May 14, 1991).

- From June to September 1986, surface water samples were collected at four locations in Herring Run and two locations on the PICORP property by Roy F. Weston, Inc (Weston Inc.). Three of the Weston Inc. sampling locations were upstream of HLA's Phase II Assessment environmental media sampling location EA11 (Figure B-1), located at the 5-ft by 10-ft box culvert that discharges to Herring Run, and the fourth sampling location was downstream of sampling location EA11, just east of the Route 95 overpass (Weston Inc., 1987) *Remedial Investigation Report for the Kane and Lombard Site, Baltimore, Maryland.*

- Sampling results from EPA's 1991 investigation of the PICORP facility conducted by NUS Corporation, documented in *Site inspection of PICORP, Incorporated (EPA, May 14, 1991).* Samples collected from 11 locations around the PICORP facility were analyzed by this investigation.

2.0 FIELD METHODOLOGY

Field sampling was conducted in October and November 1994.

2.1 Sampling Locations

Field activities and sampling procedures were conducted in accordance with the *Phase II Ecological Assessment Sampling Plan* (Sampling Plan) (Harding Lawson Associates, 1994). The Sampling Plan recommended 11 sampling locations. A description of each location and the environmental media collected at each location are described below. The sample locations were chosen in consultation with the EPA to provide adequate coverage of the wetland systems and stormwater management system associated with the Phase II EAA to evaluate potential chemical sources and pathways identified in the Phase I Ecological Assessment. The sample locations described below are shown in Figure B-1.

- **Location EA1** - Located in the wetland area between the Superfund Site and the Roadway Express Inc. parking lot. One surface water sample and one wetlands soil sample were collected from the intermittent stream channel near the outlet structure draining this area. Matrix spike (MS) and matrix spike duplicate (MSD) quality control (QC) samples were also collected at this location.

- **Location EA2** - Located in an intermittent stream channel running along the south side of East Lombard Street. The channel is located west and upgradient of the wetland area receiving runoff directly from the Superfund Site. Samples were taken at this location to assess background concentrations of chemicals that may be entering the system from other sources west of the Superfund Site. Miscellaneous debris were noted in and around the intermittent stream channel at this location, including several used motor oil canisters. One wetlands soil sample was taken from the bank of the intermittent stream channel at this location. In addition, one sediment and one surface water sample were collected from the intermittent stream channel.

- **Location EA3** - Located in an intermittent stream channel adjacent to the northwestern side of the PICORP facility. One sediment sample was collected from the intermittent stream channel. No surface water was present in the stream channel. This location was sampled to provide confirmatory data on the path of contaminants to the west and north of the PICORP facility.

- **Location EA4** - Located in the excavated drainage basin on the northern side of the PICORP facility adjacent to the Conrail Railroad Yard. One sediment sample and one surface water sample were collected from the outlet in the stormwater pipe. One soil sample was collected from the adjacent area where landfill materials have been exposed by erosion.

- **Location EA5** - Located in the stormwater drainage pipeline system upgradient of the PICORP facility in the westbound lane of East Lombard Street. Access to this sampling location was gained by removing the manhole cover in the street and entering the drainage pipe approximately 30 feet below. One sediment sample and one surface water sample were collected. These samples were taken to characterize water and sediments in the stormwater drainage system upgradient of the PICORP facility.

- **Location EA6** - No samples were collected at this location. The Phase II Sampling Plan included this location to match a location that was described in *(EPA, May 14, 1991)* as a "storm culvert and drainage ditch at bottom of central portion of embankment". Features matching the description of this location were not found by HLA personnel in the area indicated on EPA's sampling location map. HLA did identify a depression approximately 10 feet deep in this area. The depression was apparently created by the erosion of soil from the separated stormwater pipeline exposed at the bottom of the depression. As confirmed by the video survey (Volume 2, Appendix F), the depression is located on the same pipeline as sample location EA4, approximately 100 feet northwest of this location. Because of the hazards associated with sampling at the bottom of the depression and the proximity of sample location EA4, no samples were collected from this location.

- **Location EA7** - Located in the bermed wetlands area adjacent to the north side of the PICORP facility. The berm which delineates this area confines an area against the slope of the PICORP facility. One sediment sample was collected from within the bermed area. One soil sample, one soil duplicate sample, and MS/MSD QC samples were collected upgradient from the wetlands area, along the berm.

- **Location EA8** - Located in an intermittent stream channel adjacent to the railroad yard and north of the bermed area adjacent to the PICORP facility. Evidence of possible petroleum staining of soils and sediments was observed by HLA field personnel at this location. An unknown petroleum-like free product was observed floating on the ponded water sampled by HLA field personnel (Appendix A, Section 8.3). One sediment sample and one surface water sample were collected in the stream channel. One soil sample was collected upgradient from the bank of the stream channel where soil staining was observed. MS/MSD QC samples were also collected at this location as required by the QAPP.

- **Location EA9** - Located near the upstream side of a drainage culvert structure running under the Conrail access road to North Point Boulevard. This culvert receives drainage from the northeastern portion of the PICORP property, including the bermed wetlands area and portions of the Conrail railroad yard. One sediment sample was collected at this location. No surface water was present at the time of sampling.

- **Location EA10** - Located within the Phase II EAA stormwater drainage system pathway at a point where the stormwater drainage system crosses under North Point Boulevard. This sample location was selected because this is the point where the two major parts of the drainage system meet. Access to this location was gained by opening the manhole and entering the stormwater drainage system. The stormwater drain pipe is approximately 20 feet below the street surface. One surface water sample was collected. No sediments were found at this location.

- **Location EA11** - Located at the terminus of the Phase II EAA stormwater drainage system the 5-ft by 10-ft box culvert approximately 10 feet from Herring Run. One surface water sample and MS/MSD QC samples were collected from inside the culvert. No sediments were present at this location.

2.2 Sampling Procedures

To provide data under non-storm conditions, HLA collected all environmental media samples at least 24 hours after a precipitation event sufficient to generate a visibly noticeable increase in flow within the stormwater drainage system (Appendix A, Section 8.3).

Surface water samples were collected by filling laboratory prepared sampling containers directly from the surface water. The sample container was positioned upstream of the sample collector, and samples were collected with minimal agitation. At each location, the surface water sample was collected before the bottom sediment sample was collected.

In areas where the drainage channels are intermittent and where there was no water or only a small amount of water in the channel at the time of sampling, a dedicated, decontaminated stainless steel trowel was used to collect the sediment sample. At no locations was there enough water present that would have necessitated the use of an Ekman Dredge Sampler to collect sediments. Soil samples were also collected using dedicated, decontaminated stainless steel trowels and placed directly into the sample containers.

QC samples were collected to specifics in the Quality Assurance Project Plan (QAPP).

Samples were placed into appropriate laboratory-prepared sample containers and labeled with the following information:

Site Name
Location and Designation
Date and Time
Analytical Parameters
Sampler's Name and Company

Samples were logged on a chain-of-custody form and kept cool (at or below 4 °c) prior to delivery to the laboratory.

2.3 Analytical Parameters

Table B-1 identifies the chemical and physical parameters analyzed in the laboratory or in the field. Target Compound List (TCL) Volatile Organic Compounds (VOCs), Semi-volatile Organic Compounds (SVOCs), metals, cyanide, pesticides (including PCBs), herbicides, and non-CLP carbamates were analyzed using the current Contract Laboratory Program (CLP) protocols as specified in the QAPP.

Sampling included field measurement of the following physical parameters for the appropriate media: Oxidation Reduction Potential (ORP), Dissolved Oxygen (DO), conductivity, temperature, pH, and color. Field measurements were taken by HLA field personnel and recorded on field data sheets.

2.3.1 Surface Water

Unfiltered surface water samples were analyzed for TCL VOCs, TCL SVOCs, unfiltered metals, cyanide, Total Organic Carbon (TOC), Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS), Total Dissolved Solids (TDS), alkalinity, and hardness. Dissolved Oxygen (DO), Oxidation Reduction Potential (ORP), temperature, conductivity, and pH were measured in the field.

2.3.2 Bottom Sediments

Bottom sediment samples were collected and analyzed for TCL VOCs, TCL SVOCs, metals, cyanide, pesticides (including PCBs), herbicides, carbamates, TOC, particle grain size, and ORP. Sediment color was determined in the field using a Munsell Soil Color Chart.

2.3.3 Wetland Soils

The soil samples collected were analyzed for VOCs, SVOCs, metals, cyanide, TOC, pesticides (including PCBs), herbicides, carbamates, ORP, and pH. Soil color was determined in the field using a Munsell Soil Color Chart.

3.0 SUMMARY OF FINDINGS

3.1 Analytical Results

A description of the analytical results by type of media are presented below. All compounds detected that were determined in the validation process to represent external contamination such as laboratory contamination, have been discounted from the analytical results presented below. A summary of the detected compounds and concentrations is presented in Tables B-2 through B-12. A copy of the validated laboratory analytical reports is presented in Appendix G (Volume 3).

3.1.1 Surface Water

Surface water samples were collected from seven of the eleven sampling locations. Surface water was not present at locations EA3, EA6, EA7, or EA9. The surface water samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOC), TCL semi-volatile organic compounds (SVOC), Target Analyte List (TAL) inorganics, and selected water quality parameters. A duplicate sample was collected at location EA8. The discussions below reference the higher result for samples collected at this location.

3.1.1.1 Volatile Organic Compounds (Table B-2)

VOCs were detected in only three of the eight surface water locations sampled: EA1, EA2, and EA4. The only VOC detected in surface water from EA1 was carbon disulfide, reported at 1 microgram per liter (μg/L). The only VOC detected at location EA2 was toluene, reported at an estimated concentration of 0.4 μg/L.

The surface water sample from location EA4 contained 119.6 μg/L total VOCs. This included an estimated concentration of 110 μg/L of acetone. The remaining 9.6 μg/L VOCs consisted of methylene chloride (5 μg/L), total xylenes (1 μg/L), bromodichloromethane (2 μg/L), trichloroethene (estimated at 0.6 μg/L), dibromochloromethane (estimated at 0.4 μg/L), and toluene (estimated at 0.6 μg/L).

3.1.1.2 Semi-Volatile Organic Compounds (Table B-3)

The only SVOC detected in any of the surface water samples collected by HLA was diethylphthalate (estimated at 4 μg/L at EA5 and 1 μg/L at EA10). No SVOCs were detected in any of the other surface water samples. Diethylphthalate was not detected in bottom sediments or wetland soils at any of the other locations sampled.

3.1.1.3 Inorganics (Table B-4)

Up to 20 of the 24 TAL inorganic compounds were detected in the surface water samples. The following four TAL inorganics were not detected in any of the surface water samples: cyanide, mercury, silver, and thallium. Of the 20 metals detected, the highest concentrations of 19 were reported in surface water samples from locations EA8 and/or EA5. These 19 metals included: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium, vanadium, and zinc. The other metal, calcium, was detected at similar concentrations in all of the surface water samples collected.

3.1.1.4 Water Quality Parameters (Table B-8)

The surface water samples were analyzed for total organic carbon (TOC), biological oxygen demand (BOD), total suspended solids (TSS), total dissolved solids (TDS), alkalinity, and hardness. With the exception of total alkalinity, the highest concentrations of these water quality parameters were detected in surface water samples from locations EA8 and/or EA5.

TOC concentrations ranged from 6.1 milligrams per liter (mg/L) in the surface water sample from location EA11 to 17.8 mg/L in the sample from EA8. TOC was not analyzed in the surface water sample from EA2.

BOD results ranged from 1.8 mg/L in the sample from EA1 to 11 mg/L at EA8.

COD results ranged from 13 mg/L at EA11 to 131 mg/L at EA8.

TSS concentrations ranged from 3.7 mg/L at EA1 to 246 mg/L at EA8. Compared to the other locations, the TSS concentration at EA8 is anomalous. Excluding the TSS result for EA8, the remaining TSS concentrations range from 29.7 mg/L at EA5 to 3.7 mg/L at EA1.

TDS concentrations ranged from 288 mg/L at EA11 to 500 mg/L at EA5.

Total alkalinity ranged from 77 mg/L at EA8 to 140 mg/L at EA10. Alkalinity was detected only as bicarbonate; neither hydroxide nor carbonate alkalinity were detected.

Total hardness ranged from 148 mg/L at EA-8 to 320 mg/L at EA5.

With the exception of location EA1, higher alkalinity levels appear to correlate well with higher hardness. No other consistent relationships were apparent in these analyses.

3.1.1.5 Field Analyses (Table B-10)

The surface water samples were analyzed in the field for the following parameters: pH, conductivity, reduction/oxidation (Redox) potential, temperature, and dissolved oxygen.

Slightly acidic conditions were reported in two surface water sample locations: EA4 (pH=6.7) and EA10 (pH=5.5). The surface water sample from EA5 was neutral (pH=7). Surface water in the remaining four sample locations (EA1, EA2, EA8, and EA11) was slightly alkaline with pH ranging from 7.5 to 8.3.

Conductivity ranged from 223 μS/cm at EA8 to 785 μS/cm at EA5.

Redox potential ranged from 132 mV at EA4 to 614 mV at EA11.

During sampling, surface water temperature ranged from 9.5 degrees centigrade (°c) at EA2 to 18.8°c at EA4. Surface water temperatures were generally highest in the samples collected from within the underground storm water drainage system (EA4, EA10, and EA11).

Dissolved oxygen ranged from 5.61 mg/L at EA11 to 19.61 mg/L at EA4. Dissolved oxygen measured at EA4 was more than two times higher than at any other location.

With the exception of location EA11, higher dissolved oxygen levels appear to correlate well with higher temperatures. No other consistent relationships were apparent between the field analyses.

3.1.2 Bottom Sediments

Bottom sediment samples were collected from eight of the eleven sampling locations. Bottom sediments were not present at locations EA6, EA10, and EA11. The sediment samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOC), TCL semi-volatile organic compounds (SVOC), Target Analyte List (TAL) inorganics, organic pesticides, organophosphorus pesticides, chlorinated herbicides, N-methylcarbamate pesticides, and selected sediment characteristic parameters. Duplicate samples were collected at EA3 and EA8. The discussions below reference the higher result for samples collected at these locations.

3.1.2.1 Volatile Organic Compounds (Table B-2)

VOCs were detected in four of the eight bottom sediment locations sampled: EA4, EA5, EA7, and EA9. Methylene chloride was the only compound detected at locations EA5 (estimated at 2 μg/Kg) and EA9 (37 μg/Kg). The bottom sediment sample from location EA4 contained methylene chloride (estimated at 5 μg/Kg) and xylene (estimated at 2 μg/Kg). Sediments from location EA7 contained 2-butanone (estimated at 6 μg/Kg).

3.1.2.2 Semi-Volatile Organic Compounds (Table B-3)

A total of 23 TCL semi-volatile organic compounds were detected in bottom sediment samples collected by HLA. Sample locations EA5 and EA8 had 18 SVOCs detected. Of the 23 SVOCs detected in bottom sediment samples, the highest concentrations of 16 of the SVOCs were detected at EA8. These 16 SVOCs included: 4-methylphenol, naphthalene, 2-methylnaphthalene, acenaphthylene, acenaphthene, dibenzofuran, fluorene, anthracene, carbazole, pyrene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and benzo(g,h,i)perylene.

3.1.2.3 Inorganics (Table B-4)

Up to 22 of the 24 TAL inorganics were detected in bottom sediment samples. The two TAL inorganics that were not detected in any of the bottom sediment samples were silver and sodium. Of the 22 metals detected, the highest concentrations of 8 were reported at sample location EA8. These 8 inorganics included: aluminum, arsenic, chromium, copper, iron, selenium, thallium, and vanadium. The highest concentrations of 6 metals were detected at sample location EA7. These inorganics included antimony, barium, calcium, lead, potassium, and zinc. Sample location EA3 had 5 metals detected at the highest concentrations. These metals included: beryllium, cadmium, cobalt, cyanide, and nickel.

3.1.2.4 Organic Pesticides (Table B-5)

A total of 18 pesticide organic compounds were detected in bottom sediment samples collected by HLA. Of the 18 organic pesticides detected, the highest concentrations of 16 of them were found at either sample location EA7 or sample location EA8. Of particular note are the concentrations of aroclor-1242 and aroclor-1260 at sample location EA8. Aroclor-1242 was detected at a concentration of 870 micrograms per kilogram (μg/Kg) and aroclor-1260 was detected at a concentration of 770 μg/Kg.

3.1.2.5 Organophosphorus Pesticides (Table B-6)

Stirophos was the only organophosphorus pesticide compound detected in bottom sediment samples. It was detected at sample location EA8 at a concentration of 270 μg/Kg.

3.1.2.6 Chlorinated Herbicides (Table B-7)

2,4,5-T was the only chlorinated herbicide detected in bottom sediment samples. 2,4,5-T was detected at sample locations EA2, EA3, EA4, and EA5 at estimated concentrations ranging from a low of 7 μg/Kg at sample location EA5 to a high of 20 μg/Kg at sample location EA3.

3.1.2.7 N-Methylcarbamate Pesticides

No N-methylcarbamate pesticides were detected in any bottom sediment samples or wetland soil samples collected by HLA.

3.1.2.8 Sediment Characteristics (Tables B-9 and B-11)

Bottom sediments were analyzed for total solids (as received), redox potential, and total organic carbon (TOC) (measured in dry weight).

Total solids in bottom sediment samples ranged from 48.3 μg/Kg at sample location EA2 to 93.9 μg/Kg at sample location EA9.

Redox potential ranged from -20 mV at sample locations EA4, EA7, and EA9 to 350 mV at sample location EA5. Analysis of redox potential was not performed for sample location EA8.

TOC results range from 0.44 mg/Kg at EA1 to 9.8 mg/Kg at EA8.

Particle grain size for the sediment samples (Table B-11) were all below 19 mm. Sediments from locations EA1, EA3, EA7 and EA8 had an average particle grain size below 30 microns (μm). Sediments from locations EA4, EA5 and EA9 had an average particle grain size between 9.5 mm and 106 μm. Sample location EA-2 had an average particle grain size below 106 μm.

3.1.2.9 Field Analysis (Table B-10)

Sediment color was measured in the field. Sediment hue was in the 10YR grouping for sample locations EA2, EA3, EA4, EA5, and EA9. Sediment hue was in the 2.5Y grouping for sample locations EA7 and EA8. Sediment hue in the 2.5YR grouping was found at sample location EA1.

3.1.3 Wetland Soil

Wetland soil samples were collected from five of the 11 sampling locations: EA1, EA2, EA4, EA7, and EA8. Wetland soil samples were analyzed for TCL VOCs, TCL SVOCs, TAL inorganics, organic pesticides, organophosphorus pesticides, chlorinated herbicides, N-methylcarbamate pesticides, and selected soil characteristic parameters. A duplicate sample was collected at EA7. The discussions below reference the higher result for samples collected at this location.

3.1.3.1 Volatile Organic Compounds (Table B-2)

VOCs were detected in only two of the five wetland soil samples. Sample location EA2 contained acetone (100 μg/Kg) and 2-butanone (18 μg/Kg). Methylene chloride was detected at sample location EA4 at an estimated concentration of 8 μg/Kg.

3.1.3.2 Semi-Volatile Organic Compounds (Table B-3)

SVOC compounds were detected at all five of the wetland soil sample locations. Only one SVOC was detected at sample locations EA1 and EA7. The greatest number of SVOCs (18) were detected at sample location EA4. These 18 SVOCs include acenaphthene, dibenzofuran, fluorene, phenanthrene, anthracene, carbazole, di-n-butylphthalate, fluoranthene, pyrene, butylbenzylphthalate, benzo(a)anthracene, chrysene, di-n-octylphthalate, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and dibenz(a,h)anthracene. Eleven SVOCs were detected at sample location EA2 and five SVOCs were detected at sample location EA8.

3.1.3.3 Inorganics (Table B-4)

Of the 24 total TAL inorganics, 22 were detected in wetland soil samples collected by HLA. Sample location EA7 had the greatest overall concentration of inorganic compounds in wetland soil. The highest concentrations of 14 inorganics were detected at sample location EA7. These 14 metals included: aluminum, antimony, arsenic, barium, cadmium, calcium, lead, magnesium, manganese, potassium, sodium, thallium, vanadium, and zinc.

3.1.3.4 Organic Pesticides (Table B-5)

Only one organic pesticide compound was detected at sample locations EA1 (alpha-chlordane) and EA2 (endrin). The PCB compounds aroclor-1242 and aroclor-1260 were detected at location EA8. Sample location EA4 contained the following: heptachlor, heptachlor epoxide, dieldrin, endosulfan II, 4,4'-DDT, methoxychlor, endrin ketone, alpha-chlordane, gamma-chlordane, and aroclor-1260. The greatest number of pesticide organic compounds were detected at sample location EA7. These compounds included: delta-BHC, heptachlor, aldrin, heptachlor epoxide, dieldrin, 4,4'-DDE, Endosulfan II, 4,4'-DDD, alpha-chlordane, gamma-chlordane, and aroclor-1260.

3.1.3.5 Organophosphorus Pesticides (Table B-6)

Stirophos was the only organophosphorus pesticide detected. Stirophos was detected only at sample location EA8 at an estimated concentration of 280 μg/Kg.

3.1.3.6 Chlorinated Herbicides (Table B-7)

Chlorinated herbicides were detected only at sample locations EA1 and EA8. The following were detected at EA1: 2,4,5-T (estimated at 10 μg/Kg), Dicamba (estimated at 14 μg/Kg), and MCPP (13,000 μg/Kg). At EA8, 2,4-DB was detected at an estimated concentration of 110 μg/Kg.

3.1.3.7 N-Methylcarbamates

No N-methylcarbamates were detected in wetland soil samples or bottom sediment samples collected by HLA.

3.1.3.8 Soil Characteristics (Table B-9)

Wetland soil was analyzed for total solids, redox potential, total organic carbon, and pH.

Total solids (as received) results ranged from 58.5 μg/Kg at sample location EA7 to 91.7 μg/Kg at sample location EA4.

Redox potential results ranged from -30 mV at EA7 to 530 mV at EA2. Redox potential was not analyzed for at sample location EA8.

TOC results ranged from 0.50 mg/Kg at EA8 to 8.2 mg/Kg at EA7.

Soil pH results ranged from 7.13 at EA2 to 8.18 at EA4 and EA7.

3.1.3.9 Field Analysis (Table B-10)

Wetland soil color was measured in the field. Soil hue at sample locations EA1 and EA2 was in the 5YR grouping. Soil collected from sample location EA4 had a hue in the 10YR grouping. The hue at sample locations EA7 and EA8 was in the 2.5Y grouping.

Sample locations EA3, EA7, and EA8 all had low chroma soil colors (Appendix C).

3.2 Quality Assurance/Quality Control

Quality assurance/quality control procedures followed those specified in the Quality Assurance Project Plan for the *Kane and Lombard Study Area Remedial Investigation/Feasibility Study, Operable Unit 2* (HLA, March 1994). In addition, matrix spike and matrix spike duplicate samples were collected for all three matrixes.

3.2.1 Trip Blanks, Field Blanks, and Duplicate Samples

As outlined in the QAPP, trip blanks, field blanks, and duplicate samples were collected and analyzed to support data QA/QC. The analytical results for trip and field blanks are summarized in Tables B-12 and B-13. Summary analytical results for duplicate samples are included in Tables B-2 through B-7.

Aqueous field blanks were collected by pouring laboratory-supplied deionized water over the stainless steel trowel used to collect soil and bottom sediment samples. The water was collected in laboratory-supplied sample jars and analyzed for VOCs.

Trip Blanks were received from the laboratory with each sample container delivery and sent back to the laboratory with each day's samples for VOC analysis.

Duplicate samples were collected at three locations. The duplicate samples were blind to the laboratory but cross-referenced as either a surface water, sediment, or soil sample.

3.2.2 Data Validation

HLA checked laboratory, trip, field blanks, and all duplicate samples to ensure that the data were not affected by sample handling and that the data were reproducible. HLA's data validation chemists validated the analytical data for the samples using procedures outlined in the EPA's *Laboratory Data Validation, Functional Guidelines for Evaluating Organic Analysis*. A Tier I data package was provided by the laboratory for each sample to afford all the necessary documentation for validation. The Tier I package has been submitted to the EPA under separate cover.

3.2.3 Laboratory Analysis

The laboratory analysis for the Phase II Baseline Ecological Assessment environmental media sampling was performed by Inchcape Testing Services, of Colchester, Vermont, an EPA-approved CLP laboratory.

4.0 REFERENCES

Harding Lawson Associates, March 21, 1994. *Kane and Lombard Study Area, Remedial Investigation/Feasibility Study, Operable Unit 2, Baltimore, Maryland.*

Harding Lawson Associates, August 31, 1994. *Final Draft Technical Memorandum, Phase I Baseline Ecological Assessment, Summary of Results, Kane & Lombard Superfund Site Study Area, Baltimore, Maryland.*

NUS Corporation, Superfund Division, 1991. *Site Inspection of PICORP, Incorporated.* Under EPA Contract No. 68-01-7346.

US Environmental Protection Agency, 1990. *Laboratory Data Validation, Functional Guidelines for Evaluating Organic Analysis.*

Weston, Roy F., Inc., 1987. *Remedial Investigation Report for the Kane and Lombard Site, Baltimore, Maryland.*

Appendix B

Table B-1
Kane and Lombard Site
Environmental Sampling Plan
Sampling Parameters

Analytical Parameters	Wetland Soils	Unfiltered Surface Water	Bottom Sediments
Laboratory Analyses			
Volatile Organic Compounds	●	●	●
Semi-volatile Organic Compounds	●	●	●
Total Organic Carbon	●	●	●
Biochemical Oxygen Demand		●	
Chemical Oxygen Demand		●	
Total Suspended Solids		●	
Total Dissolved Solids		●	
Alkalinity		●	
Hardness		●	
Pesticides	●		●
Herbicides	●		●
Carbamates	●		●
Metals	●	●	●
Cyanide	●	●	●
Particle Grain Size			●
Oxygen Reduction Potential	●		●
pH	●		
Field Measurements			
Color	●		●
Oxygen Reduction Potential		●	
Dissolved Oxygen		●	
pH		●	
Conductivity		●	
Temperature		●	

Revised per discussion with EPA, October 7, 1994

VOLATILE ORGANIC COMPOUNDS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-2

Sample Location	EA1	EA1	EA1	EA2	EA2	EA2	EA3	EA3	EA4
Sample Matrix	Surface Water	Sediment	Soil	Surface Water	Sediment	Soil	Sediment	Sediment-(10)	Surface Water
Sample Date	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	10/21/94	10/21/94	10/20/94
Methylene Chloride	2 U	13 U	10 U	2 U	18 U	14 U	2 J	16 U	5
Acetone	6 R	13 U	12 UB	14 U	34 UB	100 B	17 U	16 U	110 J
Carbon Disulfide	1 U	13 U	10 U	1 U	18 U	14 U	17 U	16 U	1 U
Xylene	1 U	13 U	10 U	1 U	18 U	14 U	17 U	16 U	1
Chloroform	1 U	13 U	10 U	1 U	18 U	14 U	17 U	16 U	3 U
2-Butanone	5 U	13 U	10 U	5 U	18 U	18	17 UB	16 UB	5 U
Bromochloromethane	1 U	13 U	10 U	1 U	18 U	14 U	17 U	16 U	2
Trichloroethane	1 U	13 U	10 U	1 U	18 U	14 U	17 U	16 U	0.6 J
Dibromochloromethane	1 U	13 U	10 U	1 U	18 U	14 U	17 U	16 U	0.4 J
Toluene	1 U	13 U	10 U	0.4 J	18 U	14 U	17 U	16 U	0.6 J
TOTAL VOCs	1	U	U	0.4 J	U	118	2 J	U	119.6 J

NOTES:
All results reported in ug/Kg (soil and sediment) or ug/L (water)
U Undetected
B Detected in Blank
J Estimated value
(10) Duplicate sample
(RE) Sample reanalyzed
R Rejected
Total VOCs do not include results rejected during data validation

AR301717

VOLATILE ORGANIC COMPOUNDS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-2

Sample Location	EA4	EA4	EA5	EA5	EA7	EA7	EA7	EA8	EA8
Sample Matrix	Sediment	Soil	Surface Water	Sediment	Sediment	Soil	Soil-(10)	Surface Water	Surface Water-(10)
Sample Date	10/20/94	10/20/94	11/12/94	11/12/94	10/21/94	10/21/94	10/21/94	11/2/94	11/2/94
Methylene Chloride	5 J	8 J	2 U	2 J	17 U	17 U	16 U	2 U	2 U
Acetone	13 UJ	11 UJ	7 R	13 UB	32 UJ	17 UJ	16 U	12 UJ	18 UJ
Carbon Disulfide	13 U	11 U	1 U	12 U	17 U	17 U	16 U	1 U	1 U
Xylene	2 J	11 U	1 U	12 U	17 U	17 U	16 U	1 U	1 U
Chloroform	13 U	11 U	1 U	12 U	17 U	17 U	16 U	1 U	1 U
2-Butanone	13 U	11 U	5 U	12 U	6 J	17 U	16 UJ	5 U	5 U
Bromochloromethane	13 U	11 U	1 U	12 U	17 U	17 U	16 U	1 U	1 U
Trichloroethane	13 U	11 U	1 U	12 U	17 U	17 U	16 U	1 U	1 U
Dibromochloromethane	13 U	11 U	1 U	12 U	17 U	17 U	16 U	1 U	1 U
Toluene	13 U	11 U	1 U	12 U	17 U	17 U	16 U	1 U	1 U
TOTAL VOCs	7 J	8 J	U	2 J	6 J	U	U	U	U

NOTES:
All results reported in ug/Kg (soil and sediment) or ug/L (water)
U Undetected
B Detected in blank
J Estimated value
(10) Duplicate sample
(RE) Sample reanalyzed
R Rejected
Total VOCs do not include results rejected during data validation

AR301718

VOLATILE ORGANIC COMPOUNDS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-2

Sample Location	EA8	EA8	EA8	EA8	EA9	EA10	EA11
Sample Matrix	Sediment	Sediment-(10)	Soil	Soil-(RE)	Sediment	Surface Water	Surface Water
Sample Date	11/2/94	11/2/94	11/2/94	11/2/94	10/20/94	11/13/94	11/3/94
Methylene Chloride	17 U	18 U	12 U	12 U	37	2 U	2 U
Acetone	17 U	18 U	12 U	12 U	11 UJ	8 R	7 R
Carbon Disulfide	17 U	18 U	12 U	12 U	11 U	1 U	1 U
Xylene	17 U	18 U	12 U	12 U	11 U	1 U	1 U
Chloroform	17 U	18 U	12 U	12 U	11 U	1 U	1 U
2-Butanone	17 UJ	18 U	12 U	12 U	11 U	5 U	5 U
Bromochloromethane	17 U	18 U	12 U	12 U	11 U	1 U	1 U
Trichloroethane	17 U	18 U	12 U	12 U	11 U	1 U	1 U
Dibromochloromethane	17 U	18 U	12 U	12 U	11 U	1 U	1 U
Toluene	17 U	18 U	12 U	12 U	11 U	1 U	1 U
TOTAL VOCs	U	U	U	U	37	U	U

NOTES:
All results reported in ug/Kg (soil and sediment) or ug/L (water)
U Undetected
B Detected in blank
J Estimated value
(10) Duplicate sample
(RE) Sample reanalyzed
R Rejected
Total VOCs do not include results rejected during data validation

AR301719

SEMIVOLATILE ORGANIC COMPOUNDS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-3

Sample Location	EA1	EA1	EA1	EA2	EA2	EA2	EA3	EA3
Sample Matrix	Surface Water	Sediment	Soil	Surface Water	Sediment	Soil	Sediment	Sediment-(10)
Sample Date	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	11/3/94	10/21/94	10/21/94
4-Methylphenol	5 U	460 U	440 U	5 U	1400 U	460 U	570 U	540 U
Naphthalene	5 U	460 U	440 U	5 U	1400 U	460 U	570 U	540 U
2-Methylnaphthalene	5 U	460 U	440 U	5 U	1400 U	460 U	46 J	36 J
Acenaphthylene	5 U	460 U	440 U	5 U	1400 U	460 U	44 49 J	44 45 J
Acenaphthene	5 U	460 U	440 U	5 U	1400 U	460 U	16 29 J	540 U
Dibenzofuran	5 U	460 U	440 U	5 U	1400 U	460 U	32 J	540 U
Diethylphthalate	5 U	460 U	440 U	5 U	1400 U	460 U	570 U	540 U
Fluorene	5 U	460 U	440 U	5 U	1400 U	460 U	19 35 J	540 U
Phenanthrene	5 U	31 J	440 U	5 U	220 J	24 J	250 J	88 J
Anthracene	5 U	460 U	440 U	5 U	1400 U	460 U	? 90 J	? 64 J
Carbazole	5 U	460 U	440 U	5 U	1400 U	460 U	? 47 J	? 34 J
Di-n-butylphthalate	5 U	460 U	440 U	5 U	1400 U	460 U	34 J	3 J
Fluoranthene	5 U	200 72 J	440 U	5 U	600 550 J	100 56 J	600 530 J	600 210 J
Pyrene	5 U	200 70 J	440 U	5 U	700 J	100 54 J	665 160 J	660 37 J
Butylbenzylphthalate	5 U	460 U	440 U	5 U	1400 U	460 U	190 J	110 J
Benzo(a)anthracene	5 U	261 29 J	440 U	5 U	261 250 J	100 24 J	261 330 J	261 140 J
Chrysene	5 U	384 60 J	440 U	5 U	384 400 J	100 39 J	354 310 J	354 120 J
bis(2-Ethylhexyl)phthalate	18 U	100 J	62 J	5 U	1400 U	170 J	600 U	540 U
Di-n-octylphthalate	5 U	460 U	440 U	5 U	1400 U	460 U	570 U	540 U
Benzo(b)fluoranthene	5 U	3200 56 J	440 U	5 U	3200 370 J	100 32 J	3200 360 J	540 U
Benzo(k)fluoranthene	5 U	46 J	440 U	5 U	380 J	35 J	200 J	540 U
Benzo(a)pyrene	5 U	430 38 J	440 U	5 U	430 380 J	100,000 31 J	570 U	540 U
Indeno(1,2,3-cd)pyrene	5 U	600 37 J	440 U	5 U	600 360 J	100 26 J	600 53 J	600 540 U
Dibenz(a,h)anthracene	5 U	460 U	440 U	5 U	120 J	460 U	570 U	540 U
Benzo(g,h,i)perylene	5 U	670 35 J	440 U	5 U	670 340 J	100 36 J	570 U	540 U
TOTAL SVOCs	U	574 J	52 J	U	5,170 J	527 J	2,745 J	915 J

260 mg/Kg

53-260

5.3-260 mg/Kg

NOTES:
All results reported in ug/Kg (soil and sediment) or ug/L (water)
U Undetected J Estimated value (10) Duplicate sample

AR301720

SEMIVOLATILE ORGANIC COMPOUNDS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-3

Sample Location	EA4	EA4	EA4	EA5	EA5	EA7	EA7	EA7
Sample Matrix	Surface Water	Sediment	Soil	Surface Water	Sediment	Sediment	Soil	Soil-(10)
Sample Date	10/20/94	10/20/94	10/20/94	11/12/94	11/12/94	10/21/94	10/21/94	10/21/94
4-Methylphenol	5 U	420 U	360 U	5 U	420 U	600 U	2400 U	1100 U
Naphthalene	5 U	420 U	360 U	5 U	420 U	600 U	2400 U	1100 U
2-Methylnaphthalene	5 U	420 U	360 U	5 U	420 U	600 U	2400 U	1100 U
Acenaphthylene	5 U	420 U	360 U	5 U	420 U	49 36 J	2400 U	1100 U
Acenaphthene	5 U	16 96 J	100 37 J	5 U	16 28 J	600 U	2400 U	1100 U
Dibenzofuran	5 U	69 J	22 J	5 U	20 J	600 U	2400 U	1100 U
Diethylphthalate	5 U	420 U	360 U	4 J	420 U	600 U	2400 U	1100 U
Fluorene	5 U	19 160 J	100 61 J	5 U	19 43 J	600 U	2400 U	1100 U
Phenanthrene	5 U	1600	100	5 U	330	85 J	2400 U	1100 U
Anthracene	5 U	7 240 J	100 190 J	5 U	7 100 J	600 U	2400 U	1100 U
Carbazole	5 U	7 180 J	7 77 J	5 U	7 150 J	600 U	2400 U	1100 U
Di-n-butylphthalate	5 U	420 U	360 U	5 U	420 U	600 U	2400 U	1100 U
Fluoranthene	5 U	100 2400	100 2000	5 U	100 1600	100 170 J	2400 U	1100 U
Pyrene	5 U	100 1100	100 560	5 U	100 1400	600 U	2400 U	1100 U
Butylbenzylphthalate	5 U	48 J	50 J	5 U	48 J	350 J	260 J	120 J
Benzo(a)anthracene	5 U	261 1000	100 1000	5 U	261 570	261 160 J	2400 U	1100 U
Chrysene	5 U	354 1200	100 1100	5 U	354 800	354 96 J	2400 U	1100 U
Bis(2-Ethylhexyl)phthalate	5 U	520 U	360 U	8 U	390 J	4100 U	4800 U	2200 U
Di-n-octylphthalate	5 U	420 U	87 J	5 U	420 U	600 U	2400 U	1100 U
Benzo(b)fluoranthene	5 U	3250 1100	100 1100	5 U	3250 640	600 U	2400 U	1100 U
Benzo(k)fluoranthene	5 U	1100	[illegible]	5 U	650	600 U	2400 U	1100 U
Benzo(a)pyrene	5 U	320 J	100 160 J	5 U	430 580	600 U	2400 U	1100 U
Indeno(1,2,3-cd)pyrene	5 U	100 330 J	100 120 J	5 U	[illegible] 440	600 U	2400 U	1100 U
Dibenz(a,h)anthracene	5 U	270 J	[illegible]	5 U	190 J	600 U	2400 U	1100 U
Benzo(g,h,i)perylene	5 U	420 U	360 U	5 U	67 130 J	600 U	2400 U	1100 U
TOTAL SVOCs	U	11,206 J	9,134 J	U	8,609 J	997 J	230 J	120 J

NOTES:
All results reported in ug/Kg (soil and sediment) or ug/L (water)
U Undetected J Estimated value (10) Duplicate sample

AR301721

SEMIVOLATILE ORGANIC COMPOUNDS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-3

Sample Location Sample Matrix Sample Date	EA8 Surface Water 11/2/94	EA8 Surface Water-(10) 11/2/94	EA8 Sediment 11/2/94	EA8 Sediment-(10) 11/2/94	EA8 Soil 11/2/94	EA9 Sediment 10/20/94	EA10 Surface Water 11/13/94	EA11 Surface Water 11/3/94
4-Methylphenol	5 U	5 U	150 J	2200 U	1700 U	350 U	5 U	5 U
Naphthalene	5 U	5 U	160 630 J	160 510 J	1700 U	350 U	5 U	5 U
2-Methylnaphthalene	5 U	5 U	1000 U	860 U	1700 U	350 U	5 U	5 U
Acenaphthylene	5 U	5 U	44 260 J	280 J	1700 U	350 U	5 U	5 U
Acenaphthene	5 U	5 U	16 100 J	2200 U	1700 U	350 U	5 U	5 U
Dibenzofuran	5 U	5 U	600 U	560 U	1700 U	350 U	5 U	5 U
Diethylphthalate	5 U	5 U	1200 U	2200 U	1700 U	350 U	1 J	5 U
Fluorene	5 U	5 U	19 290 J	19 270 J	1700 U	350 U	5 U	5 U
Phenanthrene	5 U	5 U	600	800 U	96 J	27 J	5 U	5 U
Anthracene	5 U	5 U	? 650 J	? 590 J	1700 U	350 U	5 U	5 U
Carbazole	5 U	5 U	? 420 J	? 420 J	1700 U	350 U	5 U	5 U
Di-n-butylphthalate	5 U	5 U	1200 U	2200 U	1700 U	350 U	5 U	5 U
Fluoranthene	5 U	5 U	600 2200	600 2200	100 110 J	60 53 J	5 U	5 U
Pyrene	5 U	5 U	660 2500	660 1800 J	100 130 J	660 36 J	5 U	5 U
Butylbenzylphthalate	5 U	5 U	1200 U	2200 U	1700 U	350 U	5 U	5 U
Benzo(a)anthracene	5 U	5 U	1200 U	261 990 J	1700 U	261 36 J	5 U	5 U
Chrysene	5 U	5 U	384 3100	384 1900 J	100 140 J	384 59 J	5 U	5 U
bis(2-Ethylhexyl)phthalate	20 U	9 U	1200 U	2200 U	1700 U	350 U	6 U	7 U
Di-n-octylphthalate	5 U	5 U	1200 U	2200 U	1700 U	350 U	5 U	5 U
Benzo(b)fluoranthene	5 U	5 U	320 2100	320 3500	100 220 J	320 44 J	5 U	5 U
Benzo(k)fluoranthene	5 U	5 U	1600	2200 U	1700 U	44 J	5 U	5 U
Benzo(a)pyrene	5 U	5 U	130 2900	990 J	1700 U	350 U	5 U	5 U
Indeno(1,2,3-cd)pyrene	5 U	5 U	600 1100 J	600 860 J	1700 U	350 U	5 U	5 U
Dibenz(a,h)anthracene	5 U	5 U	1200 U	2200 U	1700 U	350 U	5 U	5 U
Benzo(g,h,i)perylene	5 U	5 U	670 J	690 J	1700 U	350 U	5 U	5 U
TOTAL SVOCs	U	U	21,770 J	17,720 J	696 J	299 J	1 J	U

NOTES:
All results reported in ug/Kg (soil and sediment) or ug/L (water)
U Undetected J Estimated value (10) Duplicate sample

AR301722

INORGANIC ANALYSIS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-4

Sample Location	EA1		EA1		EA1		EA2		EA2		EA2		EA3	
Sample Matrix	Surface Water		Sediment		Soil		Surface Water		Sediment		Soil		Sediment	
Sample Date	11/3/94		11/3/94		11/3/94		11/3/94		11/3/94		11/3/94		10/21/94	
Aluminum	57.1	B	2700	J*	9000	J*	92.9	B	7450	J*	6620	J*	9430	
Antimony	2	U	0.53	UJN	0.48	JBN	2	U	1.2	JBN	0.77	JBN	2.3	JBN
Arsenic	1.5	U	1.7	U	7.4		1.5	U	3.9	U	2.7	U	5.1	
Barium	50.6	B	16.8	B	62.8		45.7	B	56.7	B	43.8		121	
Beryllium	0.08	U	0.44	B	1.1		0.08	U	1.0	B	2.5		1.3	
Cadmium	0.3	U	0.42	B	0.58	B	0.3	U	2.2		0.67	B	1.37	
Calcium	68000		1280	B	1870		72000		18200		2960		33900	
Chromium	0.89	U	10.4	J*	25.2	J*	0.9	U	28.0	J*	33.4	J*	49.3	
Cobalt	1.5	B	12.3	B	18.8		0.8	U	24.7		16.4		14.7	
Copper	4.8	B	12.7		45.1		6.4	B	33		26.1		78.8	
Cyanide	5	U	0.64	U	0.65	U	5	U	0.78	U	0.67	U	1.1	
Iron	837	B	10300		26100		112		18800		40600		25800	
Lead	1.3	U	13.2	J*	36.4	J*	1.3	U	51.1	J*	36.5	J*	148	JE
Magnesium	14100		588	B	1020		11100		6050		1000		14200	
Manganese	10.4	B	46	JN	134	JN	9.4	B	322	JN	217	JN	242	
Mercury	0.07	U	0.05	B	0.07	B	0.07	U	0.11		0.04	U	0.23	RN
Nickel	3.2	U	15.5	JE*	26.4	JE*	4.8	U	36	JE*	38.6	JE*	75.2	JE
Potassium	5400	JE	313	JBE	346	JBE	7020	JE	1120	JBE	660	JBE	2210	JE
Selenium	3	U	0.79	U	2.1		3	U	1.9		2.6		2.0	
Sodium	15900	JE	58.5	U	43	U	13200	JE	69.1	U	38.4	B	57	U
Thallium	2.6	U	1.5	U	1.7	U	3.4	U	0.75	U	1.9	U	0.62	UJN
Vanadium	1.6	B	18.5		45.3		2.8	B	47.1		51.8		54.4	
Zinc	30.1		73.6	JN*	99.1	JN*	35.7		323	JN*	118	JN*	702	

NOTES:

All results reported in mg/Kg (soil and sediment) or ug/L (water)

U Undetected
B Detected in Blank
(10) Duplicate sample
J Estimated value

E Estimated value due to interference
* Duplicate analysis not within control limits
N Spiked sample recovery not within control limits
R Rejected

AR301723

INORGANIC ANALYSIS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-4

Sample Location	EA3	EA4	EA4	EA4	EA5	EA5	EA7
Sample Matrix	Sediment -(10)	Surface Water	Sediment	Soil	Surface Water	Sediment	Sediment
Sample Date	10/21/94	10/20/94	10/20/94	10/20/94	11/12/94	11/12/94	10/21/94
Aluminum	9570	194 JBN	2120	4730	790	2690 J*	14400
Antimony	1.8 JBN	2 U	1.1 JBN	2.3 JBN	3.6 B	0.93 JBN	8.2 JBN
Arsenic	5.4	1.6 UB	5.7	5.0	1.5 UJ	0.67 UJ	15.5
Barium	115	37 B	37.9 B	102	59.4 B	41.6 B	252
Beryllium	1.3	0.08 U	0.24 B	0.59 B	0.08 U	0.28 B	0.76 B
Cadmium	3.9	0.3 U	0.25 B	1.1	0.31 B	0.46 B	1.4 B
Calcium	29100	51400	17800	31400	118000	30100	143000
Chromium	48.6	0.89 U	15.5	62.7	7.8 B	42.5 J*	50.4
Cobalt	51.6	1.8 UB	31 B	8.3 B	7.1 B	2 B	8.4 B
Copper	77.5	6.4 UB	29.1	315	42.3	33.3	69.1
Cyanide	1.2	5 U	0.58 U	0.53 U	5 U	0.69 U	1.0 U
Iron	25500	1800	800	22100	3910	17600	21100
Lead	148 JE	1.3 B	73.2 JE	130 JE	22.2	33.4 J*	195 JE
Magnesium	14000	11100	5130	11500	18200	10200	29500
Manganese	392	352	77	561	715	786 JN	583
Mercury	0.24 RN	0.1 RB	0.09 RN	0.09 RBN	0.07 U	0.03 U	0.05 UJN
Nickel	85 JE	21.8 B	13.2 JE	33.1 JE	94.6	21.5 JE*	26.4 JE
Potassium	2210 JE	6440 JE	242 JBE	527 JBE	7540 JE	269 JBE	5980 JE
Selenium	2.4	3 U	2.2	2.8	16.4	1.4	1.5 B
Sodium	46.4 U	26300 JE	50.8 U	55.3 UB	44600 JE	74.4 B	80.7 U
Thallium	0.74 UJBN	2.4 U	0.55 UJN	0.42 UJN	2.4 U	0.55 U	1.3 UJBN
Vanadium	54.5	1.3 U	12.9	27.6	2.8 B	11.8	56.1
Zinc	697	60.0	136	391	176	109 JN*	899

NOTES:

All results reported in mg/Kg (soil and sediment) or ug/L (water)

U Undetected
B Detected in Blank
(10) Duplicate sample
J Estimated value

E Estimated value due to interference
* Duplicate analysis not within control limits
N Spiked sample recovery not within control limits
R Rejected

AR301724

INORGANIC ANALYSIS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-4

Sample Location	EA7	EA7	EA8	EA8	EA8	EA8	EA8
Sample Matrix	Soil	Soil-(10)	Surface Water	Surface Water-(10)	Sediment	Sediment -(10)	Soil
Sample Date	10/21/94	10/21/94	11/2/94	11/2/94	11/2/94	11/2/94	11/2/94
Aluminum	16800	15800	[illegible]	[illegible]	13900	13300	5580
Antimony	8.6 JBN	7.6 JBN	3.8 UB	4.4 UB	2.2 JBN	1.7 JBN	0.75 JBN
Arsenic	7.4	6.5	10.8	7.1 UB	12.6	10.9	2.8 U
Barium	263	264	91.9 B	87.5 B	137	122	31 B
Beryllium	0.79 B	0.77 B	0.25 UB	0.22 UB	0.7 B	0.67 B	0.24 B
Cadmium	1.5	1.4 B	0.16 UB	0.49 UB	1.12 B	1.3	0.08 B
Calcium	197000	170000	54800	54700	28800	21300	1950
Chromium	52.8	56.8	42.1	36.8	62.4	54.6	14.2
Cobalt	8.6 B	8.3 B	9 B	8 B	15.5	12.8	3.7 B
Copper	76.6	80.6	72.0	69.6	117	103	16
Cyanide	0.62 U	0.6 U	5 U	5 U	0.64 U	0.72 U	0.55 U
Iron	21700	24900	16800	14800	33800	29100	11100
Lead	181 JE	193 JE	[illegible]	[illegible]	168 JE	155 JE	32.3 JE
Magnesium	32000	35900	11900	11400	17600	13200	1330
Manganese	621	655	324	307	532	377	58.6
Mercury	0.04 UJN	0.03 UJN	0.19 RB	0.07 U	0.23 RN	0.11 RN	0.04 JUN
Nickel	30.5 JE	32.1 JE	39.9 B	37.4 B	52.7 JE	45.1 JE	7.2 JBE
Potassium	7010 JE	7210 JE	6540 JE	6370 JE	1810 JE	1460 JE	349 JBE
Selenium	1.8	2.2	5.6 U	4.9 UB	3.8	4.1	1.2
Sodium	60.5 U	65.4 U	20900 JE	21000 JE	62.3 U	56.4 U	51.8 U
Thallium	1.1 UJBN	1.1 UJBN	2.4 U	2.4 U	0.74 UJBN	1.4 UJBN	0.56 JUN
Vanadium	63.5	73.5	27.5 B	24 B	56.3	51.6	19.2
Zinc	839	910	[illegible]	[illegible]	448	400	65.7

NOTES:

All results reported in mg/Kg (soil and sediment) or ug/L (water)

U Undetected
B Detected in Blank
(10) Duplicate sample
J Estimated value

E Estimated value due to interference
* Duplicate analysis not within control limits
N Spiked sample recovery not within control limits
R Rejected

AR301725

INORGANIC ANALYSIS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-4

Sample Location	EA9		EA10		EA11	
Sample Matrix	Sediment		Surface Water		Surface Water	
Sample Date	10/20/94		11/13/94		11/3/94	
Aluminum	2240		22.3	B	129	B
Antimony	0.55	JB	2	U	2	U
Arsenic	3.1	U	1.5	U	1.5	U
Barium	21.2	B	40.5	B	33.5	B
Beryllium	0.12	B	0.08	U	0.08	U
Cadmium	0.09	B	0.9	U	0.9	U
Calcium	86000		65300		47000	
Chromium	12		0.9	U	0.9	U
Cobalt	2.8	B	1.4	B	0.8	U
Copper	17.6		6.4	B	14.8	B
Cyanide	0.51	U	5	U	5	U
Iron	8980		440		808	
Lead	46.1	JE	1.3	U	4.2	
Magnesium	30800		12800		10100	
Manganese	148		254		63.1	
Mercury	0.05	RBN	0.07	U	0.07	U
Nickel	9.4	JE	11.9	U	1.6	U
Potassium	645	JBE	760	JE	5260	JE
Selenium	1.3		3	U	4.3	B
Sodium	44.6	U	34800	JE	39200	JE
Thallium	0.48	UN	2.4	U	2.6	U
Vanadium	13.3		1.3	U	1.3	U
Zinc	79.0		66.6		107	

NOTES:
All results reported in mg/Kg (soil and sediment) or ug/L (water)

U Undetected
B Detected in Blank
(10) Duplicate sample
J Estimated value
E Estimated value due to interference
* Duplicate analysis not within control limits
N Spiked sample recovery not within control limits
R Rejected

AR301726

ORGANIC PESTICIDES
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-5

Sample Location	EA1	EA1	EA2	EA2	EA3	EA3	EA4	EA4	EA5
Sample Matrix	Sediment	Soil	Sediment	Soil	Sediment	Sediment-(10)	Sediment	Soil	Sediment
Sample Date	11/3/94	11/3/94	11/3/94	11/3/94	10/21/94	10/21/94	10/20/94	10/20/94	11/12/94
delta-BHC	2.4 U	2.3 U	3.5 U	2.4 U	2.9 U	2.8 U	2.2 U	1.8 U	2.2 U
Heptachlor	2.4 U	2.3 U	3.5 U	2.4 U	0.51 JP	2.8 U	2.2 U	1.2 JP	2.2 U
Aldrin	2.4 U	2.3 U	3.5 U	2.4 U	2.9 U	2.8 U	2.2 U	1.8 U	2.2 U
Heptachlor epoxide	2.4 U	2.3 U	3.5 U	2.4 U	1.5 JPZ	2.8 U	2.2 U	1.6 JP	2.2 U
Dieldrin	4.6 U	4.4 U	4.6 J	4.6 U	5.1 JPZ	4.4 JPZ	4.2 U	2.7 JPZ	4.2 U
4,4'-DDE	3.0 JZ	4.4 U	3.1 JP	4.6 U	4.4 JZ	4.3 JZ	4.2 JZ	1.9 JZ	3.0 PB
Endrin	4.6 U	4.4 U	6.9 U	5.5 JP	5.7 U	5.4 U	4.2 U	3.6 U	4.2 U
Endosulfan II	4.6 U	4.4 U	4.6 JP	4.6 U	5.7 U	5.4 U	4.2 U	3.3 JPZ	4.2 U
4,4'-DDD	4.6 U	4.4 U	6.9 U	4.6 U	5.7 U	5.4 U	4.2 U	3.6 U	4.2 U
Endosulfan sulfate	4.6 U	4.4 U	4.0 JP	4.6 U	5.7 U	5.4 U	4.2 U	3.6 U	4.2 U
4,4'-DDT	4.6 U	4.4 U	6.9 U	4.6 U	4.5 JPZ	3 JPZ	4.2 U	3.1 JPZ	4.2 U
Methoxychlor	24 U	23 U	35 U	24 U	29 U	31 JPZ	22 U	23 JPZ	22 U
Endrin ketone	4.6 U	4.4 U	6.9 U	4.6 U	5.7 U	5.4 U	4.2 U	2.8 JPZ	4.2 U
alpha-Chlordane	1.1 JZ	1.1 J	7.5 JP	2.4 U	6.5 JPZ	5.6 JPZ	3.5 JPZ	6.4 JPZ	2.1 JP
gamma-Chlordane	2.4 U	2.3 U	5.0 JP	2.4 U	6.4 JZ	5.5 JZ	3.1 JZ	7.6 JZ	2.1 JP
Aroclor-1242	46 U	44 U	69 U	46 U	57 U	54 U	42 U	36 U	42 U
Aroclor-1254	28 J	44 U	69 U	46 U	46 JP	48 JP	46 JP	36 U	42 U
Aroclor-1260	46 U	44 U	69 U	46 U	57 U	51 JP	42 U	56 U	42 U

NOTES:
All results reported in ug/Kg
U Undetected
J Estimated value
Z Reported result based on combined response from coeluting compounds
P Greater than 25% difference between two GC columns; lower value reported.
(10) Duplicate sample
(RE) Sample reanalyzed

AR301727

ORGANIC PESTICIDES
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-5

Sample Location	EA5	EA7	EA7	EA7	EA8	EA8	EA8	EA9
Sample Matrix	Sediment-(RE)	Sediment	Soil	Soil-(10)	Sediment	Sediment-(10)	Soil	Sediment
Sample Date	11/12/94	10/21/94	10/21/94	10/21/94	11/2/94	11/2/94	11/2/94	10/20/94
delta-BHC	2.2 U	3.6 U	1.5 JP	1.9 JP	9.1 U	5.6 U	2.2 U	1.8 U
Heptachlor	2.2 U	5.5 JP	2.2 JP	2.1 JP	9.1 U	5.6 U	2.2 U	1.8 U
Aldrin	2.2 U	3.2 JP	2.5 JP	2.2 JP	9.1 U	5.6 U	2.2 U	1.8 U
Heptachlor epoxide	2.2 U	3.1 U	1.7 JP	1.5 JP	9.1 U	5.6 U	2.2 U	1.0 JP
Dieldrin	4.2 U	20 JZ	35 Z	30 JZ	18 U	11 U	4.2 U	4.4 JP
4,4-DDE	4.2 U	6.1 JPZ	6.[illegible] Z	5.5 JZ	26 PZ	27 Z	4.2 U	13 [illegible]
Endrin	4.2 U	4.3 JZ	2.9 JZ	5.7 U	18 U	11 U	4.2 U	1.7 JP
Endosulfan II	4.2 U	4.6 JPZ	3.7 JPZ	4.3 JPZ	17 JPZ	19 JPZ	4.2 U	2.6 JP
4,4'-DDD	4.2 U	6.0 U	7.1 JP	6.3 JZ	18 U	28 JP	4.2 U	3.5 U
Endosulfan sulfate	4.2 U	6.0 U	5.9 U	5.7 U	13 JP	15 JP	4.2 U	4.2 JP
4,4'-DDT	4.2 U	6.0 U	5.9 U	5.7 U	18 U	12 JPZ	4.2 U	3.5 U
Methoxychlor	22 U	30 U	30 U	29 U	91 U	63 JPZ	22 U	22 JP
Endrin ketone	4.2 U	6.0 U	5.9 U	5.7 U	18 U	7.0 JPZ	4.2 U	3.1 JP
alpha-Chlordane	3.7 JP	21 JPZ	18 PZ	14 JPZ	6.2 JPZ	5.5 JPZ	2.2 U	2.1 JP
gamma-Chlordane	2.1 U	38 JZ	32 Z	26 JZ	9.1 U	5.6 U	2.2 U	2.7 U
Aroclor-1242	42 U	60 U	59 U	57 U	870	810	41 J	35 U
Aroclor-1254	42 U	60 U	59 U	57 U	180 U	110 U	42 U	35 U
Aroclor-1260	42 U	176 JP	84	53 JP	770	720	32 J	35 U

NOTES:
All results reported in ug/Kg
U Undetected
J Estimated value
Z Reported result based on combined response from coeluting compounds
P Greater than 25% difference between two GC columns; lower value reported
(10) Duplicate sample
(RE) Sample reanalyzed

AR301728

ORGANOPHOSPHORUS PESTICIDES
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-6

Sample Location Sample Matrix Sample Date	EA1 Sediment 11/3/94	EA1 Soil 11/3/94	EA2 Sediment 11/3/94	EA2 Soil 11/3/94	EA3 Sediment 10/21/94	EA3 Sediment-(10) 10/21/94	EA4 Sediment 10/20/94
Stirophos	48 U	46 U	71 U	48 U	58 U	55 U	44 U

NOTES:
All results reported in ug/Kg
U Undetected
(10) Duplicate sample
J Estimated value

AR301729

ORGANOPHOSPHORUS PESTICIDES
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-6

Sample Location Sample Matrix Sample Date	EA4 Soil 10/20/94	EA5 Sediment 11/12/94	EA7 Sediment 10/21/94	EA7 Soil 10/21/94	EA7 Soil-(10) 10/21/94	EA8 Sediment 11/2/94	EA8 Sediment-(10) 11/2/94
Stirophos	37 U	44 U	61 U	60 U	57 U	270 J	55 U

NOTES:
All results reported in ug/Kg
U Undetected
(10) Duplicate sample
J Estimated value

AR301730

ORGANOPHOSPHORUS PESTICIDES
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-6

Sample Location Sample Matrix Sample Date	EA8 Soil 11/2/94	EA9 Sediment 10/20/94
Stirophos	280 J	37 U

NOTES:
All results reported in ug/Kg
U Undetected
(10) Duplicate sample
J Estimated value

AR301731

CHLORINATED HERBICIDES
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-7

Sample Location Sample Matrix Sample Date	EA1 Sediment 11/3/94		EA1 Soil 11/3/94		EA2 Sediment 11/3/94		EA2 Soil 11/3/94		EA3 Sediment 10/21/94		EA3 Sediment-(10) 10/21/94		EA4 Sediment 10/20/94	
2,4-DB	65	U	64	U	97	U	65	U	83	U	79	U	62	U
2,4,5-T	6.5	U	10	J	12	J	6.5	U	20	J	7.9	U	14	J
Dalapon	170	U	170	U	250	U	170	U	210	U	200	U	160	U
Dicamba	6.5	U	14	J	9.7	U	6.5	U	8.1	U	7.7	U	6.1	U
MCPP	6500	U	13000		9700	U	6600	U	8000	U	7700	U	6000	U

NOTES:
All results reported in ug/Kg
U Undetected
(10) Duplicate sample
R Rejected
J Estimated value

AR301732

CHLORINATED HERBICIDES
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-7

Sample Location Sample Matrix Sample Date	EA4 Soil 10/20/94		EA5 Sediment 11/12/94		EA7 Sediment 10/21/94		EA7 Soil 10/21/94		EA7 Soil-(10) 10/21/94		EA8 Sediment 11/2/94		EA8 Sediment-(10) 11/2/94	
2,4-DB	53	U	60	U	87	U	86	U	82	U	84	U	78	U
2,4,5-T	53	U	70	U	87	U	86	U	82	U	84	U	78	U
Dalapon	1000	R	160	U	220	U	220	U	210	U	210	U	200	U
Dicamba	5.2	U	6	U	8.5	U	8.4	U	13	J	8.2	U	7.6	U
MCPP	5100	U	6000	U	8500	U	8300	U	7900	U	8100	U	7600	U

NOTES:
All results reported in ug/Kg
U Undetected
(10) Duplicate sample
R Rejected
J Estimated value

AR301733

CHLORINATED HERBICIDES
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-7

Sample Location Sample Matrix Sample Date	EA8 Soil 11/2/94		EA9 Sediment 10/20/94	
2,4-DB	110	J	51	U
2,4,5-T	61	U	51	U
Dalapon	160	U	130	U
Dicamba	6	U	50	U
MCPP	5900	U	5000	U

NOTES:
All results reported in ug/Kg
U Undetected
(10) Duplicate sample
R Rejected
J Estimated value

AR301734

WATER QUALITY ANALYSIS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-8

Sample Location Sample Matrix Sample Date	EA1 Surface Water 11/3/94	EA2 Surface Water 11/3/94	EA4 Surface Water 10/21/94	EA5 Surface Water 11/12/94	EA8 Surface Water 11/2/94	EA8 Surface Water-(10) 11/2/94	EA10 Surface Water 11/13/94	EA11 Surface Water 11/3/94
Organic Carbon Total	9.8	NA	7.4	9.4	17.4	17.8	7.6	6.1
Biological Oxygen Demand	1.8	2.4	7.0	2.7	11	<10	5.6	3.8
Chemical Oxygen Demand	25	40	25	24	120	131	16	16
Suspended Solids Total	3.7	13	11.1	29.7	246	246	4.6	4.6
Dissolved Solids Total	296	289	308	500	354	346	320	288
Alkalinity Total (as CaCO3)	119	128	96	133	81	77	140	124
Hydroxide Alkalinity	<1	<1	<1	1	<1	<1	<1	<1
Carbonate Alkalinity	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity	119	128	96	133	81	77	140	124
Hardness Total (as CaCO3)	215 J	213 J	168	320 J	148	154	208 J	176 J

NOTES:
All results reported in mg/L
NA Not analyzed
(10) Duplicate sample
J Estimated value

AR300735

SOIL AND SEDIMENT CHARACTERISTICS ANALYSIS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-9

Sample Location **Sample Matrix** **Sample Date**	**EA1** **Sediment** **11/3/94**	**EA1** **Soil** **11/3/94**	**EA2** **Sediment** **11/3/94**	**EA2** **Soil** **11/3/94**	**EA3** **Sediment** **10/21/94**	**EA3** **Sediment-(10)** **10/21/94**
Solids Total (as received)	72.2	73.7	48.3	71.7	58.1	60.9
Redox Potential / Sediments (mV)	0 J	460 J	85 J	530 J	20	20
TOC (dry weight) (mg/kg)	0.44	1.5	6.0	2.9	7.2	6.4
Soil pH	NA	7.42	NA	7.13	NA	NA

NOTES:
NA Not analyzed
(10) Duplicate sample
J Estimated value

AR300736

SOIL AND SEDIMENT CHARACTERISTICS ANALYSIS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-9

Sample Location **Sample Matrix** **Sample Date**	**EA4** **Sediment** **10/20/94**	**EA4** **Soil** **10/20/94**	**EA5** **Sediment** **11/12/94**	**EA7** **Sediment** **10/21/94**	**EA7** **Soil** **10/21/94**	**EA7** **Soil-(10)** **10/21/94**
Solids Total (as received)	78.0	91.7	78.2	55.0	56.0	58.5
Redox Potential / Sediments (mV)	-20	20	350 J	-20	-30	-30
TOC (dry weight) (mg/kg)	1.13	1.37	0.88	8.4	8.2	7.3
Soil pH	NA	8.18	NA	NA	8.16	8.18

NOTES:
NA Not analyzed
(10) Duplicate sample
J Estimated value

ARCU 737

SOIL AND SEDIMENT CHARACTERISTICS ANALYSIS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-9

Sample Location Sample Matrix Sample Date	EA8 Sediment 11/2/94	EA8 Sediment-(10) 11/2/94	EA8 Soil 11/2/94	EA9 Sediment 10/20/94
Solids Total (as received)	56.5	61.0	78.6	93.9
Redox Potential / Sediments (mV)	NA	NA	NA	-20
TOC (dry weight) (mg/kg)	9.8	7.9	0.50	4.6
Soil pH	NA	NA	7.72	NA

NOTES:
NA Not analyzed
(10) Duplicate sample
J Estimated value

AR301738

FIELD MEASUREMENT DATA
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-10

Sample Location	EA1	EA1	EA1	EA2	EA2	EA2	EA3	EA4
Sample Matrix	Surface Water	Sediment	Soil	Surface Water	Sediment	Soil	Sediment	Surface Water
Sample Date	11/3/94	11/3/94	11/3/94	11/4/94	11/4/94	11/4/94	10/21/94	10/21/94
Sample Time	1340	1600	1410	830	900	845	1115	1500
pH	8.3	NA	NA	7.5	NA	NA	NA	6.7
Conductivity	417	NA	NA	422	NA	NA	NA	429
Oxidation Reduction Potential	207	NA	NA	263	NA	NA	NA	132
Temperature	14.5	NA	NA	9.5	NA	NA	NA	18.8
Dissolved Oxygen	7.51	NA	NA	5.93	NA	NA	NA	19.61
Color	NA	2.5YR 4/4	5YR 4/3	NA	10YR 3/4	5YR 5/4	10YR 3/2	NA

NOTES:
NA Not analyzed
Conductivity measured in uS/cm
Oxidation Reduction Potential measured in mV
Temperature measured in degrees centigrade
Dissolved oxygen measured in mg/L
Color from Munsell Soil Color Chart

AR301739

FIELD MEASUREMENT DATA
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-10

Sample Location	EA4	EA4	EA5	EA5	EA7	EA7	EA8	EA8
Sample Matrix	Sediment	Soil	Surface Water	Sediment	Sediment	Soil	Surface Water	Sediment
Sample Date	10/20/94	10/20/94	11/12/94	11/12/94	10/21/94	10/21/94	11/2/94	11/2/94
Sample Time	1540	1600	1000	1030	1315	1330	1215	1445
pH	NA	NA	7.0	NA	NA	NA	8.2	NA
Conductivity	NA	NA	785	NA	NA	NA	223	NA
Oxidation Reduction Potential	NA	NA	148	NA	NA	NA	167	NA
Temperature	NA	NA	13.0	NA	NA	NA	11.3	NA
Dissolved Oxygen	NA	NA	6.0	NA	NA	NA	6.25	NA
Color	10YR 3/4	10YR 5/3	NA	10YR 5/3	2.5Y 4/2	2.5Y 4/2	NA	2.5Y 3/1

NOTES:
NA Not analyzed
Conductivity measured in uS/cm
Oxidation Reduction Potential measured in mV
Temperature measured in degrees centigrade
Dissolved oxygen measured in mg/L
Color from Munsell Soil Color Chart

AR301740

FIELD MEASUREMENT DATA
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-10

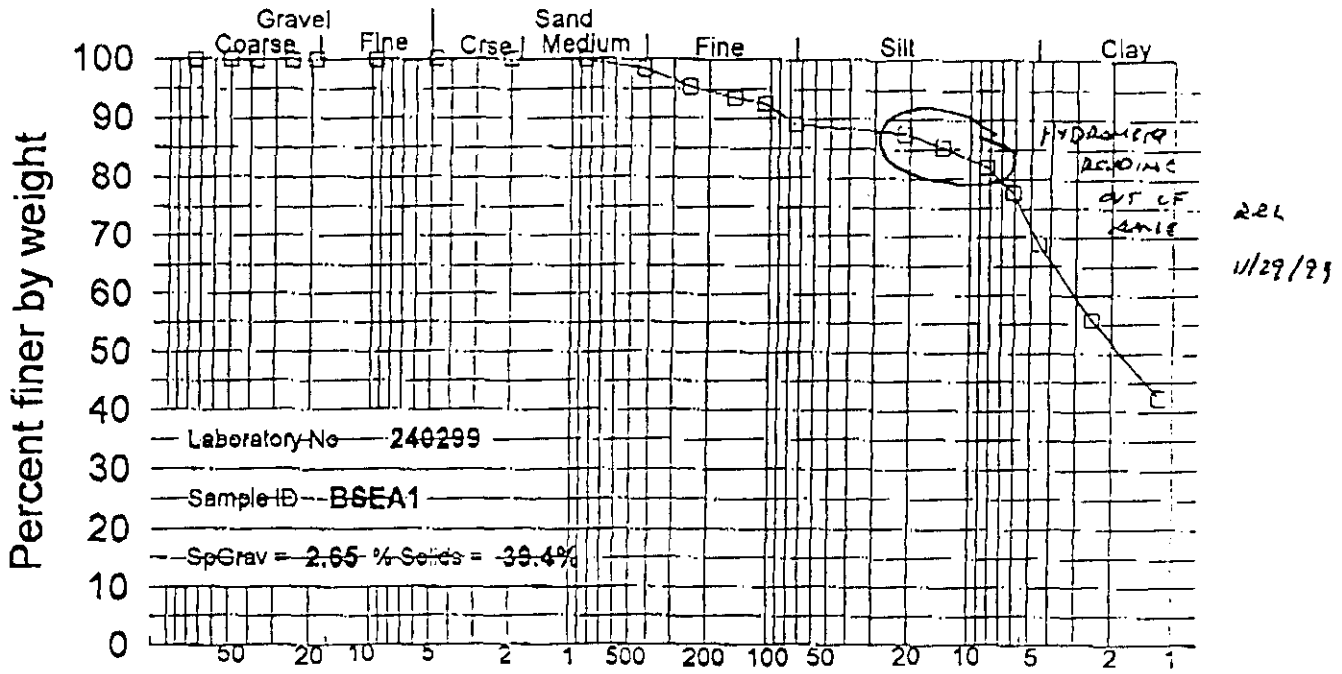
Sample Location	EA8	EA9	EA10	EA11
Sample Matrix	Soil	Sediment	Surface Water	Surface Water
Sample Date	11/2/94	10/20/94	11/13/94	11/3/94
Sample Time	1430	1400	1030	1020
pH	NA	NA	5.5	8.1
Conductivity	NA	NA	720	427
Oxidation Reduction Potential	NA	NA	230	614
Temperature	NA	NA	13.4	14.4
Dissolved Oxygen	NA	NA	7.0	5.61
Color	2.5Y 2.5/1	10YR 4/3	NA	NA

NOTES:
NA Not analyzed
Conductivity measured in uS/cm
Oxidation Reduction Potential measured in mV
Temperature measured in degrees centigrade
Dissolved oxygen measured in mg/L
Color from Munsell Soil Color Chart

AR301741

Table B-11

Inchcape ASTM D422 Particle Size Analysis Sample ID BSEA1



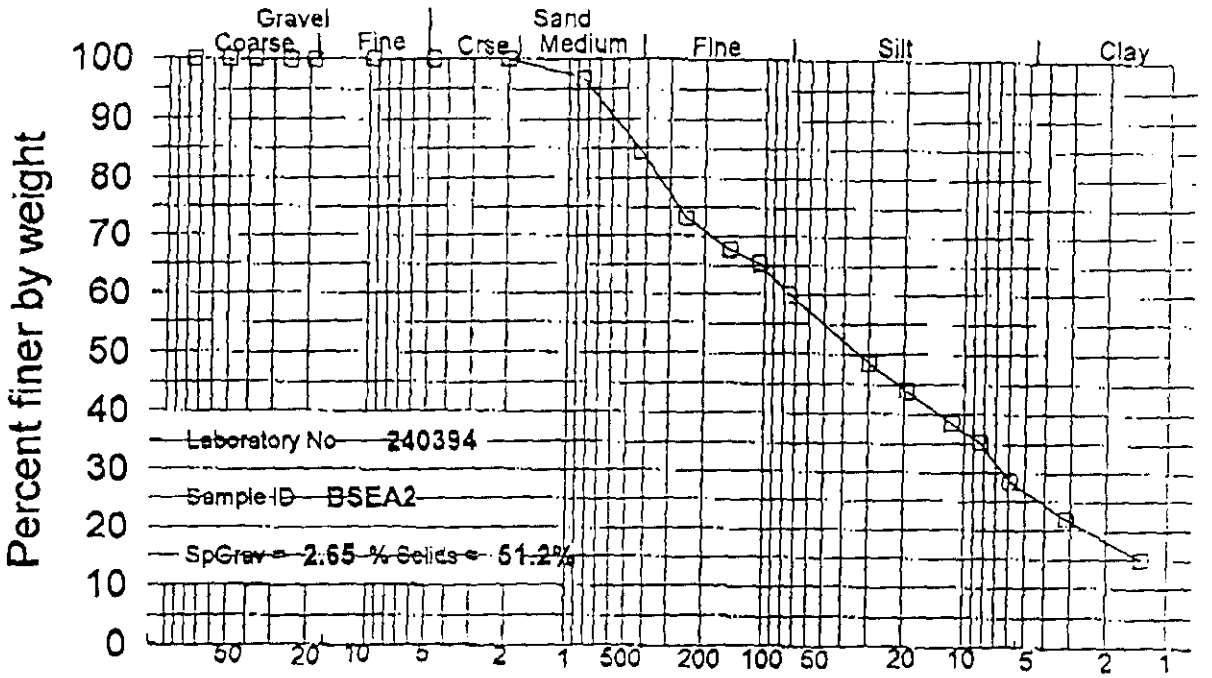
Particle Size, millimeters (mm) and microns (um)

Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	100.0	0.0	
#4	4.75	100.0	0.0	
#10	2.00	100.0	0.0	
#20	850.0 um	99.9	0.1	
#40	425.0	98.3	1.6	
#60	250.0	95.4	2.9	
#80	150.0	93.5	1.9	
#100	106.0	92.6	0.9	
#200	75.0	89.0	3.5	
Hydrometer	21.4	87.5	1.5	Dispersion of soil
|	13.9	85.3	2.2	for hydrometer test
|	8.3	82.0	3.3	by mechanical mixer
|	6.1	77.6	4.4	with metal paddle
|	4.6	68.8	8.8	operated for five
|	2.5	55.7	13.1	minute within a
|	1.2	42.4	13.3	dispersion cup.

Printed by 10:45 on 21-Nov-94

Set 89
Lab No. 240299

Inchcape ASTM D422 Particle Size Analysis Sample ID BSEA2



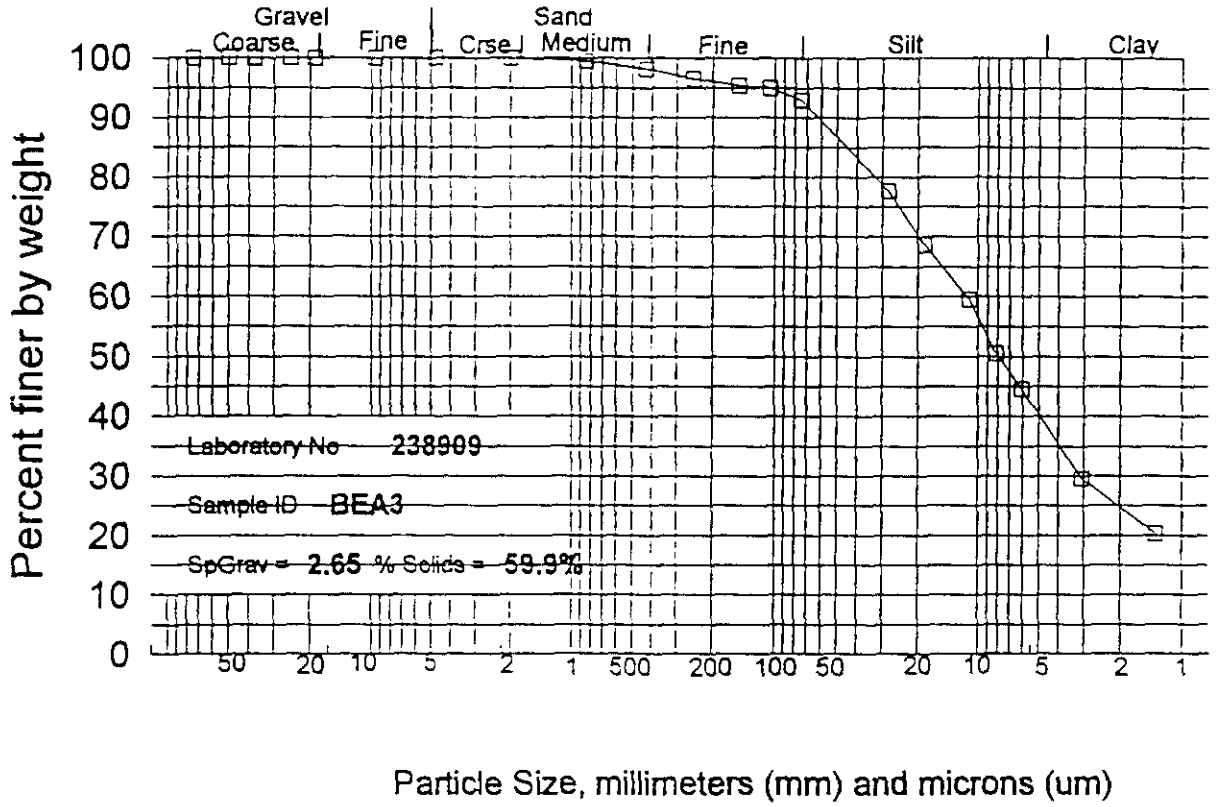
Particle Size, millimeters (mm) and microns (um)

Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	100.0	0.0	
#4	4.75	100.0	0.0	
#10	2.00	100.0	0.0	
#20	850.0 um	96.7	3.3	
#40	425.0	84.6	12.1	
#60	250.0	73.3	11.4	
#80	150.0	67.7	5.6	
#100	106.0	65.3	2.3	
#200	75.0	59.8	5.5	
Hydrometer	30.0	48.5	11.3	Dispersion of soil
|	19.5	44.0	4.5	for hydrometer test
|	11.6	38.5	5.6	by mechanical mixer
|	8.3	35.1	3.3	with metal paddle
|	6.0	28.5	6.7	operated for five
|	3.1	21.8	6.6	minute within a
|	1.3	15.1	6.8	dispersion cup.

Printed by 10:49 on 21-Nov-94

Set 89
Lab No. 240394

Inchcape ASTM D422 Particle Size Analysis **Sample ID** BEA3



Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	100.0	0.0	
#4	4.75	100.0	0.0	
#10	2.00	100.0	0.0	
#20	850.0 um	99.5	0.5	
#40	425.0	98.1	1.4	
#60	250.0	96.5	1.6	
#80	150.0	95.4	1.0	
#100	106.0	94.9	0.5	
#200	75.0	93.0	1.9	
Hydrometer	28.1	77.6	15.4	Dispersion of soil
|	18.6	68.6	9.0	for hydrometer test
|	11.2	59.6	9.0	by mechanical mixer
|	8.2	50.6	9.0	with metal paddle
|	6.1	44.5	6.0	operated for five
|	3.1	29.6	15.0	minute within a
|	1.3	20.4	9.2	dispersion cup.

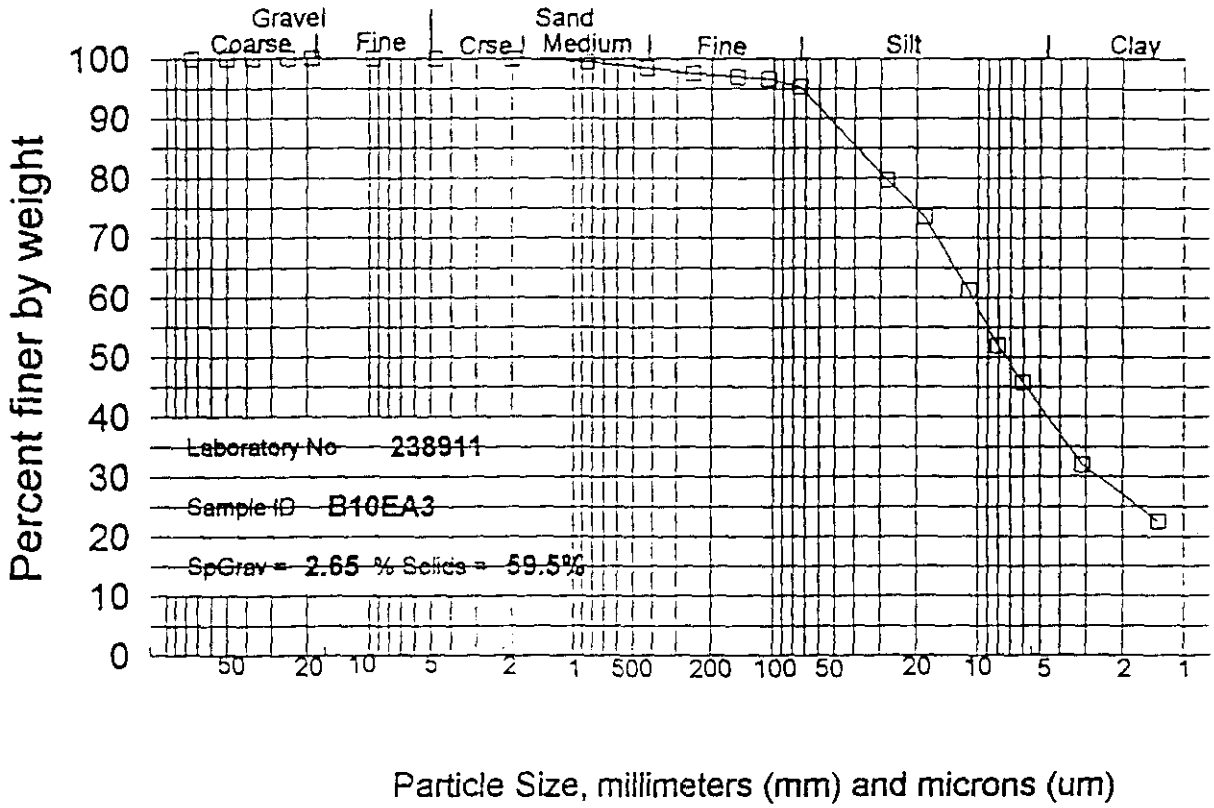
VALIDATED
Reviewed By Joyce L. White
Date 12/29/94

Printed by [signature] 09:39 on 07-Nov-94

Set 76
Lab No. 238909

Table B-11

Inchcape ASTM D422 Particle Size Analysis **Sample ID** B10EA3



VALIDATED
Reviewed By Joyce E. Whittle
Date 12/29/94

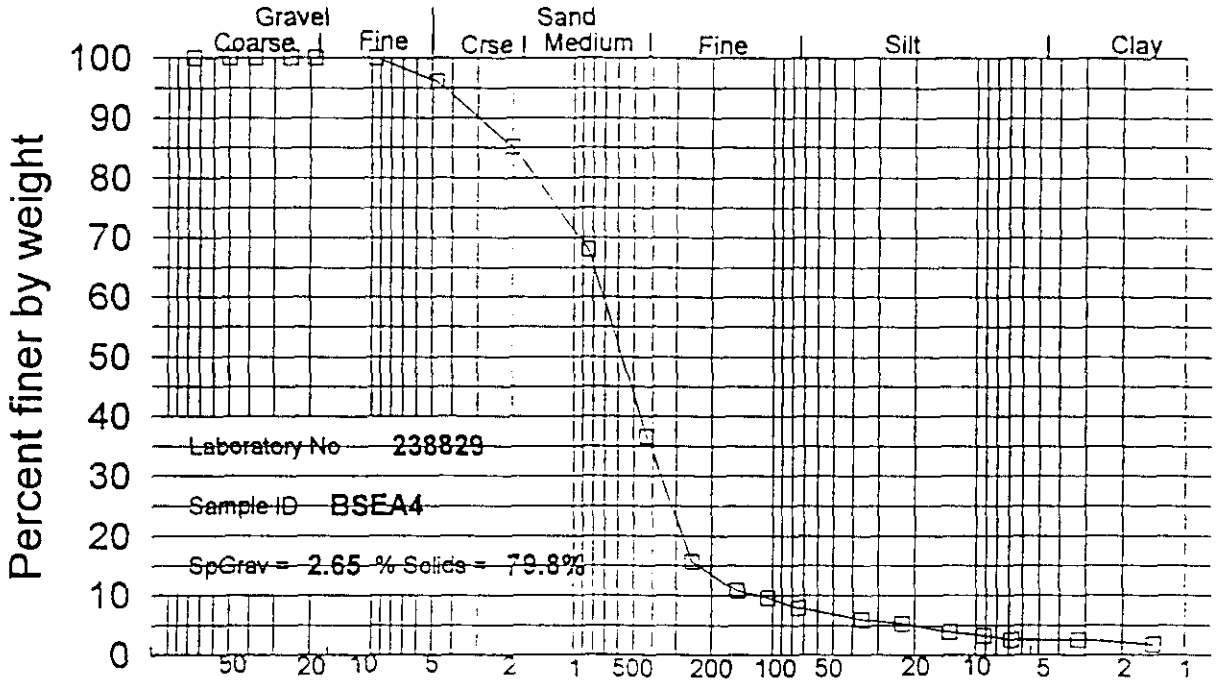
Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	100.0	0.0	
#4	4.75	100.0	0.0	
#10	2.00	100.0	0.0	
#20	850.0 um	99.5	0.5	
#40	425.0	98.5	1.0	
#60	250.0	97.5	1.0	
#80	150.0	97.0	0.5	
#100	106.0	96.6	0.4	
#200	75.0	95.3	1.3	
Hydrometer	28.1	79.8	15.5	Dispersion of soil
|	18.3	73.6	6.2	for hydrometer test
|	11.2	61.2	12.4	by mechanical mixer
|	8.1	52.0	9.3	with metal paddle
|	6.1	45.8	6.2	operated for five
|	3.1	32.0	13.8	minute within a
|	1.3	22.6	9.3	dispersion cup.

Printed by [signature] 09:41 on 07-Nov-94

Set 76
Lab No. 238911

AR301745

Inchcape ASTM D422 Particle Size Analysis Sample ID BSEA4



VALIDATED
Reviewed By
Date

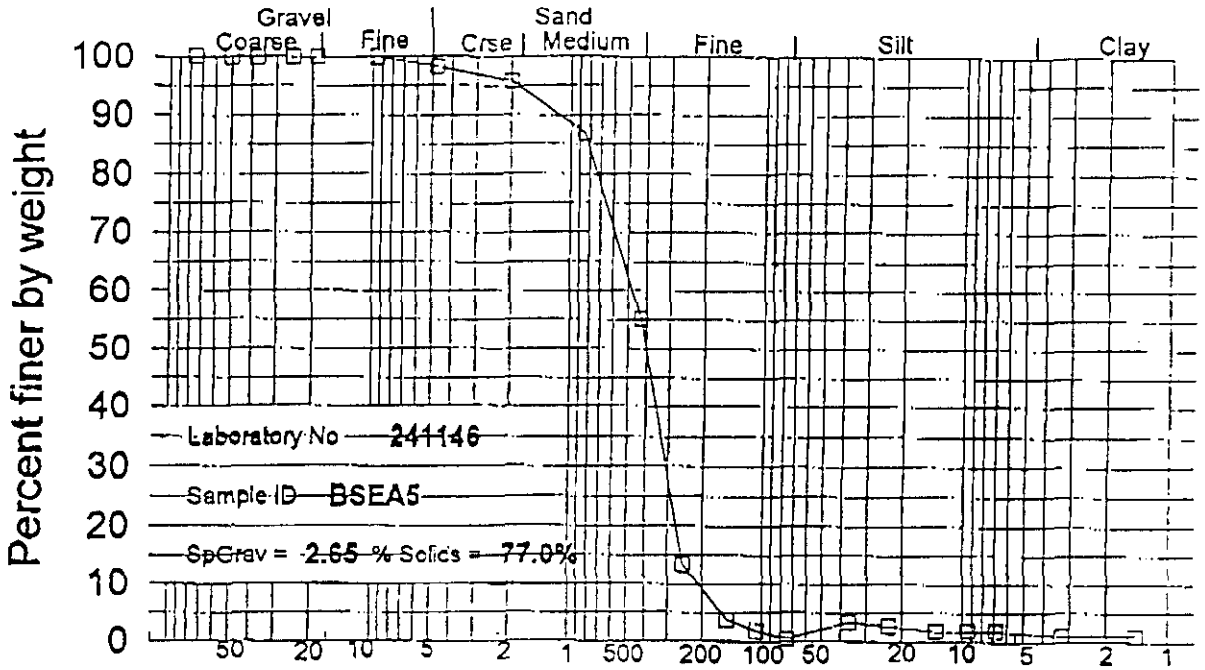
Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	100.0	0.0	
#4	4.75	96.0	4.0	
#10	2.00	85.1	10.9	
#20	850.0 um	68.1	17.0	
#40	425.0	36.6	31.5	
#60	250.0	15.7	20.9	
#80	150.0	10.9	4.9	
#100	106.0	9.7	1.2	
#200	75.0	8.0	1.7	
Hydrometer	36.2	6.0	2.0	Dispersion of soil
|	23.0	5.3	0.7	for hydrometer test
|	13.4	3.9	1.4	by mechanical mixer
|	9.2	3.2	0.7	with metal paddle
|	6.8	2.5	0.7	operated for five
|	3.2	2.5	-0.0	minute within a
|	1.4	1.7	0.8	dispersion cup.

Printed by 22:20 on 09-Nov-94

Set 76
Lab No. 238829

Table B-11

Inchcape ASTM D422 Particle Size Analysis Sample ID BSEA5

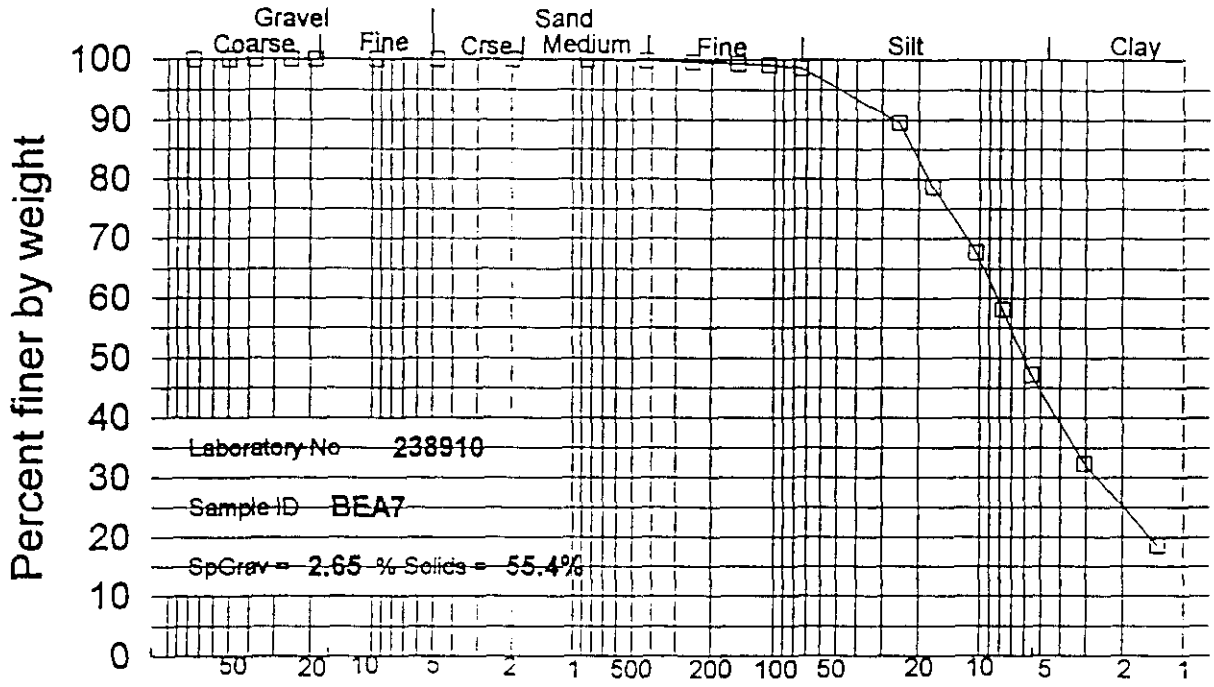


Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	100.0	0.0	
#4	4.75	98.4	1.6	
#10	2.00	95.7	2.7	
#20	850.0 um	86.9	8.8	
#40	425.0	55.3	31.6	
#60	250.0	13.3	42.0	
#80	150.0	3.7	9.6	
#100	106.0	1.9	1.8	
#200	75.0	0.6	1.3	
Hydrometer	36.6	3.4	-2.8	Dispersion of soil
|	23.3	2.6	0.7	for hydrometer test
|	13.5	1.9	0.7	by mechanical mixer
|	9.4	1.9	0.0	with metal paddle
|	6.8	1.9	0.0	operated for five
|	3.3	1.1	0.8	minute within a
|	1.4	1.0	0.1	dispersion cup.

Printed by [signature] 11:19 on 28-Nov-94 Set 91
(For) Robert Farley Lab No. 241146

AR301747 000048

Inchcape ASTM D422 Particle Size Analysis **Sample ID** BEA7



VALIDATED
Reviewed By Joyce L. Whitake
Date 12/29/94

Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	100.0	0.0	
#4	4.75	100.0	0.0	
#10	2.00	100.0	0.0	
#20	850.0 um	100.0	0.0	
#40	425.0	99.8	0.2	
#60	250.0	99.5	0.3	
#80	150.0	99.4	0.2	
#100	106.0	99.2	0.2	
#200	75.0	98.6	0.6	
Hydrometer	24.9	89.5	9.1	Dispersion of soil
|	16.9	78.6	10.9	for hydrometer test
|	10.4	67.7	10.9	by mechanical mixer
|	7.7	58.1	9.6	with metal paddle
|	5.6	47.2	10.9	operated for five
|	3.0	32.3	14.9	minute within a
|	1.3	18.5	13.8	dispersion cup.

Printed by [signature] 09:40 on 07-Nov-94

Set 76
Lab No. 238910

Inchcape ASTM D422 Particle Size Analysis **Sample ID** BSEA8

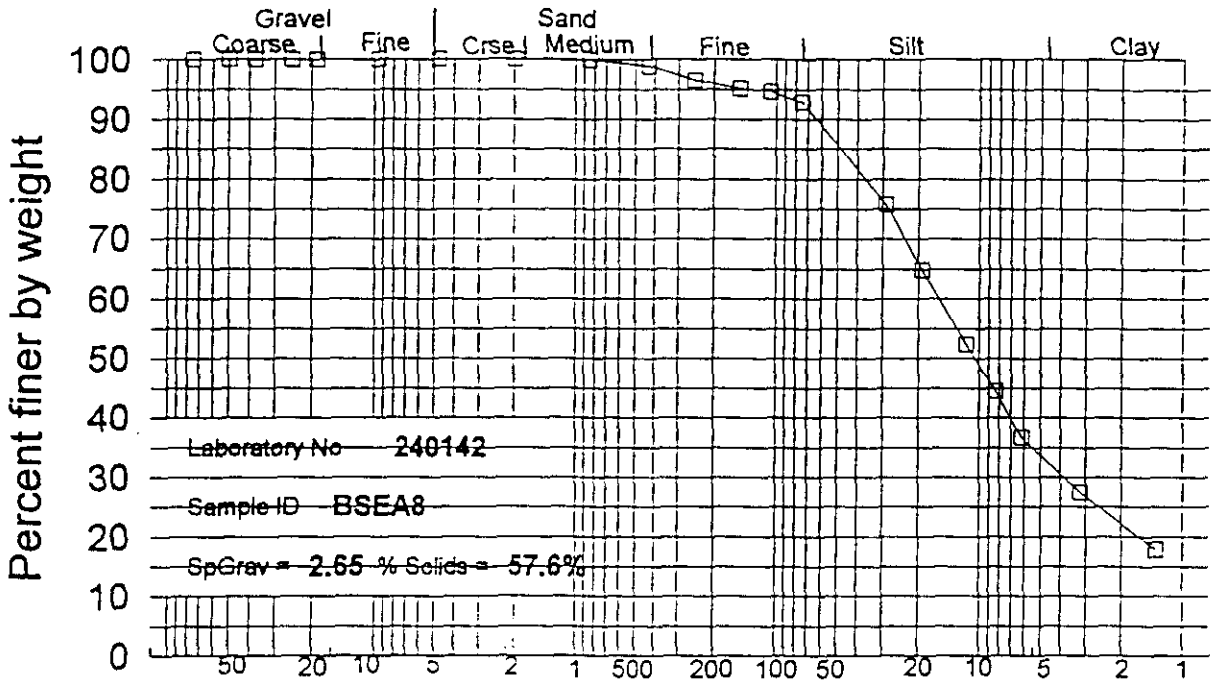


TABLE B-11

VALIDATED
Reviewed By Joyce L. Whittle
Date

Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	100.0	0.0	
#4	4.75	100.0	0.0	
#10	2.00	100.0	0.0	
#20	850.0 um	100.0	0.0	
#40	425.0	98.8	1.2	
#60	250.0	96.5	2.3	
#80	150.0	95.1	1.4	
#100	106.0	94.7	0.4	
#200	75.0	92.9	1.8	
Hydrometer	29.0	75.8	17.1	Dispersion of soil
|	19.2	64.8	10.9	for hydrometer test
|	11.7	52.3	12.5	by mechanical mixer
|	8.4	44.5	7.8	with metal paddle
|	6.2	36.7	7.8	operated for five
|	3.2	27.5	9.2	minute within a
|	1.3	17.9	9.6	dispersion cup.

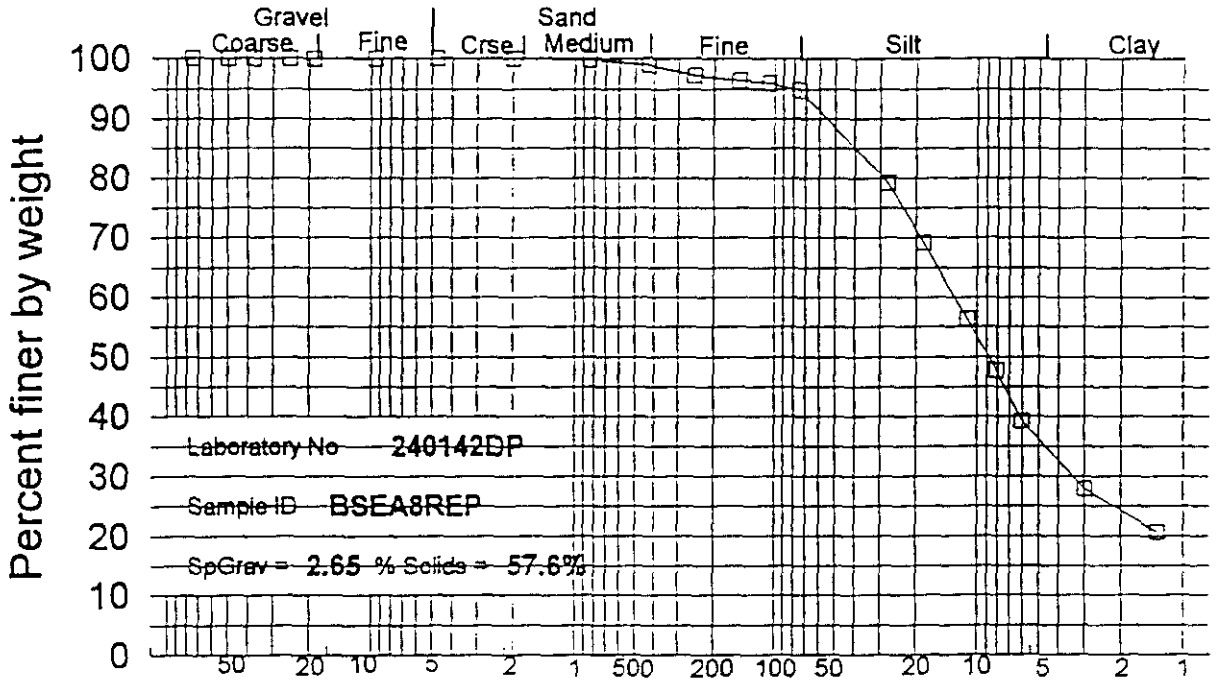
Printed by 10:39 on 21-Nov-94

Set 89
Lab No. 240142

AR301749

Inchcape ASTM D422 Particle Size Analysis Sample ID BSEA8REP

TABLE-B-11



Particle Size, millimeters (mm) and microns (um)

VALIDATED
Reviewed By Jorge E. Wittel
Date 12/29/94

Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	100.0	0.0	
#4	4.75	100.0	0.0	
#10	2.00	100.0	0.0	
#20	850.0 um	99.8	0.2	
#40	425.0	98.9	0.9	
#60	250.0	97.2	1.7	
#80	150.0	96.3	0.9	
#100	106.0	96.0	0.4	
#200	75.0	94.7	1.2	
Hydrometer	27.4	79.1	15.6	Dispersion of soil
|	18.3	69.2	10.0	for hydrometer test
|	11.2	56.3	12.8	by mechanical mixer
|	8.1	47.8	8.6	with metal paddle
|	6.1	39.3	8.5	operated for five
|	3.0	28.0	11.3	minute within a
|	1.3	20.7	7.3	dispersion cup.

Printed by 10:40 on 21-Nov-94

Set 89
Lab No. 240142DP

Inchcape ASTM D422 Particle Size Analysis Sample ID S10EA8

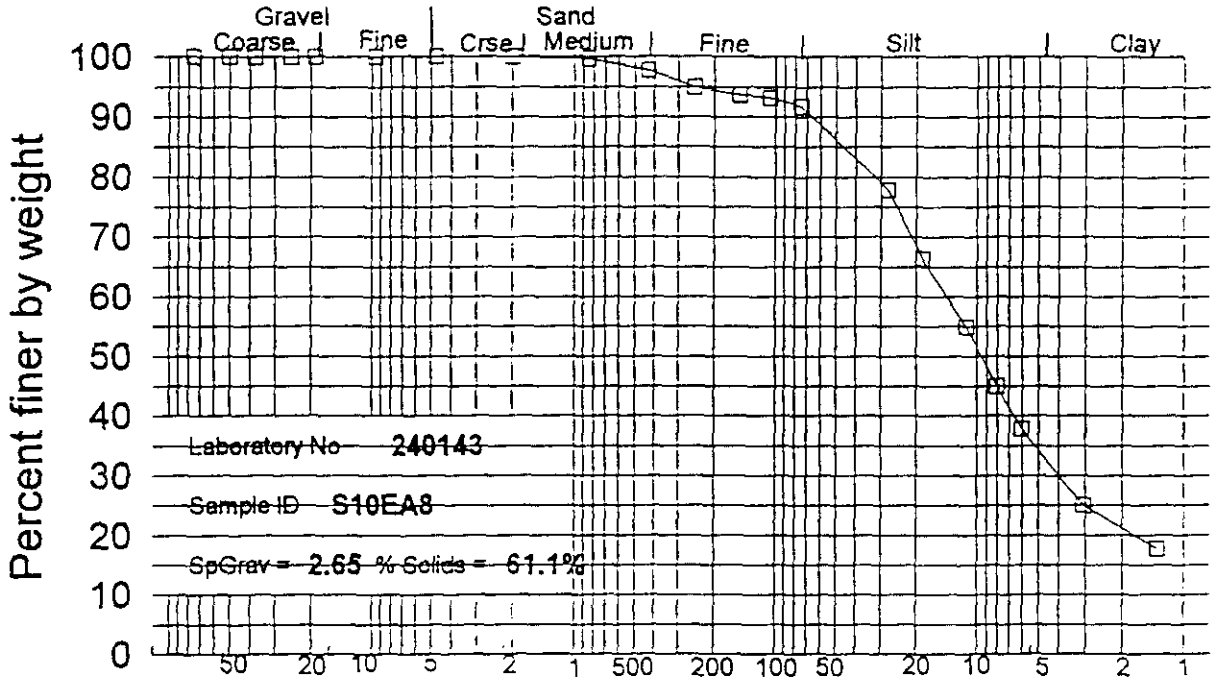


TABLE - B-11

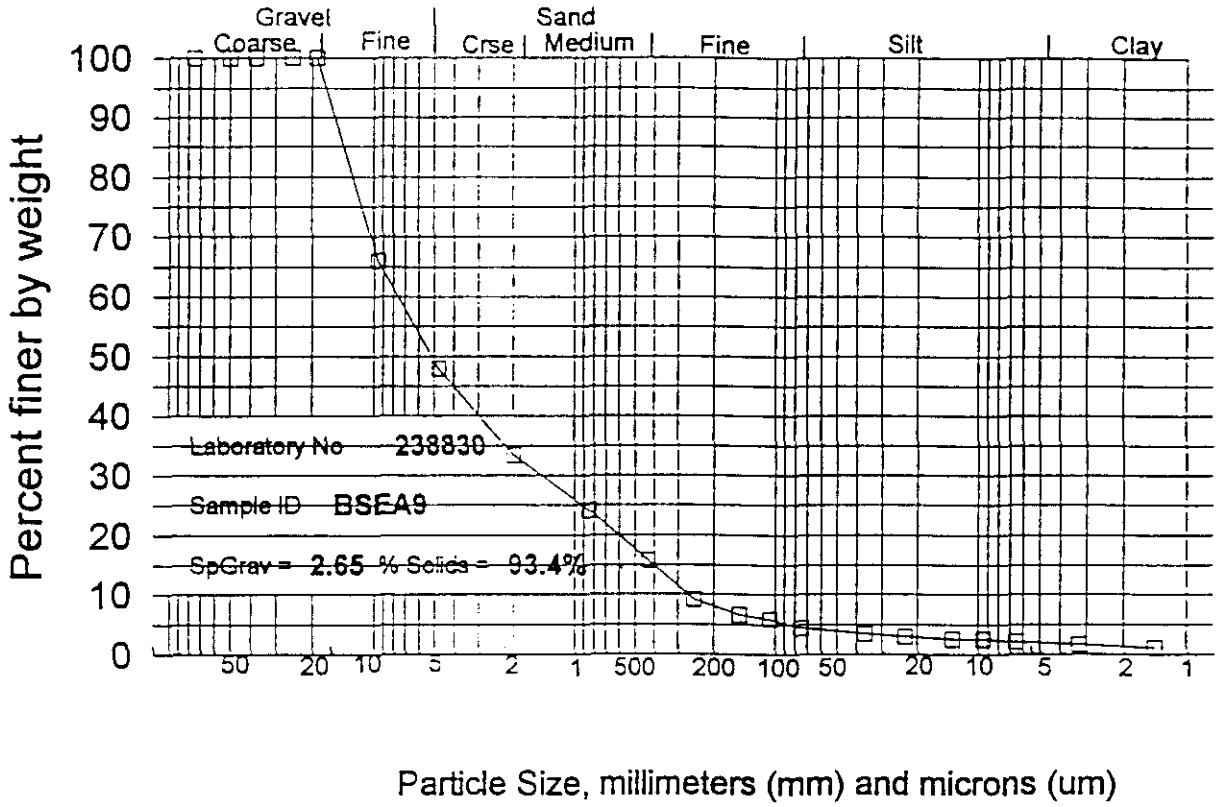
VALIDATED
Reviewed By Joyce E. Whittle
Date 12/29/94

Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	100.0	0.0	
#4	4.75	100.0	0.0	
#10	2.00	100.0	0.0	
#20	850.0 um	99.7	0.3	
#40	425.0	97.8	1.9	
#60	250.0	94.9	2.8	
#80	150.0	93.6	1.3	
#100	106.0	93.2	0.4	
#200	75.0	91.7	1.5	
Hydrometer	27.7	77.8	13.9	Dispersion of soil
|	18.6	66.4	11.4	for hydrometer test
|	11.3	55.0	11.4	by mechanical mixer
|	8.1	45.0	10.0	with metal paddle
|	6.1	37.8	7.1	operated for five
|	3.1	25.0	12.8	minute within a
|	1.3	17.8	7.2	dispersion cup.

Printed by 10:41 on 21-Nov-94

Set 89
Lab No. 240143

Inchcape ASTM D422 Particle Size Analysis Sample ID BSEA9



VALIDATED
Reviewed By Joyce L. Whittle
Date 12/29/94

Sieve size	Particle Size	Percent finer	Incremental percent	Specific Gravity assumed
3 inch	75.00 m	100.0	0.0	
2 inch	50.00	100.0	0.0	
1.5 inch	37.50	100.0	0.0	
1 inch	25.00	100.0	0.0	
3/4 inch	19.00	100.0	0.0	
3/8 inch	9.50	66.0	34.0	
#4	4.75	48.0	18.0	
#10	2.00	33.4	14.6	
#20	850.0 um	24.1	9.3	
#40	425.0	15.8	8.4	
#60	250.0	9.1	6.6	
#80	150.0	6.6	2.5	
#100	106.0	5.9	0.7	
#200	75.0	4.4	1.4	
Hydrometer	36.3	3.5	1.0	Dispersion of soil
|	23.1	3.0	0.5	for hydrometer test
|	13.4	2.5	0.5	by mechanical mixer
|	9.5	2.5	0.0	with metal paddle
|	6.6	2.1	0.4	operated for five
|	3.3	1.7	0.4	minute within a
|	1.4	1.1	0.5	dispersion cup.

Printed by 09:36 on 07-Nov-94

Set 76
Lab No. 238830

TRIP BLANKS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

TABLE B-12

Sample Identification Sample Matrix Sample Date	TB102194 Surface Water 10/21/94	TB110294 Surface Water 11/2/94	TB110394 Surface Water 11/3/94	TB110494 Surface Water 11/4/94	TB111394 Surface Water 11/13/94
Methylene Chloride	2 U	2 U	2 U	0.6 J	2 U
Acetone	1 J	5 J	5 J	3 J	9 J
Chloroform	6	1 U	3	1 U	1 U

NOTES:
U Undetected
J Estimated value

AR301753

FIELD BLANKS
SUMMARY OF RESULTS
KANE AND LOMBARD SITE
PHASE II ECOLOGICAL ASSESSMENT SAMPLING

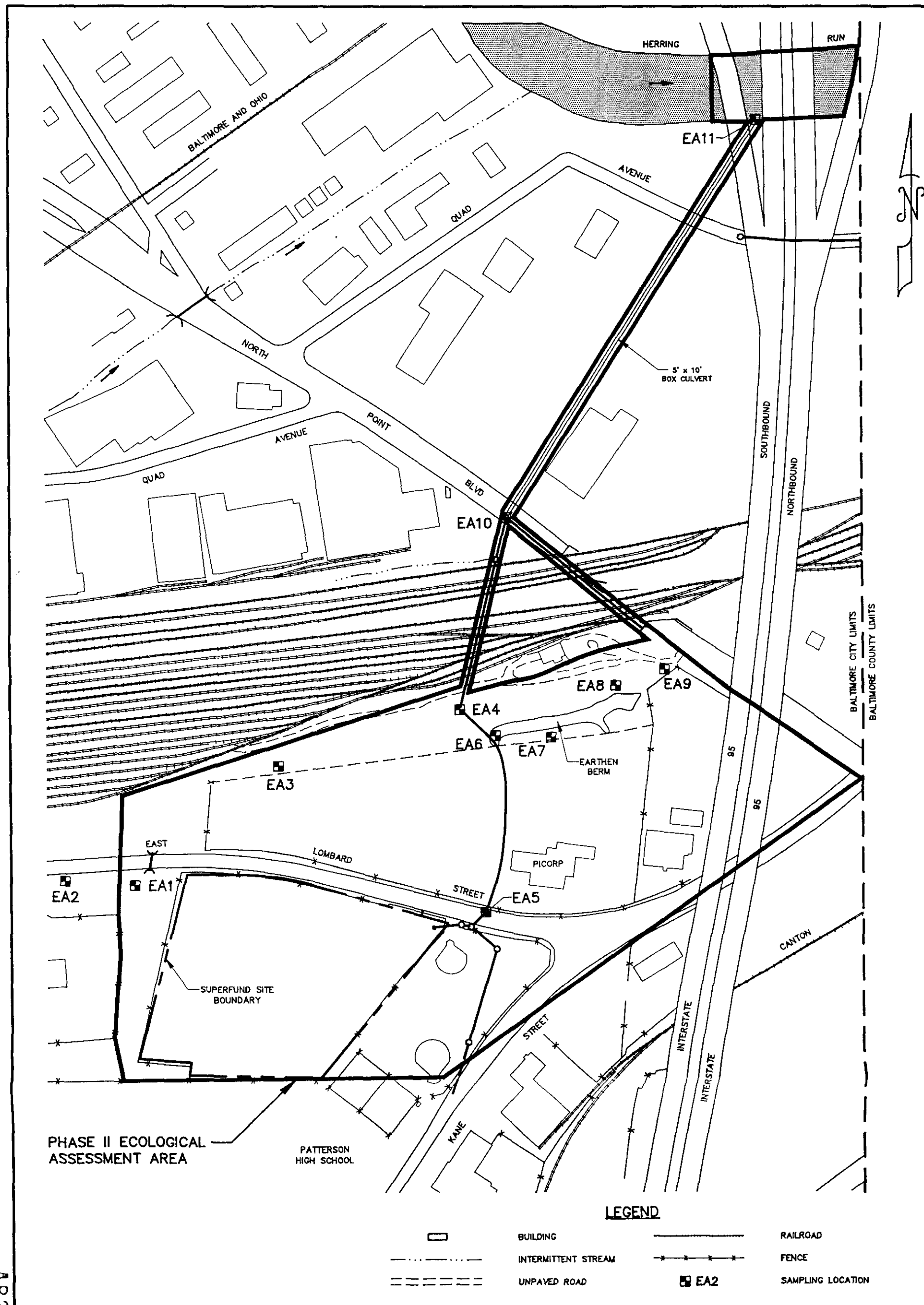
TABLE B-13

Sample Identification Sample Date	BSFB 10/20/94	BFB 10/21/94	RBBS 11/2/94	RBBS1 11/3/94	RBBS2 11/4/94	RBBS3 11/13/94
Acetone	10 UJ	7 J	10 UJ	7 J	10 U	10 U

NOTES:
U Undetected
J Estimated value

AR301754

Appendix B



0 300 600 FT.

FOR ILLUSTRATION PURPOSES ONLY

Harding Lawson Associates
Engineering and
Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-627-4505

PHASE II EAA SAMPLING LOCATIONS
OCTOBER/NOVEMBER 1994

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE
B-1

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		EAA2SAMP	3/14/95	

AR301756

TABLE B-14
SUMMARY ANALYTICAL RESULTS
MWMA
1985 PICORP ASSESSMENT

VOLATILE ORGANIC COMPOUNDS Parts Per Million	SAMPLE ID. 001 Sludge	002A/B Soil	003A/B Soil
2-BUTANONE (MEK)		13	20
METHYLENE CHLORIDE		86	100
TOLUENE	3000		40

INORGANIC COMPOUNDS Parts per Million	SAMPLE ID. 001 Sludge	002A/B Soil	003A/B Soil
ARSENIC	10.8	6.86	1.85
BERYLLIUM		0.9	7.44
CADMIUM		1.1	
CHROMIUM	147	53.8	
COPPER	11.8	166	8.3
LEAD	484	203	24802
MERCURY			10
NICKEL	11.9	38.8	7.9
THALLIUM			9.9
ZINC	32.1	329	188492

AR301758

TABLE B-15
SOILS
SUMMARY ANALYTICAL RESULTS
1991 PICORP

VOLATILE ORGANIC COMPOUNDS Parts Per Billion	SAMPLE ID. SUB-1	SUB-2	SUB-3	SUB-4	SUB-40	SUB-5	S-6	S-7	S-BACK
ACETONE	4B	3B			6B	5B	7B		4B
METHYLENE CHLORIDE	3B	18B	3B	3B	4B	3B	3B	3B	9B
CARBON DISULFIDE	4B	4B				1B	3B		2B
1,2-DICHLORO-ETHENE						1J			
TRICHLOROETHENE				2B	2B	2B			
TOLUENE		2J							
STYRENE									

NOTES:
B = Not detected substantially above the level reported in laboratory blanks.
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L = Analyte present. Reported results may be low.
R = Unreliable results. Confirm results.

AR301759

TABLE B-15
SOILS
SUMMARY ANALYTICAL RESULTS
1991 PICORP

SEMI-VOLATILE ORGANIC COMPOUNDS	SAMPLE ID. SUB-1	SUB-2	SUB-3	SUB-4	SUB-40	SUB-5	S-6	S-7	S-BACK
Parts Per Billion									
ISOPHORONE		130J							
NAPHTHALENE			2000J						
2-METHYLNAPHTHALENE			2800J						
ACENAPHTHYLENE								130J	
ANCENAPHTHENE			12000					150J	
DIBENZOFURANE			11000					110J	
FLUORENE		150J	20000					290J	
PHENANTHRENE			46000J	310J	190J	100J		2500J	
ANTHRACENE			17000J	120J				580J	
DI-N-BUTYL PHTHALATE				50R				160R	
FLUORANTHENE	130J	270J	39000	420	300J	160J		3100J	130J
PYRENE	100J	210J	31000	400J	260J	140J	67J	4600J	110J
BUTYLBENZYL PHTHALATE				180J		100J		1700J	
BENZO(A)ANTHRACENE		140J	22000J	220J	150J	76J		2000J	74J
BIS(2-ETHYL.HEXYL) PHTHALATE	120R	290R		240R	210R	1100	240R	1700J	
CRYSENE		170J	19000J	330J	220J	100J		260J	94J
DI-N-OCTYL PHTHALATE								210J	
BENZO(B)FLUORANTHENE		120J	20000J	300J	200J			2800J	75J
BENZO(K)FLUORANTHENE		150J	5200J	280J	200J			3400J	79J
BENZO(A)PYRENE		130J	17000J	250J	160J			2000J	76J
INDENO(1,2,3-CD)PYRENE		76J	7000J	190J		79J		860J	
DIBENZ(A,H)ANTHRACENE			1600J					190J	
BENZO(G,H,I)PERYLENE			6000J	210J		86J		690J	

NOTES:

B = Not detected substantially above the level reported in laboratory blanks

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L = Analyte present. Reported results may be low.

R = Unreliable results. Confirm results.

AR301760

TABLE B-15
SOILS
SUMMARY ANALYTICAL RESULTS
1991 PICORP

PESTICIDES (PPB)	SAMPLE ID. SUB-1	SUB-2	SUB-3	SUB-4	SUB-40	SUB-5	S-6	S-7	S-BACK
ALDRIN	ND	ND	ND	ND	ND	ND	ND	ND	ND
DIELDRIN	ND	ND	ND	ND	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND	ND	ND	ND	ND
INORGANIC COMPOUNDS									
Parts Per Million									
ALUMINUM	10100	9060	7410	8940	10000	6100	1300	6750	3730
ANTIMONY			13.1B		17B	8.2B		10.7B	
ARSENIC	3.8L	5.1L	4.2L	12.5L	10.3L	4.7L	4.4L	6.1L	8.6L
BARIUM	85.7	104	154	190	267	63.6	60.1	112	117
BERYLLIUM	2.1B	.78B	.61B	.87B	.98B	.58B	.56B	.7B	.29B
CADMIUM	1.1	1.1	1					2	
CALCIUM	1500J	2520J	40000J	1800J	1850J	855J	11300J	34500J	1500J
CHROMIUM	22.8	30.1	29.8	32.4	39	17.6	29.3	44.2	9.4
COBALT	18.6	12.5	9.8B	12.4B	12.3	5.2B	5.2B	8.6B	
COPPER	41.3J	35.1J	328J	152J	182J	61J	20J	99.5J	44.2J
IRON	11400	274000	14400	19200	21700	17200	18400	17100	8080
LEAD (GFAA)	11.2						42.8J		
LEAD (ICP)		165	247	209	386	91.7		203	52
MAGNESIUM	1990J	813J	13600J	874J	978J	478J	4270J	13400J	613J
MANGANESE	220	208	358	296	278	94.6	185	385	47.4
MERCURY		0.11	0.11	0.28	0.27	0.18		0.13	
NICKEL	44K	26.6B	21.4B	38.2B	36.3B	11.4B	18.4B	35.3B	30.9B
POTASSIUM	1730	771	1490	868	819	603	834	997	258
SELENIUM	0.06			1.2	0.48			0.72	2.4
SILVER					1.1L	1.4L			.92L
SODIUM	65.6	51	104	153	135	59.7		117	29.3
THALLIUM			0.52					0.68	
VANADIUM	22.9	49.9	29	37	37.8	27.6	36	28.4	14.6
ZINC		118	315	317	469	146	89.9	439	69.1

NOTES:

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L = *Analyte present. Reported results may be low.*
K = Analyte present. Reported results may be high.
J = Analyte present. *Results may not be accurate.*
R = Unreliable results. Confirm results.

AR301176

TABLE B-16
SEDIMENTS
SUMMARY ANALYTICAL RESULTS
1991 PICORP

VOLATILE ORGANIC COMPOUNDS (PPB) Parts Per Billion	SAMPLE ID. SD-1	SD-2	SD-3	SD-4	SD-5	SD-6
ACETONE	7B	5B		32B		4B
METHYLENE CHLORIDE	23B	2B	15B	11B	10B	8B
VINYL CHLORIDE				3J		
CARBON DISULFIDE			2B	5B	4B	
1,2-DICHLORO-ETHENE				18		

NOTES:

B = Not detected substantially above the level reported in laboratory blanks.

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K = Analyte present. Reported results may be high.

L = Analyte present. Reported results may be low.

R = Unreliable results. Confirm results.

AR301762

TABLE B-16
SEDIMENTS
SUMMARY ANALYTICAL RESULTS
1991 PICORP

SEMI-VOLATILE ORGANIC COMPOUNDS	SAMPLE ID.					
	SD-1	SD-2	SD-3	SD-4	SD-5	SD-6
Parts Per Billion						
4-METHYLPHENOL				970		
NAPHTHALENE				610		
2-METHYLNAPHTHALENE				1000		
ACENAPHTHYLENE	110J			550		
ANCENAPHTHENE				300J		
DIBENZOFURANE				440J		
FLUORENE				460J		
PHENANTHRENE			280J	2100J	290J	290J
ANTHRACENE			78J	830	90J	110J
DI-N-BUTYL PHTHALATE				91R		
FLUORANTHENE	230J	150J	560J	2500	610	490
PYRENE	630J	130J	520J	3700	490	360J
BUTYLBENZYL PHTHALATE			580	810	120J	1600
BENZO(A)ANTHRACENE			240J	760	220J	190J
BIS(2-ETHYL.HEXYL) PHTHALATE	3500	350R	420R	3900	690	110R
CRYSENE			370J	2300	450J	280J
DI-N-OCTYL PHTHALATE				640		
BENZO(B)FLUORANTHENE			420J	1500	440J	240J
BENZO(K)FLUORANTHENE			370J		380J	250J
BENZO(A)PYRENE			260J		290J	180J
INDENO(1,2,3-CD)PYRENE			170J	740	150J	130J
BENZO(G,H,I)PERYLENE			160J	700	140J	150J

NOTES:

B = Not detected substantially above the level reported in laboratory blanks.

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K = Analyte present. Reported results may be high.

L = Analyte present. Reported results may be low.

R = Unreliable results. Confirm results.

AR301763

TABLE B-16
SEDIMENTS
SUMMARY ANALYTICAL RESULTS
1991 PICORP

PESTICIDES Parts Per Billion	SAMPLE ID. SD-1	SD-2	SD-3	SD-4	SD-5	SD-6
ALDRIN	29R	ND	ND	50R	ND	ND
DIELDRIN	120R	ND	ND	30R	ND	ND
ENDOSULFAN SULFATE	170R	ND	ND	ND	ND	ND
INORGANIC COMPOUNDS **Parts Per Million**						
ALUMINUM	18200	5840	15600	12400	9330	7640
ANTIMONY	34B					
ARSENIC	6.5L	5.2L	8.9L	12.9	4.6L	9.1
BARIUM	330	45.3	98.2	147	62.7	144
BERYLLIUM	1.2B	.65B	1.1B	1.1B	2.2B	1.2B
CADMIUM	2.9		2	2.6		1.3
CALCIUM	150000J	6060J	10800J	27900J	2710J	14000J
CHROMIUM	60.6	18.5	44.3	70.2	39.2	98.7
COBALT	9.5B	4.2B	20.2	21	23.5	25.5
COPPER	110J	36.1J	67.2J	109J	47.7J	58.6J
IRON	20000	11000	27800	30200	37400	25300
LEAD (GFAA)		61.9			36.2	
LEAD (ICP)	294		120	177		144
MAGNESIUM	45600	2650J	4650J	13600J	1270J	4690J
MANGANESE	762	56.1	228	606	192	279
MERCURY	0.29		0.2	0.46		0.17
NICKEL	65.4K	20.1B	43.2B	119	41.9B	100
POTASSIUM	5350	675	1920	1740	1960	1340
SELENIUM	3.3	0.72		1.4	0.9	1.2
SODIUM	205	55.3	127	188	132	88.7
THALLIUM	1.2	0.89			0.82	
VANADIUM	80.4	25.9	58.3	55.3	55.2	48.3
ZINC	852	194	338	648	158	186

NOTES:

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K = Analyte present. Reported results may be high.

AR301764

TABLE B-17
SURFACE WATER
SUMMARY ANALYTICAL RESULTS
1991 PICORP

VOLATILE ORGANIC COMPOUNDS Parts Per Billion	SAMPLE ID. SW-1	SW-2	SW-10	SW-4	SW-5
ACETONE	11B	10B	5B	19B	6B
METHYLENE CHLORIDE		5B	5B	6B	4B
CHLOROMETHANE	3B	5B			
VINYL CHLORIDE				110	
CARBON DISULFIDE		34B	6B		
1,2-DICHLORO-ETHENE				280	
TRICHLOROETHENE		1B			
TOLUENE				2J	
STYRENE		11J	6		

NOTES:

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J = Analyte present. Results may not be accurate.

K = Analyte present. Reported results may be high.

L = Analyte present. Reported results may be low.

R = Unreliable results. Confirm results.

AR301765

TABLE B-17
SURFACE WATER
SUMMARY ANALYTICAL RESULTS
1991 PICORP

SEMI-VOLATILE ORGANIC COMPOUNDS	SAMPLE ID.				
	SW-1	SW-2	SW-10	SW-4	SW-5
Parts Per Billion					
4-METHYLPHENOL	ND	ND	ND	ND	ND
ISOPHORONE	ND	ND	ND	ND	ND
NAPHTHALENE	ND	ND	ND	ND	ND
2-METHYLNAPHTHALENE	ND	ND	ND	ND	ND
ACENAPHTHYLENE	ND	ND	ND	ND	ND
ANCENAPHTHENE	ND	ND	ND	ND	ND
DIBENZOFURANE	ND	ND	ND	ND	ND
FLUORENE	ND	ND	ND	ND	ND
PHENANTHRENE	ND	ND	ND	ND	ND
ANTHRACENE	ND	ND	ND	ND	ND
DI-N-BUTYL PHTHALATE	ND	ND	ND	ND	ND
FLUORANTHENE	ND	ND	ND	ND	ND
PYRENE	ND	ND	ND	ND	ND
BUTYLBENZYL PHTHALATE	ND	ND	ND	ND	ND
BENZO(A)ANTHRACENE	ND	ND	ND	ND	ND
BIS(2-ETHYL.HEXYL) PHTHALATE	ND	ND	ND	ND	ND
CRYSENE	ND	ND	ND	ND	ND
DI-N-OCTYL PHTHALATE	ND	ND	ND	ND	ND
BENZO(B)FLUORANTHENE	ND	ND	ND	ND	ND
BENZO(K)FLUORANTHENE	ND	ND	ND	ND	ND
BENZO(A)PYRENE	ND	ND	ND	ND	ND
INDENO(1,2,3-CD)PYRENE	ND	ND	ND	ND	ND
DIBENZ(A,H)ANTHRACENE	ND	ND	ND	ND	ND
BENZO(G,H,I)PERYLENE	ND	ND	ND	ND	ND

NOTES:
ND - Not Detected

AR301766

TABLE B-17
SURFACE WATER
SUMMARY ANALYTICAL RESULTS
1991 PICORP

PESTICIDES Parts Per Billion	SAMPLE ID. SW-1	SW-10	SW-2	SW-4	SW-5
ALDRIN	ND	ND	ND	ND	ND
DIELDRIN	ND	ND	ND	ND	ND
ENDOSULFAN SULFATE	ND	ND	ND	ND	ND
INORGANIC COMPOUNDS **Parts Per Million**					
ALUMINUM	307J	470J	1340J	328J	201B
BARIUM	63.1	62	89	151	80
CALCIUM	45200	44400	78300	93700	140000
CHROMIUM	7B	4.7B	4.7B	7B	
COPPER	31	32	18.7	22.7	31
IRON	611J	984J	2420J	2440J	618J
LEAD (GFAA)	4.7	5.9	13.6	9.7	2.2
MAGNESIUM	6690	6620	11900	19600	25700
MANGANESE	15.4	16.6	199	829	14,2
NICKEL		29.6B		40.3B	
POTASSIUM	7480	7440	4760	11300	17000
SODIUM	13800	13300	18200	50400	38000
THALLIUM	4.7	5.3	4.8	4.8	5.6
VANADIUM		7B	7.1B		5.2B
ZINC	71.7	67.3B	117	153	25.3B
CYANIDE	15	16			76

NOTES:

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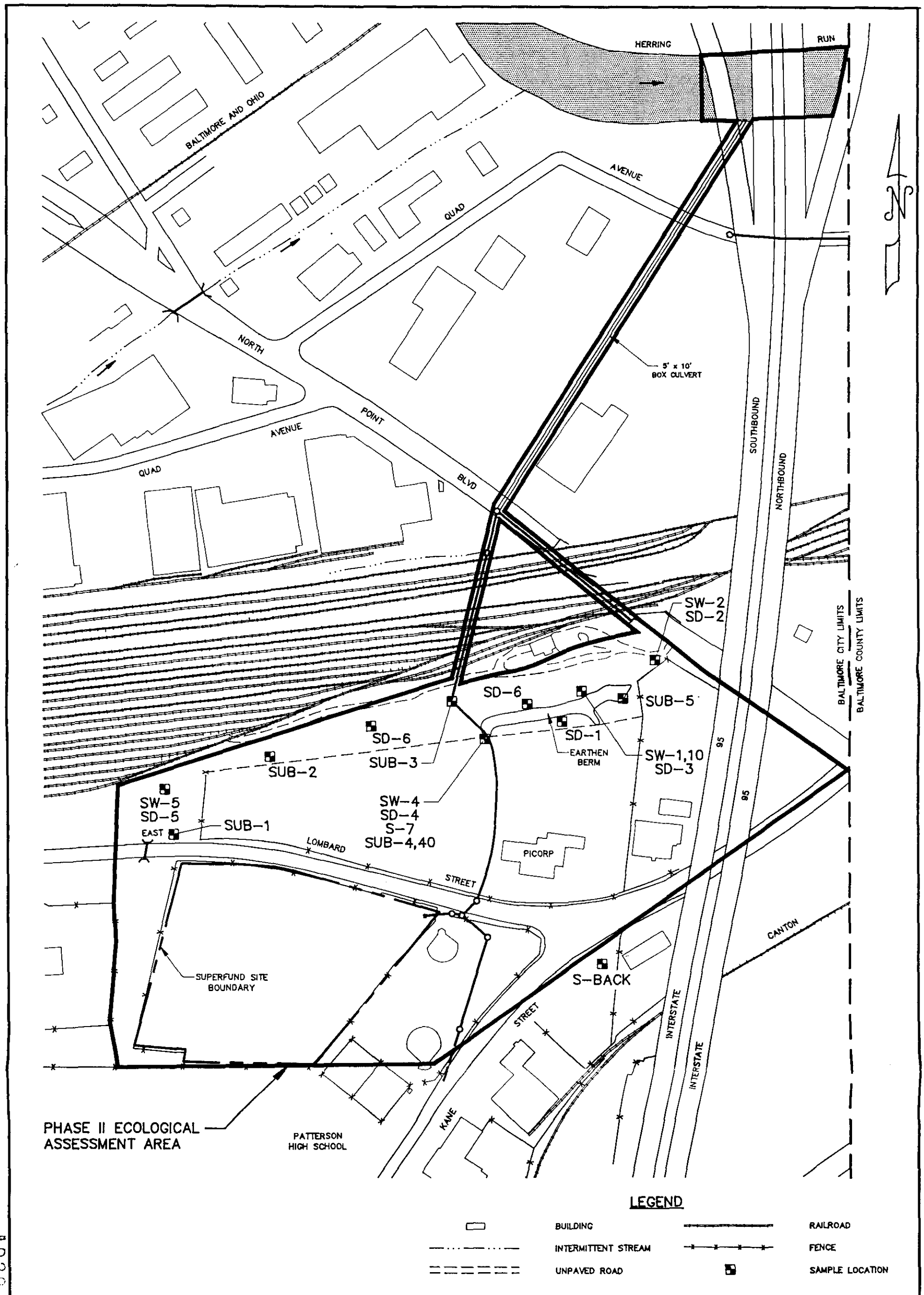
AR301767



SOURCE: SITE INVESTIGATION OF PICORP INC. NUS CORPORATION, SUPERFUND DIVISION MAY 14, 1991

0 300 600 FT.

FOR ILLUSTRATION PURPOSES ONLY

Harding Lawson Associates
Engineering and Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-627-4505

1991 SAMPLE LOCATION MAP
PICORP INCORPORATED

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE
B-2

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2PIC	3/14/95	

AR301768

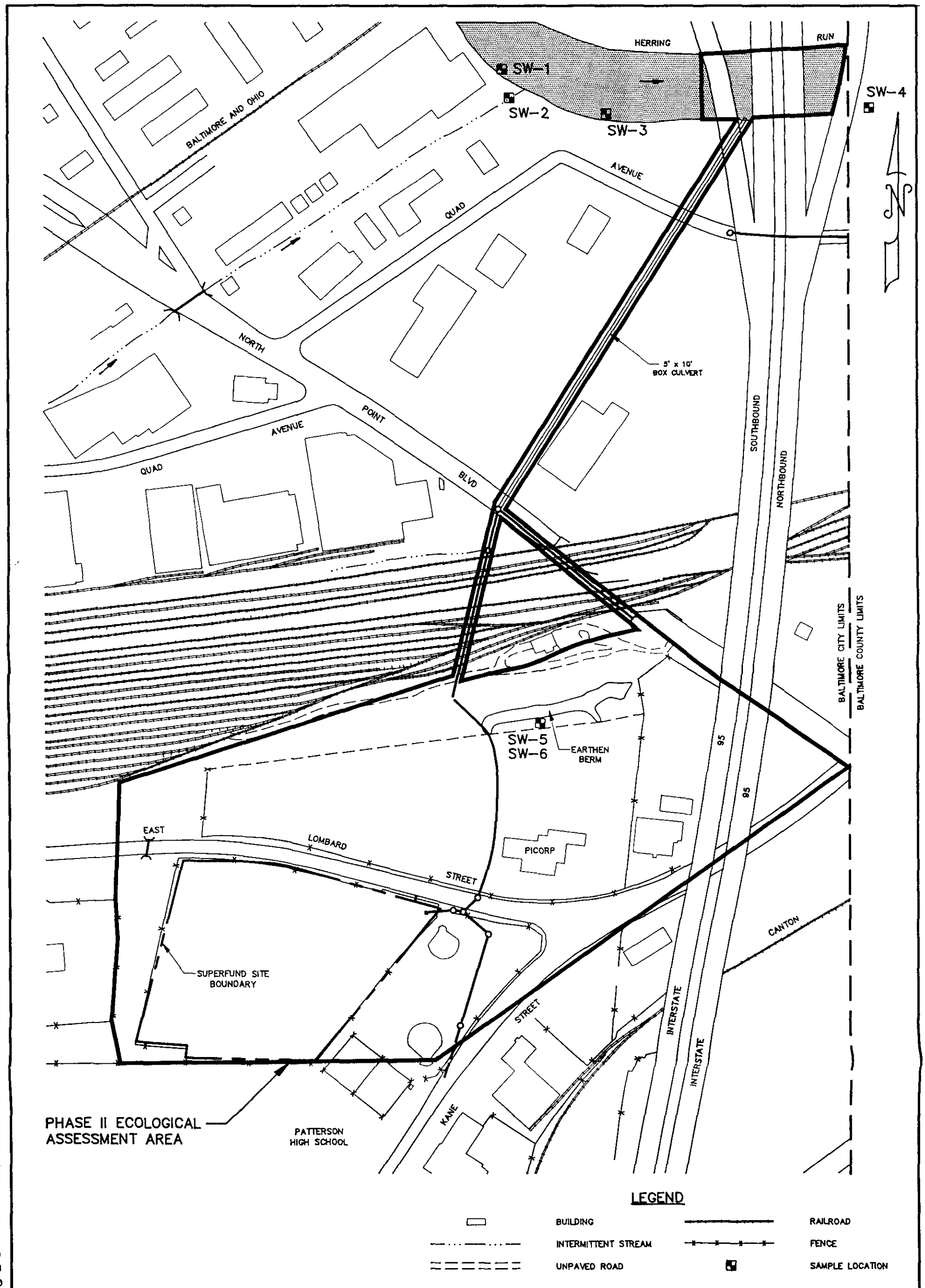
TABLE B-18
1986 Weston Sampling Results

SUMMARY OF CONCENTRATIONS OF ORGANIC AND INORGANIC COMPOUNDS IN SURFACE WATER SAMPLES (UG/L)

AMPLE UMBER	SAMPLE MEDIA	VINYL CHLORIDE	TRANS 1,2 DICHLOROETHENE	TOLUENE	TOTAL ALUMINUM
SW-1	SURFACE_WATER	-	-	1	868
SW-2	SURFACE_WATER	-	-	2	1,010
SW-3	SURFACE_WATER	-	-	1	145
SW-4	SURFACE_WATER	-	-	3	1,010
SW-5	SURFACE_WATER	67	800	14	126
SW-6	SURFACE_WATER	-	770	15	119

SAMPLE NUMBER	TOTAL BARIUM	TOTAL CALCIUM	TOTAL CHROMIUM	TOTAL COBALT	TOTAL COPPER	TOTAL IRON	TOTAL LEAD	TOTAL MAGNESIUM
SW-1	32	29,800	6.2	-	6.2	438	-	6,960
SW-2	33	30,100	3.1	-	5.5	352	-	6,720
SW-3	54	43,600	10.0	5.8	8.9	1,700	12.0	10,100
SW-4	27	26,600	6.2	-	6.8	176	-	5,940
SW-5	49	76,600	7.1	5.6	20.0	2,680	6.2	14,800
SW-6	49	74,800	5.5	3.6	19.0	2,600	11.0	14,400

SAMPLE NUMBER	TOTAL MANGANESE	TOTAL NICKEL	TOTAL POTASSIUM	TOTAL SILVER	TOTAL SODIUM	TOTAL VANADIUM	TOTAL ZINC
SW-1	89	-	3,380	-	20,700	3.4	46
SW-2	78	-	3,610	4.4	20,400	2.7	17
SW-3	792	-	6,330	-	42,800	2.4	42
SW-4	29	-	2,640	-	15,900	2.4	19
SW-5	541	50	4,910	3.3	35,800	3.7	160
SW-6	537	46	5,040	-	36,600	3.7	160



SOURCE: ROY F. WESTON, INC., 1987. REMEDIAL INVESTIGATION REPORT FOR THE KANE AND LOMBARD SITE, BALTIMORE, MARYLAND

0 300 600 FT.

FOR ILLUSTRATION PURPOSES ONLY

Harding Lawson Associates
Engineering and
Environmental Services
131 North Third Street
Philadelphia, PA 19106
215-627-4505

1986 WESTON SAMPLING LOCATIONS

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE B-3

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2WEST	3/14/95	

AR301770

SUMMARY OF CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=BORING_SOIL

SAMPLE NUMBER	CHLOROFORM	TRANS 1,2 DICHLORO ETHENE	TRICHLORO ETHENE	4-METHYL 2-PENTANONE
04S-007	-	-	-	-
04S-026	-	-	-	-
05S-005	16	-	-	-
05S-015	2	-	-	-
06S-008	-	-	-	-
06S-016	-	-	-	1,800
08S-008	-	-	-	-
08S-015	-	-	-	-
09S-006	-	-	-	-
09S-015	-	-	-	-
10S-006	-	-	-	-
10S-015	5	-	-	-
11S-006	-	-	-	-
11S-013	-	-	-	-
11S-029	-	-	-	-
11S-035	140	-	-	-
11S-049	-	-	-	-
12S-005	-	-	-	-

SAMPLE NUMBER	BENZENE	CHLORO BENZENE	TOLUENE (METHYL BENZENE)	TOTAL XYLENES	ETHYL BENZENE	CARBON DISULFIDE
04S-007	-	-	2	-	-	-
04S-026	-	-	2	-	-	-
05S-005	-	-	17	-	-	-
05S-015	-	-	2	-	-	-
06S-008	-	-	110	45	-	-
06S-016	-	-	460	-	-	-
08S-008	-	-	-	-	-	-
08S-015	-	-	16	-	-	-
09S-006	-	-	4	-	-	-
09S-015	-	-	4	-	-	-
10S-006	-	-	-	-	-	-
10S-015	-	-	-	-	-	-
11S-006	-	-	-	-	-	-
11S-013	-	6	-	-	-	-
11S-029	-	-	-	-	-	-
11S-035	-	-	-	-	-	-
11S-049	-	-	-	-	-	-
12S-005	-	-	-	-	-	-

TABLE B-19

SUMMARY OF CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=BORING_SOIL

SAMPLE NUMBER	CHLOROFORM	TRANS 1,2 DICHLORO ETHENE	TRICHLORO ETHENE	4-METHYL 2-PENTANONE
12S-015	-	-	-	-
12S-065	-	-	-	-
13S-005	-	-	-	-
13S-015	-	-	-	-

SAMPLE NUMBER	BENZENE	CHLORO BENZENE	TOLUENE (METHYL BENZENE)	TOTAL XYLENES	ETHYL BENZENE	CARBON DISULFIDE
12S-015	-	-	-	-	-	-
12S-065	-	-	-	-	-	-
13S-005	-	-	-	-	-	-
13S-015	-	-	-	-	-	-

SAMPLE MEDIA=SURFACE_SOIL

SAMPLE NUMBER	CHLOROFORM	TRANS 1,2 DICHLORO ETHENE	TRICHLORO ETHENE	4-METHYL 2-PENTANONE
SD-01	-	-	-	-
SD-02	-	-	-	-
SD-03	-	-	-	-
SD-04	-	-	-	-
SD-05	-	-	-	-
SD-07	-	-	-	-
SD-08	-	-	-	-
SD-09	-	-	-	-

SAMPLE NUMBER	BENZENE	CHLORO BENZENE	TOLUENE (METHYL BENZENE)	TOTAL XYLENES	ETHYL BENZENE	CARBON DISULFIDE
SD-01	-	-	-	-	-	-
SD-02	-	-	-	-	-	-
SD-03	-	-	48	-	-	2
SD-04	-	-	-	-	-	-
SD-05	-	-	-	-	-	-
SD-07	-	-	3	-	-	-
SD-08	-	-	-	-	-	-
SD-09	-	-	7	-	-	-

Table B-19

SUMMARY OF CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=SURFACE_SOIL

SAMPLE NUMBER	CHLOROFORM	TRANS 1,2 DICHLORO ETHENE	TRICHLORO ETHENE	4-METHYL 2-PENTANONE
SD-10	-	-	-	-
SD-12	-	-	-	-
SD-13	-	-	-	-
SD-14	-	-	-	-
SD-15	-	-	-	-
SD-16	-	-	-	-
SD-17	-	-	-	-
SD-18	-	-	-	-
SS-01	-	-	-	-
SS-02	-	-	-	-
SS-03	-	-	-	-
SS-04	-	-	-	-
SS-05	-	-	-	-

SAMPLE NUMBER	BENZENE	CHLORO BENZENE	TOLUENE (METHYL BENZENE)	TOTAL XYLENES	ETHYL BENZENE	CARBON DISULFIDE
SD-10	-	-	-	-	-	-
SD-12	-	-	6	-	-	-
SD-13	-	-	-	-	-	-
SD-14	-	-	8	-	-	3
SD-15	-	-	6	-	-	-
SD-16	-	-	2	-	-	-
SD-17	-	-	-	-	-	-
SD-18	-	-	73	-	-	-
SS-01	-	-	67	-	-	-
SS-02	-	-	77	-	-	-
SS-03	-	-	14	-	-	-
SS-04	-	-	3	-	-	-
SS-05	-	-	13	-	-	-

Table B-19

SUMMARY OF CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=TEST_PIT_SOIL

AMPLE UMBER	CHLOROFORM	TRANS 1,2 DICHLORO ETHENE	TRICHLORO ETHENE	4-METHYL 2-PENTANONE	BENZENE
P-A	-	-	-	-	-
P-B	-	-	-	-	-
P-C	2	-	2	-	-
P-D	-	-	-	-	-
P-E	-	-	-	-	-
P-F	-	-	-	-	-
P-G	1	-	-	-	-
P-H	-	-	-	-	-
P-I	-	-	-	-	-
P-J	-	-	-	-	-
P-K	-	-	-	-	-
P-L	-	-	-	-	-
P-M0	-	-	-	-	-
P-M1	-	2	-	-	-
P-M2	-	6	-	-	-
P-M3	-	-	-	-	-
P-N0	-	-	-	-	-
P-N1	-	-	-	-	-

AMPLE UMBER	CHLORO BENZENE	TOLUENE (METHYL BENZENE)	TOTAL XYLENES	ETHYL BENZENE	CARBON DISULFIDE
P-A	-	-	-	-	-
-B	-	-	490	270	310
-C	-	5	-	-	-
P-D	-	-	-	-	5
P-E	-	-	-	-	-
P-F	-	-	-	-	-
P-G	-	2	-	-	-
P-H	-	-	-	-	-
P-I	-	-	-	-	-
P-J	-	-	-	-	-
P-K	-	-	-	-	-
P-L	-	-	-	-	-
P-M0	-	1	-	-	-
P-M1	-	13	-	-	13
P-M2	23	3	-	-	7
P-M3	80	3	-	-	6
P-N0	-	5	-	-	5
P-N1	-	-	-	-	-

SUMMARY OF CONCENTRATIONS OF VOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=TEST_PIT_SOIL

SAMPLE NUMBER	CHLOROFORM	TRANS 1,2 DICHLORO ETHENE	TRICHLORO ETHENE	4-METHYL 2-PENTANONE	BENZENE
TP-O	-	-	-	-	-
TP-P	-	-	-	5	-
TP-Q	-	-	-	5	-
TP-RO	-	-	-	-	-
TP-R1	-	-	-	-	-
TP-S	-	-	-	-	-
TP-T	-	-	-	-	2
TP-U	-	-	-	-	-
TP-V	-	-	-	-	-
TP-W	-	-	-	-	-
TP-X	-	-	-	-	-
TP-Y	-	-	-	-	-

SAMPLE NUMBER	CHLORO BENZENE	TOLUENE (METHYL BENZENE)	TOTAL XYLENES	ETHYL BENZENE	CARBON DISULFIDE
TP-O	-	-	-	-	-
TP-P	62	16	5	4	2
TP-Q	5	4	2	5	6
TP-RO	180	3	-	-	4
TP-R1	-	17,000,000	1,400,000	360,000	-
TP-S	-	-	-	-	-
TP-T	-	11	610	3	-
TP-U	3	3	-	-	-
TP-V	-	-	-	-	-
TP-W	-	610,000	390,000	120,000	-
TP-X	-	-	-	-	-
TP-Y	-	-	-	-	-

Table B-19

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=BORING_SOIL

MPLE MBER	1,4-DICHLORO BENZENE	3,3-DICHLORO BENZIDINE	PHENOL (HYDROXY BENZENE)	4-METHYL PHENOL
S-007	-	-	-	-
S-026	-	-	-	-
S-005	-	-	-	-
S-015	-	-	-	-
S-008	-	-	-	-
S-016	-	-	-	-
S-008	-	-	-	-
S-015	-	-	-	-
S-006	-	-	-	-
S-015	-	-	-	-

MPLE MBER	2,4,6-TRICHLORO PHENOL	PENTACHLORO PHENOL	4-NITRO PHENOL	2,6-DINITRO TOLUENE
S-007	-	-	-	-
S-026	-	-	-	-
S-005	-	520	-	-
S-015	-	-	-	-
S-008	-	-	-	-
S-016	-	-	-	-
S-008	-	-	-	-
S-015	-	-	-	-
S-006	-	-	-	-
S-015	-	-	-	-

MPLE MBER	NAPHTHALENE	2-METHYL NAPHTHALENE	ISOPHORONE	ACENAPHTHENE
S-007	-	-	-	-
S-026	-	-	-	-
S-005	140	-	3,400	200
S-015	-	-	-	-
S-008	4,000	-	27,000	5,700
S-016	-	-	-	-
S-008	-	-	-	-
S-015	-	-	-	-
S-006	-	-	-	-
S-015	-	-	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=BORING_SOIL

SAMPLE NUMBER	ACENAPHTHYLENE	ANTHRACENE	BENZO (A) ANTHRACENE	DIBENZO (A,H) ANTHRACENE
04S-007	-	-	-	-
04S-026	-	-	-	-
05S-005	-	370	1,800	320
05S-015	-	-	-	-
06S-008	-	7,900	14,000	-
06S-016	-	-	-	-
08S-008	-	-	-	-
08S-015	-	-	-	-
09S-006	-	-	-	-
09S-015	-	-	-	-

SAMPLE NUMBER	PHENANTHRENE	CHRYSENE (BENZO (A) PHENANTHRENE)	PYRENE (BENZO (D,E,F) PHENANTHRENE)	BENZO (A) PYRENE
04S-007	-	-	-	-
04S-026	-	-	-	-
05S-005	1,600	2,100	3,200	2,000
05S-015	-	-	-	-
06S-008	41,000	14,000	24,000	12,000
06S-016	-	-	-	-
08S-008	-	-	-	-
08S-015	-	-	-	-
09S-006	-	-	-	-
09S-015	-	-	-	-

SAMPLE NUMBER	INDENO 1,2,3(C,D) PYRENE	FLUORENE (2,3-BENZINDENE)	FLUORANTHENE	BENZO (B,K) FLUORANTHENE)
04S-007	-	-	-	-
04S-026	-	-	-	-
05S-005	1,300	-	3,100	4,000
05S-015	-	-	-	-
06S-008	5,400	6,100	39,000	23,000
06S-016	-	-	-	-
08S-008	-	-	-	-
08S-015	-	-	-	-
S-006	-	-	-	-
09S-015	-	-	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=BORING_SOIL----------

AMPLE UMBER	BENZO (G,H,I) PERYLENE	DIBENZO FURAN	DIMETHYL PHTHALATE	DI-N-BUTYL PHTHALATE
6S-007	-	-	-	60
6S-026	-	-	-	75
5S-005	1,100	-	-	-
5S-015	-	-	-	-
6S-008	4,000	4,000	-	-
6S-016	-	-	-	-
3S-008	-	-	-	-
3S-015	-	-	-	-
9S-006	-	-	-	-
9S-015	-	-	-	-

AMPLE UMBER	BIS (2-ETHYLHEXYL) PHTHALATE	BUTYLBENZYL PHTHALATE	DI-N-OCTYL PHTHALATE	N-NITROSO DIPHENYLAMINE
6S-007	61	-	-	-
6S-026	44	-	-	-
5S-005	920	270	-	-
5S-015	52	-	-	-
6S-008	28,000	3,300	-	9,300
6S-016	6,300	-	-	2,500
3S-008	51,000	-	-	7,800
3S-015	2,400	-	-	1,600
9S-006	48	-	-	-
9S-015	49,000	1,400	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=BORING_SOIL

SAMPLE NUMBER	1,4-DICHLORO BENZENE	3,3-DICHLORO BENZIDINE	PHENOL (HYDROXY BENZENE)	4-METHYL PHENOL
10S-006	-	-	-	-
10S-015	-	-	-	-
11S-006	-	-	-	-
11S-013	-	-	-	-
11S-029	-	-	-	-
11S-035	-	-	-	-
11S-049	-	-	-	-
12S-005	-	-	-	-
12S-015	-	-	-	-
12S-065	-	-	-	-

SAMPLE NUMBER	2,4,6-TRICHLORO PHENOL	PENTACHLORO PHENOL	4-NITRO PHENOL	2,6-DINITRO TOLUENE
10S-006	-	-	-	-
10S-015	-	-	-	-
11S-006	-	-	-	-
11S-013	-	-	-	-
11S-029	-	-	-	-
11S-035	-	-	-	-
11S-049	-	-	-	-
12S-005	-	-	-	-
12S-015	-	-	-	-
12S-065	-	-	-	-

SAMPLE NUMBER	NAPHTHALENE	2-METHYL NAPHTHALENE	ISOPHORONE	ACENAPHTHENE
10S-006	-	-	-	-
10S-015	-	-	-	-
11S-006	-	-	-	-
11S-013	-	-	-	-
11S-029	-	-	-	-
11S-035	-	-	-	-
11S-049	-	-	-	-
12S-005	-	-	-	-
[illegible]S-015	-	-	-	-
[illegible]S-065	-	-	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=BORING_SOIL

SAMPLE NUMBER	ACENAPHTHYLENE	ANTHRACENE	BENZO (A) ANTHRACENE	DIBENZO (A,H) ANTHRACENE
0S-006	-	-	-	-
0S-015	-	-	-	-
1S-006	-	-	-	-
1S-013	-	-	-	-
1S-029	-	-	-	-
1S-035	-	-	-	-
1S-049	-	-	-	-
2S-005	-	-	-	-
2S-015	-	-	-	-
2S-065	-	-	-	-

SAMPLE NUMBER	PHENANTHRENE	CHRYSENE (BENZO (A) PHENANTHRENE)	PYRENE (BENZO (D,E,F) PHENANTHRENE)	BENZO (A) PYRENE
0S-006	-	-	-	-
0S-015	-	-	-	-
1S-006	-	-	-	-
1S-013	-	-	-	-
1S-029	-	-	-	-
1S-035	-	-	-	-
1S-049	-	-	-	-
2S-005	-	-	-	-
2S-015	-	-	-	-
2S-065	-	-	-	-

SAMPLE NUMBER	INDENO 1,2,3(C,D) PYRENE	FLUORENE (2,3-BENZINDENE)	FLUORANTHENE	BENZO (B,K) FLUORANTHENE)
0S-006	-	-	-	-
0S-015	-	-	-	-
1S-006	-	-	-	-
1S-013	-	-	-	-
1S-029	-	-	-	-
1S-035	-	-	-	-
1S-049	-	-	-	-
2S-005	-	-	-	-
2S-015	-	-	-	-
2S-065	-	-	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=BORING_SOIL

SAMPLE NUMBER	BENZO (G,H,I) PERYLENE	DIBENZO FURAN	DIMETHYL PHTHALATE	DI-N-BUTYL PHTHALATE
10S-006	-	-	-	-
10S-015	-	-	-	-
11S-006	-	-	-	-
11S-013	-	-	-	300
11S-029	-	-	-	840
11S-035	-	-	-	9,600
11S-049	-	-	-	760
12S-005	-	-	-	-
12S-015	-	-	-	-
12S-065	-	-	-	-

SAMPLE NUMBER	BIS (2-ETHYLHEXYL) PHTHALATE	BUTYLBENZYL PHTHALATE	DI-N-OCTYL PHTHALATE	N-NITROSO DIPHENYLAMINE
10S-006	47	-	-	-
10S-015	110	-	-	-
11S-006	-	940,000	-	-
11S-013	-	-	-	-
11S-029	54	-	-	-
11S-035	4,900	17,000	-	-
11S-049	-	-	-	-
12S-005	-	-	-	-
12S-015	-	-	-	-
12S-065	-	-	-	-

Table B-19

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=BORING_SOIL----------

MPLE MBER	1,4-DICHLORO BENZENE	3,3-DICHLORO BENZIDINE	PHENOL (HYDROXY BENZENE)	4-METHYL PHENOL
S-005	-	-	-	-
S-015	-	-	-	-

MPLE MBER	2,4,5-TRICHLORO PHENOL	PENTACHLORO PHENOL	4-NITRO PHENOL	2,6-DINITRO TOLUENE
S-005	-	-	-	-
S-015	-	-	-	-

MPLE MBER	NAPHTHALENE	2-METHYL NAPHTHALENE	ISOPHORONE	ACENAPHTHENE
S-005	-	-	-	-
S-015	-	-	-	-

MPLE MBER	ACENAPHTHYLENE	ANTHRACENE	BENZO (A) ANTHRACENE	DIBENZO (A,H) ANTHRACENE
S-005	-	-	-	-
S-015	-	-	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=BORING_SOIL

SAMPLE NUMBER	PHENANTHRENE	CHRYSENE (BENZO (A) PHENANTHRENE)	PYRENE (BENZO (D,E,F) PHENANTHRENE)	BENZO (A) PYRENE
13S-005	-	-	-	-
13S-015	-	-	-	-

SAMPLE NUMBER	INDENO 1,2,3(C,D) PYRENE	FLUORENE (2,3-BENZINDENE)	FLUORANTHENE	BENZO (B,K) FLUORANTHENE)
13S-005	-	-	-	-
13S-015	-	-	-	-

SAMPLE NUMBER	BENZO (G,H,I) PERYLENE	DIBENZO FURAN	DIMETHYL PHTHALATE	DI-N-BUTYL PHTHALATE
.3S-005	-	-	-	-
13S-015	-	-	-	-

SAMPLE NUMBER	BIS (2-ETHYLHEXYL) PHTHALATE	BUTYLBENZYL PHTHALATE	DI-N-OCTYL PHTHALATE	N-NITROSO DIPHENYLAMINE
13S-005	-	-	-	-
13S-015	-	-	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=SURFACE_SOIL

AMPLE UMBER	1,4-DICHLORO BENZENE	3,3-DICHLORO BENZIDINE	PHENOL (HYDROXY BENZENE)	4-METHYL PHENOL	2,4,6-TRICHLORO PHENOL
D-01	-	-	-	-	-
D-02	-	-	-	-	-
D-03	-	-	-	-	-
D-04	-	-	-	-	-
D-05	-	-	-	-	-
D-07	-	-	-	-	53
D-08	-	-	-	-	-
D-09	-	-	-	-	-
D-10	-	-	-	-	-
D-12	-	-	-	-	-

AMPLE UMBER	PENTACHLORO PHENOL	4-NITRO PHENOL	2,6-DINITRO TOLUENE	NAPHTHALENE	2-METHYL NAPHTHALENE
D-01	-	-	-	-	-
D-02	-	-	660	-	-
D-03	-	-	-	-	-
D-04	-	-	-	40	42
D-05	-	-	-	-	-
D-07	-	-	-	35	-
D-08	-	-	-	-	-
D-09	-	-	-	-	-
D-10	-	-	-	-	-
D-12	150	-	-	-	-

AMPLE UMBER	ISOPHORONE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZO (A) ANTHRACENE
D-01	-	-	-	-	110
D-02	-	-	-	-	53
D-03	-	-	-	-	92
D-04	-	-	34	87	600
D-05	-	-	-	-	200
D-07	-	-	-	-	140
D-08	-	-	-	-	-
D-09	-	-	-	-	-
D-10	-	-	-	-	680
D-12	-	-	230	270	1,100

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=SURFACE_SOIL

SAMPLE NUMBER	DIBENZO (A,H) ANTHRACENE	PHENANTHRENE	CHRYSENE (BENZO (A) PHENANTHRENE)	PYRENE (BENZO (D,E,F) PHENANTHRENE)
SD-01	-	140	110	160
SD-02	-	34	37	43
SD-03	-	79	90	120
SD-04	-	350	380	340
SD-05	-	160	160	160
SD-07	-	120	130	160
SD-08	-	-	-	-
SD-09	-	72	67	60
SD-10	250	-	1,200	1,200
SD-12	-	370	960	1,900

SAMPLE NUMBER	BENZO (A) PYRENE	INDENO 1,2,3(C,D) PYRENE	FLUORENE (2,3-BENZINDENE)	FLUORANTHENE
SD-01	130	130	-	310
SD-02	51	50	-	47
SD-03	120	100	-	110
SD-04	390	52	-	550
SD-05	120	86	-	190
SD-07	94	48	-	200
SD-08	-	-	-	-
SD-09	49	-	-	98
SD-10	750	840	-	1,300
SD-12	880	-	-	2,300

SAMPLE NUMBER	BENZO (B,K) FLUORANTHENE)	BENZO (G,H,I) PERYLENE	DIBENZO FURAN	DIMETHYL PHTHALATE	DI-N-BUTYL PHTHALATE
SD-01	200	110	-	-	-
SD-02	71	52	-	-	-
SD-03	150	100	-	-	-
SD-04	490	130	41	-	-
SD-05	230	-	-	-	-
SD-07	190	41	-	-	-
SD-08	-	-	-	-	-
-09	120	-	-	-	-
-10	2,700	700	-	-	-
SD-12	1,700	-	-	-	-

Table B-19

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=SURFACE_SOIL

MPLE MBER	BIS (2-ETHYLHEXYL) PHTHALATE	BUTYLBENZYL PHTHALATE	DI-N-OCTYL PHTHALATE	N-NITROSO DIPHENYLAMINE
-01	1,400	500	-	-
-02	180	83	-	-
-03	300	360	-	-
-04	2,200	2,400	-	-
-05	400	1,300	-	-
-07	340	510	-	-
-08	150	51	-	-
-09	150	360	-	-
-10	500	1,000	-	-
-12	2,100	3,400	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=SURFACE_SOIL

SAMPLE NUMBER	1,4-DICHLORO BENZENE	3,3-DICHLORO BENZIDINE	PHENOL (HYDROXY BENZENE)	4-METHYL PHENOL	2,4,6-TRICHLORO PHENOL
SD-13	-	-	-	-	-
SD-14	-	-	-	-	-
SD-15	-	-	-	-	-
SD-16	-	-	-	-	-
SD-17	-	-	-	-	-
SD-18	-	-	-	-	-
SS-01	-	-	-	-	-
SS-02	-	-	-	-	-
SS-03	-	-	-	-	-
SS-04	-	-	-	-	-

SAMPLE NUMBER	PENTACHLORO PHENOL	4-NITRO PHENOL	2,6-DINITRO TOLUENE	NAPHTHALENE	2-METHYL NAPHTHALENE
SD-13	-	-	-	-	-
SD-14	-	-	-	250	320
SD-15	-	-	-	42	-
SD-16	-	-	-	-	-
SD-17	-	-	-	-	-
SD-18	-	-	-	-	-
SS-01	-	-	-	-	-
SS-02	-	-	-	-	-
SS-03	-	-	-	-	-
SS-04	-	-	-	-	-

SAMPLE NUMBER	ISOPHORONE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZO (A) ANTHRACENE
SD-13	-	-	-	-	44
SD-14	380	-	130	390	1,100
SD-15	200	-	-	33	91
SD-16	-	-	-	-	-
SD-17	-	-	-	-	48
SD-18	-	-	-	-	92
SS-01	410	-	-	-	-
SS-02	-	-	-	-	-
SS-03	-	-	-	62	130
SS-04	-	-	-	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=SURFACE_SOIL----------

AMPLE UMBER	DIBENZO (A,H) ANTHRACENE	PHENANTHRENE	CHRYSENE (BENZO (A) PHENANTHRENE)	PYRENE (BENZO (D,E,F) PHENANTHRENE)
)-13	-	51	53	71
)-14	-	1,700	1,400	2,200
)-15	-	190	100	150
)-16	-	-	-	62
)-17	-	40	57	54
)-18	-	94	130	140
S-01	-	-	-	32
S-02	-	-	-	-
S-03	-	110	240	260
S-04	-	-	-	-

AMPLE UMBER	BENZO (A) PYRENE	INDENO 1,2,3(C,D) PYRENE	FLUORENE (2,3-BENZINDENE)	FLUORANTHENE
)-13	49	-	-	120
)-14	-	-	-	2,000
)-15	92	-	-	250
)-16	-	-	-	-
)-17	48	-	-	67
)-18	110	-	-	170
S-01	-	-	-	40
S-02	-	-	-	28
S-03	200	110	-	330
S-04	-	-	-	-

AMPLE UMBER	BENZO (B,K) FLUORANTHENE)	BENZO (G,H,I) PERYLENE	DIBENZO FURAN	DIMETHYL PHTHALATE	DI-N-BUTYL PHTHALATE
)-13	110	-	-	-	-
)-14	-	-	-	-	-
)-15	200	-	-	-	-
)-16	-	-	-	-	-
)-17	89	-	-	-	-
)-18	180	-	-	-	-
S-01	-	-	-	-	-
S-02	-	-	-	-	-
S-03	380	100	-	-	-
S-04	-	-	-	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=SURFACE_SOIL

SAMPLE NUMBER	BIS (2-ETHYLHEXYL) PHTHALATE	BUTYLBENZYL PHTHALATE	DI-N-OCTYL PHTHALATE	N-NITROSO DIPHENYLAMINE
SD-13	530	510	-	-
SD-14	6,600	23,000	-	-
SD-15	380	350	-	-
SD-16	480	220	-	-
SD-17	220	180	-	-
SD-18	1,500	230	-	-
SS-01	560	44	-	-
SS-02	-	-	-	-
SS-03	420	200	-	-
SS-04	-	-	-	-

Table B-19

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=SURFACE SOIL

SAMPLE NUMBER	1,4-DICHLORO BENZENE	3,3-DICHLORO BENZIDINE	PHENOL (HYDROXY BENZENE)	4-METHYL PHENOL	2,4,6-TRICHLORO PHENOL
SS-05	-	-	-	-	-

SAMPLE NUMBER	PENTACHLORO PHENOL	4-NITRO PHENOL	2,6-DINITRO TOLUENE	NAPHTHALENE	2-METHYL NAPHTHALENE
SS-05	-	-	-	-	-

SAMPLE NUMBER	ISOPHORONE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZO (A) ANTHRACENE
SS-05	-	-	-	-	-

SAMPLE NUMBER	DIBENZO (A,H) ANTHRACENE	PHENANTHRENE	CHRYSENE (BENZO (A) PHENANTHRENE)	PYRENE (BENZO (D,E,F) PHENANTHRENE)
SS-05	-	-	-	-

SAMPLE NUMBER	BENZO (A) PYRENE	INDENO 1,2,3(C,D) PYRENE	FLUORENE (2,3-BENZINDENE)	FLUORANTHENE
SS-05	-	-	-	-

SAMPLE NUMBER	BENZO (B,K) FLUORANTHENE)	BENZO (G,H,I) PERYLENE	DIBENZO FURAN	DIMETHYL PHTHALATE	DI-N-BUTYL PHTHALATE
SS-05	-	-	-	-	-

SAMPLE NUMBER	BIS (2-ETHYLHEXYL) PHTHALATE	BUTYLBENZYL PHTHALATE	DI-N-OCTYL PHTHALATE	N-NITROSO DIPHENYLAMINE
SS-05	-	-	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

SAMPLE NUMBER	1,4-DICHLORO BENZENE	3,3-DICHLORO BENZIDINE	PHENOL (HYDROXY BENZENE)	4-METHYL PHENOL	2,4,6-TRICHLORO PHENOL
TP-A	-	-	-	-	-
TP-B	-	-	-	-	-
TP-C	-	-	-	-	-
TP-D	-	-	-	-	-
TP-E	-	-	-	-	-
TP-F	-	-	-	-	-
TP-G	-	-	-	-	-
TP-H	-	-	45	-	-
TP-I	-	-	410	110	-
TP-J	-	-	-	-	-

SAMPLE NUMBER	PENTACHLORO PHENOL	4-NITRO PHENOL	2,6-DINITRO TOLUENE	NAPHTHALENE	2-METHYL NAPHTHALENE
TP-A	-	-	-	-	-
TP-B	-	-	-	-	-
TP-C	-	-	-	-	-
TP-D	-	-	-	-	-
TP-E	-	-	-	-	-
TP-F	-	-	-	-	-
TP-G	-	-	-	-	-
TP-H	-	-	-	160	-
TP-I	-	-	-	97	-
TP-J	-	-	-	-	-

SAMPLE NUMBER	ISOPHORONE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZO (A) ANTHRACENE
TP-A	-	-	-	-	-
TP-B	-	-	-	-	-
TP-C	-	-	-	-	2,100
TP-D	-	-	-	-	-
TP-E	-	-	-	58	120
TP-F	-	-	-	-	-
TP-G	-	-	-	-	-
TP-H	-	-	-	-	210
TP-I	-	-	-	200	830
TP-J	-	-	-	34	165

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=TEST_PIT_SOIL

SAMPLE NUMBER	DIBENZO (A,H) ANTHRACENE	PHENANTHRENE	CHRYSENE (BENZO (A) PHENANTHRENE)	PYRENE (BENZO (D,E,F) PHENANTHRENE)
TP-A	-	-	-	-
TP-B	-	-	-	-
TP-C	-	2,400	-	2,500
TP-D	-	-	-	-
TP-E	-	160	170	230
TP-F	-	-	-	-
TP-G	-	-	-	-
TP-H	-	360	310	610
TP-I	-	700	1,000	1,700
TP-J	-	78	210	380

SAMPLE NUMBER	BENZO (A) PYRENE	INDENO 1,2,3(C,D) PYRENE	FLUORENE (2,3-BENZINDENE)	FLUORANTHENE
TP-A	-	-	-	-
TP-B	-	-	-	-
TP-C	-	-	-	3,100
TP-D	-	-	-	-
TP-E	130	110	-	190
TP-F	-	-	-	-
TP-G	-	-	-	-
TP-H	360	350	-	360
TP-I	960	460	-	940
TP-J	82	-	-	200

SAMPLE NUMBER	BENZO (B,K) FLUORANTHENE)	BENZO (G,H,I) PERYLENE	DIBENZO FURAN	DIMETHYL PHTHALATE	DI-N-BUTYL PHTHALATE
TP-A	-	-	-	-	63
TP-B	-	-	-	-	3,100
TP-C	-	-	-	-	-
TP-D	-	-	-	-	-
TP-E	280	47	-	-	130
TP-F	-	-	-	-	-
TP-G	-	-	-	-	-
TP-H	550	480	-	-	100
TP-I	1,500	420	-	190	350
TP-J	270	-	-	-	120

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=TEST_PIT_SOIL

SAMPLE NUMBER	BIS (2-ETHYLHEXYL) PHTHALATE	BUTYLBENZYL PHTHALATE	DI-N-OCTYL PHTHALATE	N-NITROSO DIPHENYLAMINE
TP-A	-	-	-	-
TP-B	11,000	6,100	-	-
TP-C	-	-	-	-
TP-D	-	-	-	-
TP-E	250	61	-	-
TP-F	-	-	-	-
TP-G	-	-	-	-
TP-H	3,600	1,200	-	-
TP-I	11,000	3,100	-	-
TP-J	1,400	5,000	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

AMPLE UMBER	1,4-DICHLORO BENZENE	3,3-DICHLORO BENZIDINE	PHENOL (HYDROXY BENZENE)	4-METHYL PHENOL	2,4,6-TRICHLORO PHENOL
P-K	-	-	-	-	-
P-L	570	-	-	-	-
P-M0	-	-	-	55	-
P-M1	-	-	-	-	-
P-M2	-	-	-	-	-
P-M3	-	-	-	-	-
P-N0	-	-	-	-	-
P-N1	-	-	-	-	-
P-O	-	-	40	-	-
P-P	-	-	-	62	-

AMPLE UMBER	PENTACHLORO PHENOL	4-NITRO PHENOL	2,6-DINITRO TOLUENE	NAPHTHALENE	2-METHYL NAPHTHALENE
P-K	-	-	-	-	-
P-L	-	-	-	230	100
P-M0	140	570	-	100	130
P-M1	-	-	-	140	-
P-M2	-	-	-	-	-
P-M3	-	-	-	-	-
P-N0	-	-	-	-	-
P-N1	-	-	-	-	-
P-O	-	-	-	470	93
P-P	-	-	-	240	87

AMPLE UMBER	ISOPHORONE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZO (A) ANTHRACENE
P-K	55	-	-	56	190
P-L	-	76	740	8,000	26,000
P-M0	47	110	-	340	1,200
P-M1	-	-	-	-	32
P-M2	-	-	-	20,000	52,000
P-M3	-	-	-	-	-
P-N0	120	-	-	160	490
P-N1	-	-	-	-	-
P-O	1,800	140	68	750	1,500
P-P	110	110	380	640	6,400

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

SAMPLE NUMBER	DIBENZO (A,H) ANTHRACENE	PHENANTHRENE	CHRYSENE (BENZO (A) PHENANTHRENE)	PYRENE (BENZO (D,E,F) PHENANTHRENE)
TP-K	-	130	140	210
TP-L	-	5,300	30,000	16,000
TP-M0	150	1,100	830	1,500
TP-M1	-	79	67	96
TP-M2	6,900	72,000	45,000	84,000
TP-M3	-	-	-	2,800
TP-N0	-	410	410	950
TP-N1	-	-	-	-
TP-O	500	1,200	1,300	2,200
TP-P	-	4,200	5,100	7,000

SAMPLE NUMBER	BENZO (A) PYRENE	INDENO 1,2,3(C,D) PYRENE	FLUORENE (2,3-BENZINDENE)	FLUORANTHENE
TP-K	190	130	-	390
TP-L	-	2,600	330	9,100
TP-M0	910	490	110	1,800
TP-M1	-	-	-	45
TP-M2	47,000	26,000	6,500	120,000
TP-M3	-	-	-	23,000
TP-N0	360	250	-	980
TP-N1	-	-	-	-
TP-O	1,400	1,700	120	1,900
TP-P	900	780	200	6,100

SAMPLE NUMBER	BENZO (B,K) FLUORANTHENE)	BENZO (G,H,I) PERYLENE	DIBENZO FURAN	DIMETHYL PHTHALATE	DI-N-BUTYL PHTHALATE
TP-K	280	130	-	-	120
TP-L	-	-	250	-	2,200
TP-M0	1,900	390	140	-	450
TP-M1	-	-	-	-	94
TP-M2	81,000	25,000	3,200	-	6,600
TP-M3	-	-	-	-	-
TP-N0	660	220	-	-	110
TP-N1	-	-	-	-	64
TP-O	3,000	2,000	90	-	240
TP-P	7,400	3,100	170	-	950

Table B-19

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=TEST_PIT_SOIL

SAMPLE NUMBER	BIS (2-ETHYLHEXYL) PHTHALATE	BUTYLBENZYL PHTHALATE	DI-N-OCTYL PHTHALATE	N-NITROSO DIPHENYLAMINE
TP-K	1,000	3,800	-	-
TP-L	130,000	-	-	-
TP-M0	1,400	1,900	340	-
TP-M1	16,000	1,100	-	-
TP-M2	270,000	-	-	-
TP-M3	30,000	-	-	-
TP-N0	270	380	-	-
TP-N1	-	-	-	-
TP-O	1,200	620	-	-
TP-P	2,800	12,000	240	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

SAMPLE NUMBER	1,4-DICHLORO BENZENE	3,3-DICHLORO BENZIDINE	PHENOL (HYDROXY BENZENE)	4-METHYL PHENOL	2,4,6-TRICHLORO PHENOL
TP-Q	-	-	110	88	-
TP-RO	-	-	-	-	-
TP-R1	-	120,000	-	-	-
TP-S	-	-	-	-	-
TP-T	-	-	-	-	-
TP-U	-	-	-	-	-
TP-V	-	-	-	-	-
TP-W	-	-	-	-	-
TP-X	-	-	-	-	-
TP-Y	-	-	-	-	-

SAMPLE NUMBER	PENTACHLORO PHENOL	4-NITRO PHENOL	2,6-DINITRO TOLUENE	NAPHTHALENE	2-METHYL NAPHTHALENE
TP-Q	-	-	-	110	99
TP-RO	-	-	-	-	-
TP-R1	-	-	-	420	-
TP-S	-	-	-	130	-
TP-T	-	-	-	-	-
TP-U	-	-	-	760	-
TP-V	-	-	-	-	-
TP-W	1,300	-	-	-	-
TP-X	-	-	-	-	-
TP-Y	-	-	-	-	-

SAMPLE NUMBER	ISOPHORONE	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZO (A) ANTHRACENE
TP-Q	57	62	-	93	210
TP-RO	-	-	-	-	-
TP-R1	-	-	-	-	-
TP-S	670	-	120	230	590
TP-T	21,000	-	-	-	-
TP-U	170	-	-	-	140
TP-V	-	-	-	-	3,600
TP-W	-	-	-	-	-
TP-X	-	-	-	-	-
TP-Y	200	-	-	-	-

SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

AMPLE UMBER	DIBENZO (A,H) ANTHRACENE	PHENANTHRENE	CHRYSENE (BENZO (A) PHENANTHRENE)	PYRENE (BENZO (D,E,F) PHENANTHRENE)
P-Q	-	250	240	510
P-RO	-	-	-	-
P-R1	-	-	-	-
P-S	150	610	480	790
P-T	-	-	-	-
P-U	-	75	120	190
P-V	-	2,600	4,500	7,600
P-W	-	-	-	-
P-X	-	-	-	-
P-Y	-	-	-	-

AMPLE UMBER	BENZO (A) PYRENE	INDENO 1,2,3(C,D) PYRENE	FLUORENE (2,3-BENZINDENE)	FLUORANTHENE
P-Q	160	100	60	370
P-RO	-	-	-	-
P-R1	-	-	-	-
P-S	630	470	-	1,100
P-T	-	-	-	-
P-U	140	73	-	200
P-V	3,800	2,500	-	6,600
P-W	-	-	-	-
P-X	-	-	-	-
P-Y	-	-	-	-

AMPLE UMBER	BENZO (B,K) FLUORANTHENE)	BENZO (G,H,I) PERYLENE	DIBENZO FURAN	DIMETHYL PHTHALATE	DI-N-BUTYL PHTHALATE
P-Q	320	-	-	-	140
P-RO	-	-	-	-	-
P-R1	-	-	-	-	30
P-S	1,100	480	-	-	66
P-T	-	-	-	-	-
P-U	270	64	-	-	62
P-V	4,200	2,700	-	-	-
P-W	-	-	-	-	-
P-X	-	-	-	-	-
P-Y	-	-	-	-	-

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SUMMARY OF CONCENTRATIONS OF SEMIVOLATILE ORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

SAMPLE NUMBER	BIS (2-ETHYLHEXYL) PHTHALATE	BUTYLBENZYL PHTHALATE	DI-N-OCTYL PHTHALATE	N-NITROSO DIPHENYLAMINE
TP-Q	540	6,500	-	-
TP-R0	3,300	62,000	-	-
TP-R1	110	-	-	-
TP-S	1,300	450	-	-
TP-T	-	-	-	-
TP-U	420	2,400	-	-
TP-V	2,100	29,000	-	-
TP-W	3,000	1,900	-	-
TP-X	-	-	-	-
TP-Y	3,700	740	-	-

Table B-19

SUMMARY OF CONCENTRATIONS OF PESTICIDES AND PCBS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=BORING_SOIL

SAMPLE NUMBER	DIELDRIN	4,4-DDE	4,4-DDD	4,4-DDT
04S-007	-	-	-	-
04S-026	-	-	-	-
05S-005	-	-	-	-
05S-015	-	-	-	-
06S-008	-	-	-	-
06S-016	-	-	-	-
08S-008	-	-	-	-
08S-015	-	-	-	-
09S-006	-	-	-	-
09S-015	-	-	-	-
10S-006	-	-	-	-
10S-015	-	-	-	-
11S-006	-	-	-	-
11S-013	-	-	-	-
11S-029	-	-	-	-
11S-035	-	-	-	-
11S-049	-	-	-	-
12S-005	-	-	-	-
12S-015	-	-	-	-

SAMPLE NUMBER	CHLORDANE	AROCHLOR 1248	AROCHLOR 1254	AROCHLOR 1260
04S-007	-	-	-	-
04S-026	-	-	61	-
05S-005	-	-	-	-
05S-015	-	-	-	-
06S-008	-	-	-	-
06S-016	-	-	-	-
08S-008	-	-	-	-
08S-015	-	-	-	-
09S-006	-	-	-	-
09S-015	-	-	-	-
10S-006	-	-	-	-
10S-015	-	-	-	-
11S-006	-	-	-	-
11S-013	-	-	-	-
11S-029	-	-	-	-
11S-035	-	-	-	-
11S-049	-	-	-	-
12S-005	-	-	-	-
12S-015	-	-	-	-

SUMMARY OF CONCENTRATIONS OF PESTICIDES AND PCBS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=BORING_SOIL

SAMPLE NUMBER	DIELDRIN	4,4-DDE	4,4-DDD	4,4-DDT
12S-065	-	-	-	-
13S-005	-	-	-	-
13S-015	-	-	-	-

SAMPLE NUMBER	CHLORDANE	AROCHLOR 1248	AROCHLOR 1254	AROCHLOR 1260
12S-065	-	-	-	-
13S-005	-	-	-	-
13S-015	-	-	-	-

SAMPLE MEDIA=SURFACE_SOIL

SAMPLE NUMBER	DIELDRIN	4,4-DDE	4,4-DDD	4,4-DDT
SD-01	-	-	-	-
SD-02	-	-	-	-
SD-03	-	-	-	-
SD-04	-	-	-	-
SD-05	-	-	-	24
SD-07	-	-	-	-
SD-08	-	-	-	-
SD-09	-	-	-	-
SD-10	-	-	-	-
SD-12	48	-	-	61
SD-13	-	-	-	-

SAMPLE NUMBER	CHLORDANE	AROCHLOR 1248	AROCHLOR 1254	AROCHLOR 1260
SD-01	-	-	-	-
SD-02	-	-	-	-
SD-03	-	-	-	-
SD-04	100	-	-	-
SD-05	-	-	-	-
SD-07	-	-	-	-
SD-08	-	-	-	-
SD-09	-	-	-	-
SD-10	-	-	-	-
SD-12	-	-	860	-
SD-13	-	-	-	-

Table B-19

SUMMARY OF CONCENTRATIONS OF PESTICIDES AND PCBS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

SAMPLE MEDIA=SURFACE_SOIL

SAMPLE NUMBER	DIELDRIN	4,4-DDE	4,4-DDD	4,4-DDT
SD-14	45	-	-	92
SD-15	-	-	-	-
SD-16	-	-	-	-
SD-17	-	-	-	-
SD-18	-	-	-	-
SS-01	-	-	-	-
SS-02	-	-	-	-
SS-03	-	-	-	-
SS-04	-	-	-	-
SS-05	-	-	-	-

SAMPLE NUMBER	CHLORDANE	AROCHLOR 1248	AROCHLOR 1254	AROCHLOR 1260
SD-14	360	-	-	-
SD-15	-	920	530	-
SD-16	20	-	-	-
SD-17	-	-	-	-
SD-18	-	-	-	-
SS-01	-	-	-	-
SS-02	-	-	-	-
SS-03	-	-	-	-
SS-04	-	-	-	-
SS-05	-	-	-	-

SUMMARY OF CONCENTRATIONS OF PESTICIDES AND PCBS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

SAMPLE NUMBER	DIELDRIN	4,4-DDE	4,4-DDD	4,4-DDT
TP-A	-	-	-	-
TP-B	-	-	-	-
TP-C	-	-	-	-
TP-D	-	-	-	-
TP-E	-	-	-	-
TP-F	-	-	-	-
TP-G	-	-	-	-
TP-H	-	-	-	-
TP-I	-	-	-	-
TP-J	-	-	-	-
TP-K	-	-	-	-
TP-L	-	-	-	-
TP-MO	-	-	-	-
TP-M1	-	-	-	-
TP-M2	-	-	-	-
TP-M3	-	-	-	-
TP-NO	-	-	-	-
TP-N1	-	-	-	-
TP-O	-	-	-	-

SAMPLE NUMBER	CHLORDANE	AROCHLOR 1248	AROCHLOR 1254	AROCHLOR 1260
TP-A	-	-	-	-
TP-B	-	-	-	-
TP-C	-	3,000	-	-
TP-D	-	-	-	-
TP-E	-	1,400	680	-
TP-F	-	2,300	-	-
TP-G	-	14,000	-	-
TP-H	410	-	-	1,100
TP-I	-	460	810	-
TP-J	-	190	-	-
TP-K	-	5,800	-	-
TP-L	-	2,100	1,300	-
TP-MO	1,100	-	940	-
TP-M1	-	-	-	-
TP-M2	160	-	-	-
TP-M3	-	-	-	-
TP-NO	-	-	-	-
TP-N1	-	-	-	-
TP-O	-	880	400	-

Table-19

SUMMARY OF CONCENTRATIONS OF PESTICIDES AND PCBS
IN SURFACE AND SUBSURFACE SOILS (UG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

SAMPLE NUMBER	DIELDRIN	4,4-DDE	4,4-DDD	4,4-DDT
TP-P	-	-	-	-
TP-Q	-	-	-	-
TP-R0	-	-	-	-
TP-R1	-	-	-	-
TP-S	-	-	-	-
TP-T	-	63	160	86
TP-U	-	-	-	-
TP-V	-	-	-	-
TP-W	-	-	-	-
TP-X	-	-	-	-
TP-Y	-	-	-	-

SAMPLE NUMBER	CHLORDANE	AROCHLOR 1248	AROCHLOR 1254	AROCHLOR 1260
TP-P	-	-	-	-
TP-Q	-	-	-	-
TP-R0	-	-	-	-
TP-R1	-	-	-	-
TP-S	-	-	-	-
TP-T	-	-	-	-
TP-U	-	-	-	-
TP-V	-	-	7,300	-
TP-W	-	-	-	-
TP-X	-	-	-	-
TP-Y	-	-	1,700	-

SUMMARY OF CONCENTRATIONS OF INORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (MG/KG)

----------SAMPLE MEDIA=BORING_SOIL----------

SAMPLE NUMBER	TOTAL ALUMINUM	TOTAL ARSENIC	TOTAL BARIUM	TOTAL BERYLLIUM	TOTAL CADMIUM	TOTAL CALCIUM
04S-007	2,540	-	14	-	3.00	-
04S-026	7,200	-	63	-	-	840
05S-005	6,150	61.00	199	1.50	7.50	12,400
05S-015	5,100	3.00	35	1.50	3.00	295
06S-008	2,914	19.00	92	0.40	-	46,970
06S-016	4,727	-	33	1.80	-	78
08S-008	4,262	15.00	783	0.30	-	90,694
08S-015	7,615	16.00	643	0.90	-	5,774
09S-006	5,490	-	26	4.00	-	-
09S-015	5,580	-	136	-	-	45,200
10S-006	3,222	-	18	1.10	-	11,853

SAMPLE NUMBER	TOTAL COBALT	TOTAL COPPER	TOTAL CHROMIUM	TOTAL IRON	TOTAL LEAD	TOTAL MAGNESIUM
04S-007	-	19	22	70,600	-	-
04S-026	28	-	42	73,600	-	860
05S-005	20	296	63	47,200	810	3,030
05S-015	24	16	15	36,400	11	769
06S-008	22	769	1,008	48,250	169	1,243
06S-016	11	14	47	68,813	12	333
08S-008	18	670	1,540	60,785	799	1,691
08S-015	39	167	38	23,123	1,104	657
09S-006	20	24	36	57,400	9	480
09S-015	-	15	18	17,700	141	3,150
10S-006	9	21	25	11,462	10	1,335

SAMPLE NUMBER	TOTAL MANGANESE	TOTAL MERCURY	TOTAL NICKEL	TOTAL SILVER	TOTAL SODIUM	TOTAL VANADIUM	TOTAL ZINC
04S-007	885	-	43	-	-	35	44
04S-026	523	-	39	-	490	65	78
05S-005	218	1.5	73	-	1,330	45	703
05S-015	161	0.4	35	-	219	34	55
06S-008	296	-	1,395	-	451	123	547
06S-016	33	-	22	-	447	68	52
08S-008	449	1.0	2,806	-	-	179	1,348
08S-015	2,563	0.2	25	-	86	50	454
09S-006	85	-	17	3	580	44	69
09S-015	168	0.6	-	5	5,510	34	130
10S-006	119	-	20	-	369	20	62

SUMMARY OF CONCENTRATIONS OF INORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (MG/KG)

----------SAMPLE MEDIA=BORING_SOIL----------

AMPLE UMBER	TOTAL ALUMINUM	TOTAL ARSENIC	TOTAL BARIUM	TOTAL BERYLLIUM	TOTAL CADMIUM	TOTAL CALCIUM	
0S-015	2,731	-	20	0.90	2.20	550	1
1S-006	8,430	6.56	1,060	-	-	33,900	1
1S-013	11,500	3.85	30	-	-	2,420	1
1S-029	3,530	-	18	2.60	-	831	1
1S-035	1,180	-	-	-	-	9,540	1
1S-049	2,310	-	12	1.40	-	333	1
2S-005	2,410	-	-	1.40	-	333	1
2S-015	6,930	-	66	1.40	-	413	1
2S-065	1,610	-	-	1.40	-	413	1
3S-005	2,930	-	58	1.40	-	1,270	1
3S-015	3,430	-	-	1.40	-	271	1

AMPLE UMBER	TOTAL COBALT	TOTAL COPPER	TOTAL CHROMIUM	TOTAL IRON	TOTAL LEAD	TOTAL MAGNESIUM	S N
0S-015	6	34	42	28,379	4	251	1
1S-006	-	65	117	35,700	425	1,960	1
1S-013	9	12	19	18,200	13	906	1
1S-029	17	67	27	73,800	9	259	1
1S-035	-	11	6	3,990	8	414	1
1S-049	7	11	47	29,600	14	98	1
2S-005	7	6	7	6,860	7	98	1
2S-015	7	15	10	10,200	30	390	1
2S-065	7	15	7	555	8	392	
3S-005	7	18	22	20,900	23	289	1
3S-015	7	18	14	14,900	5	289	1

AMPLE UMBER	TOTAL MANGANESE	TOTAL MERCURY	TOTAL NICKEL	TOTAL SILVER	TOTAL SODIUM	TOTAL VANADIUM	TOTAL ZINC	S N
0S-015	30	-	18	-	497	44	42	1
1S-006	257	0.2	44	-	389	43	500	1
1S-013	143	-	11	-	320	31	45	1
1S-029	138	-	19	-	329	56	58	1
1S-035	22	-	-	-	607	-	29	1
1S-049	31	-	18	-	247	65	32	1
2S-005	38	-	18	-	247	16	14	1
2S-015	166	-	18	-	247	18	34	1
2S-065	166	-	18	-	247	13	34	1
3S-005	86	-	18	-	442	36	31	1
3S-015	218	-	18	-	363	20	24	1

SUMMARY OF CONCENTRATIONS OF INORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (MG/KG)

SAMPLE MEDIA=SURFACE_SOIL

SAMPLE NUMBER	TOTAL ALUMINUM	TOTAL ARSENIC	TOTAL BARIUM	TOTAL BERYLLIUM	TOTAL CADMIUM	TOTAL CALCIUM
SD-01	7,640	9.40	57	1.10	2.70	2,290
SD-02	6,210	6.70	53	1.00	2.10	1,680
SD-03	7,300	-	62	0.75	-	6,190
SD-04	8,250	6.30	213	1.30	-	41,300
SD-05	8,740	20.00	284	1.70	-	1,250
SD-07	7,100	22.00	409	1.20	-	1,220
SD-08	9,010	6.40	37	0.85	-	438
SD-09	7,410	13.00	200	0.77	-	325
SD-10	5,030	17.00	290	-	-	525
SD-12	5,890	54.00	605	0.84	4.20	11,300
SD-13	8,170	6.10	58	1.50	-	1,710

SAMPLE NUMBER	TOTAL COBALT	TOTAL COPPER	TOTAL CHROMIUM	TOTAL IRON	TOTAL LEAD	TOTAL MAGNESIUM
-01	7	41	34	15,400	92	900
SD-02	11	23	19	10,200	35	1,050
SD-03	7	30	26	10,300	76	1,100
SD-04	6	163	117	15,300	347	14,100
SD-05	18	266	38	15,500	241	602
SD-07	31	282	45	13,800	436	560
SD-08	3	17	23	24,200	22	500
SD-09	8	149	20	8,900	109	600
SD-10	6	235	35	7,450	249	349
SD-12	7	80	99	17,100	1,930	1,880
SD-13	28	47	26	14,400	66	765

SAMPLE NUMBER	TOTAL MANGANESE	TOTAL MERCURY	TOTAL NICKEL	TOTAL SILVER	TOTAL SODIUM	TOTAL VANADIUM	TOTAL ZINC
SD-01	99	-	20	-	114	43	173
SD-02	348	-	17	2	85	25	53
SD-03	318	-	13	-	174	28	86
SD-04	402	-	44	3	655	29	1,120
SD-05	774	-	27	2	67	58	124
SD-07	1,430	-	31	2	67	57	142
SD-08	55	-	7	-	70	45	69
SD-09	498	-	13	-	63	26	48
SD-10	221	-	9	2	63	51	62
-12	464	-	45	-	103	58	1,440
SD-13	864	-	33	3	54	31	138

SUMMARY OF CONCENTRATIONS OF INORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (MG/KG)

----------SAMPLE MEDIA=SURFACE_SOIL----------

AMPLE UMBER	TOTAL ALUMINUM	TOTAL ARSENIC	TOTAL BARIUM	TOTAL BERYLLIUM	TOTAL CADMIUM	TOTAL CALCIUM
D-14	9,340	15.00	522	1.60	2.50	17,900
D-15	17,600	9.70	82	0.82	-	2,780
D-16	16,900	9.20	46	0.82	-	1,560
D-17	12,600	-	40	0.73	-	1,450
D-18	7,260	-	60	0.83	-	6,310
S-01	7,940	2.90	54	2.50	-	1,400
S-02	4,960	4.80	-	-	-	-
S-03	7,330	6.90	33	-	-	-
S-04	21,300	4.50	-	-	-	-
S-05	20,300	4.60	-	-	-	-

AMPLE UMBER	TOTAL COBALT	TOTAL COPPER	TOTAL CHROMIUM	TOTAL IRON	TOTAL LEAD	TOTAL MAGNESIUM
D-14	18	332	1,060	43,400	852	2,980
D-15	5	48	84	23,600	136	1,220
D-16	5	16	32	21,700	40	1,070
D-17	3	11	25	19,300	23	910
D-18	5	28	19	9,920	73	1,140
S-01	21	41	42	40,200	34	758
S-02	-	50	17	10,306	124	252
S-03	-	134	21	11,300	153	592
S-04	-	-	31	24,100	8	746
S-05	-	13	32	25,200	16	1,030

AMPLE UMBER	TOTAL MANGANESE	TOTAL MERCURY	TOTAL NICKEL	TOTAL SILVER	TOTAL SODIUM	TOTAL VANADIUM	TOTAL ZINC
D-14	720	-	367	2	245	119	1,690
D-15	107	-	55	-	68	48	138
D-16	66	-	13	2	66	42	50
D-17	61	-	7	-	76	34	35
D-18	299	-	12	-	115	26	100
S-01	161	-	51	-	-	86	147
S-02	51	-	-	-	-	22	19
S-03	225	0.2	19	-	-	30	414
S-04	44	0.1	19	-	-	47	40
S-05	69	-	-	-	-	46	18

SUMMARY OF CONCENTRATIONS OF INORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (MG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

SAMPLE NUMBER	TOTAL ALUMINUM	TOTAL ARSENIC	TOTAL BARIUM	TOTAL BERYLLIUM	TOTAL CADMIUM	TOTAL CALCIUM
TP-A	3,210	0.96	-	81.00	-	269
TP-B	13,300	9.30	184	1.40	4.20	50,700
TP-C	6,330	56.00	263	0.97	2.70	32,400
TP-D	7,490	-	69	0.67	2.60	15,000
TP-E	3,250	-	67	0.65	2.90	6,010
TP-F	7,780	8.30	126	-	7.00	3,190
TP-G	10,400	8.00	178	1.40	10	6,190
TP-H	12,500	9.80	159	-	3.10	11,000
TP-I	1,720	-	16	1.10	-	221,000
TP-J	11,400	-	156	-	-	1,870
TP-K	7,270	6.90	344	1.40	4.50	8,220

SAMPLE NUMBER	TOTAL COBALT	TOTAL COPPER	TOTAL CHROMIUM	TOTAL IRON	TOTAL LEAD	TOTAL MAGNESIUM
TP-A	16	169	20	14,600	107	448
TP-B	27	851	1,990	47,700	1,140	2,300
TP-C	12	1,400	153	28,900	569	1,520
TP-D	11	95	137	25,600	96	1,020
TP-E	8	136	24	15,600	141	669
TP-F	8	103	95	23,500	396	527
TP-G	11	78	101	30,500	232	1,360
TP-H	9	100	93	23,900	312	1,260
TP-I	2	14	4	2,600	45	4,200
TP-J	11	44	34	27,500	401	619
TP-K	22	134	476	36,000	5,010	1,051

SAMPLE NUMBER	TOTAL MANGANESE	TOTAL MERCURY	TOTAL NICKEL	TOTAL SILVER	TOTAL SODIUM	TOTAL VANADIUM	TOTAL ZINC
TP-A	559	-	16	-	19	34	77
TP-B	490	0.4	1,670	-	280	64	532
TP-C	289	0.9	207	17	113	413	302
TP-D	285	-	173	-	101	25	71
TP-E	96	0.2	12	-	59	31	241
TP-F	135	0.2	75	-	263	48	466
TP-G	133	0.6	83	2	81	79	939
TP-H	257	1.4	150	-	127	62	479
TP-I	86	-	140	-	273	3.8	99
TP-J	330	-	17	-	40	44	145
TP-K	303	-	90	-	69	62	1,440

Table B-19

SUMMARY OF CONCENTRATIONS OF INORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (MG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

SAMPLE NUMBER	TOTAL ALUMINUM	TOTAL ARSENIC	TOTAL BARIUM	TOTAL BERYLLIUM	TOTAL CADMIUM	TOTAL CALCIUM
TP-L	3,950	11.00	262	0.64	-	9,360
TP-MO	6,400	20.00	268	1.30	5.00	27,700
TP-M1	6,280	166.00	294	2.00	-	3,660
TP-M2	9,380	10.00	269	1.50	-	41,200
TP-M3	3,420	32.00	350	1.70	4.40	53,800
TP-NO	11,300	23.00	302	2.20	-	18,800
TP-N1	7,280	6.30	45	2.10	3.50	152
TP-O	9,000	-	86	0.87	-	1,220
TP-P	10,100	21.00	794	-	89	28,000
TP-Q	10,300	21.00	6,370	1.40	10	25,900
TP-RO	7,030	62.00	1,670	1.20	19	146,000

SAMPLE NUMBER	TOTAL COBALT	TOTAL COPPER	TOTAL CHROMIUM	TOTAL IRON	TOTAL LEAD	TOTAL MAGNESIUM
TP-L	8	38	229	12,100	1,040	996
TP-MO	16	181	324	31,400	583	2,170
TP-M1	11	33	19	23,700	23	697
TP-M2	18	1,140	1,190	117,000	244	6,810
TP-M3	50	409	277	83,500	549	2,220
TP-NO	8	124	88	27,300	482	1,690
TP-N1	16	15	37	60,700	18	519
TP-O	40	50	16	17,000	26	597
TP-P	18	781	85	53,300	2,710	2,140
TP-Q	20	189	1,340	39,500	530	2,140
TP-RO	24	76	101	65,800	503	3,810

SAMPLE NUMBER	TOTAL MANGANESE	TOTAL MERCURY	TOTAL NICKEL	TOTAL SILVER	TOTAL SODIUM	TOTAL VANADIUM	TOTAL ZINC
TP-L	138	0.3	268	-	305	30	189
TP-MO	701	1.2	1,060	-	256	109	10300
TP-M1	44	0.3	32	-	826	89	1,480
TP-M2	762	0.3	1,280	-	2,450	40	532
TP-M3	669	0.4	225	-	2,020	55	825
TP-NO	108	0.3	77	-	190	78	522
TP-N1	132	-	38	-	140	71	65
TP-O	248	0.2	24	-	148	31	65
TP-P	534	1.1	72	5	3,230	28	2,420
TP-Q	361	0.2	652	-	915	79	512
TP-RO	1,140	0.3	68	-	933	36	1,020

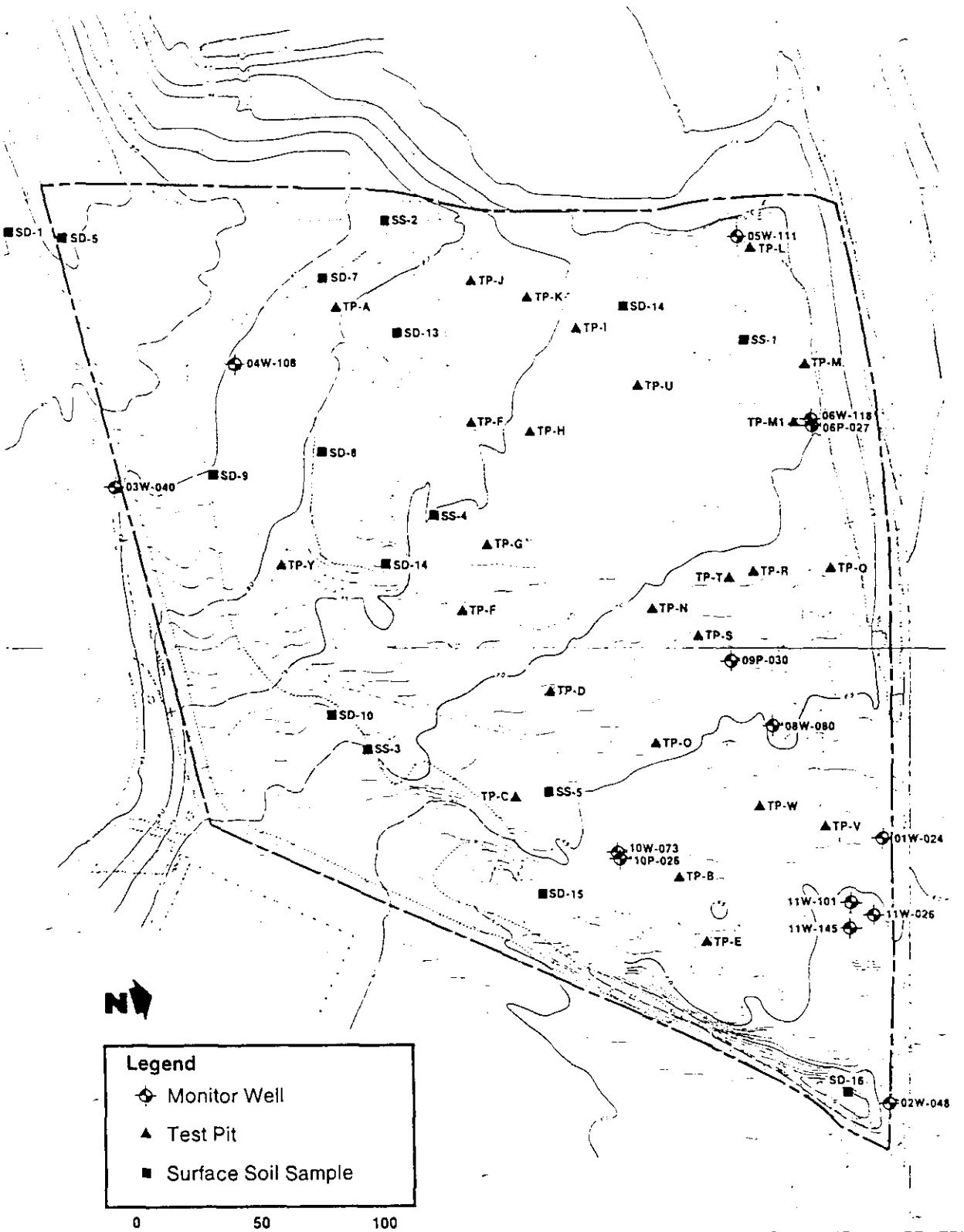
SUMMARY OF CONCENTRATIONS OF INORGANIC COMPOUNDS
IN SURFACE AND SUBSURFACE SOILS (MG/KG)

----------SAMPLE MEDIA=TEST_PIT_SOIL----------

SAMPLE NUMBER	TOTAL ALUMINUM	TOTAL ARSENIC	TOTAL BARIUM	TOTAL BERYLLIUM	TOTAL CADMIUM	TOTAL CALCIUM
TP-R1	14,700	-	638	-	4.10	56,500
TP-S	12,000	7.30	86	1.20	-	10,600
TP-T	11,000	46.00	307	0.98	5.80	12,100
TP-U	4,110	-	50	1.10	-	1,860
TP-V	5,670	10.40	1,140	-	-	36,500
TP-W	3,170	10.60	2,510	-	-	19,500
TP-X	3,150	1.10	31	0.90	-	218
TP-Y	14,500	5.20	52	0.90	-	430

SAMPLE NUMBER	TOTAL COBALT	TOTAL COPPER	TOTAL CHROMIUM	TOTAL IRON	TOTAL LEAD	TOTAL MAGNESIUM
TP-R1	7	333	76	23,400	13,600	2,470
TP-S	34	39	45	30,200	194	1,590
TP-T	6	142	79	22,200	472	956
TP-U	9	30	16	24,300	8	253
TP-V	8	137	66	89,900	1,130	2,020
TP-W	59	1,790	-	72,400	1,940	2,420
TP-X	-	13	24	25,500	7	664
TP-Y	6	16	25	22,900	14	1,050

SAMPLE NUMBER	TOTAL MANGANESE	TOTAL MERCURY	TOTAL NICKEL	TOTAL SILVER	TOTAL SODIUM	TOTAL VANADIUM	TOTAL ZINC
TP-R1	269	-	54	-	339	155	1,790
TP-S	336	-	47	-	131	37	319
TP-T	167	1.6	136	-	198	348	709
TP-U	144	-	19	-	88	33	39
TP-V	398	1.2	63	-	620	40	1,820
TP-W	1,220	0.6	4,530	-	362	38	1,710
TP-X	34	-	9	-	227	44	36
TP-Y	130	-	12	-	229	39	53



SOURCE: ROY F. WESTON, INC. 1987 REMEDIAL INVESTIGATION REPORT FOR THE KANE & LOMBARD SITE, BALTIMORE, MARYLAND

AR301812

Harding Lawson Associates
Engineering and Environmental Services

LOCATION OF ON-SITE SAMPLES KANE & LOMBARD SUPERFUND SITE

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE B-4

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED NO.
JSW	27654.3.4.2.1		S-BASE	3/14/95	

APPENDIX C

WETLANDS DELINEATION REPORT

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ATTACHMENT 1

Routine Onsite Determination Method Data Forms

APPENDIX C
KANE AND LOMBARD SUPERFUND SITE
PHASE II ECOLOGICAL ASSESSMENT AREA WETLANDS DELINEATION REPORT

1.0 INTRODUCTION

This report presents the findings of a wetlands delineation conducted by Harding Lawson Associates (HLA) for the Kane and Lombard Superfund Site (Superfund Site) Phase II Ecological Assessment Area (Phase II EAA). the Superfund Site, is located near the intersection of Kane and Lombard Streets in the City of Baltimore, Maryland. A site location map is presented in Figure C-1.

The purpose of HLA's investigation was to delineate and survey the wetland areas within the Phase II EAA originally identified by the Phase I Baseline Ecological Assessment (HLA August 30, 1994). To support the ecological evaluation of the Phase II EAA all areas identified as having wetland habitat functions were delineated. No determination was made as to the regulatory or jurisdictional status of the delineated wetland areas.

The Phase II EAA includes the Superfund Site, the athletic fields to the east of the site, the wetlands immediately adjacent to the west of the site, the area to the north of the site between East Lombard Street and the Conrail railroad yard, the stormwater drain system running north to its terminus at Herring Run and a portion of Herring Run upstream and downstream of the stormwater drainage discharge. The Phase II EAA is shown in Figure C-2.

2.0 METHOD OF INVESTIGATION

Wetland field work was performed on November 16 and 17 and December 1 and 2, 1994.

Herring Run Wetlands

Because of physical limitations encountered with delineating and surveying within the Herring Run stream channel, the wetland habitat types and boundaries associated with this area were identified and demarcated using aerial photographs, US Fish and Wildlife Service (FWS) National Wetland Inventory (NWI) mapping and a visual survey of the stream channel within the Phase II EAA.

Formal Wetland Delineation

The remaining wetland areas within the Phase II EAA were delineated using field and reporting guidelines specified by the 1987 US Army Corps of Engineers (USACOE) *Wetlands Delineation Manual*, Technical Report Y-87-1 (WDM). The methodologies outlined in the WDM are summarized below.

The following three parameters are diagnostic of wetlands: (1) the land is dominated by hydrophytic vegetation; (2) the substrate is undrained hydric soil; and (3) the substrate is saturated with groundwater or flooded for part of the growing season each year. All three parameters must be present for an area to be identified as wetlands, unless abnormal circumstances (i.e., disturbed areas, newly created wetlands, red parent material soils) are determined to be present.

Soils, vegetation, and hydrology were evaluated at 189 locations and the wetland boundaries were flagged and surveyed as shown in Figure C-4 using the parameters outlined below. Supporting data for the wetlands delineation were documented for seven of the flagged locations (W9, W21, W44, W76, W112, R5/R6, and R28). The WDM requires data to be documented at "representative observation points." These observation points are points along the delineation line at which the apparent characteristics of the entire community are represented. The seven data points documented for this delineation were representative of vegetation or soil changes within the Phase II EAA. Upland and wetland photographs of these data points are shown in Photographs C-1 through C-14 and the locations and directions of the photographs is displayed in Figure C-7. The field data was documented on the *Routine Onsite Determination Method Data Forms* included in this report and is summarized in the Summary of Results (Section 3.0).

2.1 Vegetation

A hydrophyte is any plant "growing in water, soil, or on a substrate that is at least periodically deficient of oxygen as a result of excessive water content" (WDM,1987). Since most plant species tolerate a range of growing conditions, individual species are not restricted to either wetland or upland communities. The US Department of the Interior, Fish and Wildlife Service (USFWS) has developed a classification scheme that assigns species to wetland indicator classes according to the following rule:

Classification	% Occurrence in Wetlands
Obligate (OBL)	> 99
Facultative Wet (FACW)	67 - 99
Facultative (FAC)	34 - 66
Facultative Upland (FACU)	1 - 33
Upland (UPL)	< 1

Pluses or minuses given with these classifications indicate a tendency toward the wetter (+) or drier (-) end of the scale. For example, FACW+ would indicate a greater occurrence in wetlands (toward the OBL end of the scale), while FACW- would indicate a decreased occurrence in wetlands (toward the UPL portion of the scale).

The indicator status of specific species are presented in the 1988 USFWS publication, *National List of Plant Species That Occur in Wetlands* (National Wetland Plant List). Hydrophytic vegetation is present if greater than 50 percent of the dominant plant species from all strata (canopy, shrub, sapling, and herbaceous) are OBL, FACW, and/or FAC (including FACW+, FACW-, FAC+, and FAC- species). When 50 percent or more of the dominant species are FACU and/or UPL and hydric soils and wetland hydrology are present, the area is also considered to have hydrophytic vegetation. As defined by the WDM, if hydric soils and wetland hydrology are lacking and normal circumstances exist, then an area is considered to be upland.

For this investigation, the dominance of plant species was determined by recording the vegetative cover class (based on percent areal cover) within a plot. Results are discussed in the following section.

2.2 Soils

A hand-held auger was used for sampling soil to determine the presence of hydric soil indicators such as low chroma colors, mottling, organic accumulation and high water table. Soils are generally examined to a minimum depth of 18 inches. Hydric conditions for mineral soils with low to moderate organic content are most commonly demonstrated by gleying and mottling. Mineral soils are examined with a Munsell Soil Color Chart (Kollmorgen Corp, 1985). These soils are considered hydric when they are gleyed or when the top of the B horizon has chroma of two or less if mottling is present, or chroma of one or less if no mottling is present. Low chroma numbers are an index of the degree of soil reduction as a result of anaerobic soil conditions.

Hydric mineral soils derived from red parent materials may lack the low chroma colors characteristic of most hydric mineral soils. In these soils, the hue is redder than 10 YR because of parent materials that remain red after citrate-dithionite extraction, so the low chroma requirement for hydric soil is waived (USDA Soil Conservation Service, 1982). Wetland soils derived from red parent material were encountered during this investigation (Section 3.2).

These criteria allow most soils to be classified as either hydric or nonhydric. Hydric soils that have been effectively drained may, however, still show low chroma colors but are no longer considered to be hydric because they lack the hydrology. Low chroma may not be used as an indicator of hydric soils in those soils that are sandy, or deeply colored as a result of their parent materials, or have recently been formed (i.e., alluvial). These soils are evaluated more carefully for other indicators of hydrologic influences as outlined in WDM. Results of this investigation are discussed in the following section.

2.3 Hydrology

Wetland hydrology encompasses the hydrologic characteristics of areas that are inundated or have saturated soils for sufficient duration to support hydrophytic vegetation. Of the three technical criteria, wetland hydrology is generally the least exact and most difficult to establish in the field due to annual, seasonal, and daily fluctuations. Indicators of wetland hydrology may be divided into recorded data and field data. Recorded data may be obtained from aerial photographs, soil surveys, historical data, floodplain delineations, and tide or stream gauges. In the field, wetland hydrology may be evidenced by visual observation of saturation, inundation, or depth to standing water. However, it is not necessary to directly demonstrate the hydrology. Other field indicators of wetland hydrology include morphological plant adaptations, oxidized live root channels, water marks, surface scouring, water-stained leaves, sediment deposits, drift lines, and moss lines. Unless an area has been hydrologically modified, the hydrologic parameter may also be inferred from the soil profile. Results of this investigation are discussed in the following section.

3.0 RESULTS OF INVESTIGATION

Approximately 4 acres of wetlands were identified within the Phase II EAA. The identified wetland areas are shown in Figure C-4. Figure C-8 shows the detailed boundaries of the delineated wetlands. A description of identified wetland habitat types is presented in Section 4.0.

Herring Run Wetlands

As discussed earlier, wetlands associated with Herring Run were identified and demarcated using aerial photographs, US Fish and Wildlife Service (FWS) National Wetland Inventory (NWI) mapping and a visual survey of the stream channel within the Phase II EAA. The three riverine wetland habitat types listed below were identified within the Herring Run Stream channel:

- Riverine Lower Perennial Unconsolidated Bottom Permanent (R2UB1/2/3/H)
- Riverine Lower Perennial Beach/Bar Intermittently Seasonal (R2BB1/2C)
- Riverine Lower Perennial Beach/Bar Intermittently Flooded (R2BBJ)

The vegetation along the banks of Herring Run is dominated by herbaceous species during the growing season. At the time of HLA's survey, the vegetation within this wetland habitat had been severely disturbed by what is assumed to have been recent seasonal flooding. The above ground parts of most of the vegetation within the Herring Run channel had been washed away or covered by accumulated leaf litter, often two to three feet thick.

Formal Wetland Delineation

Soils, vegetation, and hydrology were evaluated at 189 locations. These locations were flagged and surveyed to provide the wetland boundary as shown in Figure C-4. Supporting data for the wetlands delineation were documented for seven of the flagged locations (W9, W21, W44, W76, W112, R5/R6, and R28) in accordance with the WDM. Supporting field documentation is presented on the *Routine Onsite Determination Data Forms* presented with this report and is summarized below.

The field data sheets presented with this report provide documentation of field conditions at locations representative of the flagged wetland boundary. To document conditions on both sides of the delineation line, a data form was completed for the upland side of the boundary as well as the wetland side. Copies of both the wetland and the upland data forms are provided included in this report.

The formal wetland delineation of the Phase II EAA identified several wetland areas. Wetlands were delineated adjacent to the west of the Superfund Site boundary and adjacent to the western and northern side of the PICORP facility.

3.1 Vegetation

The vegetation throughout much of the wetlands adjacent to the north of the PICORP facility is dominated by *Phragmites australis* (common reed) and can be characterized as palustrine emergent. This species is designated by the *National List of Plant Species That Occur in Wetlands - Northeast* as FACW.

In wetland areas with distinct flow channels, the vegetation is generally dominated by *Acer saccharinum* (silver maple) and *Salix nigra* (black willow) and is characterized as a riverine intermittent streambed wetland. These species are designated as FACW.

The wetland areas adjacent to the Superfund Site are dominated in the southern portion by *Salix nigra*, *Phragmites australis*, and *Typha latifolia* (common cattail). The remainder of this wetland area is dominated by *Typha latifolia*, *Carex* spp. (rush species), and *Solidago* spp. (goldenrod species).

3.2 Soils

The US Department of Agriculture, Soil Conservation Service (SCS) has not developed a Soils Survey for the City of Baltimore, but the soils are mapped for adjacent Baltimore County, which borders the eastern corner of the Phase II EAA. A map with the soil types of adjacent Baltimore County is shown in Figure C-5. By extrapolating the soil types across the county line, at least three soil types can be identified as likely to exist within the Phase II EAA: alluvial land, made land, and loamy and clayey land.

Alluvial land is mapped along Herring Run and consists of soil material washed from uplands and deposited along the floodplain area of Herring Run. Made land consists of land areas that have been created by man and exists on the Superfund Site and PICORP property. Loamy and clayey land consists mainly of nearly level to steep very old clay deposits overlain by more recent deposits of sandy loam, loam, or silt loam. The loamy mantle rests abruptly over clay that is very plastic and sticky and characterized by poor stability.

Low chroma and mottled soils were found in most of the wetland areas throughout the study area. Clay soils were identified close to the surface at a majority of the wetland sampling points.

Soils associated with red parent material were identified in the wetland area adjacent to the west of the Superfund Site and wetland areas west and north of the PICORP facility. A mound of red soil approximately 25 feet high is located west of the PICORP facility. Erosion channels from this mound were observed draining into the intermittent stream channel adjacent to the western side of the PICORP facility. The mound itself appeared to be manmade. The sediments associated with these red parent material soils were sometimes lacking the low chroma colors characteristic of most hydric mineral soils. As discussed earlier, it is not unusual for the low chroma requirement for hydric soils to be lacking in wetland soils from these red parent materials.

Red soil colors have not been described in any of the three soil types identified as most likely existing in the Phase II EAA. The *Soil Survey for Baltimore County* was examined and none of the soils occurring on the nearby County border were described as being dominated by red colors.

3.3 Hydrology

The wetlands delineated adjacent to the Superfund Site and the PICORP facility were separated into two drainage areas as discussed below.

The first drainage area includes the wetland areas adjacent to the Roadway property and to the west of the Superfund Site. These wetlands are demarcated by depressed areas or channels contained on all sides by uplands with slopes draining runoff into the area (Figure C-6 shows the topography of the Phase II EAA). Surface water runs off into these areas from the high school property to the south, from the Superfund Site to the east, from the Roadway parking lot to the west, and from East Lombard Street to the north. Standing water and some slowly flowing water were observed in this wetland area during wetlands delineation field activities. Water which collects in this area is channeled through a culvert under East Lombard Street and continues as an intermittent stream on the west and northern side of the PICORP facility. Additional runoff enters the intermittent stream channel from the Conrail Railroad Yard (Railroad Yard) to the north and west and from the PICORP facility. The intermittent stream channel drains into an excavated drainage basin on the northern side of the PICORP facility and then enters the underground stormwater drainage system flowing north under the Conrail railroad yard.

The second drainage area is located in the eastern portion of the north side of the PICORP facility. In this area runoff from the PICORP facility collects in a wetland area contained by a manmade berm (Figure C-4). Drainage from this bermed area is channeled northwest along North Point Boulevard and into a stormwater drain. Standing water was seen in this bermed area behind PICORP during the wetland delineation field activities. An intermittent stream adjacent to the Railroad Yard (Figure C-4) receives runoff from the railroad Yard and channels the flow into the same drain on North Point Boulevard which receives drainage from the bermed area adjacent to the PICORP facility.

Observed hydric indicators included a sediment layer overlaying the soils in drainage channels, oxidized root channels, water marks, surface scouring, and water-stained leaves. Soils were saturated between 0 and 4 inches from the surface and a surficial silt line could be seen on the bases of many plants in this area, indicating intermittent flowing water. A more detailed discussion of the drainage within the Phase II EAA is presented in the *Phase II EAA Stormwater Drainage System Investigation Results* report (Appendix F).

4.0 WETLAND HABITAT TYPES

Five wetland habitat types were identified within the Phase II EAA: three riverine wetland habitats at Herring Run, two of which were identified in the National Wetlands Inventory Map, and a riverine wetland habitat and a palustrine habitat, both adjacent to the PICORP facility. Each wetland type is described below and shown in Figure C-4.

4.1 Palustrine

The palustrine wetland type is described as nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 parts per thousand. This includes wetlands lacking such vegetation but with all of the following four characteristics: areas less than 20 acres in size; active wave-formed or bedrock shoreline features lacking; water depth in the deepest part of basin less than six feet at low water; and salinity due to ocean-derived salts less than 0.5 parts per thousand. The palustrine ecological system is bound by either uplands or another wetland system. Palustrine wetlands can be situated shoreward of lakes, river channels, or estuaries; on river floodplains; in isolated catchments; or on slopes (Cowardin *et al.*, 1979).

The only palustrine wetland habitat found within the Phase II EAA was palustrine emergent (PEM). PEM wetlands consist of a palustrine ecological system usually dominated by perennial plants, characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. Vegetation is present for most of the growing season in most years (Cowardin *et al.*, 1979).

PEM wetlands are found adjacent to the northern slope and the western side of the PICORP facility. PEM wetlands were also identified adjacent to the west side of the Superfund Site. PEM wetlands make up approximately 1.5 acres and 3 percent of the Phase II EAA land area.

4.2 Riverine

Riverine wetland ecological systems include all wetlands and deepwater habitats contained within a channel with a salinity less than 0.5 parts per thousand. The riverine system is bound by uplands on the landward side, or by wetlands dominated by trees, shrubs, persistent emergents, emergent mosses, or lichens. The riverine system terminates at the downstream end where the concentration of ocean-derived salts in the water exceeds 0.5 parts per thousand during the period of annual average low flow, or where the channel enters a lake. It terminates at the upstream end where tributary streams originate, or where the channel leaves a lake (Cowardin *et al.*, 1979).

4.2.1 Riverine Intermittent Streambed (R4SB)

R4SB wetlands consist of a riverine ecological system where the channel contains flowing water for only part of the year. When water is not flowing in the channel, it may remain in isolated pools or surface water may be absent (Cowardin *et al.*, 1979). The vegetation in this wetland type was dominated by *Phragmites australis*.

R4SB wetlands occur adjacent to the PICORP facility and where water flows through an intermittent stream channel and eventually flows into the stormwater drainage system and under the Conrail railroad yard. This wetland type makes up approximately 0.5 acre and 2 percent of the Phase II EAA land area.

4.2.2 Riverine Lower Perennial Unconsolidated Bottom Permanent (R2UB1/2/3/H)

R2UB1/2/3/H wetlands consist of a riverine ecological system with a low gradient and a slow water velocity. The substrate consists of sand, gravel, and mud. These wetland areas remain flooded throughout the year in all years.

This wetland type defines the area of Herring Run where permanent flow occupies the stream channel. Approximately 1,800 linear feet of R2UB1/2/3/H wetlands traverse the Phase II EAA.

4.2.3 Riverine Lower Perennial Beach/Bar Intermittently Seasonal (R2BB1/2C)

R2BBC wetlands consist of a riverine ecological system where the gradient is low and water velocity is slow. There is no tidal influence, and some water flows throughout the year. The wetland is inundated most years for two weeks or more during the growing season, and usually dry by the end of the growing season. The substrate consists mainly of sand and mud. Oxygen deficits may sometimes occur. The fauna is composed mostly of species that reach their maximum abundance in still water and true planktonic organisms are common. The floodplain is well developed (Cowardin *et al.*, 1979).

This wetland type occurs at Herring Run in the area of the I95 overpass. R2BBC wetlands make up approximately 0.5 acres and 1 percent of the Phase II EAA land area.

4.2.4 Riverine Lower Perennial Beach/Bar Intermittently Flooded (R2BBJ)

R2BBJ wetlands consist of a riverine ecological system where the gradient is low and water velocity is slow. There is no tidal influence, and some water flows throughout the year. The wetland is nearly permanently flooded and exposed only during drought conditions. The substrate consists mainly of sand and mud. Oxygen deficits may sometimes occur. The fauna is composed mostly of species that reach their maximum abundance in still water and true planktonic organisms are common. The floodplain is well developed (Cowardin *et al.*, 1979).

R2BBJ wetlands occur at Herring Run east of the Interstate 95 overpass. This wetland type makes up approximately 0.5 acres and 1 percent of the Phase II EAA land area.

5.0 POST-INVESTIGATION ACTIVITIES

In January 1995, HLA field personnel observed that much of the palustrine emergent wetland habitat on the Roadway property was severely disturbed by excavation activities in that area. The excavation activities were focused within the OU-2 Study Area in the eastern portion of the wetland area adjacent to the Superfund Site. The activities appear to have included removal of the vegetation and the top layer of soil. Photograph-15 shows this area prior to the excavation activities. Photograph C-16 shows the wetlands on January 9, 1995, while excavation activities were still on-going. Photograph C-17 shows the property on January 22, 1995, after activities appear to have been completed. Field observations identified straw placed in excavated areas and it appears as if seed and fertilizer had been applied.

6.0 SUMMARY AND CONCLUSIONS

Approximately 4 acres of wetlands were identified within the Phase II Ecological Assessment Area. The lowland area between the Superfund Site and the Roadway Express facility, the intermittent stream channels located along the western and north portion of the PICORP property, the bermed area to the north of the PICORP facility, and Herring Run all meet the vegetation, soils, and hydrology criteria for wetland habitats.

As discussed in Section 5.0, the wetlands located on the Roadway Express Inc. property have been altered since this investigation. The excavation and removal of wetland vegetation and soils from this area may have a long term effect on the function of this area.

7.0 REFERENCES

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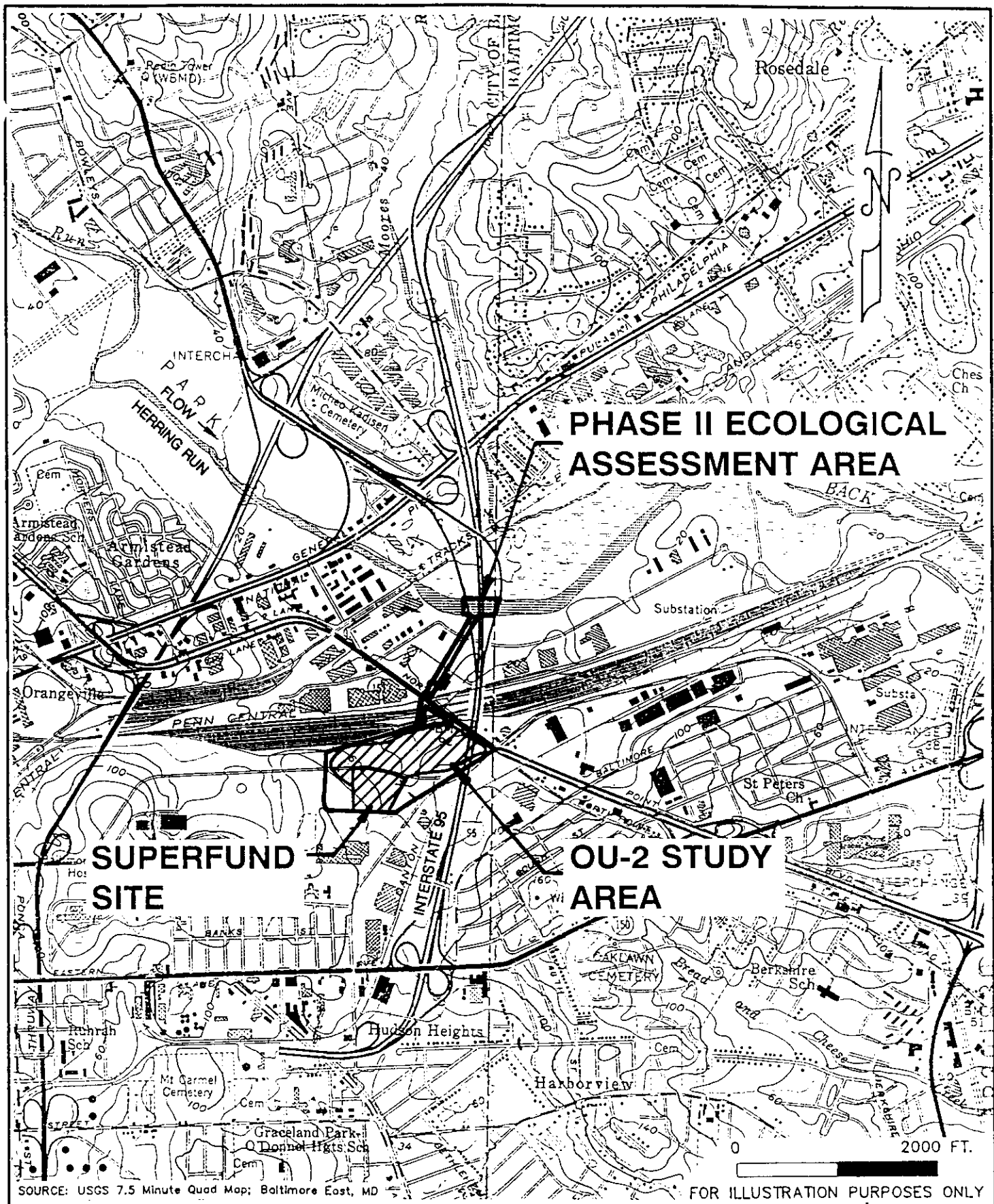
Appendix C



SOURCE: USGS 7.5 Minute Quad Map; Baltimore East, MD

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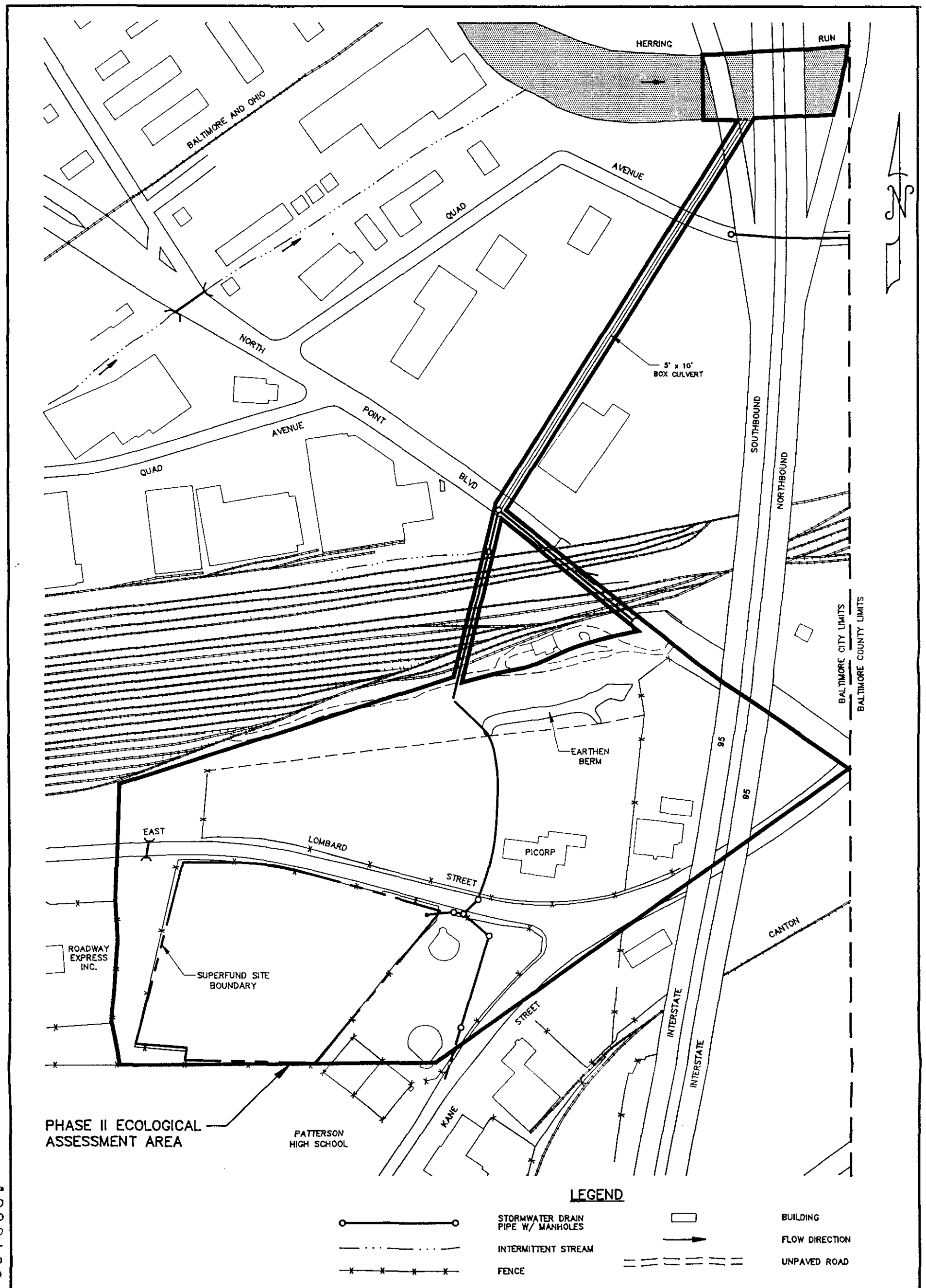
SITE LOCATION & PHASE II ENVIRONMENTAL ASSESSMENT AREA BOUNDARY MAP

FIGURE C-1

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED NO.
JSW	27654.3.4.2.1		S-BASE	3/14/95	



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PHASE II ECOLOGICAL ASSESSMENT AREA

KANE AND LOMBARD STREETS
BALTIMORE, MARYLAND

FIGURE
C-2

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
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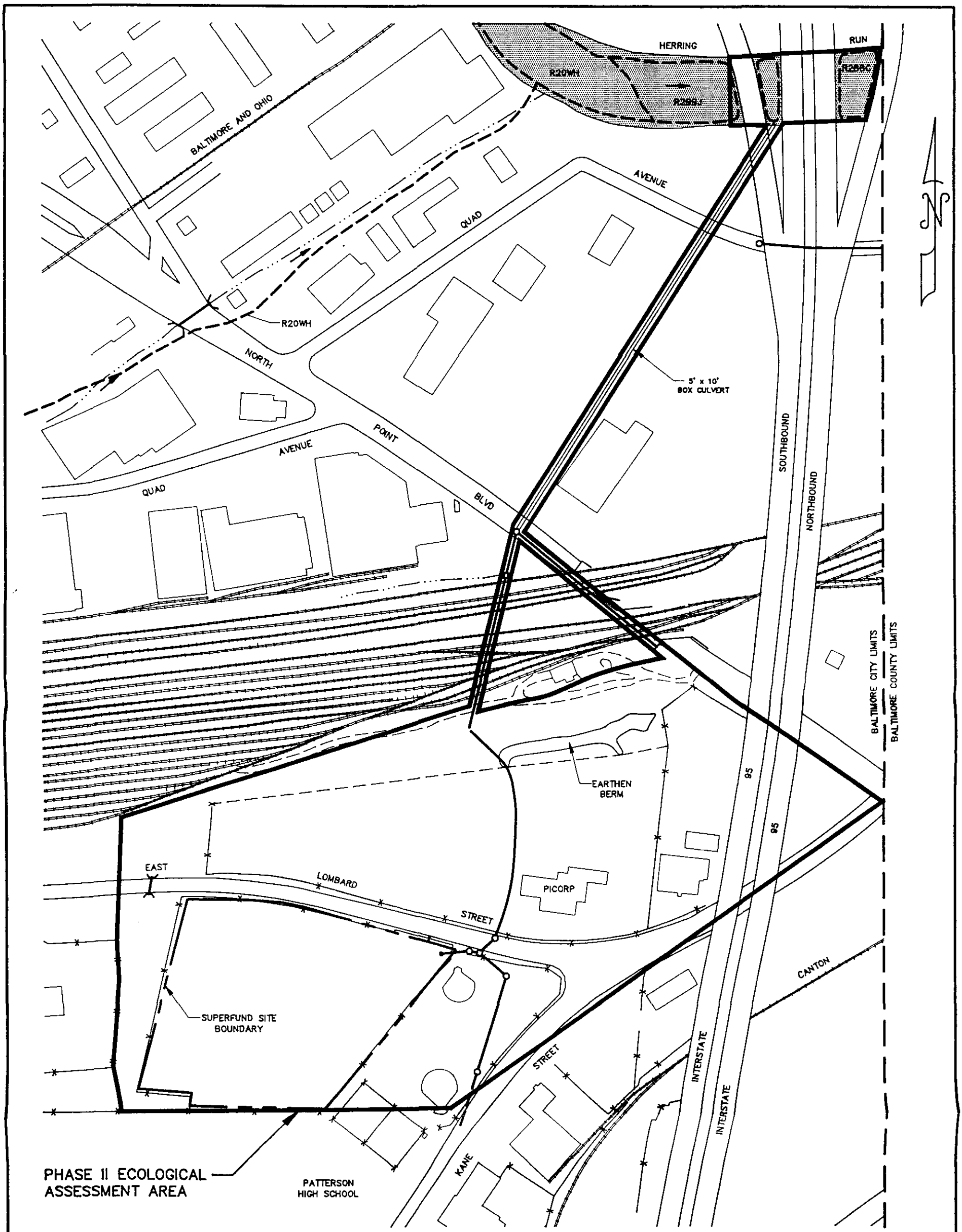
AR301831



NWI WETLANDS LEGEND

R2BBC	RIVERINE LOWER PERENNIAL BEACH/BAR INTERMITTENTLY FLOODED
R2BBJ	RIVERINE LOWER PERENNIAL BEACH/BAR INTERMITTENTLY SEASONAL
R20WH	RIVERINE LOWER PERENNIAL OPEN WATER PERMANENT

LEGEND

BUILDING	RAILROAD
INTERMITTENT STREAM	FENCE
UNPAVED ROAD	NWI DIVIDE AND DESIGNATION (E1OWL6)

SOURCE:
U.S. FISH AND WILDLIFE SERVICE NATIONAL WETLAND INVENTORY MAPPING; BALTIMORE EAST, MD.

0 300 600 FT.

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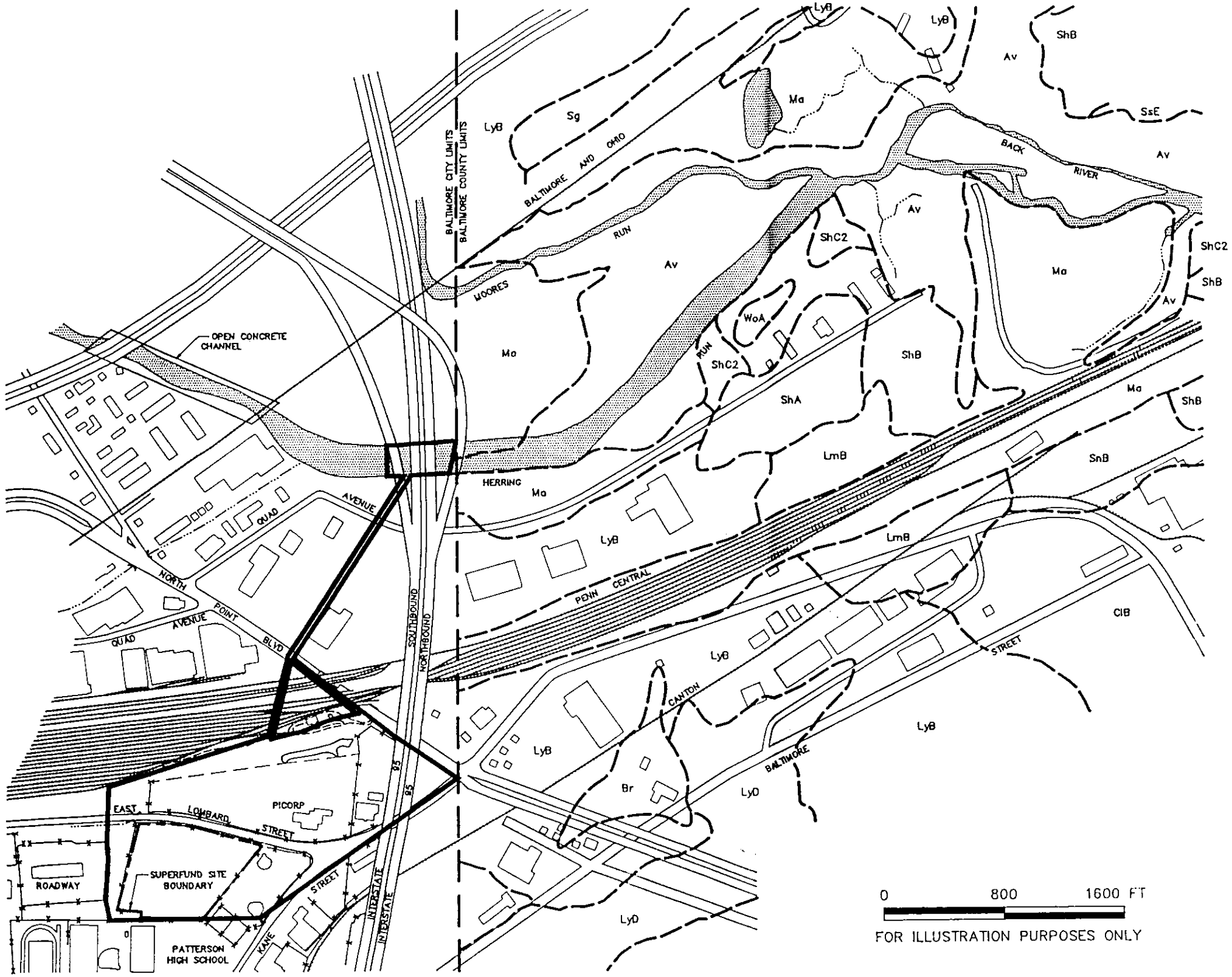
NWI WETLANDS MAP

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE C-3

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2NWI	3/8/95	



LEGEND

- BUILDING
- INTERMITTENT STREAM
- UNPAVED ROAD
- RAILROAD
- FENCE
- SURFACE WATER
- Ma — SOIL DIVIDE AND DESIGNATION

SOILS LEGEND

Av	ALLUVIAL LAND
Br	BARCLAY SILT LOAM
CIB	CHILLUM–URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES
LmB	LENOIR SILT LOAM, 0 TO 5 PERCENT SLOPES
LyB	LOAMY AND CLAYEY LAND, 0 TO 5 PERCENT SLOPES
LyD	LOAMY AND CLAYEY LAND, 5 TO 15 PERCENT SLOPES
Ma	MADE LAND
Sg	SAND AND GRAVEL PITS
ShA	SASSAFRAS SANDY LOAM, 0 TO 2 PERCENT SLOPES
ShB	SASSAFRAS SANDY LOAM, 2 TO 5 PERCENT SLOPES
ShC2	SASSAFRAS SANDY LOAM, 5 TO 10 PERCENT SLOPES, MODERATELY ERODED
SnB	SASSAFRAS–URBAN LAND COMPLEX, 0 TO 5 PERCENT SLOPES
SsE	SASSAFRAS AND JOPPA SOILS, 15 TO 30 PERCENT SLOPES
WoA	WOODSTOWN LOAM, 0 TO 2 PERCENT SLOPES

SOURCE SOIL CONSERVATION SERVICE SOIL SURVEY FOR BALTIMORE COUNTY.
SCS SOIL SURVEY MAPPING HAS NOT BEEN DONE FOR THE CITY OF BALTIMORE.

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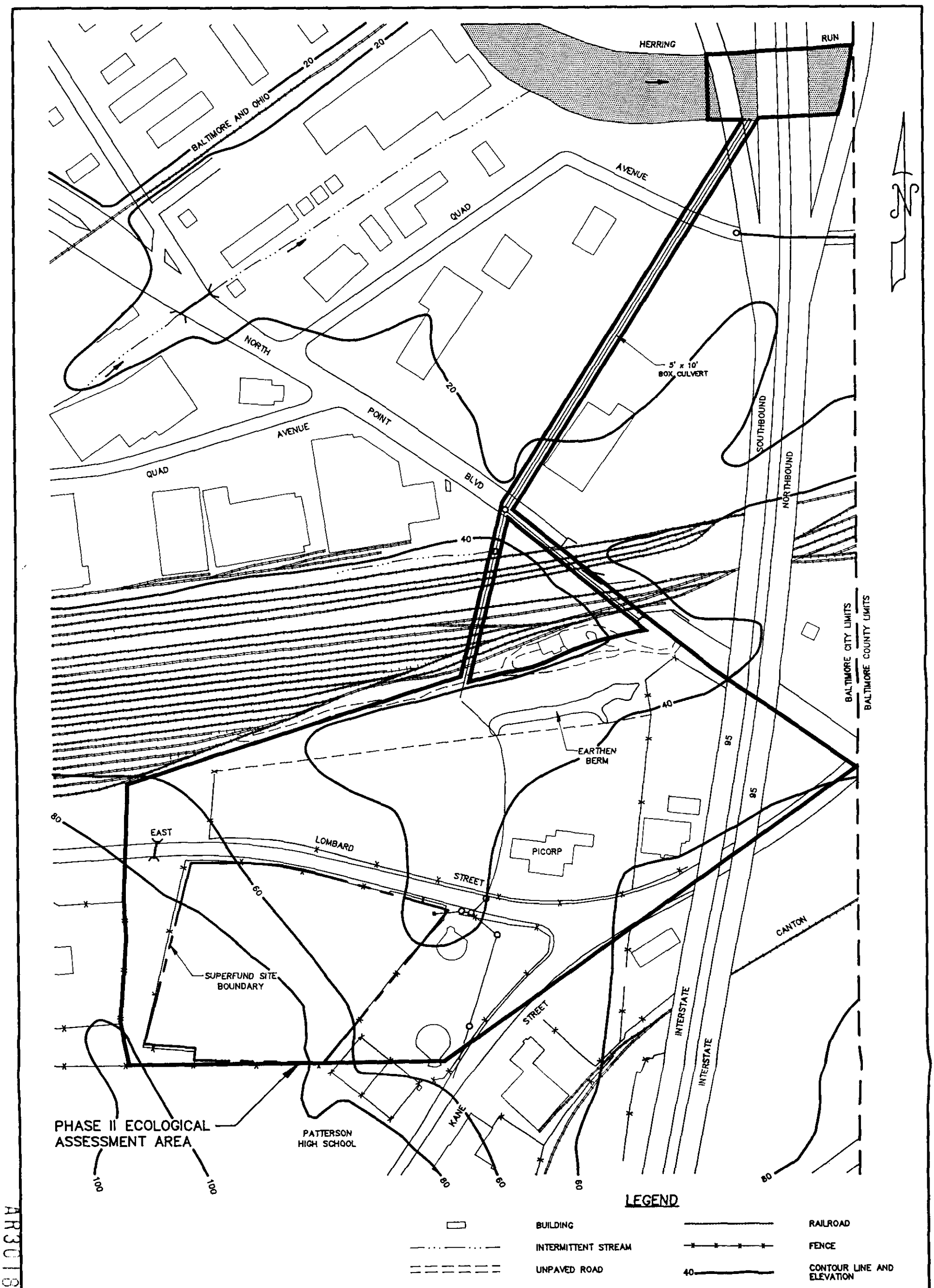
SOILS MAP

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE C-4

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.03.4.1		EAA2SOIL	3/14/95	

AR301833



SOURCE: USGS 7.5 MINUTE QUAD MAP, BALTIMORE EAST, MD, DATE 1974

0 300 600 FT.

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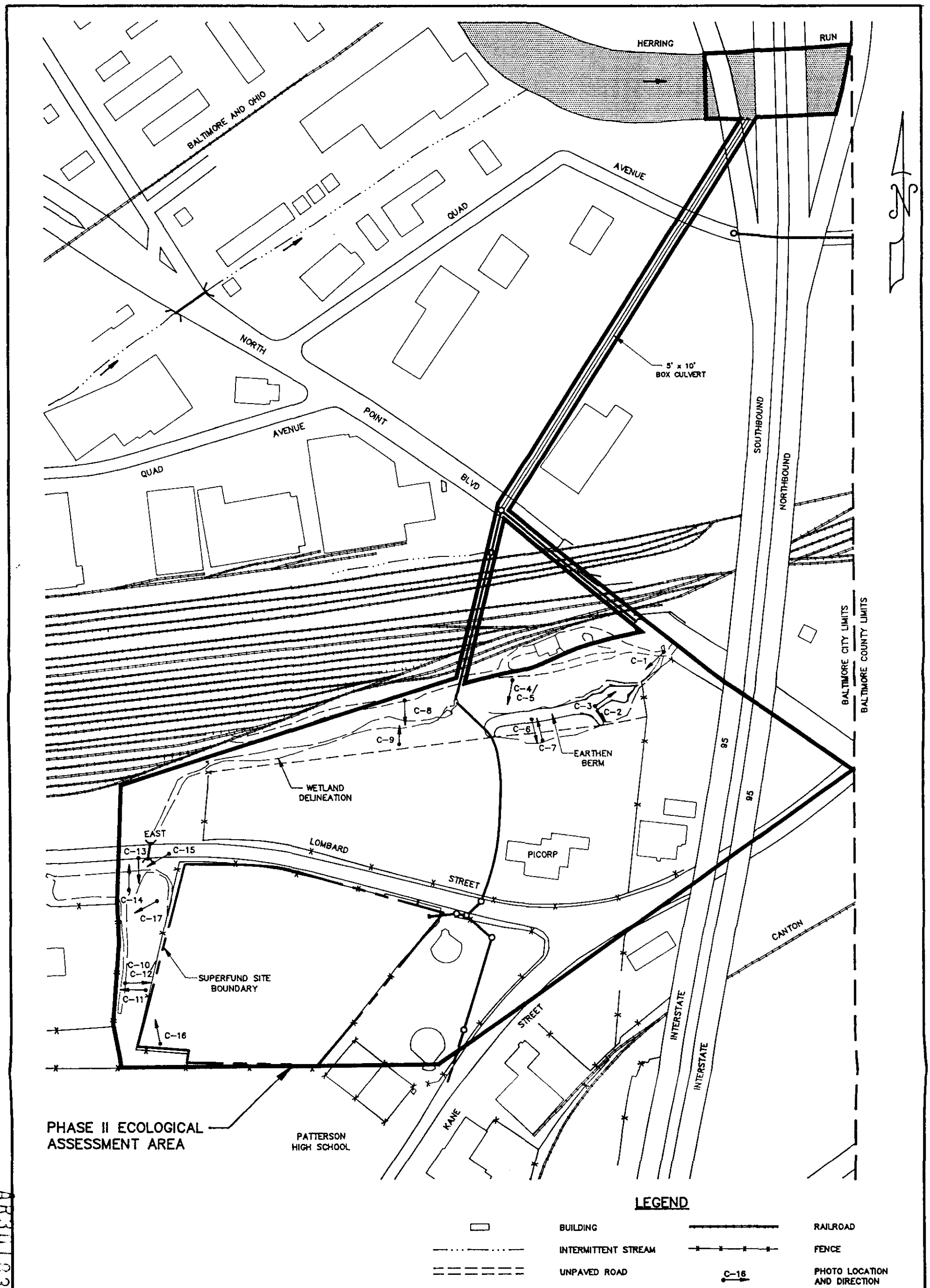
TOPOGRAPHIC MAP

KANE AND LOMBARD STREET
BALTIMORE, MARYLAND

FIGURE
C-5

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISED DATE
JSW	27654.3.4.2.1		EAA2TOPO	1/17/95	

AR301834



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WETLAND DELINEATION PHOTOGRAPH
LOCATIONS & DIRECTIONS

KANE AND LOMBARD STUDY AREA
BALTIMORE, MARYLAND

FIGURE
C-6

DRAWN	JOB NUMBER	APPROVED	FILE	DATE	REVISION NO.
JSW	27654.3.4.2.1		EAA2PH02	3/18/95	

AR301835

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UNSCANNABLE ITEM

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REPORT OR DOCUMENT TITLE Final Technical Memorandum, Phase II Baseline Ecological Assessment Summary of Results, Volume 1 of 3

DATE OF DOCUMENT 8/23/95

DESCRIPTION OF IMAGERY Oversized Map - Wetland Delineation

NUMBER AND TYPE OF IMAGERY ITEM(S) 1 Map

Appendix C

PHOTOGRAPH C-1

W9 Wetland on left, Upland on right

Photograph locations and directions of view shown on Figure C-6

AR301658

PHOTOGRAPH C-2

W21 Wetland

PHOTOGRAPH C-3

W21 Upland

Photograph locations and directions of view shown on Figure C-6

PHOTOGRAPH C-4

W44 Wetland

PHOTOGRAPH C-5

W44 Upland

Photograph locations and directions of view shown on Figure C-6.

PHOTOGRAPH C-6

W76 Wetland

PHOTOGRAPH C-7

W76 Upland

Photograph locations and directions of view shown on Figure C-6

PHOTOGRAPH C-8

W112 Wetland

PHOTOGRAPH C-9

W112 Upland

Photograph locations and directions of view shown on Figure C-6.

PHOTOGRAPH C-10

R5/R6 Wetland

PHOTOGRAPH C-11

R5 Upland

Photograph locations and directions of view shown on Figure C-6

PHOTOGRAPH C-12

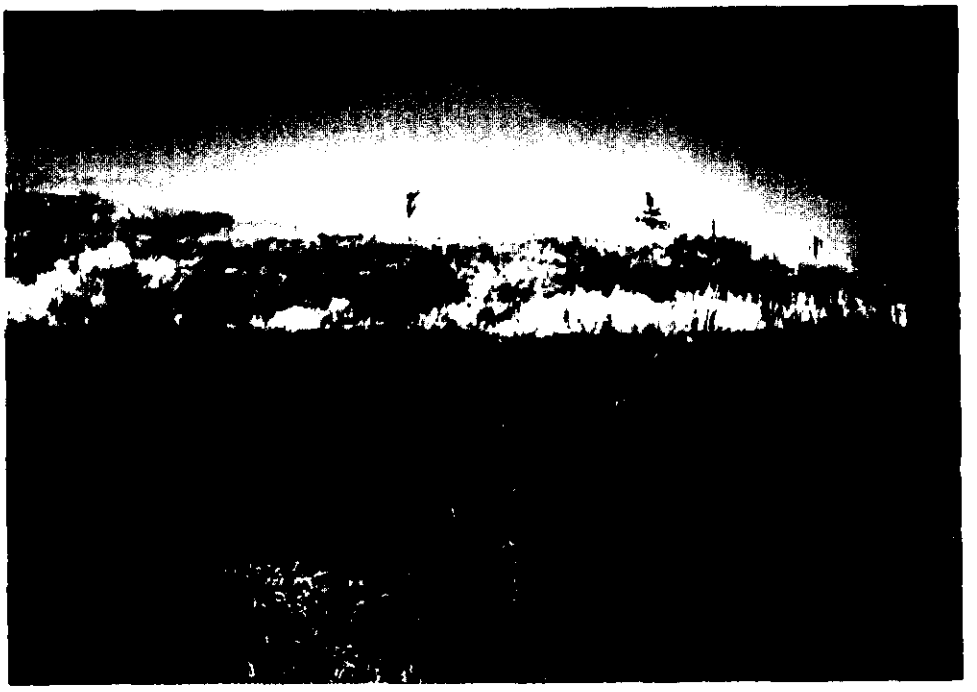
R6 Upland

PHOTOGRAPH C-13

R28 Wetland

AR301844

Photograph locations and directions of view shown on Figure C-6



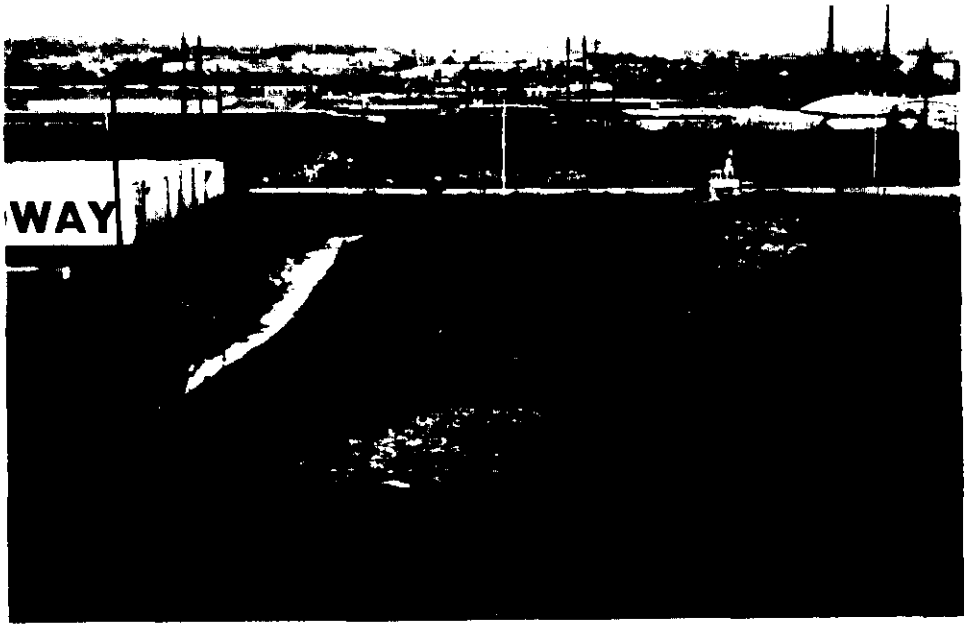
PHOTOGRAPH C-14

R28 Upland

PHOTOGRAPH C-15

Roadway Wetlands in July 1994

Photograph locations and directions of view shown on Figure C-6.



PHOTOGRAPH C-16

Roadway Wetlands on January 9, 1995

PHOTOGRAPH C-17

Roadway Wetlands on January 22, 1995

Photograph locations and directions of view shown on Figure C-6

Appendix C

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

...stigator(s): Alan J. Finio, Andrew J. Chartrand Date: 11/16/94
...Site: Kane & Lombard State: MD County: Baltimore City
...licant/Owner: _____ Plant Community #/Name: W9 Palustrine Emergent
...e: If a more detailed site description is necessary, use the back of data form or a field notebook.

...normal environmental conditions exist at the plant community?
... X No ____ (If no, explain on back)
...s the vegetation, soils, and/or hydrology been significantly disturbed?
... ____ No X (If yes, explain on back)

VEGETATION

...ominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
... Phragmites australis	FACW	H	11.		
2.			12.		
3.			13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
0.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 100%
Is the hydrophytic vegetation criterion met? Yes X No ____
Rationale: 100% FACW species

SOILS

Series/phase: Made land / Fill Subgroup:[2] _____
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes X No ____ Gleyed? Yes ____ No X
Matrix Color: 0-4" & 12-16" 10YR 4/2, 4-12" 10YR 4/1 Mottle Colors: 12-16" 2.5YR 4/4, 7.5 YR 4/0
Other hydric soil indicators: _____
Is the hydric soil criterion met? Yes X No ____
Rationale: Low croma with mottles

HYDROLOGY

Is the ground surface inundated? Yes X No ____ Surface water depth: _____
Is the soil saturated? Yes X No ____
Depth to free-standing water in pit/soil probe hole: _____
List other field evidence of surface inundation or soil saturation.
Distinct flow channel with standing water
Is the wetland hydrology criterion met? Yes X No ____
Rationale: Distinct flow channels and standing water present

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes X No ____
Rationale for jurisdictional decision: Vegetation, soils, and hydrology indicators

1 ...data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
2 Classification according to "Soil Taxonomy."

AR301848

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

Field Investigator(s): Alan J Finio, Andrew J Chartrand Date: 11/16/94
Project/Site: Kane & Lombard State: MD County: Baltimore City
Applicant/Owner: _____ Plant Community #/Name: Wa Upland Mixed Rangeland
Note: If a more detailed site description is necessary, use the back of data form or a field notebook.

Do normal environmental conditions exist at the plant community?
Yes X No ____ (If no, explain on back)
Has the vegetation, soils, and/or hydrology been significantly disturbed?
Yes ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Lonicera tatarica	FACU	S	11.		
2. Yucca filamentosa	—	H	12.		
3. Elaeagnus angustifolia	FACU	S	13.		
4. Liquidambar styraciflua	FAC	S	14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 5%
Is the hydrophytic vegetation criterion met? Yes ____ No X
Rationale: Only 5% species FAC, rest are upland species

SOILS

Series/phase: Made Land / Fill Subgroup:[2] _____
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes ____ No X Gleyed? Yes ____ No X
Matrix Color: 0-12" 5YR 5/6 Impenetrable below Mottle Colors: _____
Other hydric soil indicators: _____
Is the hydric soil criterion met? Yes ____ No X
Rationale: No hydric soil indicators

HYDROLOGY

Is the ground surface inundated? Yes ____ No X Surface water depth: _____
Is the soil saturated? Yes ____ No X
Depth to free-standing water in pit/soil probe hole: None
List other field evidence of surface inundation or soil saturation.

Is the wetland hydrology criterion met? Yes ____ No X
Rationale: Top of hillside with drainage down into intermittent stream channel

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes ____ No X
Rationale for jurisdictional decision: Does not meet criteria of hydric indicators

[1] This data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
[2] Classification according to "Soil Taxonomy."

AR301849

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

...stigator(s): Alan J. Finio, Andrew J. Chartrand Date: 11/16/94
...ite: Kane & Lombard State: MD County: Baltimore City
...ilicant/Owner: _____ Plant Community #/Name: W21 Palustrine Emergent
...e: If a more detailed site description is necessary, use the back of data form or a field notebook.

normal environmental conditions exist at the plant community?
...s X No ____ (If no, explain on back)
...s the vegetation, soils, and/or hydrology been significantly disturbed?
...s ____ No X (If yes, explain on back)

VEGETATION

...ominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Phragmites australis	FACW	H	11.		
2. Viburnum dentatum	FAC	S	12.		
3.			13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
0.			20.		

...ercent of dominant species that are OBL, FACW, and/or FAC 95%
...s the hydrophytic vegetation criterion met? Yes X No ____
Rationale: 95% FACW species. Viburnum dentatum only covered 5%

SOILS

Series/phase: Made land / Fill Subgroup:[2] _____
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes X No ____ Gleyed? Yes ____ No X
Matrix Color: 0-12" 7.5YR 4/2 12-18" 10YR 5/2 Mottle Colors: 5YR 5/8, 5YR 6/6, 10YR 6/6, 7.5YR 5/8
Other hydric soil indicators: _____
Is the hydric soil criterion met? Yes X No ____
Rationale: Low croma with mottles

HYDROLOGY

Is the ground surface inundated? Yes X No ____ Surface water depth: _____
Is the soil saturated? Yes X No ____
Depth to free-standing water in pit/soil probe hole: _____
List other field evidence of surface inundation or soil saturation.
Standing water at surface
Is the wetland hydrology criterion met? Yes X No ____
Rationale: Standing water present

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes X No ____
Rationale for jurisdictional decision: Vegetation, soils, and hydrology indicators

1 ... data form can be used for the Hydric Soil Assessment Procedure and the Plant Community ...essment Procedure.
2 Classification according to "Soil Taxonomy."

AR30 850

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

Field Investigator(s): Alan J. Finio, Andrew J. Chartrand Date: 11/16/94
Project/Site: Kane & Lombard State: MD County: Baltimore City
Applicant/Owner: Plant Community #/Name: W21 Upland Mixed Rangeland
Note: If a more detailed site description is necessary, use the back of data form or a field notebook.

Do normal environmental conditions exist at the plant community?
Yes X No ____ (If no, explain on back)
Has the vegetation, soils, and/or hydrology been significantly disturbed?
Yes ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Populus grandidentata	FACU-	O	11.		
2. Prunus serotina	FACU	O	12.		
3. Elaeagnus angustifolia	FACU	O	13.		
4. Rubus alleghaniensis	FACU-	H	14.		
5. Lonicera tatarica	FACU	H	15.		
6. Allium canadense	FACU	H	16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 0
Is the hydrophytic vegetation criterion met? Yes ____ No X
Rationale: No wetland vegetation indicators

SOILS

Series/phase: Made land / Fill Subgroup:[2]
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes ____ No X Gleyed? Yes ____ No X
Matrix Color: 0-6" 10YR 3/2, 6-12" 7.5YR 5/6 Mottle Colors: None
Other hydric soil indicators: Could not penetrate below 12"
Is the hydric soil criterion met? Yes ____ No X
Rationale: No wetland soil indicators

HYDROLOGY

Is the ground surface inundated? Yes ____ No X Surface water depth: ____
Is the soil saturated? Yes ____ No X
Depth to free-standing water in pit/soil probe hole: None
List other field evidence of surface inundation or soil saturation.
None
Is the wetland hydrology criterion met? Yes ____ No X
Rationale: No hydrology indicators

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes ____ No X
Rationale for jurisdictional decision: No wetland vegetation, soils, or hydrology indicators

[1] This data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
[2] Classification according to "Soil Taxonomy."

AR301851

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

...stigator(s): Alan J. Finio, Andrew J. Chartrand Date: 11/17/94
...te: Kane & Lombard State: MD County: Baltimore City
...licant/Owner: _____ Plant Community #/Name: W44 Riverine Intermittent Streambed
...e: If a more detailed site description is necessary, use the back of data form or a field notebook.

normal environmental conditions exist at the plant community?
... X No ____ (If no, explain on back)
...s the vegetation, soils, and/or hydrology been significantly disturbed?
... ____ No X (If yes, explain on back)

VEGETATION

...ominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
... Acer saccharinum	FACW	O	11.		
... Vitis riparia	FACW	O	12.		
... Eupatorium perfoliatum	FACW+	H	13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
0.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 100%
Is the hydrophytic vegetation criterion met? Yes X No ____
Rationale: 100% Species FACW or FACW+

SOILS

Series/phase: Made land / Fill Subgroup:[2] _____
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes X No ____ Gleyed? Yes ____ No X
Matrix Color: 0-4" 5YR 3/1, 4-12" 5YR 3/2, 12-18" 10YR 3/2 Mottle Colors: 5YR 4/4, 10YR 4/6
Other hydric soil indicators: _____
Is the hydric soil criterion met? Yes X No ____
Rationale: Low croma with mottles

HYDROLOGY

Is the ground surface inundated? Yes ____ No X Surface water depth: _____
Is the soil saturated? Yes X No ____
Depth to free-standing water in pit/soil probe hole: _____
List other field evidence of surface inundation or soil saturation.
Drainage depression, multiple tree trunks, water-stained leaves, buttressed tree trunks
Is the wetland hydrology criterion met? Yes X No ____
Rationale: Distinct drainage depression and saturated soil

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes X No ____
Rationale for jurisdictional decision: Vegetation, soils, and hydrology indicators

1 ... data form can be used for the Hydric Soil Assessment Procedure and the Plant Community ...essment Procedure.
2 Classification according to "Soil Taxonomy."

AR301852

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

Field Investigator(s): Alan J. Finio, Andrew J. Chartrand Date: 11/17/94
Project/Site: Kane & Lombard State: MD County: Baltimore City
Applicant/Owner: Plant Community #/Name: W44 Upland
Note: If a more detailed site description is necessary, use the back of data form or a field notebook.

Do normal environmental conditions exist at the plant community?
Yes X No ____ (If no, explain on back)
Has the vegetation, soils, and/or hydrology been significantly disturbed?
Yes ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. No vegetation			11.		
2.			12.		
3.			13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 0
Is the hydrophytic vegetation criterion met? Yes ____ No X
Rationale: No vegetation because upland area associated with Conrail yard

SOILS

Series/phase: Made Land/Fill Subgroup:[2]
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes X No ____ Gleyed? Yes ____ No X
Matrix Color: 0-4" 10YR 3/2, 4-18" 10YR 6/6 Mottle Colors: None
Other hydric soil indicators:
Is the hydric soil criterion met? Yes ____ No X
Rationale: No indicators present

HYDROLOGY

Is the ground surface inundated? Yes ____ No X Surface water depth:
Is the soil saturated? Yes ____ No X
Depth to free-standing water in pit/soil probe hole: None
List other field evidence of surface inundation or soil saturation.
None
Is the wetland hydrology criterion met? Yes ____ No X
Rationale: No wetland hydrology indicators

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes ____ No X
Rationale for jurisdictional decision:

[1] This data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
[2] Classification according to "Soil Taxonomy."

AR301853

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

...estigator(s): Alan J. Finio, Andrew J. Chartrand Date: 11/17/94
...site: Kane & Lombard State: MD County: Baltimore City
...plicant/Owner: _____ Plant Community #/Name: W76 Riverine Intermittent Streambed
...te: If a more detailed site description is necessary, use the back of data form or a field notebook.

...normal environmental conditions exist at the plant community?
...s X No ____ (If no, explain on back)
...s the vegetation, soils, and/or hydrology been significantly disturbed?
...s ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Phragmites australis	FACW	H	11.		
2. Typha ~~[illegible]~~ angustifolia	OBL	H	12.		
3.			13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 100 %
Is the hydrophytic vegetation criterion met? Yes X No ____
Rationale: 100% species OBL or FACW

SOILS

Series/phase: Made land / Fill Subgroup:[2] _____
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes ____ No X Gleyed? Yes X No ____
Matrix Color: 0-4" Organic, 4-18" 5Y4/1 Mottle Colors: _____
Other hydric soil indicators: _____
Is the hydric soil criterion met? Yes X No ____
Rationale: Low chroma and gleying

HYDROLOGY

Is the ground surface inundated? Yes ____ No X Surface water depth: _____
Is the soil saturated? Yes X No ____
Depth to free-standing water in pit/soil probe hole: 6 inches
List other field evidence of surface inundation or soil saturation.
Drainage channels seen
Is the wetland hydrology criterion met? Yes X No ____
Rationale: Drainage channels and water present near surface

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes X No ____
Rationale for jurisdictional decision: Vegetation, soil, and hydrology indicators

1 ...data form can be used for the Hydric Soil Assessment Procedure and the Plant Community ...sessment Procedure.
2 Classification according to "Soil Taxonomy."

AR301854

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

Field Investigator(s): Alan J. Finio, Andrew J. Chiarrand Date: 11/17/94
Project/Site: Kane & Lombard State: MD County: Baltimore City
Applicant/Owner: Plant Community #/Name: W76 Upland Herbaceous Rangeland
Note: If a more detailed site description is necessary, use the back of data form or a field notebook.

Do normal environmental conditions exist at the plant community?
Yes X No ____ (If no, explain on back)
Has the vegetation, soils, and/or hydrology been significantly disturbed?
Yes ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Solidago spp.	—	H	11.		
2. Lonicera tatarica	FACU	S	12.		
3. Rhus copallina	NI	S	13.		
4. Allium canadense	FACU	H	14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 0
Is the hydrophytic vegetation criterion met? Yes ____ No X
Rationale: No wetland vegetation indicators

SOILS

Series/phase: Made land / Fill Subgroup:[2]
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined ____
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes ____ No X Gleyed? Yes ____ No X
Matrix Color: 0-6" 10YR 3/3, 6-8" 5YR 5/8, 8-18" 10YR 5/4 Mottle Colors: None
Other hydric soil indicators: None
Is the hydric soil criterion met? Yes ____ No X
Rationale: No wetland soil indicators

HYDROLOGY

Is the ground surface inundated? Yes ____ No X Surface water depth: ____
Is the soil saturated? Yes ____ No X
Depth to free-standing water in pit/soil probe hole: ____
List other field evidence of surface inundation or soil saturation.
None
Is the wetland hydrology criterion met? Yes ____ No X
Rationale: No wetland hydrology indicators

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes ____ No X
Rationale for jurisdictional decision: No indicators for vegetation, soils, or hydrology

[1] This data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
[2] Classification according to "Soil Taxonomy."

AR301055

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

e' 'estigator(s): Alan J. Finio, Andrew J. Chartrand Date: 12/1/94
ro) Site: Kane & Lombard State: MD County: Baltimore City
pplicant/Owner: _____ Plant Community #/Name: W112 Riverine Intermittent Streambed
'ote: If a more detailed site description is necessary, use the back of data form or a field notebook.

o normal environmental conditions exist at the plant community?
es X No ____ (If no, explain on back)
las the vegetation, soils, and/or hydrology been significantly disturbed?
'es ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Phragmites australis	FACW	H	11.		
2.			12.		
3.			13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 100%
Is the hydrophytic vegetation criterion met? Yes X No ____
Rationale: 100% species present are FACW

SOILS

Series/phase: Made land / Fill Subgroup:[2] _____
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes ____ No X Gleyed? Yes ____ No X
Matrix Color: 0-4" 10YR 3/2, 4-18" 2.5YR 4/6 Mottle Colors: _____
Other hydric soil indicators: Clay from 4-18"
Is the hydric soil criterion met? Yes X No ____
Rationale: Low chroma with clay layer to hold water

HYDROLOGY

Is the ground surface inundated? Yes ____ No X Surface water depth: _____
Is the soil saturated? Yes X No ____
Depth to free-standing water in pit/soil probe hole: 4 inches
List other field evidence of surface inundation or soil saturation.
Distinct drainage channel. Deep silt deposition on surface. Distinct silt line in channel.
Is the wetland hydrology criterion met? Yes X No ____
Rationale: Drainage channel distinct. Silt line deposition. Water present at 4 inches

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes X No ____
Rationale for jurisdictional decision: Wetland vegetation, soil, and hydrology indicators present

[1] data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
[2] Classification according to "Soil Taxonomy."

AR301856

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

eld Investigator(s): Alan J. Finio, Andrew J. Chartraid Date: 12/1/94
oject/Site: Kane & Lombard State: MD County: Baltimore City
pplicant/Owner: Plant Community #/Name: W112 Upland Herbaceous Rangeland
ote: If a more detailed site description is necessary, use the back of data form or a field notebook.

o normal environmental conditions exist at the plant community?
s X No ____ (If no, explain on back)
s the vegetation, soils, and/or hydrology been significantly disturbed?
es ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Ailanthus altissima	FACU	S	11.		
2. Phytolacca americana	FACU+	H	12.		
3. Eupatorium perfoliatum	FACW+	H	13.		
4. Calluna vulgaris	FAC	H	14.		
5. Lolium perenne	—	H	15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC ____
Is the hydrophytic vegetation criterion met? Yes ____ No X
Rationale: Most of this area was barren, but the area covered by the FACW and FAC species was small.

SOILS

Series/phase: Made land / Fill Subgroup:[2]
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes ____ No X Gleyed? Yes ____ No X
Matrix Color: None Mottle Colors: None
Other hydric soil indicators:
Is the hydric soil criterion met? Yes ____ No X
Rationale: Impenetrable gravel fill associated with Railroad yard

HYDROLOGY

Is the ground surface inundated? Yes ____ No X Surface water depth:
Is the soil saturated? Yes ____ No X
Depth to free-standing water in pit/soil probe hole: None
List other field evidence of surface inundation or soil saturation.
Sloping hillside from RR yard
Is the wetland hydrology criterion met? Yes ____ No X
Rationale: No hydrology indicators for wetlands

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes ____ No X
Rationale for jurisdictional decision: Does not meet wetland vegetation, soil, or hydrology criteria

[1] This data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
[2] Classification according to "Soil Taxonomy."

AR301857

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

ai 'estigator(s): Alan J. Finio, Andrew J. Chartrand Date: 12/1/94
o; Site: Kane & Lombard State: MD County: Baltimore City
pplicant/Owner: Plant Community #/Name: R5/R6 Palustrine Emergent
ote: If a more detailed site description is necessary, use the back of data form or a field notebook.

o normal environmental conditions exist at the plant community?
es X No ____ (If no, explain on back)
las the vegetation, soils, and/or hydrology been significantly disturbed?
'es ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Salix nigra	FACW+	O	11.		
2. Typha latifolia	OBL	H	12.		
3. Phragmites australis	FACW	H	13.		
4. Rubus allegheniensis	FACU-	H	14.		
5. Carex spp.	—	H	15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 90%
Is the hydrophytic vegetation criterion met? Yes X No ____
Rationale: 90% OBL or FACW

SOILS

Series/phase: Made land/Fill Subgroup:[2]
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes X No ____ Gleyed? Yes ____ No ____
Matrix Color: 0-6" Organic, 6-12" 10YR 4/2 Mottle Colors: 10YR 5/8, 7.5YR 3/0
Other hydric soil indicators: 6-12" silty clay
Is the hydric soil criterion met? Yes X No ____
Rationale: Low croma with mottles

HYDROLOGY

Is the ground surface inundated? Yes X No ____ Surface water depth: 4 inches
Is the soil saturated? Yes X No ____
Depth to free-standing water in pit/soil probe hole: ____
List other field evidence of surface inundation or soil saturation.
Bottom of deep swale
Is the wetland hydrology criterion met? Yes X No ____
Rationale: Soils saturated

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes X No ____
Rationale for jurisdictional decision: Vegetation, soil, and hydrology wetland indicators

1 data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
2 Classification according to "Soil Taxonomy."

AR301858

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

Field Investigator(s): Alan J. Finio, Andrew J. Churtrand Date: 12/1/94
Project/Site: Kane & Lombard State: MD County: Baltimore City
Applicant/Owner: _____ Plant Community #/Name: R5 Upland Herb/Grass Rangeland
Note: If a more detailed site description is necessary, use the back of data form or a field notebook.

Do normal environmental conditions exist at the plant community?
Yes X No _____ (If no, explain on back)
Has the vegetation, soils, and/or hydrology been significantly disturbed?
Yes _____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Vicia spp.	—	H	11.		
2. Rosa multiflora	FACU	S	12.		
3.			13.		
4.			14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 0
Is the hydrophytic vegetation criterion met? Yes _____ No X
Rationale: Only FACU species

SOILS

Series/phase: Made land / Fill Subgroup:[2]
Is the soil on the hydric soils list? Yes _____ No _____ Undetermined X
Is the soil a Histosol? Yes _____ No X Histic epipedon present? Yes _____ No X
Is the soil: Mottled? Yes X No _____ Gleyed? Yes _____ No X
Matrix Color: 0-3" Organic, 3-12" 2.5YR 5/6, 12-18" 10YR 5/4 Mottle Colors: 2.5YR 6/0, 2.5YR 4/3, 2.5YR 4/8
Other hydric soil indicators: _____
Is the hydric soil criterion met? Yes _____ No _____
Rationale: _____

HYDROLOGY

Is the ground surface inundated? Yes _____ No X Surface water depth: _____
Is the soil saturated? Yes _____ No X
Depth to free-standing water in pit/soil probe hole: None
List other field evidence of surface inundation or soil saturation.

Is the wetland hydrology criterion met? Yes _____ No X
Rationale: Top of slope with drainage down to bottom

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes _____ No X
Rationale for jurisdictional decision: _____

This data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
Classification according to "Soil Taxonomy."

AR301859

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

ie' 'estigator(s): Alan J. Finio, Andrew J. Chartrand Date: 12/1/94
ro, Site: Kane & Lombard State: MD County: Baltimore City
pplicant/Owner: Plant Community #/Name: R6 Upland Herbaceous Rangeland
'ote: If a more detailed site description is necessary, use the back of data form or a field notebook.

'o normal environmental conditions exist at the plant community?
'es X No ____ (If no, explain on back)
las the vegetation, soils, and/or hydrology been significantly disturbed?
'es ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Rhus copallina	NI	S	11.		
2. Prunus serotina	FACU	S	12.		
3. Vicia spp.	—	H	13.		
4. Solidago spp.	—	H	14.		
5. Panicum virgatum	FAC	H	15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 5%
Is the hydrophytic vegetation criterion met? Yes ____ No X
Rationale: Only 5% FAC species

SOILS

Series/phase: Made land / Fill Subgroup:[2]
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes X No ____ Gleyed? Yes ____ No X
Matrix Color: 0-3" Organic, 3-7" 2.5YR 4/8, 7-10" 10YR 6/8, 10-14" 2.5YR 6/6, 2.5YR 4/4, 14-18" 10R 4/6 Mottle Colors: 10YR 4/4, 10YR 8/1, 10YR 6/8, 2.5YR 6/0
Other hydric soil indicators:
Is the hydric soil criterion met? Yes ____ No X
Rationale: Had mottles but did not have low chroma

HYDROLOGY

Is the ground surface inundated? Yes ____ No X Surface water depth:
Is the soil saturated? Yes ____ No X
Depth to free-standing water in pit/soil probe hole:
List other field evidence of surface inundation or soil saturation.
None
Is the wetland hydrology criterion met? Yes ____ No X
Rationale: No wetland hydrological indicators

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes ____ No X
Rationale for jurisdictional decision: Does not

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1 data form can be used for the Hydric Soil Assessment Procedure and the Plant Community sessment Procedure.
2 Classification according to "Soil Taxonomy."

AR301860

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

Field Investigator(s): Alan J. Finio, Andrew J. Chartrand Date: 12/1/94
Project/Site: Kane & Lombard State: MD County: Baltimore City
Applicant/Owner: _____ Plant Community #/Name: R28 Palustrine Emergent
Note: If a more detailed site description is necessary, use the back of data form or a field notebook.

Do normal environmental conditions exist at the plant community?
Yes X No ____ (If no, explain on back)
Has the vegetation, soils, and/or hydrology been significantly disturbed?
Yes ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Typha latifolia	OBL	H	11.		
2. Carex spp.	—	H	12.		
3. Solidago spp.	—	H	13.		
4. Trifolium spp.	—	H	14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 95%
Is the hydrophytic vegetation criterion met? Yes X No ____
Rationale: Typha latifolia covered 95% and is OBL

SOILS

Series/phase: Made land / Fill Subgroup:[2] _____
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes X No ____ Gleyed? Yes ____ No X
Matrix Color: 0-3" 2.5YR 2/0, 3-14" 10R 3/4 Mottle Colors: 2.5YR 6/0, 2.5YR 6/0, 10YR 5/4
Other hydric soil indicators: Silty clay below 3"
Is the hydric soil criterion met? Yes X No ____
Rationale: Low croma with mottles. Bottom of hillside receiving runoff.

HYDROLOGY

Is the ground surface inundated? Yes X No ____ Surface water depth: 4 inches
Is the soil saturated? Yes X No ____
Depth to free-standing water in pit/soil probe hole: _____
List other field evidence of surface inundation or soil saturation.
Drainage depressions. Standing water. Bottom of hillside receiving runoff
Is the wetland hydrology criterion met? Yes X No ____
Rationale: Standing water. Soil saturated

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes X No ____
Rationale for jurisdictional decision: Wetland soil, hydrology, and vegetation indicators present

[1] This data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
[2] Classification according to "Soil Taxonomy."

AR301861

DATA FORM
ROUTINE ONSITE DETERMINATION METHOD[1]

Investigator(s): Alan J. Finio, Andrew J. Chartrand Date: 12/1/94
Site: Kane & Lombard State: MD County: Baltimore City
Applicant/Owner: Plant Community #/Name: R28 Upland Herbaceous Rangeland
Note: If a more detailed site description is necessary, use the back of data form or a field notebook.

Are normal environmental conditions exist at the plant community?
Yes X No ____ (If no, explain on back)
Has the vegetation, soils, and/or hydrology been significantly disturbed?
Yes ____ No X (If yes, explain on back)

VEGETATION

Dominant Plant Species	Indicator Status	Stratum	Dominant Plant Species	Indicator Status	Stratum
1. Vicia spp.	—	H	11.		
2. Rubus allegheniensis	FACU-	H	12.		
3. Rhus copallina	NI	H	13.		
4. Inula helenium	—	H	14.		
5.			15.		
6.			16.		
7.			17.		
8.			18.		
9.			19.		
10.			20.		

Percent of dominant species that are OBL, FACW, and/or FAC 0
Is the hydrophytic vegetation criterion met? Yes ____ No X
Rationale: No species listed as OBL, FACW, or FAC

SOILS

Series/phase: Made land / Fill Subgroup:[2]
Is the soil on the hydric soils list? Yes ____ No ____ Undetermined X
Is the soil a Histosol? Yes ____ No X Histic epipedon present? Yes ____ No X
Is the soil: Mottled? Yes ____ No X Gleyed? Yes ____ No X
Matrix Color: 0-4" Organic, 4-9" 10R 4/6 Mottle Colors: —
Other hydric soil indicators: No penetration below 9"
Is the hydric soil criterion met? Yes ____ No X
Rationale: No wetland soil indicators

HYDROLOGY

Is the ground surface inundated? Yes ____ No X Surface water depth: ____
Is the soil saturated? Yes ____ No X
Depth to free-standing water in pit/soil probe hole: None
List other field evidence of surface inundation or soil saturation.

Is the wetland hydrology criterion met? Yes ____ No X
Rationale: No wetland hydrology indicators. Top of slope adjacent to Lombard Street

JURISDICTIONAL DETERMINATION AND RATIONALE

Is the plant community a wetland? Yes ____ No X
Rationale for jurisdictional decision: No wetland vegetation, soils, or hydrology indicators

1 - This data form can be used for the Hydric Soil Assessment Procedure and the Plant Community Assessment Procedure.
2 Classification according to "Soil Taxonomy."

AR301862

APPENDIX D

STATE AND FEDERAL LISTS OF RARE, THREATENED, AND ENDANGERED PLANTS AND ANIMALS

RECEIVED JUL 11 1994

William Donald Schaefer
Governor

Maryland Department of Natural Resources
Tawes State Office Building
Fish, Heritage and Wildlife Administration
580 Taylor Avenue
Annapolis, Maryland 21401

Torrey C. Brown, M.D.
Secretary

July 6, 1994

Ms. Lynnice L. Hockaday
HARDING LAWSON ASSOCIATES
131 North Third Street
Philadelphia, PA 19106-1903

RE: Eastern Portion of Baltimore City and Baltimore County, North Point Blvd, Kane and Lombard Superfund Site, Baltimore County

Dear Ms. Hockaday:

This is in regards to the above referenced project. The Fish, Heritage and Wildlife Administration has no records for Federal or State rare, threatened or endangered plants or animals within this project site. This statement should not be interpreted as meaning that no rare, threatened or endangered species are present. Such species could be present but have not yet been documented because an adequate survey has not been conducted or because survey results have not been reported to us.

Sincerely,

Janet McKegg

Janet McKegg, Director
Natural Heritage Program

JM:db

cc: Cynthia Sibrel
Robert Miller
ER#94655.BA

Telephone: (410) 974-2870
DNR TTY for the Deaf: 301-974-3683

RARE, THREATENED AND ENDANGERED PLANTS of Maryland

Maryland Department of Natural Resources, Forest, Park and Wildlife Service

RARE, THREATENED, AND ENDANGERED PLANTS OF MARYLAND

February 1, 1991

Prepared by

Maryland Natural Heritage Program
Resource Conservation Service
Department of Natural Resources
Tawes State Office Building
Annapolis, MD 21401
(410) 974-2870

INTRODUCTION

The following list identifies those native plants of Maryland which are among the rarest and most in need of conservation. It has been compiled by the biologists of the Maryland Natural Heritage Program as part of an effort begun in 1979 to identify and protect rare and endangered species, the best remaining examples of rare species habitats, and significant natural areas throughout the State. The original version of this list is included in the Maryland Department of Natural Resources' 1984 publication Threatened and Endangered Plants and Animals of Maryland, which also contains detailed information on the known distribution and status of Maryland's rare species at that time.

Between 1984 and 1987, our knowledge of Maryland's flora steadily grew. Through extensive field work, staff biologists located species which were previously unrecorded for the State and discovered that some species were more scarce than previously known. Similarly, some species were determined to be either more widespread or less vulnerable to ecological disturbances than previously believed. Thus, some species were added to the list and some were downgraded in rarity status or even removed from the list.

In 1987, the list of species protected under Maryland's Nongame and Endangered Species Conservation Act, the Threatened and Endangered Species list, was revised to include a total of 267 plants, as well as 76 animals. Most of these species occur in the Chesapeake Bay region, and they were added to the list in conjunction with the Chesapeake Bay Critical Area legislation. In December of 1990, the Threatened and Endangered Species list was revised again to include species which inhabit Central and Western Maryland. Thus, a total of 497 plants and 121 animals are currently protected by State law.

However, Natural Heritage Program biologists are concerned with many more species than those included on the State's Threatened and Endangered Species list. Some of these species are potential candidates for listing and usually require further investigation into their rarity and endangerment status. Others are thought to be secure at present, but are worthy of attention because of limited distributions, declining populations, or ecological vulnerabilities. In order to track the status of these potential candidates and other declining species, the Natural Heritage Program maintains a list of these species in addition to the Threatened and Endangered Species list. As our knowledge of Maryland's vertebrates and invertebrates continues to grow, both the Threatened and Endangered Species list and the "unofficial" Natural Heritage Program list will periodically require revision.

ABOUT THIS LIST

The list of Maryland's rare, threatened, and endangered plants is arranged alphabetically by scientific name. The nomenclature generally follows the 1982 U.S. Soil Conservation Service publication, "National List of Scientific Plant Names." An appendix provides a cross-reference to synonyms found in Fernald's Gray's Manual of Botany, 8th Edition (1950).

The Natural Heritage Program seeks to perpetuate rare native species in Maryland by maintaining populations of these species in their natural habitat. The rarity determination of species

is based upon the status of naturally occurring populations. For example, Kentucky coffee-tree (Gymnocladus dioicus) is occasionally planted as a specimen tree and may be found around abandoned homesteads. This species is considered "Highly Rare" because only two native and naturally occurring trees are known from Maryland.

Two columns under the heading STATUS are printed to the right of each name. The first column (STATE) is the species' status in Maryland as determined by the Department of Natural Resources. If the species is included on the Department's Threatened and Endangered Species list (COMAR 08.03.08), its official status is given. If the species does not appear on the official list, its unofficial status as determined by the Department's Natural Heritage Program is given. Species in the latter category may be candidates for State-listing. The codes in the second column (US) refer to the national status of each species of concern to the U.S. Fish and Wildlife Service. Definitions of the State and Federal status categories are provided below.

Explanation of Status Categories

State
Status as determined by the Maryland Department of Natural Resources. The first three categories are those included in the Department's Threatened and Endangered Species list. **Legal protection is provided only to species designated under one of these three categories.** The remaining six categories are unofficial designations as determined by the Department's Natural Heritage Program.

Endangered Extirpated- a species that was once a viable component of the flora or fauna of the State, but for which no naturally occurring populations are known to exist in the State.

Endangered - a species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy.

Threatened - a species of flora or fauna which appears likely, within the foreseeable future, to become endangered in the State.

Extirpated - a species that is historically known from the State, but has not been verified for an extended period, usually 40 years, and is apparently extirpated; or any species whose only known populations have been destroyed.

Historical - a species that is historically known from the State, but has not been verified for an extended period, usually 15 years.

Highly Rare - a species which typically has five or fewer current, naturally occurring, viable populations remaining in the State.

Rare - a species which typically has between five and twenty current, naturally occurring, viable populations remaining in the State.

Status Uncertain - an uncommon species considered to be of concern in the State, but with an uncertain status due to inadequate data to determine rarity, question of taxonomic classification, the possibility that reports of Maryland populations are based on misidentified specimens, or the possibility that the species is not native and naturally occurring in the State.

Watchlist - an uncommon species which is typically thought to be secure in the State, but which is worthy of attention or monitoring due to limited distribution, declining populations, or ecological vulnerabilities; and which may become rare in the foreseeable future.

Federal (US)
Status as determined by the U.S. Fish and Wildlife Service's Office of Endangered Species, in accordance with the Endangered Species Act of 1973.

LE - a species currently listed as Endangered in the U.S.; a species which is in danger of extinction throughout all or a significant portion of its range.

LT - a species currently listed as Threatened in the U.S.; a species which is likely to become an Endangered species within the foreseeable future throughout all or a significant portion of its range.

C1 - a candidate taxon for federal listing for which substantial information exists on biological

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vulnerability and threat(s) to support proposals to list the taxon as Endangered or Threatened. An asterisk (*) indicates the taxon is possibly extinct.

C2 - a candidate taxon for federal listing for which information indicates that listing as Endangered or Threatened is possibly appropriate, but for which substantial data on biological vulnerability and threat(s) are not currently known or on file to support proposed rules.

3A - a taxon for which available information indicates probable extinction or destruction of the habitat from which it was known.

3B - a name which does not represent a distinct taxon based on current taxonomic understanding.

3C - a taxon which has proven to be more abundant or widespread than was previously believed and/or is not subject to any identifiable threat.

OTHER LISTS AND INFORMATION

The U.S. Fish and Wildlife Service's Office of Endangered Species publishes a list of federally-designated threatened and endangered species, as well as those species considered to be candidates for official listing. Copies of the U.S. Department of Interior's booklet, "Endangered & Threatened Wildlife and Plants," published April 15, 1990, can be obtained from the Publication Unit, U.S. Fish and Wildlife Service, Washington, DC 20240.

The Department of Natural Resources' Tidewater Administration maintains an official list of game and commercial fish species that are designated as endangered, threatened, or in need of conservation in Maryland. The list of Endangered and Threatened Fish Species (COMAR 08.02.12) can be obtained by contacting the Tidewater Administration, Fisheries Division, Department of Natural Resources, Tawes State Office Building C-2, Annapolis, MD 21401.

To obtain additional copies of this list, to receive a copy of "Rare, Threatened, and Endangered Animals of Maryland," or to receive other information on Maryland's rare species and natural areas, please contact the Maryland Natural Heritage Program at the address shown above.

* * *

The Natural Heritage Program is the lead State agency for the identification, ranking, and protection of Maryland's rare species and significant natural areas. Staff biologists obtain information on the biology and status of rare native flora and fauna from various sources, including scientific experts, knowledgeable amateur naturalists, and research projects funded through the Chesapeake Bay and Endangered Species tax check-off. You can take an active part in protecting Maryland's rare species by contacting the Natural Heritage Program with the following types of information:

1. Location and population size/vigor information for any species on the Program's rare, threatened, and endangered species list, including historical information.

2. Data indicating that a species should be assigned to a category other than the one in which it appears.

3. Nominations of additional rare species to be included on the list or of species that should be deleted from the list, with supporting data.

4. Documentation of threats to any rare species populations, including the species' habitat.

5. Information on the biology or ecology of rare species and references to the species in the literature.

6. Any additional information that would support the protection, conservation, or management of rare species, habitats, or natural communities in Maryland.

AR301869

RARE, THREATENED, AND ENDANGERED PLANTS OF MARYLAND

Maryland Natural Heritage Program
Department of Natural Resources
February 1, 1991

Scientific Name	Common Name	State	US
Abies balsamea	Balsam fir	Highly Rare	
Aconitum uncinatum	Blue monkshood	Endangered	
Adlumia fungosa	Climbing fumitory	Threatened	
Aeschynomene virginica	Sensitive joint-vetch	Endangered	C2
Agalinis acuta	Sandplain gerardia	Endangered	LE
Agalinis decemloba		Highly Rare	
Agalinis fasciculata		Endangered	
Agalinis linifolia		Status Uncertain	
Agalinis obtusifolia		Endangered	
Agalinis setacea	Thread-leaved gerardia	Endangered	
Agalinis skinneriana		Status Uncertain	
Agalinis virgata	Pine-barren gerardia	Endangered Extirpated	
Agastache scrophulariifolia	Purple giant hyssop	Threatened	
Agrimonia microcarpa	Small-fruited agrimony	Endangered	
Agrimonia striata	Woodland agrimony	Endangered	
Agropyron trachycaulum	Rough-stemmed wheatgrass	Endangered Extirpated	
Aletris aurea	Golden colicroot	Endangered Extirpated	
Alnus maritima	Seaside alder	Rare	3C
Alopecurus aequalis	Short-awned foxtail	Status Uncertain	
Alopecurus carolinianus	Carolina foxtail	Highly Rare	
Amaranthus pumilus	Beach pigweed	Endangered Extirpated	C2
Amelanchier humilis	Roundleaf serviceberry	Watchlist	
Amelanchier obovalis	Coastal juneberry	Endangered	
Amelanchier spicata	Running juneberry	Threatened	
Amianthium muscaetoxicum	Fly-poison	Watchlist	
Ammannia coccinea		Status Uncertain	
Ammannia latifolia	Koehne's ammannia	Rare	
Ampelopsis arborea	Pepper-vine	Status Uncertain	
Ampelopsis cordata		Status Uncertain	
Amphicarpum purshii	Pursh's amphicarpum	Watchlist	
Amsonia tabernaemontana	Blue dogbane	Status Uncertain	
Anaphalis margaritacea	Pearly everlasting	Rare	
Andropogon ternarius	Silvery beardgrass	Watchlist	
Anemone canadensis	Canada anemone	Endangered Extirpated	
Anemone lancifolia		Watchlist	
Anemone riparia	Large white anemone	Status Uncertain	
Angelica atropurpurea	Great angelica	Endangered Extirpated	
Angelica triquinata	Filmy angelica	Endangered Extirpated	
Antennaria solitaria	Single-headed pussytoes	Threatened	
Apocynum sibiricum	Clasping-leaved dogbane	Endangered Extirpated	
Arabis glabra	Tower mustard	Status Uncertain	
Arabis hirsuta	Hairy rockcress	Status Uncertain	
Arabis missouriensis	Missouri rockcress	Endangered	

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Scientific Name	Common Name	State	US
Arabis patens	Spreading rockcress	Watchlist	
Arabis shortii	Short's rockcress	Endangered	
Aralia hispida	Bristly sarsaparilla	Endangered	
Arethusa bulbosa	Arethusa	Endangered Extirpated	
Arisaema dracontium	Green dragon	Watchlist	
Aristida curtissii	Curtiss' three-awn	Status Uncertain	
Aristida lanosa	Woolly three-awn	Endangered	
Aristida tuberculosa	Sea-beach three-awn	Highly Rare	
Aristida virgata	Wire grass	Endangered	
Aristolochia macrophylla	Pipevine	Threatened	
Aristolochia serpentaria	Virginia snakeroot	Watchlist	
Armoracia aquatica	Lake cress	Endangered Extirpated	C2
Arnica acaulis	Leopard's-bane	Endangered Extirpated	
Aronia prunifolia	Purple chokeberry	Watchlist	
Arundinaria gigantea	Giant cane	Threatened	
Asarum virginicum	Virginia heartleaf	Endangered	
Asclepias lanceolata	Smooth orange milkweed	Watchlist	
Asclepias purpurascens	Purple milkweed	Watchlist	
Asclepias rubra	Red milkweed	Endangered	
Asclepias verticillata	Whorled milkweed	Watchlist	
Asplenium bradleyi	Bradley's spleenwort	Endangered Extirpated	
Asplenium pinnatifidum	Lobed spleenwort	Endangered	
Asplenium resiliens	Black-stem spleenwort	Endangered	
Asplenium ruta-muraria	Wall-rue	Watchlist	
Aster concinnus	Steele's aster	Endangered Extirpated	
Aster concolor	Silvery aster	Endangered Extirpated	
Aster depauperatus	Serpentine aster	Endangered	C2
Aster infirmus	Cornel-leaf aster	Watchlist	
Aster lowrieanus	Lowrie's aster	Watchlist	
Aster nemoralis	Bog aster	Highly Rare	
Aster praealtus	Willow aster	Highly Rare	
Aster radula	Rough-leaved aster	Endangered	
Aster sagittifolius	Arrow-leaved aster	Status Uncertain	
Aster shortii	Short's aster	Watchlist	
Aster spectabilis	Showy aster	Endangered Extirpated	
Astragalus canadensis	Canada milkvetch	Endangered	
Astragalus distortus	Bent milkvetch	Threatened	
Athyrium pycnocarpon	Glade fern	Threatened	
Atriplex arenaria	Sea-beach orach	Watchlist	
Aureolaria flava	Smooth yellow foxglove	Watchlist	
Aureolaria laevigata	Downy yellow foxglove	Watchlist	
Axonopus furcatus		Endangered Extirpated	
Azolla caroliniana	Mosquito fern	Highly Rare	
Bacopa monnieri		Status Uncertain	
Bacopa stragula	Mat-forming water-hyssop	Endangered Extirpated	3B
Baptisia australis	Wild false indigo	Threatened	
Bartonia paniculata	Twining bartonia	Watchlist	
Berberis canadensis	American barberry	Endangered Extirpated	
Betula populifolia	Gray birch	Status Uncertain	
Bidens bidentoides	Maryland bur-marigold	Threatened	C2
Bidens coronata	Tickseed sunflower	Endangered	
Bidens discoidea	Swamp beggar-ticks	Endangered	

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Scientific Name	Common Name	State	US
Bidens mitis		Endangered	
Blephilia ciliata	Downy woodmint	Watchlist	
Blephilia hirsuta	Hairy woodmint	Rare	
Boltonia asteroides	Aster-like boltonia	Endangered	
Borrichia frutescens	Sea ox-eye	Endangered Extirpated	
Botrychium lanceolatum	Triangle grape-fern	Endangered Extirpated	
Botrychium matricariifolium	Matricary grape-fern	Watchlist	
Botrychium multifidum	Leathery grape-fern	Endangered Extirpated	
Botrychium oneidense	Blunt-lobe grape-fern	Endangered	
Botrychium simplex	Small grape-fern	Endangered Extirpated	
Bouteloua curtipendula	Side-oats grama	Rare	
Bromus ciliatus	Fringed brome	Endangered Extirpated	
Bromus kalmii	Wild chess	Endangered	
Bromus latiglumis	Broad-glumed brome	Endangered	
Bromus nottowayanus	Nottoway's brome	Endangered Extirpated	
Buchnera americana	Blue-hearts	Endangered Extirpated	
Cacalia muhlenbergii	Great indian-plantain	Endangered Extirpated	
Cacalia suaveolens	Sweet-scented indian-plantain	Endangered	
Calamagrostis canadensis	Blue-joint grass	Watchlist	
Calamagrostis porteri	Porter's reedgrass	Endangered	3C
Calla palustris	Wild calla	Endangered	
Callicarpa americana	French mulberry	Endangered Extirpated	
Callitriche verna	Vernal water starwort	Watchlist	
Calopogon tuberosus	Grass-pink	Endangered	
Calystegia spithamaea	Low bindweed	Rare	
Campanula divaricata	Southern harebell	Endangered Extirpated	
Campanula rotundifolia	Harebell	Rare	
Cardamine douglassii	Purple cress	Watchlist	
Cardamine longii	Long's bittercress	Endangered	3C
Cardamine parviflora	Small-flowered bittercress	Watchlist	
Cardamine pratensis	Cuckooflower	Highly Rare	
Cardamine rotundifolia	Mountain watercress	Watchlist	
Carex aestivalis		Endangered	
Carex aggregata		Endangered Extirpated	
Carex albursina		Watchlist	
Carex arenaria	Sand sedge	Status Uncertain	
Carex argyrantha	Hay sedge	Watchlist	
Carex atlantica	Eastern sedge	Watchlist	
Carex barrattii	Barratt's sedge	Endangered	3C
Carex brevior		Highly Rare	
Carex bromoides	Brome-like sedge	Watchlist	
Carex brunnescens	Brownish sedge	Watchlist	
Carex bullata	Button sedge	Threatened	
Carex bushii	Bush's sedge	Watchlist	
Carex buxbaumii	Buxbaum's sedge	Endangered	
Carex canescens	Silvery sedge	Watchlist	
Carex careyana		Endangered Extirpated	
Carex cephaloidea	Thin-leaved sedge	Highly Rare	
Carex collinsii	Collins' sedge	Watchlist	
Carex complanata	Flattened sedge	Watchlist	
Carex conjuncta	Soft fox sedge	Endangered Extirpated	
Carex conoidea	Field sedge	Endangered	

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Scientific Name	Common Name	State	US
Carex cristatella	Crested sedge	Watchlist	
Carex davisii	Davis' sedge	Endangered Extirpated	
Carex decomposita	Cypress-knee sedge	Endangered Extirpated	3C
Carex diandra	Lesser panicled sedge	Endangered	
Carex eburnea	Ebony sedge	Endangered	
Carex echinata	Little prickly sedge	Status Uncertain	
Carex emoryi	Emory's sedge	Highly Rare	
Carex exilis	Coast sedge	Endangered	
Carex foenea		Endangered Extirpated	
Carex gigantea	Giant sedge	Endangered	
Carex glaucescens		Endangered Extirpated	
Carex granularis	Meadow sedge	Watchlist	
Carex grayi	Asa Gray's sedge	Watchlist	
Carex hirtifolia	Pubescent sedge	Endangered	
Carex hitchcockiana	Hitchcock's sedge	Endangered	
Carex hormathodes	Marsh straw sedge	Watchlist	
Carex howei	Howe's sedge	Watchlist	
Carex hyalinolepis	Shoreline sedge	Threatened	
Carex hystericina	Porcupine sedge	Endangered	
Carex interior	Inland sedge	Watchlist	
Carex jamesii	James' sedge	Watchlist	
Carex joorii		Endangered	
Carex lacustris	Lake-bank sedge	Endangered Extirpated	
Carex lanuginosa	Woolly sedge	Threatened	
Carex leavenworthii	Leavenworth's sedge	Endangered Extirpated	
Carex leptalea	Bristle-stalked sedge	Watchlist	
Carex louisianica	Louisiana sedge	Endangered	
Carex lupuliformis	Hop-like sedge	Watchlist	
Carex meadii	Mead's sedge	Highly Rare	
Carex mesochorea	Midland sedge	Endangered	
Carex novae-angliae	New england sedge	Endangered Extirpated	
Carex pedunculata	Long-stalked sedge	Endangered	
Carex plantaginea	Plantain-leaved sedge	Watchlist	
Carex polymorpha	Variable sedge	Endangered Extirpated	C2
Carex projecta	Necklace sedge	Rare	
Carex radiata	Stellate sedge	Endangered	
Carex retrorsa		Status Uncertain	
Carex richardsonii	Richardson's sedge	Status Uncertain	
Carex rostrata	Beaked sedge	Rare	
Carex rugosperma		Rare	
Carex seorsa	Weak stellate sedge	Watchlist	
Carex shortiana	Short's sedge	Endangered	
Carex silicea	Sea-beach sedge	Endangered	
Carex straminea	Straw sedge	Watchlist	
Carex striatula	Lined sedge	Endangered Extirpated	
Carex styloflexa	Bent sedge	Watchlist	
Carex tenera	Slender sedge	Endangered Extirpated	
Carex tetanica	Rigid sedge	Endangered Extirpated	
Carex tonsa	Shaved sedge	Highly Rare	
Carex trichocarpa	Hairy-fruited sedge	Rare	
Carex typhina	Cat-tail sedge	Highly Rare	
Carex venusta	Dark green sedge	Endangered	

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Scientific Name	Common Name	State	US
Carex vesicaria	Inflated sedge	Threatened	
Carex vestita	Velvety sedge	Endangered Extirpated	
Carex woodii	Wood's sedge	Endangered Extirpated	
Carya laciniosa	Big shellbark hickory	Endangered	
Carya pallida	Pale hickory	Watchlist	
Cassia fasciculata var. macrosperma	Marsh wild senna	Endangered	C2
Cassia marilandica	Maryland senna	Watchlist	
Castanea dentata (fruiting)	American chestnut	Watchlist	
Castanea pumila	Chinquapin	Watchlist	
Castilleja coccinea	Indian paintbrush	Endangered	
Celtis laevigata	Sugarberry	Status Uncertain	
Centella erecta	Coinleaf	Endangered	
Centrosema virginianum	Spurred butterfly-pea	Rare	
Centunculus minimus	Chaffweed	Endangered Extirpated	
Ceratophyllum muricatum	Prickly hornwort	Endangered	
Chaerophyllum tainturieri		Status Uncertain	
Chamaecyparis thyoides	Atlantic white cedar	Watchlist	
Chamaedaphne calyculata	Leatherleaf	Threatened	
Chamaelirium luteum	Devil's-bit	Watchlist	
Chamaesyce vermiculata	Hairy spurge	Status Uncertain	
Chelone obliqua	Red turtlehead	Threatened	
Chenopodium gigantospermum	Maple-leaved goosefoot	Endangered	
Chenopodium leptophyllum	Narrow-leaved goosefoot	Highly Rare	
Chenopodium standleyanum	Standley's goosefoot	Endangered	
Chrysogonum virginianum	Golden-knees	Watchlist	
Cicuta bulbifera	Bulb-bearing water hemlock	Endangered	
Cimicifuga americana	American bugbane	Rare	
Cinna latifolia	Slender wood reedgrass	Threatened	
Cirsium horridulum	Yellow thistle	Watchlist	
Cirsium muticum	Swamp thistle	Watchlist	
Cladium mariscoides	Twigrush	Watchlist	
Claytonia caroliniana	Carolina spring-beauty	Watchlist	
Cleistes divaricata	Spreading pogonia	Endangered	
Clematis occidentalis	Purple clematis	Endangered Extirpated	
Clematis ochroleuca	Curly-heads	Endangered Extirpated	
Clematis viorna	Leatherflower	Watchlist	
Clintonia alleghaniensis	Harned's swamp clintonia	Highly Rare	
Clintonia borealis	Yellow clintonia	Threatened	
Coeloglossum viride	Long-bracted orchis	Endangered	
Coelorachis rugosa	Wrinkled jointgrass	Endangered	
Commelina erecta	Slender dayflower	Watchlist	
Commelina virginica	Virginia dayflower	Watchlist	
Coptis trifolia	Goldthread	Endangered	
Corallorhiza trifida	Early coralroot	Endangered	
Corallorhiza wisteriana	Wister's coralroot	Endangered	
Coreopsis rosea	Rose coreopsis	Endangered Extirpated	
Coreopsis tripteris	Tall tickseed	Endangered	
Cornus canadensis	Bunchberry	Endangered	
Cornus rugosa	Round-leaved dogwood	Endangered	
Corydalis aurea	Golden corydalis	Status Uncertain	
Corydalis sempervirens	Pale corydalis	Watchlist	

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Scientific Name	Common Name	State	US
Corylus cornuta	Beaked hazelwood	Watchlist	
Crassula aquatica	Pygmyweed	Endangered Extirpated	
Crotalaria rotundifolia	Rabbit-bells	Endangered	
Croton capitatus	Hogwort	Status Uncertain	
Croton monanthogynus	Prairie-tea	Status Uncertain	
Crotonopsis elliptica	Rushfoil	Watchlist	
Cuscuta coryli	Hazel dodder	Endangered Extirpated	
Cuscuta indecora		Highly Rare	
Cuscuta pentagona	Five-angled dodder	Watchlist	
Cuscuta polygonorum	Smartweed dodder	Endangered	
Cuscuta rostrata	Beaked dodder	Endangered	
Cymophyllus fraseri	Fraser's sedge	Endangered	3C
Cynanchum laeve	Honeyvine	Watchlist	
Cyperus aristatus	Awned cyperus	Watchlist	
Cyperus dentatus	Toothed sedge	Endangered Extirpated	
Cyperus diandrus	Low cyperus	Watchlist	
Cyperus erythrorhizos	Red-rooted cyperus	Watchlist	
Cyperus grayi	Asa Gray's cyperus	Watchlist	
Cyperus houghtonii		Status Uncertain	
Cyperus lancastriensis	Lancaster's sedge	Watchlist	
Cyperus plukenetii		Endangered Extirpated	
Cyperus refractus	Reflexed cyperus	Status Uncertain	
Cyperus retrofractus	Rough cyperus	Rare	
Cyperus tenuifolius		Endangered Extirpated	
Cypripedium candidum	Small white lady's slipper	Endangered	3C
Cypripedium reginae	Showy lady's slipper	Endangered Extirpated	
Cystopteris bulbifera	Bulblet fern	Watchlist	
Cystopteris tennesseensis	Tennessee bladder-fern	Highly Rare	
Delphinium exaltatum	Tall larkspur	Endangered	C2
Delphinium tricorne	Dwarf larkspur	Watchlist	
Deschampsia caespitosa	Tufted hairgrass	Endangered	
Desmodium canadense	Showy tick-trefoil	Watchlist	
Desmodium cuspidatum	Large-bracted tick-treefoil	Watchlist	
Desmodium glutinosum	Pointed-leaved tick-trefoil	Watchlist	
Desmodium humifusum	Trailing tick-trefoil	Endangered Extirpated	C2
Desmodium laevigatum	Smooth tick-trefoil	Endangered	
Desmodium lineatum	Linear-leaved tick-trefoil	Endangered	
Desmodium nuttallii	Nuttall's tick-trefoil	Watchlist	
Desmodium ochroleucum	Cream-flowered tick-trefoil	Endangered	
Desmodium pauciflorum	Few-flowered tick-trefoil	Endangered Extirpated	
Desmodium rigidum	Rigid tick-trefoil	Endangered	
Desmodium sessilifolium	Sessile-leaved tick-trefoil	Endangered Extirpated	
Desmodium strictum	Stiff tick-trefoil	Endangered	
Desmodium viridiflorum		Highly Rare	
Diarrhena americana	Twin oats	Endangered	
Dicentra eximia	Wild bleeding-heart	Threatened	
Digitaria villosa		Endangered Extirpated	
Dioscorea hirticaulis	Wild yam	Status Uncertain	
Dirca palustris	Leatherwood	Endangered	
Dodecatheon meadia	Shooting-star	Watchlist	
Drosera capillaris	Pink sundew	Endangered	
Drosera rotundifolia	Round-leaved sundew	Watchlist	

AR301875

Scientific Name	Common Name	State	US
Dryopteris campyloptera	Mountain wood-fern	Endangered	
Dryopteris celsa	Log fern	Endangered	
Dryopteris clintoniana	Clinton's wood-fern	Watchlist	
Dryopteris goldiana	Goldie's wood-fern	Watchlist	
Echinodorus cordifolius		Endangered	
Elatine americana	American waterwort	Endangered	
Elatine minima	Small waterwort	Endangered	
Eleocharis albida		Endangered	
Eleocharis compressa	Flattened spikerush	Endangered	
Eleocharis engelmannii	Engelmann' spikerush	Watchlist	
Eleocharis equisetoides	Knotted spikerush	Endangered	
Eleocharis erythropoda	Bald spikerush	Watchlist	
Eleocharis fallax		Watchlist	
Eleocharis flavescens	Pale spikerush	Highly Rare	
Eleocharis geniculata	Capitate spikerush	Status Uncertain	
Eleocharis halophila		Endangered Extirpated	
Eleocharis intermedia	Matted spikerush	Endangered	
Eleocharis melanocarpa	Black-fruited spikerush	Endangered	
Eleocharis microcarpa	Torrey's spikerush	Watchlist	
Eleocharis olivacea	Green spikerush	Watchlist	
Eleocharis robbinsii	Robbins' spikerush	Endangered	
Eleocharis rostellata	Beaked spikerush	Threatened	
Eleocharis tortilis	Twisted spikerush	Rare	
Eleocharis tricostata	Three-ribbed spikerush	Endangered Extirpated	
Elephantopus tomentosus	Tobaccoweed	Endangered Extirpated	
Ellisia nyctelea	Nyctelea	Watchlist	
Epilobium ciliatum	Northern willowherb	Endangered	
Epilobium leptophyllum	Linear-leaved willowherb	Highly Rare	
Epilobium strictum	Downy willowherb	Endangered Extirpated	
Equisetum fluviatile	Water horsetail	Endangered	
Equisetum sylvaticum	Wood horsetail	Endangered	
Eragrostis hirsuta		Highly Rare	
Eragrostis refracta		Threatened	
Erianthus alopecuroides	Woolly beardgrass	Highly Rare	
Erianthus brevibarbis		Endangered	
Erianthus contortus	Bent-awn plumegrass	Endangered	
Erigenia bulbosa	Harbinger-of-spring	Watchlist	
Erigeron pulchellus var. brauntiae	Lucy Braun's robin plantain	Status	
Eriocaulon compressum	Flattened pipewort	Rare Uncertain	
Eriocaulon decangulare	Ten-angled pipewort	Rare	
Eriocaulon parkeri	Parker's pipewort	Endangered	3C
Eriocaulon septangulare	Seven-angled pipewort	Endangered Extirpated	
Eriophorum virginicum	Tawny cottongrass	Watchlist	
Eryngium yuccifolium	Tall rattlesnake master	Endangered Extirpated	
Erythronium albidum	White trout lily	Threatened	
Eupatorium altissimum	Tall boneset	Watchlist	
Eupatorium leucolepis	White-bracted boneset	Endangered	
Eupatorium maculatum	Spotted Joe-pye-weed	Endangered Extirpated	
Euphorbia obtusata	Blunt-leaved spurge	Endangered	
Euphorbia purpurea	Darlington's spurge	Endangered	C2
Euphorbia zinniiflora	Flowering spurge	Status Uncertain	

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Scientific Name	Common Name	State	US
Festuca paradoxa		Endangered Extirpated	
Filipendula rubra	Queen-of-the-prairie	Endangered	
Fimbristylis annua	Baldwin's fimbristylis	Watchlist	
Fimbristylis perpusilla	Harper's fimbristylis	Endangered	C2
Fimbristylis puberula	Hairy fimbristylis	Status Uncertain	
Fraxinus nigra	Black ash	Watchlist	
Fraxinus profunda	Pumpkin ash	Endangered Extirpated	
Fuirena pumila	Smooth fuirena	Endangered	
Galactia volubilis	Downy milk pea	Endangered	
Galax aphylla	Galax	Status Uncertain	
Galium boreale	Northern bedstraw	Endangered	
Galium concinnum	Shining bedstraw	Watchlist	
Galium hispidulum	Coast bedstraw	Endangered	
Galium latifolium		Watchlist	
Galium palustre	Marsh bedstraw	Status Uncertain	
Galium trifidum	Small bedstraw	Endangered Extirpated	
Gaultheria hispidula	Creeping snowberry	Endangered	
Gaylussacia brachycera	Box huckleberry	Endangered	3C
Gentiana andrewsii	Fringe-tip closed gentian	Threatened	
Gentiana catesbaei	Catesby's gentian	Watchlist	
Gentiana linearis	Narrow-leaved gentian	Watchlist	
Gentiana puberula		Endangered Extirpated	
Gentiana villosa	Striped gentian	Endangered	
Gentianella quinquefolia	Stiff gentian	Endangered	
Gentianopsis crinita	Fringed gentian	Endangered	
Geranium robertianum	Herb-robert	Endangered	
Geum aleppicum	Yellow avens	Endangered	
Geum laciniatum	Rough avens	Watchlist	
Geum vernum	Spring avens	Watchlist	
Glaux maritima	Sea milkwort	Endangered Extirpated	
Glyceria acutiflora	Sharp-scaled mannagrass	Endangered Extirpated	
Glyceria grandis	American mannagrass	Endangered	
Glyceria septentrionalis	Floating mannagrass	Watchlist	
Goodyera repens	Dwarf rattlesnake-plantain	Endangered Extirpated	
Goodyera tesselata	Tesselated rattlesnake-plantain	Endangered Extirpated	
Gratiola ramosa		Endangered Extirpated	
Gratiola viscidula		Endangered	
Gymnocarpium dryopteris	Oak fern	Endangered	
Gymnocladus dioicus	Kentucky coffee-tree	Highly Rare	
Gymnopogon brevifolius	Broad-leaved beardgrass	Endangered	
Helenium flexuosum	Purple sneezeweed	Watchlist	
Helianthemum bicknellii	Hoary frostweed	Endangered Extirpated	
Helianthemum propinquum	Pine-barren frostweed	Watchlist	
Helianthus hirsutus	Hirsute sunflower	Status Uncertain	
Helianthus laevigatus	Smooth sunflower	Endangered	
Helianthus microcephalus	Small-headed sunflower	Endangered	
Helianthus occidentalis	McDowell's sunflower	Threatened	
Helonias bullata	Swamp pink	Endangered	LT
Hemicarpha micrantha	Small-flowered hemicarpha	Threatened	
Heracleum lanatum	Cow-parsnip	Watchlist	
Heuchera pubescens	Downy heuchera	Watchlist	
Heuchera villosa	Rough heuchera	Endangered Extirpated	

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Scientific Name	Common Name	State	US
Hexalectris spicata	Crested coralroot	Endangered Extirpated	
Hibiscus laevis	Halberd-leaved rose-mallow	Watchlist	
Hierochloe odorata	Holy grass	Endangered	
Honkenya peploides	Sea-beach sandwort	Endangered Extirpated	
Hottonia inflata	Featherfoil	Endangered	
Houstonia serpyllifolia	Thyme-leaved bluets	Watchlist	
Houstonia tenuifolia	Slender-leaved bluets	Highly Rare	
Hudsonia tomentosa	Woolly hudsonia	Watchlist	
Hybanthus concolor	Green violet	Watchlist	
Hydrastis canadensis	Goldenseal	Threatened	3C
Hydrocotyle ranunculoides	Floating water-pennywort	Watchlist	
Hydrocotyle verticillata	Whorled water-pennywort	Watchlist	
Hydrophyllum macrophyllum	Large-leaved waterleaf	Endangered	
Hypericum adpressum	Creeping St. John's-wort	Endangered	
Hypericum denticulatum	Coppery St. John's-wort	Endangered	
Hypericum drummondii	Drummond's St. John's-wort	Endangered Extirpated	
Hypericum ellipticum	Pale St. John's-wort	Watchlist	
Hypericum gymnanthum	Clasping-leaved St. John's-wort	Endangered	
Hypericum pyramidatum	Great St. John's-wort	Endangered Extirpated	
Ilex decidua	Deciduous holly	Threatened Extirpated	
Ilex montana	Large-leaved holly	Watchlist	
Iresine rhizomatosa	Bloodleaf	Endangered Extirpated	
Iris cristata	Crested iris	Endangered	
Iris prismatica	Slender blue flag	Endangered	
Iris verna	Dwarf iris	Endangered	
Iris virginica	Virginia blue flag	Watchlist	
Isoetes engelmannii	Appalachian quillwort	Watchlist	
Isoetes riparia	Riverbank quillwort	Watchlist	
Isotria medeoloides	Small whorled pogonia	Endangered Extirpated	LE
Juglans cinerea	Butternut	Rare	C2
Juncus articulatus	Jointed rush	Highly Rare	
Juncus balticus	Baltic rush	Endangered Extirpated	
Juncus brachycarpus	Short-fruited rush	Endangered Extirpated	
Juncus brachycephalus	Small-headed rush	Endangered Extirpated	
Juncus brevicaudatus	Narrow-panicled rush	Rare	
Juncus caesariensis	New Jersey rush	Endangered Extirpated	C2
Juncus coriaceus	Awl-leaved rush	Watchlist	
Juncus longii		Endangered Extirpated	
Juncus megacephalus		Endangered Extirpated	
Juncus militaris	Bayonet rush	Endangered Extirpated	
Juncus pelocarpus	Brown-fruited rush	Endangered Extirpated	
Juncus polycephalus		Status Uncertain	
Juncus torreyi	Torrey's rush	Endangered Extirpated	
Juncus trifidus	Highland rush	Endangered	
Juniperus communis	Juniper	Endangered Extirpated	
Krigia biflora	Two-flowered cynthia	Watchlist	
Krigia dandelion	Potato dandelion	Endangered	
Lachnanthes caroliana	Red-root	Endangered	
Lactuca hirsuta	Hairy lettuce	Endangered Extirpated	
Larix laricina	Larch	Endangered	
Lathyrus palustris	Vetchling	Endangered Extirpated	
Lathyrus venosus	Veiny pea	Watchlist	

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Scientific Name	Common Name	State	US
Lechea maritima	Beach pinweed	Watchlist	
Lechea tenuifolia	Narrow-leaved pinweed	Endangered Extirpated	
Lechea villosa	Hairy pinweed	Watchlist	
Leersia hexandra		Endangered	
Leersia lenticularis	Catchfly-grass	Endangered Extirpated	
Lemna perpusilla	Small duckweed	Watchlist	
Lemna trisulca	Star duckweed	Endangered	
Leptochloa fascicularis	Long-awned diplachne	Endangered Extirpated	
Leptoloma cognatum	Fall witchgrass	Endangered Extirpated	
Lespedeza stuevei	Downy bushclover	Endangered	
Lespedeza violacea	Violet bushclover	Watchlist	
Liatris spicata	Spiked blazing-star	Highly Rare	
Liatris squarrosa	Scaly blazing-star	Endangered Extirpated	
Liatris turgida	Robust blazing-star	Endangered Extirpated	
Ligusticum canadense	American lovage	Endangered Extirpated	
Lilium philadelphicum	Wood lily	Endangered Extirpated	
Limnobium spongia	American frog's-bit	Endangered Extirpated	
Limonium nashii	Nash's sea lavender	Status Uncertain	
Limosella subulata	Mudwort	Endangered	
Linnaea borealis	Twinflower	Endangered Extirpated	
Linum floridanum	Florida yellow flax	Endangered Extirpated	
Linum intercursum	Sandplain flax	Endangered	
Linum sulcatum	Grooved flax	Endangered	
Liparis loeselii	Loesel's twayblade	Watchlist	
Listera australis	Southern twayblade	Watchlist	
Listera cordata	Heartleaf twayblade	Endangered Extirpated	
Listera smallii	Appalachian twayblade	Endangered	
Lithospermum latifolium	American gromwell	Endangered Extirpated	
Litsea aestivalis	Pondspice	Endangered	C2
Lobelia canbyi	Canby's lobelia	Endangered	
Lobelia elongata	Elongated lobelia	Watchlist	
Lobelia glandulosa		Endangered Extirpated	
Lonicera canadensis	Canada honeysuckle	Endangered	
Ludwigia brevipes	Creeping ludwigia	Status Uncertain	
Ludwigia decurrens		Rare	
Ludwigia glandulosa		Endangered	
Ludwigia hirtella	Hairy ludwigia	Endangered	
Lupinus perennis	Wild lupine	Threatened	
Lycopodium alopecuroides	Foxtail clubmoss	Watchlist	
Lycopodium carolinianum	Carolina clubmoss	Endangered Extirpated	
Lycopodium inundatum	Bog clubmoss	Rare	
Lycopodium porophilum	Rock clubmoss	Endangered Extirpated	
Lycopodium sabinifolium	Ground-fir	Status Uncertain	
Lycopodium tristachyum	Ground-cedar	Watchlist	
Lycopus amplectens	Sessile-leaved water-horehound	Endangered	
Lycopus rubellus	Stalked water-horehound	Watchlist	
Lygodium palmatum	Climbing fern	Threatened	
Lysimachia hybrida	Lowland loosestrife	Endangered	
Lysimachia lanceolata	Lance-leaved loosestrife	Watchlist	
Lythrum alatum	Winged loosestrife	Endangered	
Magnolia tripetala	Umbrella magnolia	Watchlist	
Malus angustifolia	Narrow-leaved wild crab	Watchlist	

AR301079

Scientific Name	Common Name	State	US
Manfreda virginica	False aloe	Status Uncertain	
Marshallia grandiflora	Barbara's buttons	Endangered Extirpated	C2
Matelea carolinensis	Anglepod	Endangered	
Matelea decipiens		Endangered Extirpated	
Matelea obliqua		Endangered Extirpated	
Matteuccia struthiopteris	Ostrich fern	Rare	
Mecardonia acuminata	Erect water-hyssop	Endangered	
Melanthium latifolium	Broad-leaved bunchflower	Endangered Extirpated	
Melanthium virginicum	Virginia bunchflower	Watchlist	
Melica mutica	Narrow melicgrass	Threatened	
Melica nitens	Three-flowered melicgrass	Threatened	
Melothria pendula	Creeping cucumber	Endangered	
Menyanthes trifoliata	Buckbean	Endangered	
Micranthemum micranthemoides	Nuttall's micranthemum	Endangered Extirpated	C1*
Milium effusum	Millet grass	Watchlist	
Minuartia glabra	Mountain sandwort	Endangered	
Minuartia michauxii	Rock sandwort	Threatened	
Moehringia lateriflora	Grove sandwort	Endangered	
Monarda clinopodia		Watchlist	
Monarda media	Purple bergamot	Watchlist	
Monotropsis odorata	Sweet pinesap	Endangered	
Muhlenbergia capillaris	Long-awned hairgrass	Endangered	
Muhlenbergia glabriflora		Status Uncertain	
Muhlenbergia glomerata		Status Uncertain	
Muhlenbergia sylvatica	Woodland dropseed	Watchlist	
Muhlenbergia torreyana	Torrey's dropseed	Endangered	3C
Myosotis macrosperma	Large-seeded forget-me-not	Threatened	
Myosotis verna	Spring forget-me-not	Watchlist	
Myrica heterophylla	Evergreen bayberry	Endangered Extirpated	
Myriophyllum heterophyllum	Broadleaf water-milfoil	Highly Rare	
Myriophyllum humile	Low water-milfoil	Endangered	
Myriophyllum tenellum	Slender water-milfoil	Endangered Extirpated	
Myriophyllum verticillatum	Whorled water-milfoil	Watchlist	
Najas flexilis	Slender naiad	Watchlist	
Najas gracillima	Thread-like naiad	Endangered Extirpated	
Najas guadalupensis	Southern naiad	Watchlist	
Nelumbo lutea	American lotus	Threatened	
Nemopanthus mucronatus	Mountain holly	Watchlist	
Nemophila aphylla		Highly Rare	
Nymphaea tuberosa	Tuberous white water lily	Status Uncertain	
Nymphoides aquatica	Larger floating-heart	Endangered	
Nymphoides cordata	Floating-heart	Endangered	
Oenothera argillicola	Shale-barren primrose	Watchlist	
Oenothera humifusa	Seaside evening primrose	Watchlist	
Oldenlandia uniflora	Clustered bluets	Rare	
Onosmodium molle	Shaggy false-gromwell	Endangered	
Onosmodium virginianum	Virginia false-gromwell	Endangered	
Oryzopsis asperifolia	White-fruited mountainrice	Threatened	
Oryzopsis racemosa	Black-fruited mountainrice	Threatened	
Oxydendrum arboreum	Sourwood	Endangered	
Oxypolis canbyi	Canby's dropwort	Endangered	LE
Pachistima canbyi	Canby's mountain lover	Endangered	C2

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Scientific Name	Common Name	State	US
Panax quinquefolius	Ginseng	Watchlist	3C
Panicum aciculare	Bristling panicgrass	Status Uncertain	
Panicum aculeatum	Tall rough panicgrass	Status Uncertain	
Panicum angustifolium	Narrow-leaved panicgrass	Status Uncertain	
Panicum boreale	Northern panicgrass	Endangered Extirpated	
Panicum commonsianum	Commons' panicgrass	Rare	
Panicum ensifolium	Small-leaved panicgrass	Watchlist	
Panicum flexile	Wiry witch-grass	Endangered	
Panicum hemitomon	Maidencane	Watchlist	
Panicum laxiflorum		Status Uncertain	
Panicum leucothrix	Roughish panicgrass	Status Uncertain	
Panicum oligosanthes	Few-flowered panicgrass	Endangered	
Panicum ravenelii		Watchlist	
Panicum scabriusculum	Tall swamp panicgrass	Endangered	
Panicum tuckermanii	Tuckerman's panicgrass	Status Uncertain	
Panicum wrightianum	Wright's panicgrass	Endangered	
Panicum yadkinense		Status Uncertain	
Parnassia asarifolia	Kidneyleaf grass-of-parnassus	Endangered	
Paronychia virginica	Yellow nailwort	Endangered	C2
Parthenium integrifolium	American feverfew	Endangered	
Paspalum dissectum	Walter's paspalum	Endangered	
Paspalum fluitans	Floating paspalum	Endangered	
Passiflora incarnata	Purple passionflower	Status Uncertain	
Passiflora lutea	Yellow passionflower	Watchlist	
Pedicularis lanceolata	Swamp lousewort	Endangered	
Pellaea glabella	Smooth cliffbrake	Endangered	
Penstemon laevigatus	Smooth beardtongue	Watchlist	
Persea borbonia	Red bay	Threatened	
Phacelia purshii	Miami-mist	Watchlist	
Phacelia ranunculacea	Coville's phacelia	Endangered	
Phalaris caroliniana	May grass	Endangered Extirpated	
Phaseolus polystachyus	Wild bean	Watchlist	
Phlox carolina	Thick-leaved phlox	Endangered Extirpated	
Phlox glaberrima	Smooth phlox	Endangered Extirpated	
Phlox latifolia	Mountain phlox	Endangered Extirpated	
Phlox pilosa	Downy phlox	Endangered Extirpated	
Phyllanthus caroliniensis		Watchlist	
Physalis virginiana	Virginia ground-cherry	Watchlist	
Picea rubens	Red spruce	Watchlist	
Pilea fontana	Coolwort	Rare	
Pinus serotina	Pond pine	Watchlist	
Plantago cordata	Heart-leaved plantain	Endangered Extirpated	3C
Plantago pusilla	Slender plantain	Endangered Extirpated	
Platanthera blephariglottis	White fringed orchid	Threatened	
Platanthera ciliaris	Yellow fringed orchid	Threatened	
Platanthera cristata	Crested yellow orchid	Threatened	
Platanthera flava	Pale green orchid	Threatened	3C
Platanthera grandiflora	Large purple fringed orchid	Threatened	
Platanthera peramoena	Purple fringeless orchid	Threatened	3C
Platanthera psycodes	Small purple fringed orchid	Endangered Extirpated	
Pluchea camphorata	Marsh fleabane	Endangered	
Poa alsodes	Grove meadow-grass	Rare	

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Scientific Name	Common Name	State	US
Poa languida	Weak speargrass	Status Uncertain	
Poa palustris	Fowl bluegrass	Status Uncertain	
Poa saltuensis		Endangered Extirpated	
Podostemum ceratophyllum	Threadfoot	Watchlist	
Pogonia ophioglossoides	Rose pogonia	Watchlist	
Polanisia dodecandra	Clammyweed	Endangered Extirpated	
Polemonium van-bruntiae	Jacob's-ladder	Endangered	3C
Polygala cruciata	Cross-leaved milkwort	Endangered	
Polygala curtissii	Curtis' milkwort	Watchlist	
Polygala incarnata	Pink milkwort	Watchlist	
Polygala polygama	Racemed milkwort	Threatened	
Polygala senega	Seneca snakeroot	Threatened	
Polygonella articulata	Jointweed	Watchlist	
Polygonum amphibium	Water smartweed	Highly Rare	
Polygonum careyi	Carey's knotweed	Status Uncertain	
Polygonum cilinode	Fringed bindweed	Watchlist	
Polygonum densiflorum	Dense-flowered knotweed	Endangered	
Polygonum glaucum	Seaside knotweed	Highly Rare	
Polygonum opelousanum	Opelousas smartweed	Status Uncertain	
Polygonum ramosissimum	Bushy knotweed	Endangered Extirpated	
Polygonum robustius	Stout smartweed	Endangered Extirpated	
Polygonum setaceum	Bristly smartweed	Status Uncertain	
Polypodium polypodioides	Resurrection fern	Watchlist	
Populus balsamifera	Balsam poplar	Status Uncertain	
Porteranthus stipulatus	American ipecac	Endangered Extirpated	
Potamogeton amplifolius	Large-leaved pondweed	Endangered Extirpated	
Potamogeton foliosus	Leafy pondweed	Endangered	
Potamogeton illinoensis	Illinois pondweed	Highly Rare	
Potamogeton natans	Floating pondweed	Status Uncertain	
Potamogeton perfoliatus	Clasping-leaved pondweed	Rare	
Potamogeton pusillus	Slender pondweed	Highly Rare	
Potamogeton richardsonii	Redheadgrass	Endangered Extirpated	
Potamogeton robbinsii	Robbins' pondweed	Endangered Extirpated	
Potamogeton spirillus	Spiral pondweed	Highly Rare	
Potamogeton zosteriformis	Flatstem pondweed	Endangered Extirpated	
Potentilla arguta	Tall cinquefoil	Status Uncertain	
Prenanthes autumnalis	Slender rattlesnake-root	Endangered	
Prunus alleghaniensis	Alleghany plum	Endangered	3C
Prunus angustifolia	Chickasaw plum	Watchlist	
Prunus maritima	Beach plum	Endangered	
Prunus pumila	Eastern dwarf cherry	Status Uncertain	
Psilocarya nitens	Short-beaked baldrush	Endangered	
Psilocarya scirpoides	Long-beaked baldrush	Endangered	
Psoralea psoralioides		Status Uncertain	
Ptelea trifoliata	Wafer-ash	Watchlist	
Ptilimnium nodosum	Harperella	Endangered	LE
Puccinellia fasciculata		Watchlist	
Puccinellia pallida	Pale mannagrass	Endangered Extirpated	
Pycnanthemum pycnanthemoides		Southern mountain-mint	
Endangered Extirpated			
Pycnanthemum setosum	Awned mountain-mint	Endangered Extirpated	
Pycnanthemum torrei	Torrey's mountain-mint	Endangered	

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Scientific Name	Common Name	State	US
Pycnanthemum verticillatum	Whorled mountain-mint	Endangered	
Pycnanthemum virginianum	Virginia mountain-mint	Rare	
Pyrola secunda	One-sided pyrola	Endangered	
Pyrola virens	Greenish-flowered pyrola	Endangered Extirpated	
Pyrrhopappus carolinianus	Carolina false-dandelion	Watchlist	
Quercus imbricaria	Shingle oak	Watchlist	
Quercus laurifolia	Laurel-leaved oak	Highly Rare	
Quercus lyrata	Overcup oak	Watchlist	
Quercus macrocarpa	Mossy-cup oak	Highly Rare	
Quercus muhlenbergii	Chinquapin Oak	Watchlist	
Quercus prinoides	Dwarf chestnut oak	Watchlist	
Quercus shumardii	Shumard's red oak	Highly Rare	
Ranunculus allegheniensis	Mountain crowfoot	Watchlist	
Ranunculus ambigens	Water-plantain spearwort	Endangered Extirpated	
Ranunculus carolinianus	Carolina buttercup	Endangered Extirpated	
Ranunculus fascicularis	Early buttercup	Endangered	
Ranunculus flabellaris	Yellow water-crowfoot	Endangered	
Ranunculus hederaceus		Endangered Extirpated	
Ranunculus laxicaulis		Status Uncertain	
Ranunculus micranthus	Rock crowfoot	Watchlist	
Ranunculus pensylvanicus	Bristly crowfoot	Endangered Extirpated	
Ranunculus pusillus	Low spearwort	Watchlist	
Ranunculus trichophyllus	White water-crowfoot	Endangered	
Rhexia aristosa	Awned meadow-beauty	Endangered Extirpated	C2
Rhododendron arborescens	Smooth azalea	Watchlist	
Rhododendron atlanticum	Dwarf azalea	Watchlist	
Rhododendron calendulaceum	Flame azalea	Highly Rare	
Rhododendron canescens		Status Uncertain	
Rhynchosia tomentosa		Endangered	
Rhynchospora alba	White beakrush	Watchlist	
Rhynchospora cephalantha	Capitate beakrush	Endangered	
Rhynchospora corniculata	Short-bristled hornedrush	Endangered	
Rhynchospora filifolia	Thread-leaved beakrush	Endangered	
Rhynchospora globularis	Grass-like beakrush	Endangered	
Rhynchospora glomerata	Clustered beakrush	Endangered	
Rhynchospora gracilenta	Slender beakrush	Watchlist	
Rhynchospora inundata	Drowned hornedrush	Endangered	
Rhynchospora microcephala	Tiny-headed beakrush	Endangered Extirpated	
Rhynchospora pallida	Pale beakrush	Endangered Extirpated	
Rhynchospora rariflora	Few-flowered beakrush	Endangered Extirpated	
Rhynchospora torreyana	Torrey's beakrush	Endangered	
Ribes americanum	Wild black currant	Endangered Extirpated	
Ribes cynosbati	Prickly gooseberry	Watchlist	
Ribes glandulosum	Skunk currant	Highly Rare	
Ribes hirtellum	Low wild gooseberry	Highly Rare	
Rosa blanda	Smooth rose	Endangered	
Rosa setigera	Prairie rose	Status Uncertain	
Rosa virginiana	Virginia rose	Watchlist	
Rudbeckia fulgida	Orange coneflower	Watchlist	
Rudbeckia triloba	Thin-leaved coneflower	Watchlist	
Ruellia humilis	Hairy wild-petunia	Endangered Extirpated	
Ruellia purshiana	Pursh's ruellia	Endangered Extirpated	

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Scientific Name	Common Name	State	US
Ruellia strepens	Rustling wild-petunia	Endangered	
Rumex altissimus	Tall dock	Endangered	
Rumex floridanus	Florida dock	Endangered	
Rumex hastatulus	Engelmann's dock	Status Uncertain	
Sabatia campanulata	Slender marsh pink	Endangered Extirpated	
Sabatia difformis	Lance-leaved sabatia	Endangered Extirpated	
Sabatia dodecandra	Large marsh pink	Watchlist	
Sacciolepis striata	Sacciolepis	Endangered	
Sagina decumbens	Decumbent pearlwort	Watchlist	
Sagittaria calycina	Spongy lophotocarpus	Threatened	
Sagittaria engelmanniana	Engelmann's arrowhead	Threatened	
Sagittaria graminea	Grass-leaved arrowhead	Watchlist	
Sagittaria longirostra	Long-beaked arrowhead	Status Uncertain	
Sagittaria rigida	Sessile-fruited arrowhead	Endangered	
Sagittaria subulata	Subulate arrowhead	Watchlist	
Sagittaria teres	Slender arrowhead	Endangered Extirpated	
Salicornia bigelovii	Dwarf glasswort	Watchlist	
Salicornia virginica	Woody glasswort	Watchlist	
Salix bebbiana	Bebb's willow	Endangered Extirpated	
Salix caroliniana	Carolina willow	Watchlist	
Salix discolor	Pussy willow	Status Uncertain	
Salix exigua	Sandbar willow	Endangered	
Salix lucida	Shining willow	Endangered Extirpated	
Salix tristis	Dwarf prairie willow	Highly Rare	
Salvia urticifolia		Endangered Extirpated	
Sanguisorba canadensis	Canada burnet	Threatened	
Sanicula marilandica	Sanicle	Watchlist	
Sanicula trifoliata	Three-leaved snakeroot	Watchlist	
Sarracenia purpurea	Northern pitcher-plant	Threatened	
Saxifraga micranthidifolia	Lettuce-leaved saxifrage	Watchlist	
Schizachne purpurascens	Purple oat	Endangered	
Schwalbea americana	Chaffseed	Endangered Extirpated	C1
Scirpus ancistrochaetus	Northeastern bulrush	Endangered	LE
Scirpus cylindricus	Salt-marsh bulrush	Rare	
Scirpus etuberculatus	Canby's bulrush	Endangered	
Scirpus expansus	Wood bulrush	Watchlist	
Scirpus fluviatilis	River bulrush	Watchlist	
Scirpus pendulus		Watchlist	
Scirpus smithii	Smith's clubrush	Endangered Extirpated	
Scirpus subterminalis	Water clubrush	Endangered	
Scirpus torreyi	Torrey's clubrush	Endangered Extirpated	
Scirpus verecundus		Rare	
Scleria minor	Slender nutrush	Endangered	
Scleria nitida	Shining nutrush	Endangered Extirpated	
Scleria pauciflora	Papillose nutrush	Watchlist	
Scleria reticularis	Reticulated nutrush	Rare	
Scleria triglomerata	Tall nutrush	Rare	
Scleria verticillata	Whorled nutrush	Endangered	
Sclerolepis uniflora	Pink bog-button	Endangered	
Scrophularia lanceolata	Hare figwort	Watchlist	
Scutellaria galericulata	Common skullcap	Highly Rare	
Scutellaria incana	Downy skullcap	Watchlist	

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Scientific Name	Common Name	State	US
Scutellaria leonardii	Leonard's skullcap	Threatened	
Scutellaria nervosa	Veined skullcap	Endangered Extirpated	
Scutellaria ovata	Heart-leaved skullcap	Watchlist	
Scutellaria parvula	Small skullcap	Endangered Extirpated	
Scutellaria saxatilis	Rock skullcap	Endangered	C2
Scutellaria serrata	Showy skullcap	Watchlist	
Sedum glaucophyllum	Cliff stonecrop	Endangered	
Senecio anonymus	Small's ragwort	Watchlist	
Senecio antennariifolius	Pussytoes ragwort	Watchlist	3C
Senecio pauperculus	Balsam ragwort	Watchlist	
Sesuvium maritimum	Sea-purslane	Highly Rare	
Sibara virginica	Virginia cress	Status Uncertain	
Sida hermaphrodita	Virginia mallow	Threatened	3C
Silene nivea	Snowy campion	Endangered	
Silphium trifoliatum	Three-leaved rosinweed	Watchlist	
Sisyrinchium arenicola	Sand blueeyed-grass	Endangered Extirpated	
Smilacina stellata	Star-flowered false Solomon's-seal	Endangered	
Smilax bona-nox	Bullbrier	Watchlist	
Smilax ecirrhata	Upright smilax	Status Uncertain	
Smilax pseudochina	Halberd-leaved greenbrier	Endangered	
Smilax walteri	Red-berried greenbrier	Endangered	
Solidago curtisii	Curtis' goldenrod	Endangered	
Solidago elliottii	Elliott's goldenrod	Watchlist	
Solidago fistulosa	Pine barrens goldenrod	Watchlist	
Solidago hispida	Hairy goldenrod	Endangered Extirpated	
Solidago microcephala	Tiny-headed goldenrod	Watchlist	
Solidago patula	Sharp-leaved goldenrod	Watchlist	
Solidago puberula	Downy goldenrod	Watchlist	
Solidago rigida	Hard-leaved goldenrod	Endangered Extirpated	
Solidago roanensis	Mountain goldenrod	Endangered Extirpated	
Solidago rupestris	Rock goldenrod	Endangered Extirpated	
Solidago spathulata	Riverbank goldenrod	Threatened	
Solidago speciosa	Showy goldenrod	Endangered	
Solidago stricta	Wandlike goldenrod	Status Uncertain	
Solidago uliginosa	Bog goldenrod	Watchlist	
Sorbus americana	American mountain-ash	Watchlist	
Sorghastrum elliottii		Endangered Extirpated	
Sparganium androcladum	Branching bur-reed	Watchlist	
Sparganium chlorocarpum	Green-fruited bur-reed	Watchlist	
Sparganium eurycarpum	Broad-fruited bur-reed	Watchlist	
Spermacoce glabra	Buttonweed	Endangered	
Sphenopholis pensylvanica	Swamp-oats	Threatened	
Spigelia marilandica	Indian-pink	Endangered Extirpated	
Spiraea betulifolia	Corymbed spiraea	Watchlist	
Spiranthes laciniata	Lace-lip ladys' tresses	Status Uncertain	
Spiranthes lucida	Wide-leaved ladys' tresses	Endangered	
Spiranthes ochroleuca	Yellow nodding ladys' tresses	Endangered	
Spiranthes odorata	Sweet-scented ladys' tresses	Endangered Extirpated	
Spiranthes praecox	Grass-leaved ladys' tresses	Highly Rare	
Spiranthes tuberosa	Little ladys' tresses	Watchlist	
Sporobolus asper	Long-leaved rushgrass	Highly Rare	
Sporobolus clandestinus	Rough rushgrass	Endangered	

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Scientific Name	Common Name	State	US
Sporobolus heterolepis	Northern dropseed	Endangered	
Sporobolus neglectus	Small rushgrass	Endangered Extirpated	
Stachys aspera		Endangered Extirpated	
Stachys clingmanii	Clingman's hedge-nettle	Status Uncertain	
Stachys cordata	Nuttall's hedge-nettle	Highly Rare	
Stachys hyssopifolia	Hyssop-leaved hedge-nettle	Status Uncertain	
Stachys latidens		Highly Rare	
Stellaria alsine	Trailing stitchwort	Endangered Extirpated	
Stenanthium gramineum	Featherbells	Threatened	
Streptopus amplexifolius	White mandarin	Status Uncertain	
Streptopus roseus	Rose twisted-stalk	Threatened	
Stylophorum diphyllum		Status Uncertain	
Suaeda linearis	Tall sea-blite	Watchlist	
Symphoricarpos albus		Threatened	
Symplocos tinctoria	Sweetleaf	Rare	
Taenidia montana	Mountain pimpernel	Threatened	3C
Talinum teretifolium	Fameflower	Threatened	
Taxus canadensis	American yew	Watchlist	
Tephrosia spicata		Endangered Extirpated	
Thalictrum dasycarpum	Purple meadowrue	Status Uncertain	
Thalictrum macrostylum		Status Uncertain	
Thalictrum subrotundum		Status Uncertain	C2
Thaspium trifoliatum	Purple meadow-parsnip	Endangered	
Thelypteris phegopteris	Northern beech fern	Rare	
Thelypteris simulata	Bog fern	Threatened	
Thuja occidentalis	Arbor-vitae	Threatened	
Tilia heterophylla		Watchlist	
Tillandsia usneoides	Spanish moss	Extirpated	
Tofieldia glutinosa	False asphodel	Status Uncertain	
Tofieldia racemosa	Coastal false asphodel	Endangered Extirpated	
Tomanthera auriculata	Auricled gerardia	Endangered Extirpated	C2
Trachelospermum difforme	Climbing dogbane	Endangered	
Trautvetteria caroliniensis	Carolina tassel-rue	Watchlist	
Triadenum tubulosum		Highly Rare	
Trichostema brachiatum	False pennyroyal	Watchlist	
Trichostema setaceum	Narrow-leaved bluecurls	Highly Rare	
Trifolium reflexum	Buffalo clover	Endangered Extirpated	
Trifolium virginicum	Kate's-mountain clover	Threatened	3C
Triglochin maritimum	Seaside arrow-grass	Status Uncertain	
Triglochin striatum	Three-ribbed arrow-grass	Endangered Extirpated	
Trillium cernuum	Nodding trillium	Watchlist	
Trillium flexipes	Drooping trillium	Endangered	
Trillium nivale	Snow trillium	Endangered	
Trillium pusillum var. virginanum	Dwarf trillium	Threatened	C2
Triosteum angustifolium	Narrow-leaved horse-gentian	Endangered	
Triphora trianthophora	Nodding pogonia	Endangered Extirpated	
Typha domingensis		Watchlist	
Utricularia biflora	Two-flowered bladderwort	Endangered	
Utricularia cornuta	Horned bladderwort	Status Uncertain	
Utricularia fibrosa	Fibrous bladderwort	Endangered	
Utricularia gibba	Humped bladderwort	Watchlist	

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Scientific Name	Common Name	State	US
Utricularia inflata	Swollen bladderwort	Endangered	
Utricularia purpurea	Purple bladderwort	Threatened	
Utricularia radiata	Small swollen bladderwort	Watchlist	
Utricularia resupinata	Reversed bladderwort	Endangered	
Utricularia subulata	Zig-zag bladderwort	Watchlist	
Uvularia grandiflora	Large-flowered bellwort	Highly Rare	
Uvularia puberula	Mountain bellwort	Watchlist	
Vaccinium macrocarpon	Large cranberry	Watchlist	
Vaccinium myrtilloides	Velvetleaf blueberry	Watchlist	
Vaccinium oxycoccos	Small cranberry	Threatened	
Valeriana pauciflora	Valerian	Endangered	
Valerianella chenopodiifolia	Goose-foot cornsalad	Endangered	
Valerianella umbilicata	Tall cornsalad	Endangered Extirpated	
Verbesina virginica		Status Uncertain	
Vernonia gigantea	Giant ironweed	Status Uncertain	
Veronica scutellata	Marsh speedwell	Endangered	
Viburnum lentago	Nannyberry	Highly Rare	
Vicia americana	Purple vetch	Endangered Extirpated	
Viola appalachiensis	Appalachian blue violet	Highly Rare	
Viola brittoniana	Britton's violet	Watchlist	
Viola incognita	Large-leaved white violet	Highly Rare	
Viola rostrata	Long-spurred violet	Watchlist	
Viola septentrionalis	Northern blue violet	Status Uncertain	
Vitis cinerea	Graybark	Status Uncertain	
Vitis novae-angliae	New England grape	Endangered Extirpated	
Vitis rupestris	Sand grape	Highly Rare	
Wolffia columbiana	Columbian water-meal	Watchlist	
Wolffia papulifera		Rare	
Wolffia punctata	Water-meal	Rare	
Wolffiella floridana	Wolffiella	Endangered Extirpated	
Woodsia ilvensis	Rusty woodsia	Threatened	
Xyris difformis	Variable yelloweyed-grass	Rare	
Xyris fimbriata	Fringed yelloweyed-grass	Endangered	
Xyris smalliana	Small's yelloweyed-grass	Endangered	
Zanthoxylum americanum	Northern prickly-ash	Endangered	
Zephyranthes atamasca	Atamasco lily	Highly Rare	
Zizia aurea	Golden alexanders	Watchlist	

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APPENDIX
LIST OF PLANT SYNONYM NAMES

Synonym Name	Listed Name
Agastache scrophulariaefolia	A. scrophulariifolia
Agave virginica	Manfreda virginica
Amelanchier stolonifera	A. spicata
Ammannia teres	A. latifolia
Ampelamus albidus	Cynanchum laeve
Arabis perstellata var. shortii	A. shortii
Arenaria groenlandica	Minuartia glabra
Arenaria lateriflora	Moehringa lateriflora
Arenaria peploides	Honkenya peploides
Arenaria stricta	Minuartia michauxii
Aristida dichotoma var. curtissii	A. curtissii
Aristolochia durior	A. macrophylla
Asplenium cryptolepis	A. ruta-muraria
Aster steeleorum	A. concinnus
Bacopa acuminata	Mecardonia acuminata
Bidens mariana	B. bidentoides
Botrychium dissectum forma oneidense	B. oneidense
Botrychium matricariaefolium	B. matricariifolium
Callitriche palustris	C. verna
Calopogon pulchellus	C. tuberosus
Carex cephalantha	C. echinata
Carex tetanica var. woodii	C. woodii
Ceratophyllum echinatum	C. muricatum
Chenopodium hybridum var. gigantospermum	C. gigantospermum
Chenopodium hybridum var. standleyanum	C. standleyanum
Clematis verticillaris	C. occidentalis
Convolvulus spithamaeus	Calystegia spithamaea
Coptis groenlandica	C. trifolia
Cyperus inflexus	C. aristatus
Digitaria filiformis var. villosa	D. villosa
Diplachne maritima	Leptochloa fascicularis
Dryopteris cristata var. clintoniana	D. clintoniana
Dryopteris disjuncta	Gymnocarpium dryopteris
Dryopteris spinulosa var. americana	D. campyloptera
Dryopteris spp.	Thelypteris spp.
Eleocharis ambigens	E. fallax
Eleocharis calva	E. erythropoda
Epilobium glandulosum var. adenocaulon	E. ciliatum
Erianthus coarctatus	E. brevibarbis
Euphorbia vermiculata	Chamaesyce vermiculata
Euthamia minor	Solidago microcephala
Fimbristylis baldwiniana	F. annua
Fimbristylis caroliniana	F. puberula
Fraxinus tomentosa	F. profunda
Gentiana crinita	Gentianopsis crinita
Gentiana puberulenta	G. puberula
Gentiana quinquefolia	Gentianella quinquefolia
Gerardia auriculata	Tomanthera auriculata
Gerardia laevigata	Aureolaria laevigata
Gerardia spp.	Agalinis spp.
Gillenia stipulata	Porteranthus stipulatus

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Synonym Name	Listed Name
Glyceria pallida	Puccinellia pallida
Gonolobus spp.	Matelea spp.
Habenaria fimbriata	Platanthera grandiflora
Habenaria spp.	Platanthera spp.
Habenaria viridis var. bracteata	Coeloglossum viride
Hedyotis michauxii	Houstonia serpyllifolia
Hedyotis uniflora	Oldenlandia uniflora
Helenium nudiflorum	H. flexuosum
Heracleum maximum	H. lanatum
Hexastylis virginicum	Asarum virginicum
Hibiscus militaris	H. laevis
Hypericum tubulosum	Triadenum tubulosum
Isanthus brachiatus	Trichostema brachiatum
Jussiaea decurrens	Ludwigia decurrens
Lophotocarpus calycina	Sagittaria calycina
Lycopodium inundatum var. inundatum	L. inundatum
Manisuris rugosa	Coelorachis rugosa
Melanthium hybridum	M. latifolium
Nemophila microcalyx	N. aphylla
Onosmodium hispidissimum	O. molle
Paxistima canbyi	Pachistima canbyi
Phaseolus polystachios	P. polystachyus
Phlox ovata	P. latifolia
Pseudotaenidia montana	Taenidia montana
Pteretis pensylvanica	Matteuccia struthiopteris
Ptilimnium fluviatile	P. nodosum
Pyrus floribunda	Aronia prunifolia
Ranunculus aquatilis	R. tricophyllus
Sagittaria australis	S. longirostra
Salix humilis var. microphylla	S. tristis
Salix interior	S. exigua
Scirpus lineatus	S. pendulus
Scirpus maritimus var. fernaldi	S. cylindricus
Scleria muhlenbergi	S. reticularis
Scutellaria epilobiifolia	S. galericulata
Scutellaria parvula var. leonardii	S. leonardii
Senecio smallii	S. anonymus
Silphium asteriscus	S. trifoliatum
Smilax tamnifolia	S. pseudo-china
Solidago racemosa	S. spathulata
Spiraea corymbosa	S. betulifolia
Spiranthes cernus var. ochroleuca	S. ochroleuca
Stachys nuttallii	S. cordata
Stachys riddellii	S. cordata
Tillaea aquatica	Crassula aquatica
Torreyochloa pallida	Puccinellia pallida
Trillium pusillum var. virginianum	T. pusillum
Trisetum pensylvanicum	Sphenopholis pensylvanica
Utricularia inflata var. minor	U. radiata
Uvularia pudica	U. puberula
Vernonia altissima	V. gigantea
Xanthoxylum americanum	Zanthoxylum americanum

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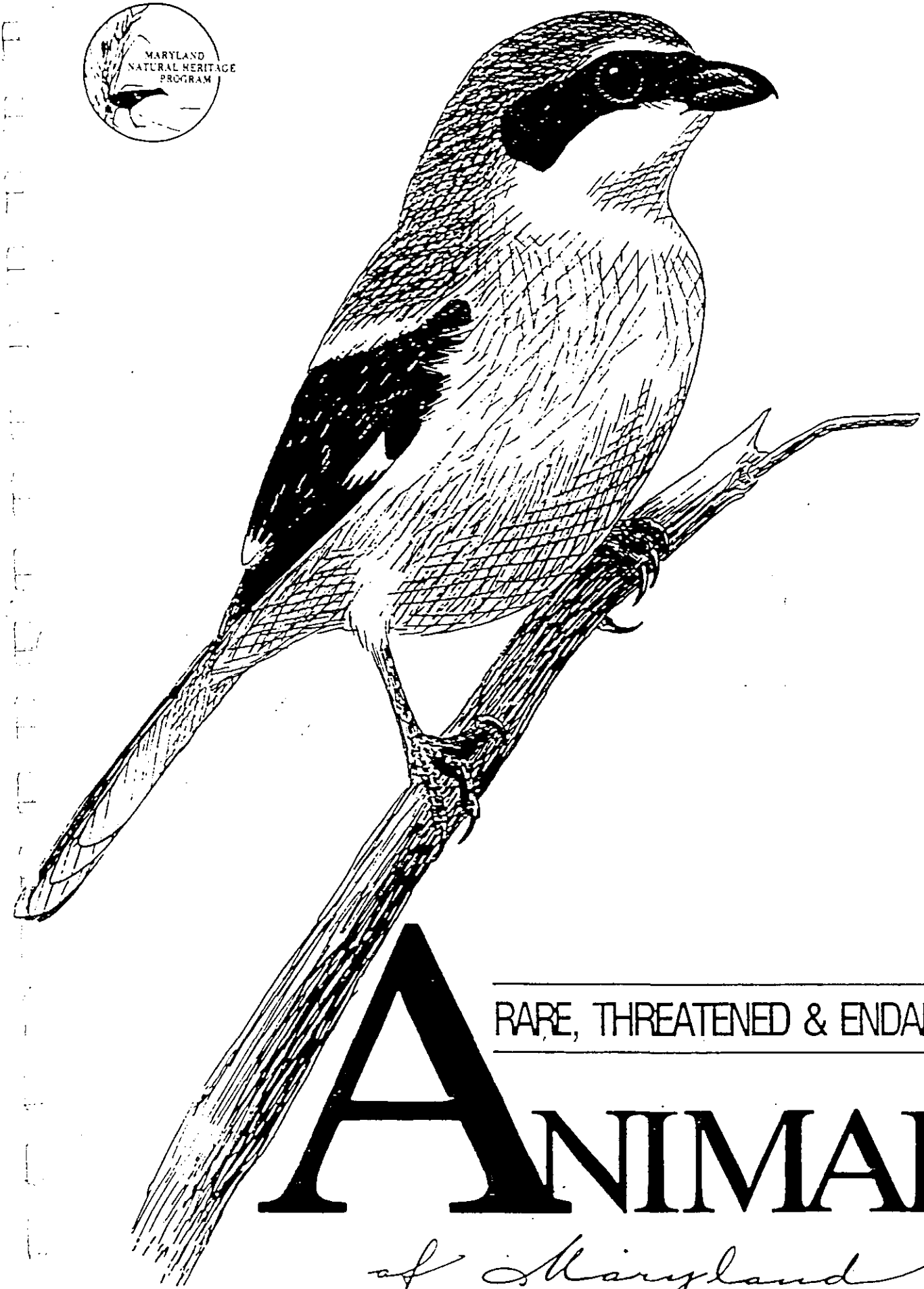
MARYLAND NATURAL HERITAGE PROGRAM



RARE, THREATENED & ENDANGERED

ANIMALS

of Maryland

AR301890

Maryland Department of Natural Resources, Forest, Park and Wildlife Service

RARE, THREATENED, AND ENDANGERED ANIMALS OF MARYLAND

May 18, 1992

Prepared by

Maryland Natural Heritage Program
Resource Conservation Service
Department of Natural Resources
Tawes State Office Building
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INTRODUCTION

The following list identifies those native animals of Maryland which are among the rarest and most in need of conservation. It has been compiled by the biologists of the Maryland Natural Heritage Program as part of an effort begun in 1979 to identify and protect rare and endangered species, the best remaining examples of rare species habitats, and significant natural areas throughout the State. The original version of this list was included in the Department of Natural Resources' 1984 publication Threatened and Endangered Plants and Animals of Maryland, which also contained detailed information on the known distribution and status of Maryland's rare species at that time.

Between 1984 and 1987, our knowledge of Maryland's fauna steadily grew. Through extensive field work, staff biologists located species which were previously unrecorded for the State and discovered that some species were more scarce than previously known. Similarly, some species were determined to be either more widespread or less vulnerable to ecological disturbances than previously believed. Thus, some species were added to the list, and some were downgraded in rarity status or even removed from the list.

In 1987, the list of species protected under Maryland's Nongame and Endangered Species Conservation Act, the Threatened and Endangered Species list, was revised to include a total of 76 animals, as well as 267 plants. Most of these species occur in the Chesapeake Bay region, and they were added to the list in conjunction with the Chesapeake Bay Critical Area legislation. In December of 1990, the Threatened and Endangered Species list was revised again to include species which inhabit Central and Western Maryland. Thus, a total of 121 animals and 497 plants are currently protected by State law.

However, Natural Heritage Program biologists are concerned with many more species than those included on the State's Threatened and Endangered Species list. Some of these species are potential candidates for listing and usually require further investigation into their rarity and endangerment status. Others are thought to be secure at present, but are worthy of attention because of limited distributions, declining populations, or ecological vulnerabilities. In order to track the status of these potential candidates and other declining species, the Natural Heritage Program maintains a list of these species in addition to the Threatened and Endangered Species list. As our knowledge of Maryland's vertebrates and invertebrates continues to grow, both the Threatened and Endangered Species list and the "unofficial" Natural Heritage Program list will periodically require revision.

ABOUT THIS LIST

The list of Maryland's rare, threatened, and endangered animals is arranged phylogenetically beginning with the most primitive group, planarians. Within each major group, species are listed alphabetically by scientific name. It should be noted that birds and some migratory insects are included on the basis of their breeding status alone. For example, Dark-eyed Juncos are abundant backyard birds during the winter; however, they breed in only a few remote areas in Western Maryland during the summer. Birds and other migrants that are rare

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Maryland breeders are included regardless of their status during non-breeding seasons. Other migrant species, such as whales and sea turtles, have been included because of their Federal status even though they typically do not breed in Maryland.

Two columns under the heading STATUS are printed to the right of each name. The first column (STATE) is the species' status in Maryland as determined by the Department of Natural Resources. If the species is included on the Department's Threatened and Endangered Species list (COMAR 08.03.08), its official status is given. If the species does not appear on the official list, its unofficial status as determined by the Department's Natural Heritage Program is given. Species in the latter category may be candidates for State-listing. The codes in the second column (US) refer to the national status of each species of concern to the U.S. Fish and Wildlife Service. Definitions of the State and Federal status categories are provided below.

Explanation of Status Categories

State

Status as determined by the Maryland Department of Natural Resources. The first four categories are those included in the Department's Threatened and Endangered Species list. **Legal protection is provided only to species designated under one of these four categories.** The remaining six categories are unofficial designations as determined by the Department's Natural Heritage Program.

Endangered Extirpated- a species that was once a viable component of the flora or fauna of the State, but for which no naturally occurring populations are known to exist in the State.

Endangered - a species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy.

Threatened - a species of flora or fauna which appears likely, within the foreseeable future, to become endangered in the State.

In Need of Conservation - an animal species whose population is limited or declining in the State such that it may become threatened in the foreseeable future if current trends or conditions persist.

Extirpated - a species that is historically known from the State, but has not been verified for an extended period, usually 40 years, and is apparently extirpated; or any species whose only known populations have been destroyed.

Historical - a species that is historically known from the State, but has not been verified for an extended period, usually 15 years.

Highly Rare - a species which typically has five or fewer current, naturally occurring, viable populations remaining in the State.

Rare - a species which typically has between five and twenty current, naturally occurring, viable populations remaining in the State.

Status Uncertain - an uncommon species considered to be of concern in the State, but with an uncertain status due to inadequate data to determine rarity, question of taxonomic classification, the possibility that reports of Maryland populations are based on misidentified specimens, or the possibility that the species is not native and naturally occurring in the State.

Watchlist - an uncommon species which is typically thought to be secure in the State, but which is worthy of attention or monitoring due to limited distribution, declining populations, or ecological vulnerabilities; and which may become rare in the foreseeable future.

Federal

Status as determined by the U.S. Fish and Wildlife Service's Office of Endangered Species, in accordance with the Endangered Species Act of 1973.

LE - a species currently listed as Endangered in the U.S.; a species which is in danger of extinction throughout all or a significant portion of its range.

LT - a species currently listed as Threatened in the U.S.; a species which is likely to become an Endangered species within the foreseeable future throughout all or a significant portion of its range.

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C1 - a candidate taxon for federal listing for which substantial information exists on biological vulnerability and threat(s) to support proposals to list the taxon as Endangered or Threatened.

C2 - a candidate taxon for federal listing for which information indicates that listing as Endangered or Threatened is possibly appropriate, but for which substantial data on biological vulnerability and threat(s) are not currently known or on file to support proposed rules.

3A - a taxon for which available information indicates probable extinction or destruction of the habitat from which it was known.

3C - a taxon which has proven to be more abundant or widespread than was previously believed and/or is not subject to any identifiable threat.

OTHER LISTS AND INFORMATION

The U.S. Fish and Wildlife Service's Office of Endangered Species publishes a list of federally-designated threatened and endangered species, as well as those species considered to be candidates for official listing. Copies of the U.S. Department of Interior's booklet, "Endangered & Threatened Wildlife and Plants," published April 15, 1990, can be obtained from the Publication Unit, U.S. Fish and Wildlife Service, Washington, DC 20240.

The Department of Natural Resources' Tidewater Administration maintains an official list of game and commercial fish species that are designated as endangered, threatened, or in need of conservation in Maryland. The list of Endangered and Threatened Fish Species (COMAR 08.02.12) can be obtained by contacting the Tidewater Administration, Fisheries Division, Department of Natural Resources, Tawes State Office Building C-2, Annapolis, MD 21401.

To obtain additional copies of this list, to receive a copy of "Rare, Threatened, and Endangered Plants of Maryland," or to receive other information on Maryland's rare species and natural areas, please contact the Maryland Natural Heritage Program at the address shown above.

* * *

The Natural Heritage Program is the lead State agency for the identification, ranking, and protection of Maryland's rare species and significant natural areas. Staff biologists obtain information on the biology and status of rare native flora and fauna from various sources, including scientific experts, knowledgeable amateur naturalists, and research projects funded through the Chesapeake Bay and Endangered Species tax check-off. You can take an active part in protecting Maryland's rare species by contacting the Natural Heritage Program with the following types of information:

1. Location and population size/vigor information for any species on the Program's rare, threatened, and endangered species list, including historical information.

2. Data indicating that a species should be assigned to a category other than the one in which it appears.

3. Nominations of additional rare species to be included on the list or of species that should be deleted from the list, with supporting data.

4. Documentation of threats to any rare species populations, including the species' habitat.

5. Information on the biology or ecology of rare species and references to the species in the literature.

6. Any additional information that would support the protection, conservation, or management of rare species, habitats, or natural communities in Maryland.

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RARE, THREATENED, AND ENDANGERED ANIMALS OF MARYLAND

Maryland Natural Heritage Program
Department of Natural Resources
May 18, 1992

Scientific Name	Common Name	State	US
	PLANARIANS		
Phagocata virilis	A planarian	Highly Rare	
Planaria dactyligera	A planarian	Rare	
Procotyla typhlops	A planarian	Endangered	C2
Sphalloplana hoffmasteri	Hoffmaster's cave planarin	Endangered	
Sphalloplana sp. 1	A planarian	Highly Rare	
	MOLLUSCS		
Alasmidonta heterodon	Dwarf wedge mussel	Endangered	LE
Alasmidonta varicosa	Brook floater	Extirpated	C2
Anguispira clarki	Clark's beehive snail	Highly Rare	
Fontigens bottimeri	Appalachian spring snail	Watchlist	
Glyphyalinia raderi	Rader's snail	Endangered Extirpated	C2
Hendersonia occulta	Cherrydrop snail	Endangered	
Lasmigona subviridis	Green floater	Endangered	C2
	CRUSTACEANS		
Ankylocythere tridentata	An entocytherid ostracod	Extirpated	
Attheyella spinipes	A harpacticoid copepod	Status Uncertain	
Caecidotea franzi	Franz's cave isopod	Endangered	C2
Caecidotea pricei	Price's cave isopod	Watchlist	
Caecidotea sp. 1	An isopod	Highly Rare	
Caecidotea sp. 2	An isopod	Highly Rare	
Caecidotea sp. 3	An isopod	Highly Rare	
Crangonyx dearolfi	Dearolf's cave isopod	Endangered	C2
Dactylocythere scotos	An entocytherid ostracod	Highly Rare	
Diacyclops palustris	A cyclopoid copepod	Status Uncertain	
Eulimnadia francesae	A conchostracan phyllopod	Highly Rare	
Eulimnadia ventricosa	A conchostracan phyllopod	Highly Rare	
Stygobromus allegheniensis	Allegheny cave amphipod	Threatened	
Stygobromus biggersi	Biggers' cave amphipod	Endangered	C2
Stygobromus emarginatus	Greenbrier cave amphipod	Endangered	
Stygobromus franzi	Franz's cave amphipod	Threatened	3C
Stygobromus gracilipes	Shenandoah cave amphipod	Endangered	
Stygobromus pizzinii	Pizzini's cave amphipod	Highly Rare	C2
Stygobromus sp. 5	Crabtree cave amphipod	Highly Rare	
Stygobromus sp. 6	An amphipod	Highly Rare	
Stygobromus tenuis	Potomac amphipod	Watchlist	

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Scientific Name	Common Name	State	US
	SPIDERS		
Atypus bicolor	American purse-web spider	Highly Rare	
Oreonetides sp. 1	Snivelys cave spider	Status Uncertain	
Porrhomma cavernicolum	Appalachian cave spider	Rare	
	INSECTS		
Collembola			
Arrhopalites sp. 1	Crabtree cave springtail	Status Uncertain	
Ephemeroptera			
Potamanthus walkeri	Walker's tusked sprawler	Status Uncertain	
Odonata			
Stylurus notatus	Elusive clubtail dragonfly	Highly Rare	C2
Tachopteryx thoreyi	Thorey's grayback damselfly	Status Uncertain	
Homoptera			
Chlorotettix sp. 1	A cicadellid leafhopper	Status Uncertain	
Limotettix sp. 1	Eastern sedge barrens planthopper	Highly Rare	C2
Coleoptera			
Cicindela dorsalis dorsalis	Northeastern beach tiger beetle	Endangered	LT
Cicindela dorsalis media	White tiger beetle	Endangered	
Cicindela lepida	Little white tiger beetle	Highly Rare	
Cicindela patruela	A tiger beetle	Highly Rare	
Cicindela puritana	Puritan tiger beetle	Endangered	LT
Cicindela purpurea	A tiger beetle	Watchlist	
Cicindela scutellaris	A tiger beetle	Watchlist	
Cicindela splendida	A tiger beetle	Watchlist	
Cicindela unipunctata	A tiger beetle	Watchlist	
Dryobius sexnotatus	Six-banded longhorn beetle	Endangered	C2
Helops cisteloides	A tenebrionid beetle	Status Uncertain	
Hoperius planatus	A hydrophylid beetle	Extirpated	
Hydrochara occulta	A hydrophylid beetle	Rare	
Hydrochus sp. 1 (spangleri)	Seth forest water scavenger beetle	Extirpated	C2
Laccophilus schwarzi	Schwarz' diving beetle	Extirpated	3C
Lucanus elephas	Giant stag beetle	Highly Rare	
Nicrophorus americanus	American burying beetle	Highly Rare	LE
Scymnus gordoni	A coccinellid beetle	Status Uncertain	
Sperchopsis tessellatus	A hydrophylid beetle	Rare	
Trichoptera			
Hydropsyche brunneipennis	A scalaris trichopteran	Watchlist	
Lepidoptera – Butterflies			
Amblyscirtes hegon	Pepper-and-salt skipper	Highly Rare	
Autochton cellus	Golden-banded skipper	Endangered	
Boloria selene	Silver-bordered fritillary	Watchlist	
Calephelis borealis	Northern metalmark	Threatened	
Celastrina ebenina	Sooty azure	Endangered	
Celastrina neglectamajor	Appalachian blue	Watchlist	
Chlosyne harrisii	Harris' checkerspot	Threatened	

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Scientific Name	Common Name	State	US
Colias interior	Pink-edged sulphur	Highly Rare	
Cyllopsis gemma	Gemmed satyr	Status Uncertain	
Erora laeta	Early hairstreak	Endangered	
Erynnis martialis	Mottled duskywing	Endangered	
Erynnis persius	Persius duskywing	Status Uncertain	
Euchloe olympia	Olympia marble	Rare	
Euphyes bimacula	Two-spotted skipper	Endangered	
Euphyes dion	Sedge skipper	Watchlist	
Euphyes pilatka	Saw-grass skipper	Status Uncertain	
Fixsenia ontario	Northern hairstreak	Endangered	
Glaucopsyche lygdamus	Silvery Blue	Watchlist	
Hermeuptychia sosybius	Carolina satyr	Rare	
Hesperia attalus	Dotted skipper	Historical	
Hesperia sassacus	Indian skipper	Watchlist	
Incisalia irus	Frosted elfin	Endangered	
Lycaena epixanthe	Bog copper	Endangered	
Mitoura hesseli	Hessel's hairstreak	Historical	3C
Nymphalis vau-album	Compton's tortoiseshell	Endangered	
Papilio cresphontes	Giant swallowtail	In Need of Conservation	
Papilio palamedes	Palamedes swallowtail	Highly Rare	
Phyciodes batesii	Tawny crescentspot	Endangered Extirpated	C2
Polites mystic	Long dash	Watchlist	
Polygonia progne	Gray comma	Watchlist	
Problema bulenta	Rare skipper	Threatened	C2
Pyrgus wyandot	Southern grizzled skipper	Endangered	
Satyrium acadica	Acadian hairstreak	Status Uncertain	
Satyrium caryaevorum	Hickory hairstreak	Endangered	
Satyrium edwardsii	Edwards' hairstreak	Endangered	
Satyrium kingi	King's hairstreak	In Need of Conservation	
Speyeria atlantis	Atlantis fritillary	Threatened	
Speyeria diana	Diana	Extirpated	C2
Speyeria idalia	Regal fritillary	Endangered	C2
Lepidoptera – Moths			
Apamea apamiformis	A noctuid moth	Rare	
Apamea plutonia	A noctuid moth	Status Uncertain	
Capis curvata	A noctuid moth	Status Uncertain	
Catocala marmorata	Marbled underwing	Historical	3C
Catocala pretiosa	Precious underwing	Historical	C2
Cyclophora nanaria	A geometrid moth	Status Uncertain	
Dasychira atrivenosa	A lymantriid moth	Status Uncertain	
Ectoedemia castaneae	American chestnut nepticulid moth	Historical	3A
Ectoedemia phleophaga	Phleophagan chestnut nepticulid moth	Historical	3A
Elaphria georgei	A noctuid moth	Status Uncertain	
Hadena ectypa	A noctuid moth	Status Uncertain	
Hemileuca maia ssp. 4	Woodland buckmoth	Status Uncertain	
Isoparce cupressi	Cypress sphinx moth	Status Uncertain	
Lytrosis sinuosa	Sinuous lytrosis	Status Uncertain	
Meropleon diversicolor	A noctuid moth	Status Uncertain	
Meropleon titan	A noctuid moth	Status Uncertain	

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Scientific Name	Common Name	State	US
Papaipema duovata	A noctuid moth	Status Uncertain	
Papaipema marginidens	A noctuid moth	Historical	
Papaipema polymniae	Polymnia stalk borer	Historical	
Schinia parmeliana	A noctuid moth	Historical	
Sphinx franckii	Franck's sphinx	Historical	
Synanthedon castaneae	Chestnut clearwing moth	Extirpated	C2
Xestia bollii	A noctuid moth	Status Uncertain	
Zale submediana	A noctuid moth	Status Uncertain	
	FISHES		
Acantharchus pomotis	Mud sunfish	Rare	
Acipenser brevirostrum	Shortnose sturgeon	Endangered	LE
Acipenser oxyrhynchus	Atlantic sturgeon	Rare	
Catostomus catostomus	Longnose sucker	Endangered	
Centrarchus macropterus	Flier	Status Uncertain	
Clinostomus elongatus	Redside dace	Highly Rare	
Cottus cognatus	Slimy sculpin	Threatened	
Enneacanthus chaetodon	Blackbanded sunfish	In Need of Conservation	
Etheostoma sellare	Maryland darter	Endangered	LE
Etheostoma vitreum	Glassy darter	Endangered Extirpated	
Fundulus luciae	Spotfin killifish	Rare	
Noturus flavus	Stonecat	Highly Rare	
Percina caprodes	Logperch	Highly Rare	
Percina notogramma	Stripeback darter	Endangered Extirpated	
Percopsis omiscomaycus	Trout-perch	Endangered Extirpated	
Rhinichthys bowersi	Cheat minnow	Endangered	C2
	AMPHIBIANS		
Ambystoma jeffersonianum	Jefferson salamander	Watchlist	
Ambystoma tigrinum	Eastern tiger salamander	Endangered	
Aneides aeneus	Green salamander	Endangered	
Cryptobranchus alleganiensis	Hellbender	Endangered	C2
Gastrophryne carolinensis	Eastern narrow-mouthed toad	Endangered	
Hyla gratiosa	Barking treefrog	Endangered	
Necturus maculosus	Mudpuppy	Endangered Extirpated	
Plethodon wehrlei	Wehrle's salamander	In Need of Conservation	
Pseudacris brachyphona	Mountain chorus frog	In Need of Conservation	
Rana virgatipes	Carpenter frog	In Need of Conservation	
Siren lacertina	Greater siren	Endangered Extirpated	
	REPTILES		
Apalone spinifera	Eastern spiny softshell	In Need of Conservation	
Caretta caretta	Atlantic loggerhead turtle	Threatened	LT
Cemophora coccinea	Eastern scarlet snake	Watchlist	
Chelonia mydas	Atlantic green turtle	Threatened	LT
Clemmys muhlenbergii	Bog turtle	Watchlist	C2
Dermochelys coriacea	Atlantic leatherback turtle	Endangered	LE
Eretmochelys imbricata	Atlantic hawksbill turtle	Endangered	LE
Eumeces anthracinus	Northern coal skink	Endangered	

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Scientific Name	Common Name	State	US
Farancia erytrogramma	Rainbow snake	Endangered Extirpated	
Graptemys geographica	Map turtle	In Need of Conservation	
Lepidochelys kempii	Atlantic ridley turtle	Endangered	LE
Pituophis melanoleucus	Northern pine snake	Historical	C2
Virginia valeriae pulchra	Mountain earth snake	Endangered	
	BIRDS		
Accipiter gentilis	Northern goshawk	Endangered	C2
Accipiter striatus	Sharp-shinned hawk	Highly Rare	
Aegolius acadicus	Northern saw-whet owl	Highly Rare	
Aimophila aestivalis	Bachman's sparrow	Endangered Extirpated	C2
Ammodramus henslowii	Henslow's sparrow	In Need of Conservation	
Asio flammeus	Short-eared owl	In Need of Conservation	
Asio otus	Long-eared owl	Historical	
Bartramia longicauda	Upland sandpiper	Endangered	
Botaurus lentiginosus	American bittern	In Need of Conservation	
Campephilus principalis	Ivory-billed woodpecker	Endangered Extirpated	LE
Carpodacus purpureus	Purple finch	Watchlist	
Catharus ustulatus	Swainson's thrush	Extirpated	
Charadrius melodus	Piping plover	Endangered	LT
Charadrius wilsonia	Wilson's plover	Endangered	
Chondestes grammacus	Lark sparrow	Endangered Extirpated	
Circus cyaneus	Northern harrier	Rare	
Cistothorus platensis	Sedge wren	In Need of Conservation	
Contopus borealis	Olive-sided flycatcher	Endangered	
Dendroica coronata	Yellow-rumped warbler	Status Uncertain	
Dendroica fusca	Blackburnian warbler	Threatened	
Egretta caerulea	Little blue heron	Rare	
Egretta tricolor	Tricolored heron	Watchlist	
Empidonax alnorum	Alder flycatcher	In Need of Conservation	
Falco peregrinus	Peregrine falcon	Endangered	LE
Gallinula chloropus	Common moorhen	In Need of Conservation	
Haematopus palliatus	American oystercatcher	Rare	
Haliaeetus leucocephalus	Bald eagle	Endangered	LE
Ixobrychus exilis	Least bittern	In Need of Conservation	
Junco hyemalis	Dark-eyed junco	Rare	
Lanius ludovicianus	Loggerhead shrike	Endangered	C2
Laterallus jamaicensis	Black rail	In Need of Conservation	C2
Limnothlypis swainsonii	Swainson's warbler	In Need of Conservation	
Lophodytes cucullatus	Hooded merganser	Highly Rare	
Numenius borealis	Eskimo curlew	Endangered Extirpated	LE
Oporornis philadelphia	Mourning warbler	Endangered	
Picoides borealis	Red-cockaded woodpecker	Endangered Extirpated	LE
Podilymbus podiceps	Pied-billed grebe	Rare	
Porzana carolina	Sora	Highly Rare	
Regulus satrapa	Golden-crowned kinglet	Rare	
Rynchops niger	Black skimmer	Threatened	
Sitta canadensis	Red-breasted nuthatch	Highly Rare	
Sphyrapicus varius	Yellow-bellied sapsucker	Historical	
Spiza americana	Dickcissel	Watchlist	
Sterna antillarum	Least tern	In Need of Conservation	

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Scientific Name	Common Name	State	US
Sterna dougallii	Roseate tern	Endangered Extirpated	LE
Sterna maxima	Royal tern	Endangered	
Sterna nilotica	Gull-billed tern	Threatened	
Sterna sandvicensis	Sandwich tern	Highly Rare	
Thryomanes bewickii	Bewick's wren	Endangered	C2
Troglodytes troglodytes	Winter wren	Rare	
Tympanuchus cupido	Greater prairie chicken	Endangered Extirpated	LE
Tyto alba	Common barn-owl	Watchlist	
Vermivora ruficapilla	Nashville warbler	In Need of Conservation	
	MAMMALS		
Balaena glacialis	Black right whale	Endangered	LE
Balaenoptera borealis	Sei whale	Endangered	LE
Balaenoptera musculus	Blue whale	Endangered	LE
Balaenoptera physalus	Finback whale	Endangered	LE
Canis lupus	Gray wolf	Endangered Extirpated	LE
Cervus canadensis	American elk	Endangered Extirpated	
Condylura cristata parva	Southeastern star-nosed mole	Status Uncertain	3C
Erethizon dorsatum	Porcupine	In Need of Conservation	
Felis concolor	Eastern mountain lion	Endangered Extirpated	LE
Lepus americanus	Snowshoe hare	Endangered Extirpated	
Lynx rufus	Bobcat	In Need of Conservation	
Martes americana	Marten	Endangered Extirpated	3C
Megaptera novaeangliae	Humpback whale	Endangered	LE
Microtus chrotorrhinus	Southern rock vole	Endangered	C2
Mustela nivalis	Least weasel	In Need of Conservation	
Myotis leibii	Eastern small-footed bat	In Need of Conservation	C2
Myotis sodalis	Indiana bat	Endangered	LE
Neotoma floridana	Eastern woodrat	In Need of Conservation	C2
Physeter catodon	Sperm whale	Endangered	LE
Reithrodontomys humulis	Eastern harvest mouse	Endangered Extirpated	
Sciurus niger cinereus	Delmarva fox squirrel	Endangered	LE
Sorex dispar	Long-tailed shrew	In Need of Conservation	3C
Sorex fumeus	Smoky shrew	Threatened	
Sorex hoyi winnemana	Southern pygmy shrew	Rare	3C
Sorex longirostris	Southeastern shrew	In Need of Conservation	
Sorex palustris	Southern water shrew	Endangered	C2
Spilogale putorius	Eastern spotted skunk	Highly Rare	
Sylvilagus transitionalis	New England cottontail	In Need of Conservation	C2
Ursus americanus	Black bear	Rare	

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Maryland's Threatened and Endangered Species List and Regulations

COMAR 08.03.08

This pamphlet is a slightly modified printing of the Threatened and Endangered Species list and regulations found in the Code of Maryland Regulations (COMAR 08.03.08). The page numbering and formatting of the regulations have been changed from that found in COMAR in order to allow the regulations to be printed on fewer pages. In addition, scientific names are italicized in this printing in accordance with accepted scientific practice. Scientific names are not italicized in COMAR. Otherwise, this printing is believed to be an accurate representation of the text of COMAR 08.03.08. The purpose of this printing is to make Maryland's Threatened and Endangered Species list and regulations more readily available to the public.

Maryland's Threatened and Endangered Species list and regulations, which includes both plants and animals, appears in the Wildlife subtitle of the Code of Maryland Regulations. The list and regulations are administered by the Maryland Natural Heritage Program in cooperation with other divisions within the State Department of Natural Resources. The list includes federally-listed species and some species which meet Maryland's statutory definition of fish. The fish species included in this list are "non-game" species which are not of sport or commercial significance.

The Tidewater Administration within the Department of Natural Resources also maintains a list of fish species that are designated as Endangered, Threatened, or In Need of Conservation, under COMAR 08.02.12, Endangered and Threatened Fish Species. This list includes federally-listed species and fish species of sport or commercial significance. Regulations implementing protective measures for fish species listed by the Tidewater Administration appear under COMAR 08.02.

The Maryland Natural Heritage Program is the lead State agency for the identification, ranking, and protection of Maryland's rare species and significant natural areas.

Maryland Department of Natural Resources
Maryland Natural Heritage Program
Tawes State Office Building, B-2
Annapolis, Maryland 21401
410 (301) 974-2870
20 August 1991

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Chapter 08 Threatened and Endangered Species

Authority: Natural Resources Article, §§4-2A-01 — 4-2A-09 and 10-2A-01 — 10-2A-09, Annotated Code of Maryland

.01 Definitions.

A. The following terms have the meanings indicated.

B. Terms Defined.

(1) "Endangered extirpated species" means any species that was once a viable component of the flora or fauna of the State but for which no naturally occuring populations are known to exist in the State. Most of these species have not been recorded in Maryland since 1950.

(2) "Endangered species" means any species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy including any species determined to be an "endangered species" pusuant to the federal Endangered Species Act of 1973, 16 U.S.C. §§1531 — 1543.

(3) "Incidental taking" means takings of listed species that are incidental to, and not the purpose of, the carrying out of an otherwise lawful activity conducted by a person on private property.

(4) "Jeopardize the continued existence of" means to engage in an action which reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of either the survival or recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of a listed species or otherwise adversely affecting the species.

(5) "Listed species" means a species of flora or fauna deemed endangered, threatened or in need of conservation in this chapter due to any of the following factors:

(a) Present or threatened destruction, modification, or curtailment of the species' habitat or range;

(b) Overutilization for commercial, sporting, scientific, educational, or other purposes;

(c) Disease or predation;

(d) Inadequacy of existing regulatory mechanisms; or

(e) Other natural or manmade factors affecting the species' continued existence within the State.

(6) "Natural heritage area" means any natural community of species designated in Regulation .10 in this chapter.

(7) "Person" means any county, municipal corporation, or other political subdivision of the State, an individual, corporation, receiver, trustee, guardian, executor, administrator, fiduciary, or representative.

(8) "Secretary" means the Secretary of the Department of Natural Resources.

(9) "Service" means the Maryland Forest, Park and Wildlife Service.

(10) "Species" means any species of wildlife or plant and reptiles, amphibians, crustaceans, mollusks and the following finfish: *Catostomus catostomus, Cottus cognatus, Enneacanthus chaetodon, Etheostoma sellare, Etheostoma vitreum, Percina notogramma, Percopsis omiscomaycus, Rhinichthys bowersi,* or any part, egg, offspring, or dead body of any of them.

(11) "Species in need of conservation" means any species determined by the Secretary to be in need of conservation measures for its continued ability to sustain itself successfully.

(12) "Take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct.

(13) "Threatened species" means any species of flora or fauna which appears likely, within the foreseeable future, to become endangered including any species determined to be a "threatened species" pursuant to the federal Endangered Species Act of 1973, 16 U.S.C. §§1531 — 1543.

.02 Petitioning.

A. Except for species determined to be threatened or endangered pursuant to the federal Endangered Species Act of 1973, 16 U.S.C. §§1531 — 1543, any interested person may petition the Director to add or remove a species or natural heritage area to or from a list in this chapter. The Director shall review the evidence regarding the requested action and make a recommendation to the Secretary whether or not to list or delist the species or natural heritage area.

B. In a petition to list or delist a natural heritage area, the following information shall be provided:

(1) A map of the proposed natural heritage area;

(2) A description of the physical boundaries of the proposed area, total acreage, landowner name and address;

(3) A description of the biological community represented by the natural heritage area including, as far as practical, a list of the fauna and flora there, and other geologic, hydrologic, or other features which blend together to make this area unique;

(4) A description of all major threats to the continued existence of the area, or if petitioning to delist an area, a description of how the natural features and species composition of the area have changed so it is no longer suitable to be designated as a natural heritage area;

(5) A statement indicating why the area should or should not be considered as among the best statewide examples of its kind;

(6) Other relevant information which might assist the Director in making a determination.

C. All sites used for evidence of current abundance shal be extant and all sitings shall be documented with appropriate vouchers. In a petition to list or delist a specie the following information shall be provided:

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(1) A description of the biological distribution of the species in Maryland.

(2) Its life needs and habitat requirements.

(3) Evidence of its decline or evidence that is more common than previously believed and documented.

(4) All known threats which jeopardize its continued existence.

(5) Other relevant biological and ecological data or other life history information pertinent to its status.

(6) The species shall be presently recognized as a valid species, or infraspecific taxa of regional or national significance. There shall be adequate documentation that it occurs naturally and is permanently established in Maryland.

.03 Permits.

A. Permits to take, transport, possess, sell, offer for sale, export or import any listed species may be obtained from the Director only after written application on a form provided by the Service, and upon payment of a fee of $25.

B. Each permit shall be subject to an expiration date and other limitations as may be prescribed by the Director.

C. Each permit application requesting permission to take a listed species from private property shall be accompanied by a signed statement from the landowner granting the applicant permission to enter the property to take the species.

D. A permit application shall describe the purpose of the request in such detail that the Director can determine whether it is in the best interest of the species and the State to issue it.

E. The Director shall consider, but not be limited to, the following information:

(1) The number of other known occurrences of the species in the State;

(2) Which of the occurrences of the species in §E(1) exist on:

(a) Private lands,

(b) Public lands, and

(c) What protection there is for the species' continued existence.

(3) The number of individuals in the occurrences of the species in §E(1) and the relative state of ecological stability.

F. Violation of any provision or restriction of the permit shall constitute a violation of this regulation and may result, at the discretion of the Director, in the revocation of the permit and confiscation of the species taken or possessed.

.04 Endangered Species of Wildlife, Reptiles, Amphibians, Mollusks, Crustaceans, and Finfish.

A. Listing Criteria. The following factors shall be considered for listing any species other than plants as endangered:

(1) Whether the species is restricted to a minimal geographic area within Maryland;

(2) Whether the species has experienced a rapid, substantial decline in Maryland, and if the decline continues, the species' extirpation from Maryland is imminent;

(3) Whether the species' essential habitat has been rapidly lost and that loss is likely to continue;

(4) Whether the species' biology makes it highly susceptible to changes in its environment; or

(5) Whether the species' essential habitat is easily altered by even relatively minor activities.

B. Permits. The permit procedures to be followed are set forth in Regulation .03. The following apply:

(1) Permits shall be issued only for:

(a) Scientific research designed to enhance the recovery of the species or population, or

(b) Appropriate educational purposes designed to further public awareness regarding the species;

(2) A person may not take, export, possess, process, sell or offer for sale, deliver, carry, transport, or ship by any means any endangered wildlife, reptile, amphibian, mollusk, crustacean, or finfish species except by special permit from the Director.

C. The following wildlife, reptile, amphibian, mollusk, crustacean, and finfish species are considered endangered throughout Maryland unless a smaller range is indicated:

(1) Platyhelminthes:

(a) A Planarian (*Procotyla typhlops*);

(b) Hoffmaster's Cave Planarian (*Sphalloplana hoffmasteri*).

(2) Mollusks:

(a) Dwarf Wedge Mussel (*Alasmidonta heterodon*);

(b) Cherrydrop Snail (*Hendersonia occulta*);

(c) Green Floater (*Lasmigona subviridis*).

(3) Crustaceans:

(a) Franz's Cave Isopod (*Caecidotea franzi*);

(b) Dearolf's Cave Isopod (*Crangonyx dearolfi*);

(c) Biggers' Cave Amphipod (*Stygobromus biggersi*);

(d) Greenbrier Cave Amphipod (*Stygobromus emarginatus*);

(e) Shenandoah Cave Amphipod (*Stygobromus gracilipes*).

(4) Insects:

(a) Gold-banded Skipper (*Autochton cellus*);

(b) Sooty Azure (*Celastrina ebenina*);

(c) Northeastern Beach Tiger Beetle (*Cicindela dorsalis*);

(d) Puritan Tiger Beetle (*Cicindela puritana*);

(e) Six-banded Longhorn Beetle (*Dryobius sexnotatus*);

(f) Early Hairstreak (*Erora laeta*);

(g) Mottled Duskywing (*Erynnis martialis*);

(h) Two-spotted Skipper (*Euphyes bimacula*);

(i) Northern Hairstreak (*Fixsenia ontario*);

(j) Frosted Elfin (*Incisalia irus*);

(k) Bog Copper (*Lycaena epixanthe*);

(l) Compton Tortoiseshell (*Nymphalis vau-album*);

(m) Southern Grizzled Skipper (*Pyrgus wyandot*);

(n) Hickory Hairstreak (*Satyrium caryaevorum*);

(o) Edwards' Hairstreak (*Satyrium edwardsii*);

(p) Regal Fritillary (*Speyeria idalia*).

(5) Fish:

(a) Longnose Sucker (*Catostomus catostomus*);

(b) Maryland Darter (*Etheostoma sellare*);

(c) Cheat Minnow (*Rhinichthys bowersi*).

(6) Amphibians:

(a) Eastern Tiger Salamander (*Ambystoma tigrinum*);

(b) Green Salamander (*Aneides aeneus*);

(c) Hellbender (*Cryptobranchus alleganiensis*);

(d) Eastern Narrow-mouthed Toad (*Gastrophryne carolinensis*);

(e) Barking Treefrog (*Hyla gratiosa*).

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(7) Reptiles:
(a) Atlantic Leatherback Turtle (*Dermochelys coriacea*);
(b) Atlantic Hawksbill Turtle (*Eretmochelys imbricata*);
(c) Northern Coal Skink (*Eumeces anthracinus*);
(d) Atlantic Ridley Turtle (*Lepidochelys kempii*);
(e) Mountain Earth Snake (*Virginia valeriae pulchra*).
(8) Birds:
(a) Northern Goshawk (*Accipiter gentilis*);
(b) Upland Sandpiper (*Bartramia longicauda*);
(c) Piping Plover (*Charadrius melodus*);
(d) Wilson's Plover (*Charadrius wilsonia*);
(e) Olive-sided Flycatcher (*Contopus borealis*);
(f) Peregrine Falcon (*Falco peregrinus*);
(g) Bald Eagle (*Haliaeetus leucocephalus*);
(h) Loggerhead Shrike (*Lanius ludovicianus*);
(i) Mourning Warbler (*Oporornis philadelphia*);
(j) Royal Tern (*Sterna maxima*);
(k) Bewick's Wren (*Thryomanes bewickii*).
(9) Mammals:
(a) Black Right Whale (*Balaena glacialis*);
(b) Sei Whale (*Balaenoptera borealis*);
(c) Blue Whale (*Balaenoptera musculus*);
(d) Finback Whale (*Balaenoptera physalus*);
(e) Humpback Whale (*Megaptera novaeangliae*);
(f) Southern Rock Vole (*Microtus chrotorrhinus*);
(g) Indiana Bat (*Myotis sodalis*);
(h) Sperm Whale (*Physeter catodon*);
(i) Delmarva Fox Squirrel (*Sciurus niger cinereus*);
(j) Southern Water Shrew (*Sorex palustris*).

.05 Endangered Species of Plants.

A. Listing Criteria. The following factors shall be considered for listing a plant species as endangered:

(1) Whether only a few populations are known in Maryland and they cover only a small portion of land;

(2) Whether the species is restricted to a minimal geographic area;

(3) Whether the species has experienced a substantial decline in Maryland, and if the decline continues, the species' extirpation from Maryland is imminent;

(4) Whether the species' essential habitat has been rapidly lost and that loss is likely to continue;

(5) Whether the species' biology makes it highly susceptible to changes in its environment; or

(6) Whether the species' essential habitat is easily altered by even relatively minor activities.

B. Permits. The permit procedures to be followed are set forth in Regulation .03. The following apply:

(1) Permits shall be issued only for scientific research designed to enhance the recovery of the species or population;

(2) A person may not:

(a) Export, possess, process, sell, offer for sale, deliver, carry, transport, or ship by any means any endangered plant species without a special permit from the Director, the federal government, or another state government;

(b) Take any endangered plant species from State property except by special permit from the Director; and

(c) Take any endangerd plant species from private property without the written permission of the landowner.

C. The following plant species are considered endangered throughout Maryland unless a smaller range is indicated:

(1) Blue Monkshood (*Aconitum uncinatum*);
(2) Sensitive Joint-vetch (*Aeschynomene virginica*);
(3) Sandplain Gerardia (*Agalinis acuta*);
(4) *Agalinis fasciculata*;
(5) *Agalinis obtusifolia*;
(6) Thread-leaved Gerardia (*Agalinis setacea*);
(7) Small-fruited Agrimony (*Agrimonia microcarpa*);
(8) Woodland Agrimony (*Agrimonia striata*);
(9) Coastal Juneberry (*Amelanchier obovalis*);
(10) Missouri Rockcress (*Arabis missouriensis*);
(11) Short's Rockcress (*Arabis shortii*);
(12) Bristly Sarsaparilla (*Aralia hispida*);
(13) Woolly Three-awn (*Aristida lanosa*);
(14) Wire Grass (*Aristida virgata*);
(15) Virginia Heartleaf (*Asarum virginicum*);
(16) Red Milkweed (*Asclepias rubra*);
(17) Lobed Spleenwort (*Asplenium pinnatifidum*);
(18) Black-stem Spleenwort (*Asplenium resiliens*);
(19) Serpentine Aster (*Aster depauperatus*);
(20) Rough-leaved Aster (*Aster radula*);
(21) Canada Milkvetch (*Astragalus canadensis*);
(22) Tickseed Sunflower (*Bidens coronata*);
(23) Small Beggar-ticks (*Bidens discoidea*);
(24) *Bidens mitis*;
(25) Aster-like Boltonia (*Boltonia asteroides*);
(26) Blunt-lobe Grape-fern (*Botrychium oneidense*);
(27) Wild Chess (*Bromus kalmii*);
(28) Broad-glumed Brome (*Bromus latiglumis*);
(29) Sweet-scented Indian-plantain (*Cacalia suaveolens*);
(30) Porter's Reedgrass (*Calamagrostis porteri*);
(31) Wild Calla (*Calla palustris*);
(32) Grass-pink (*Calopogon tuberosus*);
(33) Long's Bittercress (*Cardamine longii*);
(34) *Carex aestivalis*;
(35) Barratt's Sedge (*Carex barrattii*);
(36) Buxbaum's Sedge (*Carex buxbaumii*);
(37) Field Sedge (*Carex conoidea*);
(38) Lesser Panicled Sedge (*Carex diandra*);
(39) Ebony Sedge (*Carex eburnea*);
(40) Coast Sedge (*Carex exilis*);
(41) Giant Sedge (*Carex gigantea*);
(42) Pubescent Sedge (*Carex hirtifolia*);
(43) Hitchcock's Sedge (*Carex hitchcockiana*);
(44) Porcupine Sedge (*Carex hystericina*);
(45) *Carex joorii*;
(46) Louisiana Sedge (*Carex louisianica*);
(47) Midland Sedge (*Carex mesochorea*);
(48) Long-stalked Sedge (*Carex pedunculata*);
(49) Stellate Sedge (*Carex radiata*);
(50) Short's Sedge (*Carex shortiana*);
(51) Sea-beach Sedge (*Carex silicea*);
(52) Dark Green Sedge (*Carex venusta*);
(53) Big Shellbark Hickory (*Carya laciniosa*);
(54) Marsh Wild Senna (*Cassia fasciculata* var. *macrosperma*);
(55) Indian Paintbrush (*Castilleja coccinea*);
(56) Coinleaf (*Centella erecta*);
(57) Prickly Hornwort (*Ceratophyllum muricatum*);
(58) Maple-leaved Goosefoot (*Chenopodium gigantospermum*);
(59) Standley's Goosefoot (*Chenopodium standleyanum*);
(60) Bulb-bearing Water Hemlock (*Cicuta bulbifera*);

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(61) Spreading Pogonia (*Cleistes divaricata*);
(62) Long-bracted Orchis (*Coeloglossum viride*);
(63) Wrinkled Jointgrass (*Coelorachis rugosa*);
(64) Goldthread (*Coptis trifolia*);
(65) Early Coralroot (*Corallorhiza trifida*);
(66) Wister's Coralroot (*Corallorhiza wisteriana*);
(67) Tall Tickseed (*Coreopsis tripteris*);
(68) Bunchberry (*Cornus canadensis*);
(69) Round-leaved Dogwood (*Cornus rugosa*);
(70) Rabbit-bells (*Crotalaria rotundifolia*);
(71) Smartweed Dodder (*Cuscuta polygonorum*);
(72) Beaked Dodder (*Cuscuta rostrata*);
(73) Fraser's Sedge (*Cymophyllus fraseri*);
(74) Small White Lady's Slipper (*Cypripedium candidum*);
(75) Tall Larkspur (*Delphinium exaltatum*);
(76) Tufted Hairgrass (*Deschampsia cespitosa*);
(77) Smooth Tick-trefoil (*Desmodium laevigatum*);
(78) Linear-leaved Tick-trefoil (*Desmodium lineatum*);
(79) Cream-flowered Tick-trefoil (*Desmodium ochroleucum*);
(80) Rigid Tick-trefoil (*Desmodium rigidum*);
(81) Stiff Tick-trefoil (*Desmodium strictum*);
(82) Twin-oats (*Diarrhena americana*);
(83) Leatherwood (*Dirca palustris*);
(84) Pink Sundew (*Drosera capillaris*);
(85) Mountain Wood-fern (*Dryopteris campyloptera*);
(86) Log Fern (*Dryopteris celsa*);
(87) *Echinodorus cordifolius*;
(88) American Waterwort (*Elatine americana*);
(89) Small Waterwort (*Elatine minima*);
(90) *Eleocharis albida*;
(91) Flattened Spikerush (*Eleocharis compressa*);
(92) Knotted Spikerush (*Eleocharis equisetoides*);
(93) Matted Spikerush (*Eleocharis intermedia*);
(94) Black-fruited Spikerush (*Eleocharis melanocarpa*);
(95) Robbins' Spikerush (*Eleocharis robbinsii*);
(96) Northern Willowherb (*Epilobium ciliatum*);
(97) Water Horsetail (*Equisetum fluviatile*);
(98) Wood Horsetail (*Equisetum sylvaticum*);
(99) *Erianthus brevibarbis*;
(100) Bent-awn Plumegrass (*Erianthus consortus*);
(101) Parker's Pipewort (*Eriocaulon parkeri*);
(102) White-bracted Boneset (*Eupatorium leucolepis*);
(103) Blunt-leaved Spurge (*Euphorbia obtusata*);
(104) Darlington's Spurge (*Euphorbia purpurea*);
(105) Queen-of-the-prairie (*Filipendula rubra*);
(106) Harper's Fimbristylis (*Fimbristylis perpusilla*);
(107) Smooth Fuirena (*Fuirena pumila*);
(108) Downy Milk Pea (*Galactia volubilis*);
(109) Northern Bedstraw (*Galium boreale*);
(110) Coast Bedstraw (*Galium hispidulum*);
(111) Creeping Snowberry (*Gaultheria hispidula*);
(112) Box Huckleberry (*Gaylussacia brachycera*);
(113) Striped Gentian (*Gentiana villosa*);
(114) Stiff Gentian (*Gentianella quinquefolia*);
(115) Fringed Gentian (*Gentianopsis crinita*);
(116) Herb-robert (*Geranium robertianum*);
(117) Yellow Avens (*Geum aleppicum*);
(118) American Mannagrass (*Glyceria grandis*);
(119) *Gratiola viscidula*;
(120) Oak Fern (*Gymnocarpium dryopteris*);
(121) Broad-leaved Beardgrass (*Gymnopogon brevifolius*);
(122) Smooth Sunflower (*Helianthus laevigatus*);
(123) Small-headed Sunflower (*Helianthus microcephalus*);
(124) Swamp Pink (*Helonias bullata*);
(125) Holy Grass (*Hierochloe odorata*);
(126) Featherfoil (*Hottonia inflata*);
(127) Large-leaved Waterleaf (*Hydrophyllum macrophyllum*);
(128) Creeping St. John's-wort (*Hypericum adpressum*);
(129) Coppery St. John's-wort (*Hypericum denticulatum*);
(130) Crested Iris (*Iris cristata*);
(131) Slender Blue Flag (*Iris prismatica*);
(132) Dwarf Iris (*Iris verna*);
(133) Highland Rush (*Juncus trifidus*);
(134) Potato Dandelion (*Krigia dandelion*);
(135) Red-root (*Lachnanthes caroliana*);
(136) Larch (*Larix laricina*);
(137) *Leersia hexandra*;
(138) Star Duckweed (*Lemna trisulca*);
(139) Downy Bushclover (*Lespedeza stuevei*);
(140) Mudwort (*Limosella subulata*);
(141) Sandplain Flax (*Linum intercursum*);
(142) Grooved Flax (*Linum sulcatum*);
(143) Appalachian Twayblade (*Listera smallii*);
(144) Pondspice (*Litsea aestivalis*);
(145) Canby's Lobelia (*Lobelia canbyi*);
(146) Canada Honeysuckle (*Lonicera canadensis*);
(147) *Ludwigia glandulosa*;
(148) Hairy Ludwigia (*Ludwigia hirtella*);
(149) Sessile-leaved Water-horehound (*Lycopus amplectens*);
(150) Lowland Loosestrife (*Lysimachia hybrida*);
(151) Winged Loosestrife (*Lythrum alatum*);
(152) Angelpod (*Matelea carolinensis*);
(153) Erect Water-hyssop (*Mecardonia acuminata*);
(154) Creeping Cucumber (*Melothria pendula*);
(155) Buckbean (*Menyanthes trifoliata*);
(156) Mountain Sandwort (*Minuartia glabra*);
(157) Grove Sandwort (*Moehringia lateriflora*);
(158) Sweet Pinesap (*Monotropsis odorata*);
(159) Long-awned Hairgrass (*Muhlenbergia capillaris*);
(160) Torrey's Dropseed (*Muhlenbergia torreyana*);
(161) Low Water-milfoil (*Myriophyllum humile*);
(162) Larger Floating-heart (*Nymphoides aquatica*);
(163) Floating-heart (*Nymphoides cordata*);
(164) Shaggy False-gromwell (*Onosmodium molle*);
(165) Virginia False-gromwell (*Onosmodium virginianum*);
(166) Sourwood (*Oxydendrum arboreum*);
(167) Canby's Dropwort (*Oxypolis canbyi*);
(168) Canby's Mountain Lover (*Pachistima canbyi*);
(169) Wiry Witch-grass (*Panicum flexile*);
(170) Few-flowered Panicgrass (*Panicum oligosanthes*);
(171) Tall Swamp Panicgrass (*Panicum scabriusculum*);
(172) Wright's Panicgrass (*Panicum wrightianum*);
(173) Kidneyleaf Grass-of-Parnassus (*Parnassia asarifolia*);
(174) Yellow Nailwort (*Paronychia virginica*);
(175) American Feverfew (*Parthenium integrifolium*);
(176) Walter's Paspalum (*Paspalum dissectum*);
(177) Floating Paspalum (*Paspalum fluitans*);
(178) Swamp Lousewo

(179) Smooth Cliffbrake (*Pellaea glabella*);
(180) Coville's Phacelia (*Phacelia ranunculacea*);
(181) Marsh Fleabane (*Pluchea camphorata*);
(182) Jacob's-ladder (*Polemonium van-bruntiae*);
(183) Cross-leaved Milkwort (*Polygala cruciata*);
(184) Dense-flowered Knotweed (*Polygonum densiflorum*);
(185) Leafy Pondweed (*Potamogeton foliosus*);
(186) Slender Rattlesnake-root (*Prenanthes autumnalis*);
(187) Alleghany Plum (*Prunus alleghaniensis*);
(188) Beach Plum (*Prunus maritima*);
(189) Short-beaked Baldrush (*Psilocarya nitens*);
(190) Long-beaked Baldrush (*Psilocarya scirpoides*);
(191) Harperella (*Ptilimnium nodosum*);
(192) Torrey's Mountain-mint (*Pycnanthemum torrei*);
(193) Whorled Mountain-mint (*Pycnanthemum verticillatum*);
(194) One-sided Pyrola (*Pyrola secunda*);
(195) Early Buttercup (*Ranunculus fascicularis*);
(196) Yellow Water-crowfoot (*Ranunculus flabellaris*);
(197) White Water-crowfoot (*Ranunculus trichophyllus*);
(198) *Rhynchosia tomentosa*;
(199) Capitate Beakrush (*Rhynchospora cephalantha*);
(200) Short-bristled Hornedrush (*Rhynchospora corniculata*);
(201) Thread-leaved Beakrush (*Rhynchospora filifolia*);
(202) Grass-like Beakrush (*Rhynchospora globularis*);
(203) Clustered Beakrush (*Rhynchospora glomerata*);
(204) Drowned Hornedrush (*Rhynchospora inundata*);
(205) Torrey's Beakrush (*Rhynchospora torreyana*);
(206) Smooth Rose (*Rosa blanda*);
(207) Rustling Wild-petunia (*Ruellia strepens*);
(208) Tall Dock (*Rumex altissimus*);
(209) Florida Dock (*Rumex floridanus*);
(210) Sacciolepis (*Sacciolepis striata*);
(211) Sessile-fruited Arrowhead (*Sagittaria rigida*);
(212) Sandbar Willow (*Salix exigua*);
(213) Purple Oat (*Schizachne purpurascens*);
(214) Northeastern Bulrush (*Scirpus ancistrochaetus*);
(215) Canby's Bulrush (*Scirpus emiberculatus*);
(216) Water Clubrush (*Scirpus subterminalis*);
(217) Slender Nutrush (*Scleria minor*);
(218) Whorled Nutrush (*Scleria verticillata*);
(219) Pink Bog-button (*Sclerolepis uniflora*);
(220) Rock Skullcap (*Scutellaria saxatilis*);
(221) Cliff Stonecrop (*Sedum glaucophyllum*);
(222) Snowy Campion (*Silene nivea*);
(223) Star-flowered False Solomon's-seal (*Smilacina stellata*);
(224) Halberd-leaved Greenbrier (*Smilax pseudochina*);
(225) Red-berried Greenbrier (*Smilax walteri*);
(226) Curtis' Goldenrod (*Solidago curtisii*);
(227) Showy Goldenrod (*Solidago speciosa*);
(228) Buttonweed (*Spermacoce glabra*);
(229) Wide-leaved Ladies' Tresses (*Spiranthes lucida*);
(230) Yellow Nodding Ladies' Tresses (*Spiranthes ochroleuca*);
(231) Rough Rushgrass (*Sporobolus clandestinus*);
(232) Northern Dropseed (*Sporobolus heterolepis*);
(233) Purple Meadow-parsnip (*Thaspium trifoliatum*);
(234) Climbing Dogbane (*Trachelospermum difforme*);
(235) Drooping Trillium (*Trillium flexipes*);
(236) Snow Trillium (*Trillium nivale*);
(237) Narrow-leaved Horse-gentian (*Triosteum angustifolium*);
(238) Two-flowered Bladderwort (*Utricularia biflora*);
(239) Fibrous Bladderwort (*Utricularia fibrosa*);
(240) Swollen Bladderwort (*Utricularia inflata*);
(241) Reversed Bladderwort (*Utricularia resupinata*);
(242) Valerian (*Valeriana pauciflora*);
(243) Goose-foot Cornsalad (*Valerianella chenopodiifolia*);
(244) Marsh Speedwell (*Veronica scutellata*);
(245) Fringed Yelloweyed-grass (*Xyris fimbriata*);
(246) Small's Yelloweyed-grass (*Xyris smalliana*);
(247) Northern Prickly-ash (*Zanthoxylum americanum*).

.06 Endangered Extirpated Species.

A. Listing Criteria. The following factors shall be considered for listing a species as endangered extirpated:

(1) The species was once a viable component of the State's flora and fauna and there are no records of it naturally occurring in Maryland after 1950; or

(2) The species was once a viable component of the State's flora or fauna and recent scientific investigations have documented the loss of its habitat or disappearance of its population in Maryland.

B. Permits. Upon the discovery of a viable, naturally occurring population of any species in §§C—J, that species will be considered an endangered species and shall require the permits and conditions afforded to that status.

C. The following plant species are considered endangered extirpated throughout Maryland:

(1) Pine-barren Gerardia (*Agalinis virgata*);
(2) Rough-stemmed Wheatgrass (*Agropyron trachycaulum*);
(3) Golden Colicroot (*Aletris aurea*);
(4) Beach Pigweed (*Amaranthus pumilus*);
(5) Canada Anemone (*Anemone canadensis*);
(6) Great Angelica (*Angelica atropurpurea*);
(7) Filmy Angelica (*Angelica triquinata*);
(8) Clasping-leaved Dogbane (*Apocynum sibiricum*);
(9) Arethusa (*Arethusa bulbosa*);
(10) Lake Cress (*Armoracia aquatica*);
(11) Leopard's-bane (*Arnica acaulis*);
(12) Bradley's Spleenwort (*Asplenium bradleyi*);
(13) Steele's Aster (*Aster concinnus*);
(14) Silvery Aster (*Aster concolor*);
(15) Showy Aster (*Aster spectabilis*);
(16) *Axonopus furcatus*;
(17) Mat-forming Water-hyssop (*Bacopa stragula*);
(18) American Barberry (*Berberis canadensis*);
(19) Sea Ox-eye (*Borrichia frutescens*);
(20) Triangle Grape-fern (*Botrychium lanceolatum*);
(21) Leathery Grape-fern (*Botrychium multifidum*);
(22) Small Grape-fern (*Botrychium simplex*);
(23) Fringed Brome (*Bromus ciliatus*);
(24) Nottoway's Brome (*Bromus nottowayanus*);
(25) Blue-hearts (*Buchnera americana*);
(26) Great Indian-plantain (*Cacalia muhlenbergii*);
(27) French Mulberry (*Callicarpa americana*);
(28) Southern Harebell (*Campanula divaricata*);
(29) *Carex aggregata*;
(30) *Carex careyana*;

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(31) Soft Fox Sedge (*Carex conjuncta*);
(32) Davis' Sedge (*Carex davisii*);
(33) Cypress-knee Sedge (*Carex decomposita*);
(34) *Carex foenea*;
(35) *Carex glaucescens*;
(36) Lake-bank Sedge (*Carex lacustris*);
(37) Leavenworth's Sedge (*Carex leavenworthii*);
(38) New England Sedge (*Carex novae-anglice*);
(39) Variable Sedge (*Carex polymorpha*);
(40) Lined Sedge (*Carex striatula*);
(41) Slender Sedge (*Carex tenera*);
(42) Rigid Sedge (*Carex tetanica*);
(43) Velvety Sedge (*Carex vestita*);
(44) Wood's Sedge (*Carex woodii*);
(45) Chaffweed (*Centunculus minimus*);
(46) Purple Clematis (*Clematis occidentalis*);
(47) Curly-heads (*Clematis ochroleuca*);
(48) Rose Coreopsis (*Coreopsis rosea*);
(49) Pygmyweed (*Crassula aquatica*);
(50) Hazel Dodder (*Cuscuta coryli*);
(51) Toothed Sedge (*Cyperus dentatus*);
(52) *Cyperus plukenetii*;
(53) *Cyperus tenuifolius*;
(54) Showy Lady's Slipper (*Cypripedium reginae*);
(55) Trailing Tick-trefoil (*Desmodium humifusum*);
(56) Few-flowered Tick-trefoil (*Desmodium pauciflorum*);
(57) Sessile-leaved Tick-trefoil (*Desmodium sessilifolium*);
(58) *Digitaria villosa*;
(59) *Eleocharis halophila*;
(60) Three-ribbed Spikerush (*Eleocharis tricostata*);
(61) Tobaccoweed (*Elephantopus tomentosus*);
(62) Downy Willowherb (*Epilobium strictum*);
(63) Seven-angled Pipewort (*Eriocaulon septangulare*);
(64) Tall Rattlesnake Master (*Eryngium yuccifolium*);
(65) Spotted Joe-Pye-Weed (*Eupatorium maculatum*);
(66) *Festuca paradoxa*;
(67) Pumpkin Ash (Fraxinus profunda);
(68) Small Bedstraw (*Galium trifidum*);
(69) *Gentiana puberula*;
(70) Sea Milkwort (*Glaux maritima*);
(71) Sharp-scaled Mannagrass (*Glyceria acutiflora*);
(72) Dwarf Rattlesnake-plantain (*Goodyera repens*);
(73) Tesselated Rattlesnake-plantain (*Goodyera tesselata*);
(74) *Gratiola ramosa*;
(75) Hoary Frostweed (*Helianthemum bicknellii*);
(76) Rough Heuchera (*Heuchera villosa*);
(77) Crested Coralroot (*Hexalectris spicata*);
(78) Sea-beach Sandwort (*Honkenya peploides*);
(79) Drummond's St. John's-wort (*Hypericum drummondii*);
(80) Clasping-Leaved St. John's-wort (*Hypericum gymnanthum*);
(81) Great St. John's-wort (*Hypericum pyramidatum*);
(82) Bloodleaf (*Iresine rhizomatosa*);
(83) Small Whorled Pogonia (*Isotria medeoloides*);
(84) Baltic Rush (*Juncus balticus*);
(85) Short-fruited Rush (*Juncus brachycarpus*);
(86) Small-headed Rush (*Juncus brachycephalus*);
(87) New Jersey Rush (*Juncus caesariensis*);
(88) *Juncus longii*;
(89) *Juncus megacephalus*;
(90) Bayonet Rush (*Juncus militaris*);
(91) Brown-fruited Rush (*Juncus pelocarpus*);
(92) Torrey's Rush (*Juncus torreyi*);
(93) Juniper (*Juniperus communis*);
(94) Hairy Lettuce (*Lactuca hirsuta*);
(95) Vetchling (*Lathyrus palustris*);
(96) Narrow-leaved Pinweed (*Lechea tenuifolia*);
(97) Catchfly-grass (*Leersia lenticularis*);
(98) Long-awned Diplachne (*Leptochloa fascicularis*);
(99) Fall Witchgrass (*Leptoloma cognatum*);
(100) Scaly Blazing-star (*Liatris squarrosa*);
(101) Robust Blazing-star (*Liatris turgida*);
(102) American Lovage (*Ligusticum canadense*);
(103) Wood Lily (*Lilium philadelphicum*);
(104) American Frog's-bit (*Limnobium spongia*);
(105) Twinflower (*Linnaea borealis*);
(106) Florida Yellow Flax (*Linum floridanum*);
(107) Heartleaf Twayblade (*Listera cordata*);
(108) American Gromwell (*Lithospermum latifolium*);
(109) *Lobelia glandulosa*;
(110) Carolina Clubmoss (*Lycopodium carolinianum*);
(111) Rock Clubmoss (*Lycopodium porophilum*);
(112) Large-flowered Barbara's-buttons (*Marshallia grandiflora*);
(113) *Matelea decipiens*;
(114) *Matelea obliqua*;
(115) Broad-leaved Bunchflower (*Melanthium latifolium*);
(116) Nuttall's Micranthemum (*Micranthemum micranthemoides*);
(117) Evergreen Bayberry (*Myrica heterophylla*);
(118) Slender Water-milfoil (*Myriophyllum tenellum*);
(119) Thread-like Naiad (*Najas gracillima*);
(120) Northern Panicgrass (*Panicum boreale*);
(121) May Grass (*Phalaris caroliniana*);
(122) Thick-leaved Phlox (*Phlox carolina*);
(123) Smooth Phlox (*Phlox glaberrima*);
(124) Mountain Phlox (*Phlox latifolia*);
(125) Downy Phlox (*Phlox pilosa*);
(126) Heart-leaved Plantain (*Plantago cordata*);
(127) Slender Plantain (*Plantago pusilla*);
(128) Small Purple Fringed Orchid (*Platanthera psycodes*);
(129) *Poa saltuensis*;
(130) Clammyweed (*Polanisia dodecandra*);
(131) Bushy Knotweed (*Polygonum ramosissimum*);
(132) Stout Smartweed (*Polygonum robustius*);
(133) American Ipecac (*Porteranthus stipulatus*);
(134) Large-leaved Pondweed (*Potamogeton amplifolius*);
(135) Redheadgrass (*Potamogeton richardsonii*);
(136) Robbins' Pondweed (*Potamogeton robbinsii*);
(137) Flatstem Pondweed (*Potamogeton zosteriformis*);
(138) Pale Mannagrass (*Puccinellia pallida*);
(139) Southern Mountain-mint (*Pycnanthemum pycnanthemoides*);
(140) Awned Mountain-mint (*Pycnanthemum setosum*);
(141) Greenish-flowered Pyrola (*Pyrola virens*);
(142) Water-plantain Spearwort (*Ranunculus ambigens*);
(143) Carolina Buttercup (*Ranunculus carolinianus*);
(144) *Ranunculus hederaceus*;
(145) Bristly Crowfoot (*Ranunculus pensylvanicus*);
(146) Awned Meadow-beauty (*Rhexia aristosa*);
(147) Tiny-headed Beakrush (*Rhynchospora microcephala*);

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(3) Fish: Slimy Sculpin (*Cottus cognatus*).
(4) Reptiles:
(a) Atlantic Loggerhead Turtle (*Caretta caretta*);
(b) Atlantic Green Turtle (*Chelonia mydas*).
(5) Birds:
(a) Blackburnian Warbler (*Dendroica fusca*);
(b) Black Skimmer (*Rynchops niger*);
(c) Gull-billed Tern (*Sterna nilotica*).
(6) Mammals: Smoky Shrew (*Sorex fumeus*).

.08 Threatened Species of Plants.

A. Listing Criteria. The following factors shall be considered for listing a plant species as threatened:

(1) Whether the species has experienced a substantial decline in Maryland, and if the decline continues, the species is likely to become endangered;

(2) Whether there has been a steady widespread loss of the species' essential habitat; or

(3) Whether the species has been listed as endangered but it has been shown that protection measures taken have significantly reduced the chances of the species becoming extirpated form Maryland.

B. Permits. The permit procedures to be followed are set forth in Regulation .03. The following apply:

(1) Permits shall be issued only for scientific research designed to enhance the recovery of the species or population;

(2) A person may not:

(a) Export, possess, process, sell, offer for sale, deliver, carry, transport, or ship by any means any threatened plant species except by a special permit from the Director;

(b) Take any threatened plant species from State property except by special permit from the Director; and

(c) Take any threatened plant species from private property without the written permission of the landowner.

C. The following plant species are considered threatened throughout Maryland unless a smaller range is indicated:

(1) Climbing Fumitory (*Adlumia fungosa*);
(2) Purple Giant Hyssop (*Agastache scrophulariifolia*);
(3) Running Juneberry (*Amelanchier spicata*);
(4) Single-headed Pussytoes (*Antennaria solitaria*);
(5) Pipevine (*Aristolochia macrophylla*);
(6) Giant Cane (*Arundinaria gigantea*);
(7) Bent Milkvetch (*Astragalus distortus*);
(8) Glade Fern (*Athyrium pycnocarpon*);
(9) Wild False Indigo (*Baptisia australis*);
(10) Maryland Bur-marigold (*Bidens bidentoides*);
(11) Button Sedge (*Carex bullata*);
(12) Shoreline Sedge (*Carex hyalinolepis*);
(13) Woolly Sedge (*Carex lanuginosa*);
(14) Inflated Sedge (*Carex vesicaria*);
(15) Leatherleaf (*Chamaedaphne calyculata*);
(16) Red Turtlehead (*Chelone obliqua*);
(17) Slender Wood Reedgrass (*Cinna latifolia*);
(18) Yellow Clintonia (*Clintonia borealis*);
(19) Wild Bleeding-heart (*Dicentra eximia*);
(20) Beaked Spikerush (*Eleocharis rostellata*);
(21) *Eragrostis refracta*;
(22) White Trout Lily (*Erythronium albidum*);
(23) Fringe-tip Closed Gentian (*Gentiana andrewsii*);
(24) McDowell's Sunflower (*Helianthus occidentalis*);
(25) Small-flowered Hemicarpha (*Hemicarpha micrantha*);
(26) Goldenseal (*Hydrastis canadensis*);
(27) Deciduous Holly (*Ilex decidua*);
(28) Wild Lupine (*Lupinus perennis*);
(29) Climbing Fern (*Lygodium palmatum*);
(30) Two-flowered Melic Grass (*Melica mutica*);
(31) Three-flowered Melic Grass (*Melica nitens*);
(32) Rock Sandwort (*Minuartia michauxii*);
(33) Large-seeded Forget-me-not (*Myosotis macrosperma*);
(34) American Lotus (*Nelumbo lutea*);
(35) White-fruited Mountainrice (*Oryzopsis asperifolia*);
(36) Black-fruited Mountainrice (*Oryzopsis racemosa*);
(37) Red Bay (*Persea borbonia*);
(38) White Fringed Orchid (*Platanthera blephariglottis*);
(39) Yellow Fringed Orchid (*Platanthera ciliaris*);
(40) Crested Yellow Orchid (*Platanthera cristata*);
(41) Pale Green Orchid (*Platanthera flava*);
(42) Large Purple Fringed Orchid (*Platanthera grandiflora*);
(43) Purple Fringeless Orchid (*Platanthera peramoena*);
(44) Racemed Milkwort (*Polygala polygama*);
(45) Seneca Snakeroot (*Polygala senega*);
(46) Spongy Lophotocarpus (*Sagittaria calycina*);
(47) Engelmann's Arrowhead (*Sagittaria engelmanniana*);
(48) Canada Burnet (*Sanguisorba canadensis*);
(49) Northern Pitcher-plant (*Sarracenia purpurea*);
(50) Leonard's Skullcap (*Scutellaria leonardii*);
(51) Virginia Mallow (*Sida hermaphrodita*);
(52) Riverbank Goldenrod (*Solidago spathulata*);
(53) Swamp-oats (*Sphenopholis pensylvanica*);
(54) Featherbells (*Stenanthium gramineum*);
(55) Rose Twisted-stalk (*Streptopus roseus*);
(56) Snowberry (*Symphoricarpos albus*);
(57) Mountain Pimpernel (*Taenidia montana*);
(58) Fameflower (*Talinum teretifolium*);
(59) Bog Fern (*Thelypteris simulata*);
(60) Arbor-vitae (*Thuja occidentalis*);
(61) Kate's-mountain Clover (*Trifolium virginicum*);
(62) Dwarf Trillium (*Trillium pusillum*);
(63) Purple Bladderwort (*Utricularia purpurea*);
(64) Small Cranberry (*Vaccinium oxycoccos*);
(65) Rusty Woodsia (*Woodsia ilvensis*).

.09 Species in Need of Conservation.

A. Listing Criteria. The following factors shall be considered for listing a species as in need of conservation:

(1) Whether the population is limited or declining within Maryland; and

(2) Whether the species may become threatened in the foreseeable future, if current trends or conditions persist.

B. Permits. The permit procedures to be followed are set forth in Regulation .03. The following apply:

(1) Except by special permit, a person may not take, export, possess, process, sell, offer for sale, deliver, carry, transport, or ship by any means any species in need of conservation;

(2) Permits to take species in need of conservation shall be issued only for:

(a) Scientific research designed to enhance the recovery of the species or population;

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(148) Pale Beakrush (*Rhynchospora pallida*);
(149) Few-flowered Beakrush (*Rhynchospora rariflora*);
(150) Wild Black Currant (*Ribes americanum*);
(151) Hairy Wild-petunia (*Ruellia humilis*);
(152) Pursh's Ruellia (*Ruellia purshiana*);
(153) Slender Marsh Pink (*Sabatia campanulata*);
(154) Lance-leaved Sabatia (*Sabatia difformis*);
(155) Slender Arrowhead (*Sagittaria teres*);
(156) Bebb's Willow (*Salix bebbiana*);
(157) Shining Willow (*Salix lucida*);
(158) *Salvia urticifolia*;
(159) Chaffseed (*Schwalbea americana*);
(160) Smith's Clubrush (*Scirpus smithii*);
(161) Torrey's Clubrush (*Scirpus torreyi*);
(162) Shining Nutrush (*Scleria nitida*);
(163) Veined Skullcap (*Scutellaria nervosa*);
(164) Small Skullcap (*Scutellaria parvula*);
(165) Sand Blueeyed-grass (*Sisyrinchium arenicola*);
(166) Hairy Goldenrod (*Solidago hispida*);
(167) Hard-leaved Goldenrod (*Solidago rigida*);
(168) Mountain Goldenrod (*Solidago roanensis*);
(169) Rock Goldenrod (*Solidago rupestris*);
(170) *Sorghastrum elliottii*;
(171) Indian-pink (*Spigelia marilandica*);
(172) Sweet-scented Ladies' Tresses (*Spiranthes odorata*);
(173) Small Rushgrass (*Sporobolus neglectus*);
(174) *Stachys aspera*;
(175) Trailing Stitchwort (*Stellaria alsine*);
(176) *Tephrosia spicata*;
(177) Coastal False Asphodel (*Tofieldia racemosa*);
(178) Auricled Gerardia (*Tomanthera auriculata*);
(179) Buffalo Clover (*Trifolium reflexum*);
(180) Three-ribbed Arrow-grass (*Triglochin striatum*);
(181) Nodding Pogonia (*Triphora trianthophora*);
(182) Tall Cornsalad (*Valerianella umbilicata*);
(183) Purple Vetch (*Vicia americana*);
(184) New England Grape (*Vitis novae-angliae*);
(185) Wolffiella (*Wolffiella floridana*).

D. The following mollusk species is considered endangered extirpated throughout Maryland: Rader's Snail (*Glyphyalinia raderi*).

E. The following insect species is considered endangered extirpated throughout Maryland: Tawny Crescentspot (*Phyciodes batesii*).

F. The following fish species are considered endangered extirpated throughout Maryland:
(1) Glassy Darter (*Etheostoma vitreum*);
(2) Stripeback Darter (*Percina notogramma*);
(3) Trout-perch (*Percopsis omiscomaycus*).

G. The following amphibian species are considered endangered extirpated throughout Maryland:
(1) Mudpuppy (*Necturus maculosus*);
(2) Greater Siren (*Siren lacertina*).

H. The following reptile species is considered endangered extirpated throughout Maryland: Rainbow Snake (*Farancia erytrogramma*).

I. The following bird species are considered endangered extirpated throughout Maryland:
(1) Bachman's Sparrow (*Aimophila aestivalis*);
(2) Ivory-billed Woodpecker (*Campephilus principalis*);
(3) Lark Sparrow (*Chondestes grammacus*);
(4) Eskimo Curlew (*Numenius borealis*);
(5) Red-cockaded Woodpecker (*Picoides borealis*);
(6) Roseate Tern (*Sterna dougallii*);
(7) Greater Prairie Chicken (*Tympanuchus cupido*).

J. The following mammal species are considered endangered extirpated throughout Maryland:
(1) Gray Wolf (*Canis lupus*);
(2) American Elk (*Cervus canadensis*);
(3) Eastern Mountain Lion (*Felis concolor*);
(4) Snowshoe Hare (*Lepus americanus*);
(5) Marten (*Martes americana*);
(6) Eastern Harvest Mouse (*Reithrodontomys humulis*).

.07 Threatened Species of Wildlife, Reptiles, Amphibians, Mollusks, Crustaceans, and Finfish.

A. Listing Criteria. The following factors shall be considered for listing species other than plant species as threatened:

(1) Whether the species has experienced a steady, substantial decline in Maryland, and if the decline continues, the species is likely to become endangered;

(2) Whether there has been steady, widespread loss of the species' essential habitat; or

(3) Whether protection measures already taken have significantly reduced the chances of the species becoming extirpated from Maryland.

B. Permits. The permit procedures to be followed are set forth in Regulation .03. The following apply:

(1) Except by special permit from the Director, a person may not take, export, possess, process, sell, offer for sale, deliver, carry, transport or ship by any means any threatened wildlife, reptile, amphibian, mollusk, crustacean or finfish species.

(2) Permits to take threatened species shall be issu only for:

(a) Scientific research designed to enhance the recovery of the species or population;

(b) Other valid scientific research; or

(c) Educational purposes designed to further public awareness regarding the species.

(3) Incidental taking of a threatened wildlife, reptile, amphibian, mollusk, crustacean or finfish species shall be allowed only after the Director has been notified 30 days in advance of the change in land use or other action by a private landowner which shall result in the incidental taking. The Maryland Forest, Park and Wildlife Service, upon receipt of the application for an incidental taking permit from the landowner, shall within 30 days either:

(a) Take action to salvage the threatened species; or

(b) Issue to the landowner an incidental taking permit authorizing the landowner to proceed with the action which will result in the incidental taking of the species.

C. The following species are considered to be threatened throughout Maryland unless a smaller range is indicated:

(1) Crustaceans:

(a) Allegheny Cave Amphipod (*Stygobromus allegheniensis*);

(b) Franz's Cave Amphipod (*Stygobromus franzi*).

(2) Insects:

(a) Northern Metalmark (*Calephelis borealis*);

(b) Harris' Checkerspot (*Chlosyne harrisii*);

(c) Rare Skipper (*Problema bulenta*);

(d) Atlantis Fritillary (*Speyeria atlantis*).

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(b) Other valid scientific research; or

(c) Educational purposes designed to further public awareness regarding the species.

(3) Incidental taking permits are not required for species in need of conservation.

C. The following species are considered to be in need of conservation throughout Maryland unless a smaller range is indicated:

(1) Insects:

(a) Giant Swallowtail (*Papilio cresphontes*);

(b) King's Hairstreak (*Satyrium kingi*).

(2) Fish: Blackbanded Sunfish (*Enneacanthus chaetodon*).

(3) Amphibians:

(a) Wehrle's Salamander (*Plethodon wehrlei*);

(b) Mountain Chorus Frog (*Pseudacris brachyphona*);

(c) Carpenter Frog (*Rana virgatipes*).

(4) Reptiles:

(a) Eastern Spiny Softshell (*Apalone spinifera*);

(b) Map Turtle (*Graptemys geographica*).

(5) Birds:

(a) Henslow's Sparrow (*Ammodramus henslowii*);

(b) Short-eared Owl (*Asio flammeus*);

(c) American Bittern (*Botaurus lentiginosus*);

(d) Sedge Wren (*Cistothorus platensis*);

(e) Alder Flycatcher (*Empidonax alnorum*);

(f) Common Moorhen (*Gallinula chloropus*);

(g) Least Bittern (*Ixobrychus exilis*);

(h) Black Rail (*Laterallus jamaicensis*);

(i) Swainson's Warbler (*Limnothlypis swainsonii*);

(j) Least Tern (*Sterna antillarum*);

(k) Nashville Warbler (*Vermivora ruficapilla*).

(6) Mammals:

(a) Porcupine (*Erethizon dorsatum*);

(b) Bobcat (*Lynx rufus*);

(c) Least Weasel (*Mustela nivalis*);

(d) Eastern Small-footed Bat (*Myotis leibii*);

(e) Eastern Woodrat (*Neotoma floridana*);

(f) Long-tailed Shrew (*Sorex dispar*);

(g) Southeastern Shrew (*Sorex longirostris*);

(h) New England Cottontail (*Sylvilagus transitionalis*).

.10 Natural Heritage Areas.

A. Listing Criteria. In order to qualify as a natural heritage area a natural community shall:

(1) Contain one or more threatened or endangered species or wildlife species in need of conservation;

(2) Be a unique blend of geological, hydrological, climatalogical or biological features; and

(3) Be considered to be among the best Statewide examples of its kind.

B. The Forest, Park and Wildlife Service shall prepare maps describing the location of all natural heritage areas. The maps shall be filed in the office of the Director of the Forest, Park and Wildlife Service, Department of Natural Resources, Tawes State Office Building, Annapolis, MD 21401.

C. The following areas are designated natural heritage areas:

(1) Kasecamp Shale Barrens ..... Allegany County;

(2) Maple Run ..... Allegany County;

(3) Outdoor Club Shale Barrens ... Allegany County;

(4) Sideling Hill Creek .. Allegany,Washington County;

(5) Cypress Creek Swamp .... Anne Arundel County;

(6) Eagle Hill Bog ..... Anne Arundel County;

(7) Upper Patuxent Marshes ... Anne Arundel, Prince George's County;

(8) Black Marsh ..... Baltimore County;

(9) Robert E. Lee Park ..... Baltimore County;

(10) Camp Roosevelt Cliffs ..... Calvert County;

(11) Cove Point Marsh ..... Calvert County;

(12) Flag Ponds ..... Calvert County;

(13) Randle Cliff Beach ..... Calvert County;

(14) Grove Neck ..... Cecil County;

(15) Plum Creek ..... Cecil County;

(16) Allen's Fresh ..... Charles County;

(17) Chicamuxen Creek ..... Charles County;

(18) Popes Creek ..... Charles County;

(19) Upper Nanjemoy Creek ..... Charles County;

(20) Chicone Creek ..... Dorchester County;

(21) Mill Creek ..... Dorchester County;

(22) Savanna Lake ..... Dorchester County;

(23) Upper Blackwater River .... Dorchester County;

(24) Upper Nanticoke River, Marshes and Swamps ..... Dorchester, Wicomico County;

(25) High Rock ..... Garrett County;

(26) Toliver Run ..... Garrett County;

(27) Great Falls ..... Montgomery County;

(28) Irish Grove ..... Somerset County;

(29) Hickory Point Cypress Swamp ..... Somerset, Worcester County;

(30) Lower Nassawango Creek ... Worcester County;

(31) Mattaponi ..... Worcester County;

(32) North Sinepuxent Bay Dunes . Worcester County.

.11 Additional lists

The Tidewater Administration also maintains a list of fish species that are designated as endangered, threatened, or in need of conservation under COMAR 08.02.12. Regulations implementing protective measures for these species appear elsewhere under COMAR 08.02.

.12 Violation of Regulations.

Violation of these regulations is a misdemeanor punishable under Natural Resources Articles, §§10-2A-07, 10-1101 et seq., 4-2A-07, and 4-1201 et seq., Annotated Code of Maryland.

AR001908

Title 08
DEPARTMENT OF NATURAL RESOURCES

Subtitle 03 WILDLIFE

08.03.08 Threatened and Endangered Species

Authority: Natural Resources Article, §§10-2A-03 and 10-2A-06, Annotated Code of Maryland

Notice of Proposed Action
[92-142-P]

The Secretary of Natural Resources proposes to adopt new Regulation .11-1 under COMAR 08.03.08 Threatened and Endangered Species.

Statement of Purpose

This action is being taken to protect habitat for threatened and endangered species on lands owned or controlled by the State which are located between mean high and mean low water lines of waters of the State.

Estimate of Economic Impact

The proposed action has no economic impact.

Opportunity for Public Comment

Written comments may be sent to Donald E. MacLauchlan, Assistant Secretary, Forest, Park and Wildlife Service, Tawes State Office Building, Annapolis, Maryland, 21401, or call (410) 974-2330. These comments must be received by June 2, 1992. No public hearing has been scheduled.

.11-1 Restricted Areas.

A. Without written permission from the Secretary, a person may not trespass, enter, or release an animal on lands owned or controlled by the State which are located between the mean high and mean low water lines of waters of the State and which are posted in a conspicuous manner as a restricted area for the purpose of protecting:

(1) An endangered or threatened species of wildlife or plant listed in this chapter; or

(2) A species of wildlife in need of conservation listed in this chapter.

B. The Department shall prepare maps describing the location of each restricted area under this regulation. The maps shall be filed with the Secretary of Natural Resources, Tawes State Office Building, Annapolis, Maryland 21401.

C. A restricted area may be established only after:

(1) Notice of the proposed restriction has been placed in a newspaper in the county where the restriction is proposed;

(2) Notice of the proposed restriction has been placed in the Maryland Register;

(3) Completion of a 30-day period for comment which begins on the date that the list of restricted areas is published in the Maryland Register;

(4) All adjacent landowners have been notified by mail of the proposal; and

(5) Appropriate areas have been signed and posted.

D. The delineation of restricted areas may change to accommodate changes in the distribution of listed species after the notice provisions of §C of this regulation have been satisfied.

E. Restricted Areas.

(1) In Calvert County, the restricted areas encompass that portion of the lands owned or controlled by the State which are located between the mean high and mean low water lines of the waters of the State adjacent to Flag Ponds Nature Park.

(2) In Worcester County, the restricted areas encompass that portion of the lands owned or controlled by the State which are located between the mean high and mean low water lines of the waters of the State adjacent to:

(a) Assateague Island National Seashore; and

(b) The shoreline of Skimmer Islands (Patent No. 91 pending before the Commissioner of Land Patents) in Isle of Wight Bay.

TORREY C. BROWN, M.D
Secretary of Natural Resources

Subtitle 07 FORESTS AND PARKS

08.07.06 Use of State Parks

Authority: Natural Resources Article, §5-209, Annotated Code of Maryland

Notice of Proposed Action
[92-143-P]

The Secretary of Natural Resources proposes to amend Regulations .16 and .20 and adopt new Regulation .28 under COMAR 08.07.06 Use of State Parks.

Statement of Purpose

The purpose of this action is to ensure greater safety on the piers in the State parks, as well as to protect the integrity of the serpentine trails for passive recreational use.

Estimate of Economic Impact.

The proposed action has no economic impact.

Opportunity for Public Comment

Written comments may be sent to James W. Dunmyer, Tawes State Office Building, Annapolis, Maryland 21401, or call (301) 974-2330 until the close of business on June 5, 1992. No public hearing has been scheduled.

.16 Refuse, Rubbish, and Glass Containers.

A. — C. (text unchanged)

D. A person may not possess a glass container at any time on the Choptank River Fishing Piers *or the Point Lookout Fishing Pier.*

.20 Traffic and Parking.

A. — C. (text unchanged)

D. In State parks, [all roads] *on a road* not under the jurisdiction of the State Highway Administration or county jurisdiction, a person may not:

(1) Drive or park any vehicle within or upon a safety zone, walk, *trail,* or any other place not designated and customarily used for vehicular traffic.

(2) — (6) (text unchanged)

E. (text unchanged)

.28 Use of Trails.

Except on designated trails, an individual may not ride an animal, bicycle, or mountain bike in a State park.

TORREY C. BROWN, M.D
Secretary of Natural Resources

AR301909

Final Action On Regulations

For information concerning Final Action on Regulations, see inside front cover.

Symbol Key

›man type indicates text already existing at the time of the proposed action. *Italic type* indicates new text added at the time of ›posed action. A single underline indicates text added at the time of final action. [Single brackets] indicate deleted text.)ouble brackets]] indicate text deleted at the time of final action.

Computer Printouts Available

mputer printouts of newly adopted regulations are available to the general public and to State agencies from the Maryland Infor-tion Retrieval System (MIRS) database. MIRS automatically updates COMAR, integrating new and amended text into existing t, and removing all symbols and obsolete material. State agencies may find MIRS printouts particularly valuable in preparing the :t generation of regulation amendments for publication in the *Maryland Register*. For more information, call (410) 974-3500.

Title 05
DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT

Subtitle 06 HOUSING INSURANCE

.03 Maryland Housing Fund — Revitaliza- Program

Authority: Article 83B, §§3-203 — 3-205, Annotated Code of Maryland

Notice of Final Action

[92-161-F]

ıne 17, 1992, the Secretary of Housing and Commu- velopment adopted amendments to Regulations .02 — .08; repealed existing Regulations .06 and .07; and new Regulations .06 and .07 under COMAR 05.06.03 nd Housing Fund — Revitalization Program. ctions, which were proposed for adoption in 19:9 :81 — 882 (May 1, 1992), have been adopted as pro-

ive Date: August 3, 1992.

JACQUELINE H. ROGERS
›ecretary of Housing and Community Development

Title 08
DEPARTMENT OF NATURAL RESOURCES

tle 02 TIDEWATER ADMINISTRATION

| Fishing in Nontidal Waters

›ority: Natural Resources Article, §§4-602, and 4-603, Annotated Code of Maryland

Notice of Final Action

[92-181-F]

14, 1992, an amendment to Regulation .01 under 8.02.11 Fishing in Nontidal Waters, was adopted cretary of Natural Resources. This amendment, which was proposed for adoption in 19:11 Md. R. 1018 — 1019 (May 29, 1992), has been adopted as proposed.

Effective Date: August 3, 1992.

TORREY C. BROWN, M.D.
Secretary of Natural Resources

Subtitle 03 WILDLIFE

08.03.08 Threatened and Endangered Species

Authority: Natural Resources Article, §§10-2A-03, 10-2A-06, Annotated Code of Maryland

Notice of Final Action

[92-142-F]

On July 10, 1992, new Regulation .11-1 under COMAR 08.03.08 Threatened and Endangered Species, was adopted by the Secretary of Natural Resources. This new regulation, which was proposed for adoption in 19:9 Md. R. 883 (May 1, 1992), has been adopted as proposed.

Effective Date: August 3, 1992.

TORREY C. BROWN, M.D.
Secretary of Natural Resources

Subtitle 07 FORESTS AND PARKS

08.07.06 Use of State Parks

Authority: Natural Resources Article, §5-209, Annotated Code of Maryland

Notice of Final Action

[92-143-F]

On July 10, 1992, amendments to Regulation .16 and .20 and new Regulation .28 under COMAR 08.07.06 Use of State Parks, were adopted by the Secretary of Natural Resources. These actions, which were proposed for adoption in 19:9 Md. R. 883 (May 1, 1992), have been adopted as proposed.

Effective Date: August 3, 1992.

TORREY C. BROWN, M.D.
Secretary of Natural Resources

JUN 15 1994

October 1991

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN MARYLAND

Common Name	Scientific Name	Status	Distribution
Warbler, Kirtland's	Dendroica kirtlandii	E	Entire state; occasional migrant
Woodpecker, red-cockaded	Picoides borealis	E	Dorchester County; probably extirpated
MAMMALS:			
Bat, Indiana	Myotis sodalis	E	Garrett and Washington Counties
Squirrel, Delmarva Peninsula fox	Sciurus niger cinereus	E	Dorchester, Cecil, Talbot, Kent, Queen Annes; Somerset and Worcester Counties
Whale, blue*	Balaenoptera musculus	E	Oceanic
Whale, finback*	Balaenoptera physalus	E	Oceanic
Whale, humpback*	Megaptera novaeangliae	E	Oceanic
Whale, right*	Eubalaena spp. (All species)	E	Oceanic
Whale, sei*	Balaenoptera borealis	E	Oceanic
Whale, sperm*	Physeter catodon	E	Oceanic
MOLLUSKS:			
Mussel, dwarf wedge	Alasmidonta heterodon	E	Caroline, Queen Anne's St. Mary's, and Charles Counties
ARTHROPODS:			
Amphipod, Hay's Spring	Stygobromus hayi	E	District of Columbia
Beetle, American burying	Nicrophorus americanus	E	Considered extirpated in Maryland

AR301911

October 1991

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES IN MARYLAND

Common Name	Scientific Name	Status	Distribution
FISHES:			
Darter, Maryland	*Etheostoma sellare*	E	Harford County.
Sturgeon, shortnose*	*Acipenser brevirostrum*	E	Upper Chesapeake Bay and tributaries
REPTILES:			
Turtle, green*	*Chelonia mydas*	T	Oceanic; summer visitor coastal waters
Turtle, hawksbill*	*Eretmochelys imbricata*	E	Oceanic; summer visitor coastal waters
Turtle, leatherback*	*Dermochelys coriacea*	E	Oceanic; summer visitor coastal waters
Turtle, loggerhead*	*Caretta caretta*	T	Oceanic; summer resident coastal waters
Turtle, Atlantic ridley*	*Lepidochelys kempi*	E	Oceanic; summer resident coastal waters
BIRDS:			
Eagle, bald	*Haliaeetus leucocephalus*	E	Entire state; nests primarily in coastal plain
Falcon, American peregrine	*Falco peregrinus anatum*	E	Entire state; re-establishment of resident breeding population in progress
Falcon, Arctic peregrine	*Falco peregrinus tundrius*	T	Entire state - migratory; concentration area along coast
Plover, piping	*Charadrius melodus*	T	Worcester County

FEDERALLY LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES
IN MARYLAND

Common Name	Scientific Name	Status	Distribution
Beetle, Puritan tiger	Cicindela puritana	T	Chesapeake Bay beaches in Calvert; mouth of Sassafras R. in Kent and Cecil Counties
Beetle, northeastern beach tiger	Cicindela dorsalis dorsalis	T	Bay Beaches, Calvert and Somerset Counties (Jane's Island)
PLANTS:			
Dropwort, Canby's	Oxypolis canbyi	E	Queen Annes County
Gerardia, sandplain	Agalinis acuta	E	Baltimore County
Harperella	Ptilimnium nodosum	E	Alleghany County
Pink, swamp	Helonias bullata	T	Anne Arundel, Cecil, and Dorchester Counties
Pogonia, small-whorled	Isotria medeoloides	E	Montgomery County; probably extirpated
Bulrush, northeastern	Scirpus ancistrochaetus	E	Washington County
Joint-vetch, sensitive	Aeschynomene virginica	T	Somerset County
Coneflower, Smooth	Echinacea laevigata	E	Historic
Pigweed, Beach	Amaranthus pumilus	T	" "
American chaffseed	Schwalbia americana	E	" "

*Except for sea turtle nesting habitat, principal responsibility for these species is vested with the National Marine Fisheries Service.

E - Endangered
T - Threatened
PE - Proposed Endangered
PT - Proposed Threatened

APPENDIX E

MARYLAND DEPARTMENT OF THE ENVIRONMENT SPILL REPORT

RECEIVED FEB 10 1995
MARYLAND DEPARTMENT OF THE ENVIRONMENT
MDE 2500 Broening Highway • Baltimore, Maryland 21224
(410) 631-3000

Parris N. Glendening
Governor

David A.C. Carroll
Secretary

February 3, 1995

Mr. Alan J. Finio
Project Scientist
Harding Lawson and Associates
131 North Third Street
Philadelphia, PA 19106-1903

Re: International Petroleum - Spill at 6305 E. Lombard Street

Dear Mr. Finio:

As per you request, enclosed is the Emergency Response Report (#94 2451) dated March 10th 1994, involving a 15 gallon spill of water with a sheen of used motor oil by International Petroleum.

If you have any questions, please contact me at (410) 631-3440.

Sincerely,

Tony Leonardo

Tony Leonardo
Remedial Project Manager
WAS/NPL Superfund Division

cc: Mr. Richard Collins
Mr. Robert DeMarco

AR301916

MARYLAND DEPARTMENT OF THE ENVIRONMENT
WASTE MANAGEMENT ADMINISTRATION
EMERGENCY RESPONSE DIVISION

Sequence #: 94 2451

[ ] Chemical [✓] Petroleum [ ] Other:

CALLER

1. Name of Person Taking Report: D. Caldwell
2. Date of Report: 3 / 10 / 94 3. Time of Report: 0957
4. Original Complainant: Larry Hill
5. Complainant Agency or Address: International Petroleum
6. Complainant Telephone #: (410) 633-0606

DETAIL OF SPILL

7. Date of Spill: 3 / 10 / 94 8. Time of Spill: During Night after 7:00
9. Company Name: International Petroleum
10. Precise Location of Spill or Incident: 6305 E. Lombard St
10a. City: Baltimore
11. Nearest Cross Street: 12. County:
13. Type of Product Involved: Used motor oil
14. Quantity on Board: 15. Amount Spilled: 15 gallons
16. Details of Spill: Parking lot of E. Lombard St has sheen on water - from a oil truck that someone had released a value on ovemite causing oil spill - Truck had water in it with a residue of oil
17. Has Product Entered Waterway?: [ ] Yes [✓] No
18. Name of Waterway:

SPILLER

19. Has Corrective Action Been Taken?: [✓] Yes [ ] No
20. If Yes, what?: had Boom - Pads and have a Vac Truck on Scene - Int
21. Responsible Party: International Petroleum
22. RP's Address: 6305 E. Lombard St.
23. RP's Telephone #: (410) 633-0606

Revised 10/19/92 Form ERP 102A

AR301917

DISTRIBUTION

Phase II Ecological Assessment
Summary of Results
Kane and Lombard Superfund Site
Baltimore, Maryland

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This document was prepared for the sole use of the Respondents and the regulatory agencies involved with the project, the only intended beneficiary of our work. No other parties should rely on the information contained herein without the prior written consent of HLA.

Quality Control Reviewer

_____

Merrill Coomes
Vice President Director of Risk Management

\WORK\27654\ECO\DISTLIST.LIS March 16, 1995 2:21 pm