



ENVIRONMENTAL ASSESSMENT

BRAC 95 RELOCATIONS TO
NAVAL SURFACE WARFARE CENTER,
CARDEROCK DIVISION
BETHESDA, MARYLAND

October 1996

DECLASSIFICATION STATEMENT A

Approved for public release
Distribution Unlimited

DEPARTMENT OF DEFENSE
DEPARTMENT OF THE NAVY

FINDING OF NO SIGNIFICANT IMPACT FOR THE BRAC 1995 RELOCATIONS TO
NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION IN BETHESDA,
MARYLAND

Pursuant to Council on Environmental Quality regulations (40 CFR Parts 1500-1508) implementing the procedural provisions of the National Environmental Policy Act (NEPA), the Department of the Navy gives notice that an Environmental Assessment (EA) has been prepared and that an Environmental Impact Statement is not required for the relocation of various research and development functions, personnel, and equipment from three Naval Surface Warfare Center (NSWC) sites in Maryland to NSWC Carderock Division in Bethesda, Maryland (the Center). The Center is located along the Clara Barton Parkway near Route 495. Activities being relocated are from NSWC Carderock Division Detachments in Silver Spring, Maryland (White Oak facilities) and Annapolis, Maryland (the David Taylor Research Basin facilities and the nearby "NIKE" Annex site).

Pursuant to the Defense Base Closure and Realignment Act of 1990 (Public Law 101-510), as implemented by the 1995 BRAC process, the Department of Defense was directed to close the NSWC Carderock Division Detachments at White Oak and Annapolis, including the "NIKE" Annex, and relocate functions, personnel, equipment, and support to appropriate technical activities. The BRAC 1995 decisions further mandated that the Ship Magnetic Signature Control Research and Development (R&D) Complex relocate to NSWC Carderock in Bethesda, MD. The Defense Base Closure and Realignment Act exempted these realignment decisions from the provisions of NEPA, but required that NEPA be applied as appropriate to the implementation of these decisions.

The proposed action is to accommodate specific operational requirements of the relocating activities at NSWC Carderock through renovation of existing facilities or construction of new facilities. The relocation of the activities involved with advanced materials R&D (Carderock Division Detachments) are being consolidated at the Center because the programs are administered by, and directly related to, R&D programs currently at the Center. The realignment to the Center involves approximately 175 personnel, of which approximately 136 are technical personnel directly involved in research and development, with the remaining personnel functioning primarily as administrative support. The relocating activities are involved in research and development in the following areas: effects on ships' magnetic characteristics; personnel radiation-safety monitoring devices and shipboard radiation shielding; advanced materials and coatings for diverse

Enclosure (1)

19970303 119

DTIC QUALITY INSPECTED 1

applications; physics and chemistry of material surfaces; current and advanced battery and fuel cell applications.

Five alternative site locations within NSWC Carderock were considered in addition to the no-action alternative. The no-action alternative was not considered viable because the relocating facilities have highly specialized requirements that can not be adequately satisfied in existing spaces. The selected alternative places realigning activities in locations on-base that provide adjacency to, and consistency with, existing functions. All locations on-base have been located to be consistent with the Center's Master Plan, except the Ship Magnetic Signature Control Complex. The specialized mission for this complex requires buildings to be sited, and arranged in a specific configuration, in the Northwest quadrant of the Center because this is the only location where external magnetic influences are acceptable. The Master Plan for NSWC Carderock is being revised and will be submitted for review by the National Capital Planning Commission.

The selected alternative places the Materials Laboratory functions in a complex in the western portion of the base (near the unused windtunnel building). Existing buildings 11, 12, and 157 (the windtunnel) will be renovated to accommodate the laboratories. An addition to building 11 will be constructed. The radiation safety laboratories will be located within Building 157. No radioactive waste is generated by these operations and the laboratories will be constructed and operated according to federal, state and Navy regulations. Buildings 11, 12, 13 and 157 are considered contributing resources to a historic district, and the Center signed a Memorandum of Agreement (MOA) with the Maryland State Historic Preservation Office and the Advisory Council for Historic Preservation for documentation associated with the windtunnel. Navy will complete obligations required under the existing MOA and complete other Section 106 consultation as necessary. No significant impacts on historic or archeological resources are expected.

The selected alternative will construct a Metal Coating and Forming building at the eastern end of the Center. This facility would not be visually apparent from outside the Center and impacts associated with the operation of this facility will be minimal. Personnel involved with administrative and support functions associated with the advanced materials R&D activities would be located in the east wing, second floor of building 19 following interior renovations. Building 19 is located along the Center's southern boundary. Space in the basement of Building 19 would also be renovated for a small laboratory involved in corrosion research. Other construction associated with realignment includes; two parking areas in the vicinity of Building 19, paving for driveways and sidewalks, landscaping, and connection of utilities. All utilities are present near the project sites and have sufficient capacity for the

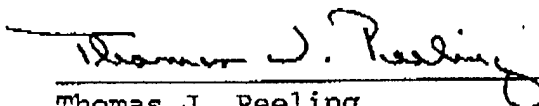
proposed action. The proposed action will not impact any federally listed threatened or endangered species or critical habitat, and no jurisdictional wetland impacts are expected.

The Center is located in Maryland Air Quality Area IV which is classified as in serious non-attainment for ozone. Analysis of the criteria air pollutant precursor emissions, Nitrogen Oxides and Volatile Organic Compounds, associated with the proposed action showed that the total, net emissions for the proposed action would be clearly de minimis, therefore the action will conform to the State Implementation Plan for air quality. Potential socioeconomic impacts associated with the realignment will be minor and no low-income or minority groups would be adversely affected. Existing low-level contamination of soils in the vicinity of the new Materials Laboratory Complex (Remedial Investigation sites #8 and #9) will be remediated before construction begins. Best management practices will be used during construction to minimize potential noise and dust impacts. An Erosion and Sediment Control Plan and a Stormwater Management Plan will be approved by the State of Maryland.

Based on the information gathered during preparation of the EA, and with implementation of the required mitigation, the Navy finds that the 1995 BRAC relocations to the NSWC Carderock Division in Bethesda, MD will not significantly impact the environment.

The EA addressing this action may be obtained from: Commanding Officer, Engineering Field Activity Chesapeake, Washington Navy Yard, Building 212, 901 M Street SE, Washington DC 20374-2121 (Attn: Mr. Matthew Hess, Code 20E), telephone (202) 685-3062, fax (202) 685-3350. A limited number of copies of the EA are available to fill single copy requests.

24 January 1997
Dated


Thomas J. Peeling
Special Assistant for Environmental Planning
Environmental Protection, Safety and
Occupational Health Division
Deputy Chief of Naval Operations (Logistics)

**ENVIRONMENTAL ASSESSMENT
for
BRAC 95 RELOCATIONS TO CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER
in
BETHESDA, MARYLAND**

Department of the Navy

EA Planner-In-Charge:

**Matt Hess, Code 20E
Engineering Field Activity, Chesapeake
Naval Facilities Engineering Command
901 M Street, SE, Building 212
Washington, DC 20374-5018**

Activity Point of Contact:

**Douglas J. Garbini
Environmental Engineer
Division Environmental Office, Code 007
Naval Surface Warfare Center, Carderock Division
Bethesda, Maryland 20884-5000**

TABLE OF CONTENTS

LIST OF FIGURES.....	iii
ACRONYMS AND ABBREVIATIONS.....	iv
1.0 INTRODUCTION.....	1-1
1.1 Background	1-1
1.2 Purpose & Need.....	1-1
1.3 Description of the Relocating Activities	1-2
1.4 Description of Community Concerns	1-4
2.0 PROPOSED ACTION AND ALTERNATIVES CONSIDERED	2-1
2.1 The Proposed Action.....	2-1
2.2 Alternative 1	2-3
2.3 Alternative 2	2-3
2.4 Alternative 3	2-3
2.5 Alternative 4	2-3
2.6 Alternative 5	2-4
2.7 No Action Alternative	2-4
3.0 EXISTING ENVIRONMENTAL CONDITIONS.....	3-1
3.1 Topography, Geology & Soils	3-1
3.2 Water Quality and Hydrology.....	3-1
3.3 Air Quality and Applicability of Air Conformity Regulations.....	3-2
3.4 Noise	3-3
3.5 Terrestrial Environment/Threatened and Endangered Species	3-3
3.6 Wetlands.....	3-4
3.7 Socioeconomics.....	3-5
3.8 Historical and Cultural Resources	3-5
3.9 Community Services	3-6
3.10 Land Use and Aesthetics	3-8
3.11 Transportation	3-9
3.12 Utilities	3-10
3.13 Hazardous Materials and Wastes.....	3-12
4.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION REQUIRED	4-1
4.1 Topography, Geology and Soils.....	4-1
4.2 Water Quality and Hydrology.....	4-3
4.3 Air Quality	4-4
4.4 Noise	4-6
4.5 Terrestrial Environment/Threatened and Endangered Species	4-8
4.6 Wetlands.....	4-10

LIST OF FIGURES

<u>Figure Number</u>	<u>Figure Title</u>	<u>Following Page</u>
1 - 1	Vicinity Map	1-2
2 - 1	Magnetics Complex - Proposed Action	2-2
2 - 2	Materials R&D - Alternative 1	2-4
2 - 3	Materials R&D - Alternative 2	2-4
3 - 1	Soils	3-2
3 - 2	Water Quality	3-2
3 - 3	Vegetation	3-4
3 - 4	Land Use	3-8
3 - 5	Transportation	3-10
3 - 6	IR Sties & EQSD Arcs	3-12

NHPA	National Historic Preservation Act
NO _x	Oxides of Nitrogen
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NRL	Naval Research Laboratory
NSWC	Naval Surface Warfare Center
NSWCCD	NSWC Carderock Division
NSWCDD	NSWC Dahlgren Division
NWI	National Wetland Inventory
OSHA	Occupational Safety and Health Administration
P2	Pollution Prevention
PEPCO	Potomac Electric Power Company
psi	Pounds per square inch
RCRA	Resource Conservation and Recovery Act
R&D	Research and Development
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
tpy	Tons per year
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compounds
WSSC	Washington Suburban Sanitary Commission

1.0 Introduction

1.1 Background

The Naval Surface Warfare Center (NSWC) operates research and development facilities that design and test systems for Navy surface ships. To accomplish this mission, NSWC has facilities and personnel in multiple sites across the nation. Due to budget constraints imposed by Congress, NSWC's extensive network of laboratories and testing ranges is in the process of consolidating and closing facilities. The mechanism for closure and realignment decisions for the Department of Defense (DoD) is the Base Realignment and Closure (BRAC) Commission, established by the Defense Base Closure Act of 1990. The BRAC Commission examines all facilities and programs and presents recommendations to Congress. Congress reviews the recommendations and, if in concurrence, forwards them to the President. When BRAC recommendations are accepted by the President, the included actions become law and must be implemented by the affected agencies.

The BRAC actions which are the subject of this Environmental Assessment (EA) involve the relocation of a number of functions, personnel, equipment and support from three NSWC sites in Maryland. Research and development (R&D) activities are relocating from NSWC Dahlgren Division Detachment and NSWC Carderock Division Detachment at the NSWC White Oak Site in Silver Spring, Maryland; and from the Carderock Division Detachment at the Naval Base in Annapolis (which includes the NIKE Annex site located approximately five miles east of Annapolis). See Figure 1-1.

1.2 Purpose and Need

As the Navy complies with the BRAC mandates, it is reducing facilities and consolidating activities. To maintain research capability, the Navy needs to relocate certain functions, personnel, equipment and support from the Detachments mandated for closure.

BRAC 1995 decisions mandate that the NSWC Dahlgren Division Ship Magnetic Signature Control Research and Development Complex relocate from White Oak to NSWC Carderock in Bethesda, Maryland. Separate from the specific relocation of the Ship Magnetic Signature Control Complex, the

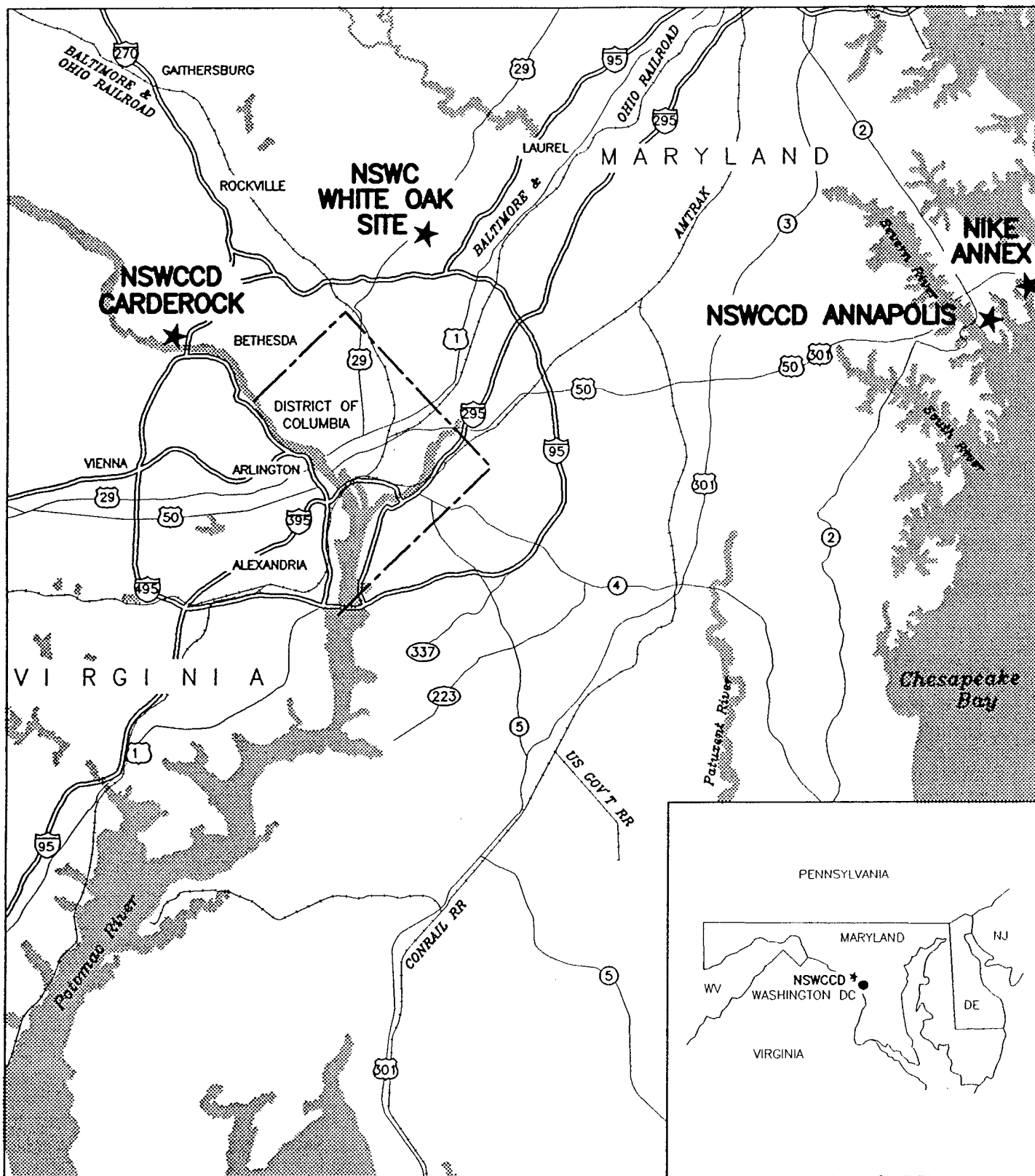
1995 BRAC recommendations included closure of NSWC, White Oak and Carderock Division Detachment in Annapolis, Maryland. The NSWC Carderock Center in Bethesda, Maryland (the Center) operates research and development detachments at each of those two locations. The detachments are involved in a variety of materials and equipment programs that support the fleet through increasing the durability, reparability and safety of shipboard systems. They also conduct research on shielding ship crews from radiation in shipboard nuclear propulsion plants. To do this research the scientists use equipment that contains reduced scale radiation sources for laboratory use. Research in this area includes development of improved personal monitoring equipment such as radiation badges.

The purpose of the relocation action is to consolidate NSWC laboratory, testing and administrative functions and to improve ongoing research and development of materials, processes and testing capabilities. This document assesses impacts associated with realignment of activities at the Center and does not cover impacts associated with closure or disposal of White Oak or Annapolis properties.

1.3 Description of Relocating Activities

NSWC scientists and engineers of the relocating activities use laboratories to improve and develop a wide variety of ship maintenance and operations methods, including development of durable metal coatings and machine surfaces, reduction of mine-triggering magnetic fields of all naval platforms, protection of nuclear powered ship crews from radiation, forming of special prototype castings using polyurethane and new metal alloys, and designs for safer shipboard electric batteries. It is important to note that the relocating activities do not operate in a manufacturing or production capacity. Specifically, the relocating activities include groups that:

- A. Conduct advanced research, testing, development and evaluation of new materials for U.S. Navy applications:
 - 1. Polyurethane Experimental Prototype Process Facility, from the NIKE Annex - 4 people
 - 2. High Temperature Metal Spray Coating Facility, from the NIKE Annex - 4 people
 - 3. Titanium Spray Forming Facility, from the NIKE Annex - 2 people
 - 4. Ceramics Science and Technology Group, from White Oak - 5 people



5. Metallurgy Science and Technology Group, from White Oak - 5 people
 6. Polymer Science Research and Technology Group, from White Oak - 5 people
 7. Magnetics Materials Development and Applications Group, from White Oak - 5 people
 8. Advanced Materials Development for Electronic and Electro-Optic Devices Group, from White Oak - 1 person
- B. Investigate the physics and chemistry of material surfaces:
1. Corrosion Control Activity, from White Oak - 4 people
 2. Biotechnological Corrosion Research Group, from White Oak - 2 people
 3. Surface Science Group, from White Oak - 4 people
 4. Non-Destructive Evaluation Group, from White Oak - 4 people
- C. Conduct research, testing, development and evaluation of current and advanced battery and fuel cell applications for U.S. Navy operations:
1. Battery Research and Development Group, from White Oak - 7 people
 2. Battery Test and Evaluation Group, from White Oak - 7 people
- D. Conduct research, testing, development and evaluation on ships' magnetic characteristics:
1. Magnetic Field Laboratory, from Annapolis - 14 people
 2. Magnetic Measurement Laboratory, from White Oak - 36 people
- E. Conduct testing, development and evaluation of radiation safety for U.S. Navy shipboard use:
1. Personnel Radiation Monitor Development and Calibration, from White Oak - 18 people
 2. Shipboard Radiation Shielding Program, from White Oak - 9 people
- (NOTE - These activities use commercially available sealed radioactive sources. No radioactive wastes are generated. These activities are regulated and inspected by state, federal and Navy regulatory agencies.)

The 136 personnel listed above are technical personnel. The balance of 175 relocating personnel, or 39, are administrative support personnel for the relocating activities. The Proposed Action is to accommodate specific operational requirements of relocating activities at NSWC Carderock through renovation of existing facilities or construction of new facilities as needed. Many of the relocating activities would be reorganized and consolidated to improve efficiency and information exchange. For the purpose of this EA, the activities proposed for relocation to the Center can be grouped into two major categories; 1) the BRAC mandated Ship Magnetic Signature Control R&D Branch, and 2) the Advanced Materials R&D functions.

1.4 Description of Community Concerns

A scoping letter, included in Section 7.1 of this report, was sent to the various agencies and individuals listed in Section 7.3. Copies of the letters received are included in Section 7.2. The concerns expressed in the letters and the Navy responses are as follows:

1. Questions about the number of persons relocating - Approximately 175 personnel are associated with the relocating activities: approximately 150 from White Oak and 25 from Annapolis and the NIKE Annex. See Section 4.7 Socioeconomics and Section 4.11 Transportation.
2. Concern about physical and activity changes to the Center - Activities relocating to the Center are similar in function and scale to current activities. They are generally quiet, non-polluting and non-invasive activities. The facilities proposed for them would be in existing and new buildings. New buildings would be sited unobtrusively to the maximum extent practicable. See Section 4.4 Noise, Section 4.5 Terrestrial Environment, Section 4.8 Historical and Cultural Resources, Section 4.9 Community Services, Section 4.10 Land Use and Aesthetics, and Section 4.12 Utilities.
3. Questions regarding the sizes of new buildings - The proposed buildings are modest in size with the three largest, the Magnetism Laboratory, the Magnetism Administration and the Building 11 Annex covering 45x120 feet, 70x145 feet and 130x130 feet, respectively. The Magnetism Administration and Laboratory would be the tallest at three stories. See Section 4.10 Land Use and Aesthetics.
4. Questions about the location of new buildings - Many of the relocating activities would be housed in existing buildings remodeled for the new uses. Of the four new buildings and three structures that would be constructed, all but the Magnetism Administration building would be sited in the interior of the Center. The Magnetism Administration building would be sited 40 feet from the MacArthur

Boulevard boundary of the Center. See Section 2.1, Figure 2-1 Proposed Action, and Section 4.10 Land Use and Aesthetics.

5. Concern that the reuse of buildings involve preservation of historic qualities and protection of other historic resources at the Center - All proposed building reuse would be evaluated by the Navy for historic preservation and coordinated with the Maryland State Historic Preservation Officer and the federal Advisory Council on Historic Preservation through the Section 106 process of the National Historic Preservation Act. See Section 4.8 Historical and Cultural Resources.
6. Concern regarding the site layout of new buildings - Budget constraints would limit the extent of site development related to new buildings. New parking and outdoor work areas would be minimal. See Section 4.2 Water Quality and Hydrology, Section 4.5 Terrestrial Environment, Section 4.6 Wetlands, Historical and Cultural Resources, and 4.10 Land Use and Aesthetics.
7. Concern about transportation changes that would impact adjacent neighborhoods - Increased traffic is expected to be minimal due to the small number of relocated personnel. A majority of new traffic would enter and leave the Center via the Clara Barton Parkway and most would enter and leave the vicinity via Interstate 495. See Section 4.11 Transportation.
8. Concern for traffic, air quality and noise impacts on schools in the area - Changes in traffic, air quality and noise resulting from the relocations are expected to have negligible impact on schools. See Section 4.3 Air Quality, Section 4.4 Noise, and Section 4.11 Transportation.
9. Concern about impacts on federal and Maryland listed endangered species of plants and animals - Minor impact to one Maryland listed endangered plant species would occur. A second plant, listed as "status uncertain," situated on one of the building sites, would be transplanted to an alternate location at the Center. See Section 4.5 Terrestrial Environment.
10. Concern regarding impacts to wetlands - New construction would be sited away from wetlands so that no impact would occur. See Section 4.6 Wetlands.
11. Concern about the presence of toxic and hazardous chemicals and the potential for soil and water contamination - Federal, Navy and Maryland regulations prescribe how toxic and hazardous materials and wastes may be stored, used and discarded. The likelihood that environmental contamination would occur at the Center is minimal because of compliance with regulations, detailed hazardous materials and waste handling procedures, and personnel training. See Section 4.13 Hazardous Materials and Wastes.

12. Questions regarding the schedule of events for the proposed action - a) Some White Oak personnel would relocate to the Center in the last quarter of 1996. This is necessary to keep other BRAC actions at White Oak on schedule. The relocated personnel would temporarily occupy existing facilities. b) The bulk of construction would occur in 1997, and is expected to taper off through 1998. Some White Oak and Annapolis personnel would relocate to the Center in 1997 as proposed facilities become available. The bulk of the relocating activities would arrive in 1998 as their respective facilities become available. See Appendix C.

2.0 PROPOSED ACTION AND ALTERNATIVES CONSIDERED

This section contains a discussion of the alternative ways that the BRAC mandated relocation and the closure of the White Oak and Annapolis Detachments were considered in planning for the affected functions. Alternative sites considered for the relocating units are outlined in this section.

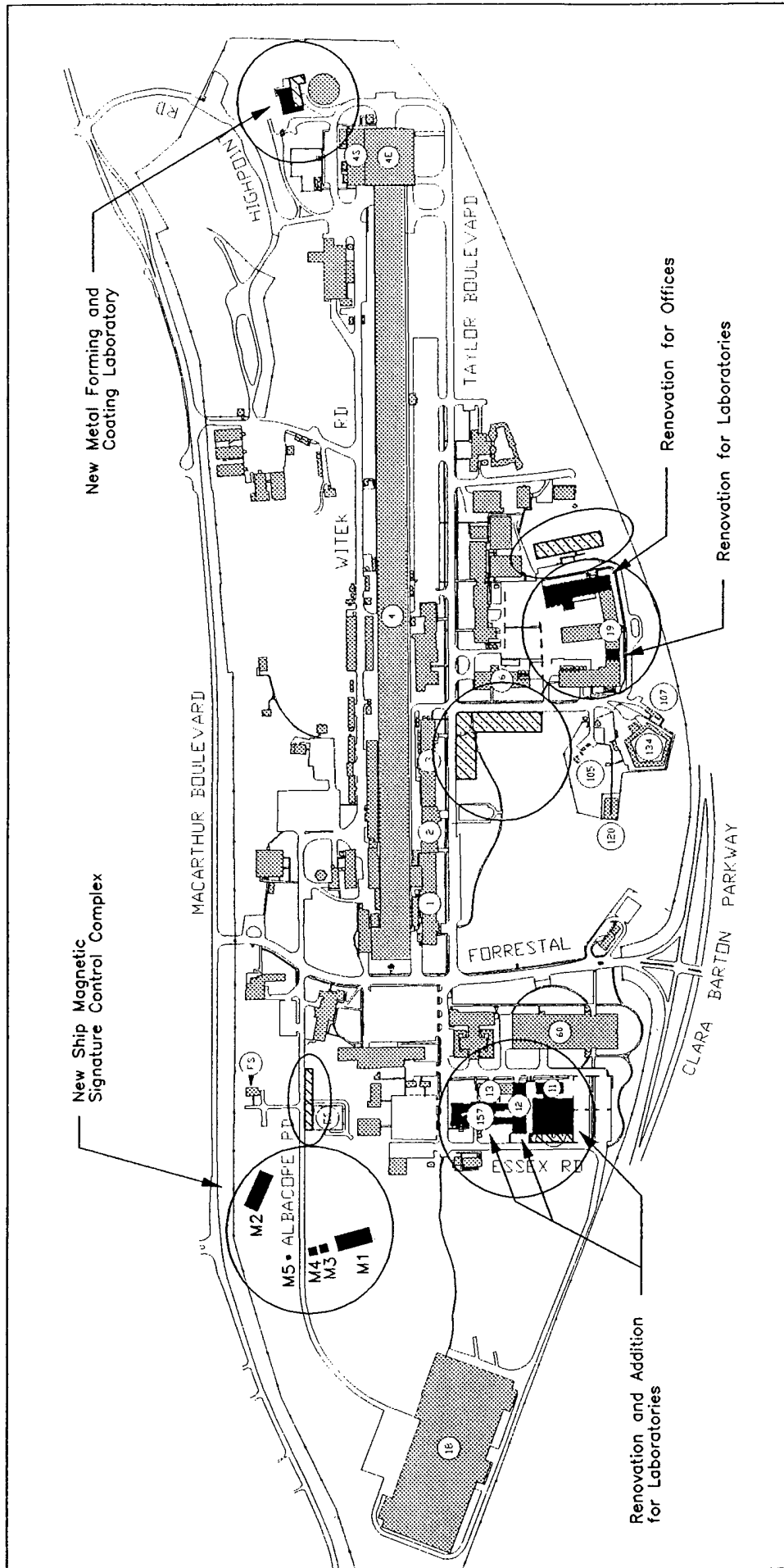
2.1 The Proposed Action

The Proposed Action is to accommodate specific operational requirements of relocating activities at NSWC Carderock through renovation of existing facilities or construction of new facilities as needed. Many relocating activities will be reorganized and consolidated to improve efficiency and information exchange. The activities proposed to be housed at the Center, for the purpose of this EA, can be grouped into two major categories; 1) the BRAC mandated Ship Magnetic Signature Control Research and Development Branch, and 2) the Advanced Materials Research and Development functions.

The proposed Ship Magnetic Signature Control Research and Development facilities would be located in a complex that includes a laboratory, two staging structures and an administrative building. The location of the complex is determined by the background magnetic characteristics of the Center. A base-wide magnetic survey was conducted to identify a site for the complex that would enable it to perform as necessary to meet its mission requirements. Only one area at the Center had the magnetic characteristics that would allow the special equipment to function properly. The area identified lies between the new Fire Station and the woods north of Building 18. Figure 2-1 shows the siting of the structures at this location and the arrangement needed for them to operate effectively. The arrangement of the structures is controlled initially by the siting of the Laboratory (M1, where equipment is tested). The research conducted in this structure is critically sensitive to outside magnetic influences. It must also be oriented as shown so that equipment to be tested can be moved into it from the Deperm structure (M3, where the magnetic field of the equipment is neutralized) and the Staging structure (M4, where the equipment is mounted on the chassis that carries it to M1). M4 must be adjacent to Albacore Road for truck and crane access and equipment loading. The Sensor structure (M5, which monitors the background magnetic field of the Earth during tests) must be at least 240 feet away and in-line with M1. This requirement places M5 just north of Albacore Road, as shown on Figure 2-1. The Administrative Building (M2) must be as close as possible to M1 because it houses the power supply, controls and monitoring equipment for the tests. To avoid interfering with the

tests, however, it can be no closer than 350 feet. This set of requirements, the desire to avoid impacts to wetlands, and the need to stay clear of existing underground and above ground utility structures places M2 in the wooded area between Albacore Road and the northern fenceline of the Center.

The Advanced Materials Research and Development functions would be relocated to the Center because they are involved in research and development programs administered by and directly related to those currently at the Center. These functions are grouped and identified as the Materials Laboratory, Metal Forming and Coating, and Administration for the research units. The Proposed Action includes adaptive reuse of buildings 11, 12, and 157 (all currently vacant) to take advantage of certain inherent architectural characteristics that they possess. Non-functioning rotating and electrical equipment associated with the wind tunnel operation would be removed from the buildings along with the metal scaffolding and structures used to support experimental apparatus in the wind tunnel. The removal would include a small scale wind tunnel (not operational) in Building 11. The first floor and basement areas of Building 11 would be renovated to create laboratories for the Magnetic Materials, Surface Properties and Battery Technology while the second floor would serve as offices for the associated staff. The high bay interior of Building 12 would be fitted with modular laboratory and office inserts serving Ceramics, Metallurgy and Battery Technology and the basement areas would be utilized primarily for small battery testing and storage. The interior of the wind tunnel in Building 157 would be cleared of experimental test stands and flooring, so that air conditioning and utilities may be inserted to provide experimental spaces for the Radiation Health and Physics laboratories and battery testing. In addition, large industrial scale equipment currently located in the area behind Building 11 would be removed; a new, single story building would be constructed on the site (the Building 11 Annex) to house Ceramics, Metallurgy, Polymer and Polyurethane laboratory functions. A space in the basement of the south wing of Building 19 would also be renovated for the Materials Laboratory. A new building to house the Metal Forming and Coating facility would be constructed at the far eastern end of the Center just northeast of Building 4S. Offices and administration would be located on the second floor of the east wing of Building 19. Parking lots in the vicinity of buildings 16 and 19 would be expanded to serve the relocating research personnel. See Figure 2-1 for the siting locations of these facilities.



NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION

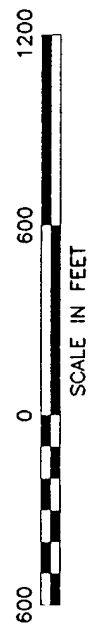
FIGURE 2-1:

PROPOSED ACTION

SOURCE: HAYES, SEAY, MATTERN & MATTERN, INC., 1996.

LEGEND

- BUILDING
- FENCE
- SIDEWALK
- ROAD
- ELECTRICAL SUBSTATION
- FIRE STATION
- NEW CONSTRUCTION/RENOVATION
- NEW PARKING



2.2 Alternative 1 - At the Carderock Center, place the Metal Forming and Coating Facility adjacent to Building 18

Alternative 1 is similar to the Proposed Action, in that it would site the Magnetics Complex in the area between the new Fire Station and the woods north of Building 18 and the Materials Laboratory and Administration in renovated portions of buildings 11, 12, 19 and 157. New parking lots would be constructed near Building 19 to accommodate vehicles of the relocated personnel. Also, a new laboratory annex would be added west of Building 11; however, the Metal Forming and Coating facility would be sited in the clearing to the east of Building 18. See Figure 2-2 for Alternative 1.

2.3 Alternative 2 - At the Carderock Center, place the Metal Coating Facility in Building 157 and Metal Forming Facility adjacent to Building 18

Alternative 2 is identical to Alternative 1, except that the Metal Coating unit would be located within Building 157 and the Metal Forming unit would be in the clearing to the east of Building 18. See Figure 2-3 for Alternative 2.

2.4 Alternative 3 - At the Carderock Center, place Radiation Health and Physics in a new building adjacent to Building 18

Alternative 3 considers constructing a new facility east of Building 18 to house the Radiation Health and Physics activities. This alternative was dropped from further consideration after a cost analysis revealed that adaptive reuse of Building 157 was substantially less costly than constructing a new building. Also, the National Historic Preservation Act encourages reuse of historic structures. Reuse of Building 157 eliminates the need to continue providing maintenance to an unused historical building and saves the cost and environmental impact of developing a new site.

2.5 Alternative 4 - Relocate the Materials Laboratory, Metal Forming and Coating and Administration to the Philadelphia Detachment

Although managed by NSWC Carderock Division, the Philadelphia Detachment is an entirely different type of activity from the relocating research and development units. The Philadelphia Detachment is an in-service engineering activity which designs and installs equipment on ships for operational testing and long

term service. Moving the relocating activities to the Philadelphia Detachment would not allow NSWC to achieve the cost savings that would be achieved by consolidating at an existing research and development site. Therefore, Alternative 4 was dropped from further consideration.

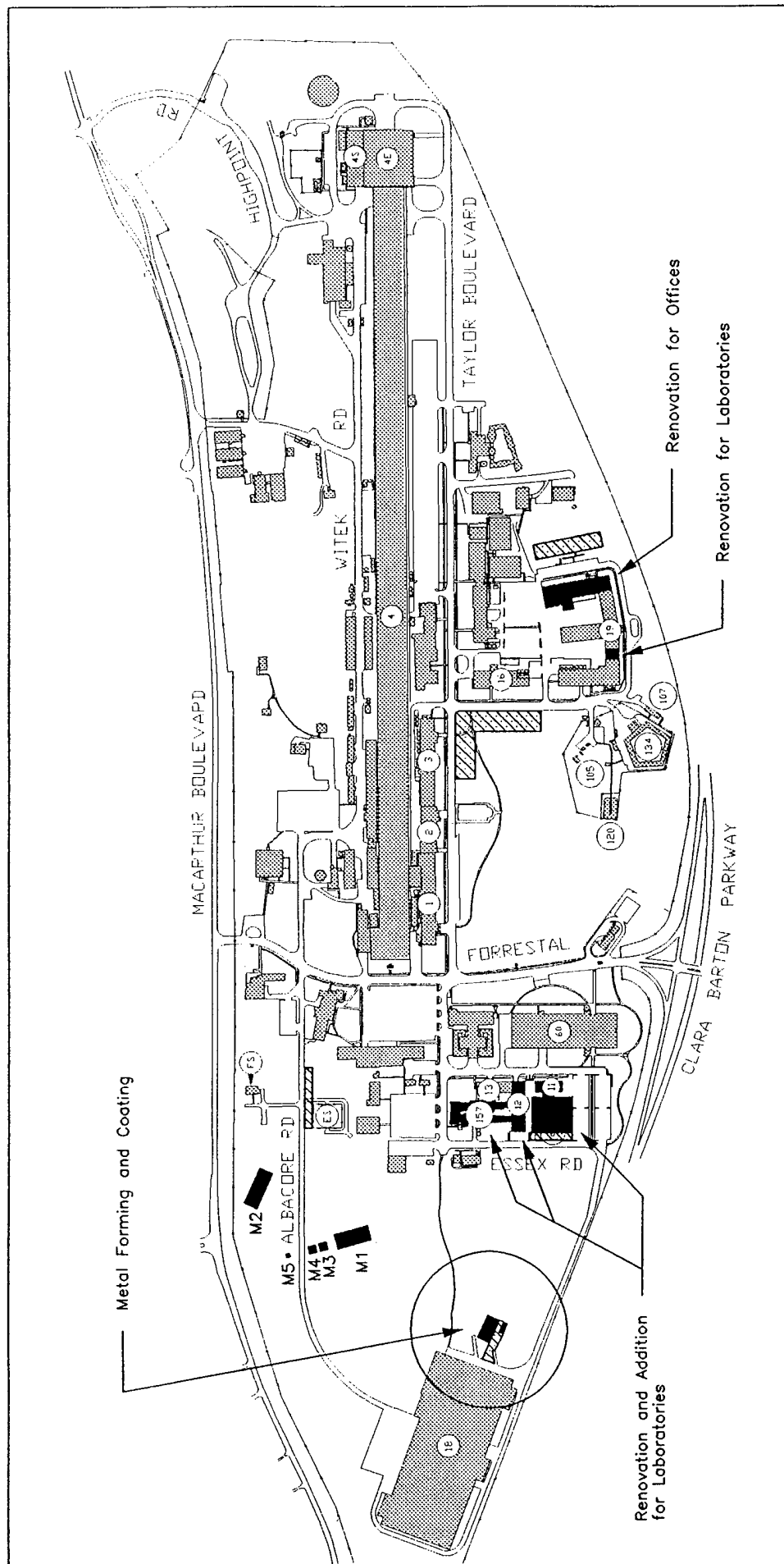
2.6 Alternative 5 - Relocate the Materials Laboratory, Metal Forming and Coating and Administration to the Naval Research Laboratory, Washington, D. C.

The Naval Research Laboratory (NRL) is a research and development activity and, therefore, similar to the relocating activities. However, because NRL is not managed by NSWCCD, relocation of facilities there would not allow NSWC to consolidate management, a major intent of the BRAC process. No other potential locations would meet the operational needs of the relocating activities as well as consolidation at the NSWC Carderock Division Headquarters in Bethesda, Maryland. The benefits to the research and development functions from being collocated with existing, related functions is essential to efficient operations, both in terms of information exchange and long-term cost savings. For these reasons, Alternative 5 was dropped from further consideration.

2.7 No Action Alternative

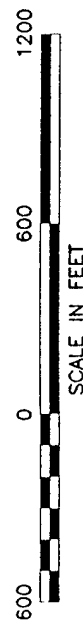
The No Action Alternative is to not construct or renovate facilities to meet specialized operational requirements and to use only existing structures to house functions, equipment and personnel relocating to the Center. After extensive review of existing buildings and infrastructure, the No Action Alternative was not considered viable because the relocating activities have highly specialized requirements that can not be adequately satisfied in existing structures.

The environmental impacts of the Proposed Action, Alternative 1 and Alternative 2 are discussed in Section 4.0 of this report.



LEGEND

- BUILDING
- FENCE
- SIDEWALK
- ROAD
- ELECTRICAL SUBSTATION
- FIRE STATION
- RENOVATION AND CONSTRUCTION
- NEW PARKING

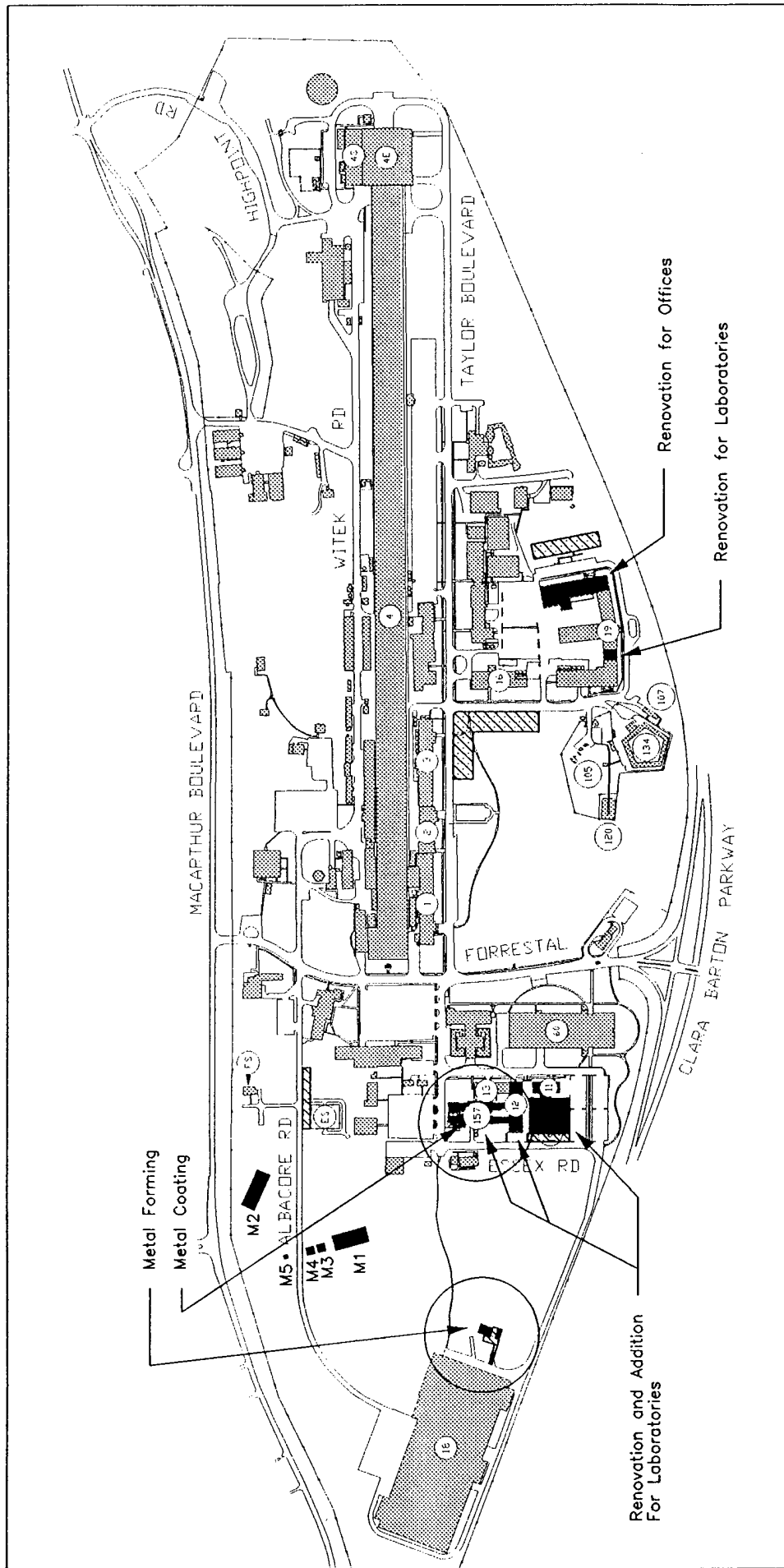


NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION

FIGURE 2-2:

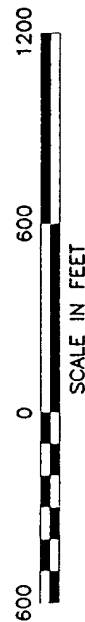
ALTERNATIVE 1

SOURCE: HAYES, SEAY, MATTERN & MATTERN, INC., 1996.



LEGEND

- BUILDING
- FENCE
- SIDEWALK
- ROAD
- ELECTRICAL SUBSTATION
- FIRE STATION
- RENOVATION AND CONSTRUCTION
- NEW PARKING



NAVAL SURFACE WARFARE CENTER
CARDEROCK DIVISION

FIGURE 2-3:

ALTERNATIVE 2

SOURCE: HAYES, SEAY, MATTERN & MATTERN, INC., 1996.

3.0 EXISTING ENVIRONMENTAL CONDITIONS

This section describes the existing environment that would be affected by implementation of the Proposed Action and Alternatives 1 and 2. The description of the existing environment is based on interviews and discussions with the individuals listed in Section 6.0, the sources listed in Section 8.0 (and referenced throughout the report), and site visits to the during January 16-17, and October 7, 1996.

3.1 Topography, Geology & Soils

The topography of the Center is relatively flat. Elevations range from 112 feet above mean sea level along the southern boundary to 150 feet above mean sea level at the northern boundary along MacArthur Boulevard. The topography rises sharply to 300 feet in elevation along ridge tops off-site to the north. Several isolated areas of slopes exceeding 15 percent occur on the Center grounds. These are located approximately 350 feet east of Building 18; along MacArthur Boulevard, near the Center's northern property boundary; northeast of Building 4E; and along the Clara Barton Parkway ramp which forms part of the eastern boundary of the Center.

The entire Center is within the Piedmont Geologic Province. It lies in an area that contains a variety of alluvial soils deposited over time by the Potomac River and streams in the area. Portions of the Center, about 38 percent or 70 acres, are comprised of natural soils which have changed little during the development of the Center (see Figure 3-1). Several of these natural soil locations are occupied by woods and wetlands. Most of the Center consists of soils that have been graded, leveled and compacted during periods of construction. Other than in the wetlands and the small streams that cross the Center, the soils do not impose constraints for construction of buildings and paving.

3.2 Water Quality and Hydrology

The Center is located in the drainage basin of the Potomac River. Specifically, the Center is part of the Rock Run watershed that begins near Potomac Village and extends southwest from Persimmon Tree Road to the ridge above MacArthur Boulevard and Brickyard Road. South of MacArthur Boulevard, Rock Run flows into the Potomac River through the Fema Tributary. The 100-year flood plain of this stream crosses the Center at its northeast boundary (Woolpert Consultants, 1989).

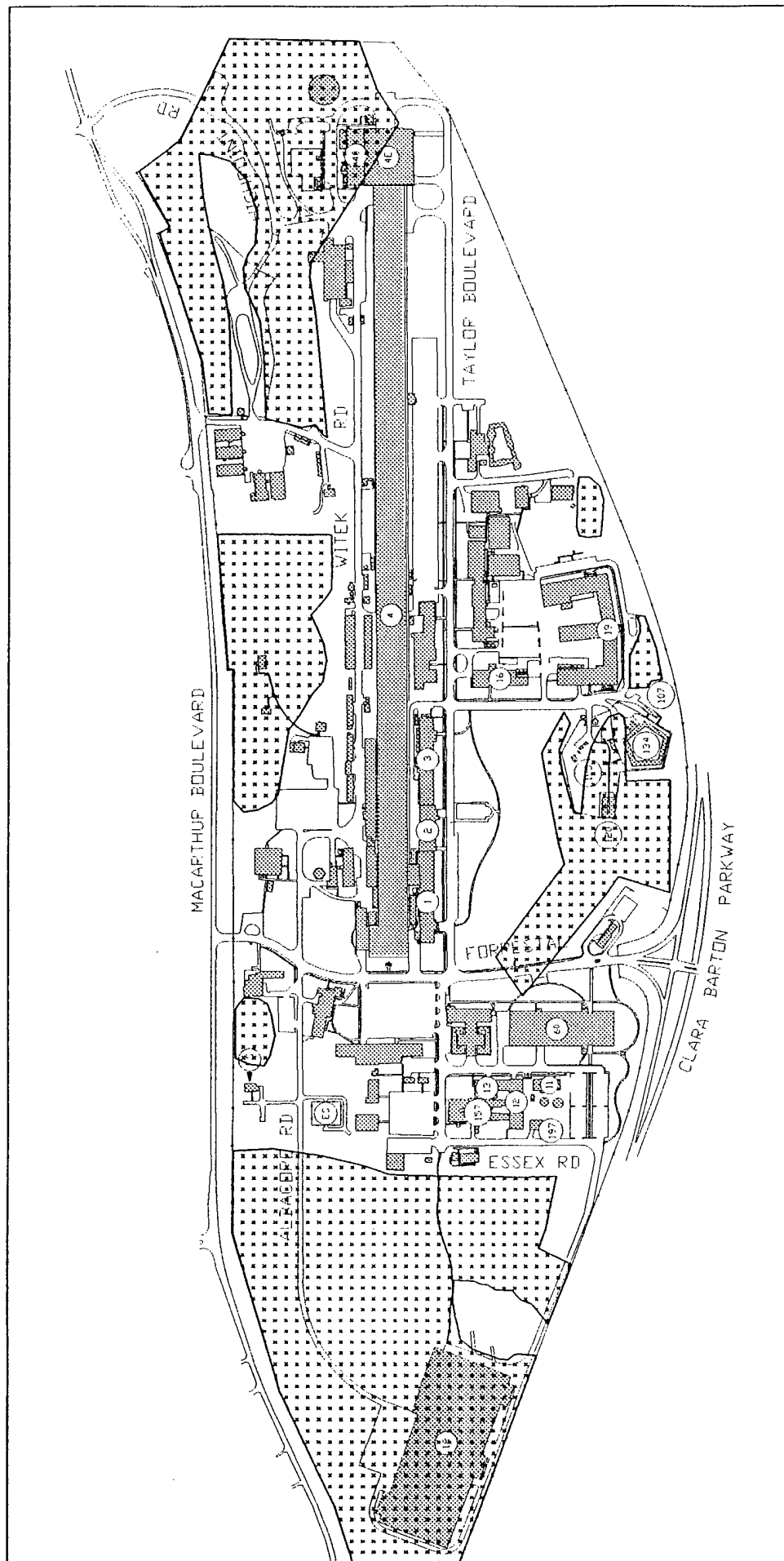
The Center has numerous drainage areas, 14 of which are regulated by its National Pollutant Discharge Elimination System (NPDES) permit. With an NPDES permit, any significant change in the amounts of pollutants allowed into a regulated drainage area requires the property owner to file for a permit modification. To avoid permit modifications, storm water from new projects is normally managed at the individual building site so that no additional pollutants flow to the regulated drainage area. This protects the quality of water resources downstream. In the case of the Center, the Fema Tributary, several unnamed tributaries that drain the general area, and the Potomac River itself are protected by the permit restrictions. Figure 3-2 shows 14 drainage points at which water samples are regularly monitored for compliance with permit limits.

During periods of heavy rain, accumulated storm water leaves the Center through three culverts that pass beneath the Clara Barton Parkway and to the Fema Tributary that lies east of the Center. Because the culverts are of sufficient size to carry large volumes of runoff, flooding at or adjacent to the Center has not been a significant problem.

3.3 Air Quality and Applicability of Air Conformity Regulations

The Clean Air Act requires the U. S. Environmental Protection Agency (EPA) to promulgate rules to ensure that Federal actions conform to the appropriate State Implementation Plan (SIP). Conformity to a SIP is defined in the Act (as amended in 1990) to mean conformity to a SIP's purpose of eliminating or reducing the severity and number of violations of the National Ambient Air Quality Standards (NAAQS) and achieving expeditious attainment of such standards. The federal agency responsible for an action is required to determine if its action conforms to the applicable SIP (U. S. Federal Register, November 30, 1993).

The Center is located within Maryland Air Quality Control Area IV, which includes Montgomery County. Air Quality in Area IV meets the National Ambient Air Quality Standards, with the exception of ozone levels. Volatile Organic Compounds (VOC) and Oxides of Nitrogen (NOx) in the region must decline in order for the designation of "Serious Non-Attainment" to be reduced. Maryland's SIP contains restrictions on new sources of VOC and NOx emissions that target stationary as well as mobile sources. New sources



LEGEND

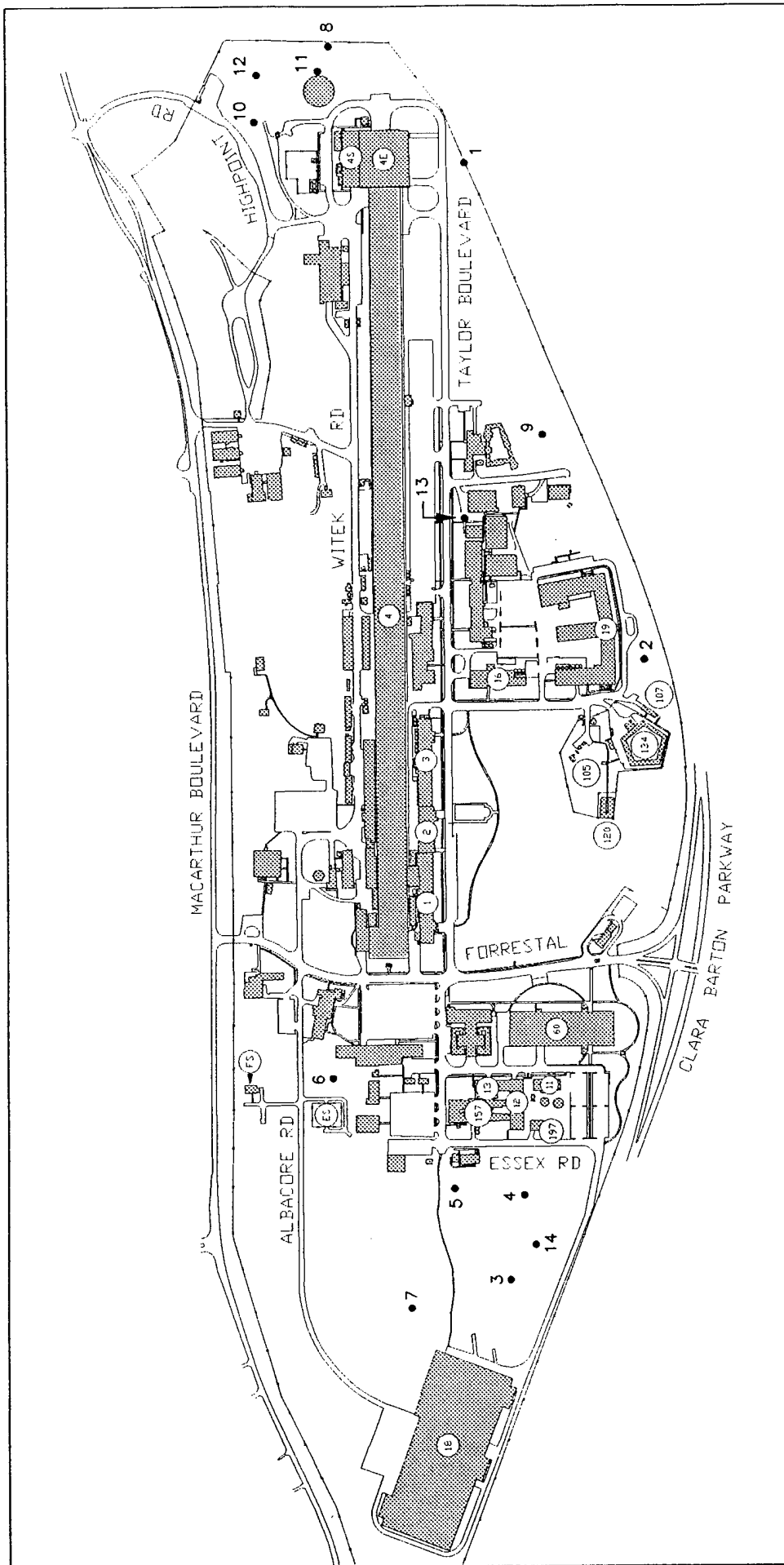
- BUILDING
- FENCE
- SIDEWALK
- ROAD
- MAIN SUBSTATION (ES)
- FIRE STATION (FS)
- NATURAL SOILS
- MANMADE SOILS



NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION

FIGURE 3-1:
SOILS

SOURCE: WOOLPERT, 1989



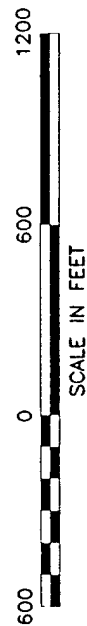
NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION

FIGURE 3-2: WATER QUALITY

SOURCE: NSWCDD ENVIRONMENTAL OFFICE, 1996.

LEGEND

- BUILDING
- FENCE
- SIDEWALK
- ROAD
- MAIN SUBSTATION
- FIRE STATION
- MONITORED OUTFALL



that expect to generate more than 50 tons per year (tpy) of either VOC or NO_x must prepare a Conformity Determination. Appendix C contains the applicability analysis for the proposed relocating activities.

3.4 Noise

Noise above certain levels is considered harmful to the health of humans. Noise levels above 45 dBA may cause a loss of sleep. Noise levels between 55 - 60 dBA interfere with hearing speech of normal volume. Hearing impairments and psychological and physiological problems may result from continuous noise levels of 70 dBA or greater. The Environmental Noise Act of 1974, the Department of Health and Mental Hygiene, and Montgomery County have established goals and standards for noise generated from various land uses. Montgomery County regulations are the most stringent and are adhered to by the Center. The existing land use of the Center is identified as Commercial-Industrial in the 1989 Master Plan for Montgomery County. A 1995 noise study conducted at NSWC Carderock indicates that average noise levels generated at the Center are below the 62 dBA established by Montgomery County for industrial areas (NSWC, Carderock, 1995).

3.5 Terrestrial Environment

The following section describes the extent and character of vegetative and animal communities at the Center.

3.5.1 Vegetation

Vegetation at the Center consists of areas of second and third generation stands of trees (see Figure 3-3), large areas of planted grasses, and foundation plantings around existing structures. The primary species of vegetation at the Center include yellow poplar, red oak, white oak, pin oak, willow oak, sweet gum, red maple, black cherry and flowering dogwood (Woolpert Consultants, 1989 and Chesapeake Division, Naval Facilities Engineering Command, September 1992). The hardwood stands occurring along the northern and southern borders function as natural buffers between the Center and the surrounding communities. Evergreens have also been added along the northern border. The area south of the open lawn area in front of buildings 1, 2, and 3, as well as several other locations at the Center, are cultivated into park-like settings. These areas typically consist of selective canopy with planted grasses and ornamentals. A large forested area occurs in the western portion of the Center encompassing a small wetland along a natural drainage swale.

3.5.2 Wildlife

Typical wildlife at the Center includes eastern chipmunk, eastern cottontail, gray squirrel and raccoon. White-tailed deer have been spotted in the vicinity, but occurrence within the installation has been curtailed by the security fence around the perimeter. Birds commonly observed in the area include American goldfinch, Baltimore oriole, blue jay, brown thrasher, Canada goose, cardinal, house sparrow, mourning dove, northern mockingbird, quail, red-headed woodpecker, red-winged blackbird, several species of sparrows, and starlings. No ponds or streams of sufficient size to support fishery resources exist at the Center (Chesapeake Division, Naval Facilities Engineering Command, September 1992). Hunting is not permitted at the Center.

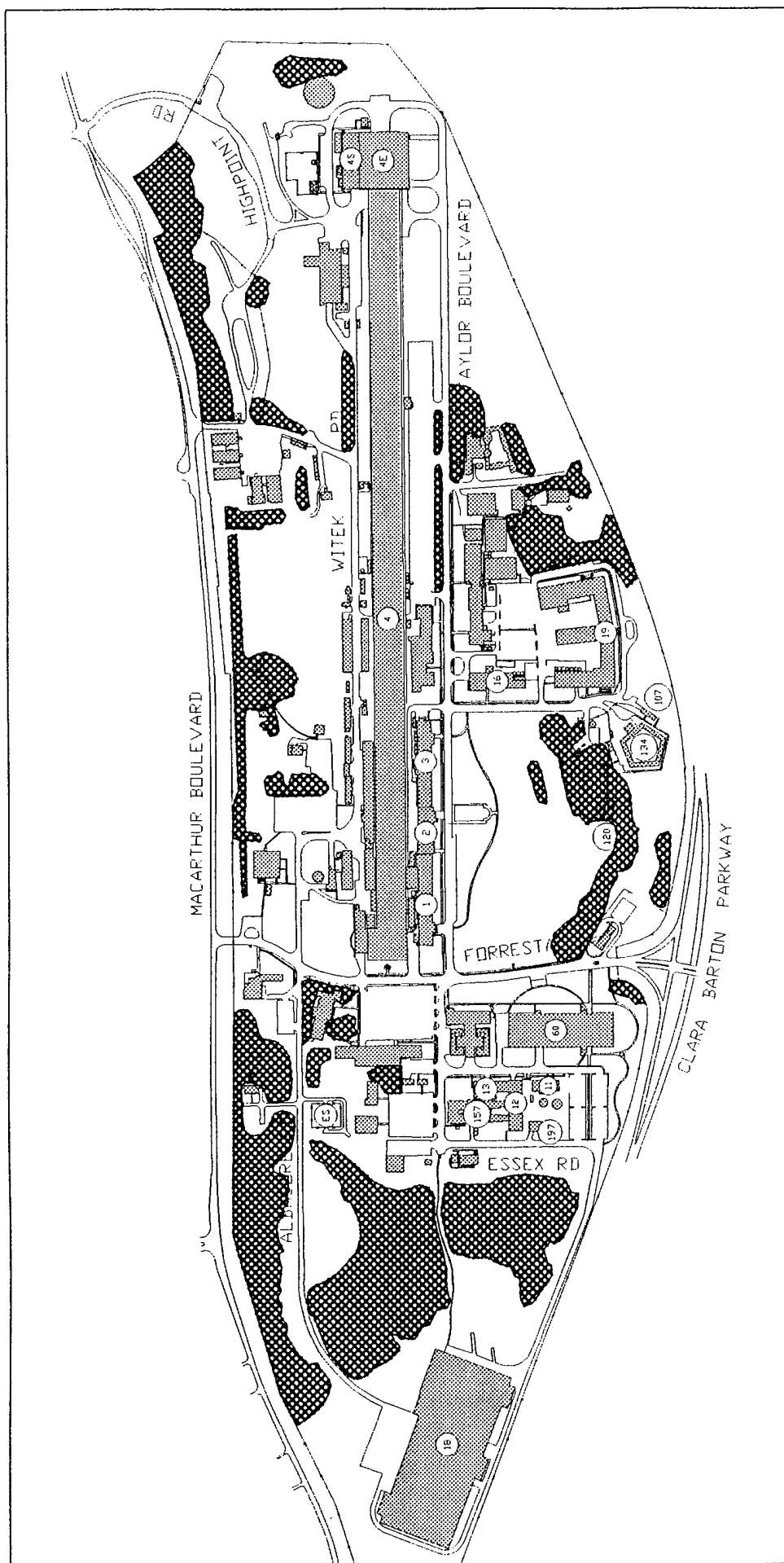
3.5.3 Threatened and Endangered Species

The federal Endangered Species Act of 1976 (as amended) protects federally listed species; however, no plant or animal species listed as federally endangered or threatened are known to occur on the Center property (Wolflin, U.S. Fish and Wildlife Service letter dated July 25, 1996).

Appendices A and B contains the current list of Maryland rare, threatened and endangered species. Two Maryland listed species are known to occur on the Center. *Carex radiata* and *Panicum laxiflorum*. *Carex radiata* is listed as "endangered" and *Panicum laxiflorum* is listed as "status uncertain." It is Navy policy to protect state-listed species to the maximum extent practicable.

3.6 Wetlands

A floodplain which crosses the Center at its northeast boundary includes wetlands as does another area along a natural drainage course at the west end of the Center. The northern edge of the latter wetland was field delineated in May 1996. The survey information for this wetland is on file in the Environmental Office at the Center. Wetlands are protected under the Clean Water Act and federal and Navy policies and regulations. Alteration or modification of a wetlands would require a permit from the U. S . Army Corps of Engineers with coordination from the Maryland Department of Natural Resources and the Maryland Department of the Environment.



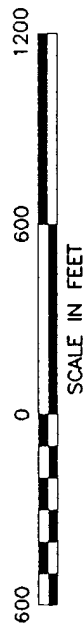
NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION

FIGURE 3-3: VEGETATION

SOURCE: NSWCCD ENVIRONMENTAL OFFICE, 1996

LEGEND

- BUILDING
- FENCE
- SIDEWALK
- ROAD
- MAIN SUBSTATION (ES)
- FIRE STATION (FS)
- WOODED AREAS



3.7 Socioeconomics

The Center is located within the eastern end of the Potomac Subregion of Montgomery County in the Potomac-Cabin John Planning Area 29. The Potomac Subregion includes 56 square miles of land bounded to the north by Maryland Route 28 and the City of Rockville, to the south and west by the Potomac River, and to the east by the Capital Beltway. The majority of the subregion's population live within the Potomac Planning Area 29 (MNCPPC, 1989). This planning area has a population of over 43,000 persons. Thirty-six percent of the population are 45 - 64 years old. Approximately 81 percent of the population is white, 13 percent are of Asian or Pacific Island descent, 4 percent are black and 2 percent are categorized as other races (Montgomery County, November 1995).

Forty-two percent of the population has a graduate, professional or doctoral education. The median household income in 1993 was \$108,680 with over 55 percent of the population earning an annual household income in excess of \$100,000. Average monthly housing costs are \$1,824. Seventy percent of the population has remained in the same dwelling for five years or longer. The dwelling types found within the Potomac Region include 78 percent or 11,540 single-family detached homes, 14 percent or 2,095 townhouses, 4 percent or 600 garden apartments and 4 percent or 650 high-rise dwelling units (Montgomery County, November 1995).

The Center is a major employment center in the Potomac Subregion. The Center employee strength as of January 18, 1996 was 1,354 persons. Federal research agencies and contracts are important to the County's economy and their importance is projected to continue into the year 2000. The highest growth rates within the work force are projected in government, wholesale and retail trades, services and finance. Additional work centers within the Potomac Subregion planning area are not expected to develop (Woolpert Consultants, 1989).

3.8 Historical and Cultural Resources

Archaeological investigations were conducted at the Center during the summer of 1983. No archaeological resources eligible for the National Register of Historic Places were identified. The 1983 investigation did report the likely existence of archaeological resources on the Center property; but, because they had been severely disturbed, further base-wide documentation was not warranted (Weinland & Weber, March 1984).

In August 1996, evidence revealed that some areas of the Center may not have been surveyed adequately to ensure that the above conclusion was fully justified. A cultural resources contractor, R. Christopher Goodwin & Associates, Inc., is currently completing a reassessment of the archaeological potential of certain areas of the Center.

Buildings 1, 2, 3, and 4 - the Tow Basin Complex - are the only historic properties at Carderock listed on the National Register of Historic Places. However, a recent architectural survey carried out by the firm of R. Christopher Goodwin & Associates, Inc., has identified several groupings of additional structures which are likely to be determined eligible for the National Register by the Maryland State Historic Preservation Officer (MD SHPO) as a historic district.

Recent surveys at the Center are a part of a larger on-going project to develop a Historic and Archeological Resource Protection (HARP) Plan, and to achieve listing of the Center as a historic district. Other historic resources which are in the immediate vicinity of the Center include the Washington Aqueduct, which is located beneath MacArthur Boulevard, the Clara Barton Parkway along the southern boundary of the Center, and the C & O Canal which lies between the Clara Barton Parkway and the Potomac River.

3.9 Community Services

Services that are provided by the surrounding community are available to the Center and its personnel.

3.9.1 Fire Stations

Station No. 10, located on River Road in Bethesda, and Station No. 30, on Falls Road in Potomac, provide fire protection for the Center on a mutual aid basis. On-base fire protection is provided from the Fire House (Station 52) located north of Albacore Road. This building is located north of the Center's major core of development. A verbal agreement exists with Montgomery County for cooperative emergency back-up for health and fire support (Woolpert Consultants, 1989).

3.9.2 Recreation

The Potomac Subregion has over 2,500 acres of public park land. Conservation oriented parks make up 85 percent of the parks in the region with many of these parks located in stream valleys. To the north of the Center, a 157 acre stream valley park is planned along Rock Run. The Cabin John Regional Park, a 540-acre park providing active recreation and several large picnic areas, is located in the hills north of the Center (Woolpert Consultants, 1989).

The C & O Canal Historic Park is located on the southern side of the Center across the Clara Barton Parkway. This is a federal park administered by the National Park Service. The park includes the physical remains of the canal including its bed, towpath, aqueducts, dams, culverts, locks, lockhouses, and other associated canal structures and ruins. The towpath provides opportunities for picnicking, fishing, and bird watching and it is used for hiking and biking. This recreation area offers a group picnic pavilion, rock climbing opportunities, and access to the Potomac River. The main park access point and area of highest use is the Great Falls Recreation Area located 2 miles upriver from the Center (Chesapeake Division, Naval Facilities Engineering Command, September 1992).

Recreational facilities for NSWC employees located within the Center include two ballfields, two tennis courts, two sand volleyball courts, two single-goal basketball courts, one handball court, one fitness/weight room with lockers, and a large picnic pavilion. In addition to the facilities, employees of the Center have opportunities to participate in organized recreational activities including picnics, wellness runs, bowling and golf (Chesapeake Division, Naval Facilities Engineering Command, September 1992). There are no public recreation facilities at the Center.

3.9.3 Medical

Medical facilities that serve Center personnel are located northeast of Bethesda and include Suburban Hospital, the National Institutes of Health, and the National Naval Medical Center. Numerous clinics, medical centers and private doctors' offices are located in the area (Woolpert Consultants, 1989). There is also a small Branch Clinic of the National Naval Medical Center located at the Center.

3.9.4 Schools

The Carderock area is served by the Montgomery County public school system. The Center is located in the Winston Churchill cluster of Area 2. This cluster contains seven elementary schools with a maximum capacity of 3,676 students. The 1996 enrollment was 3,231 or 88 percent of capacity. The Herbert Hoover Junior High School (HHJHS) and the Cabin John Junior High School (CJJHS) also serve this cluster. HHJHS has a capacity of 747 students and a 1996 enrollment of 776 or 104 percent of capacity. CJJHS has a capacity of 869 and a 1996 enrollment of 885 or 102 percent of capacity. The Winston Churchill High School is located within the cluster. This school has a student capacity of 1,481. The 1996 enrollment was 1,524 or 103 percent of capacity (Montgomery County School Department, 1996).

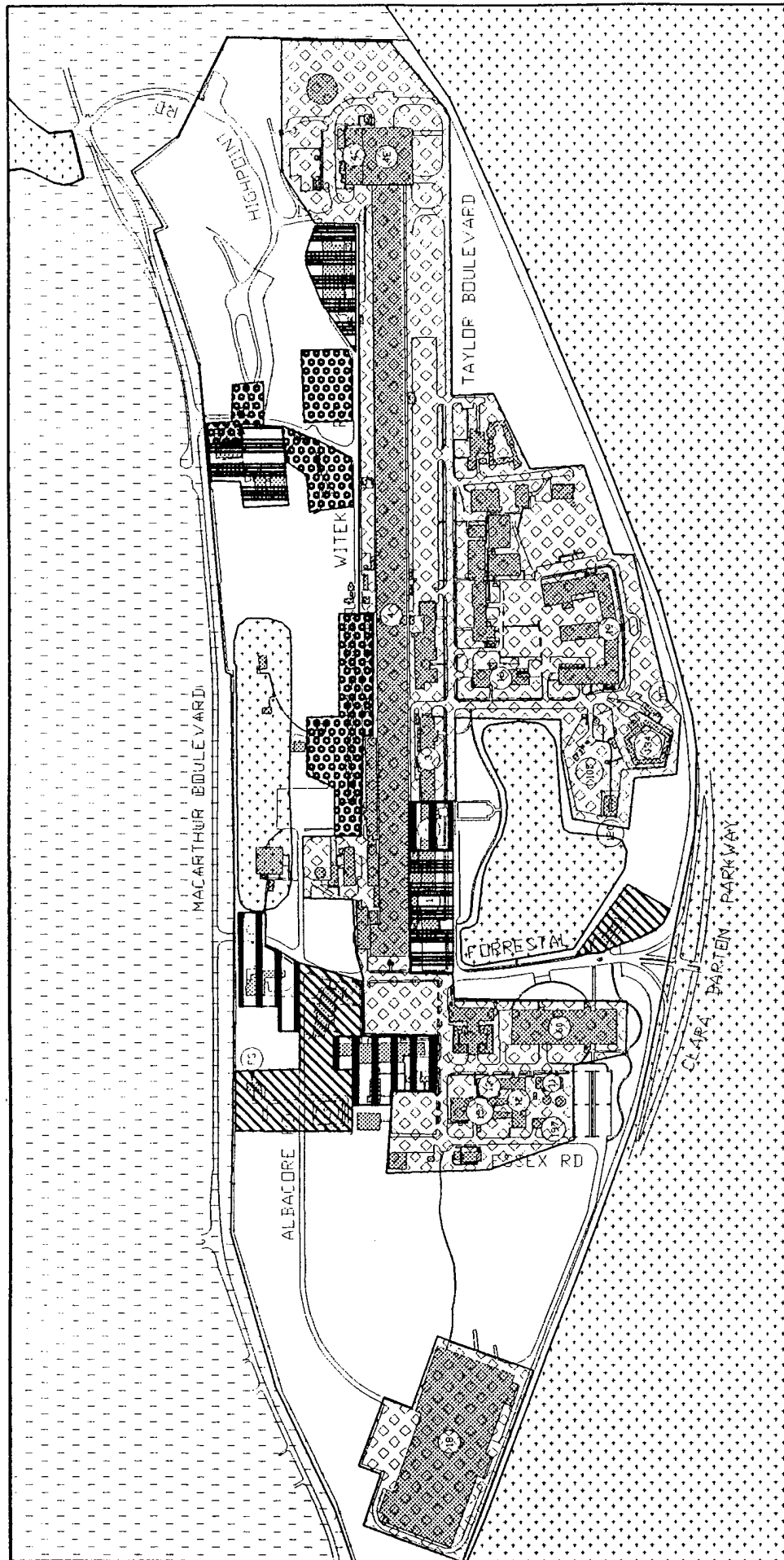
3.9.5 Libraries

The Potomac Library on Glenolden Drive serves the area near the Center (Woolpert Consultants, 1989). There is a technical library at the Center; however, because Carderock is a closed base, the library is not available for public access.

3.10 Land Use and Aesthetics

The Center is bounded to the north by MacArthur Boulevard, to the south and west by the Clara Barton Parkway, and to the east by Interstate 495. Areas north and west of the Center are occupied by low density single-family residences and are part of the prestigious Potomac Community area. The land immediately to the north of the Center has homes on wooded two-acre lots. Evergreens were planted along the northern border of the Center to improve the quality of the view for these neighbors. To the south beyond the Clara Barton Parkway lies the Chesapeake & Ohio Canal National Historic Park (Woolpert Consultants, 1989). See Figure 3-4 for land uses in and surrounding the Center.

The original section of the Center, the physical center containing buildings 1, 2, 3 and 4, has a campus-like setting with distinctive facilities grouped around a large central lawn area. Visually, the most dominant feature is the Tow Basin (Building 4). With its very long Quonset shape it is a physical and functional barrier in the eastern half of the Center. Research and administrative functions lie to the south of the Tow



NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION

FIGURE 3-4:
LAND USE

SOURCE: WOOLPERT, 1989

LEGEND

- ADMINISTRATION
- COMMUNITY FACILITIES
- MAINTENANCE
- PARKS & RECREATION
- RDT&E
- RESIDENTIAL, SINGLE FAMILY
- SUPPLY



Basin with industrial and support functions to the north. Near the midsection of the Tow Basin, on the south side, is a cluster of buildings visually dominated by Building 19, which houses administration and laboratories.

At the western end of the Tow Basin is a newer cluster of functionally related and architecturally interesting buildings and structures, including buildings 7, 11, 12, 13, 157, 158 and the recently completed Ship Materials Technology Facility (Building 60).

The eastern half of the Center is more developed than the western half. The Maneuvering and Seakeeping Building (Building 18) visually dominates the western half and is visible from the Clara Barton Parkway. Smaller buildings near the middle of the Center include a cafeteria, the Credit Union, the Fire Station and the Security Office. Recreation land uses are scattered throughout the Center.

3.11 Transportation

The regional Metrobus system and the Washington Metro System provide public transportation to the Center. The Bethesda Metro station is approximately seven miles east of the Center. Buses provide access both to and from the Bethesda Metro station. A Metro bus stop is located near the cafeteria in Building 103 (Woolpert Consultants, 1989).

Vehicular access to the Center is provided at two points (see Figure 3-5). The Main Gate, with access to the Clara Barton Parkway, is open daily from 5:00 AM to 1:00 AM. Gate 3 provides access for commercial uses at Highpoint Road and MacArthur Boulevard. This gate is primarily used by trucks and is open weekdays from 7:00 AM to 6:30 PM (Woolpert Consultants, 1989). Gate 1, off MacArthur Boulevard to the north, is no longer used.

Two primary roads, Forrestal Road and Taylor Boulevard, serve the Center. Forrestal Road runs north-south between the Main Gate to the south and Gate 1 to the north, while Taylor Boulevard runs east-west. These roads meet at a major intersection in the central portion of the Center.

Several secondary internal roads serve individual buildings. Highpoint Road serves the truck entrance to the northeast. Highpoint Road connects to Witek Road which extends the truck route to Building 143. Witek Road connects Forrestal Road and Highpoint Road and it runs parallel to and north of Taylor

Boulevard. Dolphin Road is another secondary road which loops around Building 19. Kitty Hawk Road connects Taylor Boulevard with Forrestal Road and serves buildings 139, 180 and 102. Albacore Road is a loop road around the western third of the Center and serves Building 18. Essex Road provides a secondary connection to Taylor Road and Albacore Road.

3.12 Utilities

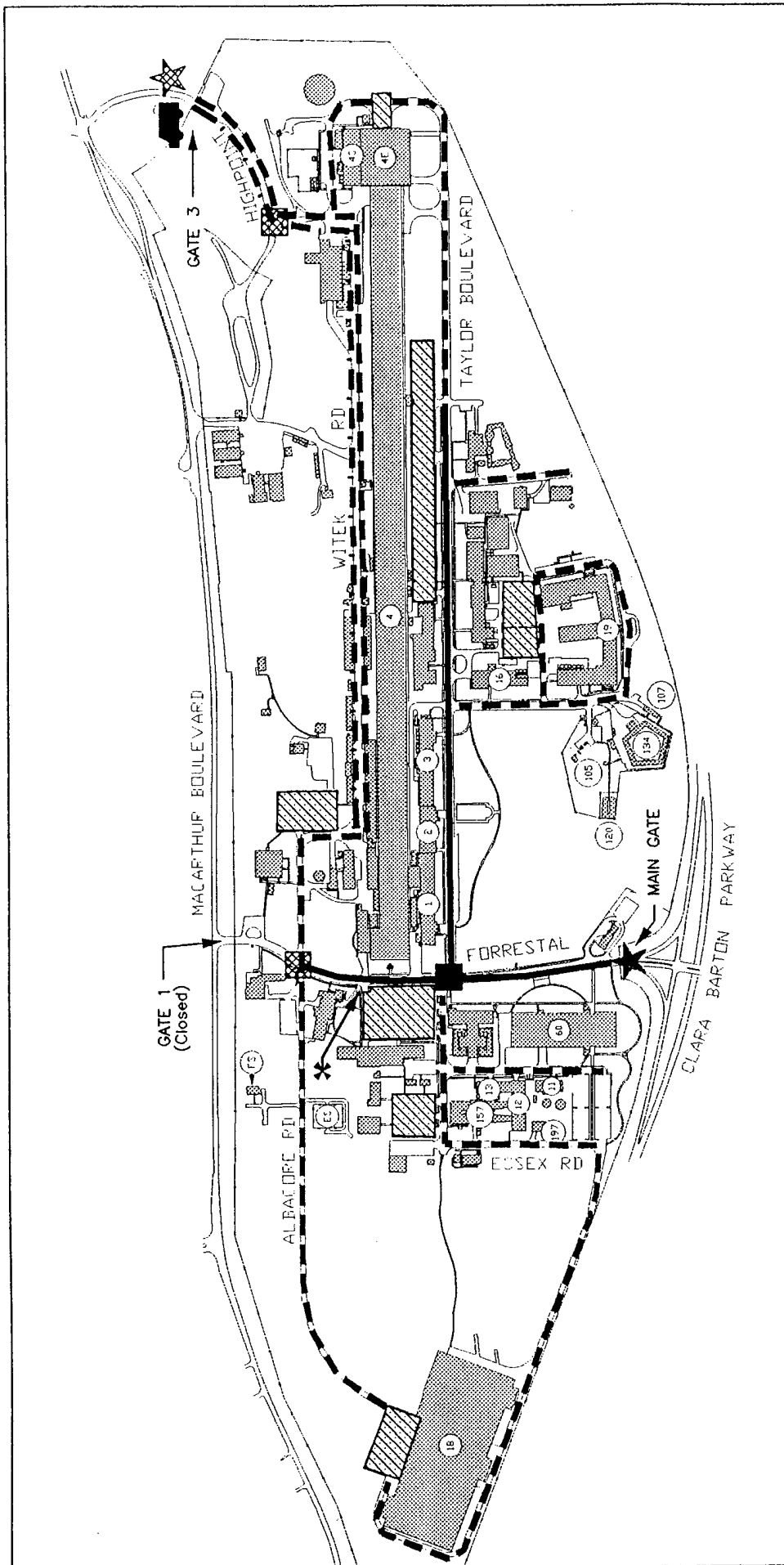
Utility systems at the Center are maintained by the Public Works Office to ensure proper functioning. Utility systems include water supply, wastewater disposal, storm water drainage, solid waste disposal, electrical service, telecommunications, steam and natural gas.

3.12.1 Water

The Center operates two separate water distribution systems: a potable water system for domestic consumption and equipment cooling, and an industrial/fire protection system. The existing average daily consumption of water is approximately 260,000 gallons per day (GPD) with a peak water demand of approximately 1.4 million GPD (Woolpert Consultants, 1989). Treated water for all uses is purchased from the Washington Suburban Sanitary Commission (WSSC). The water is transported via a 12-inch line from the existing 16-inch WSSC water main located along MacArthur Boulevard. A 2,000,000 gallon above-ground tank retains water from test facilities and provides a supply for fire protection. A small industrial water treatment plant is located in Building 107. This facility, used to clarify water from the adjacent Test Pond, has a 180,000 gallons per hour maximum capacity. It is in good condition and is adequate for serving the Test Pond.

3.12.2 Wastewater

The District of Columbia's Blue Plains Treatment Plant provides sewage treatment for the Center. The service is procured through a utility service contract and sewage is metered by the District of Columbia. The Blue Plains Plant receives 37,000 GPD (average annual daily flow) from the Center. Under the existing permit with the District, the Center is limited to a maximum average daily flow of 43,000 GPD.



NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION

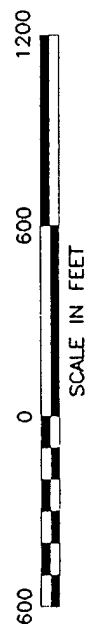
FIGURE 3-5:

TRANSPORTATION

SOURCE: WOOLPERT, 1989 and HBA, 1996

LEGEND

- PRIMARY ROAD
- SECONDARY ROAD
- TRUCK ROUTE
- MAJOR ENTRANCE
- MINOR ENTRANCE
- TRUCK ENTRANCE
- MAJOR INTERSECTION
- MINOR INTERSECTION
- EXISTING PARKING
- BUS STOP



Approximately 12,000 linear feet of vitrified clay and cast iron pipe, which range in size from 2 to 10 inches in diameter, make up the wastewater collection system at the Center. There are also 6 wastewater pumping stations located in buildings 4E, 16, 17, 104, 111, and 143 (Woolpert Consultants, 1989).

3.12.3 Storm Water

Storm drainage is separate from the sanitary sewer system. Because some industrial wastes can potentially be washed into the storm water system, a National Pollutant Discharge Elimination System (NPDES) permit for 14 storm water outfalls is required for the Center. The State of Maryland has the authority to administer federal NPDES permits and maintains inspections and enforcement of the permit conditions. The regulated outfalls are shown on Figure 3-2.

The Center's storm drainage system is in good condition and has adequate capacity for the existing conditions and some increases in runoff. A few buildings located in the low area near Rock Run are occasionally flooded. The Center installed sump pumps connected to an emergency source of power to protect these facilities (Woolpert Consultants, 1989).

3.12.4 Solid Waste Management

A yearly contract is established with a private hauling company for the collection and removal of solid waste from the Center.

3.12.5 Electric Service

The Center is provided electric service by Potomac Electric Power Company (PEPCO) through two service points, the Main Substation just west of Building 121, and the High Speed Tow Facility (HSTF) Substation just north of Building 4S. Service to the Main Substation is provided via a 34.5 thousand volt (KV) overhead feeder from the PEPCO Bells Mills Substation. Service to the HSTF Substation is provided by a single 69 KV overhead feeder which also leads from the PEPCO Bells Mills Substation (Chesapeake Division, Naval Facilities Engineering Command,

September 1992). Power is distributed throughout the Center via thirteen 13.8 KV feeders. The Main Substation has a total normal capacity of 31 million volt amperes (MVA). This limitation, imposed by the PEPCO feeder, does not restrict activity at the Center.

3.12.6 Telecommunications

Centrex 1 telephone service is received from the Bell Atlantic Telephone Company through the Defense Telephone Service-Washington (DTS-W). DTS-W is the manager of the consolidated Department of Defense (DoD) telephone system within the National Capital Region. The service is high quality and meets the existing needs at the Center (Woolpert Consultants, 1989).

3.12.7 Steam

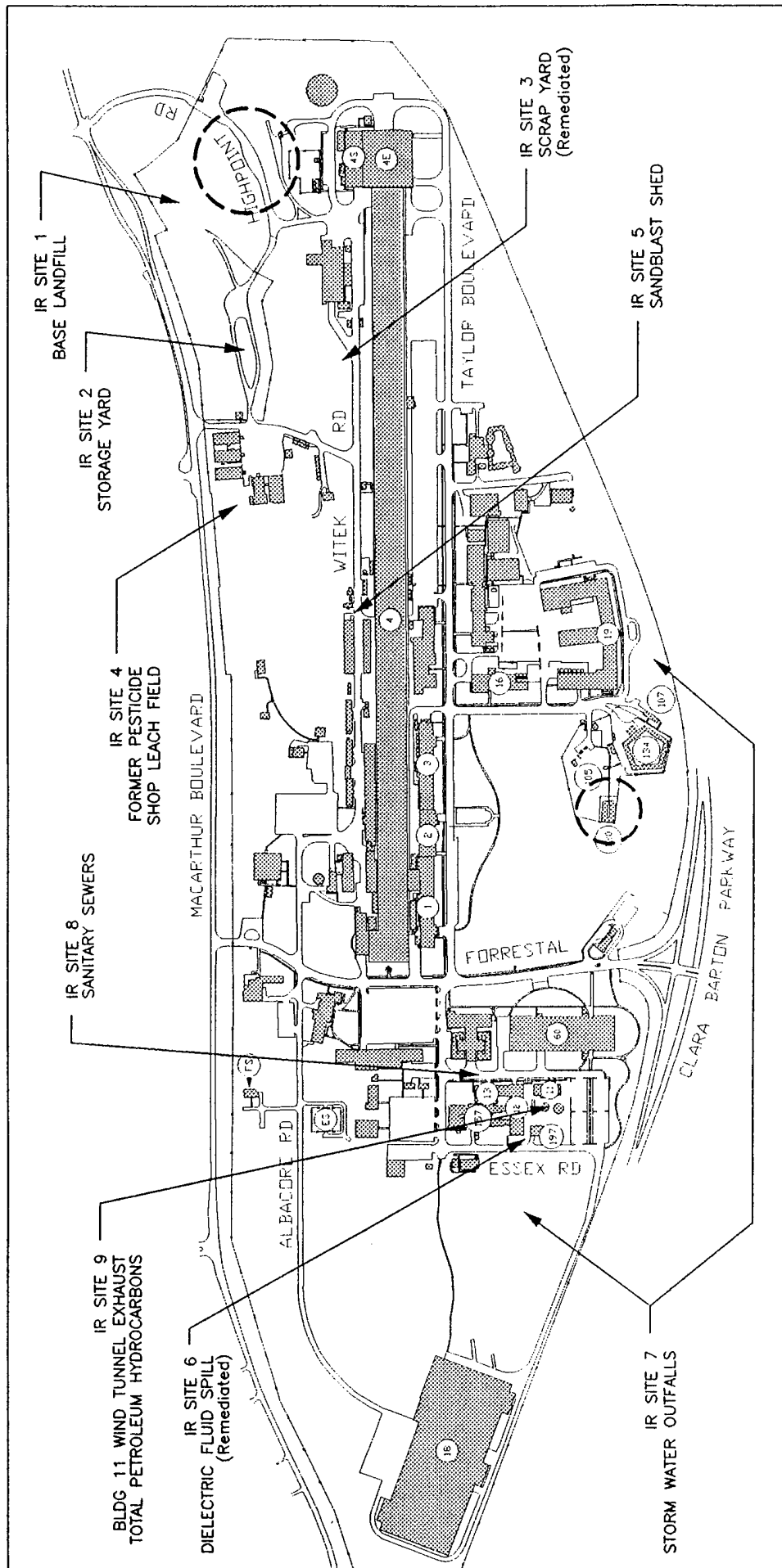
The Central Heating Plant in Building 6 supplies most of the Center's heating requirements. The plant has a maximum capacity of 80,000 lb. per hour, which is adequate capacity to serve the needs of the Center. All three boilers are both oil and natural gas fired. The Center has a storage capacity for 32,000 gallons of No. 6 fuel oil which meets the 30-day DoD fuel storage requirement. The maximum demand for steam is approximately 46,000 lb. per hour. Steam is distributed from the Central Heating Plant to the facilities through a radial steam distribution system using underground piping. The plant is in good condition and adequate to serve existing and future steam requirements. (Woolpert Consultants, 1989).

3.12.8 Natural Gas

Natural Gas is provided to the Center by Washington Gas. A six-inch main enters the Center from MacArthur Boulevard and terminates in the steam plant, Building 6. Natural gas is supplied to the three dual-fuel fired boilers in the heating plant. The natural gas supply system is considered adequate for the Center's existing and anticipated demand (Woolpert Consultants, 1989).

3.13 Hazardous Materials and Wastes

Chemical contamination occurs in nine locations at the Center (see Figure 3-6). Clean-up has been completed for Installation Restoration (IR) Site 3, an old scrap yard, and IR Site 6, a dielectric fluid spill.



NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION

FIGURE 3-6:

IR SITES & EQSD ARCS

SOURCE: WOOLPERT, 1989; NSWCCD ENVIRONMENTAL, 1996.

LEGEND

- BUILDING
- FENCE
- SIDEWALK
- ROAD
- ELECTRICAL SUBSTATION (ES)
- FIRE STATION (FS)
- EXPLOSIVE QUANTITY
- SAFETY DISTANCE ARC



The small amounts of mercury found in 1991 tests at IR Site 7 have not been detected since that time, so remedial action is not necessary. The other six sites are in various stages of analysis and planning for clean-up operations. To prevent future contamination, the Center adheres to a strict program of hazardous material and waste management.

Hazardous Materials Storage and Handling

Hazardous materials used routinely at the Center include paints, solvents, epoxy resins, corrosives, mercury, pesticides, coolants, chlorine and herbicides. The Center has implemented a Pollution Prevention (P2) program which includes an effort to minimize the amounts of hazardous materials that are acquired and stored at the Center. The "HazMart" purchases, stores and issues hazardous materials to individual laboratory and shop units from a centralized location. This centralized control eliminates the accumulation of excess amounts of lubricants, solvents, paints and other hazardous materials throughout the Center. Storage for these materials is provided in secure areas protected from storm water and other elements. The location and use of the Center's hazardous materials are tracked by the Navy's Authorized Use List (AUL). An inventory of pesticides is maintained and updated quarterly. All pesticides are stored in Building 24. This building has been constructed as a secondary contaminant structure for the material and protects chemicals from stormwater (Environmental Resources Management, Inc. September 1995).

A variety of petroleum products are stored in aboveground storage tanks (ASTs) at the Center. Products include heating oil, gasoline, diesel fuel and hydraulic oil. Standard operating procedures for oil tanks, including fuel oil deliveries, secondary containment drainage, visual inspections, tank tightness tests and operations permits are described in the Storage Tank Management Plan for the Center. A copy of the plan is maintained at the Environmental Office (Environmental Resources Management, Inc. September 1995).

The Comprehensive Environmental Response Plan for the NSWC Carderock Division, Carderock Site, Bethesda, Maryland (CERP) defines potential sources of stored and handled hazardous materials and assigns responsibility and auditing procedures to manage each.

Hazardous Waste

Hazardous waste management at the Center is regulated by the U. S. Environmental Protection Agency (EPA) and the State of Maryland. The Center does not treat hazardous wastes on site. Resource Conservation and Recovery Act (RCRA) hazardous wastes are stored for less than 90 days prior to removal to a regulated hazardous waste management facility. A licensed contractor routinely removes the Center's hazardous waste items under a contract with the Defense Reutilization and Marketing Office (DRMO) (Environmental Resources Management, Inc., September 1995).

Storage for hazardous wastes is located in Building 117. This facility has been specifically designed in accordance with state and federal guidelines to store these wastes. Satellite hazardous waste accumulation areas are also authorized at the Center for the day-to-day collection of hazardous waste. Limited quantities of waste are permitted to accumulate at these locations before delivery to the central storage facility. Hazardous wastes generated at the Center are properly packaged, labeled, inventoried and stored in special enclosures to ensure they are not disturbed or used for any other purpose.

Explosive Materials

Use of explosives at the Center is limited to the Test Pond (Building 134) and the Research Pit (Building 105). The maximum charge of explosive material allowed per test at the Center is three pounds (Woolpert Consultants, 1989). Sites used for storage of explosive materials are surrounded by Explosive Quantity Safety Distance (EQSD) arcs within which activities unrelated to the handling or use of the explosives are restricted. An explosive magazine is located at Building 120. An EQSD arc extends 125 feet from this magazine. Another EQSD arc is located in the northeast portion of the Center near Gate 3. This arc surrounds a parking area used to inspect trucks delivering explosives to the Center. The two arcs are shown on Figure 3-6.

Radioactive Material

The Nuclear Regulatory Commission (NRC) establishes guidelines for the use of radiation for research and testing, and has granted a radioactive materials permit to the Navy for the use, storage and disposal of these materials at the Center. The NRC permit outlines the types of materials and quantities licensed at the Center, the purposes for which licensed material will be used, the facilities and equipment involved in the use of the material, a radiation safety program for use of the material, and employee safety (USDN, NSWCDD, October 21, 1994).

4.0 Environmental Consequences and Mitigation Proposed

This section describes the potential impacts of the various alternative actions considered. The discussion addresses, under each environmental topic, the BRAC mandated Ship Magnetic Signature Control relocation to Carderock and the BRAC closure-related relocation of Materials Research and Development. The limited number of personnel (approximately 45) and functions that would be located in Building 19, following interior renovations, are not individually expected to have any environmental impacts. These groups are primarily administrative, but include a laser laboratory associated with development of materials for radiation sensors (no radioactive substances would be used in this laboratory). Because no new buildings are to be constructed for these groups, the only impacts associated with them are their contributions to the total number of personnel and activities relocating to the Center. In the sub-sections titled "Proposed Action," discussion of the single viable location for the Ship Magnetic Signature Control Complex is followed by the proposed location for the Materials facilities. In addition, two alternative locations for the Materials units are discussed.

4.1 Topography, Geology and Soils

Because the Proposed Action and Alternatives 1 and 2 involve siting most new construction in level areas of manmade soils, little overall impact to the geological and soils resources of the Center is anticipated.

4.1.1 The Proposed Action

The Magnetics Laboratory (M1) and two one-story staging structures (M3 and M4) would be located in the open level area to the south of Albacore Road. The Magnetics Administration Building (M2) and the Sensor (M5) would be sited to the north of Albacore Road. At the proposed M2 site, a culvert conveys surface drainage from the north side of MacArthur Boulevard onto the Center property. The water course would be routed around the building site in a culvert, but the fine soils existing in the channel would not likely be suitable for supporting the structure. These soils would be removed during preparation of the building site.

The relocations to the Center resulting from closure of the White Oak and Annapolis Detachments of NSWCCD would include the various Materials Laboratory groups, the Battery Testing unit, the Radiation Health Physics Group and Administration for the included research units.

Renovations and construction of Materials, Battery Testing and Radiation Health facilities in and adjacent to buildings 11, 12 and 157 and the basement of Building 19 would not significantly impact topography, geology or soils because no previously undeveloped land area would be disturbed by the construction. Pavement for new parking and walkways, mostly in the vicinity of Building 19, would be constructed on land that has previously been graded and compacted. Construction of the separate Metal Forming and Coating facility, approximately 200 feet northeast of Building 4S, would require soil compaction for utilities, paving, and excavation for the foundation. Construction of the new 4,800 square foot building would occur on soils which present a constraint to development due to poor internal drainage and a tendency to retain moisture. Appropriate soil testing and analysis would be completed for design of the new structure, but no extraordinary excavation or compaction is expected to be necessary to complete the project in this location. The proposed site is bounded on the north by a slope which drops approximately 15 feet in elevation to reach a drainage swale 100 feet away. That swale flows directly to Rock Run just beyond the eastern boundary of the Center.

Normal excavation for the footings of buildings and structures would not involve significant impacts to topography, geology or soils. There would be no impacts to steep slopes or highly erodible soils, as none occur within the proposed building sites. In accordance with state regulations, a soil erosion and sediment control plan would be included in the drawings and specifications governing construction of the facilities. That plan and subsequent inspections by NSWCCD Contracts and Environmental staff, during construction, would ensure that no erosion occurs at the site and that no sediment is allowed to reach Rock Run.

4.1.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

Because the area has previously been graded and compacted, impacts to topography, geology or soils would be minimal if the Metal Forming and Coating facility was constructed in the clearing to the east of Building 18.

4.1.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

No impacts to topography, geology or soils would occur if the Metal Coating unit was constructed inside existing Building 157. Because the area adjacent to Building 18 has previously been graded and compacted, impacts to topography, geology or soils due to construction of the Metal Forming unit would be minimal.

4.2 Water Quality and Hydrology

Impacts from the replacement of vegetation and increased impervious surfaces are not anticipated from new construction because appropriate storm water management controls are required to be incorporated into the development of each building site. Potential damage to local streams, the Potomac River and the Chesapeake Bay would be avoided through application of storm water management control practices for quality and quantity, in accordance with federal and state guidelines and regulations.

4.2.1 The Proposed Action

The Magnetics Laboratory, including M1, M3, M4 and M5, would cover approximately 0.20 acre with roof and paved surfaces. The Administration Building (M2), located 350 feet northeast, would have a total impervious surface area of approximately 0.45 acre. Storm water runoff shed by these new structures would be managed at each building site so that the stream and wetland would not be damaged by flooding or pollution from storm water.

Renovations in buildings 11, 12 and 157 to house Materials Laboratory facilities would result in no changes to water quality and hydrology at the Center. Construction of the proposed 16,200 square foot Building 11 Annex would involve increasing the impervious surfaces at the Center by approximately 0.40 acre. Approximately 0.85 acre of new paving for automobile parking would replace existing lawn areas near Building 19. Approximately 0.50 acre of new building cover and paving would be added by construction of the Metal Forming and Coating facility at the eastern end of the Center. The total increase of impervious surface areas in the Proposed Action is 2.35 acres. Because each site is located in a different drainage area at the Center and because each

project would include storm water management to limit potential runoff and pollutants entering streams, the combined water quality and hydrology impacts would be minimal.

In accordance with state regulations, a storm water management plan would be included in the drawings and specifications governing construction of each facility. That plan and subsequent inspections by Contracts and Environmental staff at the Center, during and after construction, would ensure that potential impacts from the new development would be negligible. Consequently, local tributaries, the Potomac River and the Chesapeake Bay would sustain no short- or long-term significant impacts by runoff flowing from the proposed development.

4.2.2 Alternative 1 - Metal forming and Coating Adjacent to Building 18

Construction of the Metal Forming and Coating facility in the clearing to the east of Building 18 would add approximately 0.50 acre of building cover and paving in the western end of the Center. A storm water management plan would be prepared and implemented for the project. Short- and long-term impact to water quality in the nearby stream from Alternative 1 would be negligible.

4.2.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

No impacts to water quality would result from construction of the Metal Coating unit within Building 157. Construction of the Metal Forming unit in the clearing to the east of Building 18 would add approximately 0.20 acre of building cover and paving in the western end of the Center. A storm water management plan would be prepared and implemented for the project. Short- and long-term impact to water quality in the nearby stream from Alternative 2 would be negligible.

4.3 Air Quality and Applicability of Air Conformity Regulations

Air pollution that could be generated by the relocating activities includes low levels of criteria pollutants and minute volumes of hazardous air pollutants. While most pollutants are regulated by federal and Maryland laws and programs, the potential volumes anticipated from the relocations are expected to fall below the levels designated for the requirement of permits. Research laboratories produce such small

volumes of emissions that they are categorically excluded from regulation. Navy laboratories additionally use fume hoods and air scrubbing equipment to further reduce emissions.

4.3.1 The Proposed Action

Construction of the Ship Magnetic Signature Control Complex at the Center would involve temporary emissions from equipment and materials typical of building construction. The Ship Magnetic Signature Control operations would emit small amounts of criteria pollutants and other air pollutants at irregular intervals. Historically, the greatest levels of emissions from this activity at the White Oak facility have resulted from magnetic testing of engines and turbines, which produce exhaust while running during the tests. The fuels and exhaust emit limited amounts of volatile organic compounds (VOC) and oxides of nitrogen (NO_x) to the atmosphere. However, all engines of that type have been tested in recent years. No similar tests are anticipated for many years. Tests of other equipment at the complex would produce only a minute fraction of the level of emissions. The operation of the Ship Magnetic Signature Control Complex at the Center would not be substantially different from existing operations at the White Oak facility, which is in the same Air Quality Control Area.

The Materials Laboratory activities use very small amounts of solvents and other chemicals, only a fraction of which enter the atmosphere. The bench scale laboratory use of chemicals and solvents is categorically excluded from most air quality regulation because of the small contribution they make to air pollution. Among the Materials Research and Development activities included in the relocations, only Abusive Battery Testing, Metal Forming and Coating, and Polyurethane Prototyping produce air pollutants at levels that can be reasonably estimated. The new facility for Abusive Battery Testing is planned to include emission control equipment that captures virtually all of the dust and gas produced when a battery ruptures during a test. The total annual increase of emissions estimated from the Metal Forming and Coating and Polyurethane Prototyping is estimated to be approximately 0.10 ton of VOC and 0.017 ton of NO_x during the highest probable year. These levels are extremely low when compared to the levels of 50 tons per year at which a new source must apply for a permit from the Maryland Department of the Environment. Location of the Materials Laboratories in renovated space in buildings 11, 12, 157 and 19, and construction

of the Building 11 Annex and the Metal Forming and Coating facility at the eastern end of the Center would therefore have a negligible impact on air quality in the area.

Maryland ACQA IV is in nonattainment for ground level ozone. Activities, including construction, operations and commuting, which produce the ozone precursors, VOC and NO_x, are subject to the requirement for Air Conformity Applicability Analysis. The Navy has completed analysis of potential emissions resulting from the Proposed Action, including vehicle emissions (see Appendix C). The analysis, required by the 1993 Clean Air Act General Conformity Rule, shows that the combined net peak year emissions from the activities moving into AQCA IV are 3.56 tons per year of VOC and 18.90 tons per year of NO_x. These are less than the levels that would require a Conformity Determination. Therefore, the relocations are such that the Proposed Action would conform with the Maryland Air Quality State Implementation Plan. Appendix D contains the Record of Non-applicability document prepared by the Center.

4.3.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

Locating the Metal Forming and Coating facility adjacent to Building 18 would have a negligible impact on air quality in the area and would not be substantially different from the Proposed Action.

4.3.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

Locating the Metal Coating unit within Building 157 and Metal Forming adjacent to Building 18 would also not be substantially different from the Proposed Action.

4.4 Noise

Noises generated by sources resulting from the Proposed Action at the Center would be of considerable variety, but would occur infrequently and typically have a short duration. Some may be audible beyond the building or location where they are generated and a few types may be occasionally heard in off-site areas surrounding the Center. Noise would occur during construction, but is not expected to be disruptive beyond the boundary of the Center. Other noises generated would vary depending on the types of research

being conducted in the various facilities, but would not exceed levels established in federal, Maryland and Montgomery County regulations.

4.4.1 The Proposed Action

The Ship Magnetic Signature Control Complex involves new construction, which for reasons of very special siting criteria, would be located in the northwest end of the Center. The noises that would be generated from this complex would consist of two types: 1) normal and routine engine and mechanical noise from trucks and cranes which deliver and position items to be tested in building M1, and 2) engine noise from the machinery that is being tested. Most equipment would be on site for 2-6 weeks with delivery and removal before and after the test. The equipment that generates the loudest noise is a gas turbine power unit. It can generate up to 118 dBA measured next to the source (U.S. Naval Academy, 6/30/87). Testing of such equipment would be the worst case that would occur at the Center, but is not likely to occur during the next ten years. Equipment being tested would be operated only during normal work hours on weekdays. M1 would be constructed in the location shown on Figure 2-1 and would include noise abatement systems for the exhausts of test engines and exterior walls to prevent noise levels from exceeding federal, Maryland and Montgomery County regulatory limits. Other than truck deliveries of laboratory equipment and office supplies, the Administration Building (M2) would emit no noise. M2 would be constructed 40 feet from the fenceline along MacArthur Boulevard. No sounds emanating from the Ship Magnetic Signature Control Complex would exceed federal, Maryland or Montgomery County regulatory levels or be disruptive beyond the boundary of the Center.

Construction noise associated with the Materials Laboratory, the Metal Forming unit and the Administration building for the included research units is not expected to be disruptive beyond the boundary of the Center. The only equipment that generates noise outdoors is a small compressor that serves the Metal Forming unit. The compressor would only be used during normal work hours and would be installed and operated in conformance with federal, Maryland and Montgomery County regulations.

The Metal Coating unit would be contained within a structure attached to the Metal Forming unit. The coating apparatus consists of a spray-gun-sized welding nozzle which directs a stream of atomized metal material at the sample to be coated, approximately 2 feet away. The process is confined within a booth which collects all overspray dust. One of the devices used generates sound up to the 135 dBA level which radiates generally evenly in all directions from the nozzle. This equipment has historically been operated 40-50 percent of the normal work year. The combined Metal Forming and Coating facility would be located in the easternmost portion of the Center. The building for the Metal Coating unit would be designed with materials that absorb noise such that levels in excess of the 62 dBA would not reach beyond the boundary of the Center.

4.4.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

Construction of the Metal Forming and Coating facility in the clearing to the east of Building 18 would contain noise absorbing features to prevent noise levels in excess of 62 dBA from reaching beyond the boundary of the Center.

4.4.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

Construction of the Metal Coating unit inside existing Building 157 would prevent noise levels in excess of 62 dBA from reaching beyond the boundary of the Center.

4.5 Terrestrial Environment

Vegetation and wildlife can be temporarily and permanently affected by land development activities. Federal laws protect listed rare, threatened or endangered species of plants or animals and their habitats from impact due to federal actions, such as those discussed in this Environmental Assessment. In response to the scoping letter, the U.S. Department of the Interior, Fish and Wildlife Service (FWS) has indicated that no federally listed or proposed threatened or endangered species of plants or animals are known to exist at the Center, therefore, federally listed endangered species would not be affected (see FWS July 25, 1996 letter in Section 7.2). The Natural Heritage Program of the Maryland Department of Natural Resources (MDNR) has indicated that two species of rare plants are known to exist in the vicinity of the

Proposed Action. They are *Carex radiata* and *Panicum laxiflorum*. It is DoD and Navy policy to preserve state listed threatened and endangered species on government land holdings to the maximum extent practicable.

4.5.1 The Proposed Action

The Magnetic Complex involves construction of five structures in the area west of the new Fire Station and in the field to the south of Albacore Road. A portion of this area, north of Albacore Road, contains a stand of trees while the balance of the site is covered with grass. In total, the Ship Magnetic Signature Control Complex would permanently convert 0.85 acres of woods and 0.30 acres of grass area to development. The site contains two species, *Carex radiata* listed as "endangered" and *Panicum laxiflorum* listed as "status uncertain," by the Maryland Natural Heritage Program. Some individual *Carex radiata* plants would be affected by construction of M2; however, the species is plentiful in other locations at the Center. The *Panicum laxiflorum* would be relocated, in close coordination with the Maryland Natural Heritage Program Office, to another site at the Center prior to construction. Following construction and revegetation of disturbed areas, most wildlife are expected to resume normal habits.

The Materials Laboratory renovations and expansion at buildings 11, 12 and 157 would not involve removal of vegetated areas or habitat and would not disturb any wildlife population. Construction of the Building 11 Annex would convert approximately 0.40 acre of compacted earth and gravel utility yard surfacing to impervious paving and roofs areas. Construction of a new building for the Metal Forming and Coating facility would occupy a 0.50 acre area that is currently grass covered at the eastern end of the Center. Renovations of administrative and laboratory space in Building 19 would not affect wooded areas or wildlife habitat, but new parking lots needed in the vicinity would replace approximately 0.85 acre that is currently lawn. No Maryland listed threatened or endangered species would be affected by these facilities.

4.5.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

Construction of the Metal Forming and Coating unit in the clearing to the east of Building 18 would result in a 0.5 acre reduction of grass cover in the western part of the Center. No permanent disruption to wildlife at the Center is anticipated from Alternative 1 and impacts would not be substantially different from the Proposed Action.

4.5.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

Construction of the Metal Coating unit within Building 157 would result in no removal of vegetation. Construction of the Metal Forming unit in the clearing adjacent to Building 18 would permanently convert 0.20 acre of grass cover to building cover and paving. No permanent disruption to wildlife at the Center is anticipated from Alternative 2. and impacts would not be substantially different from the Proposed Action.

4.6 Wetlands

Changes to wetlands from the development of land usually take the form of draining or filling of the wetland itself or flooding it with excessive amounts of storm water and pollutants. Federal regulations require that a permit be issued by the U.S. Army Corps of Engineers prior to initiation of construction that would "impact waters of the United States," which includes wetlands. It is Department of Defense and Navy policy to avoid causing a net loss of wetlands on government owned facilities.

4.6.1 The Proposed Action

The Magnetic Complex involves new construction near a wetland area in the western end of the Center. The wetland has been delineated and a 25 foot wetland protection buffer established. Structures would be sited outside the 25 foot buffer to ensure that no impacts occur to the wetland. To protect the wetland from indirect impacts, a soil erosion and sediment control plan would be prepared and submitted to the Maryland Department of the Environment for approval.

There would be no temporary or permanent changes to wetlands resulting from the renovations and expansion at buildings 11, 12, 19 and 157. Those renovations and additions would not involve any draining, filling or flooding of wetlands. The site for the Metal Forming and Coating facility at the eastern end of the Center would not impact wetland areas. Although no impacts to wetlands are anticipated from construction or operation of the Proposed Action, there is a possibility, although unlikely, that some utility connections could have temporarily affects. Although this impact would be minimal, the Navy would avoid crossing wetlands with utilities to the maximum extent practicable.

4.6.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

The Metal Forming and Coating facility would be located in the middle of the clearing to the east of Building 18, more than 100 feet from the edge of the nearest wetland area. An erosion and sediment control plan would be prepared and submitted to the Maryland Department of the Environment for approval. There would be no direct or significant indirect impacts to the wetland from Alternative 1.

4.6.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

Construction of the Metal Coating unit inside existing Building 157 would cause no impacts to wetlands. The Metal Forming unit would be located in the middle of the clearing to the east of Building 18, more than 100 feet from the nearest wetland area. An erosion and sediment control plan would be prepared and submitted to the Maryland Department of the Environment for approval. There would be no direct or significant indirect impacts to the wetland from this alternative.

4.7 Socioeconomics

The growth in staff strength at the Center from the proposed relocated research and development activities represents an approximate 13 percent increase over the present Center population of 1,354. However, the 175 people associated with the relocations would replace only half the number reduced since 1988 when the

population was 1,707 (The new total population of 1,529 still represents a 10.4 percent decrease below the 1988 level of 1707). One hundred fifty of the personnel are relocating from White Oak and 25 are relocating from Annapolis and the Nike Annex. Because the relocating White Oak employees already live in Suburban Maryland, Washington, DC, and Northern Virginia, few are expected to actually move their residences into Montgomery County. The expectation is that most would commute to the Center from their existing homes. The overall impact of families relocating to Montgomery County is expected to be insignificant.

4.7.1 The Proposed Action

The Magnetic Test Complex and Laboratory relocation would increase the current employment population at the Center by approximately 60. They would be middle and senior grade scientists and engineers. Relocation of the Materials Research and Development activities to the Center would increase employment population by approximately 115 personnel. They would be middle and senior grade scientists and engineers.

Construction of all the proposed facilities at the Center may result in economic benefits to the local area in the form of construction contracts, material supply, labor and ongoing vendor contracts. The additional staff of 175 individuals would spend a portion of their income in local businesses for personal goods and services.

4.7.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

Construction of the Materials facilities in the clearing to the east of Building 18 would provide the same potential economic benefits to local businesses as the Proposed Action.

4.7.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building

Construction of the Materials facilities within Building 157 would provide the same potential economic benefits to local businesses as the Proposed Action.

4.8 Historical and Cultural Resources

Historic and cultural resources at the Center have been the subject of a recent detailed survey and documentation effort. The structures now listed on the National Register of Historic Places (buildings 1, 2, 3 and 4) are not directly involved in the renovations or new construction. The Section 106 process provides that the Maryland State Historic Preservation Office (SHPO) and the federal Advisory Council on Historic Preservation (ACHP) review determinations and mitigation measures if eligible or listed historic structures or sites could be affected by the Proposed Action.

4.8.1 The Proposed Action

The Magnetic Complex involves construction of new buildings and structures in the open area between the new Fire Station and the woods near Building 18. No archaeological resources are known to be located in this area and no historic structures would be directly affected by this action.

Of the structures included in the proposed historic district - as defined in the recent Goodwin & Associates architectural survey - only the Wind Tunnel Complex (buildings 11, 12, 13 and 157) are contributing resources impacted by the BRAC action. These buildings, which contained scientific equipment used in the Center's aeronautical testing from World War II to the 1960s, would be adaptively reused for functions transferred from White Oak. The Center signed a Memorandum of Agreement (MOA) with the Maryland SHPO and the ACHP to complete Historic American Engineering Record (HAER) documentation of the complex prior to dismantling significant equipment in the buildings. That documentation has now been completed. A copy of the MOA is included in Appendix D.

4.8.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

No archaeological resources are known to be located in the clearing east of Building 18 and no historic structure would be affected by construction on this site, but it would be visible from the Clara Barton Parkway.

4.8.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

The MOA for historic documentation of the Wind Tunnel structure would provide a permanent record of its past use prior to conversion. Modifications to the exterior would be limited to those necessary for providing appropriate contemporary building and safety code related access, utility and ventilation.

No archaeological resources are known to be located in the clearing east of Building 18 and no historic structures would be affected by construction on this site, but it would be visible from the Clara Barton Parkway.

4.9 Community Services

Public agencies within the local communities provide security, fire, medical and other services to the Center and its staff. Increases in staff levels cause proportional increases in demand for community services. Such increases are normally greater when new staff also become residents of the local community. The growth in staff strength at the Center from the proposed relocating research and development activities represents an approximate 13 percent increase over the existing Center workforce. Because many of the new employees already live in Suburban Maryland, Washington, DC, and Northern Virginia, few are expected to actually move their residences into Montgomery County.

4.9.1 The Proposed Action

The Magnetic Test Complex and Laboratory would bring approximately 60 new personnel to work at the Center. They would be middle and senior grade scientists and engineers. Because few of the staff are anticipated to move to Montgomery County, demand for community services would not be significantly impacted by the Proposed Action.

The Materials Laboratory renovations and expansion at buildings 11, 12 and 157, renovations in Building 19, and construction of a new building for the Metal Forming and Coating facility would

accommodate approximately 115 new staff at the Center. They would be middle and senior grade scientists and engineers.

Because few of the staff are anticipated to move to Montgomery County, demand for community services would not be significantly impacted by the Proposed Action.

4.9.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

Placement of the Metal Forming and Coating facility in the clearing to the east of Building 18 would not be different than the Proposed Action.

4.9.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

Placement of the Metal Forming unit in the clearing to the east of Building 18 would not be different than the Proposed Action.

4.10 Land Use and Aesthetics

The orderliness and attractiveness of the Center are assets to the Navy and the area in general. Key elements to the visual appeal of the Center as a landmark include: maintenance of the visual integrity of the perimeter of the Center; open views from outside the Center of the major buildings; new buildings added to existing clusters rather than scattered; compatibility of new architecture; and the preservation of open space and large wooded areas.

4.10.1 The Proposed Action

The Magnetics Laboratory and Administration buildings must be located in the area between the new Fire Station and the woods north of Building 18. The grouping of two buildings and three structures must also be arranged according to special criteria that relate to protecting the Magnetics Laboratory (M1) from magnetic interference, including interference produced from the Administration Building (M2). M2 therefore would be sited such that one corner would lie approximately 40 feet from the northern boundary of the Center. Although buffered by the

remaining oak, poplar and hickory trees, the building would be visible from residences outside the northern boundary and travelers on MacArthur Boulevard. The facility would not be visible from Clara Barton Parkway. Some visual impact from locating a building in that location cannot be avoided. Construction on the north side of Albacore Road is not consistent with the current land use master plan for the Center on file with the National Capital Planning Commission. A revised plan for the sub-area would be prepared and submitted for review.

The Materials Laboratory renovations and expansion at buildings 11, 12 and 157 would involve removing some small existing utility structures. This would add to their architectural/visual appeal. The Building 11 Annex would contribute to overall improvement of the Center by replacing obsolete structures in a utility yard with a permanent occupied laboratory building. These renovations would minimize new construction and serve to modernize and therefore preserve existing facilities. Construction of the Building 11 Annex would improve the general appearance of the Center by removing obsolete and deteriorating industrial equipment. Adaptive reuse of Building 157, a damaged and inoperable wind tunnel, would facilitate restoration of its appearance. Construction of a new building for the Metal Forming and Coating facility would, by necessity, be a simple structure. Construction of the Metal Forming and Coating facility in the far eastern end of the Center places it in an area that is not noticeable from outside the Center.

The Center would maintain or add vegetation to visual buffers as practicable.

4.10.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

Constructing the Metal Forming and Coating facility in the clearing east of Building 18 would impact the view of the Center from the Clara Barton Parkway adjacent to that site.

4.10.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

Constructing the Metal Coating unit within Building 157 would have no impact on the aesthetics of the Center. Constructing the Metal Forming unit in the clearing east of Building 18 would impact the view of the Center from the Clara Barton Parkway adjacent to that site.

4.11 Transportation

The existing transportation system that serves the area and the Center is predominately used by privately owned vehicles traveling on the Clara Barton Parkway and MacArthur Boulevard.

4.11.1 The Proposed Action

The proposed location of the Magnetics Laboratory and Administration Building near the center of the site would provide good access for staff arriving and departing through the Main Gate on the Clara Barton Parkway. Traffic is not anticipated to increase significantly based on the increase of 60 personnel who would work at the Magnetics facility. Because moving vehicles would interfere with magnetic tests, vehicular traffic would be excluded from Albacore Road while the Magnetic Test Building (M1) is in use. An alternative route connecting Building 18 with the parking lot south of Building 11 would be used for access to the western end of the Center during such closures.

The 115 personnel proposed to be employed in the Materials Laboratory and Administration renovations and expansions in buildings 11, 12, 19, 157 and the new Metal Forming and Coating facility would use the Main Gate for access to and from the Center. The internal transportation network of primary and secondary roads would adequately serve the proposed action. Traffic is not anticipated to increase significantly due to the additional 175 personnel. The total new traffic generated by the relocation is expected to add 13 percent to the current traffic generated at the Center and on public roads in the area. This traffic increase represents traffic levels that would be less than those generated by the Center as recently as 1988. Due to staggered arrival and departure times, the impact of this new traffic is not expected to be significant.

4.11.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

Construction of the Metal Forming and Coating facility in the clearing to the east of Building 18 would have the same insignificant impact on the roads in the area as the Proposed Action.

4.11.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

Construction of the Metal Coating unit within Building 157 and Metal Forming adjacent to Building 18 would have the same insignificant impact on the roads in the area as the Proposed Action.

4.12 Utilities

Utility systems are adequate to support increases in demand from anticipated from the relocating facilities. Some service lines would need extension to reach new buildings, but expansion of major elements, such as electrical substations and water mains on- or off-base, would not be needed.

4.12.1 The Proposed Action

The Magnetism Laboratory and Administration Complex are new functions, which would use the utility systems generally available at the Center without requirement for special or new capacities. The existing utilities infrastructure is adequate to serve the new facilities in the proposed location along Albacore Road. No trunk line or main extensions would be required and the capacity of substations, switching equipment, treatment facilities and outfalls would not have to be increased.

The Materials Laboratory renovations and expansion at buildings 11, 12 and 157 would include redesign and reconnection to existing utilities in the area. Renovations for Administration and Laboratory uses in Building 19 would involve reuse of existing utility services within the building with limited expansions of ventilation capability for the basement Laboratory. Lighting and storm water drainage would be added to the new parking lots. Construction of the Metal Forming and Coating facility would require extensions of electrical, water and sewer utilities to serve the facility. Potential impacts from connection to existing utilities would be minimal and temporary.

4.12.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

Construction of the Metal Forming and Coating facility in the clearing to the east of Building 18 would require extensions of electrical, water and sewer utilities to serve the facility.

4.12.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

Construction of the Metal Coating unit within Building 157 would not require extensions of utility mains since current service would be adequate. Construction of the Metal Forming unit in the clearing to the east of Building 18 would require extensions of electrical, water and sewer utilities to serve the unit.

4.13 Hazardous Materials and Wastes

All federal installations are required by federal and Maryland law to store, use and dispose of hazardous materials in very specific ways. Under the Resource Conservation and Recovery Act (RCRA), hazardous materials and wastes are tracked and carefully documented at the Center to ensure that all hazardous materials acquired and wastes generated are accounted for throughout their presence on-site. The Pollution Prevention (P2) program, in particular the new "HazMart" at the Center, further minimizes the amounts of materials acquired and kept on hand in laboratories and shops. Facilities that produce electromagnetic radiation can also be a concern for personal safety, ordinance, or fuel storage if levels are high. Facilities that handle, use and store radioactive substances are highly regulated and inspected frequently. None of the activities addressed in this EA use explosive materials.

4.13.1 The Proposed Action

Hazardous Materials Storage and Handling

The Magnetism and Materials laboratories in buildings M1, 11, 11 Annex, 12, 19, 157 and the Metal Forming and Coating facility would typically use solvents for cleaning surfaces to be tested and equipment used in experiments. The various laboratories would store and use small quantities of materials such as alcohol and acetone for that purpose. The Polyurethane Technology Group would use larger amounts of solvents, mostly methylethylketone (MEK), to clean their equipment

after forming an item. The Polyurethane Technology and Metal Forming and Coating processes would not include hazardous materials as raw materials.

Hazardous Waste

The Magnetism Laboratory would produce limited volumes of hazardous waste, most commonly in the form of used lubricating oils and solvent-soaked rags used for cleaning equipment. The average annual volume historically created by this activity has been less than 1,000 pounds. All rags, swabs and empty containers would be disposed of as hazardous waste through the Center Environmental Office. Although the Metal Forming and Coating processes would use no hazardous raw materials, they would annually produce approximately 1,500 pounds of metal dust from overspray. Approximately 1,000 pounds of the metal dust from Metal Forming would be captured and recycled through the Defense Reutilization and Marketing Office (DRMO). Five hundred pounds of metal dust would be captured in a water wash scrubber in the Metal Coating unit would be handled as hazardous waste by the Center Environmental Office. The relocation of these new activities would not significantly increase the volume of hazardous materials or waste managed at the Center. The total additional 1,500 pounds represents a 3 percent increase above current levels of hazardous waste managed at the Center. The use and disposal of hazardous materials at the Center is regulated by the *Naval Surface Warfare Center Carderock Division Hazardous Material and Waste Management Standard Operating Procedure: Desk Guide*. Emergency response to accidental spills of hazardous materials and wastes follows the guidance contained in the *Comprehensive Environmental Response Plan for NSWC Carderock Division, Carderock Site, Maryland*. No increase in risk from contamination in the area would occur as a result of the Proposed Action.

Renovations and construction for the Materials Laboratories proposed for buildings 11, 11 Annex, 12 and 157 would be near contaminated IR Sites 6, 7, 8 and 9 (see Figure 3-6). IR Site 6 has recently been remediated and no remediation is required for IR Site 7 because recent tests show contaminant levels are negligible. IR Site 8 would be remediated prior to any new tap being made to the sanitary sewer line. Remediation of IR Site 9 is included in a soon to be awarded contract

for removal of the metal spheres adjacent to Building 11. All efforts have and would continue to be coordinated with federal, state and local agencies.

Electromagnetic Radiation

Magnetic fields are present in any local environment and are often generated from numerous ordinary sources, such as household appliances, automobiles, telephone lines, etc. Even living organisms and the earth itself generate magnetic fields. All these sources comprise what is considered normal in today's environment. The Magnetics Laboratory functions to "smooth out" normal fluctuations in magnetic fields, in order to make precise measurements of the effects of magnetic fields on ship components and structures. The Laboratory operations do not produce higher magnetic fields than normal background levels.

Radioactive Material

Radiation Health and Physics would be located within Building 157. Navy scientists use the equipment to develop improved methods of shielding against radioactivity. These laboratories are also involved in developing devices to detect very small sources of radiation, such as radiation badges worn by Navy personnel who work near shipboard reactors and other sources. Two research units that are proposed to be located in Building 157 (Transonic Wind Tunnel) are regulated for occupational and environmental safety reasons because they involve sources of radioactivity. They are the positive ion accelerator and the gamma dosimetry range. Both of these existing operations are authorized and are subject to regular inspections by representatives from the Navy, the Nuclear Regulatory Commission and the State of Maryland. The Proposed Action would also include the capacity to store small amounts of various types of sealed radioactive samples in a specifically designed chamber in Building 157. The equipment proposed for use in these laboratories is designed such that no fire, explosion or accident can cause leaks from the sample vessels. The positive ion accelerator, the gamma dosimetry range and radioactive samples storage would be completely contained within Building 157 and individual test cells that would be used are designed for primary and secondary containment during testing. Adaptive reuse of Building 157 was primarily considered to house these facilities because, in addition to other factors, the thick concrete walls would serve as a supplemental safety measure. Federal

regulations require that levels of radiation along the outside walls of the building would not be measurable above normal background levels that occur in nature. The adaptive reuse of Building 157 helps insure that the facility will meet regulatory requirements. No radioactive wastes would be generated by these operations.

Explosive Safety

No areas proposed for development are located within areas constrained by Explosives Quantity Safety Distance (EQSD) arcs.

4.13.2 Alternative 1 - Metal Forming and Coating Adjacent to Building 18

Impacts associated with this alternative would not be different than with the Proposed Action.

4.13.3 Alternative 2 - Metal Coating in Building 157 and Metal Forming Adjacent to Building 18

Impacts associated with this alternative would not be different than with the Proposed Action.

4.14 Irreversible and Irretrievable Commitment of Resources

Resources that would be irreversibly and irretrievably committed, if the Proposed Action were to be fully implemented, include the following:

1. The trees and grass currently located on the sites proposed for the Ship Magnetic Signature Control Complex (buildings M1, M2, M3, M4 and M5), totaling 0.85 acre of trees and 0.60 acre of grass, would be permanently replaced with the building and related site improvements.
2. The gravel and soil currently covering the site proposed for the Building 11 Annex, totaling 0.40 acre, would be permanently replaced with the buildings and related site improvements.
3. The grass currently covering the site proposed for the Metal Forming and Coating facility, totaling 0.50 acre, would be permanently replaced with the building and related site improvements.
4. The grass currently covering the sites proposed for new parking lots near Building 19, totaling 0.85 acre, would be permanently replaced with paving.

5. The Transonic Wind Tunnel test equipment currently located in Building 157 would be permanently removed and replaced with contemporary test equipment.
6. Some Maryland listed plant species would be affected, but the impact is not expected to jeprodize their continued viability.

4.15 Cumulative Impacts

No other substantial development projects in the vicinity of the Center have been reported and no new development is expected to be caused by implementation of the Proposed Action. Recent other projects completed at the Center, such as Building 60 and the Acoustics Laboratory to the east of Building 19, have added to the intensity of activity at the Center. The combined new personnel and activity of those recent actions, when combined with the relocations addressed in this assessment, returns the population of the Center to levels that it housed in the 1980s. The visual impact of those other recent buildings was minimal because they were sited such that they fit into existing clusters and did not change the visual character of the Center.

4.16 Short-Term Uses of the Environment and Enhancement of Long-Term Productivity

Placement of the Magnetics Laboratory in the clearing as proposed south of Albacore Road would ensure that additional structures would not proliferate there in the future. The Laboratory must be isolated from outside magnetic influences by at least 350 feet. Therefore, the balance of the clearing would not be available to accommodate new buildings. It is also unlikely that additional buildings would be added to the Laboratory because the proposed buildings occupy virtually all practical building sites.

4.17 Permitting Requirements and Approvals

The following permits and approvals would be required in the process of accomplishing the Proposed Action.

4.17.1 National Pollutant Discharge Elimination System (NPDES) Permit for Storm Water

No new discharges are anticipated, but in the event that pollutant loads in runoff exceeds current permit limits, the Navy would notify the Maryland Department of the Environment (MDE) and apply for a permit amendment.

4.17.2 Air Quality Registration for Metal Coating Unit

The registration requirement for the Metal Coating unit was dropped in 1993 and the Navy expects no permit would be required at the proposed new location at the Center.

4.17.3 National Capital Planning Commission (NCPC)

The Proposed Action would be submitted to NCPC for review.

4.17.4 Maryland Department of Natural Resources

Erosion and sediment control plans and storm water management plans would be reviewed by the agency for compliance with state regulations. Navy agencies would also review all plans in preparation for the state review.

4.18 Relationship to Other Laws

This environmental assessment has been prepared in accordance with the following regulations:

1. Section 102 (2) (c) of the National Environmental Policy Act of 1969 (NEPA)
2. The Council on Environmental Quality NEPA Regulations (40 CFR Parts 1500-1508 of 29 November 1978)
3. OPNAVINST 5090.1B, which implements , within the Department of the Navy, the requirements set forth in NEPA

A review of the laws and requirements, with relevance to the Proposed Action is included in the following subsections.

4.18.1 National Historic Preservation Act of 1966 (NHPA)

Section 106 requires that the effects of federal actions on known or potential National Register eligible historical, architectural and archaeological resources be considered. The comments of the SHPO and the ACHP, in accordance with the regulations, must be obtained prior to project implementation.

4.18.2 Coastal Zone Management Act of 1972 (CZMA)

The Center is not within the Maryland coastal zone and the projects will not affect any "coastal water resources".

4.18.3 The Chesapeake Bay Agreement, Maryland Critical Areas Commission

To fulfill part of its obligation under this agreement, Maryland created the Critical Areas Commission, and has instituted land use and pollution control programs and policies. Federally-owned lands are not subject to state regulation under this agreement, however it is Navy policy to comply with state regulations to the maximum extent practicable. Additionally, the Center lies outside of designated coastal critical areas which extend inland 1,000 feet from waters.

4.18.4 Clean Water Act (CWA)

The Proposed Action is subject to federal pollution control regulations under the CWA and Maryland erosion and sediment control and storm water management regulations. Erosion and sediment control and storm water management plans would be prepared and submitted to the Maryland Department of the Environment (MDE) prior to ground breaking. None of the elements of the Proposed Action would occur within a wetland. Approved best management practices for storm water pollution control would be used to ensure that storm water quality meets Maryland standards. Twenty-five foot wetland buffers would be maintained to the maximum extent practicable.

4.18.5 Clean Air Act (CAA)

An analysis was completed to estimate the net increases in volatile organic compounds (VOC) and oxides of nitrogen (NOx) that would be generated by the Proposed Action. Potential emissions would conform to the State Implementation Plan. No new air emissions permits are anticipated. EPA, Maryland Department of the Environment (MDE) and other appropriate agencies would receive copies of the final EA. An analysis of the applicability of the CWA Conformity Rule is included in Appendix C.

4.18.6 Endangered Species Act of 1973

The FWS has been contacted and has notified the Navy that no federally listed threatened or endangered species or habitats are identified at the Center. It is Navy policy to also avoid harming state listed rare, threatened and endangered species to the extent practical. The Maryland Department of Natural Resources (MDNR) has also been contacted regarding the Proposed Action. One species of plant that is listed as "status uncertain" would be relocated from one of the proposed building sites. Impacts to individual plants of a second species are unavoidable at one of the building sites, however the plant is plentiful at many other locations at the Center and in Maryland.

4.18.7 Executive Order 11988, Floodplain Management

The order requires federal agencies to avoid actions which directly or indirectly result in development in floodplains. Although the Center is near the Potomac River and other streams, the Proposed Action would not involve building in or changes to floodplain areas.

4.18.8 Executive Order 12898, Environmental Justice

This order requires that federal agencies consider and avoid disproportionately impacting low income or minority populations. The Center is not located near disadvantaged neighborhoods or populations so none would be impacted by the Proposed Action.

4.19 Mitigation Measures

The Proposed Action would include the following measures to mitigate anticipated adverse effects:

1. Completion of NSWC obligations under the existing MOA for documentation of the test equipment housed in Building 157 (Wind Tunnel), and other Section 106 consultation as necessary.
2. Best Management Practices would be used during construction as appropriate to minimize potential noise and/or dust impacts.
3. An Erosion and Sediment Control Plan and a Stormwater Management Plan would be approved by the Maryland Department of Natural Resources and Department of the Environment respectively.
4. The project would be submitted to the National Capital Planning Commission for review.
5. Contamination associated with IR Site 8 and IR Site 9 would be remediated before construction in the Wind Tunnel Complex begins. IR Site 6 has been remediated and no remediation is required for IR Site 7 because recent tests show contaminant levels are negligible. All efforts have been coordinated with federal, state and local agencies, and necessary remediation is scheduled.

5.0 LIST OF PREPARERS

5.1 Harland Bartholomew & Associates, Inc., Contractor

One Park West Circle, Suite 302
Midlothian, VA 23113

George Hull, Principal-in-Charge

Jerry Oliver, Project Manager

Robert M. McLeod, Environmental Planner

Janit Potter, Environmental Planner

Laura Atwood, CAD/GIS Technician

Nadine Sisson, Documents/records

5.2 Naval Facilities Engineering Command, Engineering Field Activity, Chesapeake

Washington Navy Yard, Bldg. 212
901 M Street, SE
Washington, DC 20374-5018

Mathew Hess, NEPA Coordinator

5.3 Naval Surface Warfare Center, Carderock Division

Naval Surface Warfare Center
Bethesda, MD 20084-5000

Douglas Garbini, Environmental Engineer

6.0 LIST OF AGENCIES AND PERSONS CONSULTED

The following is a partial listing of agencies and persons consulted during the preparation of this Environmental Assessment:

6.1 Naval Facilities Engineering Command, Engineering Field Activity, Chesapeake

Mike Bryan (202) 685-3061
NEPA Coordinator
EFA Chesapeake
Washington Navy Yard, Bldg. 212
901 M Street, SE
Washington, DC 20374-5018

Mathew Hess (202) 685-3061
NEPA Coordinator
EFA Chesapeake
Washington Navy Yard, Bldg. 212
901 M Street, SE
Washington, DC 20374-5018

6.2 Naval Surface Warfare Center, Carderock Division

Jim Barnes (301) 394-2472
Survivability, Structures and Materials
Directorate Naval Surface Warfare Center
White Oak Lab
10901 New Hampshire Ave.
Silver Spring, MD 20903-5640

Teresa Boucher (410) 293-9509
Environmental Compliance Officer
Naval Surface Warfare Center
Carderock Division Detachment
3A Legget Circle
Annapolis, MD 21402-5067

Mathew Brown (301) 394-2267
Survivability, Structures and Materials
Directorate Naval Surface Warfare Center
White Oak Lab
10901 New Hampshire Ave.
Silver Spring, MD 20903-5640

Jim Craig (301) 227-3973
Explosive Safety
Carderock Division
Naval Surface Warfare Center
Bethesda, MD 20084-5000

Bernard DeSavage (301) 394-4972
Deputy Head
Research and Technology Department
Naval Surface Warfare Center
White Oak Lab
10901 New Hampshire Ave.
Silver Spring, MD 20903-5640

Douglas Garbini (301) 227-1892
Environmental Engineer
Carderock Division
Naval Surface Warfare Center
Bethesda, MD 20084-5000

Kim Gross (301) 394-1419
Environmental Office
Naval Surface Warfare Center
White Oak Lab
10901 New Hampshire Ave.
Silver Spring, MD 20903-5640

Jim Jatko (301) 227-1298 (Carderock)
Public works Office (410) 293-3540 (Annapolis)
Carderock Division
Naval Surface Warfare Center
Bethesda, MD 20084-5000

Dr. Ronald Lee (301) 384-1546
Branch Head
Materials Evaluation Branch
Naval Surface Warfare Center
White Oak Lab
10901 New Hampshire Ave.
Silver Spring, MD 20903-5640

Jeffrey Morris (410) 293-9513
BRAC Environmental Coordinator
Naval Surface Warfare Center
Carderock Division Detachment
3A Legget Circle
Annapolis, MD 21402-5067

Terry Morton (410) 267-5392
Assistant Director
Survivability, Structures and Materials
Directorate Naval Surface Warfare Center
Carderock Division Detachment
3A Legget Circle
Annapolis, MD 21402-5067

Jim Scott (301) 227-4465
Public Affairs Office
Carderock Division
Naval Surface Warfare Center
Bethesda, MD 20084-5000

Bill Spicer (301) 227-2399
Environmental Office
Carderock Division
Naval Surface Warfare Center
Bethesda, MD 20084-5000

Gail Spiegle (410) 293-2846
Real Property Office
Naval Surface Warfare Center
Carderock Division Detachment
3A Legget Circle
Annapolis, MD 21402-5067

Jim Stafford (301) 394-3760
Radiation Safety
Naval Surface Warfare Center
White Oak Lab
10901 New Hampshire Ave.
Silver Spring, MD 20903-5640

William Sudduth (301) 394-2262
Branch Head
Materials Technology Branch
Naval Surface Warfare Center
White Oak Lab
10901 New Hampshire Ave.
Silver Spring, MD 20903-5640

Ron Wallos (301) 227-1892
Environmental Office
Carderock Division
Naval Surface Warfare Center
Bethesda, MD 20084-5000

Tom Warring (301) 227-4465
Public Affairs Office
Carderock Division
Naval Surface Warfare Center
Bethesda, MD 20084-5000

Thomas Wenzel (410) 293-2461
Branch Head
Ship Signature Materials Branch
Naval Surface Warfare Center
Carderock Division Detachment
3A Legget Circle
Annapolis, MD 21402-5067

6.3 Maryland Department of the Environment

Rob Sariscak (410) 631-3000
Air and Radiation Management
2500 Broening Highway
Baltimore, MD 21224

6.4 Maryland Department of Natural Resources

Lynn Davidson (410) 974-3195
Maryland Natural Heritage Program
Tawes State Office Building
Annapolis, MD 21401

6.5 Hayes, Seay, Mattern & Mattern

Ben Fink (540) 857-3100
315 Franklin Road, SW
Roanoke, VA 24016

7.0 SCOPING LETTER

This section includes the text of the scoping letter sent to various public agencies and individuals in late June 1996, copies of the letters received in response to the scoping letter, and the mailing list used for distribution of the letter.

7.1 Scoping Letter Text

Dear _____:

The 1995 Base Realignment and Closure (BRAC) Commission recommended realignment of Naval Surface Warfare Center (NSWC) which operates various facilities including sites at Carderock, White Oak, and Annapolis, Maryland. Congress and the President approved the BRAC Commission's recommendations making it law that NSWC White Oak, Dahlgren Division and NSWC Carderock Division, Annapolis Detachment be closed. BRAC further mandated that functions, personnel and support equipment associated with the Ship Magnetic Signature Control, Research and Development (R&D) Complex at NSWC White Oak be relocated to the NSWC Carderock Division (NSWCCD), Carderock, MD. The Carderock site (also known as the David Taylor Model Basin) functions primarily as an R&D facility and is located in Montgomery County, Maryland just west of I-495, between Clara Barton Parkway and MacArthur Boulevard (see enclosed map).

Certain R&D functions, personnel and equipment associated with the NSWC Carderock Division Detachments, currently at the White Oak and Annapolis sites, are also to be relocated and consolidated at NSWCCD, their Division Headquarters. Branches of the Advanced Materials (Annapolis NIKE Site), Magnetic Testing (Annapolis and White Oak) and Materials (White Oak) research groups, including approximately 175 scientific and engineering professionals comprise the relocating activities. The Navy is in the process of assessing how to best accommodate the operational requirements of the relocating activities at NSWCCD.

Specifically, the activities involved in this move are:

Groups conducting advanced research, testing, development and evaluation into new materials for US Navy applications include: a Polyurethane Experimental Prototype Process Facility, the High Temperature Metal Spray Forming Facility, a Titanium Spray Forming Facility, an Advanced Ceramics Materials Research and Synthesis group, Facilities for Investigations into the Physics and Chemistry of Material Surfaces, a Metallurgy Science & Technology group, a Polymer Science Research and Technology group, a Corrosion Control Activity, a non-medical Biotechnology Research Group, the Magnetics Materials Development and Applications group and an Advance Materials Development for Electronic and Electro-optic Devices group.

Groups conducting research, testing, development and evaluation into current and advanced battery and fuel cell applications for US Navy operations include the Battery Testing Group and the Battery Technology Group.

Groups conducting research, testing, development and evaluation on ships' magnetic characteristics include the Magnetic Field Laboratory and the Magnetic Measurement Laboratory. These groups conduct research on the passive effects of the earth's magnetic field on shipboard equipment and materials and develop systems for ship self-defense against mines.

Groups conducting research, testing, development and evaluation into radiation safety for the US Navy shipboard use include operations in Personnel Radiation Monitor Development and Calibration and the Shipboard Radiation Shielding Program. These activities use commercially available sealed radioactive sources. No radioactive wastes are generated and these facilities are regulated and inspected by state and federal regulatory agencies.

Consistent with requirements of the National Environmental Policy Act (NEPA), the Navy is preparing an Environmental Assessment (EA) to evaluate the preparations needed at NSWCCD to accommodate the relocating activities. The EA would document the alternative arrangements that have been considered and the degree of beneficial and negative impacts of the new activities on the Carderock environment. The project team is currently examining site resources including views, noise, wetlands, historic structures, streams, vegetation, soils and endangered species to determine their quality and potential to be negatively affected by the relocation. The project team is also developing ways to mitigate, eliminate or reduce identifiable negative impacts to these resources.

In addition to notifying various agencies and individuals that a NEPA review has started for this project, this letter is a request for information and comments pertinent to the proposed action. In order to fully evaluate the impact of the proposed construction and renovations, the Navy is providing you with the opportunity to identify, in writing, any concerns you may have regarding the proposed action's impact on the environment. Please respond in writing by July 3, 1996 to:

Harland Bartholomew & Associates, Inc.
One Park West Circle, Suite 302
Midlothian, Virginia 23113

If you would like to receive a copy of the final EA report, please send a written request to the address above. Questions regarding the Naval Surface Warfare Center, Carderock Division can be directed to Mr. Jim Scott of the Public Affairs Office at (301) 227-1142.

Sincerely,

7.2 Copies of Written Responses

The following pages are copies of letters received in response to the scoping letter.

WEST MONTGOMERY COUNTY
CITIZENS ASSOCIATION

P.O. Box 59335
Potomac, MD 20859-9335

Founded 1947

April 2, 1996

Mr. Jerry Oliver
Harland Bartholomew & Associates, Inc.
One park West Circle, Suite 302
Midlothian, VA 23113

Dear Mr. Oliver:

Betty Ann Krahne sent along a copy of her June 27th letter to you concerning the Naval Surface Warfare Center. But she did not send me any of the material that you sent to her.

WMCCA's area includes the Naval site. We are very concerned about what happens to that property. I would greatly appreciate it if you forward whatever material you have.

Please send your package to:

Fred Ward, President
WMCCA
7106 Saunders Court
Bethesda, MD 20817

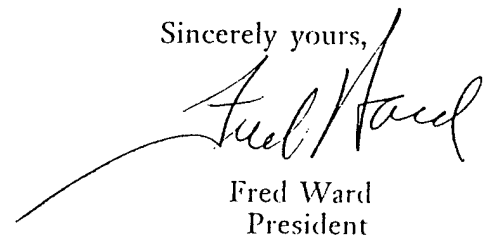
Thank you.

RECEIVED

JUL 25 1996

Harland Bartholomew & Assoc.,

Sincerely yours,


Fred Ward
President

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION
8787 Georgia Avenue • Silver Spring, Maryland 20910-3760

June 25, 1996

Jerry Oliver, AICP
Harland Bartholomew & Associates, Inc.
One Park West Circle, Suite 302
Midlothian, VA 23113

Dear Mr. Oliver:

This letter is in response to your letters to Messrs. Robertson and Ayya of the Montgomery County Park and Planning Department of the Maryland-National Capital Park and Planning Commission. As I indicated to you in our conversation earlier this week, while we understand that certain R&D functions of the Naval Surface Warfare Center, Carderock Division Detachments at the White Oak and Annapolis facilities will be relocated, without additional information, we will be unable to provide you with useful comment.

The following information is fundamental:

1. number of employees to be relocated at each site
2. size of new or existing office space
3. size of new or existing laboratories
4. site specific location of existing facilities
5. site plans for new facilities
6. location of any laboratories using toxic or hazardous chemicals
7. schedule(s) for each project(s)

Any additional information which will better permit us evaluate the accumulated effect of the relocation will be helpful. If you have any additional questions, please contact me here at (301) 495-1327.

Sincerely,



Gene Brooks,
Planning Coordinator

cc: P. Berman
J. Zyontz

RECEIVED

JUN 27 1996

Harland Bartholomew & Assoc.



MONTGOMERY COUNTY COUNCIL
ROCKVILLE, MARYLAND

RECEIVED
JUL 8 1996
Harland Bartholomew & Assoc.

BETTY ANN KRAHNKE

June 27, 1996

Mr. Jerry Oliver
Harland Bartholomew & Associates, Inc.
One Park West Circle
Suite 302
Midlothian, Virginia 23113

Dear Mr. Oliver:

Thank you for your informative letter on the Base Realignment and Closure Commission recommended realignment of Naval Surface Warfare Center facilities. Carderock is in my Council District and I would appreciate receiving, in addition to the environmental information, more information about the reuse of buildings at that site, any new construction needed and any transportation changes that would result in increased impacts on nearby neighborhoods.

I would also like to request a copy of the final Environmental Assessment report. Thank you.

Sincerely,

Betty Ann Krahne
Councilmember

cc: Neal Fitzpatrick
Audubon Naturalist Society
David Edgerly
Gail Nachman
West Montgomery Civic Association
jln/fbccissue

INTERSTATE COMMISSION ON THE POTOMAC RIVER BASIN

Suite 300
6110 Executive Boulevard
Rockville, Md. 20852-3903
(301) 984-1908
FAX (301) 984-5841



Chair

Keith R. Gentzler

Vice Chair

George H. Shoemaker

District of Columbia

Ferial S. Bishop
Shaun M. Gehan
Lloyd Preslar
Hame M. Watt, Ph. D.
James H. Hannaham
Anne D. Snodgrass

Maryland

Hon. Parris N. Glendening
George H. Shoemaker
James H. Gilford
Minny Pohlmann
Peter S. Tinsley

Pennsylvania

Irene Brooks
Hon. Jeffrey W. Coy
Keith R. Gentzler
Hon. William R. Lloyd, Jr.
William I. Plank
Roger E. Steele

Virginia

Floyd F. Eumpu
Hon. Janet D. Howell
Peter W. Schmidt
Hon. Robert E. Harris
William A. Hudnall
Horace McClerklin

West Virginia

Phyllis M. Cole
Hon. Harold K. Michael
Wm. T. Wallace, Jr., M.D.
Phoebe F. Heishman
Larry C. Smith
Victor R. Wilford

Federal

Gilbert Colón
Jean Packard
Daniel J. Weiss

Executive Director

Herbert M. Sachs

General Counsel

Robert L. Bolle

July 1, 1996

Jerry Oliver, AICP Project Manager
Harland Bartholomew & Associates, Inc.
One Park West Circle
Suite 302
Midlothian, VA 23113

Dear Mr. Oliver:

We are interested in receiving the final Environmental Assessment Report. The staff at the the Interstate Commission on the Potomac River Basin is looking over the details in your letter of June 17th and shortly will try and help with some suggestions for evaluating the impact of the move. We are concerned that the type of soil and water contamination which occurred at White Oak does not occur again.

Thank you for keeping us informed.

Sincerely,

Barbara Medina
Paint Branch Sub Basin Coordinator

JUL 3 1996
Harland Bartholomew & Assoc.

Legislative District 15
Montgomery County



Ways and Means Committee
Transportation Subcommittee

District Office:
11700 Ambleside Drive
Potomac, Maryland 20854-2101
(301) 762-7993
FAX (301) 424-7718

HOUSE OF DELEGATES
ANNAPOLIS, MARYLAND 21401-1991

Annapolis Office:
219 Lowe House Office Building
Annapolis, Maryland 21401
(301) 858-3052
(410) 841-3052

JEAN CRYOR

July 3, 1996

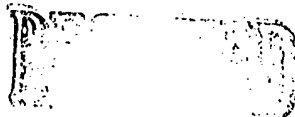
Mr. Jerry Oliver
Project Manager
Harland Bartholomew & Assoc. Inc.
One park West Circle, Suite 302
Midlothian, VA 23113

Dear Mr. Oliver:

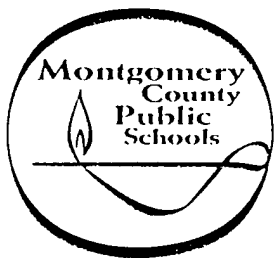
Thank you for sending me material on the Naval Surface Warfare Center
realignment dated July 1, 1996. I appreciate the opportunity to read it.

If you have any thoughts or any additional material you want to share,
please be in touch.

All my best,



Harland Bartholomew & Assoc.



850 Hungerford Drive • Rockville, Maryland • 20850-1747
Telephone (301) 279-3381

July 8, 1996

Mr. Jerry Oliver, AICP
Project Manager
Harland Bartholomew & Associates, Inc.
One Park West Circle, Suite 302
Midlothian, VA 23113

Dear Mr. Oliver:

This is in response to your June 17 letter regarding the recommendations of the 1995 Base Realignment and Closure Commission.

The Board of Education operates one elementary school and owns two unimproved school sites in the vicinity of the Carderock Naval Surface Warfare Center (NSWCCD). Any impacts upon the environment in connection with the closure and relocating activities of the NSWCCD should also identify all effects upon these facilities, especially with regard to increased traffic, air quality and noise mitigation.

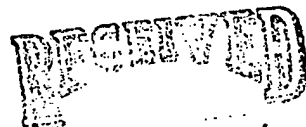
Please direct a copy of the final Environmental Assessment report to me when available. Thank you for your consideration of these remarks.

Sincerely,


Paul L. Vance
Superintendent of Schools

PLV:sw

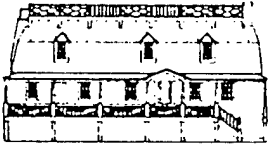
Copy to:
Mr. Bowers
Mr. Wilder



JUL 15 1996

Harland Bartholomew & Assoc.

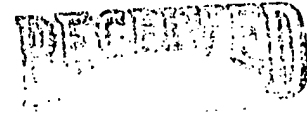
MARYLAND
HISTORICAL



TRUST

Parris N. Glendening, Governor
Patricia J. Payne, Secretary

July 10, 1996



JUL 15 1996

Office of Preservation Services

Mr. Jerry Oliver, Project Manager
Harland Bartholomew & Assoc., Inc.
One Park West Circle, Suite 302
Midlothian, Virginia 23113

Harland Bartholomew & Assoc.

Re: Realignment of Naval Surface Warfare Center (NSWC)
Carderock, White Oak, and Annapolis, Maryland

Dear Mr. Oliver:

Thank you for your recent letter, received by the Trust on 18 June 1996, informing the Trust of the Navy's plans to prepare an Environmental Assessment for the above-referenced undertaking and requesting our comments.

As you know, the Navy must comply with Sections 106 and 110 of the National Historic Preservation Act of 1966, as amended, for all of the proposed realignment activities and consider the effects of its undertakings on historic properties (including historic structures, districts, and archeological sites). While the Navy has initiated consultation with our office regarding realignment actions, it has not yet completed its identification of historic properties that may be affected by the project or determined the project's effects on historic properties. We look forward to continued coordination with the Navy on the NSWC realignment actions. Please provide us with a copy of the Environmental Assessment (EA) when it is available.

If you have questions or require additional information, please call Ms. Beth Cole (for archeology) at (410) 514-7631 or me (for structures) at (410) 514-7630. Thank you for providing us this opportunity to comment.

Sincerely,

Jo Ellen Freese
Administrator
Project Review and Compliance

JEF/EJC

cc: Mr. Larry Earle

Division of Historical and Cultural Programs
100 Community Place • Crownsville, Maryland 21032 • (410) 514-_____

*The Maryland Department of Housing and Community Development (DHCD) pledges to foster
the letter and spirit of the law for achieving equal housing opportunity in Maryland.*





United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401

REC-13 1996

July 25, 1996

Harland Bartholomew & Assoc.

Mr. Jerry Oliver
Harland Bartholomew & Associates, Inc.
One Park West Circle, Suite 302
Midlothian, VA 231113

Re: BRAC at Carderock
Montgomery County, MD

Dear Mr. Oliver:

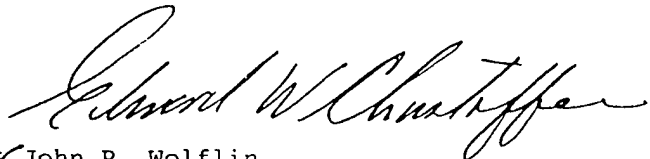
This responds to your July 8, 1996, request for information on the presence of species which are Federally listed or proposed for listing as endangered or threatened in the project area. We have reviewed the information you enclosed and are providing comments in accordance with Section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

Except for occasional transient individuals, no Federally listed or proposed endangered or threatened species are known to exist in the project impact area. Therefore, no Biological Assessment or further Section 7 Consultation with the U.S. Fish and Wildlife Service is required. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered. This response relates only to endangered species under our jurisdiction. For information on other rare species, you should contact Ms. Lynn Davidson of the Maryland Natural Heritage Program at (410) 974-2870.

An additional concern of the Service is wetlands protection. Both the Federal and the multi-state Chesapeake Bay Program wetlands policy have the interim goal of no overall net loss of the Basin's remaining wetlands, and the long term goal of increasing the quality and quantity of the Basin's wetlands resource base. Because of this policy and the functions and values wetlands perform, the Service recommends avoiding wetland impacts. All wetlands within the project area should be identified, and if construction in wetlands is proposed, the U.S. Army Corps of Engineers, Baltimore District, should be contacted for permit requirements. They can be reached at (410) 962-3670.

Thank you for your interest in fish and wildlife issues. If you have any questions or need further assistance, please contact Andy Moser at (410) 573-4537.

Sincerely,


for John P. Wolflin
Supervisor
Chesapeake Bay Field Office



STATE OF MARYLAND
OFFICE OF THE GOVERNOR

PARRIS N. GLENDENING
GOVERNOR

ANNAPOLIS OFFICE
STATE HOUSE
100 STATE CIRCLE
ANNAPOLIS, MARYLAND 21401
(410) 974-3901

WASHINGTON OFFICE
SUITE 311
444 NORTH CAPITOL STREET, N.W.
WASHINGTON, D.C. 20001
(202) 638-2215

TDD (410) 333-3028

July 31, 1996

Mr. Jerry Oliver, AICP
Project Manager
Harland Bartholomew & Associates, Inc.
One Park West Circle, Suite 302
Midlothian VA 23113

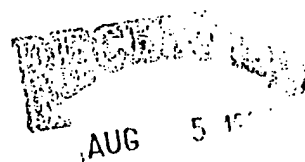
Dear Mr. Oliver:

Thank you for your letter concerning the relocation of research and development activities now based at the Naval Surface Warfare Center (NSWC) sites at White Oak and Annapolis to the NSWC Carderock Division in Carderock, Maryland. I have no questions or comments.

Marylanders can only hope its defense installations suffer no more closures or realignments. We have endured our share of physical and financial cutbacks.

Sincerely,

Parris N. Glendening
Governor



Harland Bartholomew & Assoc.

7.3 Distribution List for Scoping Letter

MS CATHERINE P STEVENSON DIRECTOR
MARYLAND DEPT OF NATURAL RESOURCES
WATER RESOURCES ADMINISTRATION
580 TAYLOR AVE TAWES BLDG D2
ANNAPOLIS MD 21401

MR GUS BAUMAN CHAIRMAN
MONTGOMERY CO PLANNING BOARD
MARYLAND NATL CAPITAL PARKS
AND PLANNING COMM
8787 GEORGIA AVE
SILVER SPRING MD 20910

MS JO ELLEN FREESE ADMINISTRATOR
PROJECT REVIEW AND COMPLIANCE
MARYLAND HISTORICAL TRUST
100 COMMUNITY PLACE
CROWNSVILLE MD 21032

POTOMAC GAZETTE
10220 RIVER ROAD SUITE 111
POTOMAC MD 20854

MONTGOMERY COUNTY SENTINEL
P O BOX 1272
ROCKVILLE MD 20849-1272

POTOMAC ALMANAC
10220 RIVER RD STE 203
POTOMAC MD 20854-4916

BETHESDA GAZETTE/CHEVY CHASE
GAZETTE
4815 RUGBY AVE
BETHESDA MD 20814

MARYLAND DEPARTMENT OF THE
ENVIRONMENT
WATER MANAGEMENT ADMINISTRATION
2500 BROENING HIGHWAY
BALTIMORE MD 21224

MR RAY DINTAMAN
ENVIRONMENTAL REVIEW UNIT
MD DEPT OF THE ENVIRONMENT
580 TAYLOR ST TAWES BLDG B-3
ANNAPOLIS MD 21401

MR ELDER GHIGIARELLI JR
WATER MGMT ADMIN
MARYLAND DEPT OF THE ENVIRONMENT
TAWES STATE OFFICE BLDG B-3
580 TAYLOR ST
ANNAPOLIS MD 21401

MARYLAND DEPT OF NATURAL RESOURCES
FOREST PARK AND WILDLIFE SERVICES
CHESAPEAKE BAY PROGRAM
TAWES STATE OFFICE BUILDING
580 TAYLOR STREET
ANNAPOLIS MD 21401

US ARMY CORP OF ENGINEERS
BALTIMORE DISTRICT
ENVIRONMENTAL BRANCH
P O BOX 1715
BALTIMORE MD 21203

MS BARBARA MEDINA
INTERSTATE COMMISSION ON
THE POTOMAC RIVER BASIN
6110 EXECUTIVE BLVD STE 300
ROCKVILLE MD 20852

METROPOLITAN WASHINGTON
COUNCIL OF GOVERNMENTS
DEPT OF ENVIRONMENTAL PROGRAMS
ATTN: JOHN GALL SUITE 300
777 NORTH CAPITOL ST
WASHINGTON DC 20002-4201

MR KENNETH LADEN
CHIEF ENVIRONMENTAL POLICY DIVISION
OFFICE OF POLICY AND PLANNING DPW
2000 14TH ST NW 7TH FLOOR
WASHINGTON DC 20009

MS ELLIE IRONS
ENVIRONMENTAL PROGRAM PLANNER
OFFICE ENVIRONMENTAL IMPACT REVIEW
VIRGINIA DEPT OF ENVIRONMENTAL
QUALITY
629 EAST MAIN ST
RICHMOND VA 23219

MONTGOMERY COUNTY PLANNING BOARD
ATTN: WILLIAM HUSSMAN HAIRMAN
8787 GEORGIA AVE
SILVER SPRING MD 20910

THE MARYLAND NATIONAL PLANNING
BOARD
PARK AND PLANNING COMMISSION
ATTN: RON BURNS SUPERVISOR
TRANSPORTATION AND PUBLIC FACILITIES
8787 GEORGIA AVE
SILVER SPRING MD 20910-3760

THE MARYLAND NATIONAL CAPITAL PARK
AND PLANNING COMMISSION
ATTN: TOM ROBERTSON SR PLANNER
8787 GEORGIA AVE
SILVER SPRING MD 20910-3760

THE MARYLAND NATIONAL CAPITAL
PARKS AND PLANNING COMMISSION
ATTN: SWAM AYYA TRANSPORTATION PLANNING
8787 GEORGIA AVE
SILVER SPRING MD 20910-3760

THE MARYLAND NATIONAL CAPITAL PARK
AND PLANNING COMMISSION
ATTN: MARGARET KAI ZIEGLER TRANSPORTATION PLANNING
8787 GEORGIA AVE
SILVER SPRING MD 20910-3760

MR MICHAEL DUBINSKY CHAIRMAN
FOUR CORNERS MASTER PLAN
CITIZENS ADVISORY COMMITTEE
511 FOREST GLEN RD
SILVER SPRING MD 20901

MS JUSTINA FERBER LEGISLATIVE ANALYST
MONTGOMERY COUNTY COUNCIL OFFICE
COUNCIL OFFICE BUILDING
100 MARYLAND AVE 5TH FLOOR
ROCKVILLE MD 20850

MS SUZANNE BIGELOW
MR ANDREW BIGELOW
QUARTERS C
10901 NEW HAMPSHIRE AVE
SILVER SPRING MD 20903-5640

FREE PRESS
ATTN: MR JIM JOYNER
615 MAIN STREET
LAUREL MD 20707

S GLASER
9611 COTTRELL TERRACE
SILVER SPRING MD 20903

SILVER SPRING GOVERNMENT CENTER
8818 GEORGIA AVENUE
SILVER SPRING MD 20910

MONTGOMERY CO CHIEF ADMINISTRATIVE
OFFICER
ATTN: GENE LYNCH
EXECUTIVE OFFICE BLDG 2ND FLOOR
101 MONROE ST
ROCKVILLE MD 20850

MONTGOMERY CO BOARD OF EDUCATION
ATTN: PAUL L VANCE
850 HUNGERFORD DR
ROCKVILLE MD 20850

MONTGOMERY COUNTY ECON DEVEL
OFFICE
ATTN: JON GERSON DIRECTOR
EXECUTIVE OFFICE BUILDING SUITE 1500
101 MONROE ST
ROCKVILLE MD 20850

MONTGOMERY CO ENVIRONMENTAL
PROTECTION DEPT
ATTN: EDWARD GRAHAM DIRECTOR
EXECUTIVE OFFICE BUILDING SUITE 1500
101 MONROE ST
ROCKVILLE MD 20850

US ENVIRONMENTAL PROTECTION AGENCY
REGION III ATTN: DIANA ESHER
841 CHESTNUT STREET BUILDING
PHILADELPHIA PA 19107-4431

US DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
ATTN: ROBERT J KLUNKE
339 BUSCHES FRONTAGE ROAD
ANNAPOLIS MD 21401

US DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT CORPS OF
ENGINEERS
ATTN: LARRY J LOWER ENVIRONMENTAL RESOURCES BRANCH
P O BOX 1715
BALTIMORE MD 21203-1715

MR WILLIAM E HANNA JR
VICE PRESIDENT MONTGOMERY COUNTY
COUNCIL
COUNCIL OFFICE BUILDING 5TH FLOOR
100 MARYLAND AVE
ROCKVILLE MD 20850

MS BETTY ANN KRAHNKE
MONTGOMERY COUNTY COUNCIL
COUNCIL OFFICE BUILDING 5TH FLOOR
100 MARYLAND AVE
ROCKVILLE MD 20850

HONORABLE PETER FRANCHOT
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE HENRY B HELLER
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE JOHN ADAMS HURSON
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE ROBERT H KITTLEMAN
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE CAROL S PETZOLD
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE LEONARD H TEITELBAUM
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE CHRISTOPHER VAN HOLLEN JR
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

MS. MARILYN J PREISNER PRESIDENT
MONTGOMERY COUNTY COUNCIL
COUNCIL OFFICE BUILDING 5TH FLOOR
100 MARYLAND AVE
ROCKVILLE MD 20850

HONORABLE CHRISTOPHER J MCCABE
MARYLAND GENERAL ASSEMBLY
SENATE
JAMES SENATE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE IDA G RUBEN
MARYLAND GENERAL ASSEMBLY
SENATE
JAMES SENATE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE PATRICIA R SHER
MARYLAND GENERAL ASSEMBLY
SENATE
JAMES SENATE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE LEON G BILLINGS
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE DANNA LEE DEMBROW
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE SHEILA ELLIS HIXSON
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE ROBERT L FLANAGAN
MARYLAND GENERAL ASSEMBLY
HOUSE OF DELEGATES
HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

HONORABLE PAUL S SARBANES
UNITED STATES SENATE
WASHINGTON DC 20510-2005

HONORABLE STENY H HOYER
UNITED STATES HOUSE OF
REPRESENTATIVES
WASHINGTON DC 20515-2004

HONORABLE ALBERT R WYNN
UNITED STATES HOUSE OF
REPRESENTATIVES
WASHINGTON DC 20525-2004

HONORABLE PARRIS N GLENDENING
THE GOVERNOR OF MARYLAND
STATE HOUSE
100 STATE CIRCLE
ANNAPOLIS MD 21401

U S DEPARTMENT OF THE INTERIOR
USFWS CHESAPEAKE BAY FIELD OFFICE
ATTN: MR JOHN WOLFLIN
177 ADMIRAL COCHRANE DR
ANNAPOLIS MD 21401

MR ROBERT MERRYMAN
MONTGOMERY COUNTY DEPT OF THE
ENVIRONMENT
EXECUTIVE OFFICE BUILDING
100 MONROE ST
ROCKVILLE MD 20850

MS SUSAN MUNCY
MONTGOMERY CO DEPARTMENT OF
HEALTH
SUITE 240
100 MONROE ST
ROCKVILLE MD 20850

MS PATRICIA EHRLICH
PALISADES CITIZENS ASSOCIATION
9128 EAGLE RIDGE DR
BETHESDA MD 20817

MR DON PAFFARD
950 BEMAN WOODS WAY
POTOMAC MD 20854

MS ELLIE PISSARA
10121 RIVER ROAD
POTOMAC MD 20854

MR NEAL FITZPATRICK
AUDOBON NATURALIST SOCIETY
8940 JONES MILL RD
CHEVY CHASE MD 20815

THE HONORABLE JEAN M ROESSER
DELEGATE FOR THE STATE OF MARYLAND
ROOM 308 LOWE HOUSE OFFICE BUILDING
ANNAPOLIS MD 20401

THE HONORABLE MARK L SHRIVER
DELEGATE FOR THE STATE OF MARYLAND
ROOM 224 LOWE HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

THE HONORABLE RICHARD LA VAY
DELEGATE FOR THE STATE OF MARYLAND
ROOM 405 LOWE HOUSE OFFICE BUILDING
ANNAPOLIS MD 21401

THE HONORABLE JEAN B CRYOR
DELEGATE FOR THE STATE OF MARYLAND
ROOM 219 LOWER HOUSE OFFICE
BUILDING
ANNAPOLIS MD 21401

THE HONORABLE PAUL S SARBANES
SENATOR FROM THE STATE OF MARYLAND
309 HART SENATE OFFICE BUILDING
WASHINGTON DC 20510

THE HONORABLE BARBARA A MIKULSKI
SENATOR FROM THE STATE OF MARYLAND
709 HART SENATE OFFICE BUILDING
WASHINGTON DC 20510

THE HONORABLE ALBERT D WYNN
REPRESENTATIVE FROM THE STATE OF MARYLAND
418 CANNON HOUSE BUILDING
WASHINGTON DC 20515

THE HONORABLE CONSTANCE A MORELLA
REPRESENTATIVE FROM THE STATE OF MARYLAND
106 CANNON HOUSE BUILDING
WASHINGTON DC 20515

MS GAIL EWING
COUNTY COUNCIL PRESIDENT
100 MARYLAND AVE
ROCKVILLE MD 20850

U S DEPARTMENT OF THE INTERIOR
USFWS CHESAPEAKE BAY FIELD OFFICE
ATTN: JONATHAN DEASON, DIRECTOR
177 ADMIRAL COCHRAN DR
ANNAPOLIS MD 21401

U S DEPARTMENT OF THE INTERIOR
USFWS CHESAPEAKE BAY FIELD OFFICE
ATTN: MR JOHN WOLFLIN
177 ADMIRAL COCHRANE DR
ANNAPOLIS MD 21401

MR DOUGLAS M DUNCAN
COUNTY EXECUTIVE'S OFFICE
101 MONROE ST
ROCKVILLE MD 20859

THE JOURNAL NEWSPAPERS
2 RESEARCH COURT
ROCKVILLE MD 20850

U S DEPARTMENT OF THE INTERIOR
USFWS CHESAPEAKE BAY FIELD OFFICE
ATTN: JONATHAN DEASON, DIRECTOR
177 ADMIRAL COCHRAN DR
ANNAPOLIS MD 21401

MR LEE EWING
9141 VENDOME DRIVE
BETHESDA MD 20084

DR JON PAN
9201 VENDOME DRIVE
BETHESDA MD 20084
DR DAVID ALKON
6701 BONAVENTURE COURT
BETHESDA MD 20084

MR DAVID WOLFE
9133 VENDOME DRIVE
BETHESDA MD 20084

DR SCOTT SPEAR
9400 EAGLE RIDGE DRIVE
BETHESDA MD 20084

MR STEVE CHANEIDES
6704 BONAVENTURE COURT
BETHESDA MD 20854

MS SUZANNE NELSON
6700 BONAVENTURE COURT
BETHESDA MD 20084

8.0 SOURCES CITED

An Archeological Survey of the David W. Taylor Naval Ship Research and Development Center, Carderock and Annapolis, Maryland. By Marcia Weinland and Carmen A. Weber. March 1984.

Comprehensive Environmental Response Plan for the NSWC, Carderock Division, Carderock Site, Bethesda, Maryland. By Environmental Resources Management, Inc. September 1995.

David Taylor Research Center, Carderock Laboratory, Master Plan Update. By Woolpert Consultants and Rhodeside & Harwell, Inc. 28 Apr 1989.

Environmental Assessment for Base Realignment of Carderock Division, Naval Surface Warfare Center, Bethesda, Maryland. Chesapeake Division, Naval Facilities Engineering Command, Washington, DC. September 1992.

Hannold, Elizabeth. Letter to James H. Jatko, P.E. August 31, 1995.

Maryland-National Capital Park & Planning Commission, Approved & Adopted Master Plan for the Potomac Subregion, Appendix containing all Amendments through February 1989. Silver Spring, MD: March 1989.

U. S. Federal Register, November 30, 1993.

USDN, NSWCDD US Navy Radioactive Materials Permit. October 21, 1994.

APPENDICES

- Appendix A Rare, Threatened, and Endangered Plants of Maryland
- Appendix B Rare, Threatened, and Endangered Animals of Maryland
- Appendix C Applicability Analysis for BRAC 1995 Relocations to NSWCCD
- Appendix D Record of Non-applicability for New Air Sources at Naval Surface Warfare Center, Carderock Division (NSWCCD)
- Appendix E Memorandum of Agreement for the Transonic Wind Tunnel Complex

Appendix A

Rare, Threatened, and Endangered Plants of Maryland

RARE, THREATENED, AND ENDANGERED PLANTS OF MARYLAND

November 1, 1994

Prepared by

Maryland Natural Heritage Program
Department of Natural Resources
Tawes State Office Building
Annapolis, MD 21401
(410) 974-2870

INTRODUCTION

The following report identifies those native Maryland plants that are among the rarest and most in need of conservation efforts as elements of our State's natural diversity. It includes species occurring in Maryland that are listed or candidates for listing on the Federal list of Endangered and Threatened Wildlife and Plants, species currently on the State's Threatened and Endangered Species List, and additional species that are considered rare by the Maryland Natural Heritage Program. The purpose of this report is to inform the public of which species are rare, to provide an indication of their degree of rarity, to solicit additional information on the status and distribution of these species, and to promote an interest in their protection.

Compiled by the Natural Heritage Program staff, this list of rare species is a result of 15 years of data gathering from numerous sources, such as herbaria and private collections, scientific literature, unpublished documents, reports from botanists and amateur naturalists, and from field work conducted by Natural Heritage Program ecologists. 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 distribution and status of Maryland's rare species known at that time.

Since 1984, our knowledge of Maryland's flora has grown steadily. Through extensive field work, Natural Heritage Program biologists and other researchers have located species which were previously unrecorded for the State and have discovered that some species are more scarce than previously known. Similarly, some species are now known to be either more widespread or less vulnerable to ecological disturbances than previously believed. Thus, the list and status of each species is periodically revised to keep pace with new information.

The official State Threatened and Endangered Species List is part of the State Threatened and Endangered Species regulations (COMAR 08.03.08). 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.

ABOUT THIS LIST

The Maryland Natural Heritage Program's list of rare, threatened, and endangered plants is arranged alphabetically by scientific name. Four columns are printed to the right of each name. The global and state rarity ranks of each species are included in the first and second columns,

respectively. The third column indicates the Federal status of each species as determined by the U.S. Fish and Wildlife Service. The last column shows the species' status on the State Threatened and Endangered Species List. Definitions for the codes used in all four columns are provided in Appendix III (see page 22). Although synonym names are included in the list as denoted by the equals sign (=), synonyms are cross referenced in Appendix I (see page 19). Species currently under consideration for inclusion on the Natural Heritage Program list appear in Appendix II (see page 21). The Natural Heritage Program seeks information on the status and location of these taxa from all interested parties.

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 booklets, Endangered and Threatened Wildlife and Plants published August 23, 1993 and Plant Taxa for Listing as Endangered or Threatened Species; Notice of Review (reprinted from the Federal Register Vol. 58, No. 188) published September 30, 1993, can be obtained from the Publication Unit, U.S. Fish and Wildlife Service, Washington, DC 20240.

To obtain additional copies of this report, 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 (exact mapped location, if possible) 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.

If you would like to provide location information for any rare species, please fill out the form on page 18 (or a copy of the page) and mail it to the Natural Heritage Program along with a location map.

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Abies balsamea</i>	Balsam fir	G5	S1		
<i>Aconitum uncinatum</i>	Blue monkshood	G4	S1		E
<i>Adlumia fungosa</i>	Climbing fumitory	G4	S2		T
<i>Aeschynomene virginica</i>	Sensitive joint-vetch	G2	S1	LT	E
<i>Agalinis acuta</i>	Sandplain gerardia	G1	S1	LE	E
<i>Agalinis auriculata</i>	Auricled gerardia	G2	S1	C2	E
= <i>Gerardia auriculata</i> , <i>Tomanthera auriculata</i>					
<i>Agalinis decemloba</i>	Blue ridge gerardia	G3G4	S1		
<i>Agalinis fasciculata</i>	Fascicled gerardia	G5	S1		E
<i>Agalinis linifolia</i>	Flax-leaved gerardia	G3G4	SU		
<i>Agalinis obtusifolia</i>	Blunt-leaved gerardia	G4	S1		E
<i>Agalinis setacea</i>	Thread-leaved gerardia	G4G5	S1		E
<i>Agalinis skinneriana</i>	Midwestern gerardia	G3	S1	C2	E
<i>Agalinis virgata</i>	Pine-barren gerardia	G3G4	SH		X
<i>Agastache scrophulariifolia</i>	Purple giant hyssop	G4	S1S2		T
<i>Agrimonia microcarpa</i>	Small-fruited agrimony	G5	S1		E
<i>Agrimonia striata</i>	Woodland agrimony	G5	S1		E
<i>Agropyron trachycaulum</i>	Rough-stemmed wheatgrass	G5T5	SH		X
= <i>Elymus trachycaulus</i> ssp. <i>trachycaulus</i>					
<i>Aletris aurea</i>	Golden colicroot	G5	SH		X
<i>Alnus maritima</i>	Seaside alder	G3	S3.1	3C	
<i>Alopecurus aequalis</i>	Short-awned foxtail	G5	SU		
<i>Alopecurus carolinianus</i>	Carolina foxtail	G5	S1		
<i>Amaranthus pumilus</i>	Seabeach amaranth	G2	SH	LT	X
<i>Amelanchier obovalis</i>	Coastal juneberry	G4G5	S1		E
<i>Amelanchier sanguinea</i>	Roundleaf serviceberry	G5	S3		
= <i>A. humilis</i>					
<i>Amelanchier spicata</i>	Running juneberry	G5	S1		T
= <i>A. stolonifera</i>					
<i>Amianthium muscitoxicum</i>	Fly-poison	G4G5	S3		
<i>Ammannia coccinea</i>	Scarlet ammannia	G5	SU		
<i>Ammannia latifolia</i>	Koehne's ammannia	G5	S2		
= <i>A. teres</i>					
<i>Ampelopsis arborea</i>	Pepper-vine	G5	SU		
<i>Ampelopsis cordata</i>	Heartleaf peppervine	G5?	SU		
<i>Amphicarpum purshii</i>	Pursh's amphicarpum	G4	S3		
<i>Amsonia tabernaemontana</i>	Blue dogbane	G5	SU		
<i>Anagallis minima</i>	Chaffweed	G5	SH		X
= <i>Centunculus minimus</i>					
<i>Anaphalis margaritacea</i>	Pearly everlasting	G5	S3		
<i>Andropogon ternarius</i>	Silvery beardgrass	G5	S3		
<i>Anemone canadensis</i>	Canada anemone	G5	SH		X
<i>Anemone lancifolia</i>		G5	S3		
<i>Anemone riparia</i>	Large white anemone	G4G5Q	SU		
<i>Angelica atropurpurea</i>	Great angelica	G5	SH		X
<i>Angelica triquinata</i>	Filmy angelica	G4	SH		X
<i>Antennaria solitaria</i>	Single-headed pussytoes	G5	S1		T
<i>Apocynum sibiricum</i>	Clasping-leaved dogbane	G?	SH		X
<i>Arabis glabra</i>	Tower mustard	G5	SU		
<i>Arabis hirsuta</i>	Hairy rockcress	G5	SU		
<i>Arabis missouriensis</i>	Missouri rockcress	G5	S1		E
<i>Arabis patens</i>	Spreading rockcress	G3G4	S3		
<i>Arabis shortii</i>	Short's rockcress	G5	S1		E
= <i>A. perstellata</i> var <i>shortii</i>					
<i>Aralia hispida</i>	Bristly sarsaparilla	G5	S1		E
<i>Arethusa bulbosa</i>	Arethusa	G4	SH		X
<i>Arisaema dracontium</i>	Green dragon	G5	S3		
<i>Aristida curtissii</i>	Curtiss' three-awn	G4G5	SU		
= <i>A. dichotoma</i> var <i>curtissii</i>					
<i>Aristida lanosa</i>	Woolly three-awn	G5	S1		E
<i>Aristida tuberculosa</i>	Sea-beach three-awn	G5	S1		
<i>Aristida virgata</i>	Wire grass	G4G5	S1		E
<i>Aristolochia macrophylla</i>	Pipevine	G5	S1		T
= <i>A. durior</i>					
<i>Aristolochia serpentaria</i>	Virginia snakeroot	G5	S3		
<i>Armoracia lacustris</i>	Lake cress	G4?	S1	3C	E
= <i>A. aquatica</i>					
<i>Arnica acaulis</i>	Leopard's-bane	G5	S1		E
<i>Aronia prunifolia</i>	Purple chokeberry	G4G5	S3		
= <i>Pyrus floribunda</i>					
<i>Arundinaria gigantea</i>	Giant cane	G5	S1		T
<i>Asclepias lanceolata</i>	Smooth orange milkweed	G5	S3		
<i>Asclepias purpurascens</i>	Purple milkweed	G4G5	S3		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Asclepias rubra</i>	Red milkweed	G4G5	S1		E
<i>Asclepias verticillata</i>	Whorled milkweed	G5	S3		
<i>Asplenium bradleyi</i>	Bradley's spleenwort	G3	SH		X
<i>Asplenium pinnatifidum</i>	Lobed spleenwort	G4	S1		E
<i>Asplenium resiliens</i>	Black-stem spleenwort	G5	S1		E
<i>Asplenium ruta-muraria</i> = <i>A. cryptolepis</i>	Wall-rue	G5	S3		
<i>Aster concinnus</i> = <i>A. steeleorum</i>	Steele's aster	G?Q	SH		X
<i>Aster concolor</i>	Silvery aster	G4?	SH		X
<i>Aster depauperatus</i>	Serpentine aster	G2Q	S1	C2	E
<i>Aster drummondii</i>	Drummond aster	G5Q	S1		
<i>Aster infirmus</i>	Cornel-leaf aster	G5	S3		
<i>Aster lowrieanus</i>	Lowrie's aster	G3G5Q	S3		
<i>Aster nemoralis</i>	Bog aster	G5	S1		
<i>Aster praealtus</i>	Willow aster	G5	S1		
<i>Aster radula</i>	Rough-leaved aster	G5	S1		E
<i>Aster sagittifolius</i>	Arrow-leaved aster	G?Q	SU		
<i>Aster shortii</i>	Short's aster	G4G5	S3		
<i>Aster spectabilis</i>	Showy aster	G5	S1		E
<i>Astragalus canadensis</i>	Canada milkvetch	G5	S1		E
<i>Astragalus distortus</i>	Bent milkvetch	G5	S2		T
<i>Atriplex arenaria</i>	Sea-beach orach	G5	S3		
<i>Aureolaria flava</i>	Smooth false foxglove	G5	S3		
<i>Aureolaria laevigata</i> = <i>Gerardia laevigata</i>	Downy yellow foxglove	G5	S3		
<i>Axonopus furcatus</i>	Big carpet grass	G5	SH		X
<i>Azolla caroliniana</i>	Mosquito fern	G5	S1		
<i>Bacopa innominata</i> includes <i>B. stragula</i>	Mat-forming water-hyssop	G5	SH		X
<i>Bacopa monnieri</i>	Coastal water-hyssop	G5?	SU		
<i>Baptisia australis</i>	Wild false indigo	G5	S2		T
<i>Bartonia paniculata</i>	Twining bartonia	G5	S3		
<i>Berberis canadensis</i>	American barberry	G3G4	SH		X
<i>Betula populifolia</i>	Gray birch	G5	SU		
<i>Bidens bidentoides</i> var. <i>mariana</i>	Maryland bur-marigold	G3T2	S3.1	C2	
<i>Bidens coronata</i>	Tickseed sunflower	G5	S2S3		
<i>Bidens discoidea</i>	Swamp beggar-ticks	G5	S2S3		
<i>Bidens mitis</i>	Small-fruited beggar-ticks	G3G4	S1		E
<i>Blephilia ciliata</i>	Downy woodmint	G5	S3		
<i>Blephilia hirsuta</i>	Hairy woodmint	G4?	S2		
<i>Boltonia asteroides</i>	Aster-like boltonia	G5	S1		E
<i>Borrichia frutescens</i>	Sea ox-eye	G5	SH		X
<i>Botrychium lanceolatum</i>	Triangle grape-fern	G5	SH		X
<i>Botrychium matricariifolium</i>	Matricary grape-fern	G5	S3		
<i>Botrychium multifidum</i>	Leathery grape-fern	G5	SH		X
<i>Botrychium oneidense</i> = <i>B. dissectum</i> forma <i>oneidense</i>	Blunt-lobe grape-fern	G3?	S1		E
<i>Botrychium simplex</i>	Small grape-fern	G5	SH		X
<i>Bouteloua curtipendula</i>	Side-oats grama	G5	S2		
<i>Bromus ciliatus</i>	Fringed brome	G5	SH		X
<i>Bromus kalmii</i>	Wild chess	G5	S1		E
<i>Bromus latiglumis</i>	Broad-glumed brome	G5	S1		E
<i>Bromus nottowayanus</i>	Nottoway's brome	G3?Q	SH		X
<i>Buchnera americana</i>	Blue-hearts	G3G4	SH		X
<i>Cacalia muehlenbergii</i>	Great indian-plantain	G3G4	SH		X
<i>Calamagrostis canadensis</i>	Blue-joint grass	G5	S3		
<i>Calamagrostis porteri</i>	Porter's reedgrass	G4	S1	3C	E
<i>Calla palustris</i>	Wild calla	G5	S1		E
<i>Callicarpa americana</i>	French mulberry	G5	SX		X
<i>Callitriche verna</i> = <i>C. palustris</i>	Vernal water starwort	G5	S3		
<i>Calopogon tuberosus</i> = <i>C. pulchellus</i>	Grass-pink	G5	S1		E
<i>Calystegia spithamea</i> = <i>Convolvulus spithameus</i>	Low bindweed	G4G5	S2		
<i>Campanula divaricata</i>	Southern harebell	G4	SH		X
<i>Campanula rotundifolia</i>	Harebell	G5	S2		
<i>Cardamine douglassii</i>	Purple cress	G5	S3		
<i>Cardamine longii</i>	Long's bittercress	G3G4Q	S1	3C	E
<i>Cardamine parviflora</i>	Small-flowered bittercress	G5	S3		
<i>Cardamine pratensis</i>	Cuckooflower	G5	S1		
<i>Cardamine rotundifolia</i>	Mountain watercress	G4	S3		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Carex aestivalis</i>	Summer sedge	G4	S1		E
<i>Carex aggregata</i>	Glomerate sedge	G5	SH		X
<i>Carex albursina</i>	A sedge	G5	S3		
<i>Carex arenaria</i>	Sand sedge	G?NE	SU		
<i>Carex argyrantha</i>	Hay sedge	G5	S3		
<i>Carex atlantica</i>	Eastern sedge	G5	S3		
<i>Carex barrattii</i>	Barratt's sedge	G4	S2	3C	T
<i>Carex brevior</i>	A sedge	G5?	S1		
<i>Carex bromoides</i>	Brome-like sedge	G5	S3		
<i>Carex brunnescens</i>	Brownish sedge	G5	S3		
<i>Carex bullata</i>	Button sedge	G5	S1		T
<i>Carex bushii</i>	Bush's sedge	G4	S3		
<i>Carex buxbaumii</i>	Buxbaum's sedge	G5	S2		T
<i>Carex canescens</i>	Silvery sedge	G5	S3		
<i>Carex careyana</i>	Carey's sedge	G5	SH		X
<i>Carex cephaloidea</i>	Thin-leaved sedge	G5	S1		
<i>Carex collinsii</i>	Collins' sedge	G4	S3		
<i>Carex complanata</i>	Flattened sedge	G5	S3		
<i>Carex conjuncta</i>	Soft fox sedge	G4G5	SH		X
<i>Carex conoidea</i>	Field sedge	G4	S1		E
<i>Carex cristatella</i>	Crested sedge	G5	S3		
<i>Carex davisii</i>	Davis' sedge	G4	SH		X
<i>Carex decomposita</i>	Cypress-knee sedge	G3G4	SH	3C	X
<i>Carex diandra</i>	Lesser panicled sedge	G5	S1		E
<i>Carex eburnea</i>	Ebony sedge	G5	S1		E
<i>Carex echinata</i>	Little prickly sedge	G5	SU		
= <i>C. cephalantha</i>					
<i>Carex emoryi</i>	Emory's sedge	G5	S1		
<i>Carex exilis</i>	Coast sedge	G5	S1		E
<i>Carex foenea</i>	Dry-spike sedge	G5	SH		X
<i>Carex gigantea</i>	Giant sedge	G4	S1		E
<i>Carex glaucescens</i>	A sedge	G4	S1		E
<i>Carex granularis</i>	Meadow sedge	G5	S3		
<i>Carex grayi</i>	Asa Gray's sedge	G4	S3		
<i>Carex hirtifolia</i>	Pubescent sedge	G5	S1		E
<i>Carex hitchcockiana</i>	Hitchcock's sedge	G5	S1		E
<i>Carex hormathodes</i>	Marsh straw sedge	G4G5	S3		
<i>Carex howei</i>	Howe's sedge	G5Q	S3		
<i>Carex hyalinolepis</i>	Shoreline sedge	G4G5	S1		T
<i>Carex hystericina</i>	Porcupine sedge	G5	S1		E
<i>Carex interior</i>	Inland sedge	G5	S3		
<i>Carex jamesii</i>	James' sedge	G5	S3		
<i>Carex joorii</i>	Cypress-swamp sedge	G4G5	S2		T
<i>Carex lacustris</i>	Lake-bank sedge	G5	S1		T
<i>Carex lanuginosa</i>	Woolly sedge	G5	S2		T
<i>Carex leavenworthii</i>	Leavenworth's sedge	G5	SH		X
<i>Carex leptalea</i>	Bristle-stalked sedge	G5	S3		
<i>Carex leptoneuria</i>	Finely-nerved sedge	G4	S1		E
<i>Carex louisianica</i>	Louisiana sedge	G5	S1		E
<i>Carex lupuliformis</i>	Hop-like sedge	G3G4Q	S3		
<i>Carex meadii</i>	Mead's sedge	G4G5	S1		
<i>Carex mesochorea</i>	Midland sedge	G4G5	S1		E
<i>Carex novae-angliae</i>	New England sedge	G4	SH		X
<i>Carex pedunculata</i>	Long-stalked sedge	G5	S1		E
<i>Carex plantaginea</i>	Plantain-leaved sedge	G5	S3		
<i>Carex polymorpha</i>	Variable sedge	G2	SH	C2	X
<i>Carex projecta</i>	Necklace sedge	G5	S2		
<i>Carex radiata</i>	Stellate sedge	G4	S1		E
<i>Carex retrorsa</i>	Retrorse sedge	G5	SU		
<i>Carex richardsonii</i>	Richardson's sedge	G4	S1		
<i>Carex rostrata</i>	Beaked sedge	G5	S2		
<i>Carex rugosperma</i>	Umbel-like sedge	G5	S2		
<i>Carex seorsa</i>	Weak stellate sedge	G4	S3		
<i>Carex shortiana</i>	Short's sedge	G5	S1		E
<i>Carex silicea</i>	Sea-beach sedge	G5	S1		E
<i>Carex straminea</i>	Straw sedge	G5	S3		
<i>Carex striatula</i>	Lined sedge	G4G5	SH		X
<i>Carex styloflexa</i>	Bent sedge	G4G5	S3		
<i>Carex tenera</i>	Slender sedge	G4G5	SH		X
<i>Carex tetanica</i>	Rigid sedge	G4G5	SH		X
= <i>C. tetanica</i> var <i>woodii</i>					
<i>Carex tosa</i>	Shaved sedge	G4G5	S1		
<i>Carex trichocarpa</i>	Hairy-fruited sedge	G4	S2		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Carex tuckermanii</i>	Tuckerman sedge	G4	S1		E
<i>Carex typhina</i>	Cat-tail sedge	G5	S1		
<i>Carex venusta</i>	Dark green sedge	G4	S1		E
<i>Carex vesicaria</i>	Inflated sedge	G5	S1		T
<i>Carex vestita</i>	Velvety sedge	G5	S1		E
<i>Carex woodii</i>	Wood's sedge	G4Q	SH		X
<i>Carya laciniosa</i>	Big shellbark hickory	G5	S1		E
<i>Carya pallida</i>	Pale hickory	G5	S3		
<i>Cassia marilandica</i>	Maryland senna	G5	S3		
= <i>Senna marilandica</i>					
<i>Castanea dentata</i>	American chestnut	G4	S2S3		
<i>Castanea pumila</i>	Chinquapin	G5	S3		
<i>Castilleja coccinea</i>	Indian paintbrush	G5	S1		E
<i>Celtis laevigata</i>	Sugarberry	G5	SU		
<i>Centella erecta</i>	Coinleaf	G5	S1		E
<i>Centrosema virginianum</i>	Spurred butterfly-pea	G5	S2		
<i>Ceratophyllum muricatum</i>	Prickly hornwort	G4G5	S1		E
= <i>C. echinatum</i>					
<i>Chaerophyllum tainturieri</i>		G5	SU		
<i>Chamaecrista fasciculata</i> var <i>macrocarpa</i>	Marsh wild senna	G5T2Q	S1	C2	E
= <i>Cassia fasciculata</i> var <i>macrocarpa</i>					
<i>Chamaecyparis thyoides</i>	Atlantic white cedar	G4	S3		
<i>Chamaedaphne calyculata</i>	Leatherleaf	G5	S1		T
<i>Chamaelirium luteum</i>	Devil's-bit	G5	S3		
<i>Chamaesyce vermiculata</i>	Hairy spurge	G5	SU		
= <i>Euphorbia vermiculata</i>					
<i>Chelone obliqua</i>	Red turtlehead	G4	S1		T
<i>Chenopodium gigantospermum</i>	Maple-leaved goosefoot	G4G5	S1		E
= <i>C. hybridum</i> var <i>gigantospermum</i>					
<i>Chenopodium leptophyllum</i>	Narrow-leaved goosefoot	G5	S1		
<i>Chenopodium standleyanum</i>	Standley's goosefoot	G5	S1		E
= <i>C. hybridum</i> var <i>standleyanum</i>					
<i>Chrysogonum virginianum</i>	Golden-knees	G5	S3		
<i>Cicuta bulbifera</i>	Bulb-bearing water hemlock	G5	S1		E
<i>Cimicifuga americana</i>	American bugbane	G5	S2		
<i>Cinna latifolia</i>	Slender wood reedgrass	G5	S2		T
<i>Cirsium horridulum</i>	Yellow thistle	G5	S3		
<i>Cirsium muticum</i>	Swamp thistle	G5	S3		
<i>Cladium mariscoides</i>	Twigrush	G5	S3		
<i>Claytonia caroliniana</i>	Carolina spring-beauty	G5	S3		
<i>Cleistes divaricata</i>	Spreading pogonia	G4	S1		E
<i>Clematis occidentalis</i>	Purple clematis	G5	S1		E
= <i>C. verticillaris</i>					
<i>Clematis ochroleuca</i>	Curly-heads	G4	SH		X
<i>Clematis viorna</i>	Leatherflower	G5	S3		
<i>Clintonia alleghaniensis</i>	Harned's swamp clintonia	G1Q	S1		
<i>Clintonia borealis</i>	Yellow clintonia	G5	S2		T
<i>Coeloglossum viride</i>	Long-bracted orchis	G5	S1		E
= <i>Habenaria viridis</i> var <i>bracteata</i>					
<i>Coelorachis rugosa</i>	Wrinkled jointgrass	G5	S1		E
= <i>Manisuris rugosa</i>					
<i>Commelina erecta</i>	Slender dayflower	G5	S3		
<i>Commelina virginica</i>	Virginia dayflower	G5	S3		
<i>Coptis trifolia</i>	Goldthread	G5	S1		E
= <i>C. groenlandica</i>					
<i>Corallorrhiza trifida</i>	Early coralroot	G5	S1		E
<i>Corallorrhiza wisteriana</i>	Wister's coralroot	G5	S1		E
<i>Coreopsis rosea</i>	Rose coreopsis	G3	S1		E
<i>Coreopsis tripteris</i>	Tall tickseed	G5	S1		E
<i>Coreopsis verticillata</i>	Whorled coreopsis	G5	S3		
<i>Cornus canadensis</i>	Bunchberry	G5	S1		E
<i>Cornus rugosa</i>	Round-leaved dogwood	G5	S1		E
<i>Corydalis aurea</i>	Golden corydalis	G5	SU		
<i>Corydalis sempervirens</i>	Pale corydalis	G4G5	S3		
<i>Corylus cornuta</i>	Beaked hazelwood	G5	S3		
<i>Crassula aquatica</i>	Pygmyweed	G5	SH		X
= <i>Tillaea aquatica</i>					
<i>Crotalaria rotundifolia</i>	Rabbit-bells	G5	S1		E
<i>Croton capitatus</i>	Hogwort	G5	SU		
<i>Croton monanthogynus</i>	Prairie-tea	G5	SU		
<i>Crotonopsis elliptica</i>	Rushfoil	G5	S3		
<i>Cuscuta campestris</i>	Field dodder	G5	S3		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Cuscuta coryli</i>	Hazel dodder	G5	SH		X
<i>Cuscuta indecora</i>	Pretty dodder	G5	S1		
<i>Cuscuta pentagona</i>	Five-angled dodder	G5	S3		
<i>Cuscuta polygonorum</i>	Smartweed dodder	G5	S1		E
<i>Cuscuta rostrata</i>	Beaked dodder	G4	S1		E
<i>Cymophyllus fraserianus</i> = <i>C. fraseri</i>	Fraser's sedge	G4	S1	3C	E
<i>Cynanchum laeve</i> = <i>Ampelamus albidus</i>	Honeyvine	G5	S3		
<i>Cyperus aristatus</i> = <i>C. inflexus</i>	Awed cyperus	G5	S3		
<i>Cyperus dentatus</i>	Toothed sedge	G4	SH		X
<i>Cyperus diandrus</i>	Low cyperus	G5	S3		
<i>Cyperus erythrorhizos</i>	Red-rooted cyperus	G5	S3		
<i>Cyperus grayi</i>	Asa Gray's cyperus	G5	S3		
<i>Cyperus houghtonii</i>	Houghton's umbrella-sedge	G3G4	S1SR		
<i>Cyperus lancastriensis</i>	Lancaster's sedge	G5	S3		
<i>Cyperus plukenetii</i>	Plukenet's cyperus	G5	SH		X
<i>Cyperus refractus</i>	Reflexed cyperus	G5	SU		
<i>Cyperus retrofractus</i>	Rough cyperus	G5	S2		
<i>Cypripedium candidum</i>	Small white lady's slipper	G4	S1	3C	E
<i>Cypripedium reginae</i>	Showy lady's slipper	G4	SH		X
<i>Cystopteris bulbifera</i>	Bulblet fern	G5	S3		
<i>Cystopteris tennesseensis</i>	Tennessee bladder-fern	G5	S1		
<i>Delphinium exaltatum</i>	Tall larkspur	G3	S1	C2	E
<i>Delphinium tricornes</i>	Dwarf larkspur	G5	S3		
<i>Deschampsia cespitosa</i>	Tufted hairgrass	G5	S1		E
<i>Desmodium canadense</i>	Showy tick-trefoil	G5	S3		
<i>Desmodium cuspidatum</i>	Large-bracted tick-trefoil	G5	S3		
<i>Desmodium glutinosum</i>	Pointed-leaved tick-trefoil	G5	S3		
<i>Desmodium humifusum</i>	Trailing tick-trefoil	G1G2Q	SH	C2	X
<i>Desmodium laevigatum</i>	Smooth tick-trefoil	G5	S1		E
<i>Desmodium lineatum</i>	Linear-leaved tick-trefoil	G5	S1		E
<i>Desmodium nuttallii</i>	Nuttall's tick-trefoil	G5	S3		
<i>Desmodium ochroleucum</i>	Cream-flowered tick-trefoil	G2G3	S1		E
<i>Desmodium pauciflorum</i>	Few-flowered tick-trefoil	G5	S1		E
<i>Desmodium rigidum</i>	Rigid tick-trefoil	G?	S1		E
<i>Desmodium sessilifolium</i>	Sessile-leaved tick-trefoil	G5	SH		X
<i>Desmodium strictum</i>	Stiff tick-trefoil	G4	S1		E
<i>Desmodium viridiflorum</i>	Velvety tick-trefoil	G5?	S1S2		
<i>Diarrhena americana</i>	Twin oats	G5	S1		E
<i>Dicentra eximia</i>	Wild bleeding-heart	G4	S2		T
<i>Digitaria villosa</i> = <i>D. filiformis</i> var <i>villosa</i>	Shaggy crabgrass	G5	SH		X
<i>Dioscorea hirticaulis</i>	Wild yam	G5T2T3Q	SU		
<i>Diplazium pycnocarpon</i> = <i>Athyrium pycnocarpon</i>	Glade fern	G5	S1		T
<i>Dirca palustris</i>	Leatherwood	G4	S2		T
<i>Dodecatheon meadia</i>	Shooting-star	G5	S3		
<i>Drosera capillaris</i>	Pink sundew	G5	S1		E
<i>Drosera rotundifolia</i>	Round-leaved sundew	G5	S3		
<i>Dryopteris campyloptera</i> = <i>D. spinulosa</i> var <i>americana</i>	Mountain wood-fern	G5	S1		E
<i>Dryopteris celsa</i>	Log fern	G4	S3.1		T
<i>Dryopteris clintoniana</i> = <i>D. cristata</i> var <i>clintoniana</i>	Clinton's wood-fern	G5Q	S3		
<i>Dryopteris goldiana</i>	Goldie's wood-fern	G4	S3		
<i>Echinodorus cordifolius</i>	Upright burhead	G5	S1		E
<i>Elatine americana</i>	American waterwort	G4	S1S2		E
<i>Elatine minima</i>	Small waterwort	G5	S1		E
<i>Eleocharis albida</i>	White spikerush	G4G5	S1		E
<i>Eleocharis compressa</i>	Flattened spikerush	G4	S1		E
<i>Eleocharis engelmannii</i>	Engelmann's spikerush	G5	S3		
<i>Eleocharis equisetoides</i>	Knotted spikerush	G4	S1		E
<i>Eleocharis erythropoda</i> = <i>E. calva</i>	Bald spikerush	G5	S3		
<i>Eleocharis fallax</i> = <i>E. ambigua</i>	Creeping spikerush	G4G5	S3		
<i>Eleocharis flavescens</i>	Pale spikerush	G5	S1		
<i>Eleocharis geniculata</i>	Capitate spikerush	G5	SU		
<i>Eleocharis halophila</i>	Salt-marsh spikerush	G4	SH		X
<i>Eleocharis intermedia</i>	Matted spikerush	G5	S1		E
<i>Eleocharis melanocarpa</i>	Black-fruited spikerush	G4	S1		E

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Eleocharis microcarpa</i>	Torrey's spikerush	G5	S3		
<i>Eleocharis olivacea</i>	Green spikerush	G5	S3		
<i>Eleocharis robbinsii</i>	Robbins' spikerush	G4G5	S1		E
<i>Eleocharis rostellata</i>	Beaked spikerush	G5	S1		T
<i>Eleocharis tortilis</i>	Twisted spikerush	G5	S2		
<i>Eleocharis tricostata</i>	Three-ribbed spikerush	G4	SH		X
<i>Elephantopus tomentosus</i>	Tobacco-weed	G5	SH		X
<i>Ellisia nyctelea</i>	Nyctelea	G5	S3		
<i>Epilobium ciliatum</i>	Northern willowherb	G5	S1		E
= <i>E. glandulosum</i> var <i>adenocaulon</i>					
<i>Epilobium leptophyllum</i>	Linear-leaved willowherb	G5	S1		
<i>Epilobium strictum</i>	Downy willowherb	G5?	S1		E
<i>Equisetum fluviatile</i>	Water horsetail	G5	S1		E
<i>Equisetum sylvaticum</i>	Wood horsetail	G5	S1		E
<i>Eragrostis hirsuta</i>	Big-topped lovegrass	G5	S1S2		
<i>Eragrostis refracta</i>	Meadow lovegrass	G5	S1		T
<i>Erianthus alopecuroides</i>	Woolly beardgrass	G5	S1		
<i>Erianthus brevibarbis</i>	Short-bearded plumegrass	G3G5	S1		E
= <i>E. coarctatus</i> , <i>Saccharum brevibarbe</i>					
<i>Erianthus contortus</i>	Bent-awn plumegrass	G5	S1		E
<i>Erigenia bulbosa</i>	Harbinger-of-spring	G5	S3		
<i>Erigeron pulchellus</i> var <i>brauniae</i>	Lucy Braun's robin plantain	G5.TU	SU		
<i>Eriocaulon aquaticum</i>	Seven-angled pipewort	G5	SH		X
= <i>E. septangulare</i>					
<i>Eriocaulon compressum</i>	Flattened pipewort	G5	S2		
<i>Eriocaulon decangulare</i>	Ten-angled pipewort	G5	S2		
<i>Eriocaulon parkeri</i>	Parker's pipewort	G3	S2	3C	T
<i>Eriophorum virginicum</i>	Tawny cottongrass	G5	S3		
<i>Eryngium yuccifolium</i>	Tall rattlesnake master	G5	SH		X
<i>Erythronium albidum</i>	White trout lily	G5	S2		T
<i>Eupatorium altissimum</i>	Tall boneset	G5	S3		
<i>Eupatorium leucolepis</i>	White-bracted boneset	G5	S1SH		E
<i>Eupatorium maculatum</i>	Spotted Joe-pye-weed	G5	SH		X
= <i>Eupatoriadelphus maculatus</i>					
<i>Euphorbia obtusata</i>	Blunt-leaved spurge	G5	S1		E
<i>Euphorbia purpurea</i>	Darlington's spurge	G3	S1	C2	E
<i>Euphorbia zinniiflora</i>	Flowering spurge	G5	SU		
<i>Festuca paradoxa</i>	Cluster fescue	G5	SH		X
<i>Filipendula rubra</i>	Queen-of-the-prairie	G4G5	S1		E
<i>Fimbristylis annua</i>	Baldwin's fimbriatylis	G5	S3		
= <i>F. baldwiniana</i>					
<i>Fimbristylis perpusilla</i>	Harper's fimbriatylis	G2	S2	C2	E
<i>Fimbristylis puberula</i>	Hairy fimbriatylis	G5	SU		
= <i>F. caroliniana</i>					
<i>Fraxinus nigra</i>	Black ash	G5	S3		
<i>Fraxinus profunda</i>	Pumpkin ash	G4G5	S2S3		
= <i>F. tomentosa</i>					
<i>Fuirena pumila</i>	Smooth fuirena	G4	S1		E
<i>Galactia volubilis</i>	Downy milk pea	G5	S1		E
<i>Galax aphylla</i>	Galax	G4G5	SU		
<i>Galium boreale</i>	Northern bedstraw	G5	S1		E
<i>Galium concinnum</i>	Shining bedstraw	G5	S3		
<i>Galium hispidulum</i>	Coast bedstraw	G5	S1		E
<i>Galium latifolium</i>	Purple bedstraw	G5	S3		
<i>Galium palustre</i>	Marsh bedstraw	G5NE	SU		
<i>Galium trifidum</i>	Small bedstraw	G5	SU		
<i>Gaultheria hispidula</i>	Creeping snowberry	G5	S1		E
<i>Gaylussacia brachycera</i>	Box huckleberry	G3	S1	3C	E
<i>Gentiana andrewsii</i>	Fringe-tip closed gentian	G4	S2		T
<i>Gentiana catesbaei</i>	Catesby's gentian	G5	S3		
<i>Gentiana linearis</i>	Narrow-leaved gentian	G4G5	S3		
<i>Gentiana puberulenta</i>	Downy gentian	G4G5	SH		X
= <i>G. puberula</i>					
<i>Gentiana villosa</i>	Striped gentian	G4	S1		E
<i>Gentianella quinquefolia</i>	Stiff gentian	G5	S1		E
= <i>Gentiana quinquefolia</i>					
<i>Gentianopsis crinita</i>	Fringed gentian	G4	S1		E
= <i>Gentiana crinita</i>					
<i>Geranium robertianum</i>	Herb-robert	G5	S1		E
<i>Geum aleppicum</i>	Yellow avens	G5	S1		E
<i>Geum laciniatum</i>	Rough avens	G5	S3		
<i>Geum vernum</i>	Spring avens	G5	S3		
<i>Glaux maritima</i>	Sea milkwort	G5	SH		X

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Glyceria acutiflora</i>	Sharp-scaled mannagrass	G5	S1		E
<i>Glyceria grandis</i>	American mannagrass	G5	S1		E
<i>Glyceria septentrionalis</i>	Floating mannagrass	G5	S3		
<i>Goodyera repens</i>	Dwarf rattlesnake-plantain	G5	SH		X
<i>Goodyera tessellata</i>	Tesselated rattlesnake-plantain	G5	SH		X
<i>Gratiola ramosa</i>	Branching hedge-hyssop	G4G5	SH		X
<i>Gratiola viscidula</i>	Short's hedge-hyssop	G4G5	S1		E
<i>Gymnocarpium dryopteris</i>	Oak fern	G5	S1		E
= <i>Dryopteris disjuncta</i>					
<i>Gymnocladus dioicus</i>	Kentucky coffee-tree	G5	S1		
<i>Gymnopogon brevifolius</i>	Broad-leaved beardgrass	G5	S1		E
<i>Helenium flexuosum</i>	Purple sneezeweed	G5	S3		
= <i>H. nudiflorum</i>					
<i>Helianthemum bicknellii</i>	Hoary frostweed	G5	SH		X
<i>Helianthemum propinquum</i>	Pine-barren frostweed	G4	S3		
<i>Helianthus hirsutus</i>	Hirsute sunflower	G5	SU		
<i>Helianthus laevigatus</i>	Smooth sunflower	G3G4	S1		E
<i>Helianthus microcephalus</i>	Small-headed sunflower	G5	S1		E
<i>Helianthus occidentalis</i>	McDowell's sunflower	G5	S1		T
<i>Helonias bullata</i>	Swamp pink	G3	S2	LT	E
<i>Heracleum lanatum</i>	Cow-parsnip	G5	S3		
= <i>H. maximum</i>					
<i>Heuchera pubescens</i>	Downy heuchera	G4?	S3		
<i>Heuchera villosa</i>	Rough heuchera	G5	SH		X
<i>Hexalectris spicata</i>	Crested coralroot	G4	SH		X
<i>Hexastylis virginica</i>	Virginia heartleaf	G4	S1		E
= <i>Asarum virginicum</i>					
<i>Hibiscus laevis</i>	Halberd-leaved rose-mallow	G3G5	S3		
= <i>H. militaris</i>					
<i>Hierochloa odorata</i>	Holy grass	G5	S1		E
<i>Honkenya peploides</i>	Sea-beach sandwort	G5	SH		X
= <i>Arenaria peploides</i> , <i>Honkenya peploides</i>					
<i>Hottonia inflata</i>	Featherfoil	G3G4	S1		E
<i>Houstonia serpyllifolia</i>	Thyme-leaved bluets	G4?	S3		
= <i>Hedyotis michauxii</i>					
<i>Houstonia tenuifolia</i>	Slender-leaved bluets	G?	S1		
<i>Hudsonia tomentosa</i>	Woolly hudsonia	G5	S3		
<i>Huperzia porophila</i>	Rock clubmoss	G4	SH		X
= <i>Lycopodium porophyllum</i>					
<i>Hybanthus concolor</i>	Green violet	G5	S3		
<i>Hydrastis canadensis</i>	Goldenseal	G4	S1	3C	T
<i>Hydrocotyle ranunculoides</i>	Floating water-pennywort	G5	S3		
<i>Hydrocotyle verticillata</i>	Whorled water-pennywort	G5	S3		
<i>Hydrophyllum macrophyllum</i>	Large-leaved waterleaf	G5	S1		E
<i>Hypericum adpressum</i>	Creeping St. John's-wort	G2G3	S1	C2	E
<i>Hypericum denticulatum</i>	Coppery St. John's-wort	G5	S1		E
<i>Hypericum drummondii</i>	Drummond's St. John's-wort	G5	SH		X
<i>Hypericum ellipticum</i>	Pale St. John's-wort	G5	S3		
<i>Hypericum gymnanthum</i>	Clasping-leaved St. John's-wort	G4?	S1		E
<i>Hypericum pyramidatum</i>	Great St. John's-wort	G4	SH		X
<i>Ilex decidua</i>	Deciduous holly	G5	S1		T
<i>Ilex montana</i>	Large-leaved holly	G5	S3		
<i>Iresine rhizomatosa</i>	Bloodleaf	G5	SH		X
<i>Iris cristata</i>	Crested iris	G5	S1		E
<i>Iris prismatica</i>	Slender blue flag	G4G5	S1		E
<i>Iris verna</i>	Dwarf iris	G5	S1		E
<i>Iris virginica</i>	Virginia blue flag	G5	S3		
<i>Isoetes engelmannii</i>	Appalachian quillwort	G4	S3		
<i>Isoetes riparia</i>	Riverbank quillwort	G4	S3		
<i>Isotria medeoloides</i>	Small whorled pogonia	G3	SH	LT	X
<i>Juglans cinerea</i>	Butternut	G3	S2S3	C2	
<i>Juncus articulatus</i>	Jointed rush	G5	S1		
<i>Juncus balticus</i>	Baltic rush	G5	SH		X
<i>Juncus brachycarpus</i>	Short-fruited rush	G4G5	SH		X
<i>Juncus brachycephalus</i>	Small-headed rush	G5	SH		X
<i>Juncus brevicaudatus</i>	Narrow-panicked rush	G5	S2		
<i>Juncus caesariensis</i>	New Jersey rush	G2	S1	C2	E
<i>Juncus coriaceus</i>	Awl-leaved rush	G5	S3		
<i>Juncus longii</i>	Long's rush	G3G5Q	SH		X
<i>Juncus megacephalus</i>	Big-headed rush	G4G5	SH		X
<i>Juncus militaris</i>	Bayonet rush	G4G5	SH		X
<i>Juncus pelocarpus</i>	Brown-fruited rush	G5	SH		X
<i>Juncus polycephalus</i>	Many-headed rush	G5	SU		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Juncus torreyi</i>	Torrey's rush	G5	S1		E
<i>Juncus trifidus</i>	Highland rush	G5	S1		E
<i>Juniperus communis</i>	Juniper	G5	SH		X
<i>Kalmia angustifolia</i>	Sheep-laurel	G5	S3S4		
<i>Krigia biflora</i>	Two-flowered cynthia	G5	S3		
<i>Krigia dandelion</i>	Potato dandelion	G5	S1		E
<i>Kyllinga pumila</i>	Thin-leaved flatsedge	G?	S1		E
= <i>Cyperus tenuifolius</i>					
<i>Lachnanthes caroliniana</i>	Red-root	G4	S1		E
= <i>L. caroliniana</i>					
<i>Lactuca hirsuta</i>	Hairy lettuce	G4?	SH		X
<i>Larix laricina</i>	Larch	G5	S1		E
<i>Lathyrus palustris</i>	Vetchling	G5	S1		X
<i>Lathyrus venosus</i>	Veiny pea	G5	S3		
<i>Lechea maritima</i>	Beach pinweed	G5	S3		
<i>Lechea tenuifolia</i>	Narrow-leaved pinweed	G5	SH		X
<i>Lechea villosa</i>	Hairy pinweed	G5	S3		
<i>Leersia hexandra</i>	Club-headed cutgrass	G5	S1		E
<i>Leersia lenticularis</i>	Catchfly-grass	G5	SH		X
<i>Lemna perpusilla</i>	Small duckweed	G5	S3		
<i>Lemna trisulca</i>	Star duckweed	G5	S1		E
<i>Leptochloa fascicularis</i>	Long-awned diplachne	G5	S1		E
= <i>Diplachne fascicularis</i>					
<i>Leptoloma cognatum</i>	Fall witchgrass	G5	S1		E
<i>Lespedeza stuevei</i>	Downy bushclover	G4?	S1		E
<i>Lespedeza violacea</i>	Violet bushclover	G5	S3		
<i>Liatris spicata</i>	Spiked blazing-star	G5	S1		
<i>Liatris squarrosa</i>	Scaly blazing-star	G5	SH		X
<i>Liatris turgida</i>	Robust blazing-star	G?	SH		X
<i>Ligusticum canadense</i>	American lovage	G4	SH		X
<i>Lilium philadelphicum</i>	Wood lily	G5	SH		X
<i>Limnium spongia</i>	American frog's-bit	G5	S1		E
<i>Limonium nashii</i>	Nash's sea lavender	G?	SU		
<i>Limosella australis</i>	Mudwort	G4G5	S2		E
= <i>L. subulata</i>					
<i>Linnaea borealis</i>	Twinflower	G5	SH		X
<i>Linum floridanum</i>	Florida yellow flax	G?	SH		X
<i>Linum intercursum</i>	Sandplain flax	G4G5	S1		E
<i>Linum sulcatum</i>	Grooved flax	G5	S1		E
<i>Liparis loeselii</i>	Loesel's twayblade	G5	S3		
<i>Lipocarpus micrantha</i>	Small-flowered hemicarpha	G4	S1		E
= <i>Hemicarpha micrantha</i>					
<i>Listera australis</i>	Southern twayblade	G4	S3		
<i>Listera cordata</i>	Heartleaf twayblade	G5	SH		X
<i>Listera smallii</i>	Appalachian twayblade	G4	S1		E
<i>Lithospermum latifolium</i>	American gromwell	G3G5	S1		E
<i>Litsea aestivalis</i>	Pondspice	G3G4	S1	C2	E
<i>Lobelia canbyi</i>	Canby's lobelia	G4	S1		E
<i>Lobelia elongata</i>	Elongated lobelia	G3G5	S3		
<i>Lobelia glandulosa</i>	Glandular lobelia	G4G5	SH		X
<i>Lonicera canadensis</i>	Canada honeysuckle	G5	S1		E
<i>Ludwigia brevipes</i>	Creeping ludwigia	G4G5	SU		
<i>Ludwigia decurrens</i>		G5	S2		
= <i>Jussiaea decurrens</i>					
<i>Ludwigia glandulosa</i>	Cylindric-fruited seedbox	G5	S1		E
<i>Ludwigia hirtella</i>	Hairy ludwigia	G5	S1		E
<i>Lupinus perennis</i>	Wild lupine	G5	S1		T
<i>Lycopodiella alopecuroides</i>	Foxtail clubmoss	G5	S3		
= <i>Lycopodium alopecuroides</i>					
<i>Lycopodiella caroliniana</i>	Carolina clubmoss	G5	SH		X
= <i>Lycopodium carolinianum</i>					
<i>Lycopodiella inundata</i>	Bog clubmoss	G5	S2		
= <i>Lycopodium inundatum</i>					
<i>Lycopodium sabinifolium</i>	Ground-fir	G4	SU		
<i>Lycopodium tristachyum</i>	Ground-cedar	G5	S3		
<i>Lycopus amplexans</i>	Sessile-leaved water-horehound	G5	S1		E
<i>Lycopus rubellus</i>	Stalked water-horehound	G5	S3		
<i>Lygodium palmatum</i>	Climbing fern	G4	S2		T
<i>Lysimachia hybrida</i>	Lowland loosestrife	G5	S1		E
<i>Lysimachia lanceolata</i>	Lance-leaved loosestrife	G5	S3		
<i>Lythrum alatum</i>	Winged loosestrife	G5	S1		E
<i>Magnolia tripetala</i>	Umbrella magnolia	G5	S3		
<i>Malus angustifolia</i>	Narrow-leaved wild crab	G5?	S3		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Manfreda virginica</i>	False aloe	G5	SU		
= <i>Agave virginica</i>					
<i>Marshallia grandiflora</i>	Barbara's buttons	G2	SR	C2	X
<i>Matelea carolinensis</i>	Anglepod	G4	S1		E
<i>Matelea decipiens</i>	Old-field milkvine	G5	SH		X
<i>Matelea obliqua</i>	Climbing milkweed	G4?	S1		E
<i>Matteuccia struthiopteris</i>	Ostrich fern	G5	S2		
= <i>Pteretis pensylvanica</i>					
<i>Mecardonia acuminata</i>	Erect water-hyssop	G5	S1		E
= <i>Bacopa acuminata</i>					
<i>Melanthium latifolium</i>	Broad-leaved bunchflower	G5	SH		X
= <i>M. hybridum</i>					
<i>Melanthium virginicum</i>	Virginia bunchflower	G5	S3		
<i>Melica mutica</i>	Narrow melicgrass	G5	S1		T
<i>Melica nitens</i>	Three-flowered melicgrass	G5	S2		T
<i>Melothria pendula</i>	Creeping cucumber	G4	S1		E
<i>Menyanthes trifoliata</i>	Buckbean	G5	S1		E
<i>Micranthemum micranthemoides</i>	Nuttall's micranthemum	GH	SH	C2*	X
<i>Milium effusum</i>	Millet grass	G5	S3		
<i>Minuartia glabra</i>	Mountain sandwort	G4	S1		E
= <i>Arenaria groenlandica</i> var. <i>glabra</i>					
<i>Minuartia michauxii</i>	Rock sandwort	G5	S2		T
= <i>Arenaria stricta</i>					
<i>Moehringia lateriflora</i>	Grove sandwort	G5	S1		E
= <i>Arenaria lateriflora</i>					
<i>Monarda clinopodia</i>	Basal bee-balm	G3G5Q	S3		
<i>Monarda media</i>	Purple bergamot	G?	S3		
<i>Monotropsis odorata</i>	Sweet pinesap	G3	S1	C2	E
<i>Muhlenbergia capillaris</i>	Long-awned hairgrass	G5	S1		E
<i>Muhlenbergia glaberrima</i>		G3G4	SU		
<i>Muhlenbergia glomerata</i>		G4	SU		
<i>Muhlenbergia sylvatica</i>	Woodland dropseed	G5	S3		
<i>Muhlenbergia torreyana</i>	Torrey's dropseed	G3	S1	3C	E
<i>Myosotis macrocarpa</i>	Large-seeded forget-me-not	G5	S1		T
<i>Myosotis verna</i>	Spring forget-me-not	G5	S3		
<i>Myrica heterophylla</i>	Evergreen bayberry	G5	SH		X
<i>Myriophyllum heterophyllum</i>	Broadleaf water-milfoil	G5	S1		
<i>Myriophyllum humile</i>	Low water-milfoil	G5	S1		E
<i>Myriophyllum tenellum</i>	Slender water-milfoil	G5	SH		X
<i>Myriophyllum verticillatum</i>	Whorled water-milfoil	G5	S3		
<i>Najas flexilis</i>	Slender naiad	G5	S3		
<i>Najas gracillima</i>	Thread-like naiad	G5	SH		X
<i>Najas guadalupensis</i>	Southern naiad	G5	S3		
<i>Nelumbo lutea</i>	American lotus	G4	S2		
<i>Nemopanthus mucronatus</i>	Mountain holly	G5	S3		
<i>Nemophila aphylla</i>	Small-flowered baby-blue-eyes	G5	S1		
= <i>N. microcalyx</i>					
<i>Nymphaea tuberosa</i>	Tuberous white water lily	G5	SU		
<i>Nymphoides aquatica</i>	Larger floating-heart	G5	S1		E
<i>Nymphoides cordata</i>	Floating-heart	G5	S1		E
<i>Oenothera argillicola</i>	Shale-barren primrose	G3	S3		
<i>Oenothera humifusa</i>	Seaside evening primrose	G5	S3		
<i>Oldenlandia uniflora</i>	Clustered bluets	G5	S2		
= <i>Hedyotis uniflora</i>					
<i>Onosmodium molle</i>	Shaggy false-gromwell	G4?	S1		E
= <i>O. hispidissimum</i>					
<i>Onosmodium virginianum</i>	Virginia false-gromwell	G4	S1		E
<i>Orthilia secunda</i>	One-sided pyrola	G5	S1		E
= <i>Pyrola secunda</i>					
<i>Oryzopsis asperifolia</i>	White-fruited mountainrice	G5	S2		T
<i>Oryzopsis racemosa</i>	Black-fruited mountainrice	G5	S2		T
<i>Oxydendrum arboreum</i>	Sourwood	G5	S1		E
<i>Oxypolis canbyi</i>	Canby's dropwort	G1G2	S1	LE	E
<i>Panax quinquefolius</i>	Ginseng	G4	S3	3C	
<i>Panicum aciculare</i>	Bristling panicgrass	G4G5	SU		
<i>Panicum aculeatum</i>	Tall rough panicgrass	G2?Q	SU	3B	
<i>Panicum angustifolium</i>	Narrow-leaved panicgrass	G4G5	SU		
<i>Panicum boreale</i>	Northern panicgrass	G5	SH		X
<i>Panicum commonsianum</i>	Commons' panicgrass	G5T4	S2		
<i>Panicum ensifolium</i>	Small-leaved panicgrass	G?	S3		
<i>Panicum flexile</i>	Wiry witch-grass	G3G5	S1		E
<i>Panicum hemitomon</i>	Maidencane	G5?	S3		
<i>Panicum laxiflorum</i>		G5	SU		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Panicum leucothrix</i>	Roughish panicgrass	G4?Q	SU		
<i>Panicum oligosanthos</i>	Few-flowered panicgrass	G5	S1		E
<i>Panicum ravenelii</i>		G5	S3		
<i>Panicum scabriusculum</i>	Tall swamp panicgrass	G4	S1		E
<i>Panicum tuckermanii</i>	Tuckerman's panicgrass	G3G5	SU		
<i>Panicum wrightianum</i>	Wright's panicgrass	G4	S1		E
<i>Panicum yadkinense</i>	A panicgrass	G?	SU		
<i>Parnassia asarifolia</i>	Kidneyleaf grass-of-parnassus	G4	S1		E
<i>Paronychia virginica</i> var <i>virginica</i>	Yellow nailwort	G4T1Q	S1	C2	E
<i>Parthenium integrifolium</i>	American feverfew	G5	S1		E
<i>Paspalum boscianum</i>	Bull paspalum	G5	SR		
<i>Paspalum dissectum</i>	Walter's paspalum	G3G4	S2		E
<i>Paspalum fluitans</i>	Floating paspalum	G4G5	S1		E
<i>Passiflora incarnata</i>	Purple passionflower	G5	SU		
<i>Passiflora lutea</i>	Yellow passionflower	G5	S3		
<i>Paxistima canbyi</i> = <i>Pachistima canbyi</i>	Canby's mountain lover	G2	S1	C2	E
<i>Pedicularis lanceolata</i>	Swamp lousewort	G5	S1		E
<i>Pellaea glabella</i>	Smooth cliffbrake	G5	S1		E
<i>Penstemon laevigatus</i>	Smooth beardtongue	G5	S3		
<i>Persea borbonia</i>	Red bay	G5	S1		E
<i>Phacelia purshii</i>	Miami-mist	G5	S3		
<i>Phacelia ranunculacea</i>	Coville's phacelia	G4	S1		E
<i>Phalaris caroliniana</i>	May grass	G5?	SH		X
<i>Phaseolus polystachios</i>	Wild bean	G4	S3		
<i>Phlox carolina</i>	Thick-leaved phlox	G5?	SH		X
<i>Phlox glaberrima</i>	Smooth phlox	G?	SH		X
<i>Phlox latifolia</i>	Mountain phlox	G4	SH		X
<i>Phlox pilosa</i>	Downy phlox	G5	S1		E
<i>Phyllanthus caroliniensis</i>	Carolina leaf-flower	G5	S3		
<i>Physalis virginiana</i>	Virginia ground-cherry	G5	S3		
<i>Picea rubens</i>	Red spruce	G5	S3		
<i>Pilea fontana</i>	Coolwort	G5	S2		
<i>Pinus serotina</i>	Pond pine	G4Q	S3		
<i>Plantago cordata</i>	Heart-leaved plantain	G3	SH	3C	X
<i>Plantago pusilla</i>	Slender plantain	G5	SH		X
<i>Platanthera blephariglottis</i> = <i>Habenaria blephariglottis</i>	White fringed orchid	G4G5	S2		T
<i>Platanthera ciliaris</i> = <i>Habenaria ciliaris</i>	Yellow fringed orchid	G5	S2		T
<i>Platanthera cristata</i> = <i>Habenaria cristata</i>	Crested yellow orchid	G5	S2		T
<i>Platanthera flava</i> = <i>Habenaria flava</i>	Pale green orchid	G4	S1	3C	T
<i>Platanthera grandiflora</i> = <i>Habenaria fimbriata</i> , <i>H. psycodes</i> var <i>grandiflora</i>	Large purple fringed orchid	G5	S2		T
<i>Platanthera peramoena</i> = <i>Habenaria peramoena</i>	Purple fringeless orchid	G5	S1	3C	T
<i>Platanthera psycodes</i> = <i>Habenaria psycodes</i>	Small purple fringed orchid	G5	SH		X
<i>Pluchea camphorata</i>	Marsh fleabane	G5	S1		E
<i>Poa alsodes</i>	Grove meadow-grass	G4?	S2		
<i>Poa chapmaniana</i>	Chapman bluegrass	G5	SR		
<i>Poa languida</i>	Weak speargrass	G3G4	SU		
<i>Poa palustris</i>	Fowl bluegrass	G5	SU		
<i>Poa saltuensis</i>	A bluegrass	G5?	SH		X
<i>Podostemum ceratophyllum</i>	Threadfoot	G5	S3		
<i>Pogonia ophioglossoides</i>	Rose pogonia	G5	S3		
<i>Polanisia dodecandra</i>	Clammyweed	G5Q	SH		X
<i>Polemonium vanbruntiae</i> = <i>P. van-bruntiae</i>	Jacob's-ladder	G3	S2	3C	T
<i>Polygala cruciata</i>	Cross-leaved milkwort	G5	S2		T
<i>Polygala curtissii</i>	Curtis' milkwort	G5	S3		
<i>Polygala incarnata</i>	Pink milkwort	G5	S3		
<i>Polygala polygama</i>	Racemed milkwort	G5	S1		T
<i>Polygala senega</i>	Seneca snakeroot	G4G5	S2		T
<i>Polygonella articulata</i>	Jointweed	G5	S3		
<i>Polygonum amphibium</i>	Water smartweed	G5	S1		
<i>Polygonum careyi</i>	Carey's knotweed	G4	SU		
<i>Polygonum cilinode</i>	Fringed bindweed	G5	S3		
<i>Polygonum densiflorum</i>	Dense-flowered knotweed	G5	S1		E
<i>Polygonum glaucum</i>	Seaside knotweed	G3	S1		E

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Polygonum opelousanum</i>	Opelousas smartweed	G5	SU		
<i>Polygonum ramosissimum</i>	Bushy knotweed	G5	SH		X
<i>Polygonum robustius</i>	Stout smartweed	G3G5	SH		X
<i>Polygonum setaceum</i>	Bristly smartweed	G5	SU		
<i>Polypodium polypodioides</i>	Resurrection fern	G5	S3		
<i>Populus balsamifera</i>	Balsam poplar	G5	SU		
<i>Porteranthus stipulatus</i> = <i>Gillenia stipulata</i>	American ipecac	G5	SH		X
<i>Potamogeton amplifolius</i>	Large-leaved pondweed	G5	SH		X
<i>Potamogeton foliosus</i>	Leafy pondweed	G5	S1		E
<i>Potamogeton illinoensis</i>	Illinois pondweed	G5	S1		
<i>Potamogeton natans</i>	Floating pondweed	G5	SU		
<i>Potamogeton perfoliatus</i>	Clasping-leaved pondweed	G5	S2		
<i>Potamogeton pusillus</i>	Slender pondweed	G5	S1		
<i>Potamogeton richardsonii</i>	Redheadgrass	G5	SH		X
<i>Potamogeton robbinsii</i>	Robbins' pondweed	G5	SH		X
<i>Potamogeton spirillus</i>	Spiral pondweed	G5	S1		
<i>Potamogeton zosteriformis</i>	Flatstem pondweed	G5	SH		X
<i>Potentilla arguta</i>	Tall cinquefoil	G5	SU		
<i>Prenanthes autumnalis</i>	Slender rattlesnake-root	G4G5	S1		E
<i>Prunus alleghaniensis</i>	Alleghany plum	G3	S2	C2	T
<i>Prunus angustifolia</i>	Chickasaw plum	G5	S3		
<i>Prunus maritima</i>	Beach plum	G4	S1		E
<i>Prunus pumila</i>	Eastern dwarf cherry	G5	SU		
<i>Psoralea psoralioides</i>	False scurf-pea	G5	SU		
<i>Ptelea trifoliata</i>	Wafer-ash	G5	S3		
<i>Ptilimnium nodosum</i> = <i>P. fluviatile</i>	Harperella	G2	S1	LE	E
<i>Puccinellia fasciculata</i>		G3	S3		
<i>Pycnanthemum clinopodioides</i>	Basil mountain-mint	G2	S1S2		
<i>Pycnanthemum pycnanthemoides</i>	Southern mountain-mint	G5	SH		X
<i>Pycnanthemum setosum</i>	Awed mountain-mint	G3G5	S2		T
<i>Pycnanthemum torrei</i>	Torrey's mountain-mint	G2	S1		E
<i>Pycnanthemum verticillatum</i>	Whorled mountain-mint	G5	S1		E
<i>Pycnanthemum virginianum</i>	Virginia mountain-mint	G5	S2		
<i>Pyrola virens</i>	Greenish-flowered pyrola	G?	SH		X
<i>Pyrrophappus carolinianus</i>	Carolina false-dandelion	G5	S3		
<i>Quercus imbricaria</i>	Shingle oak	G5	S3		
<i>Quercus laurifolia</i>	Laurel-leaved oak	G5	S1		
<i>Quercus lyrata</i>	Overcup oak	G5	S3		
<i>Quercus macrocarpa</i>	Mossy-cup oak	G5	S1		
<i>Quercus muhlenbergii</i>	Chinquapin oak	G5	S3		
<i>Quercus prinoides</i>	Dwarf chestnut oak	G5	S3		
<i>Quercus shumardii</i>	Shumard's oak	G5	S2		T
<i>Ranunculus allegheniensis</i>	Mountain crowfoot	G4G5	S3		
<i>Ranunculus ambigus</i>	Water-plantain spearwort	G4G5	SH		X
<i>Ranunculus carolinianus</i>	Carolina buttercup	G4G5	SH		X
<i>Ranunculus fascicularis</i>	Early buttercup	G5	S1		E
<i>Ranunculus flabellaris</i>	Yellow water-crowfoot	G5	S1		E
<i>Ranunculus hederaceus</i>	Long-stalked crowfoot	G5	SH		X
<i>Ranunculus laxicaulis</i>	Mississippi buttercup	G5?	SU		
<i>Ranunculus micranthus</i>	Rock crowfoot	G5	S3		
<i>Ranunculus pennsylvanicus</i>	Bristly crowfoot	G5	SH		X
<i>Ranunculus pusillus</i>	Low spearwort	G5	S3		
<i>Ranunculus trichophyllus</i> = <i>R. aquatilis</i>	White water-crowfoot	G5	S1		E
<i>Rhexia aristosa</i>	Awed meadow-beauty	G3	SR	C2	X
<i>Rhododendron arborescens</i>	Smooth azalea	G4G5	S3		
<i>Rhododendron atlanticum</i>	Dwarf azalea	G4G5	S3		
<i>Rhododendron calendulaceum</i>	Flame azalea	G5	S1		
<i>Rhododendron canescens</i>	Hoary azalea	G5	SU		
<i>Rhynchosia tomentosa</i>	Hairy snoutbean	G5	S1		E
<i>Rhynchospora alba</i>	White beakrush	G5	S3		
<i>Rhynchospora cephalantha</i>	Capitate beakrush	G5	S1		E
<i>Rhynchospora corniculata</i>	Short-bristled hornedrush	G5	S3		
<i>Rhynchospora filifolia</i>	Thread-leaved beakrush	G5	S1		E
<i>Rhynchospora globularis</i>	Grass-like beakrush	G5	S1		E
<i>Rhynchospora glomerata</i>	Clustered beakrush	G5	S1		E
<i>Rhynchospora gracilenta</i>	Slender beakrush	G5	S3		
<i>Rhynchospora inundata</i>	Drowned hornedrush	G3G4	S1		E
<i>Rhynchospora microcephala</i>	Tiny-headed beakrush	G?	SH		X
<i>Rhynchospora nitens</i> = <i>Psilocarya nitens</i>	Short-beaked baldrush	G4	S1		E

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Rhynchospora pallida</i>	Pale beakrush	G3?	SH		X
<i>Rhynchospora rariflora</i>	Few-flowered beakrush	G5	SH		X
<i>Rhynchospora scirpoides</i> = <i>Psilocarya scirpoides</i>	Long-beaked baldrush	G4	S2		T
<i>Rhynchospora torreyana</i>	Torrey's beakrush	G4	S1		E
<i>Ribes americanum</i>	Wild black currant	G5	SH		X
<i>Ribes cynosbati</i>	Prickly gooseberry	G5	S3		
<i>Ribes glandulosum</i>	Skunk currant	G5	S1		
<i>Ribes hirtellum</i>	Low wild gooseberry	G5	S1		
<i>Rosa blanda</i>	Smooth rose	G5	S1		E
<i>Rosa setigera</i>	Prairie rose	G5	SU		
<i>Rosa virginiana</i>	Virginia rose	G5	S3		
<i>Rotala ramosior</i>	Tooth-cup	G5	S3S4		
<i>Rudbeckia fulgida</i>	Orange coneflower	G5	S3		
<i>Rudbeckia triloba</i>	Thin-leaved coneflower	G4	S3		
<i>Ruellia humilis</i>	Hairy wild-petunia	G5	SH		X
<i>Ruellia purshiana</i>	Pursh's ruellia	G?	SH		X
<i>Ruellia strepens</i>	Rustling wild-petunia	G4G5	S1		E
<i>Rumex altissimus</i>	Tall dock	G5	S1		E
<i>Rumex floridanus</i>	Florida dock	G5	S1		E
<i>Rumex hastatulus</i>	Engelmann's dock	G5	SU		
<i>Sabatia campanulata</i>	Slender marsh pink	G5	SH		X
<i>Sabatia difformis</i>	Lance-leaved sabatia	G4G5	SH		X
<i>Sabatia dodecandra</i>	Large marsh pink	G5?	S3		
<i>Sacciolepis striata</i>	Sacciolepis	G5	S1		E
<i>Sagina decumbens</i>	Decumbent pearlwort	G5	S3		
<i>Sagittaria calycina</i> = <i>Lophotocarpus calycina</i> ; includes <i>L. spongiosus</i> , <i>Sagittaria spathulata</i>	Spongy lophotocarpus	G5	S2		
<i>Sagittaria engelmanniana</i>	Engelmann's arrowhead	G5?	S2		T
<i>Sagittaria graminea</i>	Grass-leaved arrowhead	G5	S3		
<i>Sagittaria longirostra</i> = <i>S. australis</i>	Long-beaked arrowhead	G?	SU		
<i>Sagittaria rigida</i>	Sessile-fruited arrowhead	G5	S1		E
<i>Sagittaria subulata</i>	Subulate arrowhead	G4	S3		
<i>Sagittaria teres</i>	Slender arrowhead	G3	SH		X
<i>Salicornia bigelovii</i>	Dwarf glasswort	G5Q	S3		
<i>Salicornia virginica</i>	Woody glasswort	G5	S3		
<i>Salix bebbiana</i>	Bebb's willow	G5	SH		X
<i>Salix caroliniana</i>	Carolina willow	G5	S3		
<i>Salix discolor</i>	Pussy willow	G5	SU		
<i>Salix exigua</i> = <i>S. interior</i>	Sandbar willow	G5	S1		E
<i>Salix lucida</i>	Shining willow	G5	SH		X
<i>Salix tristis</i> = <i>S. humilis</i> var <i>microphylla</i>	Dwarf prairie willow	G5	S1		
<i>Salvia urticifolia</i>	Nettle-leaved sage	G5	SH		X
<i>Sanguisorba canadensis</i>	Canada burnet	G5	S2		T
<i>Sanicula marilandica</i>	Sanicle	G5	S3		
<i>Sanicula trifoliata</i>	Three-leaved snakeroot	G4	S3		
<i>Sarracenia purpurea</i>	Northern pitcher-plant	G5	S2		T
<i>Saxifraga micranthidifolia</i>	Lettuce-leaved saxifrage	G5	S3		
<i>Schizachne purpurascens</i>	Purple oat	G5	S1		E
<i>Schwalbea americana</i>	Chaffseed	G2	SX	LE	X
<i>Scirpus ancistrochaetus</i>	Northeastern bulrush	G2	S1	LE	E
<i>Scirpus cylindricus</i> = <i>S. maritimus</i> var <i>fernaldi</i>	Salt-marsh bulrush	G5	S2		
<i>Scirpus etuberculatus</i>	Canby's bulrush	G3G4	S1		E
<i>Scirpus expansus</i>	Wood bulrush	G4	S3		
<i>Scirpus fluviatilis</i>	River bulrush	G5	S3S4		
<i>Scirpus pendulus</i> = <i>S. lineatus</i>	Pendulous bulrush	G5	S3		
<i>Scirpus smithii</i>	Smith's clubrush	G5?	SH		X
<i>Scirpus subterminalis</i>	Water clubrush	G4G5	S1		E
<i>Scirpus torreyi</i>	Torrey's clubrush	G5?	SH		X
<i>Scirpus verecundus</i>	Bashful bulrush	G5?	S2		
<i>Scleria minor</i>	Slender nutrush	G4	S1		E
<i>Scleria nitida</i>	Shining nutrush	G?	S1		E
<i>Scleria pauciflora</i>	Papillose nutrush	G5	S3		
<i>Scleria reticularis</i> = <i>S. muhlenbergi</i>	Reticulated nutrush	G5	S2		
<i>Scleria triglomerata</i>	Tall nutrush	G5	S2		
<i>Scleria verticillata</i>	Whorled nutrush	G4?	S1		E

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Sclerolepis uniflora</i>	Pink bog-button	G4	S1		E
<i>Scrophularia lanceolata</i>	Hare figwort	G5	S3		
<i>Scutellaria galericulata</i> = <i>S. epilobiiifolia</i>	Common skullcap	G5	S1		
<i>Scutellaria incana</i>	Downy skullcap	G5	S3		
<i>Scutellaria leonardii</i> = <i>S. parvula</i> var <i>leonardii</i>	Leonard's skullcap	G4	S2		T
<i>Scutellaria nervosa</i>	Veined skullcap	G5	S1		E
<i>Scutellaria ovata</i>	Heart-leaved skullcap	G5	S3		
<i>Scutellaria parvula</i>	Small skullcap	G4	SH		X
<i>Scutellaria saxatilis</i>	Rock skullcap	G3G4	S1	3C	E
<i>Scutellaria serrata</i>	Showy skullcap	G4G5	S3		
<i>Sedum glaucophyllum</i>	Cliff stonecrop	G3G4	S1		E
<i>Senecio anomus</i> = <i>S. smallii</i>	Small's ragwort	G5	S3		
<i>Senecio antennariifolius</i>	Shale-barren ragwort	G4	S3	3C	
<i>Senecio pauperculus</i>	Balsam ragwort	G5	S3		
<i>Sesuvium maritimum</i>	Sea-purslane	G5	S1		E
<i>Sibara virginica</i>	Virginia cress	G5	SU		
<i>Sida hermaphrodita</i>	Virginia mallow	G3	S1	3C	E
<i>Silene nivea</i>	Snowy campion	G3G4	S1		E
<i>Silphium trifoliatum</i> = <i>S. asteriscus</i>	Three-leaved rosinweed	G?	S3		
<i>Sisyrinchium arenicola</i>	Sand blueeyed-grass	G5?	SH		X
<i>Smilacina stellata</i>	Star-flowered false Solomon's-seal	G5	S1		E
<i>Smilax bona-nox</i>	Bullbrier	G5	S3		
<i>Smilax ecirrata</i>	Upright smilax	G5?	SU		
<i>Smilax pseudochina</i> = <i>S. tamnifolia</i>	Halberd-leaved greenbrier	G4G5	S1		E
<i>Smilax walteri</i>	Red-berried greenbrier	G5	S3		
<i>Solidago curtisii</i>	Curtis' goldenrod	G4G5Q	S1		E
<i>Solidago elliotii</i>	Elliott's goldenrod	G5	S3		
<i>Solidago fistulosa</i>	Pine barrens goldenrod	G4G5	S3		
<i>Solidago hispida</i>	Hairy goldenrod	G5	SH		X
<i>Solidago microcephala</i> = <i>Euthamia minor</i>	Tiny-headed goldenrod	G5T?	S3		
<i>Solidago patula</i>	Sharp-leaved goldenrod	G5	S3		
<i>Solidago puberula</i>	Downy goldenrod	G5	S3		
<i>Solidago rigida</i>	Hard-leaved goldenrod	G5	SH		X
<i>Solidago roanensis</i>	Mountain goldenrod	G4G5	SH		X
<i>Solidago rupestris</i>	Rock goldenrod	G2?Q	S1		X
<i>Solidago spathulata</i> = <i>S. racemosa</i>	Riverbank goldenrod	G5	S1		T
<i>Solidago speciosa</i>	Showy goldenrod	G5	S1		E
<i>Solidago stricta</i>	Wandlike goldenrod	G5	SU		
<i>Solidago uliginosa</i>	Bog goldenrod	G4G5	S3		
<i>Sorbus americana</i>	American mountain-ash	G5	S3		
<i>Sorghastrum elliotii</i>	Long-bristled indian-grass	G5	SH		X
<i>Sparganium androcladum</i>	Branching bur-reed	G4G5	S3		
<i>Sparganium chlorocarpum</i>	Green-fruited bur-reed	G5	S3		
<i>Sparganium eurycarpum</i>	Broad-fruited bur-reed	G5	S3		
<i>Spermacoce glabra</i>	Buttonweed	G4G5	S1		E
<i>Sphenopholis pennsylvanica</i> = <i>Trisetum pensylvanicum</i>	Swamp-oats	G4	S1S2		T
<i>Spigelia marilandica</i>	Indian-pink	G5	SH		X
<i>Spiraea betulifolia</i> = <i>S. corymbosa</i>	Corymbid spiraea	G4G5	S3		
<i>Spiranthes laciniata</i>	Lace-lip ladys' tresses	G4G5	SU		
<i>Spiranthes lucida</i>	Wide-leaved ladys' tresses	G5	S1		E
<i>Spiranthes ochroleuca</i> = <i>S. cernus</i> var <i>ochroleuca</i>	Yellow nodding ladys' tresses	G4	S1		E
<i>Spiranthes odorata</i>	Sweet-scented ladys' tresses	G5	SH		X
<i>Spiranthes praecox</i>	Grass-leaved ladys' tresses	G5	S1		
<i>Spiranthes tuberosa</i>	Little ladys' tresses	G5	S3		
<i>Sporobolus asper</i>	Long-leaved rushgrass	G5	S1		
<i>Sporobolus clandestinus</i>	Rough rushgrass	G5	S1		E
<i>Sporobolus heterolepis</i>	Northern dropseed	G5	S1		E
<i>Sporobolus neglectus</i>	Small rushgrass	G5	SH		X
<i>Stachys aspera</i>	Rough hedge-nettle	G4	SH		X
<i>Stachys clingmanii</i>	Clingman's hedge-nettle	G3Q	S1		E
<i>Stachys cordata</i> = <i>S. nuttallii</i> , <i>S. riddellii</i>	Nuttall's hedge-nettle	G5?	S1		
<i>Stachys hyssopifolia</i>	Hyssop-leaved hedge-nettle	G5	SU		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Stachys latidens</i>		G?	S1		
<i>Stellaria alsine</i>	Trailing stitchwort	G5	S1		E
<i>Stenanthium gramineum</i>	Featherbells	G5	S1		T
<i>Streptopus amplexifolius</i>	White mandarin	G5	SU		
<i>Streptopus roseus</i>	Rose twisted-stalk	G5	S1S2		T
<i>Stylophorum diphyllum</i>	Celandine poppy	G5	SU		
<i>Suaeda linearis</i>	Tall sea-blite	G5	S3		
<i>Symphoricarpos albus</i>	Snowberry	G5	S1		T
<i>Symplocos tinctoria</i>	Sweetleaf	G5	S2		
<i>Synosma suaveolens</i>	Sweet-scented indian-plantain	G4?	S1		E
= <i>Cacalia suaveolens</i>					
<i>Taenidia montana</i>	Mountain pimpernel	G3G4	S2	3C	T
= <i>Pseudotaenidia montana</i>					
<i>Talinum teretifolium</i>	Flameflower	G4	S1		T
<i>Taxus canadensis</i>	American yew	G5	S2		T
<i>Tephrosia spicata</i>	Southern goat's rue	G4G5	S1		E
<i>Thalictrum dasycarpum</i>	Purple meadowrue	G5	SU		
<i>Thalictrum macrostylum</i>	Piedmont meadowrue	G4?	SU		
<i>Thaspium trifoliatum</i>	Purple meadow-parsnip	G5	S1		E
<i>Thelypteris phegopteris</i>	Northern beech fern	G5	S2		
<i>Thelypteris simulata</i>	Bog fern	G5	S2		T
<i>Thuja occidentalis</i>	Arbor-vitae	G5	S1		T
<i>Tilia heterophylla</i>	White basswood	G5	S3		
<i>Tillandsia usneoides</i>	Spanish moss	G5	SX		
<i>Tofieldia glutinosa</i>	False asphodel	G5	SU		
<i>Tofieldia racemosa</i>	Coastal false asphodel	G5	SH		X
<i>Torreyochloa pallida</i>	Pale mannagrass	G5?	S1		E
= <i>Puccinellia pallida</i> , <i>Glyceria pallida</i>					
<i>Trachelospermum difforme</i>	Climbing dogbane	G4G5	S1		E
<i>Trautvetteria caroliniensis</i>	Carolina tassel-rue	G5	S3		
<i>Triadenum tubulosum</i>		G4?	S1		
= <i>Hypericum tubulosum</i>					
does not include <i>T. tubulosum</i> var <i>walteri</i>					
<i>Trichostema brachiatum</i>	False pennyroyal	G4G5	S3		
= <i>Isanthus brachiatus</i>					
<i>Trichostema setaceum</i>	Narrow-leaved bluecurls	G5	S1		
<i>Trifolium reflexum</i>	Buffalo clover	G5	SH		X
<i>Trifolium virginicum</i>	Kate's-mountain clover	G3	S2S3	3C	T
<i>Triglochin maritimum</i>	Seaside arrow-grass	G5	SU		
<i>Triglochin striatum</i>	Three-ribbed arrow-grass	G5	S1		E
<i>Trillium cernuum</i>	Nodding trillium	G5	S3		
<i>Trillium flexipes</i>	Drooping trillium	G5	S1		E
<i>Trillium nivale</i>	Snow trillium	G4	S1		E
<i>Trillium pusillum</i> var <i>pusillum</i>		G3T1	S?	C2	T
<i>Trillium pusillum</i> var <i>virginianum</i>	Dwarf trillium	G3T2	S2	C2	T
<i>Triosteum angustifolium</i>	Narrow-leaved horse-gentian	G5	S1		E
<i>Triphora trianthophora</i>	Nodding pogonia	G4	SH		X
<i>Typha domingensis</i>	Southern cattail	G4G5	S3		
<i>Utricularia biflora</i>	Two-flowered bladderwort	G5	S1		E
<i>Utricularia cornuta</i>	Horned bladderwort	G5	SU		
<i>Utricularia fibrosa</i>	Fibrous bladderwort	G4G5	S1		E
<i>Utricularia gibba</i>	Humped bladderwort	G5	S3		
<i>Utricularia inflata</i>	Swollen bladderwort	G5	S1		E
<i>Utricularia purpurea</i>	Purple bladderwort	G5	S1		T
<i>Utricularia radiata</i>	Small swollen bladderwort	G4	S3		
= <i>U. inflata</i> var <i>minor</i>					
<i>Utricularia resupinata</i>	Reversed bladderwort	G4	S1		E
<i>Utricularia subulata</i>	Zig-zag bladderwort	G5	S3		
<i>Uvularia grandiflora</i>	Large-flowered bellwort	G5	S1		
<i>Uvularia puberula</i>	Mountain bellwort	G5	S3		
= <i>U. pudica</i>					
<i>Vaccinium macrocarpon</i>	Large cranberry	G4	S3		
<i>Vaccinium myrtilloides</i>	Velvetleaf blueberry	G5	S3		
<i>Vaccinium oxycoccos</i>	Small cranberry	G5	S2		T
<i>Valeriana pauciflora</i>	Valerian	G3G4	S1		E
<i>Valerianella chenopodiifolia</i>	Goose-foot cornsalad	G5	S1		E
<i>Valerianella umbilicata</i>	Tall cornsalad	G3G5	SH		X
<i>Verbesina virginica</i>	White crownbeard	G4G5	SU		
<i>Vernonia gigantea</i>	Giant ironweed	G5	SU		
= <i>V. altissima</i>					
<i>Veronica scutellata</i>	Marsh speedwell	G5	S1		E
<i>Viburnum lentago</i>	Nannyberry	G5	S1		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Vicia americana</i>	Purple vetch	G5	SH		X
<i>Viola appalachensis</i>	Appalachian blue violet	G3Q	S2		
<i>Viola brittoniana</i>	Britton's violet	G4?	S3S4		
<i>Viola incognita</i>	Large-leaved white violet	G5	S1		
<i>Viola rostrata</i>	Long-spurred violet	G5	S3		
<i>Viola septentrionalis</i>	Northern blue violet	G5	SU		
<i>Vitis cinerea</i>	Graybark	G4G5	SU		
<i>Vitis novae-angliae</i>	New England grape	G4G5	SH		X
<i>Vitis rupestris</i>	Sand grape	G3Q	S1		
<i>Wolffia columbiana</i>	Columbian water-meal	G5	S3		
<i>Wolffia papulifera</i>		G4	S2		
<i>Wolffia punctata</i>	Water-meal	G5	S2		
<i>Wolffiella floridana</i>	Wolffiella	G?	SH		X
<i>Woodsia ilvensis</i>	Rusty woodsia	G5	S1		T
<i>Xerophyllum asphodeloides</i>	Eastern Turkeybeard	G3	SR		
<i>Xyris difformis</i>	Variable yelloweyed-grass	G5	S2		
<i>Xyris fimbriata</i>	Fringed yelloweyed-grass	G5	S1		E
<i>Xyris smalliana</i>	Small's yelloweyed-grass	G5	S1		E
<i>Zanthoxylum americanum</i>	Northern prickly-ash	G5	S1		E
= <i>Xanthoxylum americanum</i>					
<i>Zephyranthes atamasco</i>	Atamasco lily	G4G5	S1		E
<i>Zizaniopsis miliacea</i>	Southern wildrice	G5	S1		E
<i>Zizia aurea</i>	Golden alexanders	G5	S3		

RARE SPECIES REPORTING FORM

Maryland Natural Heritage Program

Species name: _____

Date(s) species was located: _____

County name: _____ Directions to the site: _____

Habitat description: _____

Data on species (for example; number seen, age or maturity, presence of flowers or fruits on plants, amount of area occupied, soil moisture, etc.):

Photograph taken? _____ Yes _____ No

Specimen taken? _____ Yes _____ No

if yes, give coll. # and repository: _____

Identification problems? _____ Yes _____ No; explain: _____

Other comments (for example; other people who observed this species, known threats/management needs for species or habitat, land ownership, etc.): _____

Reporter's name: _____

Address & phone number: _____

PLEASE ATTACH A LOCATION MAP TO THIS FORM

(e.g., photocopy of ADC book map or USGS quadrangle map with species' location marked.)

Return to: Lynn Davidson
MD Natural Heritage Program
Tawes State Office Bldg, E-1
Annapolis, MD 21401

APPENDIX I
CROSS REFERENCE OF PLANT SYNONYM NAMES

<u>Synonym Name</u>	<u>Current Name</u>
Agave virginica	Manfreda virginica
Amelanchier humilis	Amelanchier sanguinea
Amelanchier stolonifera	Amelanchier spicata
Ammannia teres	Ammannia latifolia
Ampelamus albidus	Cynanchum laeve
Arabis perstellata var shortii	Arabis shortii
Arenaria groenlandica var glabra	Minuartia glabra
Arenaria lateriflora	Moehringia lateriflora
Arenaria peploides	Honckenya peploides
Arenaria stricta	Minuartia michauxii
Aristida dichotoma var curtissii	Aristida curtissii
Aristolochia durior	Aristolochia macrophylla
Armoracia aquatica	Armoracia lacustris
Asarum virginicum	Hexastylis virginica
Asplenium cryptolepis	Asplenium ruta-muraria
Aster steeleorum	Aster concinnus
Athyrium pycnocarpon	Diplazium pycnocarpon
Bacopa acuminata	Mecardonia acuminata
Botrychium dissectum forma oneidense	Botrychium oneidense
Cacalia suaveolens	Synosma suaveolens
Callitriche palustris	Callitriche verna
Calopogon pulchellus	Calopogon tuberosus
Carex cephalantha	Carex echinata
Carex tetanica var woodii	Carex tetanica
Cassia fasciculata var macrosperma	Chamaecrista fasciculata var macrosperma
Centunculus minimus	Anagallis minima
Ceratophyllum echinatum	Ceratophyllum muricatum
Chenopodium hybridum var gigantospermum	Chenopodium gigantospermum
Chenopodium hybridum var standleyanum	Chenopodium standleyanum
Clematis verticillaris	Clematis occidentalis
Convolvulus spithameus	Calystegia spithamea
Coptis groenlandica	Coptis trifolia
Cymophyllus fraseri	Cymophyllus fraserianus
Cyperus inflexus	Cyperus aristatus
Cyperus tenuifolius	Kyllinga pumila
Digitaria filiformis var villosa	Digitaria villosa
Diplachne fascicularis	Leptochloa fascicularis
Dryopteris cristata var clintoniana	Dryopteris clintoniana
Dryopteris disjuncta	Gymnocarpium dryopteris
Dryopteris spinulosa var americana	Dryopteris campyloptera
Eleocharis ambigens	Eleocharis fallax
Eleocharis calva	Eleocharis erythropoda
Elymus trachycaulus ssp trachycaulus	Agropyron trachycaulum
Epilobium glandulosum var adenocaulon	Epilobium ciliatum
Erianthus coarctatus	Erianthus brevibarbis
Eriocaulon septangulare	Eriocaulon aquaticum
Eupatoriadelphus maculatus	Eupatorium maculatum
Euphorbia vermiculata	Chamaesyce vermiculata
Euthamia minor	Solidago microcephala
Fimbristylis baldwiniana	Fimbristylis annua
Fimbristylis caroliniana	Fimbristylis puberula
Fraxinus tomentosa	Fraxinus profunda
Gentiana crinita	Gentianopsis crinita
Gentiana puberula	Gentiana puberulenta
Gentiana quinquefolia	Gentianella quinquefolia
Gerardia auriculata	Agalinis auriculata
Gerardia laevigata	Aureolaria laevigata
Gillenia stipulata	Porteranthus stipulatus
Glyceria pallida	Torreyochloa pallida
Habenaria fimbriata	Platanthera grandiflora

<u>Synonym Name</u>	<u>Current Name</u>
Habenaria psycodes var grandiflora	Platanthera grandiflora
Habenaria spp	Platanthera spp
Habenaria viridis var bracteata	Coeloglossum viride
Hedyotis michauxii	Houstonia serpyllifolia
Hedyotis uniflora	Oldenlandia uniflora
Helenium nudiflorum	Helenium flexuosum
Hemicarpha micrantha	Lipocarpha micrantha
Heracleum maximum	Heracleum lanatum
Hibiscus militaris	Hibiscus laevis
Honkenya peploides	Honckenya peploides
Hypericum tubulosum	Triadenum tubulosum
Isanthus brachiatus	Trichostema brachiatum
Jussiaea decurrens	Ludwigia decurrens
Lachnanthes caroliniana	Lachnanthes caroliniana
Limosella subulata	Limosella australis
Lophotocarpus calycina	Sagittaria calycina
Lophotocarpus spongiosus	Sagittaria calycina
Lycopodium alopecuroides	Lycopodiella alopecuroides
Lycopodium carolinianum	Lycopodiella caroliniana
Lycopodium inundatum	Lycopodiella inundata
Lycopodium porophyllum	Huperzia porophila
Manisuris rugosa	Coelorachis rugosa
Melanthium hybridum	Melanthium latifolium
Nemophila microcalyx	Nemophila aphylla
Onosmodium hispidissimum	Onosmodium molle
Pachistima canbyi	Paxistima canbyi
Polemonium van-bruntiae	Polemonium vanbruntiae
Pseudotaenidia montana	Taenidia montana
Psilocarya nitens	Rhynchospora nitens
Psilocarya scirpoides	Rhynchospora scirpoides
Pteretis pensylvanica	Matteuccia struthiopteris
Ptilimnium fluviatile	Ptilimnium nodosum
Puccinellia pallida	Torreyochloa pallida
Pyrola secunda	Orthilia secunda
Pyrus floribunda	Aronia prunifolia
Ranunculus aquatilis	Ranunculus trichophyllus
Saccharum brevibarbe	Erianthus brevibarbis
Sagittaria australis	Sagittaria longirostra
Sagittaria spathulata	Sagittaria calycina
Salix humilis var microphylla	Salix tristis
Salix interior	Salix exigua
Scirpus lineatus	Scirpus pendulus
Scirpus maritimus var fernaldi	Scirpus cylindricus
Scleria muhlenbergi	Scleria reticularis
Scutellaria epilobiifolia	Scutellaria galericulata
Scutellaria parvula var leonardii	Scutellaria leonardii
Senecio smallii	Senecio anonymus
Senna marilandica	Cassia marilandica
Silphium asteriscus	Silphium trifoliatum
Smilax tamnifolia	Smilax pseudochina
Solidago racemosa	Solidago spathulata
Spiraea corymbosa	Spiraea betulifolia
Spiranthes cernus var ochroleuca	Spiranthes ochroleuca
Stachys nuttallii	Stachys cordata
Stachys riddellii	Stachys cordata
Tillaea aquatica	Crassula aquatica
Tomanthera auriculata	Agalinis auriculata
Trisetum pensylvanicum	Sphenopholis pensylvanica
Utricularia inflata var minor	Utricularia radiata
Uvularia pudica	Uvularia puberula
Vernonia altissima	Vernonia gigantea
Xanthoxylum americanum	Zanthoxylum americanum

APPENDIX II

SPECIES UNDER REVIEW FOR INCLUSION ON HERITAGE LIST

SCIENTIFIC NAME	COMMON NAME
<i>Aconitum reclinatum</i>	White monkshood
<i>Arabis glabra</i>	Tower mustard
<i>Asplenium montanum</i>	Mountain spleenwort
<i>Aster ontarionis</i>	Ontario aster
<i>Celastrus scandens</i>	Climbing bittersweet
<i>Echinacea laevigata</i>	Smooth coneflower
<i>Epilobium angustifolium</i>	Fireweed
<i>Erianthus strictus</i>	Narrow plumegrass
= <i>Saccharum baldwinii</i>	
<i>Geum rivale</i>	Purple avens
<i>Gymnopogon ambiguus</i>	
<i>Hydrolea quadrivalvis</i>	
<i>Liatris scariosa</i>	
<i>Lysimachia thyrsiflora</i>	Water loosestrife
<i>Narthecium americanum</i>	Bog asphodel
<i>Poa chapmaniana</i>	Chapman bluegrass
<i>Polemonium reptans</i>	Greek valerian
<i>Polypremum procumbens</i>	
<i>Rhexia mariana</i> var <i>ventricosa</i>	
<i>Rubus centralis</i>	
<i>Saxifraga pensylvanica</i>	Swamp saxifrage
<i>Senecio pauperculus</i>	
<i>Spiranthes ovalis</i>	
<i>Strophostyles leiosperma</i>	Small-flowered woolly bean
<i>Trichomanes intricatum</i>	
<i>Veronicastrum virginicum</i>	
<i>Utricularia intermedia</i>	

APPENDIX III

EXPLANATION OF GLOBAL AND STATE SPECIES RANKS

Originally developed and instituted by The Nature Conservancy, an international conservation organization, the global and state ranking system is used by all 50 state Natural Heritage Programs and numerous Conservation Data Centers in other countries in this hemisphere. Because they are assigned based upon standard criteria, the ranks can be used to assess the range-wide status of a species as well as the status within portions of the species' range. The primary criterion used to define these ranks are the number of known distinct occurrences with consideration given to the total number of individuals at each locality. Additional factors considered include the current level of protection, the types and degree of threats, ecological vulnerability, and population trends. Global and state ranks are used in combination to set inventory, protection, and management priorities for species both at the state as well as regional level. Definitions for the following ranks have been modified from The Nature Conservancy's Operations Manual (1988).

GLOBAL RANK

- G1 Highly globally rare. Critically imperiled globally because of extreme rarity (typically 5 or fewer estimated occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
- G2 Globally rare. Imperiled globally because of rarity (typically 6 to 20 estimated occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
- G3 Either very rare and local throughout its range or distributed locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; typically with 21 to 100 estimated occurrences.
- G4 Apparently secure globally, although it may be quite rare in parts of its range, especially at the periphery.
- G5 Demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery.
- GH No known extant occurrences (i.e., formerly part of the established biota, with the expectation that it may be rediscovered).
- GU Possibly in peril range-wide, but its status is uncertain; more information is needed.
- GX Believed to be extinct throughout its range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.
- G? The species has not yet been ranked.
- _Q Species containing a "Q" in the rank indicates that the taxon is of questionable or uncertain taxonomic standing (i.e., some taxonomists regard it as a full species, while others treat it at an infraspecific level).
- _T Ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species.

STATE RANK

- S1 Highly State rare. Critically imperiled in Maryland because of extreme rarity (typically 5 or fewer estimated occurrences or very few remaining individuals or acres in the State) or because of some factor(s) making it especially vulnerable to extirpation. Species with this rank are actively tracked by the Natural Heritage Program.
- S2 State rare. Imperiled in Maryland because of rarity (typically 6 to 20 estimated occurrences or few remaining individuals or acres in the State) or because of some factor(s) making it vulnerable to becoming extirpated. Species with this rank are actively tracked by the Natural Heritage Program.
- S3 Watch List. Rare to uncommon with the number of occurrences typically in the range of 21 to 100 in Maryland. It may have fewer occurrences but with a large number of individuals in some populations, and it may be susceptible to large-scale disturbances. Species with this rank are not actively tracked by the Natural Heritage Program.
- S3.1 A "Watch List" species that is actively tracked by the Natural Heritage Program because of the global significance of Maryland occurrences. For instance, a G3 S3 species is globally rare to uncommon, and although it may not be currently threatened with extirpation in Maryland, its occurrences in Maryland may be critical to the long term security of the species. Therefore, its status in the State is being monitored.
- S4 Apparently secure in Maryland with typically more than 100 occurrences in the State or may have fewer occurrences if they contain large numbers of individuals. It is apparently secure under present conditions, although it may be restricted to only a portion of the State.
- S5 Demonstrably secure in Maryland under present conditions.
- SA Accidental or a vagrant in Maryland.
- SE Established, but not native to Maryland; it may be native elsewhere in North America.
- SH Historically known from Maryland, but not verified for an extended period (usually 20 or more years), with the expectation that it may be rediscovered.
- SP Potentially occurring in Maryland or likely to have occurred in Maryland (but without persuasive documentation).
- SR Reported from Maryland, but without persuasive documentation that would provide a basis for either accepting or rejecting the report (e.g., no voucher specimen exists).
- SRF Reported falsely (in error) from Maryland, and the error may persist in the literature.
- SU Possibly rare in Maryland, but of uncertain status for reasons including lack of historical records, low search effort, cryptic nature of the species, or concerns that the species may not be native to the State. Uncertainty spans a range of 4 or 5 ranks as defined above.
- SX Believed to be extirpated in Maryland with virtually no chance of rediscovery.
- S? The species has not yet been ranked.

FEDERAL STATUS

This is the status of a species as determined by the U.S. Fish and Wildlife Service's Office of Endangered Species, in accordance with the Endangered Species Act. Definitions for the following categories have been modified from 50 CRF 17.

- LE Taxa listed as endangered; in danger of extinction throughout all or a significant portion of their range.
- LT Taxa listed as threatened; likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
- PE Taxa proposed to be listed as endangered.
- PT Taxa proposed to be listed as threatened.
- C1 Candidate taxa for listing for which the Service has on file enough substantial information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened.
- C2 Candidate taxa for listing for which information now in possession of the Service indicates that proposing to list them as endangered or threatened is possibly appropriate, but for which conclusive data on biological vulnerability and threat(s) are not currently available to support proposed rules.
- 3A Taxa for which the Service has persuasive evidence of extinction.
- 3B Names that, on the basis of current taxonomic understanding (usually as represented in published revisions and monographs), do not represent distinct entities meeting the Act's definition of "species".
- 3C Taxa that have proven to be more abundant or widespread than previously believed and/or those that are not subject to any identifiable threat.
- * A qualifier denoting taxa which may be possibly extinct (although persuasive documentation of extinction has not been made -- compare to 3A status).

STATE STATUS

This is the status of a species as determined by the Maryland Department of Natural Resources, in accordance with the Nongame and Endangered Species Conservation Act. Definitions for the following categories have been taken from Code of Maryland Regulations (COMAR) 08.03.08.

- E Endangered; a species whose continued existence as a viable component of the State's flora or fauna is determined to be in jeopardy.
- I 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.
- T Threatened; a species of flora or fauna which appears likely, within the foreseeable future, to become endangered in the State.
- X 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.
- * A qualifier denoting the species is listed in a limited geographic area only.

Appendix B

Rare, Threatened, and Endangered Animals of Maryland

RARE, THREATENED, AND ENDANGERED ANIMALS OF MARYLAND

November 1, 1994

Prepared by

Maryland Natural Heritage Program
Department of Natural Resources
Tawes State Office Building
Annapolis, MD 21401
(410) 974-2870

INTRODUCTION

The following report identifies those native Maryland animals that are among the rarest and most in need of conservation efforts as elements of our State's natural diversity. It includes species occurring in Maryland that are listed or candidates for listing on the Federal list of Endangered and Threatened Wildlife and Plants, species currently on the State's Threatened and Endangered Species List, and additional species that are considered rare by the Maryland Natural Heritage Program. The purpose of this report is to inform the public of which species are rare, to provide an indication of their degree of rarity, to solicit additional information on the status and distribution of these species, and to promote an interest in their protection.

Compiled by the Natural Heritage Program staff, this list of rare species is a result of 15 years of data gathering from numerous sources, such as museums and private collections, scientific literature, unpublished documents, reports from biologists and amateur naturalists, and from field work conducted by Natural Heritage Program ecologists. 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 distribution and status of Maryland's rare species known at that time.

Since 1984, our knowledge of Maryland's fauna has grown steadily. Through extensive field work, Natural Heritage Program biologists and other researchers have located species which were previously unrecorded for the State and have discovered that some species are more scarce than previously known. Similarly, some species are now known to be either more widespread or less vulnerable to ecological disturbances than previously believed. Thus, the list and status of each species is periodically revised to keep pace with new information.

The official State Threatened and Endangered Species List is part of the State Threatened and Endangered Species regulations (COMAR 08.03.08). 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.

ABOUT THIS LIST

The Maryland Natural Heritage Program's list of rare, threatened, and endangered animals is arranged phylogenetically; the invertebrate groups are listed first followed by vertebrates. Within each major group, species are listed alphabetically by scientific name. Some invertebrate groups are not fully represented or are entirely absent from this list. To date, available information has been compiled for only certain species or groups of invertebrates. Many invertebrate species are not well known and have not been fully researched or inventoried in Maryland, and the taxonomy of some has not been standardized.

Birds and other migratory species are tracked and considered rare by the Natural Heritage Program 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. To be included on the official State Threatened and Endangered Species list, migrants that are rare Maryland breeders must also be rare during the non-breeding season. Thus, the Dark-eyed Junco cannot be included on the official State List under current listing criteria. Other migratory species, such as whales and sea turtles, have been included because of their Federal status even though they typically do not breed in Maryland.

Four columns are printed to the right of each name. The global and state rarity ranks of each species are included in the first and second columns, respectively. The third column indicates the Federal status of each species as determined by the U.S. Fish and Wildlife Service. The last column shows the species' status on the State Threatened and Endangered Species List. Definitions for the codes used in all four columns are provided in Appendix II (see page 12). Species currently under consideration for inclusion on the Natural Heritage Program list appear in Appendix I (see page 10). The Natural Heritage Program seeks information on the status and location of these taxa from all interested parties.

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 booklets, Endangered & Threatened Wildlife and Plants published August 23, 1993 and Endangered and Threatened Wildlife and Plants; Animal Candidate Review for Listing as Endangered or Threatened Species, Proposed Rule published November 21, 1991, 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 report, 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 (exact mapped location, if possible) and population size/vigor information for any species on the Program's rare, threatened, and endangered species list, including historical information if known.
2. Data documenting that a species should be assigned a different state rank or status.
3. Nominations of species that either should be added to, or 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.

If you would like to provide location information for any rare species, please fill out the form on the reverse side of this page (or a copy of the page) and mail it to the Natural Heritage Program along with a location map.

RARE SPECIES REPORTING FORM

Maryland Natural Heritage Program

Species name: _____

Date(s) species was located: _____

County name: _____ Directions to the site: _____

Habitat description: _____

Data on species (for example; number seen, age or maturity, breeding behavior, nature of observation - song, tracks, sight record, etc.): _____

Photograph taken? _____ Yes _____ No

Specimen taken? _____ Yes _____ No

if yes, give coll. # and repository: _____

Identification problems? _____ Yes _____ No; explain: _____

Other comments (for example; other people who observed this species, known threats/management needs for species or habitat, land ownership, etc.): _____

Reporter's name: _____

Address & phone number: _____

PLEASE ATTACH A LOCATION MAP TO THIS FORM

(e.g., photocopy of ADC book map or USGS quadrangle map with species' location marked.)

Return to: Lynn Davidson
MD Natural Heritage Program
Tawes State Office Bldg, E-1
Annapolis, MD 21401

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
PLANARIANS					
Phagocata virilis	A planarian	G?	S1		
Planaria dactyligera	A planarian	G?	S2		
Procotyla typhlops	A planarian	G?	S1	C2	E
Sphalloplana hoffmasteri	Hoffmaster's cave planarian	G3	S1		E
Sphalloplana sp 1	A planarian	G?	S1S2		
MOLLUSCS					
Alasmidonta heterodon	Dwarf wedge mussel	G1	S1	LE	E
Alasmidonta undulata	Triangle floater	G4	S1		E
Alasmidonta varicosa	Brook floater	G3	S1	C2	E
Elliptio fisheriana	Northern lance	G4	S3		
Fontigens bottimeri	Appalachian spring snail	G?	S3		
Fontigens orolibas	Blue ridge spring snail	G?	S1		E
Glyphyalinia raderi	Rader's snail (Maryland glyph)	G2	SH	C2	X
Hendersonia occulta	Cherrydrop snail (Cherrystone drop)	G4	S2		I
Lampsilis cariosa	Yellow lampmussel	G4	SX	C2	X
Lampsilis radiata	Eastern lampmussel	G5	SU		
Lasmigona subviridis	Green floater	G4	S1	C2	E
CRUSTACEANS					
Ankylocythere tridentata	An entocytherid ostracod	G?	SX		
Attheyella spinipes	A harpacticoid copepod	G?	SU		
Caecidotea franzi	Franz's cave isopod	G1	S1	C2	E
Caecidotea holsingeri	Holsinger's cave isopod	G3	SR		
Caecidotea pricei	Price's cave isopod	G3	S3		
Caecidotea sp 1	An isopod	G?	S2		
Caecidotea sp 2	An isopod	G?	S1		
Caecidotea sp 3	An isopod	G3	S1		
Caecidotea sp 4	An isopod	G?	S1		
Caecidotea sp 5	An isopod	G?	S1		
Caecidotea sp 6	An isopod	G?	S2		
Crangonyx dearolfi	Dearolf's cave isopod	G2	S1	C2	E
Dactylocythere scotos	An entocytherid ostracod	G?	S1		
Diacyclops palustris	A cyclopoid copepod	G?	SU		
Eulimnadia francesae	A conchostracan phyllopod	G?	SU		
Eulimnadia ventricosa	A conchostracan phyllopod	G?	SU		
Stygobromus allegheniensis	Allegheny cave amphipod	G4	S2S3	3C	I
Stygobromus biggersi	Biggers' cave amphipod	G1G2	S1	C2	E
Stygobromus emarginatus	Greenbrier cave amphipod	G3	S1	3C	E
Stygobromus franzi	Franz's cave amphipod	G2	S2S3	3C	I
Stygobromus gracilipes	Shenandoah cave amphipod	G2	S1	3C	E
Stygobromus indentatus	Tidewater amphipod	G2G3	S1	C2	
Stygobromus pizzinii	Pizzini's cave amphipod	G2	S1	C2	
Stygobromus sp 5	Barrelville amphipod	G?	S1		
Stygobromus sp 6	An amphipod	G?	S1		
Stygobromus sp 14	Roundtop amphipod	G?	S1		
Stygobromus tenuis tenuis	Tenuis amphipod	G4T2Q	SU		
Stygobromus tenuis potomacus	Potomac amphipod	G4T3Q	S3	3C	
SPIDERS					
Atypus bicolor	American purse-web spider	G?	S1S2		
Oreonetides sp 1	Snivelys cave spider	G?	SU		
Porrhomma caverniculum	Appalachian cave spider	GU	S2		
INSECTS					
<u>Collembola</u>					
Arrhopalites sp 1	Crabtree cave springtail	G?	SU		
<u>Ephemeroptera</u>					
Potamanthus walkeri	Walker's tusked sprawler	G?	SU		
<u>Odonata</u>					
Aeshna mutata	Spring blue darner	G3G4	S1		E
Gomphus rogersi	Sable clubtail	G4	S1		E
Somatochlora provocans	Treetop emerald	G3G4	S1		
Stylurus notatus (= Gomphus notatus)	Elusive clubtail	G3G4	S1	C2	
Tachopteryx thoreyi	Gray petaltail	G4	SU		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<u>Hemiptera</u>					
Chlorotettix sp 1	A cicadellid leafhopper	G?	SU		
Limotettix sp 1	Eastern sedge barrens planthopper	G?	S1	C2	
<u>Coleoptera</u>					
Cicindela ancocisconensis	A tiger beetle	G3	S1		E
Cicindela dorsalis dorsalis	Northeastern beach tiger beetle	G4T2	S1	LT	E
Cicindela dorsalis media	White tiger beetle	G4T4	S1		E
Cicindela lepida	Little white tiger beetle	G4	S1		E
Cicindela patruela	A tiger beetle	G3	S1S2		
Cicindela puritana	Puritan tiger beetle	G1G2	S1	LT	E
Cicindela purpurea	A tiger beetle	G5	S3		
Cicindela scutellaris	A tiger beetle	G5	S3		
Cicindela splendida	A tiger beetle	G5	S3		
Cicindela unipunctata	A tiger beetle	G4	S3		
Dryobius sexnotatus	Six-banded longhorn beetle	G?	S1	C2	E
Hopierius planatus	A dytiscid beetle	G?	S1		
Hydrochara occulta	A hydrophilid beetle	G?	SU		
Hydrochus sp 1	Seth forest water scavenger beetle	GH	SH	C2	
Laccophilus schwarzi	Schwarz' diving beetle	G?	SX	3C	
Lucanus elephas	Giant stag beetle	G3G5	S1		
Nicrophorus americanus	American burying beetle	G1	SX	LE	X
Scymnus gordonii	A coccinellid beetle	G?	SU		
Sperchopsis tessellatus	A hydrophilid beetle	G?	S2		
<u>Trichoptera</u>					
Hydropsyche brunneipennis	A scalaris trichopteran	G?	S3		
<u>Lepidoptera - Butterflies</u>					
Amblyscirtes hegon	Pepper-and-salt skipper	G5	S2		I
Atlides halesus	Great purple hairstreak	G3G4	S1S2		
Autochthon cellus	Golden-banded skipper	G4	S1		E
Boloria selene myrina	Silver-bordered fritillary	G5T5	S3		
Calephelis borealis	Northern metalmark	G3G4	S2		T
Celastrina ebenina	Sooty azure	G4	S1		E
Celastrina neglectamajor	Appalachian blue	G4	S3S4		
Chlosyne harrisii	Harris' checkerspot	G4	S2		T
Colias interior	Pink-edged sulphur	G5	S1		
Cyllopsis gemma	Gemmed satyr	G5	SHSR		
Erora laeta	Early hairstreak	G4	S1		E
Erynnis martialis	Mottled duskywing	G4	S1		E
Erynnis persius	Persius duskywing	G4	SHSR		
Euchloe olympia	Olympia marble	G4	S2		I
Euphyes bimacula	Two-spotted skipper	G4	S1		E
Euphyes dion	Sedge skipper	G4	S3		
Euphyes pilatka	Saw-grass skipper	G3G4	SU		
Fixsenia ontario	Northern hairstreak	G4T4	S1S2		E
Glaucopsyche lygdamus	Silvery blue	G5	S2		I
Hermeuptychia sosybius	Carolina satyr	G5Q	S1S3		
Hesperia attalus slossonae	Dotted skipper	G4T3	SH		
Hesperia sassacus	Indian skipper	G5	S3		
Incisalia irus	Frosted elfin	G4	S1		E
Lycaena epixanthe	Bog copper	G4G5	S1		E
Mitoura hesseli	Hessel's hairstreak	G3G4	SH	3C	X
Nymphalis vaualbum	Compton's tortoiseshell	G5	S1		E
Papilio cresphontes	Giant swallowtail	G5	S2		I
Papilio palamedes	Palamedes swallowtail	G5	SU		
Phyciodes batesii	Tawny crescent spot	G3G4	SH	C2	X
Poanes massasoit chermockii	Chermock's mulberrywing	G4T?	S1	C2	E
Polites mystic	Long dash	G5	S3S4		
Problema bulenta	Rare skipper	G2G3	S1	C2	T
Pyrgus wyandot	Southern grizzled skipper	G3Q	S1	C2	E
Satyrus acadica	Acadian hairstreak	G5	SA		
Satyrus caryaevorum	Hickory hairstreak	G4	S1		E
Satyrus edwardsii	Edwards' hairstreak	G4	S1		E
Satyrus kingi	King's hairstreak	G3G4	S1		T
Speyeria atlantis	Atlantis fritillary	G5	S1		T
Speyeria diana	Diana	G3	SA	C2	
Speyeria idalia	Regal fritillary	G3	S1	C2	E
<u>Lepidoptera - Moths</u>					
Apamea apamiformis	A noctuid moth	G4	S2S3		
Apamea mixta	A noctuid moth	GU	S1		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
<i>Apamea plutonia</i>	A noctuid moth	G4	SU		
<i>Capis curvata</i>	A noctuid moth	G4	S1S2		
<i>Catocala marmorata</i>	Marbled underwing	G4	SH	3C	
<i>Catocala pretiosa pretiosa</i>	Precious underwing	G4	SH	C2	
<i>Cyclophora nanaria</i>	A geometrid moth	G5	S1?		
<i>Dasychira atrivenosa</i>	A lymantriid moth	G4	SU		
<i>Ectoedemia castaneae</i>	American chestnut nepticulid moth	GX	SX	3A	
<i>Ectoedemia phleophaga</i>	Phleophagan chestnut nepticulid moth	GX	SX	3A	
<i>Elaphria georgei</i>	A noctuid moth	G4	SU		
<i>Hadena ectypa</i>	A noctuid moth	G3G4	SU		
<i>Hemileuca maia</i> ssp 4	Woodland buckmoth	G4T4	SU		
<i>Isoparce cupressi</i>	Cypress sphinx moth	G4	SU		
<i>Lytrosia sinuosa</i>	Sinuuous lytrosis	G4?	S1S3		
<i>Meropoleon titan</i>	A noctuid moth	G2G4	SU		
<i>Papaipema duovata</i>	Seaside goldenrod stem borer	G3G4	SU		
<i>Papaipema polymniae</i>	Polymnia stalk borer	GU	SH		
<i>Schinia parmeliana</i>	A noctuid moth	GH	SH		
<i>Sphinx franckii</i>	Franck's sphinx	G4	SH		
<i>Synanthedon castaneae</i>	Chestnut clearwing moth	G2G3	SX	C2	
<i>Xestia bollii</i>	A noctuid moth	G4?	SU		

FISHES

<i>Acantharchus pomotis</i>	Mud sunfish	G5	S2		
<i>Acipenser brevirostrum</i>	Shortnose sturgeon	G3	S1	LE	E
<i>Acipenser oxyrinchus</i>	Atlantic sturgeon	G3	S1		
<i>Catostomus catostomus</i>	Longnose sucker	G5	S1		E
<i>Centrarchus macropterus</i>	Flier	G5	SU		
<i>Clinostomus elongatus</i>	Redside dace	G5	S1		
<i>Cottus cognatus</i>	Slimy sculpin	G5	S1		T
<i>Enneacanthus chaetodon</i>	Blackbanded sunfish	G5	S1		I
<i>Etheostoma sellare</i>	Maryland darter	G1	S1	LE	E
<i>Etheostoma vitreum</i>	Glassy darter	G4	S1		E
<i>Fundulus luciae</i>	Spotfin killifish	G4?	S2		
<i>Noturus flavus</i>	Stonecat	G5	S1		I
<i>Percina caprodes</i>	Logperch	G5	S1		
<i>Percina notogramma</i>	Stripeback darter	G4	SH		X
<i>Percopsis omiscomaycus</i>	Trout-perch	G5	SH		X
<i>Rhinichthys bowersi</i>	Cheat minnow	G1	SX	C2	X

AMPHIBIANS

<i>Ambystoma jeffersonianum</i>	Jefferson salamander	G5	S3		
<i>Ambystoma tigrinum</i>	Eastern tiger salamander	G5	S2		E
<i>Aneides aeneus</i>	Green salamander	G3G4	S2		E
<i>Cryptobranchus alleganiensis</i>	Hellbender	G4	S1	C2	E
<i>Gastrophryne carolinensis</i>	Eastern narrow-mouthed toad	G5	S1S2		E
<i>Hyla gratiosa</i>	Barking treefrog	G5	S1		E
<i>Necturus maculosus</i>	Mudpuppy	G5	S1		X
<i>Plethodon wehrlei</i>	Wehrle's salamander	G5	S2		I
<i>Pseudacris brachyphona</i>	Mountain chorus frog	G5	S2		T
<i>Rana virgatipes</i>	Carpenter frog	G5	S2		I
<i>Siren lacertina</i>	Greater siren	G5	SRF		X

REPTILES

<i>Apalone spinifera</i>	Eastern spiny softshell	G5	S1		I
<i>Caretta caretta</i>	Atlantic loggerhead turtle	G3	S1	LT	T
<i>Cemophora coccinea</i>	Eastern scarlet snake	G5	S3		
<i>Chelonia mydas</i>	Atlantic green turtle	G3	S1	LT	T
<i>Clemmys muhlenbergii</i>	Bog turtle	G3	S2	C2	T
<i>Crotalus horridus</i>	Timber rattlesnake	G5	S3		
<i>Dermochelys coriacea</i>	Atlantic leatherback turtle	G3	S1	LE	E
<i>Eretmochelys imbricata</i>	Atlantic hawksbill turtle	G3	SR	LE	E
<i>Eumeces anthracinus</i>	Northern coal skink	G5	SU		E
<i>Farancia erythrogramma</i>	Rainbow snake	G5	S1		E
<i>Graptemys geographica</i>	Map turtle	G5	S1		E*
<i>Lepidochelys kempi</i>	Atlantic ridley turtle	G1	S1	LE	E
<i>Nerodia erythrogaster</i>	Redbelly water snake	G5	S2S3		
<i>Pituophis melanoleucus</i>	Northern pine snake	G5	SR	C2	
<i>Virginia valeriae pulchra</i>	Mountain earth snake	G5T5	S2		E

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
BIRDS					
Accipiter gentilis	Northern goshawk	G4	S1B	C2	E
Accipiter striatus	Sharp-shinned hawk	G5	S1S2B		
Aegolius acadicus	Northern saw-whet owl	G5	S1B		
Aimophila aestivalis	Bachman's sparrow	G3	SHB	C2	X
Ammodramus caudacutus	Sharp-tailed sparrow	G5	S3B		
Ammodramus henslowii	Henslow's sparrow	G4	S1B	C2	T
Asio flammeus	Short-eared owl	G5	SHB		I
Asio otus	Long-eared owl	G5	SHB		
Bartramia longicauda	Upland sandpiper	G5	S1B		E
Botaurus lentiginosus	American bittern	G4	S1S2B		I
Campephilus principalis	Ivory-billed woodpecker	G1	SX	LE	X
Camptorhynchus labradorius	Labrador duck	GX	SX		
Caprimulgus vociferus	Whip-poor-will	G5	S3S4B		
Carpodacus purpureus	Purple finch	G5	S3B		
Catharus guttatus	Hermit thrush	G5	S3S4B		
Catharus ustulatus	Swainson's thrush	G5	SXB		
Charadrius melodus	Piping plover	G3	S1B	LT	E
Charadrius wilsonia	Wilson's plover	G5	S1B		E
Chondestes grammacus	Lark sparrow	G5	SXB		X
Chordeiles minor	Common nighthawk	G5	S3S4B		
Circus cyaneus	Northern harrier	G5	S2B		
Cistothorus platensis	Sedge wren	G5	S1B		T
Contopus borealis	Olive-sided flycatcher	G5	SHB		E
Conuropsis carolinensis	Carolina parakeet	GX	SX		
Corvus corax	Common raven	G5	S3B		
Dendroica cerulea	Cerulean warbler	G5	S3S4B	C2	
Dendroica fusca	Blackburnian warbler	G5	S1S2B		T
Ectopistes migratorius	Passenger pigeon	GX	SX		
Egretta caerulea	Little blue heron	G5	S3B		
Egretta tricolor	Tricolored heron	G5	S3B		
Empidonax alnorum	Alder flycatcher	G5	S2B		I
Empidonax minimus	Least flycatcher	G5	S3S4B		
Falco peregrinus	Peregrine falcon	G3	SXSEB	LE	E
Gallinula chloropus	Common moorhen	G5	S2B		I
Haematopus palliatus	American oystercatcher	G5	S2S3B		
Haliaeetus leucocephalus	Bald eagle	G3	S2S3B	LE	E
Ixobrychus exilis	Least bittern	G5	S2S3B		I
Junco hyemalis	Dark-eyed junco	G5	S2B		
Lanius ludovicianus	Loggerhead shrike	G4	S1B	C2	E
Larus atricilla	Laughing gull	G5	S1B		
Laterallus jamaicensis	Black rail	G4?	S2S3B	C2	I
Limothlypis swainsonii	Swainson's warbler	G4	S1B		E
Lophodytes cucullatus	Hooded merganser	G5	S1B		
Numenius borealis	Eskimo curlew	G1	SX	LE	X
Nyctanassa violacea	Yellow-crowned night-heron	G5	S2S3B		
Oporornis philadelphia	Mourning warbler	G5	S1B		E
Passerculus sandwichensis	Savannah sparrow	G5	S3S4B		
Picoides borealis	Red-cockaded woodpecker	G2	SHB	LE	X
Podilymbus podiceps	Pied-billed grebe	G5	S2B		
Poocetes gramineus	Vesper sparrow	G5	S3S4B		
Porzana carolina	Sora	G5	S1B		
Regulus satrapa	Golden-crowned kinglet	G5	S2B		
Rynchops niger	Black skimmer	G5	S1S2B		T
Seiurus noveboracensis	Northern waterthrush	G5	S2S3B		
Sitta canadensis	Red-breasted nuthatch	G5	S1B		
Sphyrapicus varius	Yellow-bellied sapsucker	G5	SHB		
Spiza americana	Dickcissel	G4	S2B		
Sterna antillarum	Least tern	G4	S2B		T
Sterna dougallii	Roseate tern	G3	SHB	LE	X
Sterna maxima	Royal tern	G5	S1B		E
Sterna nilotica	Gull-billed tern	G5	S1B		T
Sterna sandvicensis	Sandwich tern	G4	S1B		
Thryomanes bewickii altus	Bewick's wren	G5T?	S1B	C2	E
Troglodytes troglodytes	Winter wren	G5	S2B		
Tympanuchus cupido	Greater prairie-chicken	G4	SX		X
Tyto alba	Common barn-owl	G5	S3		
Vermivora chrysopetra	Golden-winged warbler	G4	S3B		
Vermivora ruficapilla	Nashville warbler	G5	S1S2B		I
Wilsonia canadensis	Canada warbler	G5	S3B		

SCIENTIFIC NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
MAMMALS					
Balaenoptera borealis	Sei whale	G2	S?	LE	E
Balaenoptera musculus	Blue whale	G2	S?	LE	E
Balaenoptera physalus	Fin whale	G2	S?	LE	E
Bos bison	American bison	G4	SX		
Canis lupus	Gray wolf	G4	SX	LE	X
Cervus elaphus	American elk	G5	SX		X
Condylura cristata parva	Southeastern star-nosed mole	G5T4	SU	3C	
Erethizon dorsatum	Porcupine	G5	S1S2		I
Eubalaena glacialis	Black right whale	G2	S?	LE	E
Felis concolor cougar	Eastern cougar	G4TH	SH	LE	X
Lepus americanus	Snowshoe hare	G5	SH		X
Lynx rufus	Bobcat	G5	S3		I
Martes americana	American marten	G5	SX		X
Megaptera novaeangliae	Humpback whale	G2	S?	LE	E
Microtus chrotorrhinus carolinensis	Southern rock vole	G5T3	S1	C2	E
Mustela nivalis	Least weasel	G5	SU		I
Myotis leibii	Eastern small-footed bat	G3	S2	C2	I
Myotis sodalis	Indiana bat	G2	S1	LE	E
Neotoma magister	Allegheny woodrat	G3G4	S1	C2	E
Physeter catodon	Sperm whale	G2	S?	LE	E
Reithrodontomys humulis	Eastern harvest mouse	G5	SH		X
Sciurus niger cinereus	Delmarva fox squirrel	G5T3	S1	LE	E
Sorex dispar	Long-tailed shrew	G5	S2	3C	I
Sorex fumeus	Smokey shrew	G5	S1?		T
Sorex hoyi winnemana	Southern pygmy shrew	G5T5	S2	3C	
Sorex longirostris	Southeastern shrew	G5	S3S4		
Sorex palustris punctulatus	Southern water shrew	G5T3	S1	C2	E
Spilogale putorius	Eastern spotted skunk	G4	S1		
Sylvilagus obscurus	Appalachian cottontail	G4	S2	C2	I
Synaptomys cooperi	Southern bog lemming	G5	S3		
Ursus americanus	Black bear	G5	S2		

APPENDIX I

SPECIES UNDER REVIEW FOR INCLUSION ON HERITAGE LIST

SCIENTIFIC NAME

COMMON NAME

MOLLUSCS

Anodonta imbecillis	Paper pondshell
Anodonta implecata	Alewife floater
Discus catskillensis	A snail
Elliptio producta	Atlantic spike
Fontigens nickliniana	A snail
Leptodea ochracea	Tidewater mucket
Ligumia nasuta	Eastern pondmussel
Stenotrema stenotrema	A snail
Strophitus undulatus	Interior squawfoot
Vitrina limpida	A snail

CRUSTACEANS

Cambarus acuminatus	A crayfish
Cambarus carolinus	A crayfish
Cambarus dubius	A crayfish
Fallicambarus uhleri	A crayfish
Orconectes limosus	A crayfish
Orconectes obscurus	A crayfish
Orconectes virilis	A crayfish
Procambarus acutus	A crayfish

INSECTS

Odonata

Calopteryx amata	Superb jewelwing
Celithemis martha	Martha's pennant
Cordulegaster bilineata	Brown spiketail
Epitheca spinosa	Robust baskettail
Gomphus abbreviatus	Spine-crowned clubtail
Gomphus parvidens	Piedmont clubtail
Helocordulia selysii	Selys' sunfly
Nannothemis bella	Elfin skimmer
Ophiogomphus incurvatus	Alegheeny snaketail
Stylurus amnicola	Riverine clubtail
Stylurus laurae	Laura's clubtail

Plecoptera

Alloctapania zekia	A stonefly
--------------------	------------

Heteroptera

Cariniocoris nyssae	A mirid bug
Chinaola quercicola	A microphysid
Hesperophylum heidemannii	A plant bug

Coleoptera

Agabates acuductus	A dytiscid beetle
Cicindela formosa	A tiger beetle
Cyphon sp.	A water beetle

SCIENTIFIC NAME

COMMON NAME

Diabrotica cristata
Eutochia picea
Helocombus bifidus
Helops cisteloides
Hydroporus deflatus
Polypleurus perforatus
Pseudanophthalmus sp. 1
Schoenicus puberulus

A chrysomelid beetle
A tenebrionid beetle
A hydrophilid beetle
A tenebrionid beetle
A dytiscid beetle
A tenebrionid beetle
A cave beetle
A tenebrionid beetle

Lepidoptera - Butterflies

Atrytone logan
Atrytonopsis hianna
Closyne nycteris
Hesperia leonardis
Hesperia metea
Neonympha mitchellii
Pieris virginensis
Polygonia progne

Delaware skipper
Dusted skipper
Silvery checkerspot
Leonard's skipper
Cobweb skipper
Mitchell's marsh satyr
West Virginia white
Gray comma

Lepidoptera - Moths

Anacamptodes pergracilis
Apamea mixta
Argyrostroma quadrifilaris
Euxoa immixta
Hemeroplanis scopulepes
Holomelina immaculata
Lithophane lemmeri
Pachypolia atricornis
Papaipema araliae
Parapema buffaloensis
Ptichodis bistrigata
Ptichodis herbarum
Rhodoecia aurantiago
Semiothisa aequiferaria

A geometrid moth
A noctuid moth
Four-lined chocolate moth
A noctuid moth
Variable tropic moth
Plain-winged holomelina
Lemmer's noctuid moth
A noctuid moth
A noctuid moth
A noctuid moth
Southern ptichodis
Common ptichodis
Aurelaria seed borer
A geometrid moth

Diptera

Wyeomyia haynei
Wyeomyia smithi

A mosquito
A Pitcher-plant mosquito

Hymenoptera

Proceratium croceum

A formicid ant

FISHES

Cottus sp.
Etheostoma zonale
Notropis bifrenatus
Notropis chalybeus

A darter
Banded darter
Bridle shiner
Ironcolor shiner

REPTILES

Clemmys insculpta
Elaphe guttata
Eumeces laticeps
Malaclemys terrapin
Regina septemvittata
Thamnophis sauritus

Wood turtle
Corn snake
Broadhead skink
Diamondback terrapin
Queen snake
Eastern ribbon snake

APPENDIX II

EXPLANATION OF GLOBAL AND STATE SPECIES RANKS

Originally developed and instituted by The Nature Conservancy, an international conservation organization, the global and state ranking system is used by all 50 state Natural Heritage Programs and numerous Conservation Data Centers in other countries in this hemisphere. Because they are assigned based upon standard criteria, the ranks can be used to assess the range-wide status of a species as well as the status within portions of the species' range. The primary criterion used to define these ranks are the number of known distinct occurrences with consideration given to the total number of individuals at each locality. Additional factors considered include the current level of protection, the types and degree of threats, ecological vulnerability, and population trends. Global and state ranks are used in combination to set inventory, protection, and management priorities for species both at the state as well as regional level. Definitions for the following ranks have been modified from The Nature Conservancy's Operations Manual (1988).

GLOBAL RANK

- G1 Highly globally rare. Critically imperiled globally because of extreme rarity (typically 5 or fewer estimated occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.
- G2 Globally rare. Imperiled globally because of rarity (typically 6 to 20 estimated occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
- G3 Either very rare and local throughout its range or distributed locally (even abundantly at some of its locations) in a restricted range (e.g., a single western state, a physiographic region in the East) or because of other factors making it vulnerable to extinction throughout its range; typically with 21 to 100 estimated occurrences.
- G4 Apparently secure globally, although it may be quite rare in parts of its range, especially at the periphery.
- G5 Demonstrably secure globally, although it may be quite rare in parts of its range, especially at the periphery.
- GH No known extant occurrences (i.e., formerly part of the established biota, with the expectation that it may be rediscovered).
- GU Possibly in peril range-wide, but its status is uncertain; more information is needed.
- GX Believed to be extinct throughout its range (e.g., passenger pigeon) with virtually no likelihood that it will be rediscovered.
- G? The species has not yet been ranked.
- _Q Species containing a "Q" in the rank indicates that the taxon is of questionable or uncertain taxonomic standing (i.e., some taxonomists regard it as a full species, while others treat it at an infraspecific level).
- _T Ranks containing a "T" indicate that the infraspecific taxon is being ranked differently than the full species.

Appendix C

Applicability Analysis for BRAC 1995 Relocations to NSWCCD

APPLICABILITY ANALYSIS
for
BRAC 1995 Relocations to NSWCCD
Required by the
Clean Air Act Conformity Rule of 1993 (40 CFR 93)

October 17, 1996

THE PROPOSED ACTION

A number of research and development activities from other NSWCC sites in Maryland are to be relocated to the Carderock Center in Bethesda, Maryland because of 1995 BRAC Commission recommendations. The proposed action is to accommodate the new activities at the Carderock Center by renovating existing buildings and constructing new ones, and adding associated facilities such as parking and utility connections. Four new buildings, four renovations and 3 small structures would house the laboratories, offices and equipment of the 175 personnel employed by the relocating activities. The new and renovated buildings would be served by existing Carderock base utility systems, which currently possesses capacity without undergoing expansions. Increases in support services at the Center are not expected to be needed to accommodate the new personnel.

CONFORMITY ANALYSIS

The Carderock Center is located within Maryland Air Quality Control Area IV (AQCA IV) which is classified as a serious ozone non-attainment area. Because of this classification, new sources of volatile organic compounds (VOC) and oxides of nitrogen (NOx) which exceed *de minimis* levels, as defined in federal and state regulations, must make a Conformity Determination to demonstrate conformance with the State Implementation Plan. This applicability analysis was conducted to identify potential increases in VOC and NOx that would be associated with the proposed action, and to determine if the proposed action would be clearly *de minimis*. The estimates of emissions were compared to the *de minimis* levels of 50 tons per year (tpy) each for VOC and NOx. If the estimated emissions for the proposed action are below *de minimis* levels, the action is assumed to conform. If they are at or above *de minimis* levels, then a formal conformity determination must be made.

Some of the emissions sources that will be relocating to the Naval Surface Warfare Center at Carderock are currently operating at the Naval Surface Warfare Center at White Oak, Maryland. Because they are and will continue to operate within AQCA IV, and because conformity estimates are for the net increase that is expected from new sources in an area, the sources relocating from White Oak are not included in the calculation. The functions that will produce a net emissions increase of VOC and NOx and the estimated levels of emissions are included in the tables on pages 4 through 6.

PEAK YEAR NET EMISSIONS OF CRITERIA POLLUTANTS

Emissions During Construction Construction of the new facilities and renovations would all take place in 3 locations at the Center during 1996, 1997 and 1998. The peak year of construction

would be during 1997 with a combined 35 months of construction scheduled for the year. That would be the equivalent of three buildings under construction all year. The specific projects that would be active during 1998 are; the last 3 months of renovation to buildings 11 and 12, the initial 9 months of construction for the Building 11 Annex, 7 months of renovations in Building 157, complete construction of the Metal Forming and Coating Facility, and the initial 9 months of construction on the Magnetics Complex. Management practices would be used, as appropriate, to control dust during construction. Disturbed soil areas would be stabilized as soon as practical after construction to minimize wind erosion of dust.

The structures are planned to be constructed of common materials including concrete block, poured concrete, wood, glass and various metals. Construction equipment, such as backhoes and cranes will be used during construction, and will emit VOC and NOx while in use. Heavy equipment emissions were estimated using emission rates from the EPA document *Compilation of Air Pollutant Emission Factors Volume II: Mobile Sources (AP-42)*. Emission factors, expressed in pounds per hour (lb/hr) of equipment use are based on average emissions from 9 classes of diesel construction equipment. That factor is multiplied by 10 pieces of equipment operating for 8 hours per day for 240 days.

Vehicles delivering construction materials will also produce emissions. These have been estimated using an assumed 30 vehicle trips per day from the Main Gate to the proposed construction sites. Emission factors for delivery vehicles have been based on the EPA approved MOBILE5a model for 1996. The model calculates an average fleet emission rates in grams of pollutant per vehicle mile traveled (g/mile).

VOC emissions from waterproofing and sealants to be used in the buildings were estimated assuming that a single coating of these products would be applied to foundations and various joints in the structures. The areas to be coated with these products were based on the architect's estimates. Paint and wood finish are assumed to be applied using 1 primer and 2 finish coats. Coverage and VOC content for latex paint and petroleum based wood varnish products are based on what is typical for commonly used products.

The parking areas would be paved using emulsified asphalt, which has a minimal VOC content. Therefore, emissions for installation of the paved areas are only those associated with the paving equipment. These have been included with the construction equipment discussed above.

Emissions from Facility Operations New sources of emissions coming into AQCA IV from the Annapolis Detachment would be metal forming, metal coating, polyurethane prototyping and new employee commuting to Carderock. The assumptions and formulae used to arrive at these totals are as follows:

1. Metal Forming: A closed system with an inert argon atmosphere, with residual metal captured in a water wash scrubber and recycled. There are no air emissions from this process, however, a 4 horse power gasoline powered compressor, used to pressurize the argon, is estimated to emit 0.017 ton VOC and 0.015 ton NOx per peak operating year. (480 hrs x 31.3 grams/hr VOC and 28.2 grams/hr NOx = 0.017 ton per year VOC and 0.015 ton per year NOx)
2. Metal Coating: Based on 1993 registration data filed with MDE, the process emits 0.008 pounds of NOx per hour during a 600 hour peak operating year. (0.008 lbs x 600 hrs. = 4.8 lbs per year / 2000 lbs = 0.0024 tons per year) The annual total emission is,

therefore, 0.0024 tons per year. Solidified overspray dust is captured in a water wash scrubber and managed as hazardous waste.

3. Polyurethane Forming: Cleaning solvents used to clean process equipment emit 0.083 tons per year of VOC. This estimate is based on historical material usage.

When all the relocations are complete, 175 personnel who currently commute from throughout the region to NSWC White Oak and Annapolis will shift their destination to Carderock. It is assumed that approximately 2/3, or 115 individuals live outside AQCA IV and will begin commuting into it to reach the Carderock Center. Approximately 30 new vehicle miles will be driven by each of the individuals within AQCA IV each work day. Emission factors provided by WASHCOG for sketch level analysis projected to 1999 are used in the calculation shown in the table for Commuter Vehicle Emissions.

Heating and cooling in the new facilities would be accomplished using electric heat pumps and space heaters that would produce no net increase in emissions within the AQCA IV.

ANALYSIS AND FINDINGS

Construction emissions are estimated to total 2.99 tons of VOC and 17.62 tons of NOx during the busiest construction year, 1997. Emissions for construction during 1996 and 1998 are estimated to reach only 1.0 tons of VOC and 5.9 tons of NOx. The peak annual increase in emissions from the Carderock Center during operation of the relocated facilities is estimated to be 0.57 tons of VOC and 1.29 tons of NOx. Therefore, the net peak year increase of emissions over present levels in AQCA IV due to the proposed relocations to Carderock are:

VOC	3.56 tons
NOx	18.90 tons

The applicability analysis shows that annual emissions during construction and operation, allowing for closing of facilities at White Oak, would be below the *de minimis* levels of 50 tons per year for VOC and NOx. Therefore Conformity Regulations would not apply to this federal action and a Conformity Determination would not be required.

Calculation of Peak Year Net Emissions

Construction Equipment

Assumed number of construction vehicles operating: 10 per day
 Number of construction hours per day: 8
 Number of work days per year: 240
 Total hours per year for equipment use: 19,200 hours/yr

Construction Equipment Emissions

Pollutant	lb/hr*	lb/yr	tpy
VOC	0.154	2,956.8	1.48
NOx	1.835	35,232.0	17.62

*AP-42 Volume II: Mobile Sources (Composite emissions for 9 construction vehicle types)

Construction Delivery Vehicles

Average round trip mileage per delivery: 0.25
 Number of vehicle trips per day: 30
 Number of delivery days per year: 240
 Total yearly mileage for delivery vehicles: 1,800 miles/yr

Delivery Vehicle Emissions

Pollutant	g/mile*	kg/yr	lb/yr	tpy
VOC	1.810	3.3	7.2	0.004
NOx	2.380	4.3	8.8	0.004

*Mobile5a: 1996; 30 mph

Calculation of Peak Year Net Emissions

Construction Paint Use

Paint coverage: 400 ft²/gal
 Paint VOC content: 2.09 lb/gal
 Number of coats: 3 (Includes primer)
 Wood Finish VOC Content: 4.25 lb/gal

Paint Emissions

Facility	Painting Surface (ft ²)	Gallons Used	Year VOC Emission (lb)	VOC tpy
M1 - M5 (wood finish)	12,265	92.0	390.9	0.20
Metal Form & Coat	11,300	84.8	177.1	0.09
Building 19, Floor 2	19,600	147.0	307.2	0.15
Building 19, Basement	4,900	36.8	76.8	0.04
Building 11, Existing	16,600	124.5	260.2	0.13
Building 11, Annex	43,000	322.5	674.0	0.34
Building 12	16,000	120.0	250.8	0.13
Total	123,665	927.5	2,137.1	1.07

Construction Sealant Use

Sealant coverage: 150 ft²/gal
 Sealant VOC content: 2.5 lb/gal
 Number of coats: 1

Sealant Emissions

Facility	Painting Surface (ft ²)	Gallons Used	Year VOC Emission (lb)	VOC tpy
M1 through M5	36,300	242.0	605.0	0.30
Metal Form & Coat	7,000	46.7	116.7	0.06
Building 19, Floor 2	-	-	-	-
Building 19, Basement	-	-	-	-
Building 11, Existing	-	-	-	-
Building 11, Annex	9,835	65.6	163.9	0.08
Building 12	-	-	-	-
Total	53,135	354.2	885.6	0.44

Construction Emissions Summary - 1997

Pollutant	Equipment	Delivery	Paint	Sealant	Total
VOC (tpy)	1.48	0.004	1.07	0.44	2.99
NOx (tpy)	17.62	0.004			17.62

Calculation of Peak Year Net Emissions

Operation Emissions - Activities Relocating from Annapolis

Activity	VOC tpy	NOx tpy
Metal Forming:	0.02	0.015
Metal Coating:	-	0.002
Polyurethane Form:	0.08	-
Total:	0.10	0.017

Vehicle Emissions - New Commuting into Area IV

Work days per year:	240
Average round trip miles per commuter in AQA IV:	30
New commuters into AQA IV:	115
Total new commuter miles per year:	828,000

Emissions

Pollutant	g / mile*	kg / year	lb / year	tpy
VOC	0.516	427.25	939.95	0.47
NOx	1.390	1,150.92	2,532.02	1.27

* Mobile5a 1997; 35mph.

TOTAL NET EMISSIONS

Highest Year - 1997 Increase to Air Quality Area IV		
	VOC tpy Total	NOx tpy Total
Construction:	2.99	17.62
Operations:	0.10	0.02
Commuting:	0.47	1.27
Total:	3.56	18.90

Appendix D

**Record of Non-applicability for New Air Sources at Naval Surface Warfare
Center, Carderock Division (NSWCCD)**



DEPARTMENT OF THE NAVY

NAVAL SURFACE WARFARE CENTER
CARDEROCK DIVISION

CARDEROCK DIVISION HEADQUARTERS
DAVID TAYLOR MODEL BASIN
BETHESDA, MD. 20084-5000

IN REPLY REFER TO:

5090
007:519

MEMORANDUM TO THE RECORD

From: Commander, Naval Surface Warfare Center, Carderock Division

Subj: RECORD OF NON-APPLICABILITY FOR NEW AIR SOURCES AT NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION (NSWCCD)

Ref: (A) Chief of Naval Operations Interim Guidance on Compliance with the Clean Air Act General Conformity Rule (Draft)

Encl: (1) Applicability Analysis for BRAC 1995 Relocations to NSWCCD Required by the Clean Air Act Conformity Rule of 1993 (40 CFR 93)

1. In accordance with section E, paragraph 2 of Ref (A) this memo and Encl (1) serve as the Record of Non-Applicability for the BRAC 95 NSWCCD relocation action.
2. The POC for this matter is Mr. Michael Klitsch, telephone 301-227-3899.

A handwritten signature in cursive script, reading "Marie E. Ferdman", is positioned above the typed name.

MARIE E. FERDMAN
Division/Site Environmental Program Manager
By Direction

Appendix E

Memorandum of Agreement for the Transonic Wind Tunnel Complex

MEMORANDUM OF AGREEMENT

SUBMITTED TO THE ADVISORY COUNCIL ON HISTORIC PRESERVATION
PURSUANT TO 36 CFR§800.6(a)

WHEREAS, the Department of the Navy, U. S. Department of Defense, has determined that the Base Realignment and Closure (BRAC) modifications to the NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION (NSWCCD) in Bethesda Maryland will have an adverse effect upon the Wind Tunnel Complex, properties eligible for inclusion in the National Register of Historic Places, and has consulted with the Maryland State Historic Preservation Officer (SHPO) pursuant to 36 CFR Part 800, regulations implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470f);

NOW, THEREFORE, NSWCCD and the Maryland SHPO agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the effect of the undertaking on historic properties.

Stipulations

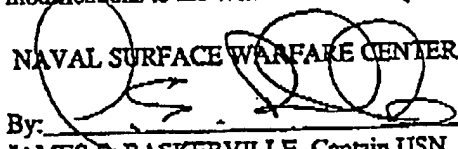
NSWCCD will ensure that the following measures are carried out:

1. With regards to the Wind Tunnel Complex consisting of the Subsonic Wind Tunnel Buildings No. 7, 138, 139; Ancillary structures No. 140, 141 and 163; the Transonic Wind tunnel Buildings No. 12, 13, and 157; Ancillary structures No. 158, 182 and 187; the Supersonic Wind Tunnel Air Building No. 11; Ancillary structures No. 146 and 168.

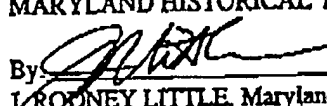
a. The Navy will record the Wind Tunnel Complex in accordance with the documentation required by the National Park Service projects #1400-A, 1400-B, 1401, and 1402. This documentation includes a concise Historic American Engineering Record (HAER) "Narrative Format" summary and a separate "Narrative Format" report and graphic documentation on each building in accordance with the "Guide to Written Reports for the Historic American Engineering Record (April 1995) (GWR HAER). The photographic documentation will follow the "Guide for the Preparation of Photographic Documentation in Accordance with the Standards of the Historic American Buildings Survey/Historic American Engineering Record" (March 1991) HABS/HAER). A copy of the final documentation will be provided to the SHPO.

Execution of this Memorandum of Agreement by NSWCCD and the Maryland SHPO, its subsequent acceptance by the Council, and implementation of its terms, is evidence that NSWCCD has afforded the Council an opportunity to comment on the Base Realignment and Closure (BRAC) modifications to the Wind Tunnel Complex and its effects on historic properties.

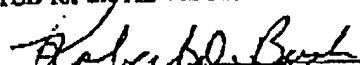
NAVAL SURFACE WARFARE CENTER CARDEROCK DIVISION

By:  Date: 30 MAY 96
JAMES E. BASKERVILLE, Captain USN

MARYLAND HISTORICAL TRUST

By:  Date: 6-11-96
J. RODNEY LITTLE, Maryland State Historic Preservation Officer

ACCEPTED for the ADVISORY COUNCIL ON HISTORIC PRESERVATION

By:  Date: 9-4-96
ROBERT D. BUSH, Executive Director