AA-2179
Engineering Experiment Station
Anne Arundel County
Annapolis, Maryland

Capsule Summary

The Annapolis Laboratory of NSWC, Carderock Division (NSWC, Annapolis), is located in Annapolis, Maryland, on the northeast bank of the Severn River, across from the U.S. Naval Academy. In 1904, the Annapolis installation was founded as the U.S. Naval Engineering Experiment Station. At the behest of Rear Admiral George W. Melville, Engineer-in-Chief of the Navy at that time, the Station was established as a permanent, full-time laboratory to develop Naval standards for material procurement, and machinery operation and maintenance.

The first significant enlargement of the installation occurred during World War II, and continued into the beginning of the Cold War-era. Expansion occurred primarily when accelerated workloads resulted in a shortage or insufficiency of testing facilities. During the 1950s, the installation's mission changed gradually from testing and experimentation to research and development. R&D programs continued to be the focus of operations at the installation through success organizational changes; NSWC, Annapolis, began operations in 1988. However, NSWC, Annapolis, is scheduled to close by the year 2000. The majority of the R&D programs, and the machinery and personnel already have been transferred to the Carderock or Philadelphia detachments of NSWC. Complete closure of the base is expected by the year 2000, but until then, work on R&D programs continues.

The National Register eligibility was assessed for 96 buildings and structures at Annapolis Laboratory of NSWC, Carderock Division. Architectural resources over 50 years in age were assessed applying the National Register criteria for evaluation (36 CFR 60.4 [a-d]). Cold War-era resources (1946-1989) were evaluated applying the National Register criteria considerations and DoD guidance for *exceptional significance* for resources less than 50 years of age. None of the surveyed buildings and structures at this site possess significance or those qualities of integrity necessary for listing in the National Register of Historic Places.

Maryland Historical Trust
State Historic Sites Inventory Form

MARYLAND INVENTORY OF HISTORIC PROPERTIES

Survey No. AA-2179

Magi No.

DOE __yes __no

1. Name (indicate preferred name)

historic U.S. Naval Engineering Experiment Station

and/or common Naval Surface Warfare Center (NSWC) Annapolis

2. Location

street & number N/A ___ not for publication

city, town Annapolis ___ vicinity of congressional district

state Maryland county Anne Arundel

3. Classification

Category	Ownership	Status	Present Use	
X district	___ public	X occupied	___ agriculture	___ museum
___ building(s)	X private	___ unoccupied	___ commercial	___ park
___ structure	___ both	___ work in progress	___ educational	___ private residence
___ site	**Public Acquisition**	**Accessible**	___ entertainment	___ religious
___ object	___ in process	X yes: restricted	___ government	___ scientific
	___ being considered	___ yes: unrestricted	___ industrial	___ transportation
	X not applicable	___ no	X military	___ other:

4. Owner of Property (give names and mailing addresses of all owners)

name U.S. Department of the Navy

street & number Naval Surface Warfare Center, Carderock Div. telephone no.: N/A

city, town Bethesda state and zip code Maryland 20084

5. Location of Legal Description

courthouse, registry of deeds, etc. liber

street & number folio

city, town state

6. Representation in Existing Historical Surveys

title See Attatched Sheet.

date ___ federal ___ state ___ county ___ local

depository for survey records

city, town state

7. Description

Survey No. AA-2179

Condition		Check one	Check one
___ excellent	___ deteriorated	___ unaltered	___ original site
_X_ good	___ ruins	___ altered	___ moved date of move _____
___ fair	___ unexposed		

Prepare both a summary paragraph and a general description of the resource and its various elements as it exists today.

See Attatched Sheets.

8. Significance

Survey No. AA-2179

Period	Areas of Significance—Check and justify below				
___ prehistoric	___ archeology-prehistoric	___ community planning	___ landscape architecture	___ religion	
___ 1400–1499	___ archeology-historic	___ conservation	___ law	___ science	
1500–1599	_X_ agriculture	___ economics	___ literature	___ sculpture	
___ 1600–1699	___ architecture	___ education	_X_ military	___ social/ humanitarian	
___ 1700–1799	___ art	___ engineering	___ music	___ theater	
___ 1800–1899	___ commerce	___ exploration/settlement	___ philosophy	___ transportation	
_X_ 1900–	___ communications	___ industry	___ politics/government	___ other (specify)	
		___ invention			

Specific dates **Builder/Architect**

check: Applicable Criteria: _X_A __B _X_C __D
and/or
Applicable Exception: __A __B __C __D __E __F __G

Level of Significance: _X_national __state __local

Prepare both a summary paragraph of significance and a general statement of history and support.

See Attatched Sheets.

9. Major Bibliographical References

Survey No. AA-2179

10. Geographical Data

Acreage of nominated property 52 AC

Quadrangle name Annapolis **Quadrangle scale** 1:24,000

UTM **References** do NOT complete UTM references

	Zone	Easting	Northing		Zone	Easting	Northing
A				B			
C				D			
E				F			
G				H			

Verbal boundary description and justification

NSWC, Annapolis is situated on the Northeast bank of the Severn River, across from the U.S. Naval Academy.

List all states and counties for properties overlapping state or county boundaries

state	code	county	code
state	code	county	code

11. Form Prepared By

name/title Lori O. Thursby, Architectural Historian

organization R. Christopher Goodwin & Assoc., Inc. **date** 21 February 1997

street & number 241 E. Fourth St., Ste. 100 **telephone** 301-694-0428

city or town Frederick **state** Maryland

The Maryland Historic Sites Inventory was officially created by an Act of the Maryland Legislature to be found in the Annotated Code of Maryland, Article 41, Section 181 KA, 1974 supplement.

The survey and inventory are being prepared for information and record purposes only and do not constitute any infringement of individual property rights.

return to: Maryland Historical Trust
Shaw House
21 State Circle
Annapolis, Maryland 21401
(301) 269-2438

Representation in Existing Historical Surveys

1) *Intensive Level Reconnaissance at the United States Naval Academy: the Main Campus, NSWC Annapolis Housing, USNA North Severn, and the Naval Academy Dairy Farm, Annapolis and Anne Arundel County, Maryland.* Draft report by R. Christopher Goodwin & Associates, Inc., November 1996. Corresponding MHT forms on file at the Maryland Historical Trust, Crownsville, Maryland.

2) An Archeological Survey of the David W. Taylor Naval Ship Research and Development Center, Carderock and Annapolis, Maryland. March 1984. Maryland Historical Trust Manuscript Series No. 35, Crownsville, Maryland.

Project Location and Description

The Annapolis Laboratory of NSWC, Carderock Division, is located in Annapolis, Maryland, on the northeast bank of the Severn River, across from the U.S. Naval Academy. It is bounded by the U.S. Naval Station, Annapolis on the north and west sides. The 43.74-acre installation contains 93 buildings and structures. Most of these built resources are laboratories and storage facilities. Initially, as the U.S. Naval Engineering Experiment Station, and now as a research and development facility, these laboratories were constructed to serve specific research functions. The storage facilities provided direct support to the main technical labs. Storage buildings were utilized to store the laboratory materials, equipment, and machinery; fuels; and, hazardous materials. Other building property types identified at NSWC, Annapolis, included industrial, infrastructure, administrative, and transportation facilities.

Architectural Resources at NSWC, Annapolis

Currently, NSWC, Annapolis, is comprised of 93 buildings and structures. This inventory form documents 87 of these resources plus an additional nine resources currently owned by the U.S. Naval Station but historically associated with the installation for a total of 96 buildings and structures identified. Of the 93 buildings and structures within NSWC, Annapolis, three resources not included include two basins, Worthington and Dungan, and Building 3, the original laboratory of the installation. These three resources, which were constructed in 1907, were examined during a previous study and determined to be ineligible for inclusion in the National Register (Weinland and Weber 1984:ii). The other three resources excluded from the documentation consist of two laboratories (Buildings 14 and 32) and one storage building (Building 161) that postdate 1989.

This documentation also did not include six residential buildings, which are located on two housing parcels which once were owned by NSWC, Annapolis. The two parcels, which total approximately 23 ac, were acquired by the U.S. Naval Academy in 1995 to alleviate a housing shortage. These dwellings were inventoried previously; they have been documented on a separate MHT Architectural Inventory Form (see Section 6).

The 96 architectural resources are organized chronologically according to four periods of development: 1) Establishment of Engineering Experiment Station (1904-1933); 2) Pre-World War II (1934-1940); 3) World War II (1941-1945); and, 4) Cold War-era (1946-1989). The following discussion provides a description of each resource's character-defining features, physical condition, and function.

Establishment of the U.S. Naval Engineering Experiment Station (1904 - 1933)

Six firemen's cottages (**Buildings 4, 5, 6, 7, 8** and 40) located on the south side of Halligan Road were constructed prior to 1918. These buildings currently are owned by Naval Station, Annapolis. The six cottages utilize identical construction techniques. The one-and-one-half story, wood-frame cottages sit on a concrete wall foundation. The cottages are three-bays wide and two-bays deep. The exterior walls are clad with stucco and terminate in a front gable roof sheathed with asphalt shingles. One gable dormer is featured on the west pitch of the roof of each cottage. The primary (north) elevation exhibits a centrally located porch entrance, which features a hipped roof supported by two Doric columns. The entrance contains a single wood panel door surmounted by a one-light transom.

Each elevation exhibits double-hung, six-over-six-light windows. To the rear is a one-story enclosed porch. The porch is five-bays wide and two-bays deep and terminates in a hipped roof.

Three garages **(Buildings 4a, 6a, 8a)** are located north of the cottages on the north side of Halligan Road. These one-story, two-bay-by-two-bay, wood-frame structures sit on poured concrete foundations. The board-and-batten walls rise to a shed roof sheathed with composition roll. The principal (south) elevation exhibits two aluminum overhead track doors. The side elevations feature six-over-one-light, wood-sash windows.

Pre-World War II (1934 - 1940)

Five buildings survive from this period of development; these resources include two laboratories (Buildings 47 and 13), two industrial facilities (Buildings 11 and 20), and one storage facility (Building 12). They currently are classified as semi-permanent construction. According to real property records, they were constructed between 1938 and 1940; however, archival research indicated that "three portable steel buildings - one each for a metallurgical laboratory [Building 47], a chemical laboratory, and a foundry [Building 11]" were constructed between 1910 and 1920 (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). The five extant pre-war resources are metal- and wood-frame construction, suggesting that these buildings may be earlier temporary buildings that were renovated between 1938 and 1940. In addition, a 1931 installation map shows Buildings 11, 13, and 20.

Building 47 is a two-story, rectangular building. It originally served as the first detached Metals Laboratory. The building continues to perform its original role and is involved in a range of activities associated with metals research. The primary entry on the east elevation consists of offset double doors surmounted by a metal hipped hood. The building terminates in a side-gable roof that is distinguished by shed dormers added to the south end. The dormers, which were installed in 1979 for office space, consist of four bays of paired window units. Fenestration consists predominantly of paired metal-sash, two-light sliding window units; these were installed ca. 1977 to replace the original bands of industrial sash windows. Other exterior modifications include the removal of a roof ventilator, and the installation of metal siding over the original stucco finish.

Building 13, the Advanced Marine Composites (Materials) Facility, is a two-story, wood-frame building terminating in a front-gabled roof sheathed with composition roll. It was constructed in 1940 as a Physical Lab, and was converted to a garage and storage facility shortly thereafter. The front elevation features an offset single door and two, second story windows. Paired metal louvered vents punctuate the east and west gable ends.

Numerous modifications have been made to the building. A second story entry on the west elevation has been enclosed, and a double door entry was installed on the south elevation. A large, central, metal overhead track door on the south elevation replaces the original sliding steel doors. All other doors consist of metal replacement units. The original industrial sash windows were replaced ca. 1980 with metal-sash, two-light sliding units. Finally, the stucco finish has been obscured by ribbed metal siding.

Buildings 11 and 20 initially were constructed as industrial shops. Several years later, the shops were renovated to house materials and metals laboratories, respectively. Both two-story buildings

terminate in a gable roof. Between 1941 and 1944, an addition was constructed to join the west end of Building 11 with Building 3E. The current rectangular configuration of Building 20 was established ca. 1941 when a central addition joined two formerly detached buildings, Buildings 20 and 20A (NSWC, Annapolis, Facilities Engineering Office 1940, 1941).

Buildings 11 and 20 feature similar exterior alterations, including replacement metal door units and metal-sash, two-light sliding window units. Original window openings consisted of single or triple units of industrial metal sash. Corrugated metal siding has been installed over the original stucco exterior. Additions also have modified the buildings' original footprints; a wood frame lean-to was appended to the west (rear) end of the east elevation of Building 11, and an addition constructed within the last 20 years connects the fronts of Buildings 11 and 13. Two bracketed, metal frame, shed hoods shelter flammable storage lockers on the east elevation of Building 11. Building 20 contains a one-story concrete block addition appended to the west end of the north elevation.

The lone storage building surviving from the pre-war development period is **Building 12.** It first served as a garage and storage building, and has been utilized subsequently for several different functions. The two-story building, which now houses an elastomers lab and offices, is three bays wide and 11 bays deep; it terminates in a front-gabled roof. The front elevation features central metal double doors surmounted by a hipped metal hood. Multiple metal pipes and ventilators puncture the east and west walls and the roof. A small, one-story, flat roof extension projects from the rear elevation.

Like the other buildings associated with the pre-war development period, Building 12 has undergone a series of exterior modifications to update and modernize the facility. For instance, the original six- and nine-light pivot windows have been replaced with metal-sash, sliding window units; some window and door openings have been infilled or replaced with air conditioning units; various single- and double-door entries on each elevation have been replaced by metal door units; and, ribbed metal siding has been installed over the buildings' original stucco exteriors.

World War II (1941 - 1945)

World War II prompted the first significant enlargement of the Experiment Station. Additional facilities were constructed within this four year period to accommodate the extensive number of test and experiment activities conducted at the Station. According to historic maps and archival resources, the number of buildings comprising the EES complex doubled from 15 at the start of the war to 30 by 1945. Laboratories and storage buildings constituted most of the wartime building stock, with a few infrastructure facilities erected for the newly-established underground water and sewage systems.

Development extended along the waterfront west of the basins. The south corner of the installation was built up from dredged fill and utilized for new construction. A small number of storage buildings were constructed northwest of Worthington Basin, marking the beginning of development in this area of the installation.

Twenty-two buildings are associated with the World War II development period. The surviving World War II resources are concentrated along the east and northeast sides of Building 3. These resources include laboratories (Buildings 43, 45, 46, 52, 53, 72), various types of storage facilities (Buildings 31, 44, 63, 85-90, 91), five infrastructure buildings (Buildings 34, 35, 49, 50, 109), and one

transportation-related property (Building 33). Most of the buildings are semi-permanent construction; only a handful of storage and infrastructure buildings employed permanent construction. The extant buildings typify the functional designs and construction utilized during World War II. Many of the World War II buildings have undergone modifications similar to those utilized for other earlier structures, including the installation of metal siding over the original stucco or concrete exteriors, replacement windows, and building additions.

Six of the World War II era resources are laboratories. Each of these buildings has been expanded through the addition of one or more wing extensions. **Building 45** was designed as a one-story, rectangular laboratory distinguished by hipped dormers on the front and rear elevations. An extension on the west side of the building terminates in a flat roof with false parapets on its north and south elevations. **Building 52** is composed of three different sections, including a three-story front block, a two-story middle block, and a one-story rear ell addition. The front and middle blocks terminate in flat roofs, while the rear addition terminates in a low-pitched gable roof. **Building 72** consists of a rectangular, one-story concrete block core with two additions appended to the building. All of these laboratory facilities also have been upgraded through the installation of replacement metal window and door units. Corrugated metal siding obscures the original exterior finish of Buildings 45 and 52. These modifications reflect the multiple uses each has served in subsequent years.

Building 53, constructed in 1944 as a diesel engine test facility, is the composite of two laboratory buildings. Construction drawings dating from 1947 revealed that an L-shaped annex was constructed on the west side of Building 53 to join it with the adjacent building, Building 77. Shortly thereafter, the entire building was redesignated as Building 53. The core and annex are one-story buildings, and the west end of the building (the former Building 77) is two stories in height; a metal staircase ascends to a second floor entrance on the west elevation. Windows consist of double-hung, one-over-one-light, metal-sash replacement units with applied muntins. The original windows were double-hung, six-over-six-light, wood-sash units. The window openings retain concrete slip sills. Door units also are replacements; according to 1947 construction drawings, the original doors consisted of wood-paneled units surmounted by four-light transoms. Several openings on the rear elevation have been infilled, and other openings appear to have replaced larger openings. The exterior has been refinished with a stucco-like material.

The original interior of Building 53 exhibited glazed tile wainscoting and textured tile board walls. Subsequent functional changes have removed the original interior finish. The western portion of the building currently serves as an environmental lab, while the eastern half houses a credit union and offices.

Buildings 43 and 46 are notable for their association with Dr. Robert Goddard's JATO research. **Building 43** currently serves as a high temperature/marine corrosion laboratory, and consists of a one-room, shed roof core and a larger, rectangular, side-gabled addition appended to the rear. Entry to the core is through metal double doors on the north elevation. Windows on each elevation are double-hung, six-over-six-light, wood-sash units defined by heavy projecting concrete lintels and concrete slip sills. Air conditioning units have been installed in some window openings, and two openings on the east elevation have been enclosed with concrete. The side-gabled addition is characterized by minimal openings.

Building 46 is a one-story, rectangular, front-gabled building. Two shed roof extensions are located on the north elevation, and a prominent shed extension is located on the south elevation; the

south elevation is called the Goddard Room. Full-length shed dormers project from the roof plane. A single door entrance at the rear (east) gable end is enclosed within a flat roof vestibule. The south elevation is dominated by the Goddard Room wing projection. The entire building has been modified through the installation of metal-sash replacement windows and metal siding, which covers the stucco finish and exposed rafter ends. The front entrance, added in 1967, and contains double, metal frame glass doors sheltered by a flat roof canopy. After Goddard's research was completed in 1945, the building was renovated to house a cafeteria.

Nine of the ten storage buildings at NSWC, Annapolis, were constructed in 1942; one was erected in 1945. Generally, the storage facilities are characterized by their utilitarian design. Eight of the storehouses (Buildings 44, 63, 85-90) are one-story buildings exhibiting minimal openings and devoid of architectural embellishment. Building 44 contains four metal single doors on the front elevation. Building 63 is an underground gas tank with its location defined by a modern above-ground building. Buildings 85-90 are arched Quonset huts set in concrete bases and sheathed with corrugated metal.

Buildings 31 and 91 originally were designed as storehouses that later were converted to laboratories; both buildings are characterized by their large size and readily convertible open interior spaces. **Building 31**, a rectangular, two-story building, rests on a concrete foundation and is sheathed with ribbed metal siding. A storehouse and paint shop during the war, the building now serves as an underwater equipment laboratory. The main entrance on the south elevation consists of a single offset metal door sheltered by a modern metal awning. Each elevation contains multiple window and door openings, several of which have been infilled. The original windows consisted of six- and 12-light metal-sash industrial windows; these windows have been replaced with metal-sash, two-light casement window units. Eave brackets also have been removed.

Between 1945 and 1947, **Building 91** served as an exhibition hall and storage facility for the Captured Enemy Equipment Project. Upon the project's termination, the semi-permanent building housed the new consolidated Chemical Engineering Laboratory (USNA Archives, RG 405:Box 1, Folder 6). Building 91 is a two-story, L-shaped building that rests on a concrete foundation, and is sheathed with raised seam metal siding. The building terminates in a flat roof with projecting eaves. The front elevation contains 12 bays of paired window units on the first and second floor levels. A one-story, flat roofed, concrete vestibule occupies the midsection of the building; a set of metal double doors is located at this section. Exterior metal staircases provide access to second floor entrances on the east and west elevations. The rear elevation contains nine bays of window units at the second floor; the first floor is occupied by a one-story, two-by-six-bay, flat roofed wing. The three-bay rear ell incorporates paired window units. Windows throughout the building consist of one-over-one-light, double-hung aluminum sash replacement units.

All infrastructure facilities from the World War II era are associated with the establishment of the Station's water and sewage systems. **Buildings 34 and 35** originally were constructed as septic tanks; both buildings have been converted into storage vaults. These partially subterranean buildings are characterized by minimal openings. **Building 109**, a sewage pump station, is a simple, one-story concrete block building with metal single doors on the front and rear elevations.

Buildings 49 and 50 were designed as water treatment facilities. Building 49 is a two-story, concrete building formed by a main, rectangular, front-gabled block with a rear clipped gable addition, and a lower, one-story flat roof wing addition. The building is set on a bermed slope, and is supported by

a concrete foundation wall. Multiple doors, windows, and louvered vents punctuate each elevation. Building 50 is a one-story facility sheathed with ribbed metal and defined by minimal openings.

Building 33, a garage, is the only World War II transportation-related building. It consists of a two-story side-gabled section and a front, one-story, flat roof wing. The wing's south elevation contains four garage bays with metal overhead track doors. Three of the overhead track doors are covered partially at the top by corrugated metal siding. One of the overhead track doors incorporates a single-door entry. Windows are aligned across the south elevation of the gabled section, above the front wing. The west elevation of the gabled section features an exterior metal staircase that ascends to a second floor double door entry. The original bays of industrial sash windows throughout the building have been replaced by modern aluminum sash units. Metal siding, which obscures the exterior's stucco finish, has been installed.

Cold War-Era (1946 - 1989)

The Annapolis installation expanded substantially during the Cold War-era as a result of an increased magnitude of investigations required by technological advances. During this period, the facility also underwent a series of internal programmatic and administration changes that transformed its mission from one of testing and experimentation to research and development. As the test concepts evolved, so did the Station's physical plant. However, new construction projects did not follow a comprehensive plan, but were undertaken in response to the increased workload or to fill the needs of a specific research program. As a result, laboratories and some storage facilities were designed for specialized or unique functions that often dictated the buildings' plan, construction methods, or materials. Unlike the laboratories constructed during World War II, functional differences were evident in the designs of the buildings.

During this period, many existing buildings also were redesigned to house new functions, and/or were modernized to accommodate the latest technological advances. Archival research indicated that initial modifications were fairly minor, such as removing a door, adding a small wing extension, or installing interior partition walls, but that modifications became more substantial as research needs evolved. In more recent times, the exteriors of many buildings were refinished with ribbed metal siding, and aluminum sash windows replaced older or original units.

Of the 87 resources surveyed for this investigation, 60 buildings were constructed during the Cold War-era. Although the Station's mission evolved into research and development, the primary objectives of developing and standardizing improved Naval materials and machinery did not change. Therefore, with few exceptions, new building types were not required. The majority of the Cold War resources at NSWC, Annapolis, consist of laboratories (n=19), storage facilities (n=18), and infrastructure buildings (n=17). Other resources include three administration buildings, two transportation buildings, and one communication building.

The majority of the Cold War-era laboratories were designed as unembellished one- or two-story buildings. Many of the laboratories (Buildings 95, 96, 127, 171, 182, 183, 188, 197) are side- or front-gabled buildings sheathed with corrugated metal siding. Two labs (Buildings 125 and 178) feature concrete block construction. Lab 72A is a one-story, flat roof addition to Building 72. These laboratories

rest on concrete foundations, and are defined by metal-sash windows and metal doors. The majority of these buildings have been modified with one-story additions, new window units, and infilled windows.

Five laboratories are characterized by distinct construction methods and building forms. **Building 100**, which currently houses the Fiber Optics Technology Lab and the Electric Power Technology Facility, was constructed in 1947 as the Gas Turbine Laboratory. The building consists of a large, central, three-story section situated between two-story blocks on the north and south elevations. The central block comprises a large test lab formed by 11 structural bays of steel columns and diagonal bracing (Drawing No. 1117790, August 1966). The north (front) two-story block has a central metal double door entry flanked by sidelights incorporated within a projecting, one-story vestibule. Prominent features on the south elevation include a three-story exterior metal staircase that ascends to single door entries at each story, and a two-story riveted, steel-panel, vertical-sliding door at the west end. The rear and side elevations feature minimal openings. The flat roofed building is finished with stucco and rests on a concrete foundation.

Building 100 features several major alterations. One-story, flat-roof additions have been appended to each end of the north block. The west end addition was constructed in 1966 (Drawing No. 1117790, August 1966). A two-bay, shed roof garage/storage addition was appended to the south block. A large, hinged double door entry at the second floor of the south elevation has been covered by stucco. In 1983, bands of large, industrial sash windows on the north and south blocks were removed and replaced by aluminum sash, one-light sliding units (Drawing No. 3122742, June 1983). The two windows flanking the north entry vestibule are the only surviving original units.

Building 113 is characterized as a tall, three-story, L-shaped building terminating in a flat roof. The exterior walls are dominated by projecting vertical piers. This feature is particularly dominant on the north and east elevations, where large, metal sliding track or overhead track doors are framed on each side by the vertical piers. A metal single door with a concrete canopy provides the main entrance to the building at the south end of the west elevation. A two-story flat roofed wing at the southwest end contains a single door at the west elevation and double doors at the east elevation. Windows consist of paired, metal-sash casement units.

Building 113 was constructed as the Wave Mechanics Laboratory, a function that required special construction methods to make the interior sound-proof for acoustical and shock vibration testing. Its thick concrete walls were lined on the interior with columns of fiberglass so that sound reverberation was eliminated (Leggett 1951). The building was modified during the 1980s through building and service upgrades (Montana 1990).

Building 126 has been incorporated into the northeast corner of Building 113. This one-story, flat-roofed building houses paint formulation and application laboratories. It first served as a steam turbine test lab. The north elevation consists of two sets of metal double doors. The east elevation is seven bays wide and contains narrow, metal double doors at the south end, and four bays of paired, metal-sash one-light windows at the north end.

Building 120, the largest building at NSWC, Annapolis, was constructed in 1952 as the Propulsion Test Facility. It is a tall, rectangular, poured concrete and steel-frame building terminating in a concrete slab flat roof with broad overhangs. According to 1952 construction drawings, the building is framed with steel structural bents centered every 18 feet. Some of the bents are reinforced with light

truss cross-bracing. The building is 13 bays long and six bays wide. The exterior elevations are divided into three levels. The first and second floors are defined by bays of replacement metal-sash windows or by large overhead track doors; some of the openings have been infilled. The upper level contains a continuous band of fixed and awning, one-light, metal-sash replacement windows. The main, double door entrance is located at the east elevation within a raised metal-frame and glass vestibule. A secondary entrance located at the west elevation consists of metal double doors sheltered by a concrete, flat roofed vestibule. Additions to the building include a one-story covered walkway at the rear elevation and a one-story, flat roofed wing at the north elevation.

The interior of Building 120 is characterized by two large, high-bay test areas. Large machinery and equipment, such as overhead cranes, still occupy these testing spaces. The Air Force is the current tenant of the east test area; the west test room is vacant. Offices are confined to the west perimeter of the first and second floors. The facilities engineering and planning divisions of the Annapolis Detachment occupy the offices.

Three buildings were designed for stray magnetics field testing: Building 174, which served as the primary test facility, and Buildings 173 and 175, which functioned as support facilities. **Building 174** is a four-story, rectangular, concrete block building constructed entirely of nonmagnetic materials (Montana 1990). It is set into a steeply-sloped hill, and is accessed by a wood frame trestle with I-beam tracks. The front of the building is dominated by large, central, plywood double doors. The side elevations are defined by three vertical, recessed bands of metal-sash windows positioned at each story. The windows consist of fixed and awning units. The rear elevation features a metal single door at the basement level. Three bays of vertical metal-sash windows punctuate each of the four levels of the rear elevation.

Each level of Building 174 functioned as a test area, and is characterized by open spaces with removable metal grating at the floors. The top floor, containing two instrumentation rooms, served as the main test floor (Drawing No. 779201, 14 February 1958). The main test floor was capable of supporting shipboard machinery weighing up to 40 tons (Montana 1990). The lower three floors contain magnetic field measurement sensors. A dumbwaiter is located at one corner of the building, and a staircase is at the other corner.

Building 173 operated as the instrumentation and control building for Building 174. The interior contained an equipment room, work area, locker room, and pit. The building was connected to Building 174 via a walk-through underground tunnel (Drawing No. 779218, 14 February 1958). Building 173 is a rectangular, one-story, concrete block building terminating in a flat roof. The main entrance is centered on the north elevation and consists of a set of replacement metal double doors. The east and rear elevations are defined by bands of fixed metal-sash windows, and the west elevation features alternating fixed metal-sash window units and metal single doors. The original building footprint has been enlarged by extensions on the west and south ends of the building.

Building 175, a support building for magnetic field research, is a one-story, rectangular concrete block building terminating in a front-gabled roof sheathed with asphalt shingles. Its functional design is characterized by its openings, which include two wood-panel doors, and double-hung, one-over-one light, wood-sash windows.

Building 177 was constructed in 1966 as a submarine test facility. The original interior contained a large central test area; three 1,000 psi facilities; a control room; a compressor room; and, a blow down air flask pit (Drawing No. 1110936, 17 December 1965). It is a large, steel-frame and concrete block building distinguished by a multi-story tower. The building is sheathed with ribbed galvanized steel siding, and is characterized by only three openings; two are oversized, metal overhead track doors, and the third is a second-story metal single door reached by a covered metal staircase. A one-story concrete block addition was appended to the east side in 1973 (Drawing No. 3100733, 26 March 1973). The entire building rests on a concrete foundation and terminates in a flat roof.

Eighteen Cold War-era buildings were designed as storage facilities. These simple, one-story buildings feature minimal openings and no architectural embellishment. They are constructed of concrete (Buildings 94 and 176), concrete block (Buildings 187 and 191), or metal frame (Buildings 157, 184-186), and terminate in front-gabled or shed roofs. Building 128 is an arched Quonset hut. Facility 176 is a subterranean, concrete structure.

Buildings 92, 93, 101-103, 111, 112, and 169 comprise a row of eight, nearly identical warehouses. Seven of these buildings were constructed between 1946 and 1948; Building 169 was built in 1956. Construction drawings indicate that each building measures 40 x 100 ft, and consists of a structural framing system of six steel bents centered at 20-foot intervals. Each building is supported on a concrete wall foundation and terminates in a front-gabled roof sheathed with corrugated metal. Corrugated metal sheeting also covers the exterior walls. The identical front and rear elevations feature a large, central metal overhead track door flanked by metal-sash, two-light windows. A single door entry is positioned below one of the windows. Construction drawings from 1974 show that the central overhead track door replaced an offset steel single door. There are no openings on the side elevations, and the building interior is defined by an open plan with a central aisle.

Each warehouse has been modified to various degrees, including modern, metal-sash window units; infilled openings; attached metal flues or pipes; and, metal door replacement units. Building 103 exhibits some of its original fenestration, which includes wood-sash, six-light awning windows and a double-hung, eight-over-eight-light, wood-sash window. It also features an original, wood frame, front-gabled ell extension at the rear of the north elevation that serves as a recreational facility. The walls are sheathed with horizontal wood paneling, and are punctuated on each elevation by multiple double-hung, six-over-six-light, wood-sash windows. A metal canopy attached to the north elevation shelters a picnic area.

One-story flat roofed additions have been constructed between Buildings 111 and 101, 101 and 92, 92 and 93, and 93 and 102. These additions are 20 feet wide and they span the entire 100-ft length of each warehouse. Each two-bay addition is sheathed with modern corrugated metal siding. Doors were installed on the side elevations of the adjoining core buildings to provide interior entry to the addition. Because construction drawings dated April 1974 indicate that only the addition between Buildings 92 and 93 had been built, it can be presumed that the other additions were constructed soon thereafter.

Building 119 represents a notable exception to the typical storage facility. This storehouse was built in 1952 to contain the special fuel utilized for the propulsion tests in Building 120. Currently, Building 119 serves as a fabrication and machine shop. It is a tall, square, steel-frame and poured concrete building capped by a flat concrete slab roof with a broad overhang. The exterior elevations are

divided into three levels. The first and second floors are defined by various types of entries and square bays of 12-light, metal-sash awning and fixed replacement windows. The upper level contains a continuous band of fixed and awning, one-light, metal-sash replacement windows. The front elevation originally consisted of five bays; four of these openings have been enclosed with concrete, and the central bay contains a large, metal overhead track door. Other modifications include the addition of a one-story, corrugated metal corridor to connect the rear of the building to Building 120, and the addition of a one-story, prefabricated shed roof building to the northwest corner. The interior is characterized by a large, high-bay open space. A metal platform lines the perimeter of the second floor level. Offices occupy the third floor.

NSWC, Annapolis, contains 17 infrastructure buildings constructed during the Cold War-era. The majority of these resources are transformer stations. Other infrastructure-related buildings include fuel, oil, or water pumping stations; a water treatment facility; a switching station; and, a refrigeration equipment building. These one-story buildings are defined by their utilitarian design and their concrete block construction, and their flat roofs with overhanging eaves. They exhibit few openings (usually a metal single or double door, and metal louvered vents), and no stylistic embellishments.

Building 141, a transformer station, is an example of a typical infrastructure building at NSWC, Annapolis. The one-story, rectangular concrete block building terminates in a flat concrete slab roof defined by a wide eave overhang. Centered on the north and south ends is a set of metal double doors surmounted by louvers. The east elevation is punctuated by two metal louvered vents; there are no openings on the west elevation. **Building 114**, a water pump station, exhibits many of the same features, but it is constructed of concrete. In addition, it is distinguished by wood-paneled doors and a double hung, six-over-six-light, wood-sash window.

With two exceptions, the design of infrastructure buildings has changed little since 1946. **Buildings 190 and 194** are one-story, metal-frame facilities constructed during the 1980s. Both are sheathed with ribbed metal siding, and both terminate in low-pitched gable roofs. Each contains a metal single door on the front elevation. Building 190 features multiple, metal-sash pivot windows, but Building 194 is defined by a single metal-sash sliding window unit on the front elevation.

Three Cold War-era buildings serve administrative functions. **Building 99** is the security office and sentry house. The one-story, irregularly-shaped, concrete and masonry utilitarian building terminates in a flat roof with broad eave overhangs. Three elevations are punctuated by various replacement openings. The northwest corner of the building retains a single-light, wood-sash window unit. The accompanying sentry house features a rough-faced masonry base and metal-frame and glass enclosure capped by a hipped roof sheathed in standing seam copper. **Buildings 189 and 193** are side-gabled, one- and two-story office buildings sheathed with synthetic siding. They display few openings and no architectural embellishment.

Two transportation-related buildings dating to the Cold War-era are located at NSWC, Annapolis. **Facility 166** is a wooden pier comprised of six structural bays composed of wood piles with wood cross-bracing. A metal fence blocks access to the pier, which has a wood plank deck. The pier was built in 1956 to berth submarines undergoing noise reduction tests.

Building 146, located at the western edge of Worthington Basin, serves as a fuel pumping station for berthed vessels. It is a one-story concrete building capped by a flat, concrete slab roof.

Three elevations contain metal door openings, and the fourth is distinguished by a four-light awning window defined by a rowlock brick sill.

Building 167 is the only communications building located within the NSWC, Annapolis, installation. It is a simple, one-story concrete block building constructed in two stages. The front section is slightly shorter, and appears to be an addition. Both sections terminate in a flat roof.

Overview of NSWC, Annapolis

NSWC, Annapolis, was established originally as the U.S. Naval Engineering Experiment Station. The Station was constructed between 1904 and 1908 as a permanent, full-time laboratory to develop Naval standards for material procurement, and machinery operation and maintenance. The Station experienced major periods of growth during World War II and the Cold War-eras. During the 1950s, the installation's mission changed gradually from testing and experimentation to research and development. In 1963, the Engineering Experiment Station was renamed the Marine Engineering Laboratory to reflect its evolving mission. Successive name changes reflect administrative reorganizations. These include the Annapolis Lab of the David Taylor Research and Development Center in 1967 and NSWC, Annapolis, in 1988.

Historic Context for NSWC, Annapolis

Establishment of the U.S. Naval Engineering Experiment Station (1904 - 1940)

Although development of the NSWC, Annapolis, occurred during the twentieth century, its roots were grounded in the late-nineteenth century. During the 1880s, after a relatively inactive period, the U.S. Navy embarked upon a program to upgrade and modernize its fleet, which included a major overhaul of its training programs and facilities.

The approach was both long-term and multi-faceted. Vessel design testing began in 1898 with the opening of the Washington Navy Yard's Experimental Model Basin. A need also was identified to improve the procurement, development, and maintenance of vessel propulsion systems, namely steam-powered systems. Rear Admiral George W. Melville, then Engineer-in-Chief of the Navy's Bureau of Steam Engineering, was responsible for promoting the establishment of a naval engineering test and training facility. In 1903, Melville convinced Congress to appropriate a total of $400,000 to establish the U.S. Naval Engineering Experiment Station (EES). Of that amount, $250,000 was earmarked for building construction, while $150,000 was designated for equipping and staffing the laboratory (U.S. Congress 1903 (1):194). The initial mission of the new installation was to test boilers prior to their installation in naval vessels; to test equipment and procedures developed by private shipbuilders and other industrial engineering firms; and, to educate and provide practical training in naval engineering to U.S. Naval Academy students (Leggett 1956:518). Due to its close working relationship with the U.S. Naval Academy, the Experiment Station was placed under the direct supervision of the Superintendent of the U.S. Naval Academy (Sheehan 1994:437).

A 10-acre, government-owned parcel located across the Severn River from the U.S. Naval Academy campus was the site chosen for the installation. According to Melville, safety considerations precluded locating the facility within the grounds of the U.S. Naval Academy itself; furthermore, a site on campus would limit the Navy's ability to expand the test station at a later date (Leggett 1956:519-520). The riverfront location was ideal for providing sufficient berthing facilities for on-board experimentation. Two basins, Worthington and Dungan, were constructed at the time of the installation's establishment to fulfill this purpose. Both basins were supported by wooden bulkheads. Worthington Basin measured 375 x 170 ft, while Dungan Basin measured approximately 260 x 98 ft (NSWC, Annapolis, Facilities Engineering Office 1940). Additional berthing facilities were provided along a concrete sea wall fronting the waterfront, between Worthington and Dungan basins.

The station was established officially in 1904, when Walter F. Worthington was appointed the Commanding Officer. The station did not become operational, however, until the first test building was completed between 1906 and 1908 by the Noel Construction Company. The first EES building housed the entire research program, which consisted of the Mechanical Laboratory, the boilers, a dynamo, machine and woodworking shops, a foundry, and an ice machine (Sheehan 1994:430). Much of the original machinery for the building was taken from the Old Steam Building at the U.S. Naval Academy (USNA Archives, RG 405:Box 28, Folder 37).

The first test activities of the Station were limited to simple mechanical tests involving the analyses of boiler water treatment, boiler corrosion, coal, and lubricating oils. The various roles and responsibilities of EES expanded modestly during the following decade to include experiments on corrosion prevention, optimum use of fuel, and the endurance of various metal alloys. The presence of the Naval Air Station (NAS), Annapolis at Greenbury Point between 1910 and 1913 created yet another role for EES. During the two-year period that NAS was located at Annapolis, EES maintained and tested the engines of their planes. The aircraft engine testing function continued after the removal of NAS to Pensacola (USNA Archives 1981:4-5). The laboratory's mission also included testing all vessel parts that failed in service (Leggett 1956:521). Over 1,340 projects were initiated at EES during its first 12 years of operation (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959).

The scale and types of experiments carried out during this period resulted in an expansion of the station's facilities. By the end of World War I, three newly-constructed "portable" steel buildings had been added to the station's physical complex. These buildings were designed specifically to house the Metallurgical (Metals) Lab, which was established in 1911; a chemical laboratory; and, a foundry. A boiler house, several storage buildings, and six cottages also were erected (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). The six cottages housed the personnel of station's own fire unit, which was formed due to the dangerous and volatile nature of the experiments. These cottages subsequently have been acquired by the Annapolis Naval Station.

Test and evaluation activities during the latter part of this period focused on improving the economy and efficiency of naval materials. One important study conducted at EES involved testing the effects of water and corrosion on the life expectancy of metals. Dr. D. J. McAdams, the chief of the Metals Lab, was responsible for conducting these tests (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). Two major advances made during this decade included development of the Sonic Depth Finder, developed by Dr. Harvey C. Hayes, and the Sonic Range Finder.

During the 1920s, direct control of the technical aspects of the EES was transferred from the Navy's Bureau of Steam Engineering to the Bureau of Engineering (NSWC, Annapolis, Historical Notebook). Prior to this transfer, the EES laboratories had functioned primarily as an independent unit, with a minimum of input from the Bureau of Steam Engineering. The Bureau of Engineering, however, assumed a more active role in managing and coordinating all Navy engineering stations. This became evident particularly when funding increased after the Depression (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). The role of the EES was expanded during the 1930s, with an increased emphasis on cooperation between the Navy and private industry (Leggett 1956:526).

While activities at other Naval installations languished during the interwar years, the mission of EES was expanded. This was due largely to submarine construction, which represented the only significant type of naval activity occurring during this time period (Leggett 1951). The station's testing program was increased to include a diesel engine test program and a Welding Laboratory. The diesel

engine test program was initiated by the Mechanical Lab in 1929 to evaluate various types of internal combustion engines (Leggett 1956:522). The Welding Lab, which was established in 1931, was responsible for developing standardized methods of welding and fabrication. Two years after its founding, the Arconograph, was developed by Dr. Bela Ronay; this instrument was able to chart arc stability during welding (NSRDL n.d.).

Activities were bolstered in 1933 with the passage of the National Industrial Recovery Act, which provided substantial funding for test activities; this increased funding, in turn, resulted in an enlargement in testing performed at EES (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). The Station's fifth laboratory, the Internal Combustion Engine Laboratory, was created in 1933 to conduct experiments in gas and diesel engine performance. By 1935, engineers at the laboratory succeeded in producing an improved diesel engine fuel (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). Other significant testing carried out at EES included analyzing submarine diesel engines; diesel fuels; SONAR; motor boats and other ships; and, the cause of machinery failure.

The increased responsibilities assumed by the Experiment Station required both an increase in the labor force and expansion of its physical plant. By 1925, the area occupied by EES had doubled; much of this additional acreage comprised filled ravines and riverfront marshes. Its physical plant had grown to include the main building, which housed offices, storage and machinery areas, and laboratories; an expanded boiler house that contained power generating equipment; an expanded Metals laboratory; a foundry with blacksmith and coppersmith shops; a pattern shop; and, 10 small utility and storage buildings. Several of the buildings located along the Severn River were constructed on infilled land (Engineering Experiment Station 1925).

Efforts also were made to reorganize and beautify the grounds of the installation. Proposed improvements to the property featured establishing a vegetable garden, and planting oaks, hemlocks and other species recommended by the Senior Horticulturalist of the U.S. Department of Agriculture. Portions of the present road configuration, including the formal circular driveway in front of the main building, also were laid out as part of this improvement plan (USNA Archives, RG 405:Box 1, Folder 4).

World War II (1941 - 1945)

The United States' official involvement in World War II in 1941 brought about changes in the status and the operation of EES. One significant change was the accelerated pace and amount of research work undertaken at the station to support all phases of the war effort. Cooperation with private industry continued to be stressed. During the war, all naval installations in the Annapolis area were incorporated into the Severn River Naval Command, which was established in December 1941; this administrative unit encompassed the U.S. Naval Academy, the Naval Radio Station, the Naval Hospital, and EES (Bolander 1946:1-2).

EES personnel worked to develop quiet machinery, submarine engines, shock simulation tests, gas turbines, heavy-duty oils, and Marine Corps landing vehicles. By the end of the war, the EES enlarged its testing activities to include five major technical divisions: Chemical, Mechanical, Metallurgical, Internal Combustion, and Welding Laboratories. The Internal Combustion Engine Laboratory grew to become the largest lab at the Station because most naval vessels were built with diesel engines (Leggett 1951).

In addition to the day-to-day testing conducted at each technical laboratory, special projects were carried out that addressed unique wartime concerns. Dr. Robert Goddard, the famous pioneer of rocket propulsion, worked at EES between 1941 and 1945 to develop a Jet-Assisted Take-Off (JATO) system for the Navy's seaplanes. Goddard was the leading civilian scientist of rocket studies in the early twentieth century; in 1926, Goddard used his patented rocket components to develop and successfully launch the world's first liquid-fuel rocket (Lonnquest and Winkler n.d.).

The jet propulsion experiments carried out by Goddard were completed within the Bureau of Aeronautics Project. Goddard's team consisted of 25 officers and 105 enlisted men who were assembled in May 1941. Rocket propulsion studies conducted by this team included developing liquid-propellant and solid-propellant JATO devices; testing and training personnel on controlled missile propulsion units; and, developing resojet, or "buzz bomb" motors (Bolander 1946:26; Truax 1964). These experiments were conducted in three EES facilities: Buildings 43 and 44, and in the "Goddard Room" of Building 46. In addition, two Quonset huts obtained from the Bureau of Docks in Davisville, Rhode Island, were erected for storage facilities (USNA Archives, RG 405:Box 1, Folder 5).

In 1942, the number of civilian personnel (engineers, scientists, administrative and co-ops) totaled 1,150, with most working six-day, 48-hour weeks (Bolander 1946:25). The increased wartime personnel and activities, coupled with the unique JATO experiments undertaken during the war, resulted in a substantial enlargement of the facilities. To accommodate the installation's expansion, additional acreage was acquired through land procurement and reclamation. In 1941, three acres of property located at the boundary between EES and the USNA Rifle Range were acquired. An additional 12.9 acres were assigned by the North Severn Naval Activities in 1942 for use by EES; EES later would acquire this land permanently (USNA Archives, RG 405:Box 1, Folder 5). The south corner of the installation, east of Dungan Basin, was formed entirely from dredged fill. Comparison between 1940 and 1944 installation maps illustrates the utilization of this area for new construction: three buildings for the Aeronautics Project (Buildings 42, 43, 46); an operating shed (Building 55); a super charge test facility (Building 72); and, a gamma ray building (Building 73). Other new construction was concentrated east of this area, along an inland boat basin, and along the Severn River frontage northwest of Worthington Basin.

The existing stock of permanent buildings was modified by wing additions (Buildings 11, 20, 20A, 12), and by enlarging existing one-story lean-to additions to a two-story height. Four additions were added to the Internal Combustion Engines Lab (Building 3) to house an experimental gas turbine and additional test diesel engines. By the end of 1944, the Station comprised over 30 buildings valued at $5 million (Bolander 1946:25).

After World War II, the EES gradually departed from its historically cooperative position with private industry and placed increased emphasis on its own test and evaluation programs in such fields as ship control, propulsion, habitability, oceanography, marine corrosion, and silencing techniques (USNA Archives 1981).

Cold War-Era (1946 - 1989)

The Cold War-era marked a significant expansion of EES. Initially, however, the overall work load of the five technical laboratories was reduced as the Navy demobilized after the war. Two special

projects created immediately following World War II provided EES personnel with work during the interim. These included the Captured Enemy Equipment Project and the H_2O_2 Project (Project Hill).

The Captured Enemy Equipment Project was initiated to study and analyze the engineering and mechanics of German, Japanese, and Italian equipment and machinery (Bolander 1946:37). The crux of the project was the careful examination of two captured German destroyers berthed at the west side of Worthington Basin, at Finger Pier. Remnants of the destroyers included two stainless steel propellers that were removed from one of the destroyers and displayed in the center of the circular drive (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). During the duration of the two-year project, portions of the German destroyers were exhibited to the public in Building 91 (USNA Archives, RG 405:Box 1, Folder 5).

Project Hill studied six German submarines (U-boats) that incorporated "Walters" propulsion machinery. These propulsion systems, designed by Dr. H. Walters, utilized hydrogen peroxide as an oxidant for continuous submerged navigation (Bolander 1946:38). Buildings 95 and 96 housed the testing activities for this project. Project Hill represented an important project for the Navy since these submarines employed a unique propulsion system for that time. The research carried out as part of these investigations contributed to the design of new and improved submersible oxidation equipment for the Navy (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959).

Following the success of the Captured Enemy Equipment Project and Project Hill, EES organized two additional special projects associated with the technical laboratories: the Gas Turbine Project and the Bearings Project. The Gas Turbine Project was started by the Mechanical Lab in 1945. This project undertook studies of gas turbine components, as well as an entire 3,500 horsepower gas turbine motor. On 1 September 1948, the Gas Turbine Project, Project Hill, and the Mechanical Lab merged to form a new Mechanical Lab (USNA Archives, RG 405:Box 1, Folder 3). The Bearings Project, which was initiated in November 1946, consisted of a comprehensive program of bearing research that had a direct influence on the development of new propulsion equipment for the Navy (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). The Bearings Project was undertaken by the Mechanical, Metals, and Internal Combustion Engine Labs, and continued operations beyond 1954. A fuel and lubricants special project also was added during the early 1950s.

Two additional laboratories created shortly after the war illustrate the evolving specialization of testing activities at EES. A Wave Mechanics Laboratory was established in December 1946 and moved into its new facility, housed in Building 113, in 1948. Experiments conducted by this lab included acoustical measurements and vibration analyses of Naval vessels and machinery. In 1949, the transfer of electrical and radio interference equipment from the Naval Research Laboratory to EES prompted the creation of an Electrical Laboratory (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). By 1950, testing work at EES had been organized under seven major technical departments: Chemical Engineering, Internal Combustion Engine, Wave Mechanics, Mechanical, Electrical, Metals, and Welding.

As a result of the wartime and Cold War special research programs, both the station's territory and its physical plant continued to grow. At the end of World War II, an 8.1-ac tract west of Church Road was purchased from the Fort Severn Development Company to provide room for expansion. Additional land also was created by dredging Worthington Basin and depositing the soil behind a sea wall immediately to its north. Between 1949 and 1950, dredging operations reclaimed a 12-foot channel from Dungan Basin; a 20-foot channel from Worthington Basin, which had filled during the two years the

captured German destroyers were berthed in the basin; and, a 7,800 sq. ft area in front of Building 3. The fill was utilized to construct an earth dike to bound and protect the spoil area filled in adjacent to Finger Pier. The repair and concrete surfacing of Finger Pier was included in this riverfront project (Office of the Chief of Naval Operations 1946; USNA Archives, RG 405:Box 1, Folders 7, 11).

As the Station continued to expand, existing buildings either were modernized or modified, and new buildings were erected. For instance, in 1952 the $2 million Wolverine Building (Building 120) and the associated Building 119 were constructed on the spoil area. By the Station's fiftieth anniversary in 1954, it employed 1,000 persons, and comprised 60 facilities that occupied a 59-acre site valued at $12 million (Haseltine 1954).

A major technological development during the Cold War was the introduction of nuclear-powered weaponry. One of the main technical programs at EES was noise reduction experimentation, particularly the noise reduction of generators and turbines of nuclear-powered subs. During the next two decades, EES created technical programs that contributed to this new technology. Programs testing the levels of machinery noise in nuclear subs began during the early 1950s. In 1956, a pier (Facility 166) was constructed northeast of the installation at Carr's Creek specifically to carry out tests for quiet machinery. Ironically, the remote berthing site became necessary when noise from nearby riverfront laboratories disturbed the noise reduction experiments on a submarine berthed at Finger Pier.

In 1957, the seven technical labs and the Bearings and Fuel and Lubricants special projects were realigned into four technical departments: Chemistry, Mechanical Engineering, Applied Physics, and Metallurgy. Each department was divided into 10 divisions, and each division was subdivided into 26 branches (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). The internal programmatic reorganization emphasized further the technical specialization that had begun to evolve during the late 1940s. The emphasis of Naval investigations at EES was changing from testing and experimentation to research and development (R&D). To reflect its expanded role in R&D, the name of the installation was changed in 1963 to the Marine Engineering Laboratory (MEL); the installation was placed under the stewardship of the Bureau of Ships.

Along with the internal reorganization came a series of renovations and new construction projects that were intended to improve the installation's facilities. A 1951 study assessed the facilities as adequate, possibly because many test facilities were housed in lean-to additions and isolated test rooms (Leggett 1951). New construction consisted of a shock and vibration lab (Building 171), and three facilities for measuring and analyzing stray magnetic fields (Buildings 173-175). Located at the northwest corner of the installation, the three latter buildings were constructed on a 1.26-ac parcel of land transferred from NAVSTA to MEL in 1957 (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959). Renovation projects included the 50-year old main laboratory, Building 3, which was allocated $1.2 million to undergo a major renovation. In addition, three unused WWII temporary structures were demolished to save annual maintenance costs (Naval Historical Center, Operational Archives, OPNAV Report 5750-5 1959).

By 1965, routine testing and evaluation largely had been eliminated from MEL's annual operations. Instead, the installation's approximately 900 employees concentrated on major R&D programs. These R&D programs included development of shock-resistant mountings to protect a ship's equipment; thermal insulation; thermal conductivity; bearings and seals; fuel cell development; corrosion resistance; metal alloys; superconductors; and, a hydraulic torque converter (Naval Historical Center, Operational Archives, OPNAV Reports 1959-1960, 1964). In 1966, MEL also established five advanced

R&D programs that focused on "advanced concepts" in the development of new metal alloys for marine applications (Naval Historical Center, Operational Archives, OPNAV Report 1966).

Included in MEL's long-range goals to broaden its research objectives was the establishment of an oceanographic program. Engineers and scientists worked to develop deep-diving submersibles for civilian and military use in a newly-constructed Ocean Pressure and Submarine Test facility (Building 177) and in test labs in Building 3 (Naval Historical Center, Operational Archives, OPNAV Report 1966). Work included research on the propulsion and electrical systems of subs, and on auxiliary systems such as air purification. As a result of these advanced technological R&D programs, the annual operating costs of MEL increased to over $18.5 million by 1967 (Naval Historical Center, Operational Archives, OPNAV Report 1967).

Older existing technical and support buildings continued to be modified to accommodate new research initiatives. One of the largest projects during this era included the 1965 rehabilitation of Building 100 at a cost of $600,000 (Naval Historical Center, Operational Archives, OPNAV Report 1965). By 1967, the technical plant at Annapolis contained 24 laboratories, 17 storage buildings, 6 shop buildings, and 30 miscellaneous structures ranging from oil tanks to pumphouses (NSRDL 1967:11).

In 1967, both MEL and the David Taylor Model Basin at Carderock, Maryland, were transferred from the Bureau of Ships to the Naval Materiel Command, and merged to create one unit known as the Naval Ship Research and Development Center (NSRDC) (NSWC, Annapolis, Historical Notebook). One year later, the installation incorporated the Mine Defense Laboratory at Panama City, Florida, and formed the Annapolis Division of NSRDC. Five years later, the Panama City Detachment was removed from NSRDC, and the Annapolis detachment was renamed the David W. Taylor Naval Ship Research and Development Center (DTNSRDC) (Coletta 1985:73; NSRDC n.d.).

The administrative reorganizations did not, however, change the overall direction of R&D work at the installation. During the 1970s and 1980s, the research focused on superconductivity; fuel-cell electrode processes; applications of bearings, lubricants, paints, plastics, new metal alloys, coatings, and elastomers; acoustical silencing; ship preservation; ship propulsion systems; pollution abatement; and, hover jet studies (NSRDL 1967; USNA Archives 1981). In 1969, DTNSRDC employed over 1,000 scientists, engineers, and administrative and support personnel to conduct the work for the R&D programs, a considerable increase from its peak in the World War II era.

Several programs were established in response to the Vietnam conflict. DTNSRDC coordinated the Vietnam Laboratory Assistance Program, which sent three DTNSRDC volunteers (two engineers and one test operating mechanic) to South Vietnam for nine months. Their mission during the summer of 1968 was to collect data on the riverine operations of the U.S. Navy forces. Other programs established during this time period included those dealing with Amphibious Assault Landing Craft, the Surface Effect Ship Program, and Hydrofoil Propulsion Systems and Materials (Naval Historical Center, Operational Archives, OPNAV Report 1969).

New facilities were brought under the administrative arm of DTNSRDC by 1981. These included: an Underwater Explosions Research Division at Portsmouth, Virginia; an Acoustic Trials Branch at Cape Canaveral, Florida; an Amphibious Assault Landing Craft Experimental Trial Unit at Panama City, Florida; a Hydrofoils Special Trials Unit at Bremerton, Washington; and, an Acoustic Research Detachment at Lake Pend Oreille near Bayview, Idaho (USNA Archives 1981:8).

The final administrative change occurred in 1988 when the Annapolis Division of the David Taylor Research Center was incorporated within the Naval Surface Warfare Center (NSWC), Carderock Division. Carderock, Maryland, serves as the division's headquarters, and the Annapolis Lab comprises one of three detachments within the Carderock Division. Laboratories are located at Annapolis and at the Carderock headquarters in Maryland, and in Philadelphia, Pennsylvania.

Present Activities of NSWC, Annapolis (1990 - present)

At present, 90 buildings and structures comprise the 43.74-acre Annapolis installation, the smallest of the three detachments. The Carderock Division has guided the direction of the R&D programs conducted at the Annapolis Lab, which focus on hydrodynamics and future applications of composite materials, machinery systems, and electronics (Montana 1990). The NSWC, Annapolis, Detachment, however, is being closed due to actions taken under the Base Closure and Realignment Act in 1995. The majority of the R&D programs, as well as machinery and personnel, have been transferred to the Carderock or Philadelphia detachments of NSWC. Complete closure of the base is expected by the year 2000. Until then, work on R&D programs continues (Scott 1995; personal communication, Jim Jatko, NSWC, Annapolis, 19 November 1996).

Data Analysis

The built resources at NSWC, Annapolis, were evaluated to determine their eligibility for listing in the National Register of Historic Places. The Annapolis installation was evaluated within the appropriate historic context applying the National Register of Historic Places criteria for evaluation (36 CFR 60 [a-d]). Two themes were identified as significant to the initial establishment and subsequent development of the installation. The first included the theme of Naval testing and evaluation (T&E), which encompassed the period prior to World War II and continued through the beginning of the Cold War. The second relevant theme included research and development (R&D), which reflected the installation's revised mission during the Cold War-era.

Ninety-six buildings and structures were documented at NSWC, Annapolis. Of these ninety-six buildings and structures, 9 represented resources associated with the establishment of the U.S. Naval Engineering Experiment Station, 27 represented pre-World War II and World War II resources, and 60 were Cold War-era resources. In general, the majority of the extant resources at the installation are characterized by their functional design. They employ standardized construction methods and most buildings are devoid of architectural embellishment. Archival research indicates that many of these buildings were modified during the 1980s. These modifications included additions, door and window replacements, alterations to fenestration patterns, and exterior re-sheathing. The architectural field investigations verified the extent of the building modifications. In many cases, it was determined that the changes were extensive and primarily irreversible.

The following discussion is divided into three parts. The first section examines the significance and integrity of those resources associated with the establishment of the installation. The second section examines the installation's pre-World War II and World War II development periods. These resources were evaluated following the National Register criteria for evaluation (36 CFR 60 [a-d]). The third portion provides evaluative recommendations for those resources associated with the installation's Cold War-era

of development. The National Register's criteria considerations for *exceptional* significance were used as the primary guidance for evaluating these less-than-50-year-old resources. In order for DoD Cold War properties less than 50 years of age to qualify for listing in the National Register, the resources must possess *exceptional significance* on a *national* level and retain sufficient integrity to convey their period(s) of significance (Center for Air Force History 1994:65; Green 1993:np; U.S. Department of the Interior n.d.).

Establishment of the U.S. Naval Engineering Experiment Station (1904-1933)

Nine buildings were documented in this investigation at NSWC, Annapolis, that date from this time period. These resources include six residential dwellings and three associated garages. The residential buildings and associated garages were evaluated under Criteria A, B, and C of the National Register of Historic Places. These buildings represented personnel support structures and have no significant association with the mission of Naval Testing and Evaluation (Criterion A). Moreover, archival research conducted during this investigation did not suggest that any of the dwellings were directly associated with an important person (Criterion B). Finally, the building designs are not representative of distinguishable types, periods, or methods of construction. The buildings are not the work of a master nor do they posses artistic value (Criterion C). These buildings do not possess those qualities of significance and integrity either individually or as an historic district identified in the *National Register of Historic Places Criteria for Evaluation* (36 CFR 60).

Pre-World War II and World War II Resources (pre - 1945)

Twenty-seven buildings were documented at NSWC, Annapolis, from this time period. Of this total, five buildings survive from the pre-war period of the Engineering Experiment Station (1934-1940) and 22 built resources date from World War II (1941-1945). These resources include eight laboratories, eleven storage facilities, one transportation building, two industrial buildings, and five infrastructure facilities. Most of these resources are concentrated along the riverfront, near the basins and the main laboratory (Building 3).

This group of buildings represents the core of the installation from the early period of development and subsequent expansion during World War II. The historical setting and location of these facilities, as well as their relationship to the overall plan of the installation, has been retained. Laboratories from this period were identified as primary resources associated directly with the installation's mission of T&E (Criterion A); storage facilities, industrial shops, and other support facilities played a necessary support role for the laboratories and base operations (Criterion A). Their function was important to the initial mission and development of the installation.

The majority of the extant resources from this period are characterized by their functional design. They employ standardized semi-permanent and permanent military construction methods, and are constructed of metal frame or concrete block. Most buildings are devoid of architectural embellishment. Archival research indicates that many of these buildings were modified over the years to meet the installation's changing roles and functions during the Cold War-era. These modifications included additions, door and window replacements, alterations to fenestration patterns, and exterior re-sheathing. The architectural field investigations verified the extent of the building modifications. In many cases, it

was determined that the changes were extensive and primarily irreversible, thereby compromising the integrity of the buildings. These resources, individually and collectively, no longer retain sufficient integrity in terms of design, materials, workmanship, and feeling to qualify for National Register consideration.

Archival research indicated that two buildings at NSWC, Annapolis, were associated with Dr. Robert Goddard, an American physicist and pioneer in rocket propulsion systems (Criterion B). Between 1941 and 1945, Goddard conducted numerous tests on jet-assisted take-off (JATO) devices at the installation. His work contributed to the Navy's wartime efforts for aircraft rocket take-offs and led to some of the earliest developments of rocket propulsion systems for guided missiles in the U.S. (Truax 1964). Goddard's JATO research was conducted in Buildings 42, 43 and 46. Buildings 43 and 46 were constructed in 1941 and 1943; Building 42 was demolished in 1985. Although these resources are significant due to their association with Goddard and his research (Criterion B), both buildings have been altered substantially by contemporary modifications and, therefore, no longer convey their period of significance. Due to fenestration replacements and enclosures, cladding changes, and the installation of additions, these buildings no longer possess their original qualities of design, workmanship, materials, and feeling. Furthermore, the equipment used by Goddard was removed after the termination of the JATO project, and the buildings were converted for different functions. Building 43 was converted into a storage facility for the metals lab, and Building 46 was turned into a cafeteria. Buildings 43 and 46 do not possess the qualities of integrity necessary to convey their significance.

Cold War Resources (1946 - 1989)

Sixty buildings and structures documented at NSWC, Annapolis, are associated with the Cold War-era. These included 19 laboratories, 18 storage facilities, 17 infrastructure buildings, 3 administration buildings, 2 transportation facilities, and 1 communications building. These resources were evaluated according to the criteria for *exceptional significance*. As stated earlier, interim guidance prepared for DoD facilities recommends that only those resources of national exceptional significance are eligible for National Register consideration, and that military resources of local or regional significance should be evaluated as they reach the 50 year age criteria. These facilities were evaluated for their role in Navy Cold War T&E and R&D programs (Criterion A) and for their embodiment of distinguishing characteristics of architectural, engineering, or technological advancements in military construction (Criterion C).

Activities at NSWC, Annapolis, installation evolved gradually from T&E to R&D during the Cold War-era. Seven primary technical labs comprised T&E activities until 1957, when the labs were consolidated to emphasize R&D projects. Eventually the labs were dissolved and activities were refined into specific R&D programs.

Archival investigations indicated that the research undertaken at NSWC, Annapolis, during the Cold War-era supported several important objectives of military plans and operations. These included containment of Communist threat; maintaining sea control; hardware (aircraft carriers, submarines, missiles); combat weapons systems and combat support systems; communication; command structure; and, R&D (Green 1993). NSWC, Annapolis, played an important role in terms of R&D activities during this period. The principal R&D programs undertaken at the installation included development of propulsion machinery, submarine systems, machinery silencing techniques, fuels and lubricants,

electrical and radio interference equipment, and metal alloys. The work produced by the installation's scientists and engineers assisted the Navy in its Cold War concepts, and resulted in several important studies and numerous patents. However, based on current data, it was not determined that any of the facilities involved in the installation's research efforts contributed on a nationally-significant level to naval Cold War R&D activities (Criterion A).

Many of the research programs undertaken at the station consisted of highly technical, specialized work that required sophisticated and original equipment and machinery. As a result, some laboratories at NSWC, Annapolis, were designed to accommodate program-specific needs. For example, the Stray Magnetics Field Measurement facility (Building 174) was constructed entirely with nonmagnetic materials, and was connected to an instrumentation and control building via an underground tunnel. The Submarine Ballast Blow Test Facility (Building 177) represented another specialized laboratory. This building was constructed of steel frame and concrete block, and was sheathed in ribbed steel siding to withstand the rigorous tests conducted to investigate the dynamics of various air and water submarine systems. However, although unique construction was employed for these facilities and others at NSWC, Annapolis, they do not exemplify nationally-significant building technologies (Criterion C).

All of the remaining resources dating from the Cold War-era represent secondary support facilities, such as storage buildings, offices, pump stations, and equipment buildings. These resources represent minor support buildings and are not associated directly with the installation's primary mission. In keeping with DoD guidance, military resources less than 50 years old must possess exceptional significance on a national level for National Register considerations G, and they must retain sufficient integrity to convey exceptional historic significance. No properties at NSWC, Annapolis,, less than 50 years old, possess the exceptional significance necessary for inclusion in the National Register of Historic Places.

Maryland Comprehensive Historic Preservation Plan Data

Geographic Organization:

Western Shore

Chronological/Developmental Period(s):

Industrial/Urban Dominance A.D. 1870 - 1930

Modern Period A.D. 1930 - present

Historic Period Theme(s):

Military

Architecture

Resource Type:

Category: District

Historic Environment: Suburban

Historic Function and Use: Experiment (testing & evaluation) station

Known Design Source: None

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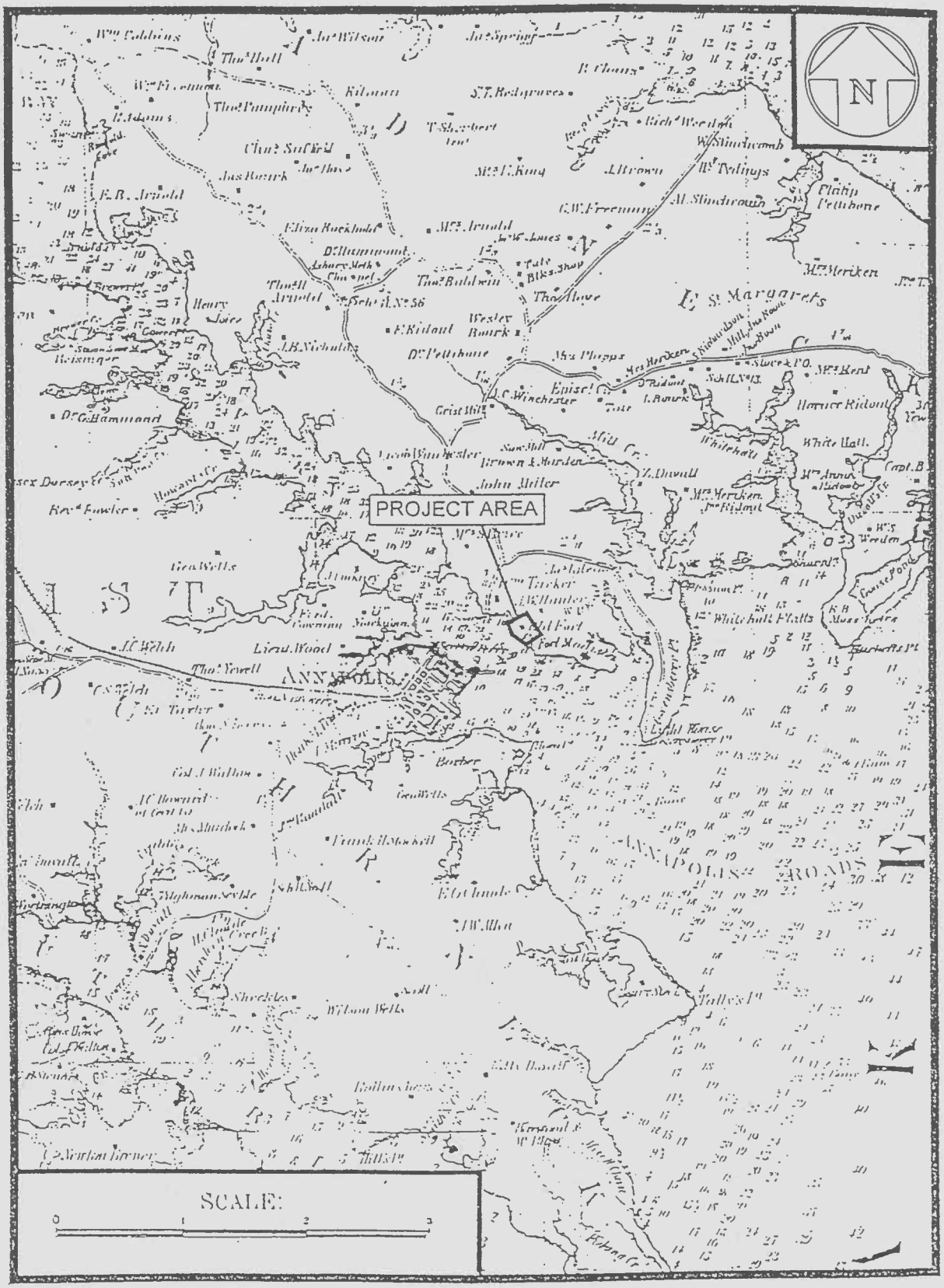

2 of 4 Excerpt from the 1860 Martenet *Map of Anne Arundel County*, illustrating the NSWC, Annapolis project area

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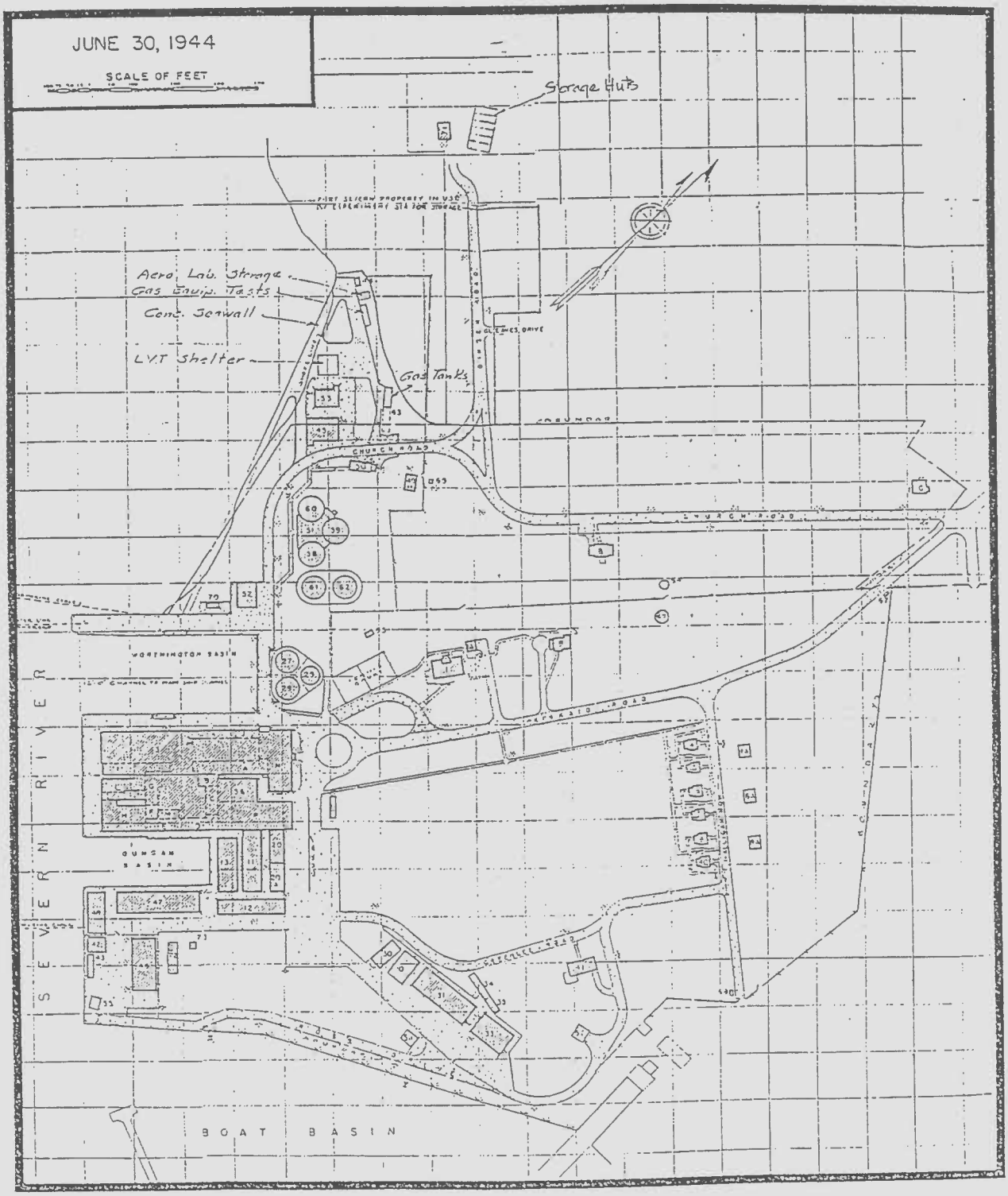
Engineering Experiment Station
Anne Arundel County
Historic Map



 Excerpt from the 1944 *Map of Engineering Experiment Station Annapolis, MD*

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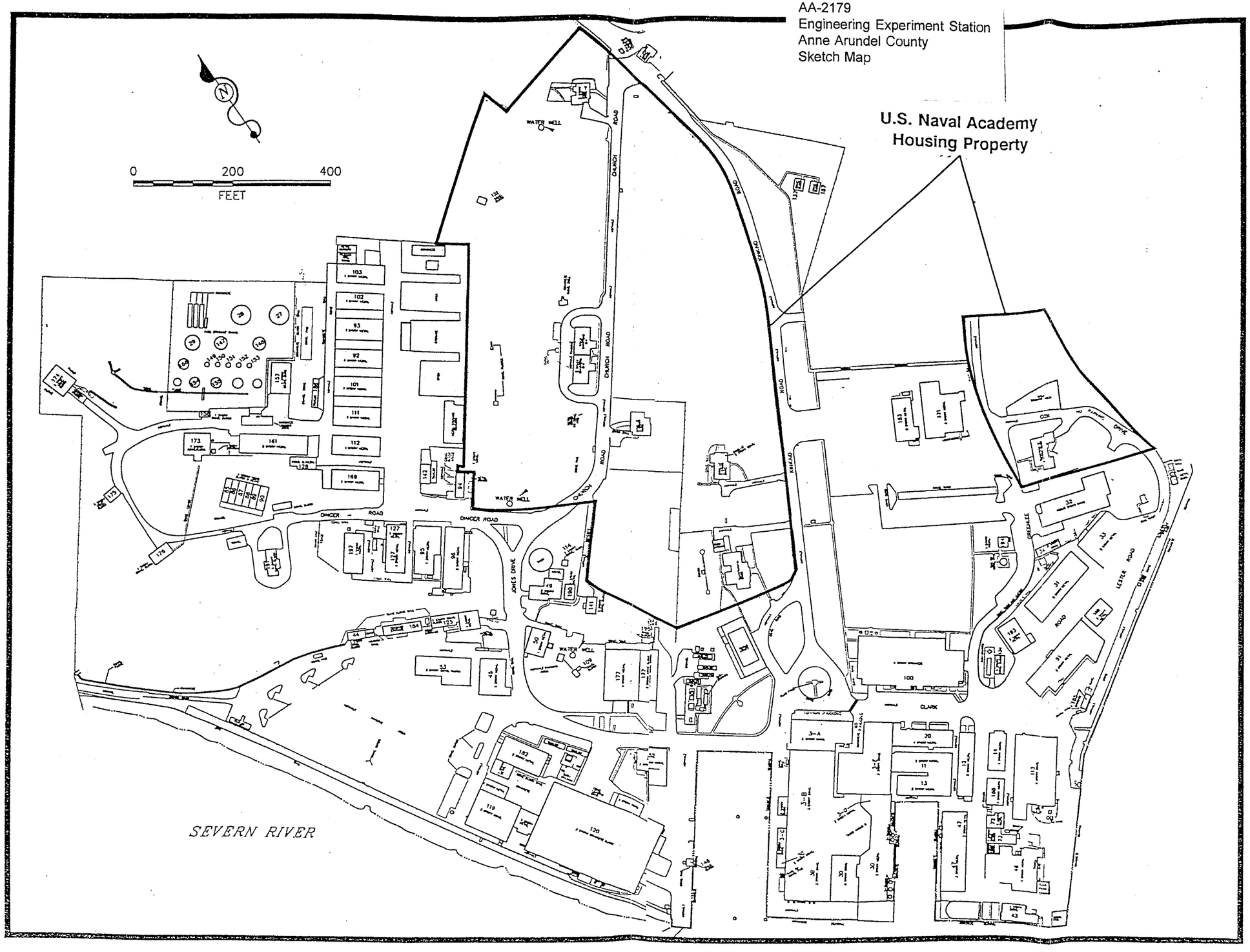
Engineering Experiment Station
Anne Arundel County
Sketch Map



4 of 4 AutoCAD map of NSWC, Annapolis, showing the buildings contained within the present boundaries

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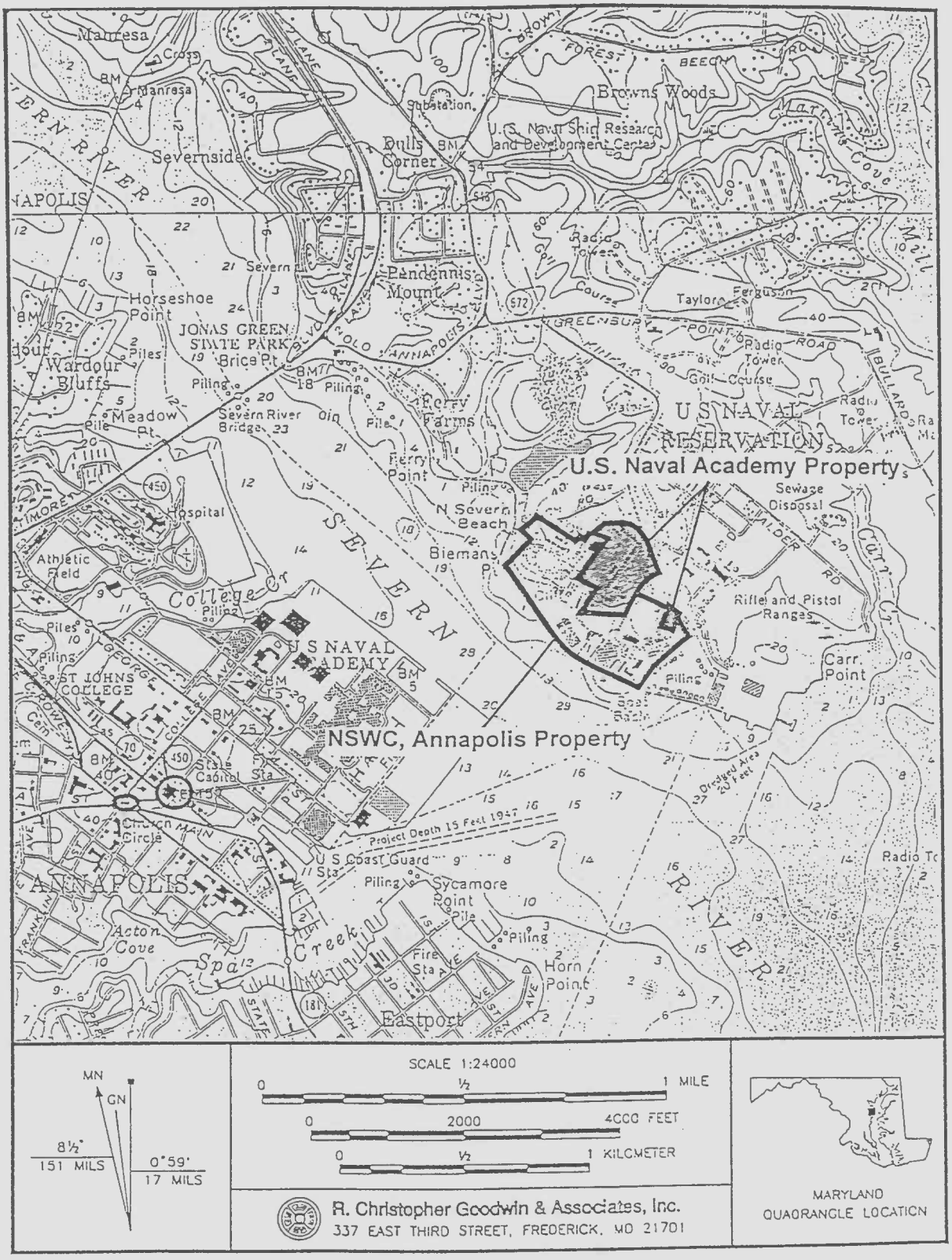
Engineering Experiment Station
Anne Arundel County
USGS Quadrangle Map



1 of 4 Excerpt from the USGS 7.5' Annapolis Quadrangle showing the location and current boundaries of NSWC, Annapolis

MHT No. AA-2179
Engineering Experiment Station
Anne Arundel County, Maryland

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The Information for items a-f is identical for each print.

a. Inventory No.: AA-2179
b. Historic Name: Engineering Experiment Station
c. Location: Anne Arundel County, Maryland
d. Photographer: Lori O'Donnell
e. Date: November 1997
f. Location of Neg: Engineering Field Activity-Chesapeake
Building 212, 901 M Street, S.E.
Washington Navy Yard
Washington, D.C. 20374-2121

1 of 23 View Southwest of North and East Elevations of Building 47, the Metals Laboratory.

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11/22/96

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