

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
NASA CONTRACT NO. NASW-4598  
NASA TASK ASSIGNMENT NO. 93

ENVIRONMENTAL ASSESSMENT  
14 X 22 FOOT SUBSONIC TUNNEL  
PRODUCTIVITY ENHANCEMENT PROJECT

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
NASA CONTRACT NO. NASW-4598  
NASA TASK ASSIGNMENT NO. 93

ENVIRONMENTAL ASSESSMENT  
14 X 22 FOOT SUBSONIC TUNNEL  
PRODUCTIVITY ENHANCEMENT PROJECT  
LANGLEY RESEARCH CENTER, HAMPTON, VIRGINIA

FEBRUARY 1997

Prepared by:  
Foster Wheeler Environmental Corporation  
2111 Wilson Boulevard, Suite 435  
Arlington, Virginia 22201

## TABLE OF CONTENTS

<u>SECTION</u>	<u>PAGE</u>
ACRONYMS AND ABBREVIATIONS .....	iv
1.0 <u>SUMMARY AND CONCLUSIONS</u> .....	1
2.0 <u>PURPOSE AND NEED</u> .....	2
2.1 FACILITY BACKGROUND.....	2
2.2 PROJECT PURPOSE .....	2
2.3 PROJECT NEED .....	5
2.3.1 Test Section Ceiling .....	5
2.3.2 Facility Automation.....	5
2.3.3 Model Support/Cart System Upgrades .....	5
2.3.4 Building/Institutional Upgrades.....	6
2.3.5 Modification of Model Cart #1 .....	6
2.3.6 Fully Automated Cart Transportation System.....	6
2.3. Fully Functional MPA Upgrade.....	6
2.4 SCOPE OF THE ENVIRONMENTAL ASSESSMENT .....	6
3.0 <u>DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES</u> .....	8
3.1 PROPOSED ACTION .....	8
3.1.1 Group 1 Enhancement .....	8
3.1.2 Group 2 Enhancements .....	8
3.1.3 Group 3 Enhancements .....	13
3.2 CONSTRUCTION SCHEDULE.....	14
3.3 ALTERNATIVES .....	14
3.3.1 No-Action Alternative .....	14
3.3.2 Modification to Building 1212 .....	14

4.0	<u>ENVIRONMENTAL IMPACTS</u> .....	15
4.1	PROPOSED ACTION .....	15
4.1.1	Land Use.....	15
4.1.2	Water Quality .....	15
4.1.3	Air Quality.....	15
4.1.4	Noise.....	16
4.1.5	Waste Generation, Treatment, Storage, and Disposal.....	17
4.1.6	Toxic Substances.....	17
4.1.7	Radioactive Materials and Non-ionizing Radiation .....	17
4.1.8	Biological Resources.....	18
4.1.9	Endangered and Threatened Species .....	18
4.1.10	Wetlands and Floodplains.....	18
4.1.11	Coastal Resources Management .....	18
4.1.12	Historic, Archeological, and Cultural Factors .....	19
4.1.13	Economic, Population, and Employment Factors .....	20
4.1.14	Traffic and Parking .....	22
4.1.15	Aesthetic Resources .....	22
4.1.16	Energy .....	22
4.1.17	Environmental Justice .....	22
4.2	NO-ACTION ALTERNATIVE .....	23
5.0	<u>REFERENCES</u> .....	24
6.0	<u>LIST OF AGENCIES CONSULTED</u> .....	25
7.0	<u>AGENCIES RECEIVING A COPY OF THE ENVIRONMENTAL ASSESSMENT</u> .....	26

## APPENDIX A - NATURAL HERITAGE RESOURCES WITHIN LaRC REGION

## LIST OF FIGURES

<u>Figure</u>	<u>Description</u>	<u>Page</u>
1	Location of NASA Langley Research Center .....	3
2	West Area Overview Map - 14 x 22 Ft. Subsonic Tunnel Location .....	4
3	General Layout of the 14 x 22 Ft. Subsonic Tunnel .....	9
4	Typical Model Cart System .....	11
5	Proposed Layout of Major Additions.....	12
6	Potential Cultural Resources in the Vicinity of the 14 x 22 Ft. Subsonic Tunnel ....	21

## LIST OF TABLES

<u>Table</u>	<u>Description</u>	<u>Page</u>
4-1	Programs Comprising Virginia's Coastal Resources Management Programs .....	19

## ACRONYMS AND ABBREVIATIONS

14 x 22 ft. ST	14 x 22 Foot Subsonic Tunnel
16 ft. TT	16-Foot Transonic Tunnel
ACHP	Advisory Council on Historic Preservation
ACOE	U.S. Army Corps of Engineers
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CRMP	Coastal Resources Management Program
dBA	Decibels, A-Weighted Scale
EA	Environmental Assessment
EPA	U.S. Environmental Protection Agency
ft	feet, foot
FONSI	Finding of No Significant Impact
FY	Fiscal Year
HCRMP	Historic Cultural Resources Management Plan
HRPDC	Hampton Roads Planning District Commission
HRSD	Hampton Roads Sanitation District
ICUZ	Installation Compatibility Use Zone
LAFB	Langley Air Force Base
LaRC	Langley Research Center
lb	Pound(s)
LHB	Langley Handbook
m	meter, meters
MPA	Model Preparation Area
MSA	Metropolitan Statistical Area
msl	mean sea level
NASA	National Aeronautics and Space Administration
NCSHPO	National Conference of State Historic Preservation Officers
NEPA	National Environmental Policy Act
NHB	NASA Handbook
NHL	National Historic Landmark
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
OSHA	Occupational Safety and Health Administration
RFSGF	Refuse-Fired Steam Generating Facility
SIP	State Implementation Plan
SOP	Standard Operating Procedure
TBT	Tributyltin
VDEQ	Virginia Department of Environmental Quality
VOC	Volatile Organic Compound
VOCEC	Volatile Organic Compound Emission Control
V/STOL	Vertical/Short Takeoff and Landing

## 1.0 SUMMARY AND CONCLUSIONS

The proposed action is intended to support the National Aeronautics and Space Administration (NASA) Langley Research Center's (LaRC) commitment to integrate tests functions at the 30 x 60 foot Full Scale Tunnel to the Langley 14 x 22 foot subsonic tunnel (14 x 22 ft. ST) and to increase the productivity, reliability, and efficiency of the 14 x 22 ft. ST. The 14 x 22 ft. ST is a research facility providing state-of-the-art wind tunnel testing capabilities and is located on the West Area of the NASA LaRC in Hampton, Virginia.. The facility requires a number of upgrades and modifications to meet the projected national demand for its services and to maintain U.S. testing capability at the forefront of research.

The proposed action involves 12 work elements grouped into 7 enhancement areas. The enhancement areas consist of test section ceiling modifications to accommodate free flight testing from the 30 x 60 ft. tunnel; facility automation, model support cart systems upgrades, building upgrades, fully automated cart transportation system, and a fully functional model preparation area upgrade. NASA LaRC proposes to construct the enhancement activities over a 3 year period ending late 1999.

The proposed action, the No-Action Alternative, and alternatives for new model carts were considered in this Environmental Assessment (EA). The No-Action Alternative entails operating the facility with the current equipment and infrastructure. This alternative would not provide the needed capabilities for integrating the functions at the 30 x 60 ft. Tunnel, which has been deactivated. Also, the No-Action Alternative will not meet the expected demand for the facility from NASA, the U.S. Department of Defense, and the aircraft industry. Without the added capability and increase in productivity, the U.S. industry may be forced to use test facilities overseas for sensitive and competitive industrial research.

The environmental analysis indicates that the proposed action will not have a significant impact on physical and human environment in the local area. There would be no significant impact on local vegetation, wildlife habitat, wetlands, local surface and ground water resources because of the clearing required to construct the cart storage building. All other proposed activities will be primarily require internal modifications to existing buildings. Construction and operation of the proposed enhancements would not affect local air quality. Any potential hazardous and toxic wastes resulting from facility upgrades would be disposed of in accordance with applicable Federal, State, and local regulations. NASA LaRC is coordinating with the State Historic Preservation Officer (SHPO) to evaluate the potential significance of the area where the cart storage building is proposed to be constructed. While no major finding is anticipated, the NASA LaRC is committed to take appropriate actions required by the SHPO to avoid or minimize potential impacts to cultural resources in the area from the proposed action.

Based on the evaluation presented in the EA, it does not appear that potential environmental impacts associated with the proposed enhancement of the 14 x 22 ft. ST will individually or cumulatively have a significant impact on the quality of local environment. A Finding of No Significant Impact (FONSI) is recommended.

## 2.0 PURPOSE AND NEED

### 2.1 FACILITY BACKGROUND

The National Aeronautics and Space Administration (NASA) Langley Research Center (LaRC) is located in the City of Hampton in Virginia (Figure 1). The Langley 14 x 22 foot Subsonic Tunnel (14 x 22 ft. ST) located in Building 1212C at NASA LaRC (Figure 2) was built in 1970. The tunnel has been used to conduct subsonic aerodynamic research on vertical/short takeoff and landing (V/STOL) since its construction. A wide range of configurations and hardware of powered and unpowered models of fixed and rotary wing, civil and military aircraft are tested at the facility. Specifically the tunnel has been used for force, moment and pressure studies of full span and semispan powered advance fighter aircraft. The models are powered with high pressure air or variable frequency electrical systems.

The 14 x 22 ft. ST is used by NASA, the U.S. Department of Defense, and the aircraft industry to address a wide variety of low speed aerodynamic challenges from high-lift systems performance to dynamic simulation of ground effects. The facility is 25 years old and its productivity suffers from a lack of upgrading to meet the needs of its clients. With the closure of other facilities such as the 30 x 60 ft. Full Scale Tunnel at NASA LaRC, the role of the 14 x 22 ft. ST in aerodynamic research will increase.

### 2.2 PROJECT PURPOSE

The primary objective of the proposed action to modify the 14 x 22 ft. ST is to improve productivity and expand testing capability of the facility to become more responsive to client expectations and needs and to offer a world class facility for low-speed aerodynamic research. The project purposes include improving the facility to provide new research capabilities to accommodate work from the 30 x 60 ft. Full Scale Tunnel, which has been deactivated, improving tunnel flexibility to accommodate a large number of different types of tests, and improving operational efficiencies and reducing operational costs.

NASA LaRC has identified 12 specific work elements to improve productivity, reliability, and efficiency of the 14 x 22 ft. ST. These work elements are assembled in 7 enhancement areas. When implemented, the work elements would result in the following operational improvements:

- the ability to perform free flight testing that was formerly performed at the 30 x 60 ft tunnel;
- ability to lift and handle models, struts and other loads between the model preparation area (MPA) and the tunnel test section;
- ability to handle advanced types of tests and provide shorter data turnaround time to improve operational efficiency;
- fully automated tunnel controls that will reduce tunnel operational costs;
- capability for the models to be built up and moved to the test section on a model support cart without disassembling the model;





- the ability to quickly change small models while leaving the carts in the test-section; and
- allow easy movement and storage of carts in or near the MPA.

## 2.3 PROJECT NEED

The following sections provide an overview of existing components of the 14 x 22 ft. ST and describe the need for upgrades, additions, and modifications required to achieve the project objective.

### 2.3.1 Test Section Ceiling

Currently the test section can be operated in closed, slotted, partially open and fully open configurations. The closed test section configuration is 14.5 ft. (4.42 meters [m]) high, 21.75 ft. (6.63 m) wide and 50 ft. (15.24 m) long and supports a maximum speed of about 338 ft/second (s) (103 m/s). The open test section configuration, with a maximum speed of approximately 270 ft/s (82 m/s), is formed by raising the ceiling and walls to form a floor-only configuration. A 15 ft. square opening is required in the test section ceiling of the 14 x 22 ft. ST to provide access for free flight model testing that was conducted at the 30 x 60 ft. Full Scale Tunnel.

### 2.3.2 Facility Automation

Functions at the 14 x 22 ft. ST are controlled manually by operators during the test phase. Four operators, and sometimes more, are needed to manually operate all tunnel processes. The present control system is limited in function and is severely outdated with only a few individual sections automated. Automating facility and research processes will decrease the time currently required to achieve and hold test conditions steady while measurements are taken. Such reduction in time for observations will increase the productivity of the facility.

### 2.3.3 Model Support Cart System Upgrades

Test models are currently built-up and checked out in the MPA on carts that incorporate the model support positioning mechanisms and control systems. The model cart is moved beneath the test section of the tunnel and elevated into the test section by hydraulic lifts. For a majority of tests, low ceiling height between the MPA and the tunnel test section precludes moving the cart under the test section with the model attached. In such cases, the model is removed from its support in the MPA and re-installed after moving the cart inside the test section. This double handling curtails tunnel productivity severely. In several tests, small model support carts provide an alternative to model installation. Models would be built-up on these carts in the MPA and moved into the tunnel test section with a large cart remaining in the tunnel. Such systems, used extensively in other tunnels, would improve productivity in testing smaller models in the 14 x 22 ft. ST. Additional large carts which are shorter in height and smaller carts are required to realize improved productivity of the facility.

- the ability to quickly change small models while leaving the carts in the test-section; and
- allow easy movement and storage of carts in or near the MPA.

## 2.3 PROJECT NEED

The following sections provide an overview of existing components of the 14 x 22 ft. ST and describe the need for upgrades, additions, and modifications required to achieve the project objective.

### 2.3.1 Test Section Ceiling

Currently the test section can be operated in closed, slotted, partially open and fully open configurations. The closed test section configuration is 14.5 ft. (4.42 meters [m]) high, 21.75 ft. (6.63 m) wide and 50 ft. (15.24 m) long and supports a maximum speed of about 338 ft/second (s) (103 m/s). The open test section configuration, with a maximum speed of approximately 270 ft/s (82 m/s), is formed by raising the ceiling and walls to form a floor-only configuration. A 15 ft. square opening is required in the test section ceiling of the 14 x 22 ft. ST to provide access for free flight model testing that was conducted at the 30 x 60 ft. Full Scale Tunnel.

### 2.3.2 Facility Automation

Functions at the 14 x 22 ft. ST are controlled manually by operators during the test phase. Four operators, and sometimes more, are needed to manually operate all tunnel processes. The present control system is limited in function and is severely outdated with only a few individual sections automated. Automating facility and research processes will decrease the time currently required to achieve and hold test conditions steady while measurements are taken. Such reduction in time for observations will increase the productivity of the facility.

### 2.3.3 Model Support Cart System Upgrades

Test models are currently built-up and checked out in the MPA on carts that incorporate the model support positioning mechanisms and control systems. The model cart is moved beneath the test section of the tunnel and elevated into the test section by hydraulic lifts. For a majority of tests, low ceiling height between the MPA and the tunnel test section precludes moving the cart under the test section with the model attached. In such cases, the model is removed from its support in the MPA and re-installed after moving the cart inside the test section. This double handling curtails tunnel productivity severely. In several tests, small model support carts provide an alternative to model installation. Models would be built-up on these carts in the MPA and moved into the tunnel test section with a large cart remaining in the tunnel. Such systems, used extensively in other tunnels, would improve productivity in testing smaller models in the 14 x 22 ft. ST. Additional large carts which are shorter in height and smaller carts are required to realize improved productivity of the facility.

- NASA's regulations implementing the provisions of NEPA (14 CFR Part 1216.3, as addressed in Implementing the Provisions of the National Environmental Policy Act (NHB 8800.11); and
- NASA LaRC Environmental Program Manual (LHB 8800.1).

### **3.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES**

#### **3.1 PROPOSED ACTION**

In order to meet the objective to increase productivity and testing capability of the 14 x 22 ft. ST, NASA LaRC proposes to implement several work elements grouped in 7 enhancement areas. NASA LaRC has prioritized these improvements based on client requirements in the order of descending incremental improvement in productivity and capability of the facility. The work elements in 7 enhancement areas are further consolidated into 3 groups based on budgetary constraints as below:

Enhancement area to be completed in fiscal year (FY) 1997 as Group 1 comprises test-section ceiling modification;

Group 2 (FY 1998) includes facility automation, model support cart system upgrades, and building/facility upgrades;

Group 3 (FY 1999 or later) includes modifications to Model Cart #1, installation of a fully automated cart transportation system, and a fully functional MPA upgrade.

Figure 3 shows the layout of the existing facility.

##### **3.1.1 Group 1 Enhancement**

###### **Test-Section Ceiling Modifications**

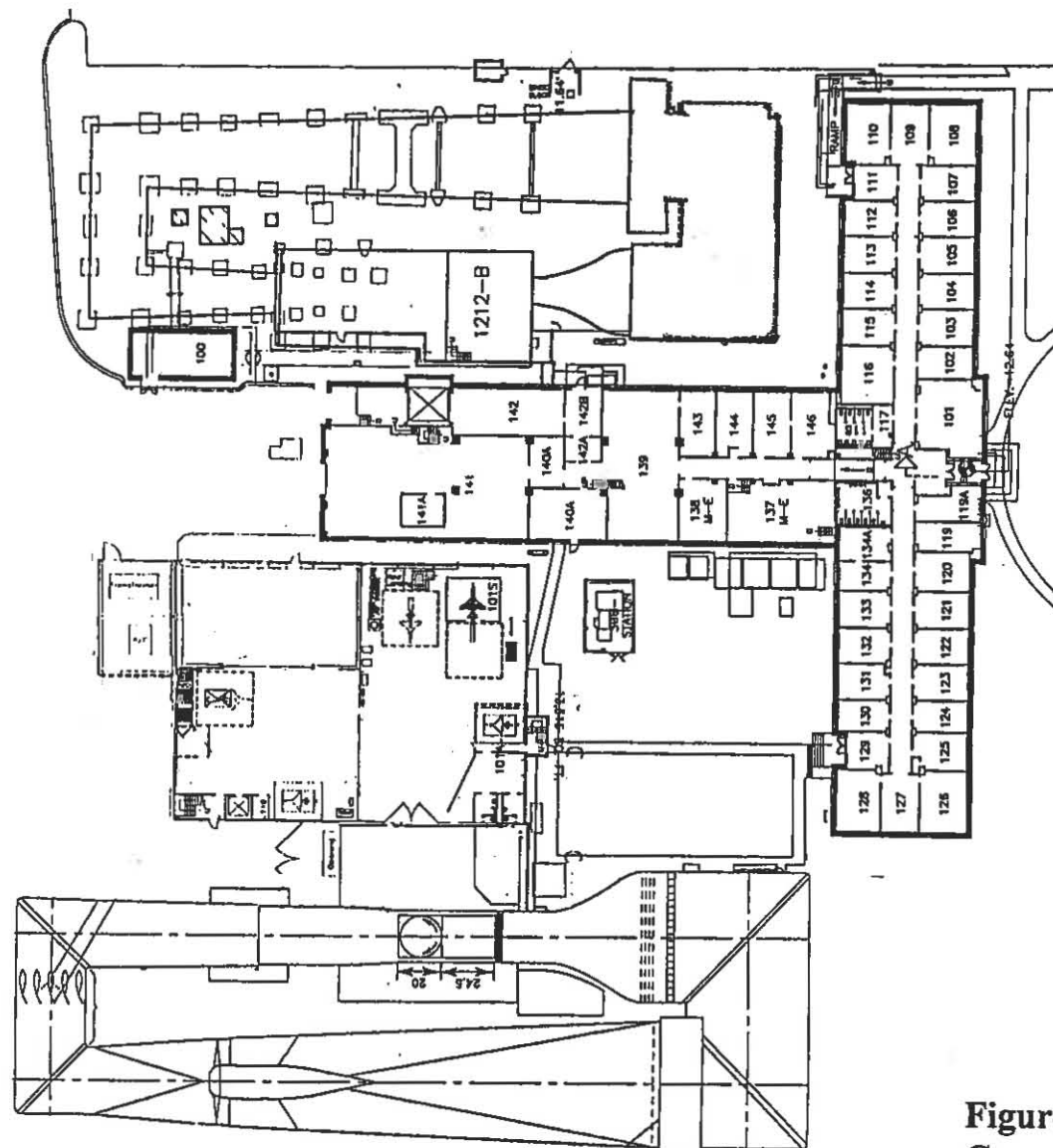
NASA proposes to enlarge the ceiling over the test section to allow for the access of free flight model testing. Two 7 x 15 ft. doors will replace the existing fixed ceiling structure. The existing ceiling skin plate, stiffeners, and the roof truss would be cut to install the doors. The doors will be opened and closed through electrically operated actuators. The door movement will be activated from a control station at the test-section level.

##### **3.1.2 Group 2 Enhancements**

###### **Automatic Controls Modifications**

NASA proposes to install a new control system to automate facility operations including fan speeds, air pressure, temperature and model cart mechanisms. A new automated system would also be installed to control and stabilize research parameters including dynamic pressure in the test section, air speed, model positioning and boundary layer control. The control system design would integrate the tunnel controls, research data acquisition and data storage into a single networked system. Such a system would facilitate a testing environment in which all elements of the data system have access to data from all other elements of the system.





**Figure 3**  
**General Layout of the**  
**14 x 22 ft. Subsonic Tunnel**

SOURCE: NASA Technical Paper 3008  
 Modification to the Langley 14 x 22 ft. Subsonic Tunnel Conceptual Study

## Model Support/Cart System Upgrades

### New Model Cart # 7

NASA proposes to develop a new model cart, #7. Figure 4 provides typical details of the cart. In order to accommodate testing large models, the cart will be shorter by up to 3 ft. than the existing carts. The emphasis on this new design will be a vertical telescopic translation mechanism to facilitate this 3-foot reduction in height.

### New Small Model Handling Carts

NASA also proposes to design two new small model handling carts to increase productivity. The design would permit the larger carts to remain fixed in the test section while the small carts are used to maneuver compatible models for testing. The small carts will be self-powered and steerable and will have limited lift and tilt capability to assist in model assembly. With these small model carts, tests can be carried out without disturbing large model carts, thus saving considerable operating time.

### Upgrade of Existing Large Cart #2

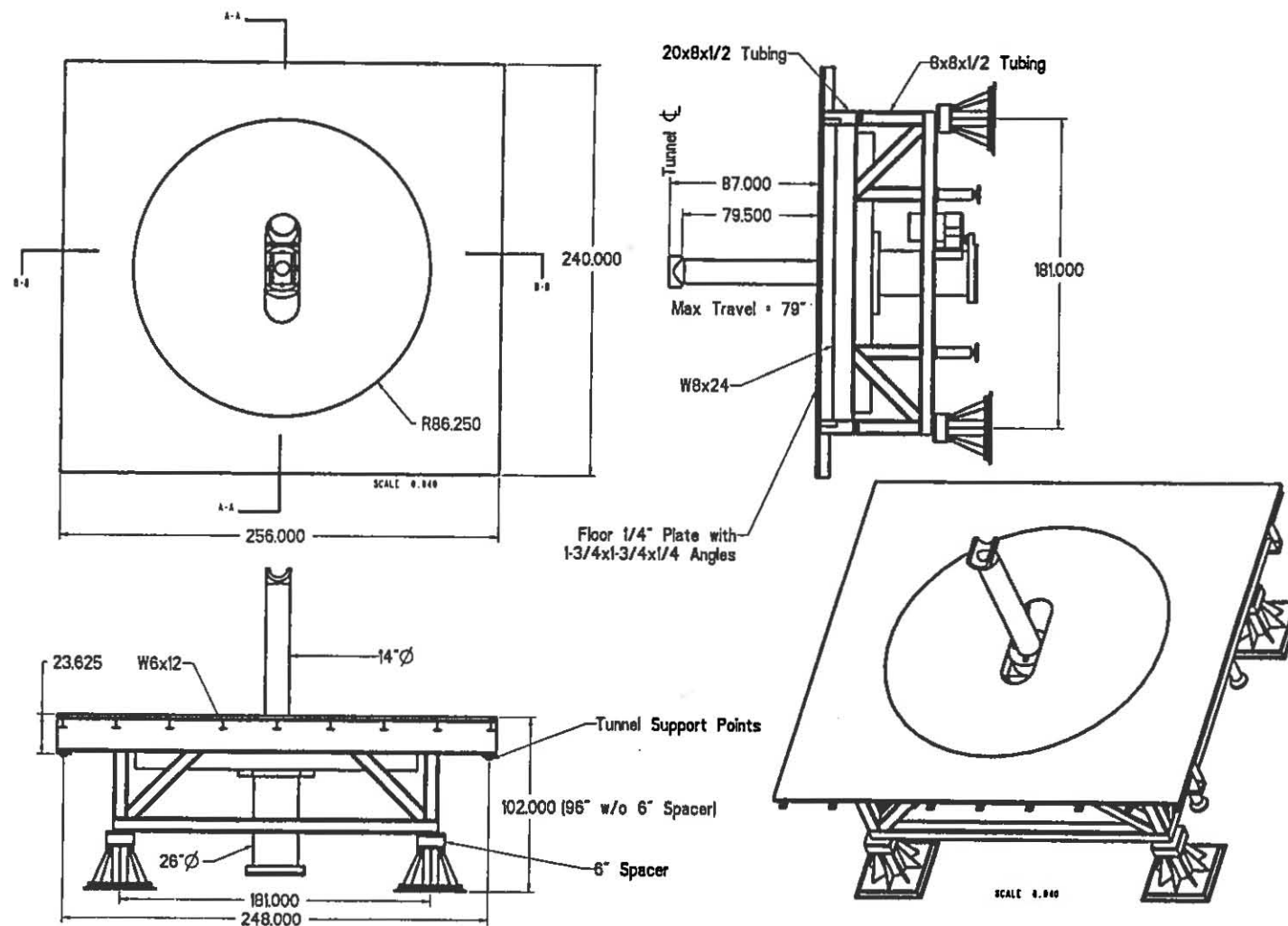
When the new model cart # 7 is completed, the existing cart # 2 will be used less. However, this cart is used for specialized high angle of attack testing using vertical air struts and for semi-span testing. Such testing cannot be carried out on other carts. The proposed upgrade will minimize rigging time by providing a permanent centerline mounting for the vertical air strut and a permanently available semi-span mount which would save model installation and dismantling time.

When all the proposed cart upgrades are implemented, the facility will have 7 large model carts and 2 smaller carts in operation.

## Building/Institutional Upgrades

### Dedicated Cart Storage Building

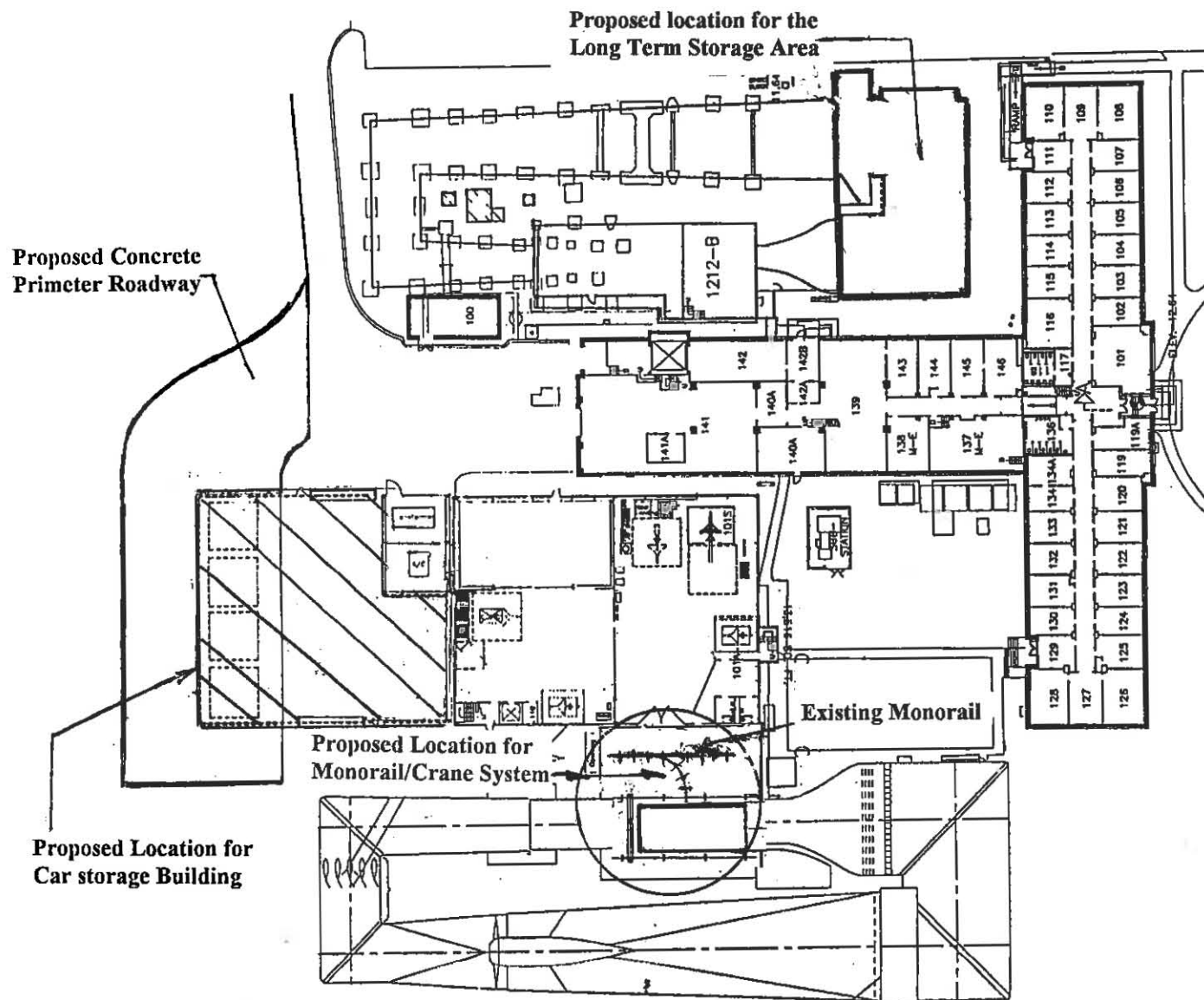
The volume and weight of the carts cause transportation and storage problems at the facility. The number of carts at the 14 x 22 ft. ST will increase from 5 in 1995 to 9 in 1999. To adequately store the carts and carry out facility functions, NASA LaRC proposes to extend the existing shop area to construct a 9,200 square foot high bay (Figure 5). A new roadway around the building is proposed to provide easy and direct access for cart drop-off and pick-up for outside maintenance operations and to move to the long-term storage area (Figure 5). A small technician work area will be constructed in a portion of the second floor of the building.



SOURCE: Modification to the Langley 14 x 22 ft. Subsonic Tunnel Conceptual Study

Figure 4  
Typical Model Cart System





SOURCE: NASA Technical Paper 3008  
 Modification to the Langley 14 x 22 ft. Subsonic Tunnel Conceptual Study

**Figure 5**  
**Proposed Layout**  
**of Major Additions**

organic compounds, and toxic air pollutants. These secondary emissions are expected to be insignificant and are not subject to stationary source permitting.

In accordance with §176 of the Clean Air Act (CAA), each State must modify its State Implementation Plan (SIP) to establish criteria and procedures for demonstrating that all Federal actions, which would occur in or impact on non-attainment areas, conform to the requirements of the SIP. Such revisions to SIPs have not yet been finalized by the Commonwealth of Virginia and approved by the U.S. Environmental Protection Agency (EPA). Therefore, Federal actions must be reviewed in accordance with the requirements of 40 CFR Parts 6, 51, and 93 "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" dated November 30, 1993. The Federal agency responsible for the action must determine if its actions conform to the applicable SIP.

LaRC is located within a State-designated ozone non-attainment area (marginal) and Volatile Organic Compound Emission Control (VOCEC) area. The proposed action involves no additional emission of ozone precursors such as oxides of nitrogen or volatile organic compounds (VOCs).

No toxic pollutants or VOCs are expected to be released to the atmosphere. Space heating will be provided by the existing LaRC steam system which is supplied by the refuse-fired steam generating facility (RFSGF) in Building 1288 and the oil- and gas- fired boilers in the central heat plant in Building 1215. Both of these facilities are permitted by the Virginia Department of Environmental Quality (VDEQ). No additional capacity to the existing steam system will be required for the proposed action. No increase in the electrical load on the local utility (Virginia Power) system is anticipated from the new connection. No emergency back-up system (e.g., diesel generator) is proposed for the 14 x 22 ft. ST. Hence, operation of the 14 x 22 ft. ST is below the EPA *de minimis* threshold and will not violate any provisions adopted in the Virginia SIP for maintaining air quality. Therefore, no significant impact to local air quality is anticipated.

#### 4.1.4 Noise

Much of the construction related to the proposed upgrades in the test section, tunnel controls, carts and cart handling areas will be inside the existing building and exterior noise levels will be unaffected. The only outside construction will be the cart storage building at the northwest corner of building 1212C. Noise producing equipment will include ordinary construction equipment such as backhoes, concrete trucks, material delivery trucks, cranes, welding equipment, generators, grading and paving equipment. Noise from this equipment will be compatible with the existing high daytime noise environment arising from traffic, military aircraft and other adjacent wind tunnel operations. There will be no nighttime construction.

The nearest residential receptors are the Spinnaker Cove Apartments west of the facility on Armistead Avenue and the trailer park south of the facility. Existing building structures in the tunnel complex will act as an effective noise barrier and minimize the effect of construction noise at the nearest sensitive receptors. No noise impact is expected due to construction of the proposed upgrades.

Installation of the proposed enhancements will increase the efficiency and utilization of the facility but will not significantly change the operational noise level. Noise measurements made

#### 4.1.8 Biological Resources

Biological resources of LaRC are described in the facility Environmental Resources Document (Foster Wheeler Environmental, 1996). The 14 x 22 ft. ST is located in a heavily developed area of LaRC with minor natural habitat in the vicinity. The proposed clearing for the cart storage building will be less than 0.5 acre of land. This clearing is not anticipated to significantly impact any biological resources at LaRC since it does not provide any significant habitat (Foster Wheeler Environmental, 1996).

#### 4.1.9 Endangered and Threatened Species

Old Dominion University conducted a facility-wide endangered and threatened species survey at NASA LaRC (ODU, 1995). A total of 164 plant species, 16 reptile and amphibians, and 14 species of mammals were identified. None of the plants or animals identified during the survey are listed as threatened or endangered. Additionally, a review of the Virginia Natural Heritage Program database indicates that no Federal or State-listed endangered or threatened species are known to occur at LaRC (Letter from the Virginia Department of Conservation and Recreation's Division of Natural Heritage dated July 1, 1996- Appendix A). The proposed action will not affect any listed or proposed endangered or threatened species or their critical habitat.

#### 4.1.10 Wetlands and Floodplains

LaRC has large areas of tidal wetlands associated with Brick Kiln Creek and Tabbs Creek, and small, scattered areas of forested wetlands. No wetlands occur in the vicinity of Buildings 1212 and 1212C. The proposed action does not involve construction within wetlands or a redirection of stormwater in the area; no wetlands will be affected by the proposed action.

The 100-year floodplain elevation at LaRC is at 2.6 m (8.5 ft) above mean sea level (msl), and the 500-year floodplain is at 3 m (9.8 ft) above msl. Buildings 1212 and 1212C are located above the 500-year floodplain elevation.

#### 4.1.11 Coastal Resources Management

The city of Hampton is a tidewater jurisdiction under the Commonwealth of Virginia's approved Coastal Resources Management Program (CRMP). The Virginia CRMP is an integrated program based upon existing State licenses, permits, and approval requirements (Table 4-1). In implementing the CRMP, the VDEQ Division of Public and Intergovernmental Affairs considers an activity to affect the coastal zone if it requires a permit or approval under any of the listed programs and considers the activity to be consistent with the CRMP if it is consistent with all applicable programs (i.e., receives all applicable state licenses, permits, and approvals). The only programs applicable to the proposed 14 x 22 ft. ST modifications are the non-point source pollution control, the point source pollution control (the NPDES permit program), and the air pollution control program. No change in air emissions or wastewater effluents are anticipated with the proposed action. Consequently the proposed action is consistent with the Virginia CRMP.

which through demolition, alteration, or new construction affect facilities designated as National Historic Landmarks (NHLs). LaRC has been inventoried under the congressional-mandated thematic study "Man in Space" which produced 5 NHLs. A comprehensive inventory of the remainder of the Center is on-going, and under contract with the National Park Service.

LaRC is developing a Historic Cultural Resources Management Plan (HCRMP) under the direction of its Facility Preservation Officer. This plan will be based upon information obtained from the previous archeological surveys and building inventories within LaRC as well as from the current Center-wide archeological Phase I and Phase II surveys under contract with the Army Corps of Engineers (ACOE) and building inventories. The plan will specify zones of cultural resources potential and will probably establish a Historic District within LaRC.

Phase I investigations conducted near the 14 x 22 ft. ST complex produced evidence of prehistoric occupation and a possible 18th to 20th century domestic occupation at a site to the northwest of the facility (Figure 6). The SHPO has issued an identification number 44HT46 for the site (Cassebeer et. al 1995). NASA LaRC has completed a Phase 2 investigation to determine if the site is eligible for inclusion in the National Register for Historic Places (NRHP). The area that may be impacted by the proposed action was found to be highly disturbed and no significant artifacts were found in the disturbed upper or the undisturbed lower layers. NASA LaRC is currently coordinating with the SHPO to obtain SHPO's concurrence with the findings of the Phase 2 investigations. Based on the finding of the investigations, no significant impact to historical and cultural resources in the area are anticipated with the proposed action.

#### 4.1.13 Economic, Population, and Employment Factors

LaRC is located in the northern portion of the city of Hampton in the southern Peninsula Area of southeastern Virginia and lies in the Hampton Roads Metropolitan Statistical Area (MSA). The MSA consists of the Virginia cities of Chesapeake, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg; the Virginia counties of Gloucester, Isle of Wight, James City, Matthews, and York; and Currituck County, North Carolina.

The population of the city of Hampton was about 135,000 in 1991, while the entire Hampton Roads MSA had a population of 1,431,088. The 1980 population for this area was 1,187,846, which represents a 19.4 percent increase in population in ten years. The Hampton Roads MSA work force consisted of 656,869 civilian and 148,000 active duty military in 1993 (Hampton Roads Planning District Commission, 1993).

LaRC presently employs approximately 2,500 civil service and 1,700 contractors, with an annual payroll of \$153 million. LaRC contracts about \$409 million annually in goods and services both locally and nationally, thus performing an important role in the local economy.

The 14 x 22 ft. ST has a present staff compliment of 24 which is anticipated to decrease to 20 once all improvements are completed. A capital expenditure of \$10 million over a 4 year period for the 14 x 22 ft. ST modification and upgrade is expected to have a minor positive effect on the local economy.

outreach efforts continue to target groups that constitute a representative cross-section of the local population (Foster Wheeler Environmental, 1996).

As addressed in the previous sections, the proposed actions will comply with all applicable environmental statutes and regulations. In so far as the proposed 14 x 22 ft. ST modifications and upgrades are not anticipated to have significant environmental or socioeconomic effects, the proposed action will not have disproportionately high or adverse human health effects or environmental effects on minority or low-income populations.

#### 4.2 NO-ACTION ALTERNATIVE

Modernization and upgrading of the facility is needed for the United States to maintain a world-class subsonic wind tunnel facility that will provide model testing to accurately reflect the full-scale vehicle performance. Without such testing capability, the U.S. would continue to lose its edge on wind tunnel research which would compromise commercial viability of U.S. aircraft manufacturers and result in overseas testing.

#### 4.3 MODIFICATION TO BUILDING 1212

Potential construction and operational impacts to natural resources because of modifications to Building 1212 would not be significant and would not be much different from those of the proposed action. However, the alternative would be technically inferior and more expensive and would result in lower productivity of the facility.

## **5.0    REFERENCES**

**Ebasco, 1995. Comprehensive Environmental Noise Survey of Langley Research Center Operations .**

**Foster Wheeler Environmental Corporation, 1996. Environmental Resources Document, Langley Research Center.**

**Hampton Roads Planning District Commission, 1993. HRPDC Economic Outlook.**

**NASA Langley Research Center, January 1996. Modification to the Langley 14 x 22 ft. Subsonic Tunnel Concept Study.**

**NASA Langley Research Center, November 1991. Langley Research Center Environmental Program Manual, LHB 8800.1.**

**NASA Langley Research Center, June 1991. Langley Research Center Noise Control and Hearing Conservation Program, LHB 2710.1.**

**ODU (Old Dominion University), 1995. Baseline Biological Survey of Terrestrial and Aquatic Habitats at NASA Langley Research Center, with Special Emphasis on Endangered and Threatened Fauna and Flora.**

## **6.0 LIST OF AGENCIES CONSULTED**

During preparation of this EA, the following agencies were consulted:

U.S. Fish & Wildlife Service

Commonwealth of Virginia Department of Environmental Quality

Commonwealth of Virginia Department of Conservation and Recreation

Commonwealth of Virginia Department of Historic Resources

City of Hampton



## **7.0 AGENCIES RECEIVING A COPY OF THE ENVIRONMENTAL ASSESSMENT**

**Mr. Roy Denmark  
U.S. Environmental Protection Agency, Region III  
M/S 3ES43  
841 Chestnut Street  
Philadelphia, PA 19107**

**Ms. Cindy Schultz  
U.S. Department of the Interior, Fish and Wildlife Service  
Mid-County Center  
U.S. Route 17  
P.O. Box 480  
Whitemarsh, VA 23183**

**Ms. Ellie Irons  
Department of Environmental Quality  
Office of Environmental Impacts Review  
629 East Main Street, 6th Floor  
Richmond, VA 23219**

**Mr. Raymond T. Fernald  
Department of Game and Inland Fisheries  
4010 West Broad Street  
Richmond, VA 23230**

**Mr. John R. Davy  
Department of Conservation and Recreation  
203 Governor Street  
Suite 326  
Richmond, VA 23219**

**Mr. David Dutton  
Department of Historic Resources  
221 Governor Street  
Richmond, VA 23219**

**Mr. Robert W. Grabb  
Assistant Commissioner  
Marine Resources Commission  
P.O. Box 756  
2600 Washington Avenue  
Newport News, VA 23607**



Ms. Dona Huang  
Department of Environmental Quality  
Air Division  
629 East Main Street, 8th Floor  
Richmond, VA 23219

Ms. Michele Carter  
Chesapeake Bay Local Assistance Department  
8th Street Office Building, (Room 701)  
Richmond, VA 23219

Mr. Joseph Hassell  
Department of Environmental Quality  
Water Division, Office of Water Protection Program  
629 East Main Street, 8th Floor  
Richmond, VA 23219

Mr. Thomas A. Barnard, Jr.  
Virginia Institute of Marine Science  
Gloucester Point, VA 23062

Dr. Asif Malik  
Department of Health  
1500 East Main Street  
Water Programs, Room 109  
Richmond, VA 23219

Mr. Ulysses Brown  
Department of Environmental Quality  
Waste Resources Division  
629 East Main Street, 7th Floor  
Richmond, VA 23219

Ms. Sheri Kattan  
Department of Environmental Quality  
Tidewater Regional Office  
5636 Southern Boulevard  
Virginia Beach, VA 23462

Mr. John Tate  
Dept. of Agriculture & Consumer Services  
Division of Consumer Protection  
P.O. Box 1163  
Richmond, VA 23209

Mr. Eugene K. Rader  
Dept. of Mines, Minerals & Energy  
P.O. Box 3667  
Charlottesville, VA 22903

Mr. Chris Collins  
Dept. of Transportation  
Environmental Quality Division  
1221 East Broad Street  
Richmond, VA 23219

Mr. L.S. Button  
Dept. of Conservation and Recreation  
Bureau of Rivers and Shores  
203 Grovenor Street, Suite 206  
Richmond, VA 23219

Mr. Arthur L. Collins  
HR PDC  
Regional Building  
723 Woodlake Drive  
Chesapeake, VA 23220

Mr. Robert J. O'Neill  
Hampton City Manager  
City Hall  
22 Lincoln Street  
Hampton, VA 23660

**NATURAL HERITAGE RESOURCES WITHIN LARC REGION**

**APPENDIX A**

George Allen  
Governor

Becky Norton Dunlop  
Secretary of Natural  
Resources



Kathleen W. Lawrence  
Director

**COMMONWEALTH of VIRGINIA**  
**DEPARTMENT OF CONSERVATION AND RECREATION**

Main Street Station, 1500 East Main Street Suite 312

TDD (804) 786-2121 Richmond, Virginia 23219 (804) 786-7951 FAX (804) 371-2674

July 1, 1996

Amy Braccia  
Foster Wheeler Environmental Corporation  
2111 Wilson Blvd., Suite 435  
Arlington, Virginia 22201

Re: Information Update for NASA Langley Research Facility

Dear Ms. Braccia:

The Department of Conservation and Recreation (DCR) has processed your recent request for natural heritage information update. DCR's Division of Natural Heritage functions to identify, preserve, and protect the natural heritage resources of the Commonwealth. Natural heritage resources (NHR's) are defined by the Virginia Natural Area Preserves Act as the habitat of rare, threatened, or endangered plant and animal species, unique or state significant natural communities or geologic sites, and similar features of scientific interest.

I have enclosed updated lists of natural heritage resources that have been documented on the Poquoson West, Newport News North, and Hampton USGS Quadrangle Maps. The Eastern bloodleaf (*Iresine rhizomatosa*, G5/S2S3/NF/NS), a state rare plant species was recently documented in the Tabbs Creek Wetlands on Langley Air Force Base. Natural heritage resources have not been documented on the Poquoson East Quadrangle.

No fee has been assessed for providing this information update. DCR's Biological and Conservation Data System is constantly growing and being revised. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

An explanation of species rarity ranks and legal status abbreviations is included for your reference. Thank you for the opportunity to provide this updated information.

Sincerely,

A handwritten signature in cursive script, reading "Lesa S. Berlinghoff".  
Lesa S. Berlinghoff

Project Review Coordinator

**Natural Heritage Resources  
of the Poquoson West Quadrangle**

SPECIES NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
AMBYSTOMA TIGRINUM	TIGER SALAMANDER	G5	S1	NF	LE
AMBYSTOMA MABEEI	MABEE'S SALAMANDER	G4	S1S2	NF	LT
HYLA GRATIOSA	BARKING TREEFROG	G5	S1	NF	LT
IXOBRYCHUS EXILIS	LEAST BITTERN	G5	S2	NF	NS
ESTUARINE HERBACEOUS VEGETATION					
ESTUARINE SCRUB					
LOW HERBACEOUS WETLAND					
OLIGOTROPHIC SEASONALLY FLOODED WOODLAND					
OLIGOTROPHIC SEMIPERMANENTLY FLOODED WOODLAND					
SUBMESOTROPHIC FOREST					
FIMBRISTYLIS PERPUSILLA	HARPER'S FIMBRISTYLIS	G2G3	S1	SOC	LE
SPHAGNUM MACROPHYLLUM VAR MACROPHYLLUM	LARGE-LEAF PEATMOSS	G3T3	S2	NF	NS
BOLTONIA CAROLINIANA	CAROLINA BOLTONIA	G4?	S2	NF	NS
CUSCUTA INDECORA	PRETTY DODDER	G5	S2?	NF	NS
SABATIA CAMPANULATA	SLENDER MARSH PINK	G5	S2	NF	NS
LYTHRUM LANCEOLATUM	LANCE-LEAVED LOOSESTRIFE	G?	SH	NF	NS
HOTTONIA INFLATA	FEATHERFOIL	G4	S2	NF	NS
TILLANDSIA USNEOIDES	SPANISH MOSS	G5	S2	NF	NS

**Natural Heritage Resources  
of the Newport News North Quadrangle**

SPECIES NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
FALCO PEREGRINUS	PEREGRINE FALCON	G4	S1	LE	LE
CROTALUS HORRIDUS ATRICAUDATUS	CANEBRAKE RATTLESNAKE	G5TUQ	S1	NF	LE
AMBYSTOMA MABEEI	MABEE'S SALAMANDER	G4	S1S2	NF	LT
TRILLIUM PUSILLUM VAR VIRGINIANUM	VIRGINIA LEAST TRILLIUM	G3T2	S2	SOC	NS
CAREX LUPULIFORMIS	FALSE HOP SEDGE	G3?	S1	NF	NS
CYPERUS DIANDRUS	UMBRELLA FLATSEDGE	G5	SH	NF	NS

# Natural Heritage Resources of the Hampton Quadrangle

SPECIES NAME	COMMON NAME	GLOBAL RANK	STATE RANK	FEDERAL STATUS	STATE STATUS
CHARADRIUS MELODUS	PIPING PLOVER	G3	S2	LT	LT
CICINDELA DORSALIS DORSALIS	NORTHEASTERN BEACH TIGER BEETLE	G4T2	S2	LT	NS
CASMERODIUS ALBUS	GREAT EGRET	G5	S2B,S4	NF	SC
STERNA ANTILLARUM	LEAST TERN	G4	S2	NF	SC
RYNCHOPS NIGER	BLACK SKIMMER	G5	S2	NF	NS
IRENE RHIZOMATOSA	EASTERN BLOODLEAF	G5	S2S3	NF	NS
ERIGERON VERNUS	WHITE-TOP FLEABANE	G5	S2	NF	NS
IVA IMBRICATA	SEA-COAST MARSH-ELDER	G5?	S1S2	NF	NS
CUSCUTA INDECORA	PRETTY DODDER	G5	S2?	NF	NS
DESMODIUM STRICTUM	PINELAND TICK-TREFOIL	G4	S2	NF	NS
DESMODIUM TENUIFOLIUM	SLIM-LEAF TICK-TREFOIL	G3G4	S1	NF	NS
QUERCUS INCANA	BLUE JACK OAK	G5	S2	NF	NS

Definition of Abbreviations Used on Natural Heritage Resource Lists  
of the  
Virginia Department of Conservation and Recreation

Natural Heritage Ranks

The following ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources. Natural Heritage Resources, or "NHR's," are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The primary criterion for ranking NHR's is the number of populations or occurrences, i.e. the number of known distinct localities. Also of great importance is the number of individuals in existence at each locality or, if a highly mobile organism (e.g., sea turtles, many birds, and butterflies), the total number of individuals. Other considerations may include the quality of the occurrences, the number of protected occurrences, and threats. However, the emphasis remains on the number of populations or occurrences such that ranks will be an index of known biological rarity.

- S1 Extremely rare; usually 5 or fewer populations or occurrences in the state; or may be a few remaining individuals; often especially vulnerable to extirpation.
- S2 Very rare; usually between 5 and 20 populations or occurrences; or with many individuals in fewer occurrences; often susceptible to becoming extirpated.
- S3 Rare to uncommon; usually between 20 and 100 populations or occurrences; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances.
- S4 Common; usually >100 populations or occurrences, but may be fewer with many large populations; may be restricted to only a portion of the state; usually not susceptible to immediate threats.
- S5 Very common; demonstrably secure under present conditions.
- SA Accidental in the state.
- S#B Breeding status of an organism within the state.
- SH Historically known from the state, but not verified for an extended period, usually > 15 years; this rank is used primarily when inventory has been attempted recently.
- S#N Non-breeding status within the state. Usually applied to winter resident species.
- SU Status uncertain, often because of low search effort or cryptic nature of the element.
- SX Apparently extirpated from the state.
- SZ Long distance migrant whose occurrences during migration are too irregular, transitory and/or dispersed to be reliably identified, mapped and protected.

Global ranks are similar, but refer to a species' rarity throughout its total range. Global ranks are denoted with a "G" followed by a character. Note that GA and GN are not used and GX means apparently extinct. A "Q" in a rank indicates that a taxonomic question concerning that species exists. Ranks for subspecies are denoted with a "T". The global and state ranks combined (e.g. G2/S1) give an instant grasp of a species' known rarity.

These ranks should not be interpreted as legal designations.

Federal Legal Status

The Division of Natural Heritage uses the standard abbreviations for Federal endangerment developed by the U.S. Fish and Wildlife Service, Division of Endangered Species and Habitat Conservation.

- |                          |  |
|--------------------------|--|
| LE - Listed Endangered   | C - Candidate (formerly C1-Candidate, category 1)            |
| LT - Listed Threatened   | SOC - Species of concern (formerly C2-Candidate, category 2) |
| PE - Proposed Endangered | NF - no federal legal status                                 |
| PT - Proposed Threatened |  |

State Legal Status

The Division of Natural Heritage uses similar abbreviations for State endangerment.

- |                        |                            |
|------------------------|----------------------------|
| LE - Listed Endangered | PE - Proposed Endangered   |
| LT - Listed Threatened | PT - Proposed Threatened   |
| C - Candidate          | NS - no state legal status |

For information on the laws pertaining to threatened or endangered species, contact:

U.S. Fish and Wildlife Service for all FEDERALLY listed species  
Department of Agriculture and Consumer Services Plant Protection Bureau for STATE listed plants and insects  
Department of Game and Inland Fisheries for all other STATE listed animals