Final

ENVIRONMENTAL ASSESSMENT
DEMOLITION OF THE AIRCRAFT LANDING DYNAMICS FACILITY COMPLEX AT NASA LANGLEY RESEARCH CENTER, HAMPTON, VIRGINIA

Lead Agency: National Aeronautics and Space Administration (NASA), Langley Research Center (LaRC), Hampton, Virginia

Proposed Action: Demolition of the Aircraft Landing Dynamics Facility Complex at NASA LaRC

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Abstract: NASA is proposing to demolish nine buildings and the track associated with the Aircraft Landing Dynamics Facility Complex at Langley Research Center (LaRC), located in Hampton, Virginia. The Complex is closed and no longer operational and NASA has determined it is no longer needed to support NASA's mission. The Proposed Action is intended to reduce the Center's infrastructure and allow LaRC to direct limited resources towards facilities that support NASA's overall mission, both currently and in the future. Demolition activities would begin in 2013 and would involve a "deconstruction" approach, whereby building materials and debris would be recycled to the maximum extent practicable. The proposed project would result in reducing the footprint of LaRC facilities by approximately 8,086 square meters (87,037 square feet) and creating additional green space at the Center. This Environmental Assessment evaluates the environmental impacts of the Proposed Action and the No-Action Alternative.

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AT NASA LaRC, HAMPTON, VIRGINIA

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ACM	Asbestos-Containing Materials
AICUZ	Air Installations Compatible Use Zone
ALDF	Aircraft Landing Dynamics Facility
AQCR	Air Quality Control Region
ARPA	Archaeological Resource Protection Act
AST	Aboveground Storage Tank
BERA	Baseline Ecological Risk Assessment
BMP	Best Management Practice
CAA	Clean Air Act
CDL	Construction Debris Landfill
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CRMP	Cultural Resource Management Plan
CWA	Clean Water Act
CZMA	Coastal Zone Management Act of 1972
dBA	Decibels, A-weighted Scale
DCR	Department of Conservation and Recreation
DEQ	Department of Environmental Quality
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMB	Environmental Management Branch
EMS	Environmental Management System
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
ESI	Expanded Site Inspection
FC	Facility Coordinator
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FSH	Facility Safety Head
FUDS	Formerly Used Defense Site
GAO	Government Accountability Office
HHRA	Human Health Risk Assessment
HPO	Historic Preservation Officer
HRSD	Hampton Roads Sanitation District
km	Kilometer
LAFB	Langley Air Force Base
LandIR	Landing Impacts Research Facility
LaRC	Langley Research Center
LEED	Leadership in Energy and Environmental Design
MSL	Mean Sea Level
NACA	National Advisory Committee for Aeronautics
NAGPRA	Native American Graves Protection and Repatriation Act
NCSHPO	National Conference of State Historic Preservation Officers
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NOx	Nitrogen Oxides
NPR	NASA Procedural Requirement
OIG	Office of Inspector General
OSHA	Occupational Safety and Health Administration
O_3	Ozone
Pb	Lead
PCB	Polychlorinated Biphenyls
P2	Pollution Prevention
RMA	Resource Management Area
ROD	Record of Decision
RPA	Resource Protection Area
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
$S0_2$	Sulfur Dioxide
SWP3	Stormwater Pollution Prevention Plan
UST	Underground Storage Tank
VPDES	Virginia Pollutant Discharge Elimination System
VPP	Voluntary Protection Program
VSMP	Virginia Stormwater Management Program

METRIC UNITS

NASA requires that numeric calculations and figures be presented in metric units with the British equivalent provided in parenthesis.

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

This Environmental Assessment (EA) has been prepared to analyze the potential environmental impacts associated with NASA's proposed demolition of buildings and structures associated with the Aircraft Landing Dynamics Facility (ALDF) Complex at NASA Langley Research Center (LaRC), located in Hampton, Virginia.

This EA was prepared in accordance with the requirements of the National Environmental Policy Act of 1969 (NEPA), as amended (42 United States Code 4321 et seq.), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations (CFR) Parts 1500–1508), NASA's regulations (14 CFR Part 1216 Subpart 1216.3), and NASA Procedural Requirements (NPR) 8580.1, "Implementing the National Environmental Policy Act and Executive Order 12114." Information contained in this EA will be used by NASA and the appropriate regulatory agencies to facilitate the NEPA decision-making process and to determine if the Proposed Action would significantly affect the quality of the natural or human environment. If implementing the Proposed Action is determined to have significant environmental impacts, an Environmental Impact Statement may be prepared. If the implementation of the Proposed Action is determined not to be significant, the NEPA decision-making process would conclude with a Finding of No Significant Impact (FONSI).

Chapter 1 of this EA includes background information and the purpose and need for the Proposed Action. Chapter 2 includes a description of the Proposed Action, the No-Action alternative, and a description of alternatives considered but not carried forward in the EA. Chapter 3 describes the existing conditions of various environmental resources in the area of the Proposed Action, and Chapter 4 describes how those resources would be affected by implementation of the Proposed Action and the No-Action alternative. Chapter 5 addresses the cumulative effects of other past, present, and reasonably foreseeable actions that may be implemented in the area of the Proposed Action. Appendix A includes the list of agencies and outside organizations contacted by NASA LaRC regarding the project, as well as any responses received, and Appendix B includes photographs and description of the ALDF Complex.

1.2 PROJECT LOCATION

NASA LaRC is situated near the southern end of the lower Virginia Peninsula, approximately 241 kilometers (km) (150 miles) south of Washington, D.C. and 80 km (50 miles) southeast of Richmond, Virginia. LaRC is located within close proximity to several surface water bodies within the tidal zone of the Chesapeake Bay. The cities of Hampton, Poquoson, Newport News, and York County form a major metropolitan statistical area around LaRC. The Center is comprised of research facilities located in two areas which are approximately 4.8 km (3 miles) apart. The two areas, commonly called the West Area and the East Area, are divided by the runways of Langley Air Force Base (LAFB), the headquarters of the Air Combat Command. The East Area is located on 8 hectares (20 acres) of land permitted to the National Advisory Committee on Aeronautics (subsequently subsumed by NASA) from the Secretary of War in 1939, replacing previous permits granted in 1919 and 1929. This area is the original 1917

portion of LaRC and contains several wind tunnels, research facilities, and administrative offices. The West Area occupies 318 hectares (788 acres) of land and contains the major portion of LaRC with the majority of the facilities located there. Figure 1.1 shows LaRC's regional location and relation to LAFB.

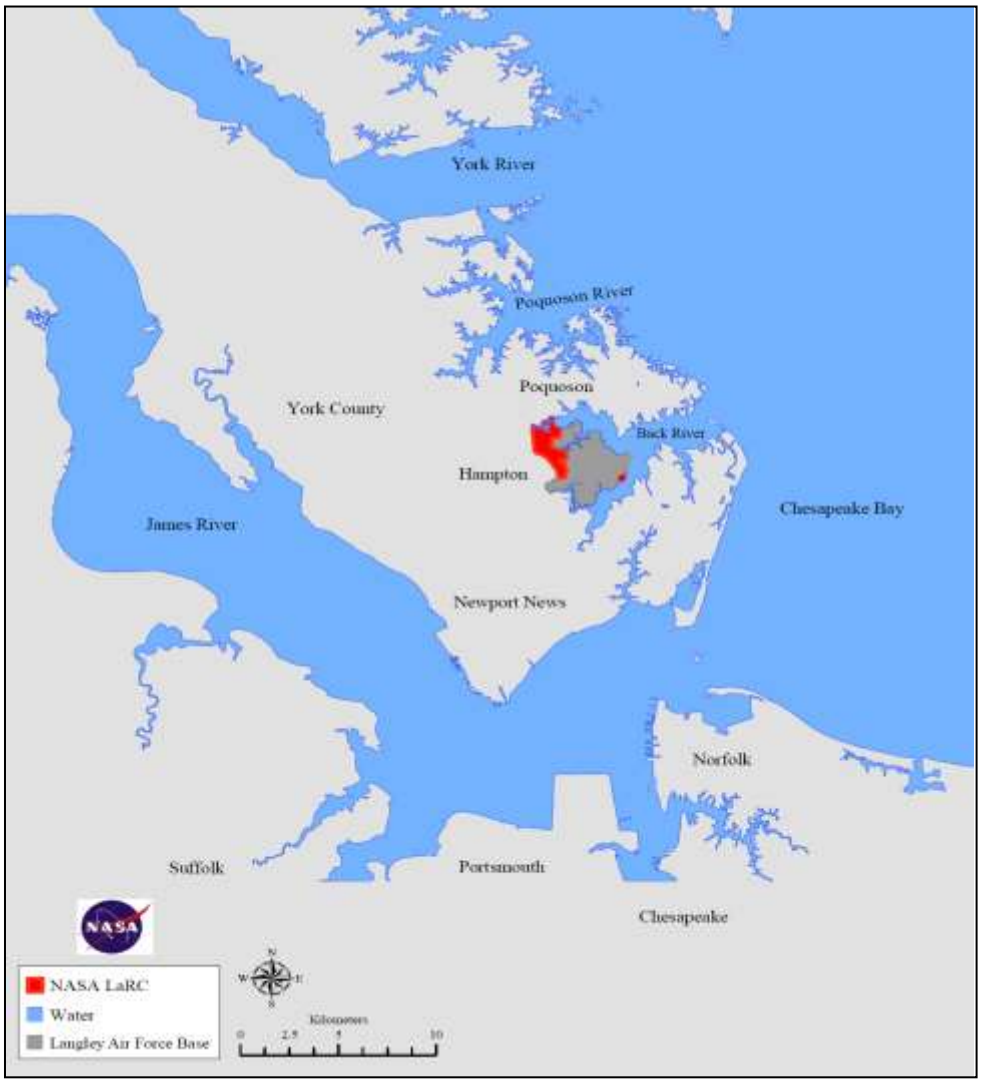

Figure 1.1 – Regional Location of NASA LaRC

1.3 BACKGROUND

In 1917, the War Department purchased land in what is now Hampton, Virginia, for joint use by the Army and the National Advisory Committee for Aeronautics (NACA), the forerunner organization for NASA. The site was designated the Langley Field after Professor Samuel Pierpont Langley, an early pioneer in flight. Congress had created NACA to "supervise and direct the scientific study of the problems of flight" and the Langley Field served as an experimental airfield and proving ground for aircraft. The facility was renamed Langley Memorial Aeronautical Laboratory in 1920 with the dedication of the first wind tunnel. As the

organization grew, NACA concentrated mainly on laboratory studies at Langley, adding military rocketry to its aeronautical research mission. As the Cold War brought an increasing priority to missile development, major NACA contributions to the military missile programs came in the mid 1950s.

In 1958, as a result of the escalating space race, President Eisenhower signed the National Aeronautics and Space Act establishing the National Aeronautics and Space Administration (NASA). NASA absorbed the NACA intact: its 8,000 employees, an annual budget of $100 million, the Langley, Ames and Lewis laboratories and two smaller test facilities. Langley Laboratory, which was then officially designated Langley Research Center, was the largest of the new agency's field centers, with 3,368 government employees. NASA quickly incorporated other organizations and eventually created ten research centers and three component facilities located around the United States.

Over the years, LaRC has made significant contributions to NASA's mission. Research performed at LaRC in the 1950s and 1960s helped aircraft break the sound barrier and played a major role in helping Americans reach the moon. In the 1970s, research at the Center focused on aircraft design to cut emissions and noise, and on testing space shuttle concepts. In the 1980s, triggered by the Cold War, LaRC and its Complex of over 20 wind tunnels performed critical military aircraft research. From the 1980s to the present, LaRC has continued to provide research support and technological advances in aerospace systems concepts and analysis; aerodynamics, aerothermodynamics, and acoustics; structures and materials; airborne systems; and atmospheric sciences. The majority of LaRC's work over the years has been in aeronautics.

1.4 LaRC's MASTER PLAN

Agency-wide, NASA continually evaluates its resources and infrastructure in order to align its capabilities to meet the Agency's evolving mission. Consistent with this approach, LaRC has embarked on a bold planning initiative to strategically reposition its physical facilities and research campus for the 21st Century. The plan, entitled "New Town" focuses on the future requirements of LaRC while maintaining its tradition for technical excellence. Specific goals addressed in the plan include the following:

- Focus on the Future: Employ a master plan approach that focuses on the future of the Center, incorporating sustainable design concepts that accommodate change while enhancing the value and performance of existing assets.

- Upgrade Facilities: Provide new and renovated facilities that fully support LaRC's objectives for space efficiency, flexibility, and state-of-the-art systems.

- Cost-Effective Strategy: Provide an economically viable approach for modernizing facilities through a 'repair-by-replacement' program, using a mix of renovation and new construction, balanced with significant demolition of obsolete facilities.

- Flexible Implementation: Implement a phased approach coupled with budgeted funding, with little or no need for temporary swing space.

- Reduce O&M Costs: Reduce the operations and maintenance burden of the aging campus by erecting new lower consumption and lower cost buildings and reducing overall building square footage through a selective program of demolition.

1.5 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the Proposed Action is to streamline LaRC's infrastructure by removing facilities from the Center's real property inventory that are no longer operational and/or needed to support NASA's mission. For nearly a decade, the issue of the Agency's aging infrastructure has been identified as a top challenge by NASA, the Office of Inspector General (OIG), and the Government Accountability Office (GAO). The NASA Authorization Act of 2010 directs NASA to examine its real property assets and, as appropriate, downsize to fit current and future missions and expected funding levels, "pay[ing] particular attention to identifying and removing unneeded or duplicative infrastructure." Public Law 111-267, section 1102, 124 Stat. 2839. See also, "NASA's Real Property Management Plan," November 2004; NASA OIG, "NASA's Top Management and Performance Challenges," November 2010; GAO, "Federal Real Property: Progress Made Toward Addressing Problems, but Underlying Obstacles Continue to Hamper Reform" (GAO-07-349, April 2007); and Public Law 111-267, "NASA Authorization Act of 2010," October 11, 2010. Capabilities and infrastructure assessments recently performed by the Agency have identified the ALDF Complex as having no current or future NASA programmatic requirements.

The Proposed Action is consistent with the NASA Authorization Act of 2010 because it removes unneeded infrastructure and allows NASA LaRC to direct limited funding towards the maintenance and operation of facilities that support the Agency's overall mission, currently and in the future. The ALDF Complex was closed in 2008 and, as discussed below, there are no projects, programs or other direct funding sources interested in its continued maintenance and upkeep.

1.6 PUBLIC AND AGENCY SCOPING

Prior to making the decision to close the ALDF Complex in 2008, NASA LaRC solicited feedback from other government agencies, industry, and academia regarding possible use of the facility for their own research endeavors. No parties were interested in establishing a lease agreement with NASA to keep ALDF operational for research activities.

In August 2011, NASA LaRC sent scoping letters to various local agencies and outside organizations in order to solicit comments regarding the proposed demolition of the ALDF Complex, including suggestions on possible salvage of artifacts or building components. No responses were received.

Copies of the scoping letters and distribution lists are included in Appendix A.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The Proposed Action consists of the demolition of nine buildings and the track associated with the ALDF Complex at NASA LaRC. The ALDF Complex is located in NASA LaRC's West Area as shown in Figure 2.1 and listed in Table 2-1. A description of the Complex and photographs of the facilities are provided in Appendix B.

Table 2-1. ALDF Complex Facilities Proposed for Demolition

Building Number	Building Name	Square Meters	Square Feet	Year Built
1257	Track	6,067	65,310	1956
1257N	North Arresting Gear House	258	2,780	1985
1257S	South Arresting Gear House	258	2,780	1985
1258	Compressor and Control Building	269	2,891	1953
1258A	Jet Valve Building	9	97	1956
1259	Shop and Storage Facility	297	3,200	1953
1260	Shop and Storage Facility	297	3,200	1953
1261	Traction Shop	593	6,383	1982
1261A	Filter Plant Building No. 2	18	192	1982
1261B	Carriage House Annex	20	212	1982

Demolition activities would begin in 2013 and would involve a "deconstruction" approach whereby demolition debris, such as concrete, metals, and other building materials would be recycled to the maximum extent as discussed in Section 4.5.1. The Proposed Action would be completed within 6 months and would involve complete removal of the buildings and track including slabs and foundations. Utilities would be capped below grade, and the properties would be re-graded to match existing site contours. The Proposed Action would reduce the Center's operation and maintenance costs, as well as streamline the infrastructure to better align LaRC's capabilities with the future direction of NASA missions. The demolition would result in a reduction of LaRC's total building inventory by approximately 8,086 square meters (87,037 square feet).

Demolition activities would be carried out by qualified and properly licensed contractors. All contractors performing work at LaRC are required to comply with applicable Federal, State and local environmental, safety and health regulations, including NASA regulations. Contractors involved in the demolition activities would be required to prepare and follow Waste Management, Stormwater Pollution Prevention, Health and Safety and other applicable plans that comply with the regulations to ensure the safety of human health and the environment during the demolition. Hazardous or other regulated wastes would be disposed of in accordance with LaRC's established hazardous waste management procedures and following all applicable safety and environmental regulations.

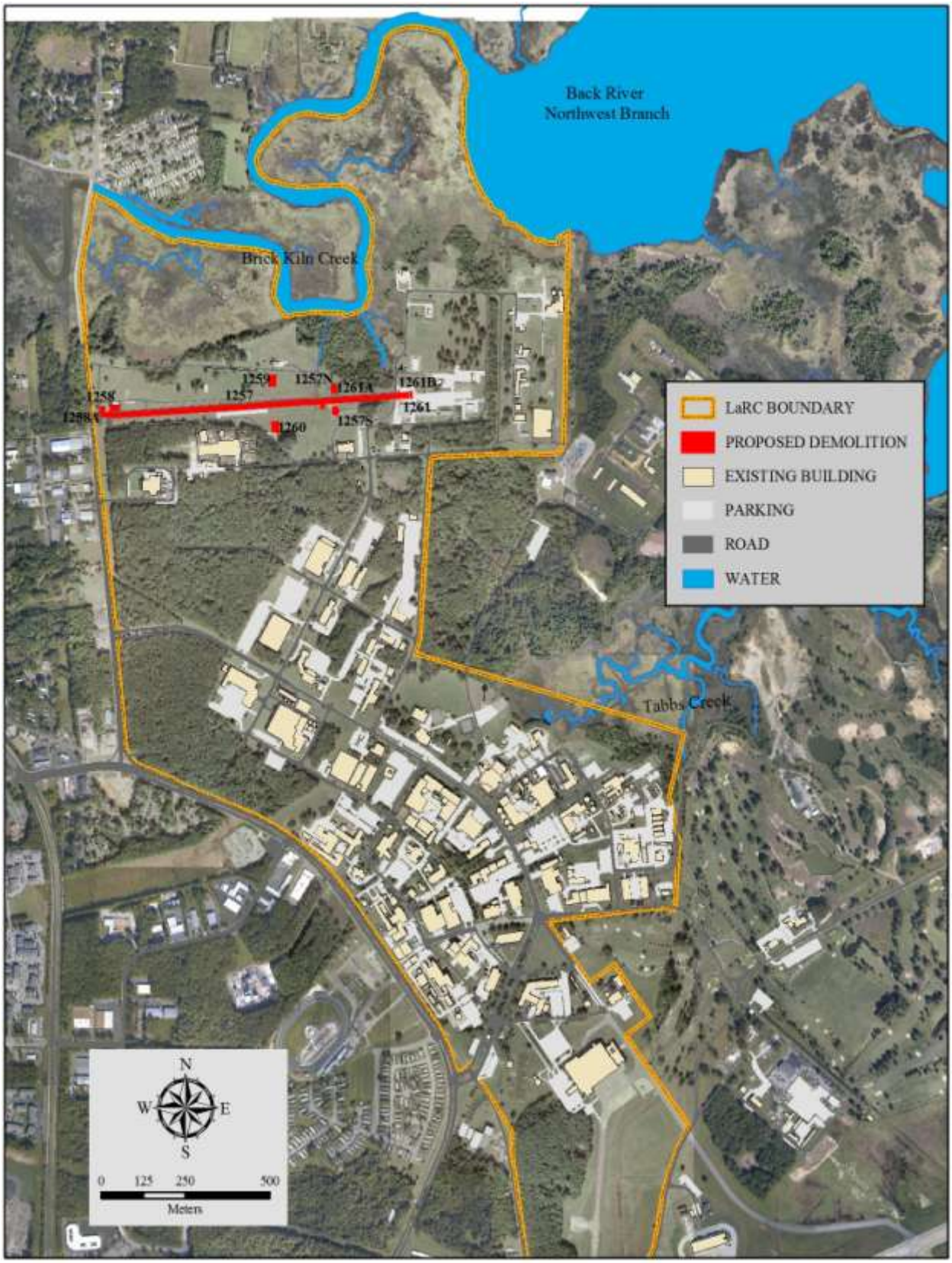

Figure 2.1 – Location of NASA LaRC's ALDF Complex

2.2 NO-ACTION ALTERNATIVE

Under the No-Action alternative, LaRC would not demolish the ALDF Complex facilities and structures. They would remain closed and unused. NASA LaRC would continue to monitor and maintain the buildings' emergency utilities, but the facilities would continue to deteriorate. The No-Action alternative would forego the opportunity to streamline the Center's infrastructure and refocus limited resources on the critical infrastructure that is needed to meet NASA LaRC's mission requirements.

2.3 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

One alternative was considered but eliminated from further analysis. The option of leasing the buildings to an outside tenant or organization was considered but eliminated from detailed analysis for several reasons. First, as mentioned in Section 1.6, LaRC solicited other agencies, outside organizations and academia for possible use of the facilities for research. No parties were interested in establishing a funded agreement with NASA to keep the ALDF Complex operational for research activities. Second, leasing the buildings to an outside tenant or organization would fail to meet the purpose and need of the Proposed Action as this option would not allow LaRC to streamline its infrastructure or to remove deteriorating facilities that are no longer needed to support NASA's mission. Third, this alternative is not practical due to the issues associated with LaRC being a secure federal facility with limited, badge-only access. Fourth, this alternative is not practical due to the condition and/or function of the buildings. The ALDF Complex facilities are either small, with limited utilities and office space, or the structure and functions of the facilities are very specialized.

3.0 AFFECTED ENVIRONMENT

This chapter describes relevant environmental conditions at LaRC for resources potentially affected by the Proposed Action and the No-Action alternative described in Chapter 2.0. In compliance with guidelines contained in NEPA and the Council on Environmental Quality (CEQ) regulations, and NASA Procedural Requirements (NPR) 8580.1, the description of the existing environment focuses on those environmental resources potentially subject to impacts. The environment includes all areas and lands that might be affected, as well as the natural, cultural, and socioeconomic resources they contain or support.

Resources Eliminated From Detailed Consideration

Several resources were not evaluated in this EA because it was determined unlikely that implementation of either the Proposed Action or the No-Action alternative would have any impacts to these areas of concern. A brief explanation of the reasons why each resource has been eliminated from further consideration in this EA is provided below.

Virginia Coastal Zone Management Programs. The following Virginia Department of Environmental Quality (DEQ) enforceable programs and policies are not applicable because the demolition activities would not have any effect on the resources. Additionally, the No-Action alternative would not have any effect on the resources. The programs and policies include:

> Fisheries Management. The demolition activities would have no effect on the conservation and enhancement of finfish and shellfish resources or the promotion of commercial and recreational fisheries.
>
> Subaqueous Lands Management. The demolition activities would not involve encroachment into, on or over state-owned subaqueous lands.
>
> Dunes Management. There are no sand covered beaches or sand dunes in the vicinity of the demolition activities.
>
> Shoreline Sanitation. The demolition activities would have no effect on shoreline sanitation.

Other Virginia Coastal Zone Management Program areas that are applicable are addressed in Sections 3.1 and 4.1.

Soils and Geology. The demolition activities would involve existing structures and previously developed areas. There would be minimal ground disturbance to remove pile caps, foundations and slab sections during demolition and the areas would be backfilled and graded to match existing surroundings. Since implementation of the Proposed Action or the No-Action alternative would have a negligible effect on soils and geology, these resources were eliminated from further analysis.

Socioeconomic. The No-Action alternative would have no effect on the socioeconomic character of the communities surrounding LaRC. There would be no change in the number of NASA employees as a result of the Proposed Action. As is the case with previous and current demolitions at LaRC, the majority of the demolition work would be performed by out-of-state contractors. The temporary in-flow of additional workforce in the area around LaRC would

result in an increased use of the area's hospitality and retail services, such as hotels, restaurants and shopping malls. Therefore, implementation of the Proposed Action would have a short-term positive effect on the socioeconomic character of the surrounding communities and this resource was eliminated from further analysis.

Climate and Climate Change. Climate is the prevalent long-term weather conditions in a particular area. Climatic elements include precipitation, temperature, humidity, sunshine and wind velocity and other natural occurrences such as fog, frost, and hail storms. Climate change is a shift in temperature, precipitation, wind and other long-term weather patterns - both regionally and globally - largely due to the combustion of fossil fuels and other human activities that increase atmospheric concentrations of greenhouse gases (GHG). Implementation of the Proposed Action or the No-Action alternative would have no measurable effect on temperature, precipitation, wind and other long-term weather patterns and as such, this resource was eliminated from further analysis.

Environmental Justice. Low-income populations and minority populations that are subject to environmental justice considerations are not located within or near the location of the Proposed Action. Since implementation of the Proposed Action or the No-Action alternative would not have disproportionately high or adverse human health or environmental effects on low-income populations or minority populations, this resource was eliminated from further analysis.

Wild and Scenic Rivers. None of the waterways within the LaRC property qualify for the provisions of the Wild and Scenic Rivers Act, therefore, analysis of this resource was not carried forward in this EA.

Threatened and Endangered Species. The most recent biological survey conducted in 2009 did not identify any threatened or endangered species on NASA LaRC property. Several threatened species (bald eagles and peregrine falcons) have been observed within 402 meters (1/4 mile) of NASA LaRC property, however, it is anticipated that implementation of the Proposed Action or the No-Action alternative would have no impact on these species and this resource was eliminated from further analysis.

Traditional Resources. Traditional resources are associated with cultural practices and beliefs of a living community that are rooted in its history and are important in maintaining the continuing cultural identity of the community. An example is a location where Native American practitioners have utilized in the past or still use for ceremonial purposes. Since no traditional resources have been identified at LaRC, this resource was eliminated from further analysis.

Transportation. Implementation of the Proposed Action would not change the use of transportation resources in the region. Transportation of the demolition materials would be along an established haul route leading off the Center. The increase in truck traffic would be minimal because the demolition activities would be phased over time. Implementation of the No-Action alternative would not affect transportation resources. Therefore, this resource was eliminated from further analysis.

Since NASA LaRC does not have any *prime or unique farmland*, or *conservation areas*, these resources were also eliminated from further analysis.

3.1 LAND USE

Coastal Zone Management Act

NASA LaRC is located within the coastal zone of the Commonwealth of Virginia. Federal agency activities within the coastal zone must be carried out in a manner that is consistent to the maximum extent practicable with Virginia's applicable enforceable policies. All federal actions are subject to this consistency requirement if they would affect natural resources, land uses, or water uses in the coastal zone. The Virginia DEQ oversees activities in the coastal zone of the State through a number of enforceable programs. In reviewing the Proposed Action, DEQ may require agencies to coordinate with its specific divisions or other agencies for consultation or to obtain permits; they also may comment on environmental impacts and mitigation. Virginia DEQ enforceable programs and policies pertain to Fisheries Management, Subaqueous Lands Management, Tidal and Non-tidal Wetlands Management, Dunes Management, Non-Point Source Pollution Control, Point Source Pollution Control, Shoreline Sanitation, Air Pollution Control, and Coastal Lands Management. Not all of these enforceable programs are applicable to the Proposed Action, as explained in Section 3.0. The remaining programs (Tidal and Non-tidal Wetlands Management, Non-Point Source Pollution Control, Point Source Pollution Control, Air Pollution Control and Coastal Lands Management) are discussed in relevant resource sections (e.g., air quality and water resources).

The Coastal Lands Management program establishes authority for the oversight of activities in the Chesapeake Bay Resource Management Areas (RMAs) and Resource Protection Areas (RPAs). RPAs include tidal shores, tidal wetlands, and non-tidal wetlands that are contiguous to and connected by surface flow to tidal wetlands and perennial streams, and a 30-meter (100-foot) buffer located landward of these features. RMAs include floodplains, highly erodible soils, highly permeable soils, steep slopes, and areas 30 meters (100 feet) landward of an RPA (shown in Figure 3.1). Certain development activities within these zones are restricted in order to protect the quality of state waters. In addition to wetlands, both RPA and RMA features exist on LaRC property. Approximately 38 meters (125 feet) of the ALDF Track, Building 1257, is located within an RPA and a portion is adjacent to wetlands. Building 1261 and 1261B are located within an RMA. All other buildings proposed for demolition are outside designated RPAs or RMAs. See Figure 3.1 for the location of LaRC's RPA and RMA features and wetlands in relation to the ALDF Complex.

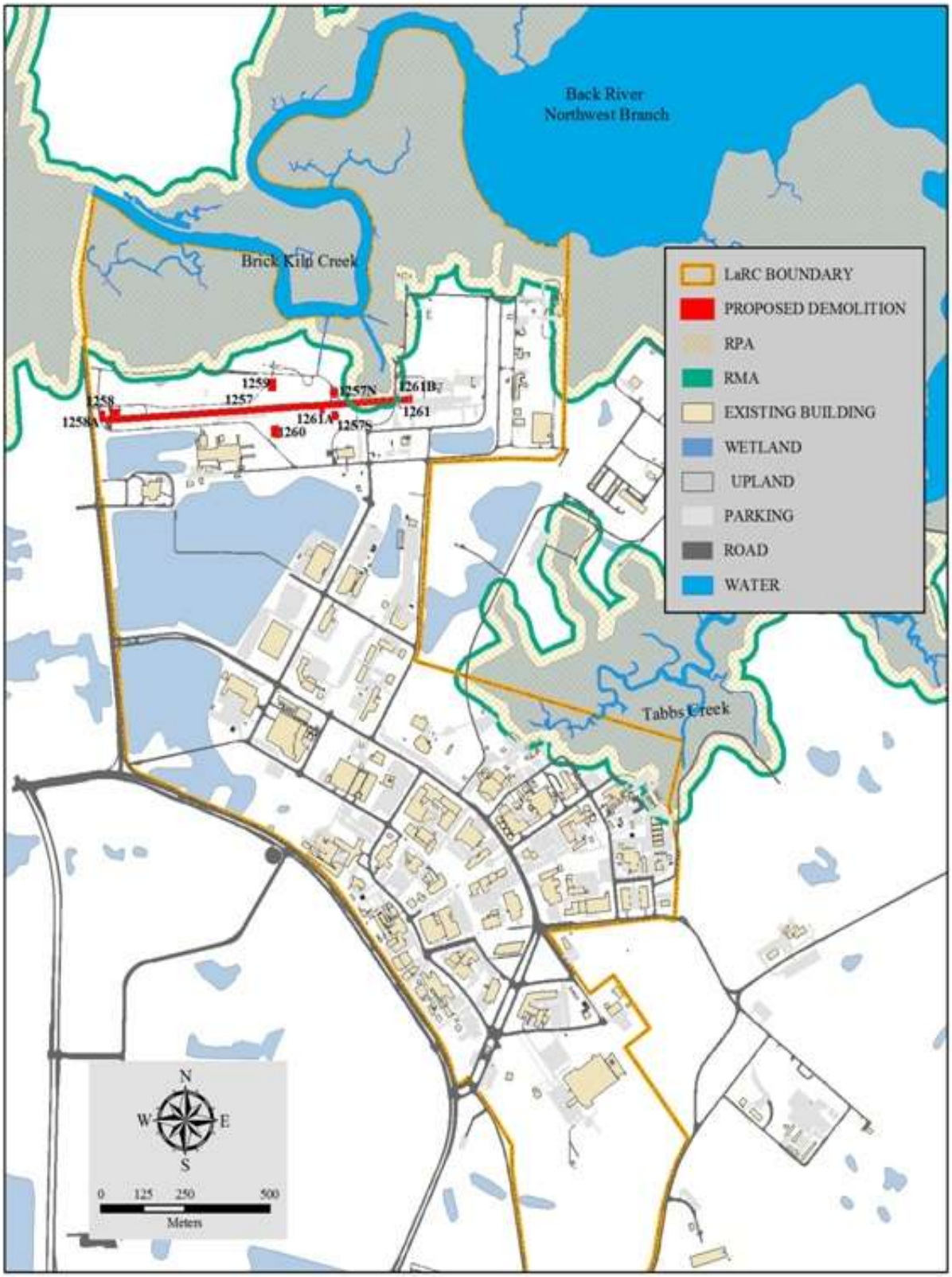

Figure 3.1 – Location of RMA, RPA and Wetland Areas at NASA LaRC

Functional Areas

Land uses are frequently regulated by management plans, policies, ordinances, and regulations that determine the types of uses that are allowable or protect specially designated or environmentally sensitive areas. LaRC has a master plan that supports the Center's strategic approach to programmatic facility planning and prioritization. The master plan identifies six functional zones (shown in Figure 3.2): The ALDF Complex is located in a more rural area within the Large Test Facilities Zone.

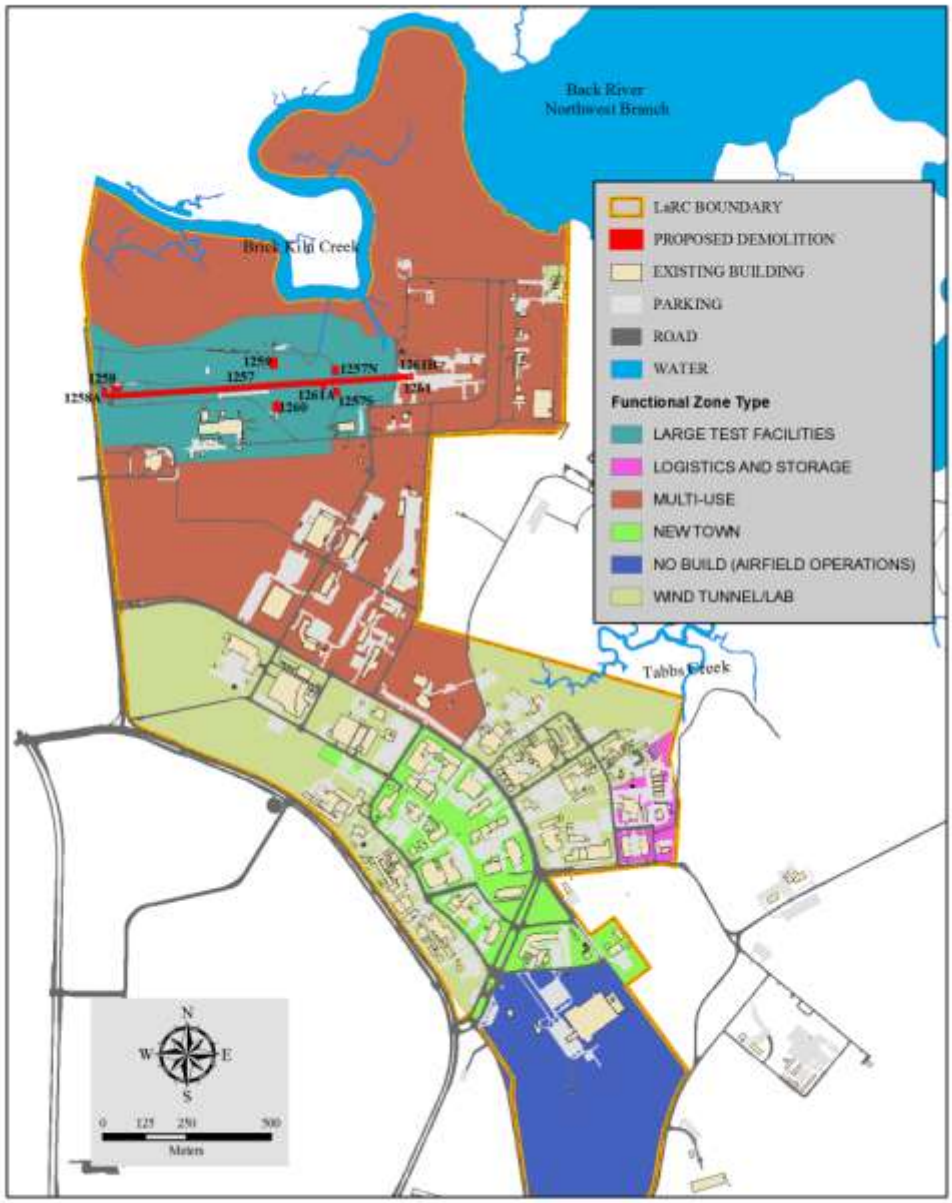

Figure 3.2 – Functional Zones at NASA LaRC

3.2 NOISE

The fighter aircraft operating from LAFB are by far the dominant and most widespread noise source in the area. The Noise Contour Map (Figure 3.3) was derived from the Air Installations Compatible Use Zone report prepared by LAFB. The decibel (dBA) contours on the map are calculated using the "Ldn" parameter, which is preferred by the EPA for assessing environmental noise impacts. It accounts for all the noise occurring throughout the 24-hour day but with a 10-decibel penalty added to the nighttime hours to account for people's greater sensitivity to noise at night. Ldn levels up to 65 dBA are generally considered acceptable for residences. A portion of the ALDF Complex is located in the 65 dBA noise contour zone.

Although Virginia does not have noise control regulations, Hampton and Poquoson have noise ordinances which prohibit creating any unreasonably loud or disturbing noise of such character, intensity, or duration that may be detrimental to the life or health of any individual or which disturbs the public peace and welfare. NASA LaRC's Industrial Hygiene staff monitors noise levels both inside and outside of the Center facilities to ensure excessive noise does not harm human health or the environment. In addition, the Industrial Hygiene staff ensures proper controls are in place to protect Center personnel from exposure to excessive noise levels in accordance with Occupational Safety and Health Administration (OSHA) requirements.

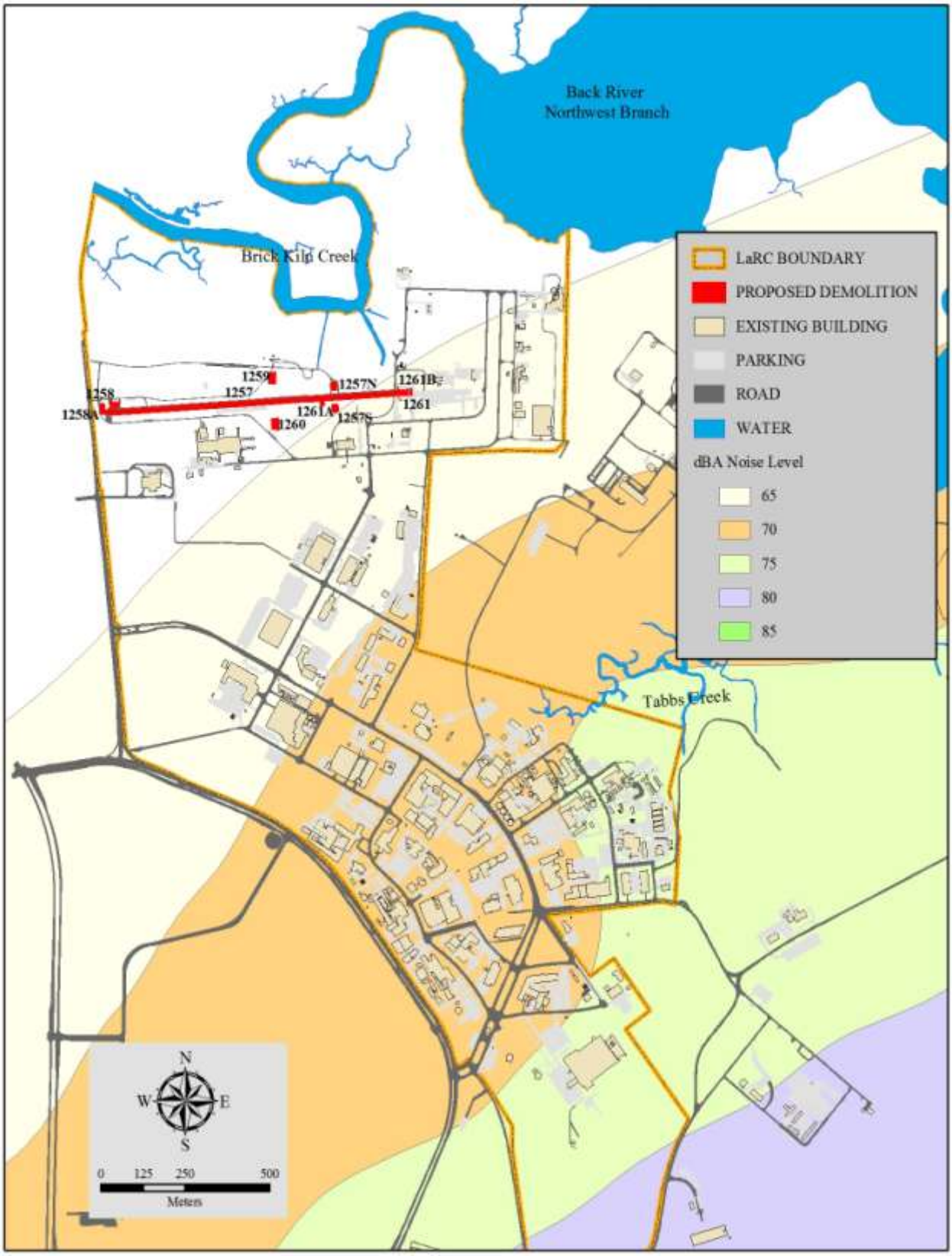

Figure 3.3 – Noise Contours at NASA LaRC

3.3 CULTURAL RESOURCES

Cultural resources are any prehistoric or historic district, site, building, structure, or object considered important to a culture, subculture, or community for scientific, traditional, religious or other purposes. They include architectural resources, archaeological resources, and traditional resources. Architectural resources include standing buildings, dams, canals, bridges, and other structures of historic or aesthetic significance. Archaeological resources are locations where prehistoric or historic activity measurably altered the earth or produced deposits of physical remains (e.g., arrowheads, bottles). Traditional resources are associated with cultural practices and beliefs of a living community that are rooted in its history and are important in maintaining the continuing cultural identity of the community. Historic properties (as defined in 36 CFR 60.4) are significant archaeological, architectural, or traditional resources that are either eligible for listing, or listed in, the National Register of Historic Places (National Register).

The management of cultural resources is primarily regulated by the National Historic Preservation Act (NHPA). Section 106 of the NHPA requires Federal agencies to take into account the effects of their undertakings on historic properties. Impacts to cultural resources may be considered adverse if the resources have been determined to be eligible for listing in the National Register. Section 110 of the NHPA advocates proactive management of resources through the incorporation of historic preservation into the comprehensive plans of agencies, facilities, or programs. The act requires agencies to compile cultural resource inventories which should be integrated into systems for property administration, land use planning and project planning.

The Archaeological Resources Protection Act (ARPA) preserves and protects resources and sites on Federal and Indian lands by prohibiting the removal, sale, receipt, or interstate transportation of archaeological resources obtained illegally (i.e., without permits) from public or Indian lands. ARPA permits are not required for archaeological work conducted by or on behalf of LaRC; however, the specific requirements of ARPA may be addressed in contract documents or other documentation authorizing the work.

For activities on Federal lands, the Native American Graves Protection and Repatriation Act (NAGPRA) requires consultation with "appropriate" Indian tribes or Native Hawaiian organizations prior to the intentional excavation or removal after inadvertent discovery, of several kinds of cultural items. Native American cultural items include human remains, associated funerary objects, unassociated funerary objects, sacred objects, and cultural patrimony. Native American cultural items are the property of Native American groups. For activities on Native American or Native Hawaiian lands, which are defined in the statute, NAGPRA requires the consent of the Indian tribe or Native Hawaiian organization prior to the removal of cultural items. Agencies must inventory Native American cultural items, repatriate Native American cultural items, and consult with Native American groups about permits to excavate.

3.3.1 LaRC's Cultural Resource Management Program

LaRC has a 2010 Cultural Resource Management Plan (CRMP) that contains information on LaRC's historic background, cultural resources and historic properties. It provides information on cultural resource surveys that have been performed at the Center and the types of LaRC

activities that may affect cultural resources. The CRMP also provides information and guidelines for preservation and management of LaRC's cultural resources and historic properties. Although oversight of the cultural resource program at LaRC is primarily the responsibility of LaRC's Historic Preservation Officer (HPO), all persons involved in project planning and implementation at the Center also have a responsibility to be aware of the cultural resource management goals of both NASA and LaRC, and to see that NASA complies with historic preservation laws and regulations.

In addition to the CRMP, LaRC has a Programmatic Agreement among the National Aeronautics and Space Administration, the Virginia State Historic Preservation Office (SHPO), and the Advisory Council on Historic Preservation (ACHP) for the Management of Facilities, Infrastructure and Sites at NASA LaRC. Executed in January 2010, the agreement provides for a streamlined Section 106 review process as well as standard mitigation and documentation procedures for LaRC's undertakings that may impact historic properties. Additionally, Stipulation III of the PA, "Identification and Categorization of Historic Technological or Scientific Facilities" provides for NASA LaRC to compile an inventory list of those highly technological or scientific facilities that are listed in, or meet the criteria for listing in the NRHP. Per Stipulation III C of the PA, modification, deactivation, or removal of NASA LaRC's historic highly technological or scientific facilities to meet mission needs shall not require any further consultation with the SHPO, ACHP, or other consulting parties once the inventory is complete. NASA LaRC completed the inventory in December of 2010 and it is included in the PA as Appendix I. LaRC also has a 1989 PA among the National Conference of State Historic Preservation Officers (NCSHPO), and the ACHP which addresses agency consultation and mitigation for projects impacting NASA's National Historic Landmark (NHL) properties.

3.3.2 Architectural Resources

In 2009, in advance of the retirement of the Space Shuttle Program (SSP), NASA performed an agency-wide historic eligibility survey of resources that supported the SSP. The survey at LaRC identified the ALDF Complex as being eligible for listing in the National Register within the context of the SSP. In May 2010, LaRC completed a center-wide reconnaissance level survey of all architectural resources located throughout the Center. Of the 271 properties surveyed, 166 were determined to be eligible for listing in the National Register, either as individual properties or as contributing elements to a historic district. The survey identified a historic district that illustrates the major contributions and advances made by NASA researchers in the fields of aeronautics and space flight. The district is eligible for listing in the National Register because of major contributions the facilities made to aeronautics and space research testing. Results of the survey were incorporated in to the Programmatic Agreement mentioned in 3.3.1.

Table 3-1 provides the National Register eligibility for each facility that would be affected by the Proposed Action. Figure 3.4 shows the location of the buildings in relation to the proposed NASA LaRC Historic District boundaries.

Table 3-1. Architectural Resources Affected by Proposed Demolition

Building Number	Name of Building	Year Built	National Register Eligibility
1257	Track	1956	I + C
1257N	North Arresting Gear House	1985	I + C
1257S	South Arresting Gear House	1985	I + C
1258	Compressor and Control Building	1953	I + C
1258A	Jet Valve Building	1956	NC
1259	Shop and Storage Facility	1953	C
1260	Shop and Storage Facility	1953	C
1261	Traction Shop	1953	C
1261A	Filter Plant Building No. 2	1964	C
1261B	Carriage House Annex	1953	C

I = Individually Eligible; C = Contributing Element; NC = Non-contributing

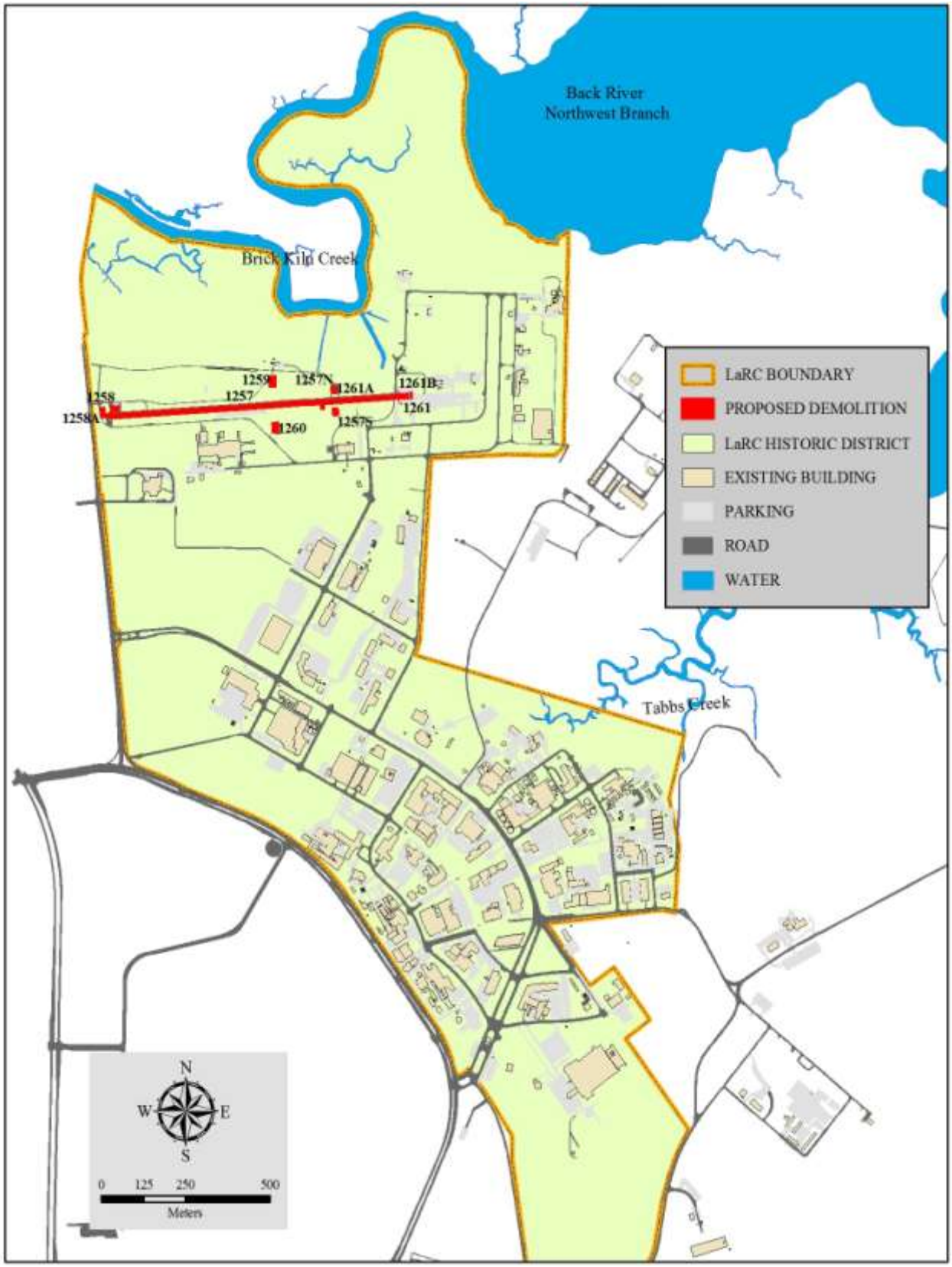

Figure 3.4 – NASA LaRC Historic District Boundaries

3.3.3 Archaeological Resources

Since the mid-1970s, LaRC has conducted numerous archaeological surveys which have identified 11 archaeological sites located throughout LaRC. Native American artifacts have been discovered as well as the remains of colonial and early American plantations. One of the sites, identified as 44HT001 and known as the Chesterville Plantation, is listed in the National Register, as it was the birthplace of George Wythe, an original signer of the Declaration of Independence. The site has been preserved in place in the northern part of the LaRC West Area, adjacent to and partially overlapping the footprint of the ALDF Complex. Building 1259 and Building 1257N are located at the southern edge of the Chesterville Plantation site. The large "box-like" boundary for the site was established in 1973 when the site was listed in the National Register. The southern edge of the boundary was drawn to follow the linear definition of the ALDF Track. Building 1259 is located approximately 30 meters (100 feet) and Building 1257N is located approximately 274 meters (900 feet) from any known archaeological features.

A smaller archaeological site, identified as 44HT074, is located approximately 15 meters (50 feet) from Building 1260. A 1995 survey of the site identifies it as a multi-component site containing prehistoric and historic artifacts and recommends it as potentially eligible for the National Register. Table 3-2 provides information on Site 44HT001 and 44HT0074. All of the other archaeological sites at NASA LaRC are located far away from the ALDF Complex.

Table 3-2. Description of Archaeological Sites Near ALDF Complex

Site Number	Historic and Thematic Contexts	Description	Eligibility / Management
44HT001	European Settlement to Society (1607-1750) through Reconstruction and Growth (1865-1917); Domestic	Plantation occupied beginning in 17th Century and burned in 1911. Known as "Chesterville" home of George Wythe. Site includes remains of two dwellings (dating to 17th and 18th Centuries), brick kiln, granary, and wharf.	Listed in the National Register in 1973; preserve in place
44HT0074	Woodland (1200 B.C. – A.D. 1600); Domestic Colony to Nation (1750-1789); Through Reconstruction and Growth (1865-1917) Domestic	Multi-component site containing prehistoric and historic artifacts. Prehistoric materials include low numbers of debitage, FCR, and a pottery sherd. The site probably reflects limited activity camp. At least a Woodland component is represented. The historical component includes moderate quantities of ceramics, glass, architectural materials, and shell. This component could reflect an 18th to 20th century habitation.	Potentially eligible for the National Register; further evaluation recommended; preserve in place until evaluation completed.

3.4 HAZARDOUS, REGULATED AND SOLID WASTE

3.4.1 Waste Management Program

NASA LaRC has established a pollution prevention policy with the goal of minimizing the volume and toxicity of wastes generated at the Center to the extent technically and economically feasible. Source reduction, recycling, recovery and reuse are utilized whenever possible.

Hazardous wastes generated at LaRC are managed and disposed of according to established Center policies and applicable laws and regulations. LaRC is considered a large quantity generator of hazardous waste. The Center is not authorized to transport hazardous waste off-site, store hazardous waste beyond a 90-day accumulation period, or treat or dispose of hazardous waste on site. The hazardous and regulated wastes generated at LaRC include of a wide variety of items, such as solvents, fuels, oils, gases, batteries, fluorescent light bulbs and laboratory chemicals. Waste generated from remediation projects such as paint removal and spill cleanup are sampled and analyzed to ensure proper waste characterization and disposal. Any materials that contain hazardous waste or exhibit hazardous characteristics are transported by an appropriately permitted contractor to a permitted hazardous waste disposal facility.

LaRC ensures the proper management and disposal of materials containing polychlorinated biphenyls (PCBs). All large transformers at the Center that contained PCBs have been retrofilled or removed. Many of the older facilities at the Center still have small PCB light ballasts or capacitors. LaRC ensures that PCB materials are properly packaged, transported and disposed of at an approved disposal facility. Similar requirements apply for the management of Asbestos Containing Materials (ACM). A small amount of ACM is located in Building 1258. All contractors performing asbestos work at LaRC must be appropriately licensed, and the waste must be properly packaged, labeled and transported to a permitted landfill.

LaRC generates large volumes of municipal solid waste. The major items are paper, wood, metals, cardboard, plastics, grass and tree clippings, glass, and maintenance wastes. NASA LaRC recycles white and mixed paper, cardboard, toner cartridges, plastic bottles, aluminum cans, scrap metal, used oil, batteries, fluorescent light bulbs, and used tires. Non-hazardous, non-regulated, solid materials that are not collected for recycling are consolidated and transported for disposal to a local landfill or for energy recovery at Hampton's Refuse-Fired Steam Generating Facility.

LaRC maintains an Integrated Spill Contingency Plan that provides information on applicable regulatory requirements and procedures related to oil and hazardous material spill control at LaRC. In addition it documents the policies and procedures regarding the management of underground and aboveground storage tanks. There is a 3,785 liter (1,000 gallon) No. 2 Fuel Oil aboveground storage tank located at Building 1258.

3.4.2 Waste and CERCLA Sites

NASA LaRC has five sites that fall under the Comprehensive Environmental Responsibility Compensation and Liability Act (CERCLA) program. They are the Area E Warehouse, the Construction Debris Landfill (CDL), Site 15, Stratton Substation, and Tabbs Creek. Table 3-3 shows the status of each site regarding remediation activities and Records of Decision (RODs).

Table 3-3. Status of Remediation at LaRC CERCLA sites

Site Description	Status
Area E Warehouse	ROD signed; Complete
Stratton Substation	ROD signed; Soil complete; Groundwater pending
Site 15	Remediation pending
Tabbs Creek	ROD signed; Complete
Construction Debris Landfill	Soil ROD pending

The only site within a 0.8 kilometer (half mile) radius of the proposed demolitions is the CDL site. In the 1960s and 1970s, NASA LaRC temporarily stored construction debris and drums containing stored waste materials within a 1.6 hectare (four acre) area in the northern part of LaRC. NASA LaRC conducted preliminary studies of the area, including an Expanded Site Inspection (ESI) in 1995. Results of the ESI identified some low-level PCB, solvent and metal soil contamination, as well as some low-level solvents and metals present in groundwater samples. The ESI indicated the need to conduct a more in-depth site investigation, which NASA LaRC did during 1996 and 1997. In the spring of 2000, NASA LaRC conducted a Baseline Ecological Risk Assessment (BERA) for the CDL, using the USEPA's Ecological Risk Assessment Guidance for Superfund sites. The BERA consisted of a number of site-specific studies including sampling of biota, fish tissue, soil, and sub-tidal sediment, along with toxicity testing. The BERA was submitted to USEPA in 2001. NASA LaRC also updated the Human Health Risk Assessment (HHRA) of the CDL which was submitted to USEPA in July 2003.

Based on the results of the BERA and HHRA, NASA LaRC conducted a Feasibility Study (FS). NASA's recommended alternative involved grading existing surface debris at the site and placing a soil cover over the areas where the buried debris is present. NASA also proposed to conduct groundwater monitoring at the site for up to 30 years. The FS was finalized in 2008 and the ROD was finalized in 2010. The remedy was for enhanced bio-remediation using ethyl lactate to be injected into the groundwater. The injection occurred in July 2011. A soil ROD is still pending. The location of the ALDF Complex in relation to the CDL site is shown in Figure 3.5.

In addition to identifying the CERCLA sites located at NASA LaRC, a geographic information system (GIS) database search of waste-related data bases revealed other CERCLA, hazardous waste, solid waste, formerly used defense site (FUDS), and Voluntary Remediation Sites located near NASA LaRC; however, none of the sites are within a 0.8 kilometer (half mile) radius of the proposed demolitions.

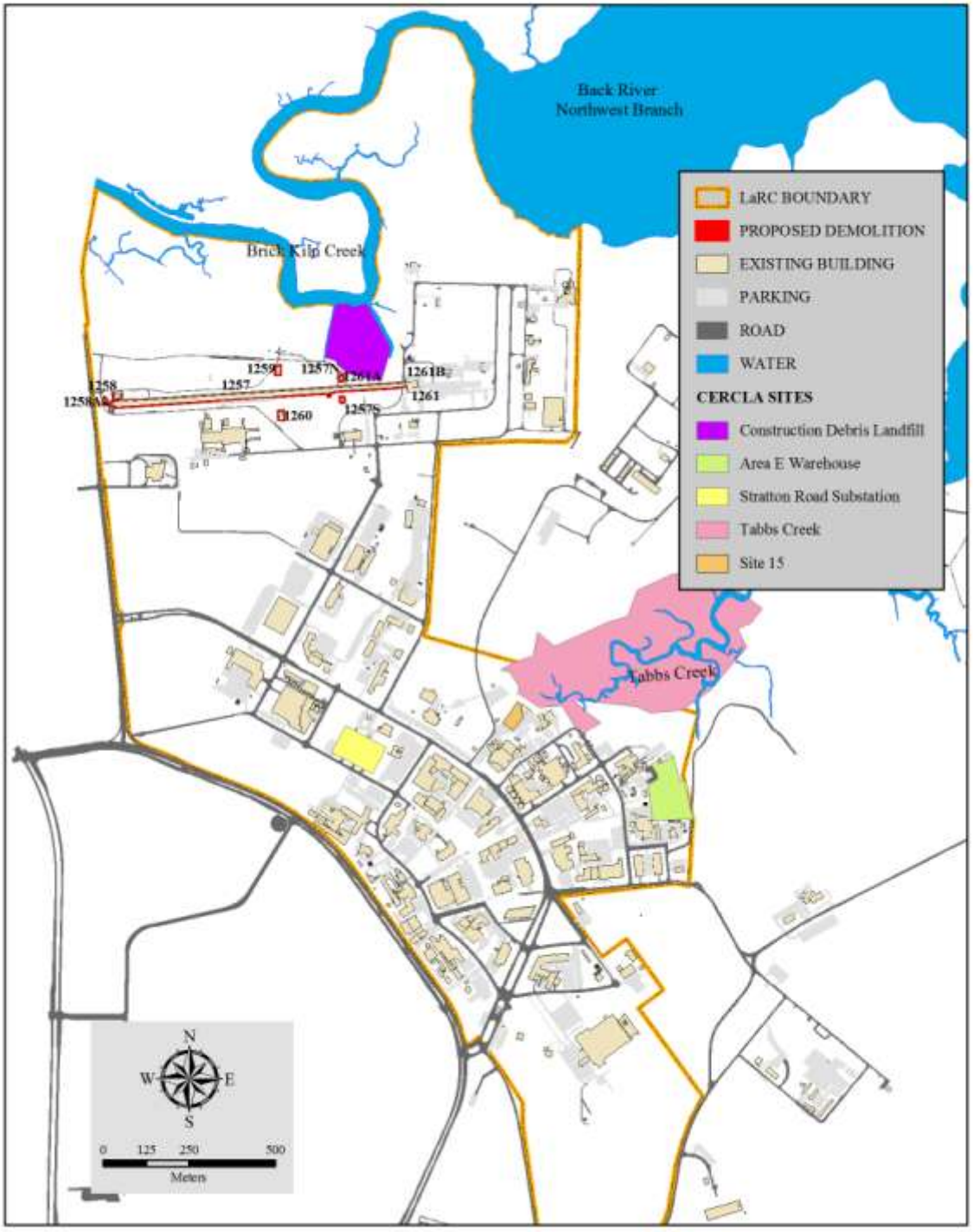

Figure 3.5 – Location of CERCLA Sites at NASA LaRC

3.5 POLLUTION PREVENTION AND ENVIRONMENTAL MANAGEMENT SYSTEM

Pollution prevention (P2) is a multimedia approach to environmental management based on the priorities outlined in the Pollution Prevention Act of 1990. When applying P2 methodologies to LaRC activities (e.g. operations generating air emissions, wastewater, or solid/hazardous waste), priority is given to the use of source reduction techniques. Source reduction is the prevention of waste generation through process modifications or material substitutions. Where source reduction is not feasible, other environmentally preferable methods such as reuse or recycling may be appropriate. Remaining wastes are then managed to minimize potential present and future environmental impacts. LaRC developed a P2 Plan in 1992 to document P2 initiatives and has been implementing a Center-wide P2 Program since that date.

LaRC's P2 Program has been integrated into the broader Environmental Management System (EMS) program that:

1. incorporates people, procedures, and work practices in a formal structure to ensure that the important environmental impacts of the organization are identified and addressed,
2. promotes continual improvement including periodically evaluating environmental performance,
3. involves all members of the organization as appropriate, and
4. actively involves Senior Management in support of the environmental management program.

LaRC's EMS is committed to the goals of Executive Order 13423, "Strengthening Federal Environmental, Energy and Transportation Management" and Executive Order 13514, "Federal Leadership in Environmental, Energy, and Economic Performance," which calls for Federal facilities to conduct their environmental activities in a continuously improving, efficient, and sustainable manner. Between the two Executive Orders, there are numerous Agency goals regarding:

- Vehicles
- Petroleum conservation
- Alternative fuel use
- Energy efficiency
- Greenhouse gases
- Sustainable buildings
- Renewable power
- Building performance
- Water conservation
- Procurement
- Toxic materials and chemicals
- Electronics management

One of the P2 objectives of LaRC's Environmental Management System is to ensure that debris from facility construction and demolition activities is reused and recycled to the maximum extent practical.

3.6 HEALTH AND SAFETY

NASA LaRC adheres to OSHA and applicable Federal, State and local safety and health regulations. In addition to Federal regulations LaRC also implements its own health and safety regulations many of which are referenced in Langley Policy Directive 1700.1, "Safety Program." This directive sets forth the Center's Safety Policy, which is to provide employees a safe and healthful work environment that is free from hazards that can cause or result in loss of life or injury or damage to equipment and property.

The Center Director is the ranking official charged with the ultimate responsibility for the Center's Safety Program. Implementation of the program is achieved through specific delegation of responsibilities. The LaRC Safety Office is responsible for the day-to-day implementation of LaRC's Safety Program. Each building at the Center is assigned a Facility Safety Head (FSH) and Facility Coordinator (FC) to ensure operations are carried out in accordance with the LaRC's safety requirements. The FSH and FC responsibilities include establishing emergency operation procedures, reviewing and implementing facility operational procedures, and personnel training.

LaRC has been recognized by OSHA as a leader in health and safety by awarding the Center the Star designation level of achievement in the Voluntary Protection Program (VPP). In addition to its VPP and Safety Programs, LaRC has its own fire program and maintains a fire department on site which is centrally located at Building 1248. In the event of an emergency such as fire, explosion, chemical spill or other accident, fire department personnel serve as first responders to initiate actions as necessary to minimize hazards to all personnel and limit damage to property and the environment.

As part of its Safety Program, contractors performing work at NASA LaRC must comply with all applicable safety and health regulations, including OSHA, Agency and Center regulations. Contractors are responsible for providing their own employees with a safe and healthful workplace, and for ensuring their work is performed in a safe manner. Every major on-site contractor must have a designated Safety Officer and site-specific safety and health plan. For off-sight contractors performing temporary work at the Center, supervisory personnel must attend a safety briefing provided by the LaRC Safety Office prior to project startup.

3.7 VISUAL RESOURCES

The aesthetic quality of an area or community is composed of visual resources. Physical features that make up the visible landscape include land, water, vegetation and man-made features, such as buildings, roadways and structures. As defined in the master plan, LaRC's buildings and structures reflect two broad architectural themes: an entirely functional architecture, such as wind tunnels; and institutional architecture, typical of various period architectural styles. Examples of architecture at LaRC include Brick Box, Fluid Structure, Metal Box, Panel Type, Open Volume, and New Campus. Details of the architectural category types for the proposed demolitions are provided below:

Open Volume architecture:

- Ridged roof structures.
- Metal panels or corrugated cement asbestos panels used for exterior walls and roof.
- Variable exterior colors: aluminum, blue, yellow, gray.

Fluid Structures architecture:

- Spherical and cylindrical building forms.
- Exposed structural elements.
- Silver or white color.
- Large scale elements which become dominant focal points throughout the Center.
- Functional elements clearly articulated.

Metal Box architecture:

- Flat roof structures.
- Aluminum panels used as exterior skins.
- Generally used in conjunction with "brick-box" or "panel-type" buildings.

The ALDF Complex is located within a more rural and open setting at LaRC with Fluid Structure being the main architectural theme. The large L-Vessel of the complex is approximately 15 meters (50 feet) high and is clearly visible from Wythe Creek Road which is a public road that passes along the northwest portion of the Center's boundary. Large air storage tanks and the overhead rainmaking apparatus which runs the length of the test track are also visible from the road. Additionally, the Complex is located adjacent to the enormous LandIR (Gantry facility) which is 73 meters (240 feet) tall. The smaller support buildings associated with the ALDF Complex are mainly Open Volume and Metal Box architecture as is shown in the photographs included in Appendix B.

3.8 AIR QUALITY

The Virginia DEQ administers the state's air Operating Permit Program. LaRC has a State Operating permit that establishes emission limits for specific stationary air pollution sources as well as Center-wide emission limits. The Center is not required to have a Title V Federal Operating Permit. LaRC qualifies as a synthetic minor source because its air emissions are limited below the prescribed thresholds by its air permit. The Center's air permit contains enforceable conditions that limit the amount of air pollutants that LaRC may emit. Specific permit requirements vary according to the air pollution source, but they generally include physical, operational, record keeping and reporting requirements.

The Clean Air Act (42 U.S.C. 7401 et. seq.), as amended, establishes the authority to set safe concentration levels for six criteria pollutants: particulate matter measuring less than 10 microns in diameter (PM_{10}), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), ozone (O_3), and lead (Pb). LaRC is located within the Hampton Roads Intrastate Air Quality Control Region (AQCR). The Hampton Roads AQCR includes four counties (Isle of Wight, James City, Southampton, and York), as well as ten cities (Chesapeake, Franklin, Hampton, Newport News, Norfolk, Poquoson, Portsmouth, Suffolk, Virginia Beach, and Williamsburg). Air quality in the Hampton Roads AQCR is currently designated as attainment for all criteria pollutants.

The General Conformity Rule of the Clean Air Act (Section 176(c)) prohibits Federal actions in nonattainment or maintenance areas which do not conform to the State implementation plan (SIP) for the national ambient air quality standards. An action is subject to the general conformity rule if the emissions from a proposed Federal action in a nonattainment or maintenance area exceed certain annual emission thresholds (de minimis levels) or are regionally significant (i.e. greater than or equal to 10% of the emissions inventory for the region). In the Hampton Roads AQCR, the applicable de minimis thresholds are 100 tons per year of NO_x and 100 tons per year of Volatile Organic Compounds (VOCs). Regionally significant (10%) emissions inventories in the Hampton Roads AQCR would be 715.2 tons per year of NO_x and 879 tons per year of VOCs.

Greenhouse gases (GHG) are emitted from stationary fuel combustion sources at LaRC including boilers, furnaces, and process heaters. In CY 2010, GHG emissions from these sources were calculated to be 9,779 metric tons CO2 equivalent (MtCO2e). This is well below the reporting threshold of 25,000 MtCO2e under the EPA Mandatory Greenhouse Gas Reporting Rule. LaRC is not required to report under this rule. Ozone-depleting substances (ODS) are used at LaRC, primarily as refrigerants in facility air-conditioning systems. In CY 2010, 1,600 pounds of ODS were used at LaRC. As older air-conditioning systems are replaced at LaRC, new units are being installed that contain non-ODS refrigerants accepted under EPA's Significant New Alternatives Policy (SNAP).

3.9 WATER RESOURCES

3.9.1 Surface Waters

NASA LaRC is located on the coastal basin of the Back River, which flows into the Chesapeake Bay. Approximately forty percent of the LaRC West Area drains into the Brick Kiln Creek, which runs along the northern boundary of LaRC and joins the Back River Northwest Branch. Tabbs Creek, which drains most of the rest of the West Area, also flows north into the Back River Northwest Branch. A small portion of the West Area in the south drains to Tides Mill Creek, which joins the Back River Southwest Branch. The entire LaRC East Area drains to the Back River. An upstream segment of Brick Kiln Creek, all of Tabbs Creek, and the Back River are listed as impaired waters by the EPA. All local waterways are influenced by tides in the Chesapeake Bay.

LaRC operates under three water discharge permits. A permit from the Hampton Roads Sanitation District (HRSD) allows LaRC to discharge non-hazardous industrial wastewater and sanitary sewage to the HRSD sanitary sewer system. The Center has two water permits under the Virginia Pollutant Discharge Elimination System (VPDES), which regulate industrial process wastewater and storm water discharges from the Center. LaRC has ten permitted outfalls in the West Area, and the Center performs periodic sampling and monitoring of the effluent from the outfalls to ensure compliance with permit limits. Figure 3.6 shows the locations of LaRC's permitted outfalls in relation to the proposed demolition activities. The ALDF facilities proposed for demolition are located at the northern part of the Center and drain to outfalls 5, 6, and 7.

In accordance with Virginia's Department of Conservation and Recreation (DCR), construction activities at NASA LaRC that disturb equal to or greater than 4,047 square meters (one acre)

require coverage under the General Permit for Discharges of Stormwater From Construction Activities. Additionally, since LaRC is within a Chesapeake Bay Preservation locality, construction activities any larger than 232 square meters (2,500 square feet) also require coverage.

NASA LaRC has few water pollution sources due to the relatively low level of industrial operations at the Center. The major pollutants are the chemicals used to treat the boilers and cooling towers, and these are discharged in accordance with LaRC's permits. LaRC employs various Best Management Practices to prevent or mitigate storm water and/or sewer system pollution from facility activities.

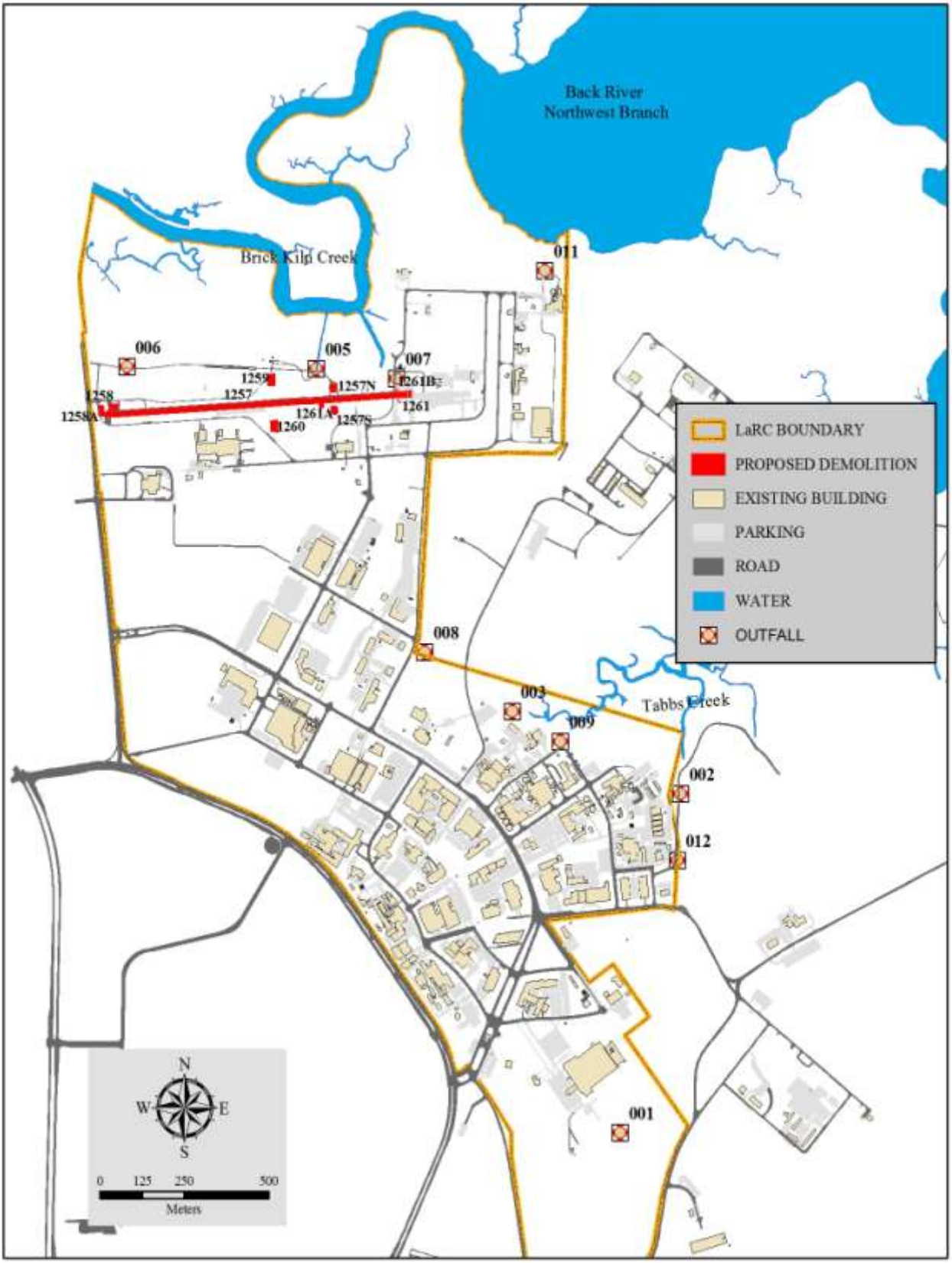

Figure 3.6 – Location of Outfalls at NASA LaRC

3.9.2 Wetlands

The US Army Corps of Engineers and the EPA define wetlands as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Executive Order 11990, Protection of Wetlands, requires Federal agencies to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. LaRC has a 2005 Army Corps of Engineers-confirmed wetlands delineation. Figure 3.7 shows the wetlands identified at LaRC. Although none of the ALDF buildings are located directly within the identified wetlands, there are wetlands to the north of the ALDF Track at its eastern end, as well as wetlands to the south of its western end. The wetlands north of the Track's eastern section are the closest, located approximately 2.4 meters (8 feet) away.

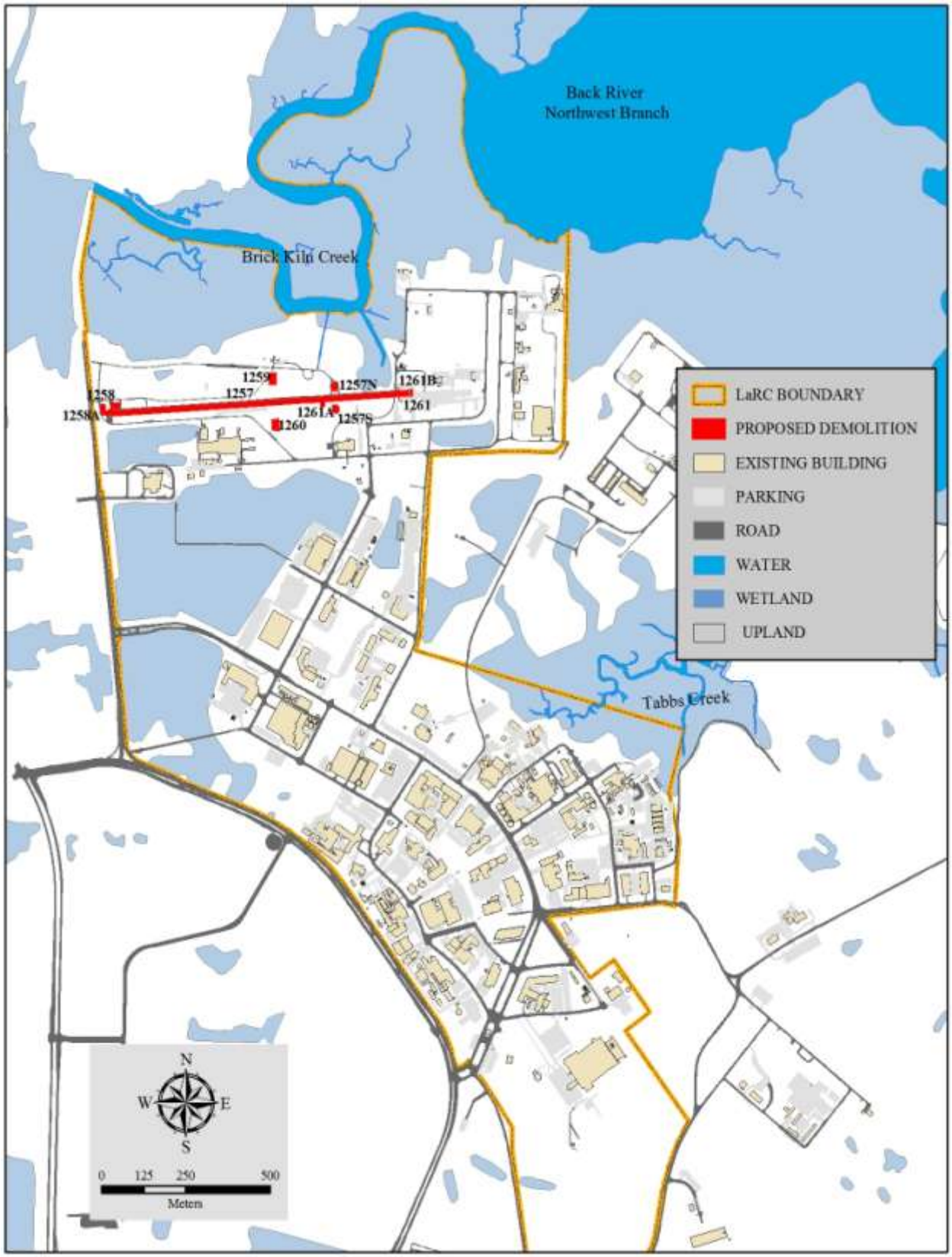

Figure 3.7 – Location of Wetlands at NASA LaRC

3.9.3 Floodplains

Floodplains are the flood-prone, lowland areas adjoining inland and coastal water including areas of offshore islands. The 100-year floodplain area is considered the area where there is a one percent chance of flooding in any given year. Due to its proximity to the Chesapeake Bay and Back River, approximately one-third of the West Area of LaRC is within the 100-year floodplain. The stillwater elevation for the 100-year floodplain for LaRC is estimated by the Federal Emergency Management Agency (FEMA) to be 2.6 meters (8.5 feet) above mean sea level (MSL). FEMA has estimated 100-year floodwater levels with accompanying waves at about 3.3 meters (11 feet) above MSL near the Center. Eight buildings, 1257N, 1257S, 1258, 1258A, 1260, 1261, 1261A, 1261B, and a majority of the ALDF track are located within this floodplain. The stillwater level for the 500-year floodplain is 2.9 meters (9.8 feet) above MSL. Building 1259 and a portion of the track are located within the 500-year floodplain. Figure 3.8 shows the extent of the floodplains on LaRC and the location of the ALDF facilities.

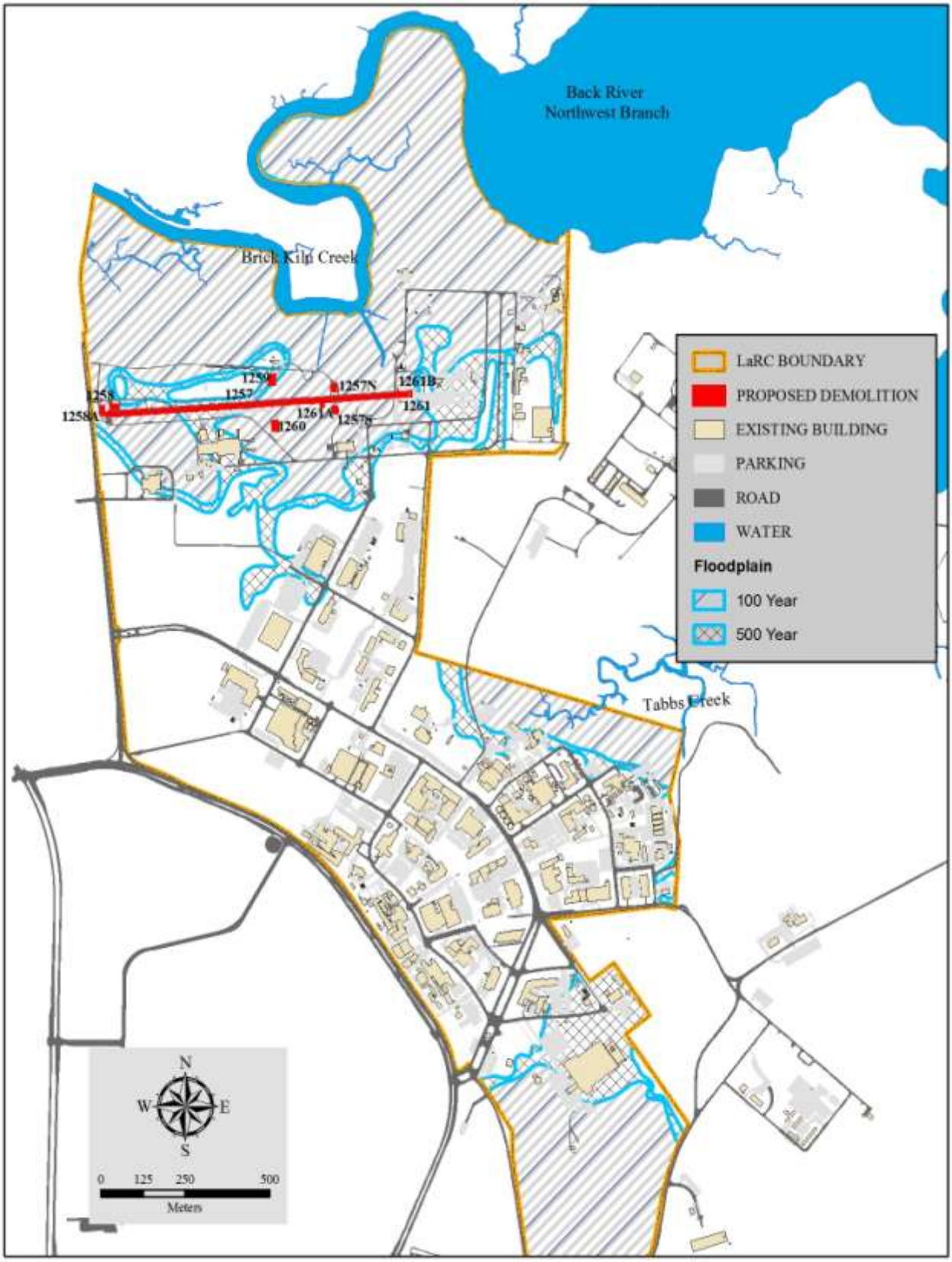

Figure 3.8 – Floodplains at NASA LaRC

3.10 WILDLIFE RESOURCES

LaRC's West Area supports several wildlife species with its unimproved lands providing habitat for fur-bearing (game) mammals, small mammals, birds, reptiles, amphibians, and fish. Tall fencing surrounding the West Area property limits movement of many larger animals on and off the property from adjacent unimproved lands. Some species that that been encountered in this area include common rodents, such as house mouse or white-footed mouse; birds such mourning doves, blue jays, turkey, osprey, barn owls, and reptiles such as eastern box turtle. LaRC also attracts some white-tailed deer, raccoons, and Virginia opossum that forage from the adjacent woods and wetland areas. The buildings proposed for demolition are located in a partially developed and grass-filled area that offers limited support to the wildlife species listed above.

3.11 VEGETATION

Significant portions of LaRC contain undeveloped wooded vegetation as well as large areas of maintained grass and landscaping. Figure 3.9 shows that the ALDF Complex facilities are located in a partially developed area surrounded by minimally maintained grass.

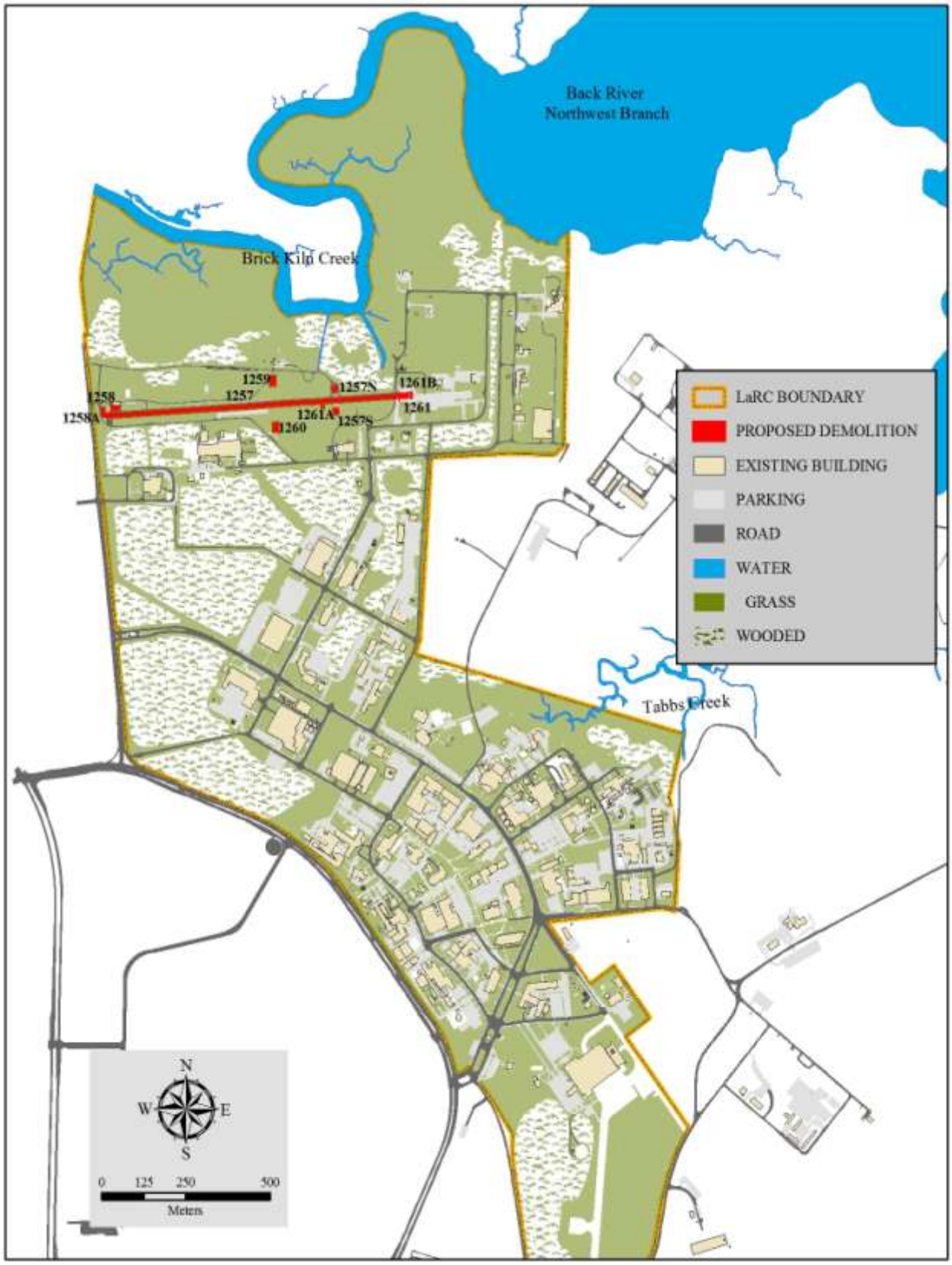

Figure 3.9 – Vegetation at NASA LaRC

4.0 ENVIRONMENTAL IMPACTS

This chapter describes the potential impacts or effects of the Proposed Action and the No-Action alternative on the environmental resources described in Chapter 3.

4.1 LAND USE

4.1.1 Proposed Action

Coastal Zone Management
Since NASA LaRC is located within the coastal zone as defined under Virginia DEQ's Coastal Zone Management Program, proposed activities at LaRC must be consistent with the enforceable policies regarding coastal resources. As noted in Section 3.0, the following enforceable policies are not applicable to the location of the Proposed Action: Fisheries Management, Subaqueous Lands Management, Dunes Management, and Shoreline Sanitation. The Coastal Lands Management policy is addressed in this section and the remaining Coastal Zone Management Program policies relating to air, wetlands and water pollution are addressed in Section 4.8 and Section 4.9 respectively. As described in these sections, the Proposed Action would be consistent with the Coastal Zone Management Program's enforceable policies. NASA LaRC sent a separate Consistency Determination regarding the proposed demolition activities to DEQ on September 21, 2011.

The Coastal Lands Management program establishes authority for the oversight of activities in the Chesapeake Bay Resource Management Areas (RMAs) and Resource Protection Areas (RPAs). Certain development activities within these zones are restricted in order to protect the quality of state waters. Portions of the concrete test track and two buildings associated with the ALDF Complex demolition are located within a RPA and RMA. In accordance with the VA DCR's Stormwater Management requirements, demolition contractors would be required to submit a Stormwater Pollution Prevention Plan (SWP3) and an Erosion and Sediment Control (ESC) Plan, and secure a Virginia Stormwater Management Program (VSMP) General Permit for Stormwater Discharges from Construction Activities. During demolition activity, the contractor's performance and adherence to the permits and plans would be monitored by the LaRC Environmental Management Branch's construction inspection team which includes two DCR certified inspectors. Following demolition, the areas located within the RPA would be planted with natural vegetation to restore the buffer zones. The removal of buildings would facilitate the infiltration of storm water into the ground by decreasing impervious surface area. As such, implementation of the Proposed Action would have positive impact on the RPA, RMA and land use in the area around the ALDF Complex.

Functional Areas
The demolition of the ALDF Complex facilities would involve localized changes from developed research use to open space. The removal of buildings and infrastructure would have an environmental benefit because there would be an increase of green space resulting from a facility footprint reduction of approximately 8,086 square meters (87,037 square feet). Implementation of the Proposed Action would have a minor positive impact to the functional use of the area around the ALDF Complex.

4.1.2 No-Action

Under the No-Action alternative, NASA LaRC would not demolish the ALDF Complex facilities. There would be a minor change to the land use and functional zones in the area since the Complex is no longer operational. NASA LaRC would adjust the functional zones to reduce the Tunnels and Testing zone to remove the ALDF Complex, placing it in the North 40 zone.

4.2 NOISE

4.2.1 Proposed Action

With the implementation of the Proposed Action, heavy equipment and vehicles would cause temporary increases in noise at the project area and along traffic corridors. Although the Proposed Action would occur in an area of LaRC that is not highly developed, the project area does experience fairly high noise levels generated from aircraft, the Refuse Fired Steam Generating Facility, testing operations at the nearby Landing and Impact Research Facility (LandIR), and traffic noise from the nearby Wythe Creek road. Compared to noise generated by aircraft, noise produced by the demolition activities would generally be more impulsive, relatively lower in magnitude, and spread out during the day. As such, implementation of the Proposed Action would have a negligible, short term effect on the noise environment in the area around the ALDF Complex.

4.2.2 No-Action

Under the No-Action alternative, NASA LaRC would not demolish the ALDF Complex facilities, and there would be no change in noise levels in the surrounding area.

4.3 CULTURAL RESOURCES

4.3.1 Architectural Resources

4.3.1.1 Proposed Action

Implementation of the Proposed Action would have an adverse impact to NASA LaRC's cultural resources as nine of the ten facilities associated with the ALDF Complex are eligible for listing in the National Register. Per Stipulation III C of the PA, since the ALDF Complex is included on the list of highly technological and scientific facilities, consultation with the SHPO, ACHP and other consulting parties regarding impacts to architectural resources is not required for removal of the facilities.

NASA LaRC plans to minimize the adverse affects of removal of the buildings through carrying out mitigation measures as prescribed in the Programmatic Agreement described in Section 3.3.1. The mitigation would be completed prior to implementation of the Proposed Action and includes the following:

- Completion of documentation to include photographs with large format negatives of exterior and interior views, historic views, and written data to include property description and history. The documentation would be sent to the archives at the Virginia Department of Historic Preservation.
- Salvaging of architectural or scientific/engineering elements from the ALDF Complex to include the High G Test Carriage (large sled), and two Space Shuttle main gear tires.

- Placing salvaged items on public display either at LaRC or other suitable location, such as a museum or other public venue.
- Supplementing information about the ALDF Complex on the Center's Cultural Resource Management website to include scanning test videos and other historical documents and performing interviews of researchers.

4.3.1.2 No-Action

Under the No-Action alternative, NASA LaRC would not demolish the ALDF Complex facilities and they would remain closed and abandoned. Over time, the buildings and track would continue to deteriorate which would result in a minor adverse impact to LaRC's cultural resources.

4.3.2 Archaeological Resources

4.3.2.1 Proposed Action

Implementation of the Proposed Action would involve ground disturbance activity similar to when the ALDF Complex was constructed. Demolition activities would be restricted to the footprint of the facilities and in areas that have experienced previous ground disturbance. As such, the discovery of intact archaeological resources would not be anticipated. If archaeological resources exist in these areas, they would be in highly disturbed secondary contexts. In the event that resources were uncovered during demolition, all earthmoving activity would immediately stop and NASA LaRC would notify the SHPO. In addition, LaRC would implement the protective procedures included in Section 4.6 of the CRMP, "Unanticipated Discovery of Cultural Materials or Human Remains." As such, implementation of the Proposed Action would not affect known archaeological resources.

Additionally, in accordance with the Programmatic Agreement described in 3.3.1, NASA LaRC consulted with the SHPO to ensure impacts to any archaeological resources are avoided. Section VI.A. of the Programmatic Agreement requires that in the event NASA LaRC plans ground disturbance as part of rehabilitation, new construction, site improvement, or other project in an area with a previously identified archaeological property, and if the resource is eligible for or listed in the NRHP, NASA LaRC shall consult with the SHPO on ways to avoid, minimize, or mitigate potential effects to the identified property. Copies of the consultation letters are included in Appendix C. The SHPO concurred with NASA LaRC's determination of no adverse effect for the Proposed Action.

4.3.2.2 No-Action

Under the No-Action alternative, NASA LaRC would not demolish the ALDF Complex facilities, and there would be no impact to archaeological resources.

4.4 HAZARDOUS, REGULATED AND SOLID WASTE

4.4.1 Proposed Action

4.4.1.1 Waste Management

All hazardous and regulated waste generated from demolition activities would be disposed of in accordance with LaRC's waste management procedures and applicable Federal, State, and local regulations. In accordance with LaRC's building closure and demolition policies, the buildings would be thoroughly inspected for hazardous and regulated materials prior to deconstruction. Examples of hazardous and regulated materials that could be encountered include mercury switches, fluorescent light bulbs, oils, chemicals, and lead-based paints. Many of the older facilities at the Center still have small PCB light ballasts or capacitors. LaRC ensures that PCB materials are properly packaged, transported and disposed of at an approved disposal facility. Asbestos is also present in many LaRC buildings. Small amounts of ACM have been identified in Building 1258. All contractors performing asbestos work at LaRC would be appropriately licensed and permitted, and the waste would be properly packaged, labeled and transported to a permitted landfill. Prior to demolition of Building 1258, remaining fuel oil in the aboveground storage tank would be disposed or transferred to another facility for reuse if possible.

Implementation of the Proposed Action would generate large volumes of solid waste including concrete, structural steel, and miscellaneous building components. As described in 4.5.1, contractors would be directed to recycle materials to the maximum extent possible, thereby reducing the amount of debris disposed in landfills. Non-hazardous, non-regulated, solid materials that are not collected for recycling would be consolidated and transported for disposal to a local landfill. As such, implementation of the Proposed Action would have a negligible impact on the environment resulting from the generation of hazardous, regulated and solid waste.

4.4.1.2 Waste and CERCLA Sites

Portions of the ALDF test track and Building 1257N are located within approximately 15 meters (50 feet) of the Construction Debris Landfill (CDL) site. A buffer zone of grass and road exists between the CDL site and Building 1257N and the track. Additionally, the CDL site is enclosed by a security fence and entry is only allowed to authorized personnel. As such, implementation of the Proposed Action would not impact the CDL site.

4.4.2 No-Action

Under the No-Action alternative, LaRC would not demolish ALDF Complex facilities, and there would be no change to the current levels of hazardous, regulated or solid waste generation at NASA LaRC.

4.5 POLLUTION PREVENTION AND ENVIRONMENTAL MANAGEMENT SYSTEM

4.5.1 Proposed Action

The demolition activities would be carried out following NASA LaRC's principles of P2, to include source reduction, recycling/reuse, treatment and proper disposal of wastes. Demolition would involve a "deconstruction" approach to include the dismantling and extracting of

reusable/recyclable materials prior to the removal of the facilities. Materials extracted from the buildings such as concrete, steel structural elements and other metals would be recycled to the maximum extent possible. Maximizing recycling in order to reduce the quantity of materials disposed in the local landfill is advocated by LaRC's Environmental Management System and is one of LaRC's P2 goals. While there would be an increase in solid waste generated from demolition activities, this would be offset by eliminating the need for future maintenance on the facilities that could potentially result in pollution, such as painting, cleaning, and other general maintenance activities. Furthermore, contractors would be required to follow applicable Best Management Practices to further reduce pollution. As such, use of P2 practices would ensure that the implementation of the Proposed Action would have minimal impacts on the environment.

4.5.2 No-Action

Under the No-Action alternative, NASA LaRC would not demolish the ALDF Complex facilities, and there would be no change in the levels of wastes or pollution generated at NASA LaRC.

4.6 HEALTH AND SAFETY

4.6.1 Proposed Action

The demolition activities performed during the Proposed Action would be carried out by qualified and properly licensed and permitted contractors. All contractors performing work at LaRC are required to comply with all applicable safety and health regulations, including OSHA and NASA regulations. Contractors involved in the Proposed Action would be required to prepare and follow a site-specific Health and Safety Plan that complies with the regulations to ensure the safety of human health and the environment during the demolition activities. Adherence to applicable health and safety procedures would minimize the risk of injury to either the contractors working in the active project area or the surrounding LaRC personnel. Therefore, implementation of the Proposed Action would have minimal impacts on worker health and safety.

4.6.2 No-Action

Under the No-Action alternative, LaRC would not demolish the ALDF Complex facilities, and there would be no impacts to worker health and safety.

4.7 VISUAL RESOURCES

4.7.1 Proposed Action

Implementation of the Proposed Action would remove aging and deteriorating buildings and infrastructure and create more open space. The resulting open space would improve the visual resources around the project area. The area of the project located within an RPA and RMA would be replanted with native vegetation to restore the buffer to its original condition, while the remaining area would be graded and reseeded following demolition. Although visual resources in the immediate project area would be temporarily degraded during the active demolition, the resulting open space and restored vegetative buffer around the nearby water resource would

provide enhanced visual quality. Therefore, implementation of the Proposed Action would have a long-term positive impact on visual resources in the area around the ALDF Complex.

4.7.2 No-Action

Under the No-Action alternative, the exterior of the aging facilities would continue to deteriorate, and no new open green space would be created. Eventual degradation would result in a decline in aesthetic quality of the area in and around where the buildings are located. As such, implementation of the No-Action alternative would result in a minor negative impact to the visual resources in the area around the ALDF Complex.

4.8 AIR QUALITY

4.8.1 Proposed Action

The demolition of the ALDF Complex facilities would result in a slight increase in emissions from vehicle/equipment exhaust and from fugitive dust. These effects would be minor and short term during the length of the project. In relation to the large number of personal and Government vehicles operating on LaRC, the additional emissions resulting from vehicles and from equipment would be negligible. In addition, fugitive dust would be minimized by using control methods outlined in the Virginia Regulations for the Control and Abatement of Air Pollution (9 Virginia Administrative Code 5-40-90). These precautions may include the use of water for dust control, covering of open equipment for conveying materials, prompt removal of spilled or tracked dirt from paved streets, and removal of dried sediments resulting from soil erosion.

The Proposed Action is not subject to the General Conformity Rule of the Clean Air Act because emissions of applicable pollutants would not exceed annual de minimis thresholds, nor are they regionally significant (i.e. 10% of regional emissions inventory). Emissions of particulate matter (PM10) were calculated for the demolition associated with the Proposed Action using the *U.S. Air Force Air Conformity Applicability Model (ACAM) Version 4.5.* Calculated PM10 emissions associated with this demolition were below 0.2 tons. No changes in GHG gas emissions or ODS usage are anticipated with implementation of the Proposed Action.

The Proposed Action would not involve open burning.

No new stationary air emission sources are associated with the demolition of the facilities, so there would be no revisions to LaRC's Stationary Source Permit to Operate from the Virginia DEQ. LaRC would ensure that all activities associated with demolition activities would comply with the Federal Clean Air Act as enforced by the Virginia State Implementation Plan and the State Air Control Board (Code of Virginia § 10-1.1300). Therefore the Proposed Action would be consistent with the enforceable air management policies of the Coastal Zone Management Act. As such, implementation of the Proposed Action would result in minimal impact on air quality at LaRC.

4.8.2 No-Action

Under the No-Action alternative, LaRC would not demolish the ALDF Complex facilities, and there would be no change in air quality in the area around the ALDF Complex.

4.9 WATER RESOURCES

4.9.1 Surface Waters

4.9.1.1 Proposed Action

The demolition of the ALDF Complex facilities would result in minimal impact to the water of LaRC and the surrounding environment. Soil disturbance during demolition activities would produce a minor and temporary increase in suspended solids in the storm water reaching the outfalls that drain the affected areas (primarily outfalls 5, 6, and 7). In accordance with Virginia's Department of Conservation and Recreation (DCR), construction activities at LaRC that disturb equal to or greater than 4,047 square meters (one acre) require coverage under the General Permit for Discharges of Stormwater From Construction Activities. Additionally, since LaRC is within a Chesapeake Bay Preservation locality, construction activities larger than 232 square meters (2,500 square feet) also require coverage. Silt fences, storm drain inlet and outlet protection, and other appropriate standard construction practices would be implemented in accordance with the erosion and sediment control requirements of Virginia's DCR. Additionally, NASA LaRC would ensure that the contractors obtain the appropriate permits and prepare the required plans in accordance with DCR's construction site stormwater permit requirements. Following completion of the demolition, there would be no long-term impact to the quality or quantity of stormwater drainage to local surface waters.

The Virginia Coastal Zone Management Program maintains enforceable policies related to point source and non-point source water pollution. The Proposed Action does not involve point source water pollution, but does have the potential to generate a non-point water pollution source. The Coastal Zone Management Program requires that soil-disturbing projects be designed to reduce soil erosion and to decrease inputs of chemical nutrients and sediments to the State's waters. By contract, LaRC would require contractors to adhere to the standards of LaRC's current General Permit for Storm Water Discharges from Small Municipal Separate Storm Sewer Systems that requires LaRC to implement Best Management Practices (BMPs) mitigating stormwater pollution from Center activities. These BMPs include employee training, preventive maintenance, visual inspections, spill prevention and response, sediment and erosion control, good housekeeping, and record keeping and reporting. Since LaRC would implement appropriate BMPs to reduce erosion and pollution, the Proposed Action would be consistent with the Coastal Zone Management Program. A separate Consistency Determination was submitted by LaRC to DEQ on September 21, 2011.

As such, implementation of the Proposed Action would result in minor impacts to water resources in the area around the ALDF Complex.

4.9.1.2 No-Action

Under the No-Action alternative, LaRC would not demolish the ALDF Complex facilities, and there would be no change in surface water resources at LaRC.

4.9.2 Wetlands.

4.9.2.1 Proposed Action

The Proposed Action would take place north of identified wetlands and south and east of identified wetlands, as shown in Figure 3.8. In addition to implementing the BMPs associated with obtaining permit coverage for General Permit for Discharges of Stormwater From Construction Activities, LaRC would minimize the risk of affecting the wetlands during demolition activities by fencing off the areas to ensure heavy equipment is restricted from entering wetlands areas. As such, implementation of the Proposed Action would have minimal impacts on wetlands.

4.9.2.2 No-Action

Under the No-Action alternative, LaRC would not demolish the ALDF Complex facilities, and there would be no impact on wetlands.

4.9.3 Floodplains

4.9.3.1 Proposed Action

The entire ALDF Complex is located in the 100-year or 500-year floodplains. Demolition activities would comply with provisions of Executive Order 11988, *Floodplain Management*, and the Chesapeake Bay Preservation Act. Since structures built within the floodplains are at increased risk for loss due to flooding, the removal of the buildings would reduce LaRC's vulnerability to natural disaster. In addition, demolition would reduce the hindrance of natural flood flow and entrainment of debris. As such, implementation of the Proposed Action would result in minor positive impacts to water resources in the area around the ALDF Complex.

4.9.3.2 No-Action

Under the No-Action alternative, LaRC would not demolish the ALDF Complex facilities and they would remain in the floodplains. They would continue to impede natural flood flow and entrainment of debris. As such, implementation of the No-Action alternative could result in a minor negative impact to the water resources in the area around the ALDF Complex.

4.10 WILDLIFE RESOURCES

4.10.1 Proposed Action

Disturbance resulting from the Proposed Action would be limited to the local project sites. The activity and noise generated from equipment and vehicles may temporarily displace wildlife from the immediate vicinity of the project areas. The buildings do not currently provide significant habitat to wildlife, so it is expected that the impacts to wildlife caused by the deconstruction activities would be very minor and short-term. Implementation of the Proposed Action would result in long-term positive impact to wildlife as removal of the buildings would result in more open green space on LaRC property.

4.10.2 No-Action

Under the No-Action alternative, LaRC would not demolish the ALDF Complex facilities, and there would be no change to the current status of LaRC's wildlife resources.

4.11 VEGETATION

4.11.1 Proposed Action

All buildings proposed for demolition are located in a developed area with minimally maintained grass. The only vegetation that would be impacted by the Proposed Action would be landscaping plants and grass in the project area, but these landscapes would be replanted following removal of the facilities. Caution tape and/or temporary fencing would be placed around any trees within the project area to protect them from root compaction or other damage by heavy machinery. There would be a net increase in vegetation at the Center because the Proposed Action would result in a reduced facility footprint of approximately 8,086 square meters (87,037 square feet). The area of the project located within an RPA and RMA would be replanted with native vegetation to restore the buffer around the nearby water resource to its original condition. The remaining area would be graded and reseeded. Therefore the Proposed Action would have a positive impact on LaRC's vegetation resources.

4.11.2 No-Action

Under the No-Action alternative, LaRC would not demolish the ALDF Complex facilities, and there would be no change to LaRC's current vegetation.

5.0 CUMULATIVE EFFECTS

The CEQ regulations require that all Federal agencies include cumulative impacts in their environmental analyses (40 CFR 1508.25(c)). Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR 1508.7). This includes those that may be "individually minor but collectively significant actions taking place over time" (40 CFR 1508.7).

Cumulative effects are most likely to arise when a relationship exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or in close proximity to the proposed action would be expected to have more potential for a relationship than actions that may be geographically separated. Similarly, actions that coincide, even partially, in time would tend to offer a higher potential for cumulative effects. The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the timeframe in which the effects could be expected to occur.

The geographic extent for the environmental resources analyzed in this EA is limited to the local LaRC West Area because the region of influence for potential environmental impacts from the proposed project is largely confined within the LaRC fence line. The timeframe includes recent past and present actions continuing into the foreseeable future. An effort has been made to generally identify actions that are being considered and that are in the planning phase at this time.

5.1 PAST, PRESENT AND REASONABLY FORESEEABLE ACTIONS

As an active research facility, LaRC undergoes continual change in order to align its capabilities with the Agency's overall mission. Like any major research installation, LaRC requires new construction, facility improvements and infrastructure upgrades to ensure the Center's resources are appropriate for carrying out its research. Many of LaRC's recent past, present and foreseeable future actions are related to an overarching NASA objective to streamline the Center's infrastructure and restructure and modernize the Center's facilities, as described in Section 1.4. To meet NASA's developing mission requirements, LaRC continues to pursue projects that transform the Center into a more modern, efficient, and technologically advanced Center. Given the age of LaRC's infrastructure and the changes in NASA's mission, many facilities have outlived their useful life and require extensive renovation or demolition. The projects below comprise the major past, present, and reasonably foreseeable future actions at NASA LaRC.

Between 2004 and 2006, LaRC demolished fourteen dilapidated and abandoned buildings in order to reduce the Center's unneeded and unused infrastructure. In 2008, LaRC began demolition of thirteen smaller buildings and structures located throughout the Center. The facilities are under-utilized and no longer needed to support LaRC's mission. Also in 2008 LaRC deconstructed Building 1212B, the 7x10-Foot High Speed Tunnel. NASA closed the facility in 1994 due to lack of need and because duplicate or superior testing capabilities exist at other NASA facilities.

In the summer of 2009, LaRC constructed a Hydro-Impact Basin at the Landing and Impact Research Facility (LandIR), Building 1297. The basin allows for full-scale water-impact testing for simulated Orion Multipurpose Crew Exploration Vehicle (MPCV) ocean splashdown research in support of NASA's future space launch system.

Beginning in the fall of 2009 and continuing over the next 15 years, LaRC is implementing a major phased modernization and upgrade project called New Town. Site improvements include construction of five new buildings, the renovation of two existing buildings, and the demolition of an additional 22 abandoned and unneeded buildings; as well as upgrades to roadwork, parking lots, and utilities. The project will modernize the center core of LaRC, better align LaRC's capabilities with the future direction of the NASA mission, and significantly reduce the Center's operations and maintenance costs. This initiative removes aging and inefficient facilities and replaces them with modern offices and research laboratories. The new facilities and modifications to existing facilities will, at a minimum, meet the Leadership in Energy and Environmental Design (LEED) silver standards for building design. The first phase of New Town, the new NASA LaRC Headquarters was completed in the spring of 2011 and was designated as LEED Platinum. Construction of the second New Town building, a shared services facility that will house the new conference center and cafeteria, will begin in the spring of 2012.

Also in the fall of 2009 and continuing into 2011, 21 buildings that were closed and abandoned were demolished in order to further reduce unneeded, unused structures at LaRC and allow for more resources to be directed towards LaRC's overall mission.

In 2010, LaRC began demolition of four closed wind tunnels. The facilities are Building 640 (the 8-Foot Transonic Pressure Tunnel), Building 641 (the 8-Foot High Speed Tunnel), Building 643 (the Full Scale Tunnel), and Building 1146 (the 16-Foot Transonic Tunnel). The decision to demolish the facilities was based on the determination of no current or future government need to use the tunnels and no viable plans from non-governmental entities (industry, universities, etc.) to operate or adaptively reuse the facilities.

5.2 ANALYSIS OF CUMULATIVE IMPACTS

The following analysis examines the impacts on the environment that could result from the incremental impact of the Proposed Action when added to the actions described above. The analysis examines whether such a relationship would result in potentially significant impacts not identified when the Proposed Action is considered alone.

With the exception of cultural resources, LaRC has determined that the projected effect of the Proposed Action, coupled with the other past, current and future actions described above, would result in positive cumulative impacts to the resources analyzed in this EA. As mentioned in several areas, replacing aging infrastructure with more energy efficient buildings, reducing LaRC's built environment and returning developed areas to natural green space will benefit the overall environment around NASA LaRC.

LaRC has determined that the projected cumulative effect of the Proposed Action, coupled with the other past, current and future actions occurring at LaRC would be the loss of LaRC's historic

properties. The impacts would be caused by the removal or modification of historic properties and the potential change in the character and/or integrity of the NASA LaRC Historic District. In accordance with Section 106 of the National Historic Preservation Act and LaRC's Programmatic Agreement Management of Buildings, Infrastructure and Sites at LaRC, NASA plans to continue to minimize the impacts to historic properties through consultation carrying out appropriate mitigation measures to preserve LaRC's history and legacy to the maximum extent practical. While the resources once removed would be lost, the history of the facilities would be preserved through mitigation measures, as described in Section 4.3.1.1.

6.0 REFERENCES

GAO, 2007. Federal Real Property: Progress Made Toward Addressing Problems, but Underlying Obstacles Continue to Hamper Reform. GAO-07-349. http://www.gao.gov/new.items/d07349.pdf

NASA, 2004. Real Property Management Plan. http://www.hq.nasa.gov/office/codej/codejx/Assets/Docs/RPMPFinalwithdate11-04.pdf

NASA, 2010. NASA's Top Management and Performance Challenges. Prepared by NASA Office of the Inspector General. http://oig.nasa.gov/NASA2010ManagementChallenges.pdf

NASA, 2011. NASA Procedural Requirement (NPR) 8580.1, Implementing the National Environmental Policy Act and Executive Order 12114. http://nodis3.gsfc.nasa.gov/npg_img/N_PR_8580_0001_/N_PR_8580_0001_.pdf

NASA Langley Research Center, 2003. Environmental Assessment, Demolition of Fourteen Buildings at NASA Langley Research Center. Prepared by SAIC, Hampton, VA.

NASA Langley Research Center, 2007. Environmental Assessment, Demolition of Building 1212B, the 7- by-10-Foot High Speed Tunnel at NASA Langley Research Center. Prepared by SAIC, Hampton, VA.

NASA Langley Research Center, 2008. Cultural Resource Management Plan. Prepared by SAIC, Hampton, VA.

NASA Langley Research Center, 2008. Environmental Assessment, Demolition of 13 Buildings at NASA Langley Research Center. Prepared by SAIC, Hampton, VA.

NASA Langley Research Center, 2008. Environmental Assessment, New Town Project at NASA Langley Research Center. Prepared by SAIC, Hampton, VA.

NASA Langley Research Center, 2008 and 2009. Phase I Reconnaissance Level Survey of Architectural Resources at the National Aeronautics and Space Administration, Langley Research Center. Prepared by Dutton & Associates, LLC, Richmond, VA.

NASA Langley Research Center, 2009. Environmental Assessment, Deconstruction and Transfer of Low-Turbulence Pressure Tunnel Complex Facilities at NASA Langley Research Center, Hampton, Virginia. Prepared by SAIC, Hampton, VA.

NASA Langley Research Center, 2009. Environmental Assessment, Demolition of 21 Buildings at NASA Langley Research Center, Hampton, Virginia. Prepared by SAIC, Hampton, VA.

NASA Langley Research Center, 2009. Environmental Assessment, Hydro-Impact Basin at the Landing and Impact Research Facility at NASA Langley Research Center, Hampton, Virginia. Prepared by SAIC, Hampton, VA.

NASA Langley Research Center, 2009. Langley Policy Directive 1700.1, Safety Program

NASA Langley Research Center, 2011. Environmental Management and Sustainability Plan. Prepared by SAIC, Hampton, VA.

NASA Langley Research Center, 2011. Environmental Resources Document.

NASA Langley Research Center, 2011. Configuration Management Online. https://cmol.ndc.nasa.gov/.

NASA Langley Research Center, 2011. LaRC Center Master Plan. http://gis-www.larc.nasa.gov/masterplan/

NASA Langley Research Center, 2011. LPR 8500.1, LaRC Environmental and Energy Program Manual. https://lms.larc.nasa.gov/admin/documents/LPR_8500-1.pdf.

Public Law 111-267. NASA Authorization Act of 2010. Prepared by the 111th Congress. http://www.nasa.gov/pdf/516655main_PL_111-267.pdf

7.0 LARC PREPARERS AND CONTRIBUTORS

The LaRC Environmental Management Branch prepared this EA. Individuals listed below contributed to this document by writing portions of the text, contributing background and supporting information, or providing technical review and comment on the draft.

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APPENDIX A

Scoping and Correspondence with Outside Agencies

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2008 Scoping Letter

National Aeronautics and
Space Administration
Langley Research Center
Hampton, VA 23681-0001

March 27, 2008

Reply to Attn of: 230

Dear Colleague:

I am writing to solicit your feedback as a respected authority in the field of aircraft ground handling performance. After more than 50 years of operation, NASA Langley Research Center (LaRC) must consider putting the Aircraft Landing Dynamics Facility (ALDF) into an inactive facility status. NASA's current mission content, as well as the forecast for the future, does not require the experimental research capabilities that ALDF offers; without active programs in the facility, NASA does not have a compelling business case to keep this laboratory operational past the government's fiscal year 2008.

Originally opened in 1955, and later upgraded in 1985, ALDF today is a unique research facility designed to test aircraft landing gear systems on actual runway or semi-prepared surfaces at operational ground speeds, loading scenarios, and environmental conditions. In the 1960's, ALDF was instrumental in promoting the use of pavement grooving on runways and highways to minimize tire hydroplaning on wet surfaces, which has resulted in significant reduction in the number of skidding accidents. Figure 1 shows ALDF and Table 1 summarizes its current capabilities; detailed historic information can be found in NASA-RP-1189 (*http://hdl.handle.net/2060/19870020111*). Testing at ALDF has historically been safer, more affordable, more versatile, and more controllable than flight-testing. The facility is able to accept virtually any landing gear system or sub-system including new and novel landing gear concepts as well as a wide variety of non-landing gear test articles to address other vehicle/ground interaction problems, such as hazard detection.

Figure 1: Aircraft Landing Dynamics Facility (ALDF)

Table 1: Summary of ALDF Capabilities

Maximum Test Speed, knots	220
Test Duration:	
At 100 knots, sec	11
At 220 knots, sec	5
Track:	
Length of Overall Track, ft	2,800
Length of Test Section, ft	1,800
Length of Arrestment Section, ft	600
Length of Water Sprinkler System, ft	1,800
Length of Overhead Rain Making Apparatus, ft	500
Overhead Rain Making Apparatus Precipitation Rate, in./hour	40 (15 sec duration max)
Pressurized Water Jet Propulsion System:	
Maximum Catapult Stroke, ft	400
Maximum Pressure, psi	3,150
Exit Nozzle Diameter, in.	18
Water Consumption, gallons	9,600
Carriage:	
Maximum Carriage Acceleration, g units on carriage	20
Maximum Carriage Deceleration, g units on carriage	6
Maximum Catapult Force on Carriage, lb	2,200,000
Open Bay Size, ft	20 x 40
Maximum Vertical Velocity of Test Article, ft/sec	20
Maximum Vertical Load on Test Article at 220 knots, lb	65,000
Maximum Vertical Load on Test Article at <220 knots, lb	> 65,000
Data Acquisition:	
Channels of Data	64, expandable
Maximum Data Rate, samples/second	19,200
Productivity:	
Maximum Test Rate*, runs per day	6
Staff Required per Test, # people	6 Technicians + 1 Engineer

**Rainfall will terminate carriage testing because of adverse moisture effects on arresting gear tapes.*

While NASA has been unable to identify any future program requirements for ALDF's research capabilities, it is possible that other government agencies, industry, and academia may have been planning to have access to this unique laboratory to ensure the success of their own research endeavors. Moving ALDF to one of the official NASA inactive status classifications, defined in Table 2, would inherently affect any such plans. If your current or future research investigations would be negatively impacted by ALDF being designated as inactive, please respond to this inquiry, in writing, by April 30, 2008, to address the following points:

1. What is the title, sponsoring organization, performing organization, and nature of the research activity requiring access to ALDF?
2. What is the approximate dollar value of the research that would be compromised by not having access to ALDF?
3. If ALDF is placed in an inactive facility status, are there existing alternative methods or testing venues that could be used to conduct your research? If so, please describe.
4. If ALDF is placed in an inactive facility status, would your organization pursue replicating these capabilities in another test facility, either via new construction or upgrade of existing facilities? If so, please describe.
5. Would your organization be interested in establishing a funded agreement with NASA to keep ALDF operational for your research activities? If so, please describe.

Table 2: NPR 8800.15A Inactive Facility Status Definitions

Status	Definition
Stand-by	A facility that is temporarily not in use and appropriate maintenance measures have been taken to maintain its vital or essential operating systems in a state of readiness or availability for future use. Selective life cycle cost effective facilities maintenance and repair is required. Total time to deactivate and then to reactivate the facility, including the standby period, is expected to be less than 12 months.
Mothballed	A condition where a facility has been deactivated and appropriate maintenance measures have been taken to prevent deterioration of its vital or essential systems or placed in protective storage. Higher first year costs would be expected because of preparations for mothballing, but future annual costs should be significantly lower due to reduced maintenance and repair requirements. Total time to deactivate and then to reactivate the facility, including the mothballed period, is expected to exceed 12 months.
Abandoned	There are no plans for future reactivation. A condition in which a facility has been "walked away from" or ceasing to maintain any part of the property. Facility systems and collateral equipment should be considered for excess and/or identified for use at other NASA locations where feasible and cost-effective. Plans have been made to demolish or declare the facility excess at the earliest practical date.

Thank you in advance for your time. As a respected colleague, NASA values your input prior to making any permanent decisions about the future of the unique national research capabilities available at ALDF. I look forward to your response.

Sincerely,

Jill M. Marlowe
Head, Structural Dynamics Branch
Research and Technology Directorate

2008 Scoping Letter Distribution List

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National Aerospace Laboratory NLR Flight Testing & Safety Department	Gerard W.H. Van ES Senior Research Engineer 1006 BM Amsterdam, The Netherlands
	Scott Parrish 807 Padonia Road Cockeysville, MD 21030
Texas Transportation Institute	Richard Zimmer Texas A & M University System College Station, TX 77843-3155
US Army Cold Regions Research Engineering Laboratory	Barry Coutermarsh 72 Lyme Road Hanover, NH 03755
Pennsylvania Transportation Institute	Dr. Zoltan Rado 201 Transportation Research Building University Park, PA 16802
Federal Aviation Administration William J. Hughes Technical Center	Ryan King Airport Safety Technology R&D AAR-411 Bldg. 296 Atlantic City International Airport Atlantic City, NJ 08405
Michelin Aircraft Tire Corporation	Richard C. Scholtz Aircraft Tire R & D Design Engineer 515 Michelin Road Bldg. 56 Greenville, SC 29605
United States Air Force Landing Gear Test Facility 46 OG/OGM/OL-ACS	Martin Vogel Chief of Ops., Safety & Sustainment Branch 1981 Fifth Street, Bldg 31 Wright-Patterson AFB, OH 45433-7202
NASA Johnson Space Center	Carlisle C. Campbell, Jr. Mail Code ES5 Houston, TX 77058-3696
Boeing NASA Systems	Tom Hoffman Mail Code HZ1-10 502 Gemini Avenue Houston, TX 77058-3696
Group Airside Operations, BAA PLC	Mr. John B.K. Lim Airside Operations Standards Manager Gatwick Airport - London West Sussex RH6 0NP UK

Chemtek	Mr. David L. Rigsbee President/CEO 697 County Home Road Yanceyville, NC 27379
Lockheed Martin Aeronautics Company	Robert F. Hoskin 86 S. Cobb Drive, MZ: 0663 Marietta, GA 30063-0663

2011 Scoping Letter

National Aeronautics and Space Administration
Langley Research Center
MS 213
Hampton, VA 23681

August 11, 2011

TO: Distribution

FROM: 213/ LaRC NEPA Manager, Historic Preservation Officer, EMB, COD

SUBJECT: Compliance with the National Environmental Policy Act (NEPA)

The purpose of this letter is to solicit comments regarding a future proposed undertaking at NASA Langley Research Center (LaRC), located in Hampton, Virginia. After more than 50 years of operation, LaRC has determined that the Aircraft Landing Dynamics Facility (ALDF) no longer supports Agency mission requirements. In accordance with National Aeronautics and Space Administration (NASA) policies (14 CFR 1216.1 and 1216.3) and the requirements of NEPA (42 U.S.C. 4321 *et seq.*), NASA will be preparing an Environmental Assessment (EA) for the proposed demolition of the ALDF complex.

The proposed action would involve demolition of ten abandoned buildings and structures associated with the complex as well as the test track. The proposed demolition is intended to reduce the Center's infrastructure and allow LaRC to direct limited resources towards facilities that support NASA's overall mission, both currently and in the future. The proposed demolition would involve complete removal of the buildings and structures and the site would be returned to open green space. Demolition debris, such as metal, concrete, and other materials would be recycled to the maximum extent possible.

The ADLF complex is located in the northern section of NASA LaRC, fronting Wythe Creek Road prior to crossing into Poquoson. The ten structures include the compressor and control building, a calibration and shop building, the "L" vessel with air and water tanks, the concrete track and test surface, the arresting gear housing facilities, and an office building.

Location of Aircraft Landing Dynamics Facility

The ALDF is a unique research facility primarily designed to test aircraft landing gear systems on actual runways or semi-prepared surfaces at operational ground speeds, loading scenarios, and environmental conditions. The facility was instrumental in promoting the use of grooved pavement on runways and highways to minimize hydroplaning. Upgraded in 1985, the facility was also used to improve tires and landing gear components including those used for the X-15 and the Space Shuttle. In a joint effort with NASA Wallops Flight Facility and the FAA, the ALDF supported research to evaluate the effects of heavy rainfall on the aerodynamic performance of airfoils. Prior to making the decision to close the ALDF in 2008, NASA LaRC solicited feedback from other government agencies, industry, and academia regarding possible use of the facility for their own research endeavors. No parties were interested in establishing a funded agreement with NASA to keep ALDF operational for research activities.

The ALDF complex is eligible for the National Register of Historic Places both for its contributions to the Space Shuttle Program and as a contributing element to the NASA Langley Historic District. In accordance with Section 106 of the National Historic Preservation Act (NHPA), in order to mitigate the adverse effects of demolishing a historic property, NASA LaRC would comply with the Programmatic Agreement among NASA, the Virginia State Historic Preservation Office, and the Advisory Council on Historic Preservation for Management of Buildings, Infrastructure and Sites at NASA Langley Research Center. The Programmatic Agreement provides for mitigation measures associated with demolition of facilities. In the case of the ALDF, mitigation measures include documentation of the facility, large format photographs, possible salvage of the test sled, and supplementing publicly available information on LaRC's Cultural Resource Website: http://crgis.ndc.nasa.gov/historic/Langley_Research_Center.

In accordance with NEPA and NHPA requirements, NASA is eliciting comments regarding any environmental and cultural issues associated with the proposed demolition, including suggestions on possible salvage of artifacts or building components. All comments and suggestions must be received by September 15, 2011 in writing to:

NASA LaRC Environmental Management Branch
Attn: Ms. Mary Gainer
Mail Stop 213
Hampton, VA 23681-2199
Mary.e.gainer@nasa.gov
757-864-7762

Sincerely,

Mary E. Gainer
LaRC NEPA Manager
Historic Preservation Officer

2011 Scoping Letter Distribution List

National Institute of Aerospace	Robert Lindberg President 144 Research Drive Hampton, VA 23666
City of Hampton	Ms. Mary Bunting City Manager 22 Lincoln Street Hampton, VA 23669
City of Hampton	Mr. Bruce Sturk Director Federal Facility Support 22 Lincoln Street Hampton, VA 23669
Hampton Roads Planning District Commission	Dwight L. Farmer Executive Director 723 Woodlake Drive Chesapeake, VA 23320
City of Poquoson	Mr. J. Randall Wheeler City Manager 500 City Hall Ave. Poquoson, VA 23662
Virginia Air and Space Center	Mr. Todd C. Bridgford Executive Director 600 Settlers Landing Rd Hampton, VA 23669
Old Dominion University	Dr. John R. Broderick President Old Dominion University Norfolk, VA 23529
Old Dominion University	Dr. Oktay Baysal, Dean Frank Batten College of Engineering and Technology 102 Kaufman Hall Norfolk, VA 23529
Hampton History Museum	Ms. Bethany Austin 120 Old Hampton Lane Hampton, VA 23669
Hampton University	Dr. Morris H. Morgan, III Olin Engineering Building, Suite 117 168 Marshall Avenue Hampton, VA 23668

Langley Air Force Base	Adanna Davis Cultural Resource Manager 633d CES/CEAO 37 Sweeney Blvd Langley, AFB, VA 23665-2107
Langley Air Force Base	Dr. Paul Green
Virginia Aviation Museum	Mr. Michael Boehme, Director 5701 Huntsman Road Richmond, VA 23250
Hampton Roads Convention Center	Mr. Eric Nealy, Manager 1610 Coliseum Drive Hampton, VA 23666

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APPENDIX B

Description and Photographs of ALDF Complex Facilities Proposed for Demolition

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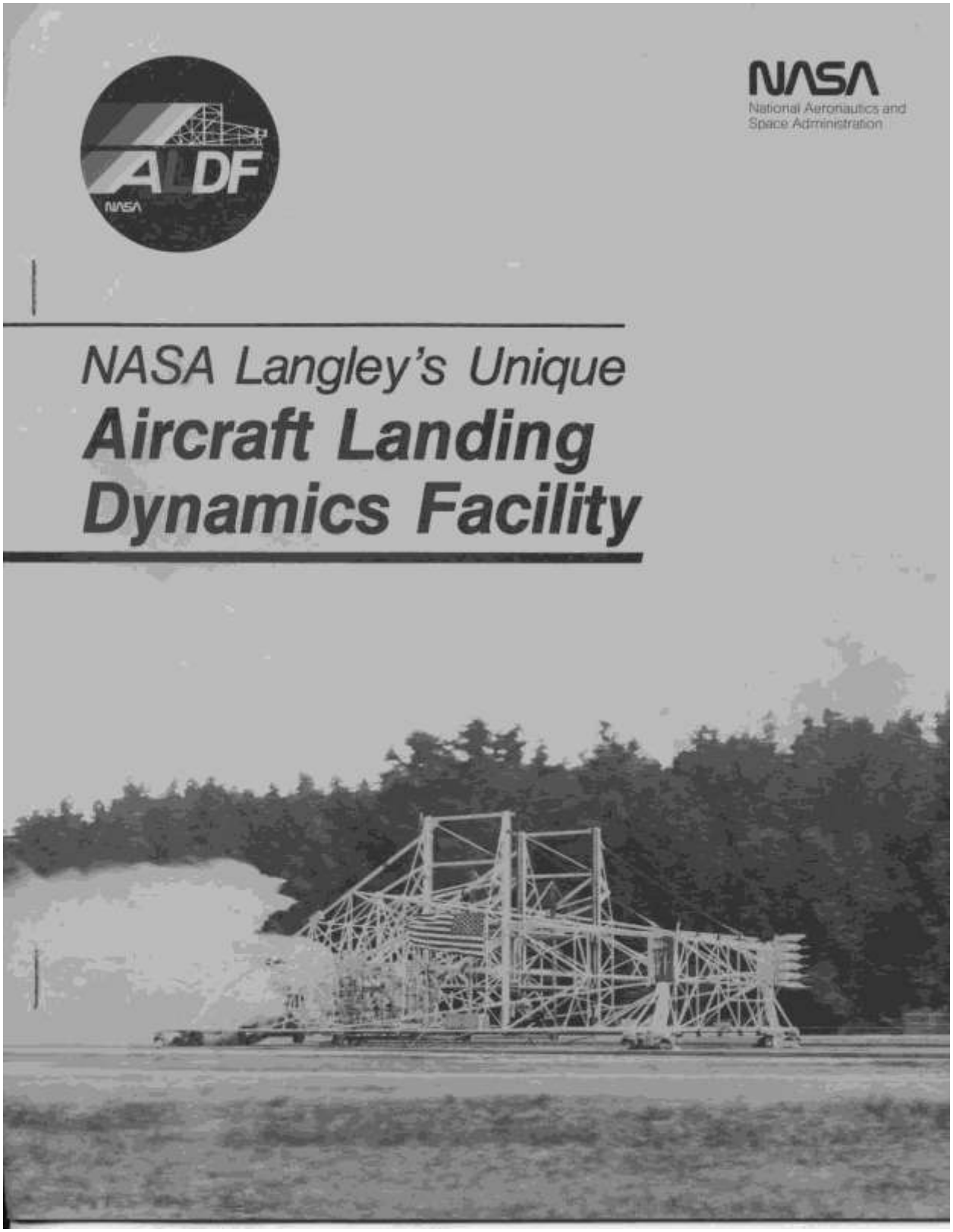

ALDF
NASA
NASA
National Aeronautics and
Space Administration
NASA Langley's Unique
Aircraft Landing
Dynamics Facility

NASA Langley's Unique Aircraft Landing Dynamics Facility

The Aircraft Landing Dynamics Facility (ALDF), formerly called the Landing Loads Track, is a unique national test facility for evaluating a variety of aircraft landing gear systems and components under closely controlled conditions. The facility originally became operational in 1956 and a three-year project to update and enhance its capabilities was completed in 1985. Testing at this facility has advantages over flight testing because of safety, economy, parameter control, and versatility. Essentially any conventional landing gear and some new, advanced concepts can be mounted on the test carriage for evaluation. The facility, pictured from the test carriage propulsion end in figure 1, consists of a concrete runway test surface with a pressurized water-jet propulsion system at one end and a cable arrestment system to slow the test carriage to a stop at the far end. A truss-structure carriage which carries the test article is propelled down the track on steel rails. The original facility had a maximum carriage speed and track length of 110 knots and 2200 ft, respectively. The recently completed upgrade project doubled the maximum carriage speed to 220 knots and extended the track length to 2800 ft. A new carriage was designed and constructed to accommodate large test articles and withstand high acceleration loads. The flexibility to continue using the old test carriage in addition to the new carriage was also provided for in the upgrade. This two carriage capability allows test preparations on one carriage to be underway while testing with the other carriage is in progress. A brief description of the three main components of this facility, namely, the propulsion system, the new test carriage, and the arrestment system is given in the following sections and the scope of research applications is indicated.

Propulsion System

The propulsion system used to propel the carriage down the track is shown in the foreground of figure 1. It consists of an L-shaped vessel that holds 26,000 gallons of water, three air storage tanks pressurized to 3150 psi, and a high-speed shutter valve which controls the water jet duration. The high pressure air is carried through a manifold up through the goose-necked pipe to the top of the L-vessel where the compressed air meets the water level in the vertical portion of the L-vessel. The 18 inch-diameter water jet nozzle opening is controlled by the special high-speed shutter valve mounted on the lower horizontal end of the L-vessel. A spherical valve body was chosen to contain the high pressure water with an inner shutter used to maintain a water tight seal between runs. The internal nozzle is centrally positioned within the 20 in. valve body opening and provides a smooth contour from the end of the L-vessel. During a typical catapult, the high-speed shutter valve opens in approximately 0.3 seconds and remains open for a preselected dwell time to obtain the desired speed. The shutter valve then closes in approximately 0.3 seconds. During a test run the water contained in the vertical leg of the L-vessel is displaced to the horizontal leg allowing flow continuity to be maintained. At a maximum pressure of 3150 psi, the 18 inch-diameter water jet produces a thrust of over 2 million pounds on the high-speed carriage creating a peak acceleration of 20 g's during the 400 feet of catapult stroke. Figure 2 shows the carriage and water jet during a maximum speed catapult run. Mounted downstream from the high-speed shutter valve is a flow straightener structure used to direct the water jet downward and into the carriage reaction bucket during valve opening. After the valve is fully open the jet shoots through the flow straightener without touching it. The new test carriage can

accelerate from zero velocity to 220 knots in 400 ft of track distance and in only 2 seconds.

New Test Carriage

The 54 ton carriage, shown in figure 3, is constructed of tubular steel members and overall dimensions are 70 ft long, 30 ft wide, and 30 ft high. At the back of the carriage is the water jet reaction bucket, 10 ft high and 8 ft wide. The water jet enters near the top of the bucket, turns through an angle of 170 degrees, and the momentum exchange involved in this process provides the carriage thrust. The drop fixture, which is located in the central open bay area of the carriage, is used to mount most test articles. The drop fixture is positioned between four vertical rails within the open bay, and two hydraulic lift cylinders are used to raise and lower the test article. Four additional hydraulic cylinders are used to apply required vertical loads on the test article. This central open bay, 40 ft long and 20 ft wide, permits testing of a wide variety of test article shapes and sizes. The hydraulic system on the near side of the carriage shown in figure 3 is used for positioning the drop carriage, applying loads, obtaining sink speeds up to 20 ft/sec, and for simulating effects of aircraft wing lift on tire loading. The outriggers located at each corner of the carriage are rollers that run under two hold-down rails at the propulsion end of the track. The hold-down rollers are designed to hold the carriage on the main rails during the catapult stroke when upward force vectors might cause the carriage to be lifted off the rails. At the front of the carriage is the nose block which has five V-grooves to capture the five arresting gear cables that bring the carriage to a stop at the end of the 1800 ft test section. Because of the high "g" loading on the

carriage during the initial catapult stroke, the test parameter measurements are recorded using a telemetry system. The data signals are routed through the instrumentation box shown in figure 3 and telemetered to the computer data room in the ALDF control building at the propulsion end of the track. Two 14-channel magnetic tape recorders and a computer with 26 megabytes of memory are used to record and analyze the data.

Arrestment System

The carriage arrestment system, shown in figure 4, is vital to the facility operation. Located 2200 ft down the track from the water jet nozzle, the system includes five arresting gear engines mounted in a concrete foundation on each side of the track. The sketch in figure 5 provides additional hardware details of this installation. The system is a water twister type where each engine contains a tub that holds a mixture of water and antifreeze. The tubs have stator vanes on the inside at both the bottom and top surfaces. Rotor vanes are attached to the rotating shaft that protrudes through the top of the tub. A spool on this tub shaft contains the nylon tape, 8 in. wide and approximately 3/8 in. thick, which is connected to a cable that stretches across the track and is coupled to a similar tape/engine arrangement on the other side (see figure 5). As the nose block pulls out the tapes, the rotor vanes churn the water in the tub and this churning action dissipates the kinetic energy of the carriage. This system is capable of stopping the carriage in 500 ft or less with only 3 of the arresting cables operational. The carriage is extricated from the cables following an arrestment by the combined action of a tug vehicle coupled to the front corner of the carriage and the arresting gear engines operating in the

tape/cable rewind mode. To permit overnight storage of the carriage in the calibration building at the far end of the facility, electric motor-driven elevators on the pendant support gantry towers (see figure 5) permit raising the tape/cables high enough to clear the test carriage.

Research Applications

The initial research program conducted using the upgraded ALDF involved measuring Shuttle Orbiter tire friction and wear performance on a simulated Kennedy Space Center runway surface under a variety of operational conditions. Future research will include evaluating frictional characteristics of radial and H-type aircraft tires for comparison with conventional bias ply tires. This program will be supported by the Federal Aviation Administration (FAA), U.S. Air Force, Society of Automotive Engineers, and the U.S. tire industry. Another planned study is a joint NASA/FAA runway surface traction program to study effects of different grooved and nongrooved runway pavements on aircraft tire braking and steering performance. With its upgraded capability, the ALDF is uniquely equipped to conduct research on present landing gear systems under realistic operational conditions and to explore and evaluate future aircraft landing system designs.

The authors, Pamela A. Davis and Thomas J. Yager, wish to express their appreciation for the excellent support and dedicated efforts of fellow members of the Aircraft Landing Dynamics Facility staff including:

Charles R. Booth	Howard H. Robinson
Vernie W. Boyd	Nelson L. Seabolt
Robert H. Daugherty	Donnie K. Shinn
Connie O. Featherston	Mark A. Spiers
Wayne S. Hollenbaugh	Sandy M. Stubbs
William E. Howell	John A. Tanner
Charles B. Karpa	William A. Vogler
Mercedes C. Lopez	Teresa L. Wallace
Sharon E. Perez	Willis H. Ward, Jr.
John R. McGehee	Granville L. Webb
Timothy A. McGinnis	William E. Wilkerson

If additional brochure copies or further information concerning the ALDF is needed, please contact Granville Webb, Facility Manager, at (804) 864-1303.

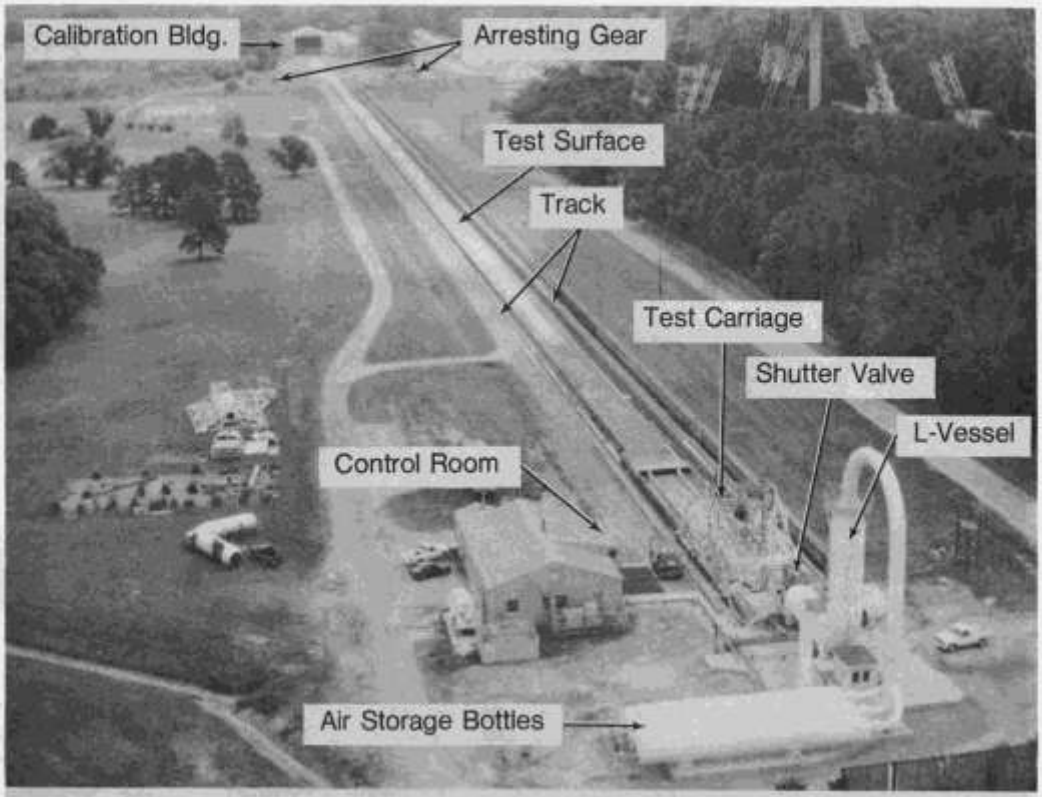


Figure 1.- Aircraft Landing Dynamics Facility.

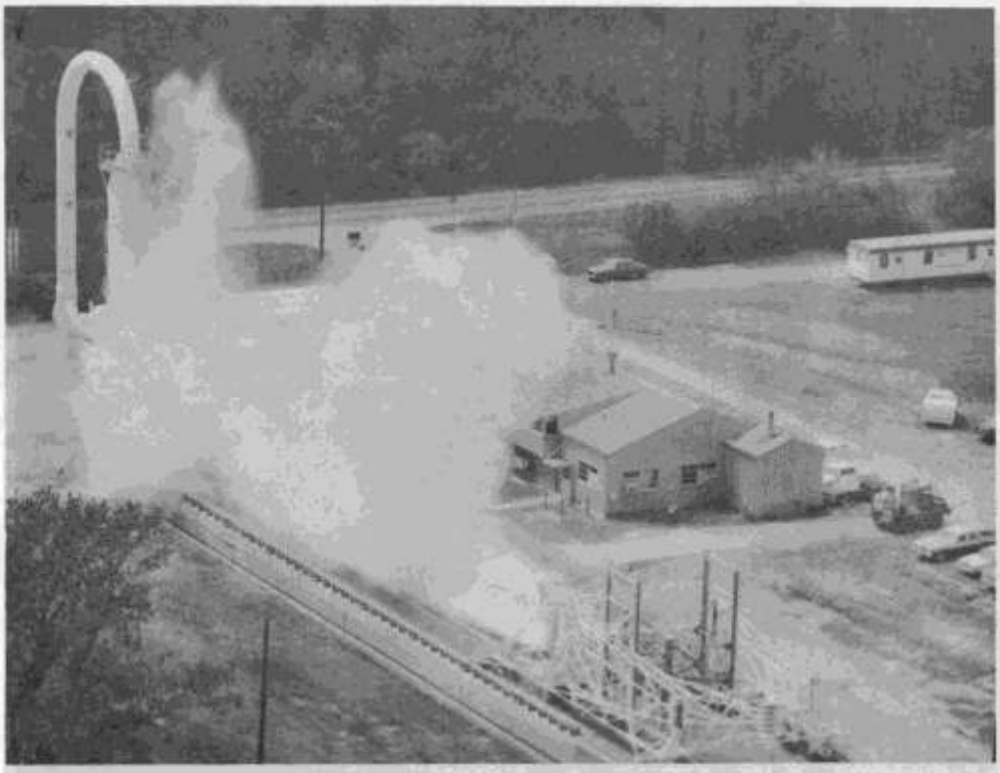


Figure 2.- Typical new test carriage catapult.

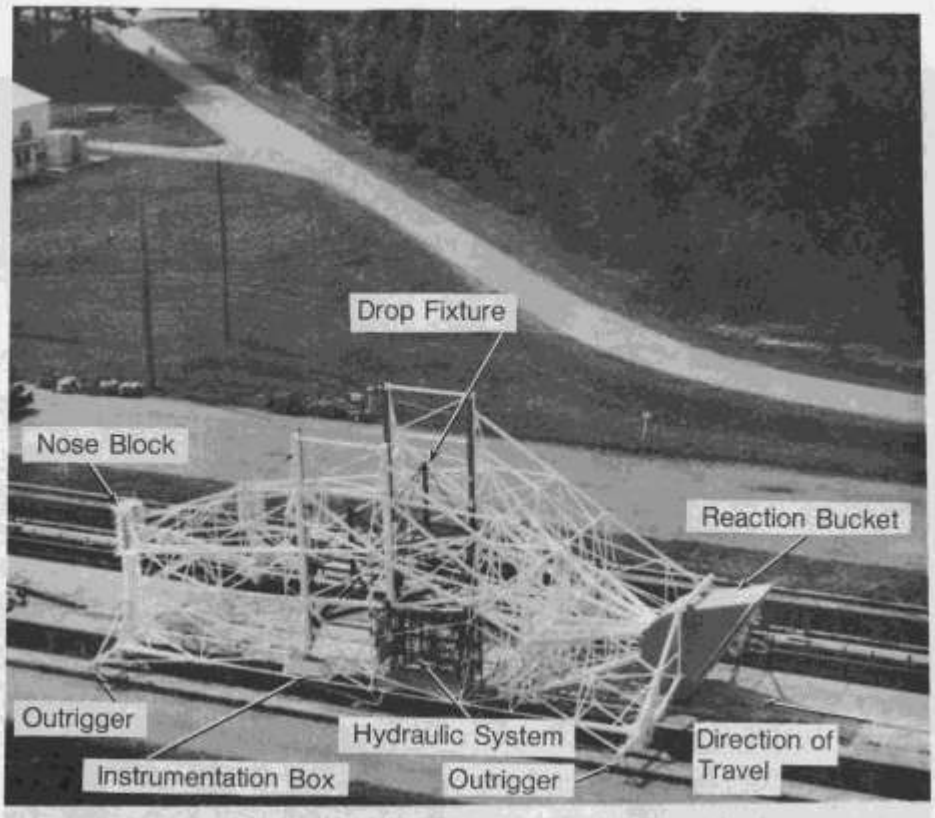


Figure 3.- New high speed test carriage.

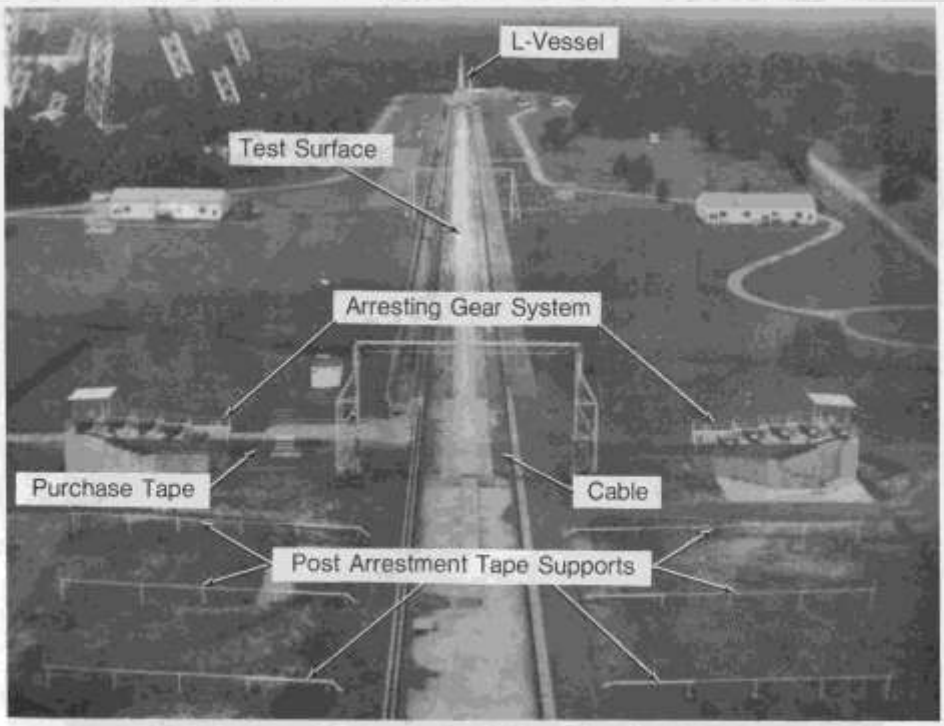


Figure 4.- Arresting gear end of ALDF track.

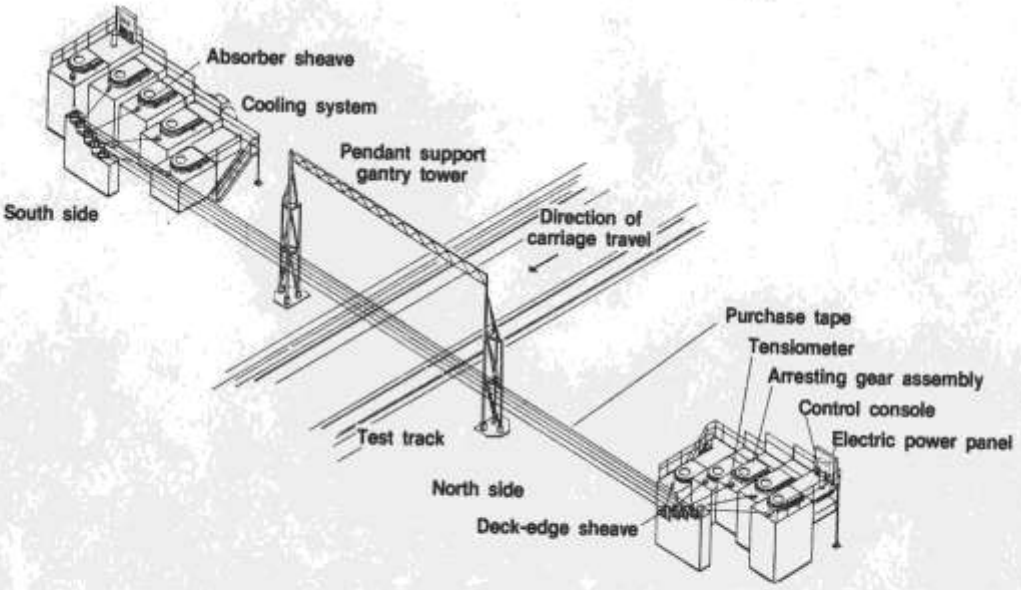
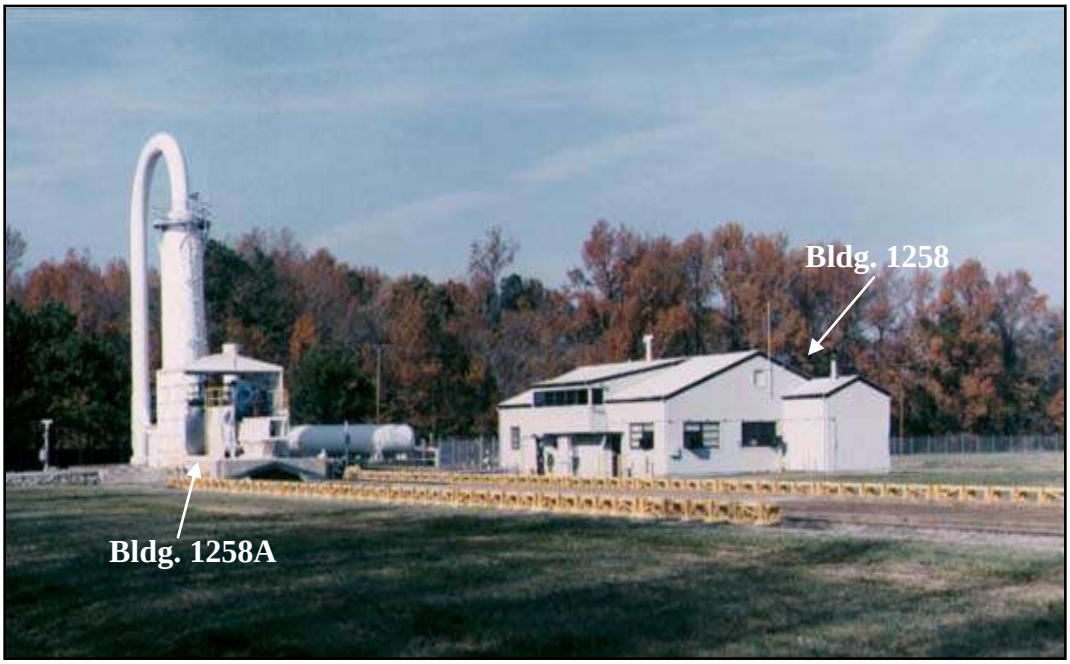
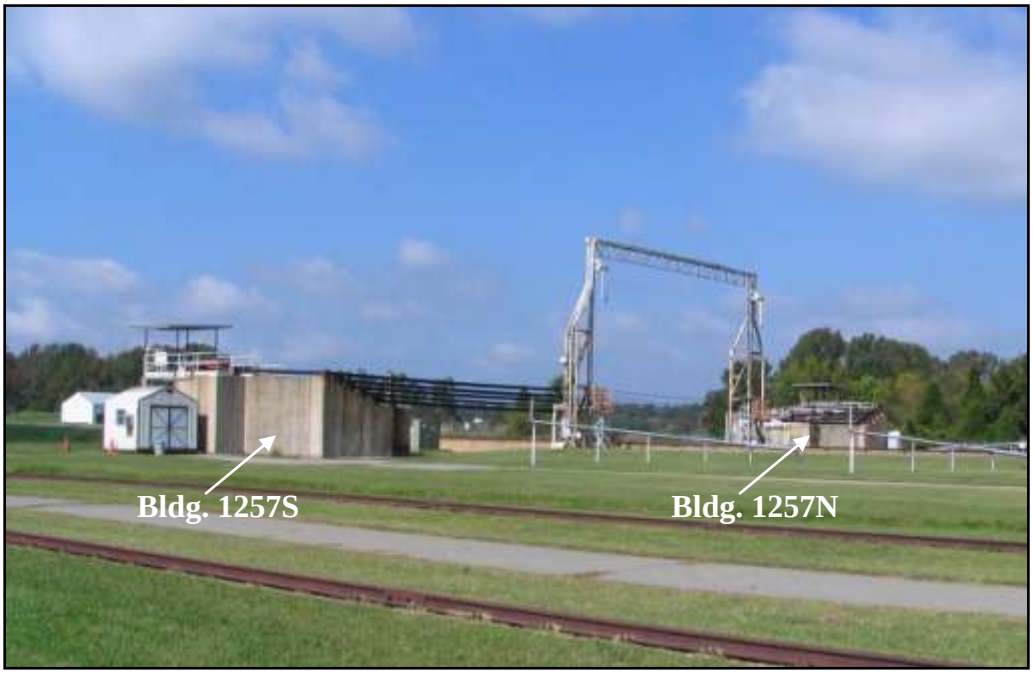


Figure 5.- Arresting gear system.

Building 1257 – Track



Building 1258 – Compressor and Control Building
Building 1258A – Jet Valve Building



Building 1257N – North Gear Arresting House
Building 1257S – South Gear Arresting House

Building 1261 – Traction Shop

Building 1259 – Shop and Storage Facility
Building 1260 – Shop and Storage Facility
Building 1261B – Carriage House Annex

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APPENDIX C

Consultation with the Virginia State Historic Preservation Office

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National Aeronautics and Space Administration
Langley Research Center
MS 213
Hampton, VA 23681

October 6, 2011

Amanda Lee
Virginia Department of Historic Resources
Office of Review and Compliance
2801 Kensington Avenue
Richmond, Virginia 23221

Subject: Demolition of the Aircraft Landing Dynamics Facility at NASA Langley Research Center, Hampton, Virginia

Dear Ms. Lee,

In accordance with the Programmatic Agreement (PA) among the National Aeronautics and Space Administration (NASA), the Virginia State Historic Preservation Office, and the Advisory Council on Historic Preservation for Management of Facilities, Infrastructure, and Sites at NASA Langley Research Center (LaRC), Hampton, Virginia, we are consulting with your office regarding the potential impacts to Site 44HT0001 and 44HT0074 resulting from the proposed demolition of the Aircraft Landing Dynamics Facility (ALDF) Complex at NASA LaRC.

The ALDF Complex is included in the inventory of highly technical and scientific facilities (Appendix I) of the PA, and as such, according to Section III.C, its removal does not require consultation with your office. However, since portions of the Complex are located on or adjacent to the Site 44HT0001 and 44HT0074, we are consulting with you in accordance with Section VI.A of the PA to address potential impacts to archaeological resources.

NASA LaRC is proposing to demolish the ALDF Complex, which includes 9 buildings and the test track. Two of the buildings (Buildings 1257N and 1259) and the test track (Building 1257) are located at the southern edge of Site 44HT0001, and Building 1260 is located adjacent to Site 44HT00074. The enclosed SHPO Project Review Application includes maps showing the Area of Potential Effect (APE) identified as well as the location of the proposed demolitions in relation to Site 44HT0001 and Site 44HT0074. The following provides information for Question 13 of the project review form.

Written Description:

a) *Description of the existing land use. Include photographs of the project area.*
Current land use is open grassy area with large testing facilities to include the adjacent Gantry (DHR # 114-140) and ALDF Complex buildings interspersed around cement test track.
An aerial photograph is attached.

b) *Description of any recent modifications to the landscape.*
N/A

c) *For projects involving the rehabilitation, alteration, or demolition of a structure over 50 years of age, a detailed description of the extent of the proposed alterations, along with photographs, architectural and engineering drawings, project specifications, and maps will be required.* N/A since ALDF Complex is in inventory of highly technical facilities (Appendix I of PA).

d) *Detailed project description that includes the precise location of all construction, destruction, and other proposed disturbance, the horizontal and vertical dimensions of all above and below ground construction, and the nature and extent of any previous disturbance within the APE.* The location of the demolitions is shown on the enclosed maps. Building 1259 is located approximately 100 feet and Building 1257N is located approximately 900 feet from any known archaeological feature at Site 44HT0001 (the remains of George Wythe home). Building 1260 is located approximately 50 feet from the boundaries of Site 44HT0074. The footprint for each of the three buildings is approximately 3,000 square feet with foundations averaging one to two feet in depth. The test track footprint is approximately 65,310 square feet with a depth approximately six feet below grade. Previous ground disturbance within the APE occurred during construction of the ALDF Complex in 1956 and during modification and expansion of the Complex in 1985. Demolition of the facilities would involve a "deconstruction" approach whereby demolition debris and building materials would be recycled to the maximum extent practicable. The demolitions would involve complete removal of the building foundations as well as the track to return the area to open green space.

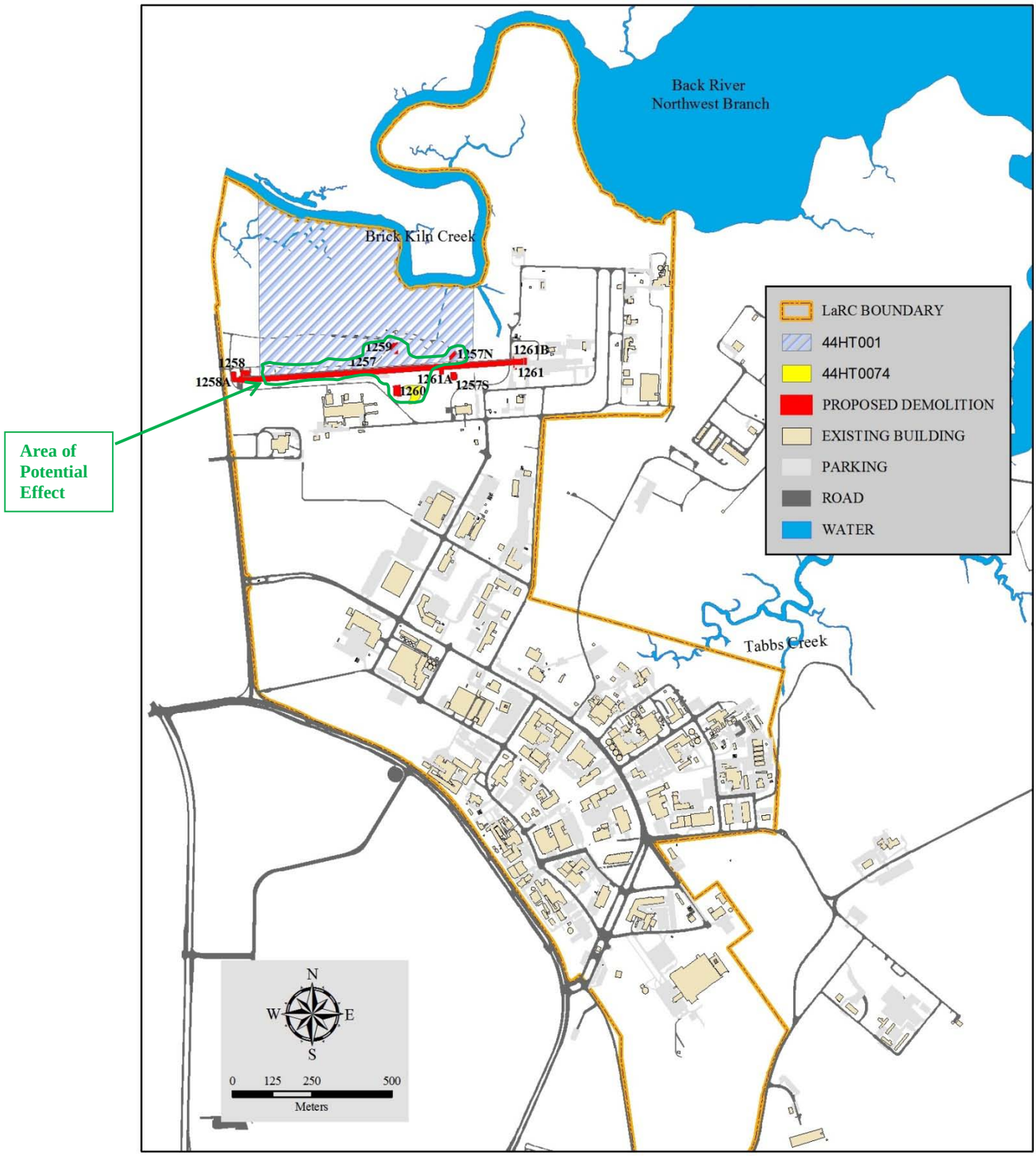
Determination of Effect

Site 44HT0001 is listed in the National Register of Historic Places (NRHP) and Site 44HT0074 is potentially eligible for the NRHP. In accordance with Stipulation VI.A of the PA, I have reviewed the plans and have determined that the proposed project would have no adverse effect on the properties. This determination was made based on the fact that the demolitions would involve ground disturbance activity similar to when the ALDF Complex was constructed. Demolition activities would be restricted to the footprint of the facilities and in areas that have experienced previous ground disturbance. As such, the discovery of intact archaeological resources would not be anticipated. If archaeological resources exist in these areas, they would be in highly disturbed secondary contexts. In the event that resources were uncovered during demolition, all earthmoving activity would immediately stop and NASA LaRC would notify your office. In addition, LaRC would implement the protective procedures included in Section 4.6 of the CRMP, "Unanticipated Discovery of Cultural Materials or Human Remains" as well as Section XIV of the PA.

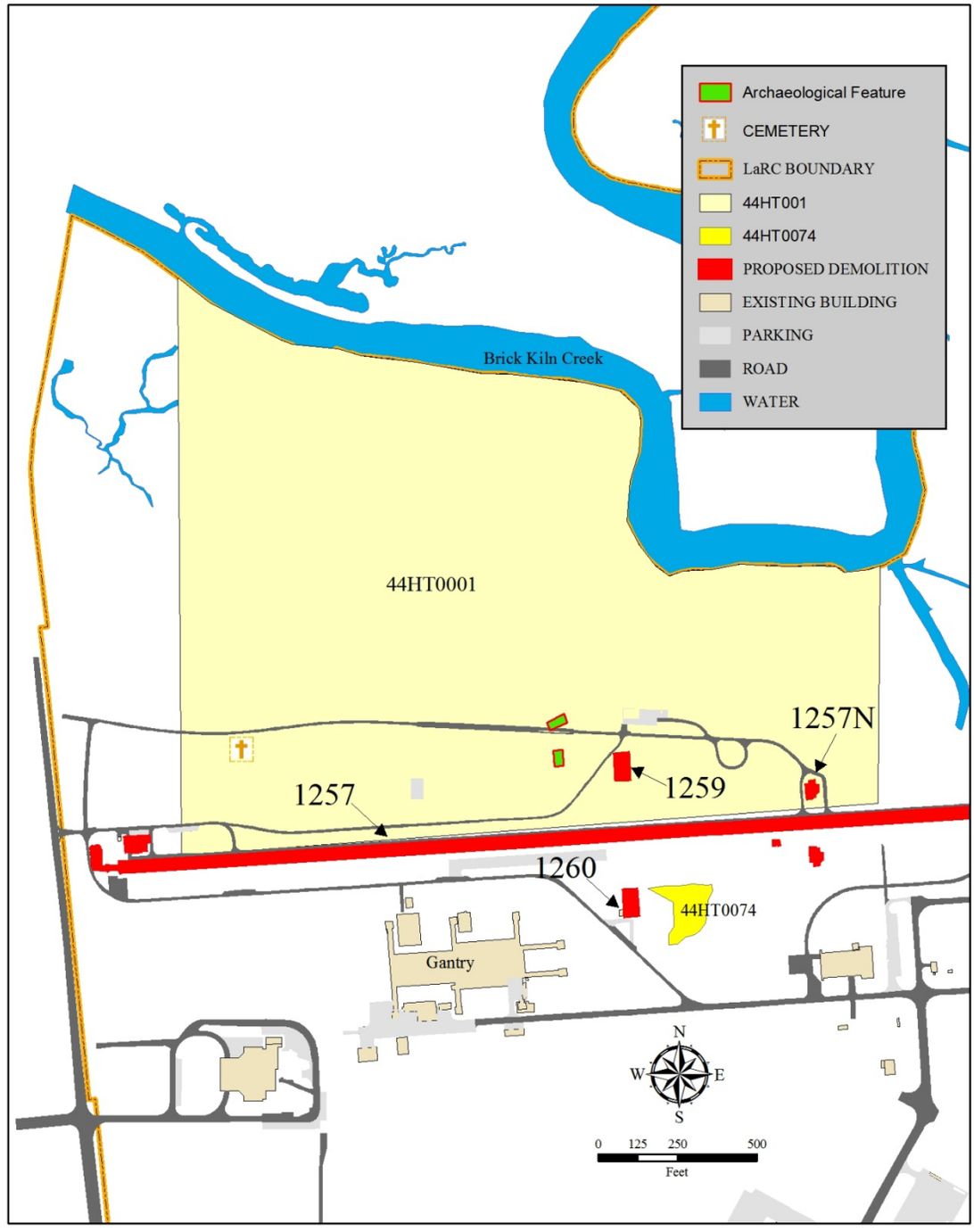
I am requesting your concurrence with my determination of no adverse effect. Please contact me at 757-864-7762 if you have any questions or need additional information. We look forward to hearing from you.

Mary Gainer
Cultural Resource Specialist
Historic Preservation Officer

Enclosure

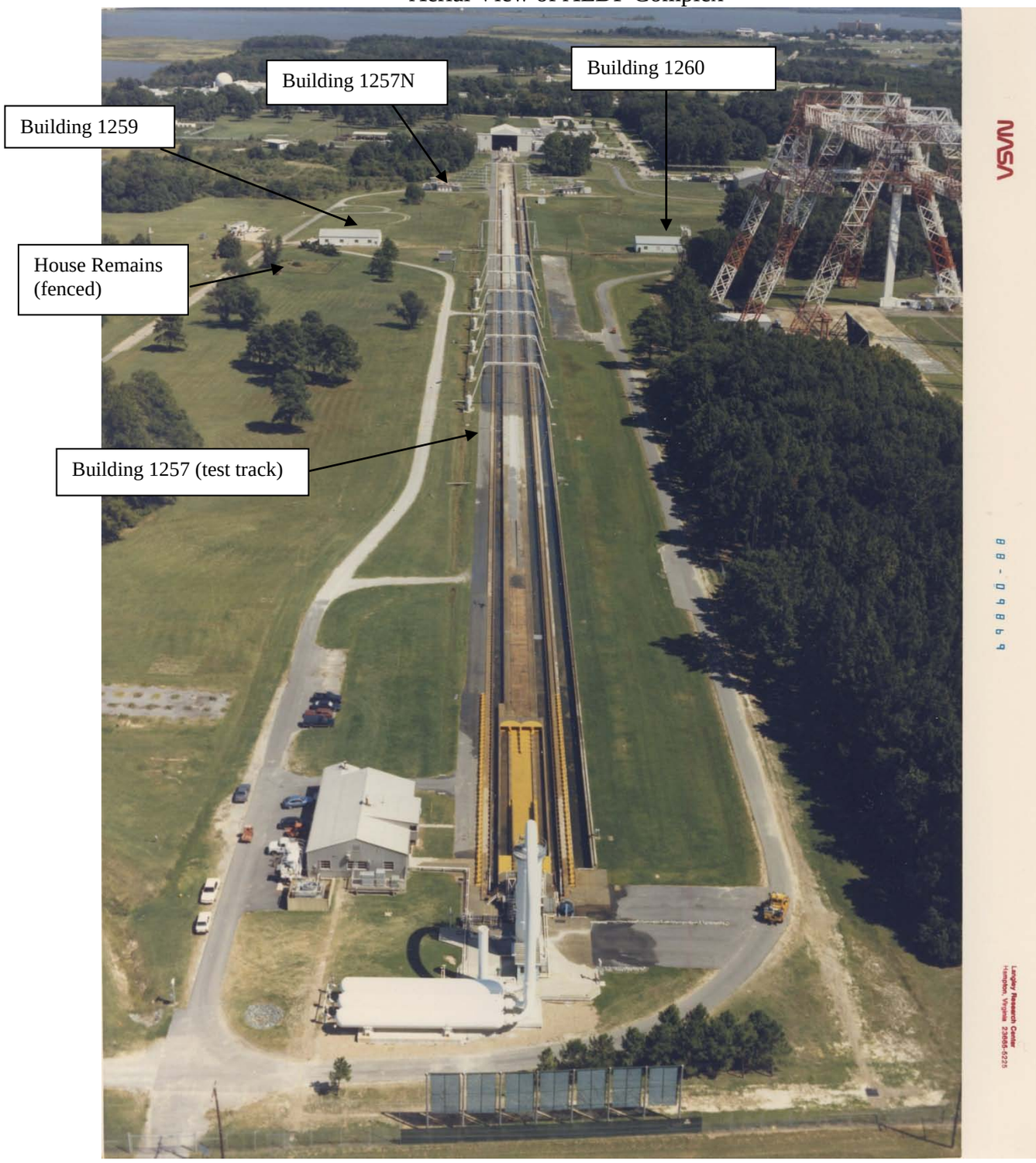


Area of Potential Effect



Location of Proposed Demolitions and Sites 44HT0001 and 44HT0074

Aerial View of ALDF Complex



Project Review Application Form

This application must be completed for all projects that will be federally funded, licensed, or permitted, or that are subject to state review. Please allow 30 days from receipt for the review of a project. All information must be completed before review of a project can begin and incomplete forms will be returned for completion.

I. GENERAL PROJECT INFORMATION

1. Has this project been previously reviewed by DHR? YES ___ NO X **DHR File #** _____

2. Project Name Demolition of the Aircraft Landing Dynamics Facility at NASA LaRC

3. Project Location Hampton

City Town County

4. Specify Federal and State agencies involved in project (providing funding, assistance, license or permit). Refer to the list of agencies and abbreviations in the instructions.

Lead Federal Agency NASA Langley Research Center

Other Federal Agency

State Agency

5. Lead Agency Contact Information

Contact Person Cheryl Allen

Mailing Address Mailstop 241

Phone Number 757-864-4438 **Fax Number**

Email Address Cheryl.l.allen@nasa.gov

6. Applicant Contact Information

Contact Person Mary Gainer

Mailing Address Mailstop 213

Phone Number 757-864-7762 **Fax Number**

Email Address Mary.e.gainer@nasa.gov

II. PROJECT LOCATION AND DESCRIPTION

7. USGS Quadrangle Name Newport News North

8. Number of acres included in the project 1.7

9. Have any architectural or archaeological surveys of the area been conducted? **YES__X_ NO___**

If yes, list author, title, and date of report here. Indicate if a copy is on file at DHR.
Phase I Survey of Proposed Construction Sites at NASA LaRC, Gray+Pape, 1995; An Archaeological Survey of Chestserville Plantation, DATA Investigations, LLC, 2011-on file

10. Are any structures 50 years old or older within or adjacent to the project area? **YES__X_ NO___**

If yes, give date(s) of construction and provide photographs.
N/A; included in Appendix I of Programmatic Agreement

11. Does the project involve the rehabilitation, alteration, removal, or demolition of any structure, building, designed site (e.g. park, cemetery), or district that is 50 years or older? If *yes*, this must be explained fully in the project description. **YES_X__ NO___**

12. Does the project involve any ground disturbance (e.g. excavating for footings, installing sewer or water lines or utilities, grading roads, etc.)? If *yes*, this must be explained fully in the project description. **YES_X__ NO___**

13. DESCRIPTION: Attach a complete description of the project. Refer to the instructions for the required information.

To the best of my knowledge, I have accurately described the proposed project and its likely impacts.

Mary Gainer _____ ____ 10/5/2011

Signature of Applicant/Agent Date

The following information must be attached to this form:

X Completed DHR Archives search
X USGS map with APE shown
X Complete project description
X Any required photographs and plans

____ No historic properties affected _____ No adverse effect
____ Additional information is needed in order to complete our review.
____ We have previously reviewed this project. A copy of our correspondence is attached.
Comments: _____
_____
_____
_____

Signature_____ Date _____

Phone number _____ DHR File # _____
This Space For Department Of Historic Resources Use Only

MAIL COMPLETED FORM AND ATTACHMENTS TO:
Virginia Department of Historic Resources
Attention: Project Review
2801 Kensington Avenue, Richmond, VA 23221
www.dhr.virginia.gov

COMMONWEALTH of VIRGINIA

Department of Historic Resources

Douglas W. Domenech
Secretary of Natural Resources

2801 Kensington Avenue, Richmond, Virginia 23221

Kathleen S. Kilpatrick
Director

Tel: (804) 367-2323
Fax: (804) 367-2391
TDD: (804) 367-2386
www.dhr.virginia.gov

November 10, 2011

Ms. Mary Gainer
Cultural Resource Specialist & Historic Preservation Officer
National Aeronautics and Space Administration (NASA)
Langley Research Center (LaRC)
Hampton, Virginia 23681-2199

Re: Demolition of the Aircraft Landing Dynamics Facility (ALDF) at NASA LaRC
City of Hampton
DHR File No. 2011-1654

Dear Ms. Gainer,

On October 7, 2011 the Virginia Department of Historic Resources (DHR) received information regarding the above referenced project for our review and comment pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended. We apologize for the delay in responding.

DHR understands that NASA LaRC proposes to demolish the ALDF Complex, which includes nine (9) buildings and two (2) test tracks. Two of the buildings (Buildings 1257N and 1259) and the test track (Building 1257) are located on the southern edge of Site 44HT0001, and Building 1260 is located adjacent to Site 44HT0074.

DHR concurs with your finding of no adverse effect to historic properties on the condition that NASA LaRC minimizes to all practicable extents impacts to areas beyond the footprints of the buildings and structures to be demolished and that staging should take place in previously disturbed areas.

Should you any questions, I may be reached via email at amanda.lee@dhr.virginia.gov.

Sincerely,

M. Amanda Lee, Historic Preservationist
Office of Review and Compliance

Administrative Services
10 Courthouse Ave.
Petersburg, VA 23803
Tel: (804) 862-6416
Fax: (804) 862-6196

Capital Region Office
2801 Kensington Office
Richmond, VA 23221
Tel: (804) 367-2323
Fax: (804) 367-2391

Tidewater Region Office
14415 Old Courthouse Way 2nd Floor
Newport News, VA 23608
Tel: (757) 886-2807
Fax: (757) 886-2808

Western Region Office
962 Kime Lane
Salem, VA 24153
Tel: (540) 387-5428
Fax: (540) 387-5446

Northern Region Office
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