REVITALIZATION OF THE NATIONAL AIR AND SPACE MUSEUM

DRAFT ENVIRONMENTAL ASSESSMENT

OFEO PROJECT NO. 1206101

QEA PROJECT NO. 31301800

March 2017

QUINN EVANS ARCHITECTS

Smithsonian Institution

National Capital Planning Commission

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EXECUTIVE SUMMARY

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The National Capital Planning Commission (NCPC), as lead responsible federal agency for compliance with the National Environmental Policy Act (NEPA), and the Smithsonian Institution (SI), as project owner, have prepared a Draft Environmental Assessment (EA) for the revitalization of the National Air and Space Museum National Mall building. Concurrently, SI and NCPC are conducting Section 106 consultation in accordance with the National Historic Preservation Act (NHPA 800.8).

The proposed project is subject to the review of NCPC under the National Capital Planning Act (40 USC § 8722 (b)(1) and (d)). The EA has been prepared in compliance with the National Environmental Policy Act of 1969 (NEPA), as amended (Title 42, US Code [USC], 4321-4347); the Council on Environmental Quality's Regulations for Implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508); the National Capital Planning Commission's (NCPC) implementing regulations (69 FR 41299) and the National Capital Planning Act. Concurrently, SI and NCPC have agreed that SI will be the lead federal agency in conducting consultation in accordance with Section 106 of the National Historic Preservation Act (NHPA36 CFR 800.2(a)(2)).

Purpose and Need for Action

The purpose of the project is to replace NASM's building exterior envelope (including the stone cladding, curtain walls, skylights and roof systems), heating, ventilation, and air conditioning (HVAC), plumbing, and fire protection systems. The project also addresses related work including revitalization of the landscape, portions of perimeter security, addition of vestibules at the north and south entrances (for security screening and improvement of visitor experience), and reductions to carbon emissions and energy consumption.

NASM's improvement project is needed to address specific deficiencies related to the building systems and envelope. Addressing these deficiencies is necessary to allow the museum to perform the mission for which it was created: to "commemorate the national development of aviation and spaceflight, and educate and inspire the nation."[1]

[1] Smithsonian Institution, "National Air and Space Museum Mission Statement," http://airandspace.si.edu/.

The HVAC, plumbing and fire protection systems are inadequate and at the end of their service lives. The Tennessee marble cladding is deteriorating and does not meet current requirements for energy performance and insulation. The skylights, curtain walls, and entrances do not provide the required interior environmental conditions necessary to protect the museum collections. Entrances do not provide adequate queuing space and do not meet security screening requirements. Finally, in order to meet requirements for reduced carbon emissions and energy consumption, a modernization project is necessary to correct the deficiencies identified above.

Overview of the Alternatives

This EA identifies three design concepts, or action alternatives, and a no action alternative, and assesses the potential effects of the proposed action on the environment. Alternative A, the No Action Alternative, provides a basis for comparing the design and environmental consequences of the other alternatives. Alternatives B, C and D include common approaches to address deficiencies and implement improvements. The action alternatives differ only in their approach to replacement of the exterior stone cladding of the building. The Smithsonian Institution has not selected a preferred alternative at this time, it is anticipated that a preferred alternative will be selected in Spring 2017.

Common to All Action Alternatives

Under Alternatives B, C, and D, the existing curtain wall would be replaced with a new aluminum-framed curtain wall system, designed to achieve project-specific performance criteria. The skylight system would be replaced with a new system that would meet blast resistance requirements, establish water, air, and thermal barrier continuity with the new exterior wall assembly, and limit the potential for condensation on the system components with the re-introduction of mechanically-controlled humidity in the museum. The proposed replacement skylight glazing would better protect the collection from harmful ultraviolet rays, in addition to being thermally adequate and blast resistant. Both the curtain wall and skylight glazing would increase visible light transmission. A replacement roofing system including vapor retarders would be installed to replace the aging system and support reintroduction of mechanically-controlled humidification, which is necessary to protect artifacts in the building. New vestibules would be added at the north and south entrances of the building to enhance the visitor entry experience and improve the security screening process. The vestibules would be designed to respond to the original design of the

building while serving the current needs for safety and comfort. Two design concepts are being considered for the vestibules. Both are similar in massing, scale, location, and function. A rooftop photovoltaic array system would be installed on the building's flat roof. The percentage of electricity contributions from the rooftop photovoltaics could be as high as 7% of the electricity load for the revitalized museum. The installation of the rooftop photovoltaic array would be designed to minimize visibility from the Mall. Implementation of a variety of strategies to improve energy efficiency would substantially reduce NASM's energy consumption, utility costs, and greenhouse gas emissions.

Also under Alternatives B, C, and D, revitalization of the landscape at NASM would be incorporated with the replacement of the plaza and planter waterproofing would include replacing plantings, paving, hardened planter walls, and ramps to improve views, access, security, structural conditions, and visitor experience. An unobstructed, continuous and paved pedestrian loop would be provided for visitor access and service utility vehicles. Wider areas would allow for site furnishing, interpretation, and vendor venues. Public art and signs would provide way-finding and information about the mission of the museum. The *Delta Solar* sculpture would be moved slightly from its original location and the grove of trees north of the *Delta Solar* would be maintained. The *Ad Astra* sculpture would be shifted slightly to the north, remaining centered on the building. The *Continuum* sculpture would be relocated to another location on the NASM site if the south vestibule canopy is constructed.

Cladding Alternatives

Alternative B would replace the existing Tennessee Pink marble (limestone) with new Tennessee Pink marble matching the existing pattern and color range as closely as possible with thicker stone. Under Alternative C, the existing Tennessee Pink marble (limestone) would be replaced with another natural stone that has a similar appearance to the original stone cladding. Alternative D would replace the existing Tennessee Pink marble (limestone) with a manufactured material. The manufactured material, ultra high performance concrete (UHPC), would be custom designed to meet all of the performance requirements, including having a color and mineral quality that matches the original stone cladding as closely as possible.

Comments on the EA

Government agencies and the public are encouraged to review and comment on the contents of this EA. The EA will be available for public review during the 30-day public comment period at the following locations:

Smithsonian Facilities
Capital Gallery West Building
Suite 5001, 600 Maryland Avenue SW
Washington, D.C. 20024

National Capital Planning Commission
401 9th Street NW, North Lobby, Suite 500
Washington, D.C. 20004

Southwest Neighborhood Library
900 Wesley Place SW
Washington, D.C. 20024

A digital copy of the EA can be obtained from the NCPC website:
https://www.ncpc.gov/project/airandspace

Written comments must be submitted during the official 30-day comment period, ending 1 May 2017.

Questions or comments on the EA should be sent to: National Capital Planning Commission
Attention: Vivian Lee
401 9th Street, NW, North Lobby, Suite 500
Washington, DC 20004
Phone: (202) 482-7200
Email: vivian.lee@ncpc.gov

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LIST OF ACRONYMS

ABA - *Architectural Barriers Act*

ADA - *Americans with Disabilities Act*

AIA - *American Institute of Architects*

AOEHR - *Assessment of Effects on Historic Resources*

APE - *Area of Potential Effects*

BIPV - *Building Integrated Photovoltaic*

CAA - *Clean Air Act of 1970*

CCAP-*Climate Change Adaptation Plan*

CFA - *U.S. Commission of Fine Arts*

CO - *Carbon Monoxide*

CO_2 - *Carbon Dioxide*

dB - *Decibel: metric of sound pressure*

dBA - *"A" weighted decibel*

DC GIS - *District of Columbia Geographic Information System*

DC SHPO - *District of Columbia State Historic Preservation Office*

DC OP - *Washington DC Office of Planning*

DC WASA - *District of Columbia Water and Sewer Authority*

DOEE - *District Department of Energy and Environment*

DDOT - *District Department of Transportation*

DDPW - *District Department of Public Works*

DHRC - *Dedicated Heat Recovery Chiller*

DOEE - *Department of Energy and Environment*

EA - *Environmental Assessment*

EISA - *Energy Independence and Security Act of 2007*

EO - *Executive Order*

EPA - *Environmental Protection Agency*

EUI - *Energy Use Intensity*

FAA - *Federal Aviation Administration*

FEMA - *Federal Emergency Management Agency*

FONSI - *Finding of No Significant Impact*

GHG - *Greenhouse Gasses (such as CO_2)*

GSA - *General Services Administration*

HABS - *Historic American Building Survey*

HAER - *Historic American Engineering Record*

HALS - *Historic American Landscape Survey*

HOK - *Hellmuth, Obata & Kassabaum Firm*

HVAC - *Heating, Ventilation, and Air Conditioning*

ICC - *International Code Council*

LEED - *Leadership in Energy and Environmental Design*

MOA - *Memorandum of Agreement*

MWAA - *Metropolitan Washington Airports Authority*

NAAQS–*National Ambient Air Quality Standards*

NASA - *National Aeronautics and Space Administration*

NASM - *National Air and Space Museum National Mall Building*

NCPC - *National Capital Planning Commission*

NEPA - *National Environmental Policy Act of 1969*

NFPA - *National Fire Protection Association*

NHPA - *National Historic Preservation Act*

NMB - *National Mall Building*

NO_2 - *Nitrogen dioxide*

NOAA - *National Oceanic and Atmospheric Administration*

NPDES - *National Pollutant Discharge Elimination System*

NRHP - *National Register of Historic Places*

NPS - *National Park Service*

O_3 - *Ground Level Ozone*

OCTO - *District of Columbia Office of the Chief Technology Officer*

Pb - *Lead*

PM - *Particulate Matter*

REC - *Renewable Energy Credit*

SI - *Smithsonian Institution*

SO_2 - *Sulfur dioxide*

UHI - *Urban Heat Island effects*

UHPC - *Ultra high performance concrete*

USACE - *US Army Corps of Engineers*

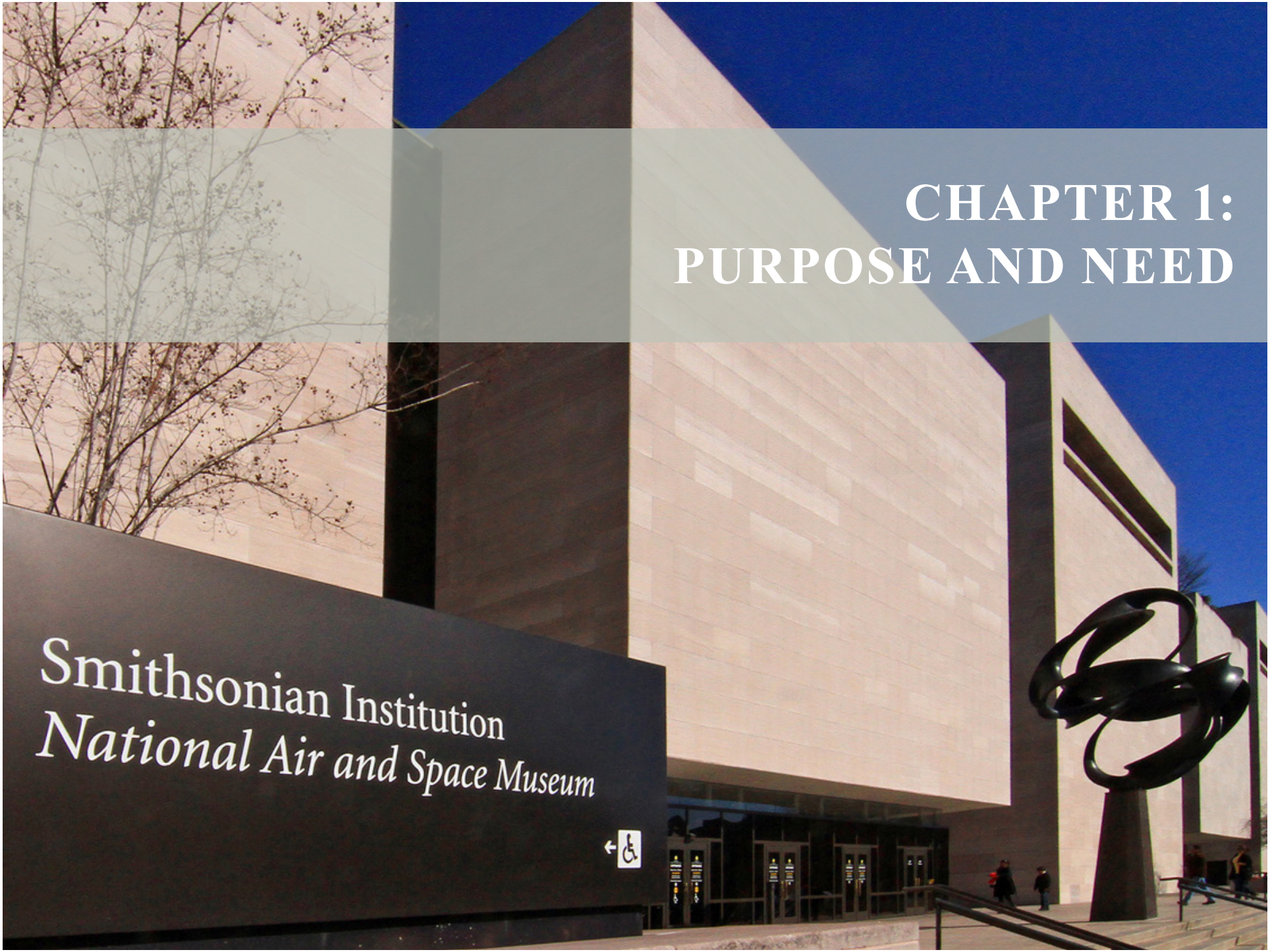
USGBC - *US Green Building Council*

USFWS - *US Fish and Wildlife Service*

UV - *Ultraviolet*

VLT - *Visible Light Transmittance*

CHAPTER 1: PURPOSE AND NEED



CHAPTER 1: PURPOSE AND NEED

Introduction

The Smithsonian Institution's (SI) National Air and Space Museum National Mall Building (NASM) is one of the top five most visited museum facilities in the world, attracting an average seven million people annually. The museum opened in 1976 for the Bicentennial and to "commemorate the national development of aviation and spaceflight, and educate and inspire the nation."[1] Within its 23 themed galleries, the 647,000 square foot museum houses some of the most iconic objects pertaining to the history and technology of aviation and space exploration. The collection includes the 1903 *Wright Flyer*, the *Spirit of St. Louis,* the Apollo 11 command module *Columbia,* and a lunar rock.

In 1965, Hellmuth Obata and Kassabaum Architects (HOK) was commissioned to design the museum and surrounding landscape. Lead Architect Gyo Obata aspired to design a building that was in harmony with the character of the National Mall and reflected the architectural elements of the surrounding buildings, while also pursuing modern architectural principles.[2] Obata's solution included four large marble-clad pavilions separated by three recessed steel-and-glass atria. Drawing inspiration from neighboring buildings, primarily the National Gallery, Obata reflected formal massing and materials in his design. The alternation of solids and voids were placed and proportioned to respond to corresponding projections and recesses of the West Building of the National Gallery of Art, which sat directly across the Mall. Equivalent volumes faced Independence Avenue, but the recessed glass-enclosed bays of the Mall façade were replaced by floating marble cubes, cantilevered to be flush with the south façade. The volumes were clad in Tennessee Pink marble, which is actually a limestone, the same stone used for the National Gallery of Art West Building, which opened in 1941, and the National Gallery of Art East Building, which opened on 1 June 1978.

[1] Smithsonian Institution, "National Air and Space Museum Mission Statement," http://airandspace.si.edu/.

[2] Gyo Obata, National Air and Space Design Concept, prepared by Hellmuth, Obata & Kassabaum, St. Louis Missouri, Smithsonian Institution Archives, Accession 06-225, Box 51, folder General Information.

The popularity of the museum brought more visitors than anticipated, creating increased impacts on certain building systems. The weathering of the building was also accelerated by the limited longevity of building components that were downgraded as part of the original construction in order to reduce cost and meet the schedule.

In 1970 it was determined that the SI's goals to open in 1976 for the Nation's Bicentennial celebration and meet the $41,900,000 budget approved by Congress, would not be met using GSA's traditional design and construction process. The application of three innovative management techniques facilitated accomplishment of these goals. The techniques included application of phased design and construction; use of a construction manager throughout design and construction; and limiting the decision making process to include only one GSA project manager. The phased process reduced the overall schedule by replacing formal review periods with "on board" reviews and initiating construction prior to completion of the complete design.[3] For example, excavation of the site, construction of the foundation, procurement of the marble slabs, and the erection of structural steel all took place while other aspects of the building continued to be designed (see Figure 1.1).[4] Other efforts to meet the schedule and budget included the use of 1-1/4 inch marble panels on a steel frame over a standard horizontal girt system, and the use of bronze tinted glass curtain walls with domed acrylic skylight units, in lieu of the original design of glass pyramid skylights.[5]

Repairs and replacements to the initial building systems began in 1978 with the replacement of the collapsible revolving doors due to concerns regarding emergency egress. Later renovations were necessary to address failure of the sealant applied to the joints between the limestone panels that led to moisture problems. A 1985 building envelope improvement project included isolating, flashing, and insulating the parapets, and adding flashing and insulation to the intersections of stone with skylights. Concrete pavers

[3] Smithsonian Institution and John Milner Associates, *Smithsonian National Air and Space Museum, Comprehensive Facilities Master Plan, Historic Building and Landscape Report* (August 2013) 46.

[4] Smithsonian Institution and Quinn Evans Architects, *National Air and Space Museum, Exterior Envelope Study, Volume 1* (30 June 2014).

[5] Smithsonian Institution and John Milner Associates, *Smithsonian National Air and Space Museum, Comprehensive Facilities Master Plan, Historic Building and Landscape Report* (August 2013) 61-62.

were replaced in 1986 because they were beginning to fail. The emergency egress doors were rehabilitated in 1988 to improve access and safety. This included replacement of the revolving entrance doors with paired bronze stile and glass egress doors.

In 1988, an addition to the building's east end was completed providing restaurant facilities for the museum. Designed by the original architect, Gyo Obata of HOK, the addition was designed to appear detached from the museum, with an enclosed walkway at ground level connecting the structures.

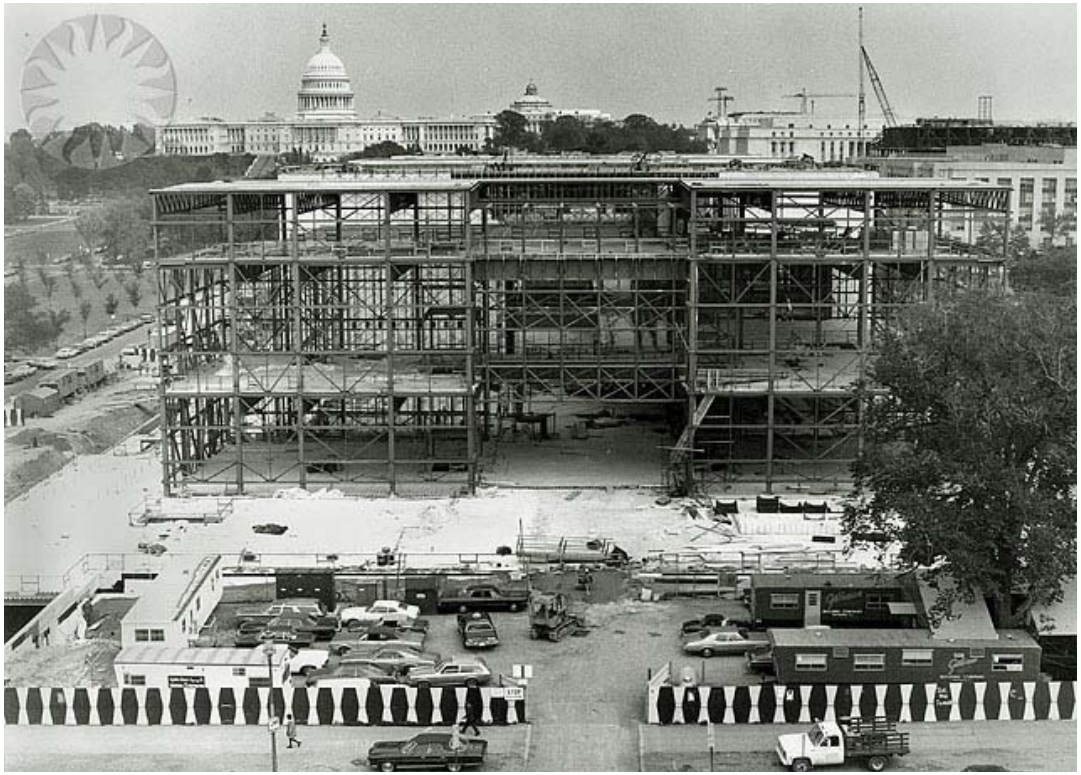


Figure 1. 1: NASM under construction. View looking East towards the Capitol building. (Source: Smithsonian Institution Archives.)

In 1990 the main roof and the third floor ballasted built-up roof were replaced. In 1991 alterations to improve accessibility included the addition of exterior ramps, modifications to handrails, and replacement of curb ramps.[6] A snow melt repair project, requiring replacement of concrete slabs at ramps, was completed in 1992. In 1995 limestone façade restoration included cleaning, repair and replacement of stone panels, enlargement of select joints, installation of plastic weep holes, and addition of new sealant assemblies. The acrylic skylights, which were introduced as a value engineering substitution for the glass enclosure originally proposed, were replaced with glass in 2001 as part of glazing replacement that included the curtain wall and the addition of the north and south vestibules. The acrylic skylights were showing effects of aging, as would be common for acrylic skylights after 30 years. The vestibules were added to improve visitor flow with greater accessibility while improving the climatic control of the interior spaces.

Perimeter security improvements resulted from a Mall-Wide Perimeter Security project in 2004. The existing perimeter security at the NASM consist of 30-inch high free-standing walls with breaks at the west terrace to allow access to the lawn area; hardened raised terrace planters; custom bollards and plinths at building entrances and site access locations; guard booths and retractable bollards. Following a terrace water infiltration study that was completed in 2006, recommendations for foundation wall, planter, and terrace flashing and waterproofing were implemented.[7]

Extensive analysis of envelope and heating, ventilation, and air conditioning (HVAC) has determined that the stone cladding system is failing, as well as the HVAC systems, which have reached the end of their usable life. Due to the integration of the exterior cladding with the mechanical air distribution system, it is necessary to undertake these upgrades together. Further analysis established that the waterproofing of the terraces and roof are similarly aging and beyond their projected life span.

[6] Ibid, 63.

[7] Ibid. 62.

Proposed Action

SI proposes to revitalize the National Air and Space Museum National Mall Building, addressing deficiencies in the building and improving visitor experience, artifact protection, and energy efficiency. The renewal of NASM presents an opportunity for SI to advance its leadership role in sustainable museum design. By leveraging the synergies between the building envelope and building systems, significant energy savings can be achieved in the process of implementing needed improvements to the building envelope.

Purpose and Need for Action

The purpose of the project is to replace NASM's building exterior envelope (including the stone cladding, curtain walls, skylights and roof systems), heating, ventilation, and air conditioning (HVAC), plumbing, and fire protection systems. The project also addresses related work including revitalization of the landscape, portions of perimeter security, addition of vestibules at the north and south entrances (for security screening and improvement of visitor experience), and reductions to carbon emissions and energy consumption.

NASM's improvement project is needed to address specific deficiencies related to the building systems and envelope. Addressing these deficiencies is necessary to allow the museum to perform the mission for which it was created: to "commemorate the national development of aviation and spaceflight, and educate and inspire the nation."[8]

The HVAC, plumbing and fire protection systems are inadequate and at the end of their service lives. The Tennessee marble cladding is deteriorating and does not meet current requirements for energy performance and insulation. The skylights, curtain walls, and entrances do not provide the required interior environmental conditions necessary to protect the museum collections. Entrances do not provide adequate queuing space and do not meet security screening requirements. Finally, in order to meet requirements for reduced carbon emissions and energy consumption, a modernization project is necessary to correct the deficiencies identified above.

[8] Smithsonian Institution, "National Air and Space Museum Mission Statement," http://airandspace.si.edu/.

Project Objectives

Project objectives include:

- Replacing the Tennessee marble cladding with a material that is compatible with the original design of the building, has an acceptable life-span, and meets requirements for energy performance and insulation.
- Replacing the HVAC, plumbing, and fire protection systems with systems that provide a safe and comfortable environment, protect museum collections, and reduce carbon emissions and energy consumption.
- Improving the skylights and curtain walls so that they will provide required performance for the new interior environmental conditions necessary to properly protect and preserve the museum's collections.
- Upgrading the building entrances to provide adequate queuing space, meet security screening requirements, and provide an adequate buffer between exterior and interior environments that results in acceptable fluctuations in temperature and humidity levels for the protection of museum collections.
- Considering renewable energy alternatives for the roof and south façade of the building to address federal requirements for reduced carbon emissions and reduced energy consumption for major modernization projects.
- Enhancing the visitor experience with greater accessibility and amenities.
- Improving the landscape terrace surrounding the building to address leaks into the lower level and to enhance visitor access.

Guiding Principles

A number of "Guiding Principles," have informed and shaped the development of alternatives for NASM including:

- Use durable components to endure 100-year service life for all building envelope components.
- Incorporate energy harvesting where appropriate.
- Achieve minimum LEED Gold® certification and reduce total building greenhouse gas emissions by a minimum of 32% (see Sustainability section).
- Comply with federal and local stormwater management requirements. Retain and reuse over 50% of stormwater on site in accordance with the District of Columbia Department of Energy and Environment (DOEE) requirements put forward in July 2013; and maintain or restore stormwater runoff to the maximum extent technically feasible in accordance with the Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the

Energy Independence and Security of 2007 (EISA).

- Incorporate a humidification system for the exhibit and archives storage spaces.
- Maintain as much of the building as is practical open during the course of the work.
- Protect the Museum's collections that remain in the building during construction. This includes maintaining a favorable environment for the objects.

Sustainability

At a minimum, due to the size of the project, Smithsonian would require the NASM renovation to obtain LEED Gold® certification. In addition, SI's Strategic Sustainability Performance Plan established the goal of achieving a minimum reduction of 32% greenhouse gas emissions compared to 2008 by 2020. In addition to these benchmarks, it is useful to look at the project in the light of the American Institute of Architects (AIA) 2030 Challenge which establishes 2030 as a target to achieve net zero energy use. Using this benchmark, the objective is to reduce energy use intensity (EUI) by 80% as compared to the average EUI of comparable buildings.

The National Capital Planning Commission (NCPC), as the lead responsible federal agency, has a responsibility to meet the goals of Executive Orders (EO) relating to the environment, energy use, and flood risk, including: EO 13693-Planning for Federal Sustainability in the Next Decade; EO 11988 – Flood Plain Management, as amended by EO 13690-Establishing a Federal Flood Risk Management Standard; EO 13653-Preparing the United States for the Impacts of Climate Change; EO 13514-C02 Emissions; and Presidential Memo-Creating a Federal Strategy to Promote the Health of Honey Bees and other Pollinators, and takes them into account in its actions. The Smithsonian, a trust instrumentality of the United States, manages its buildings and operations consistent with these requirements to the extent which is practical.

Regulatory Framework

Typical International Code Council (ICC) and National Fire Protection Association (NFPA) codes, as well as the Americans with Disabilities Act (ADA) and a number of other regulatory requirements will apply to this project. The DOEE issued storm water requirements in July 2013 that apply to the project. These regulations require over 50% of stormwater to be retained and reused on site. In addition, the project is subject to federal stormwater management regulations under the Energy Independence and Security Act of 2007 (EISA). The project will also be subject to review by the National Capital Planning Commission (NCPC), the U.S. Commission of Fine Arts (CFA), and the District of Columbia Historic Preservation Office (DC SHPO).

Project Components

Building Envelope

The building enclosure of NASM includes Tennessee Pink Marble (technically limestone) cladding, curtain walls, skylights, built-up roofing, terrace paving (garage roof) and foundation waterproofing. Investigation of the building enclosure components demonstrated that the stone panels are failing (allowing water and air infiltration), and that other building enclosure components, such as the roofing and plaza waterproofing, are beginning to fail and are reaching the end of their useful service life.

Revitalization of NASM would involve significant improvements to the building envelope requiring modifications to all of the building envelope components, including the exterior wall assembly, cladding, curtain walls, skylights, and roof. It would also include addition of new photovoltaic arrays on the main roof, and a demonstrative installation of thin film photovoltaic panels on the south vestibule canopy.

Currently, the sole weather barrier for the building is the existing stone cladding with spray foam insulation applied to the back face. The project improvements would provide a rain screen cladding system with a thermally isolated frame, a dedicated drainage cavity, insulation panels of increased thermal resistance, and a continuous water, air, thermal, and vapor barrier. This would reduce building energy use, provide appropriate system durability and service life, and establish NASM as a model for sustainable design.

Major Building Systems

Revitalization of NASM would include replacement or improvement of major building systems including mechanical, electrical, plumbing, fire protection, life safety, information technology, security, blast protection, and structural.

Site / Landscape

Revitalization of the NASM terrace and landscape would include the replacement of the terrace waterproofing, paving, planter wall cladding, perimeter security and planting to address extensively damaged materials, improvement of site accessibility and entrances, and enhanced stormwater management.

Project Area

NASM is located on the south side of the National Mall in Washington, D.C. (see Figure 1.2). The building is adjacent to the Hirshhorn Museum and Sculpture Garden (west), National Museum of the American Indian (east), the Wilbur Wright Federal Office Building, headquarters of Federal Aviation Administration (south), and the future Eisenhower Memorial site. NASM is on an axis with the National Gallery of Art West Building, located across the National Mall to the north.

The project area includes the National Mall Building and surrounding terraces (see Figure 1.3). The project boundaries are Jefferson Drive SW on the north, 4th Street SW on the east, Independence Avenue SW on the south and 7th Street SW on the west.

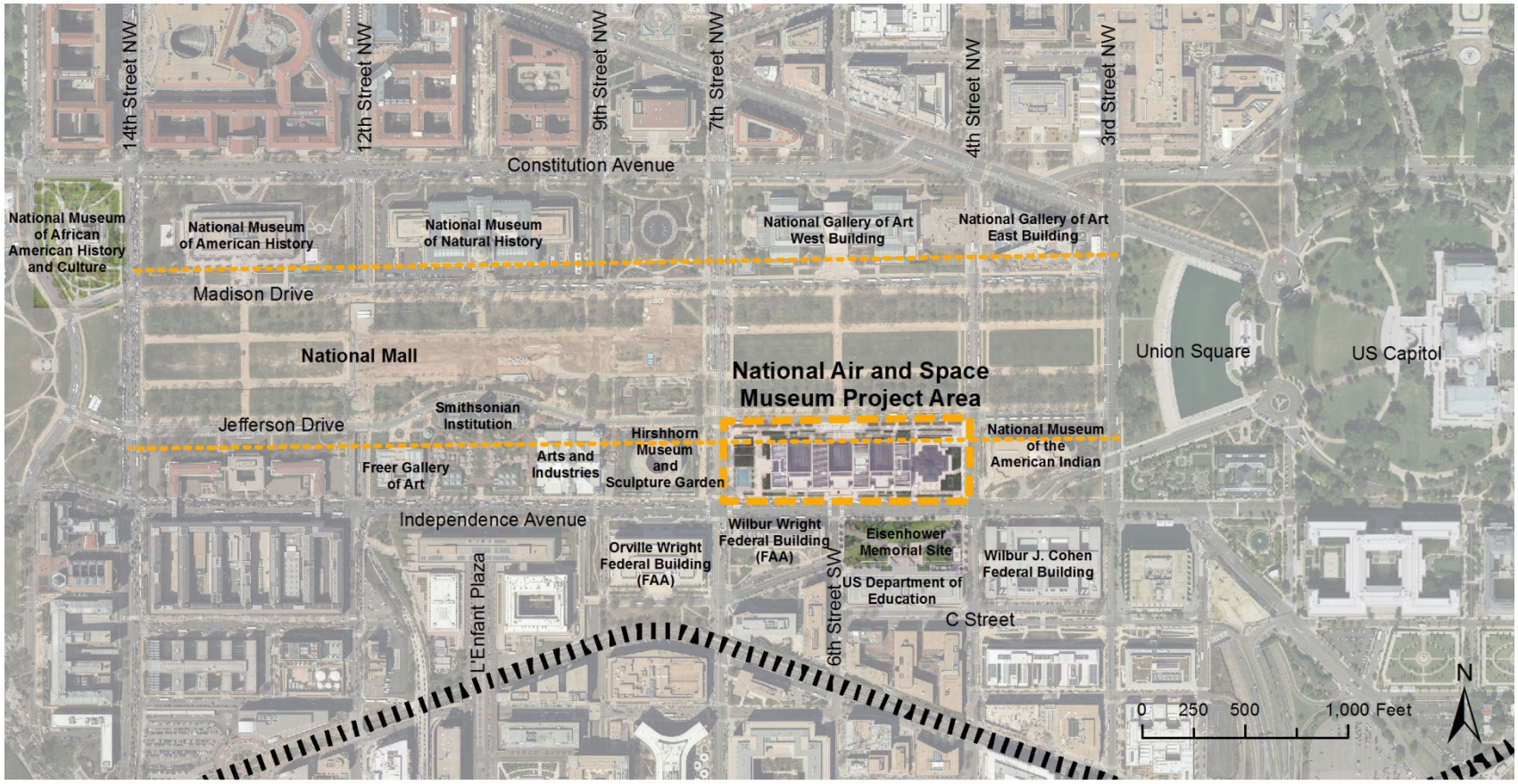


Figure 1. 2: Location of the National Air and Space Museum National Mall Building. (Source: ESRI and QEA.)

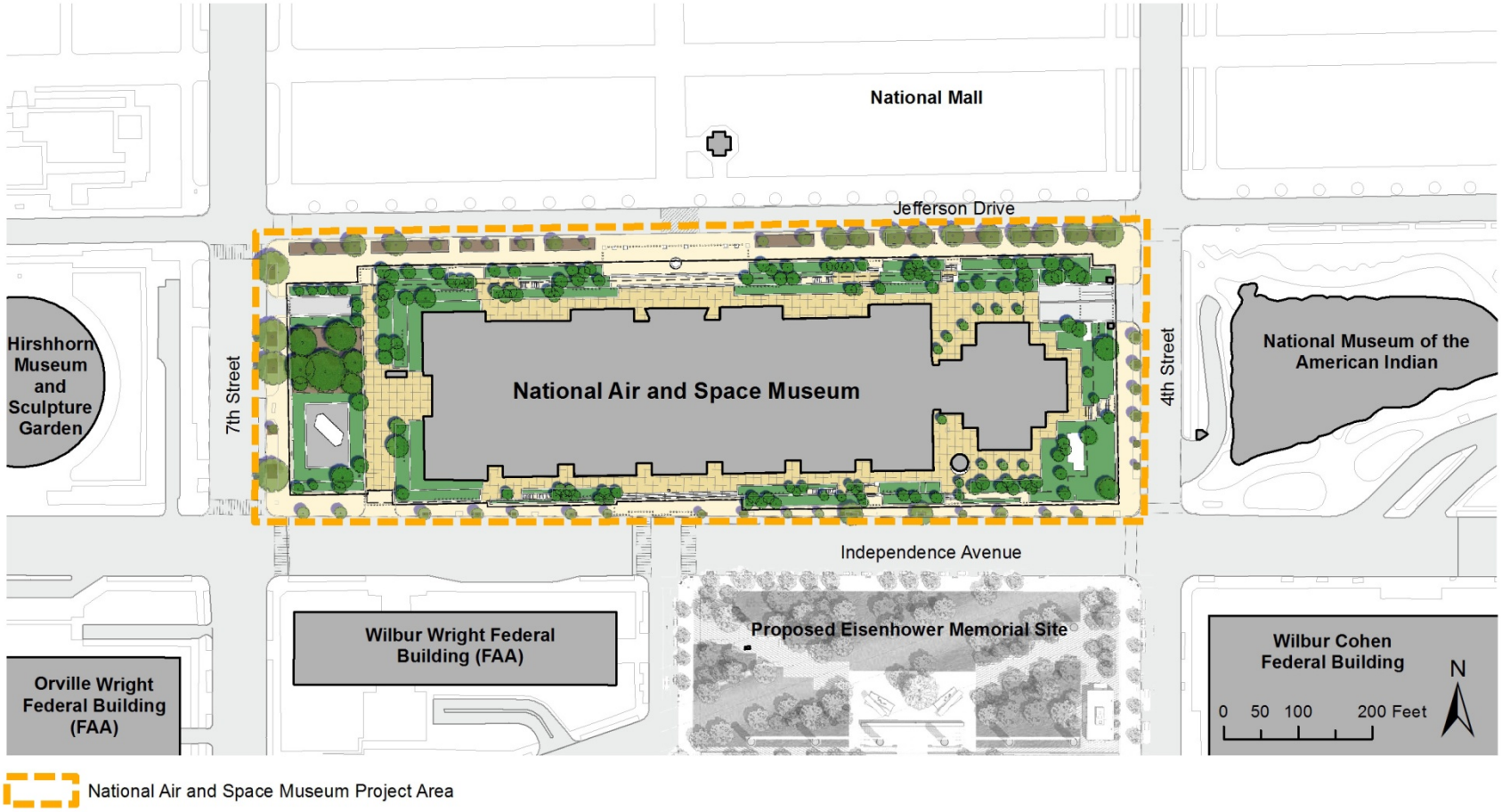


Figure 1. 3: The project area includes the entire block defined by Jefferson Drive SW, 4th Street SW, Independence Avenue SW, and 7th Street SW. (Source: ESRI, DC Planning, AECOM, and QEA.)

Historic Significance of the National Mall

The National Mall was listed on the National Register of Historic Places in 1966 as an historic site. The original nomination was accepted by the Keeper of the National Register in 1981. A revision was accepted by the Keeper on 29 November 2016. The 2016 nomination for the National Mall Historic District "…redefines the National Mall as a historic district with extended boundaries, reevaluates the historic context of the National Mall, and reassesses the significance of its resources."[9] The nomination also evaluates resources not included in the previous documentation. A total of 110 contributing resources are identified, including 17 contributing and 20 noncontributing buildings, 24 contributing and 7 noncontributing sites, 38 contributing and 6 noncontributing structures, and 31 contributing and 2 noncontributing objects. NASM is identified as a contributing building. Other contributing buildings visually associated with NASM include the National Museum of the American Indian, the Hirshhorn Museum and Sculpture Garden, and the National Gallery of Art West Building (see Figure 1.4). The food service building located on the Mall across Jefferson Drive from the entrance of NASM is a noncontributing building. Contributing structures associated with NASM include 7th Street, SW, 4th Street SW, and Jefferson Street. The National Mall (Reservations Nos. 3-6A) is enumerated as a contributing site. Reservations 4 and 5 are directly associated with NASM.[10]

The project area lies within the monumental core of the capital planned by Pierre L'Enfant in the late eighteenth century (see Figure 1.5). L'Enfant's Plan for the City of Washington was listed on the National Register in 1997. The National Park Service (NPS) is currently preparing a National Historic Landmark nomination for the 1791 L'Enfant Plan. The nomination also recognizes components of the 1902 McMillan Plan (The Report of the Senate Park Commission) that contribute to the plan of the historic city of Washington, D.C. The nomination identifies historic streets, reservations and appropriations, and historic vistas.

[9] U.S. Department of the Interior, National Park Service, National Register of Historic Places Nomination Form, "National Mall Historic District (revised nomination)," November 29, 2016 (updated), 4.

[10] Ibid. 2-80.

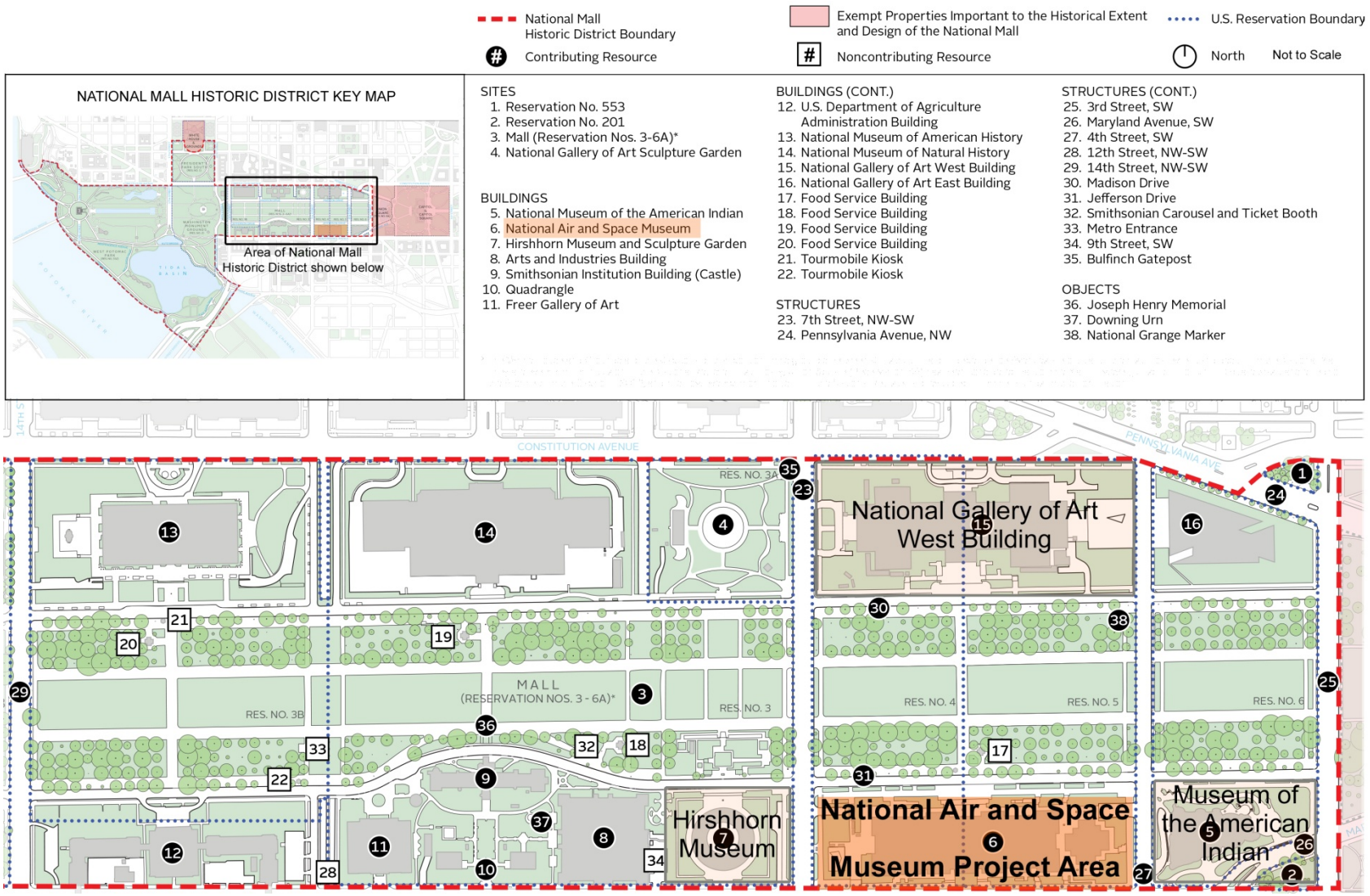


Figure 1. 4: The project area lies near contributing resources to the National Mall Historic District (Source: NRHP, Map 2, 2016; and QEA.)

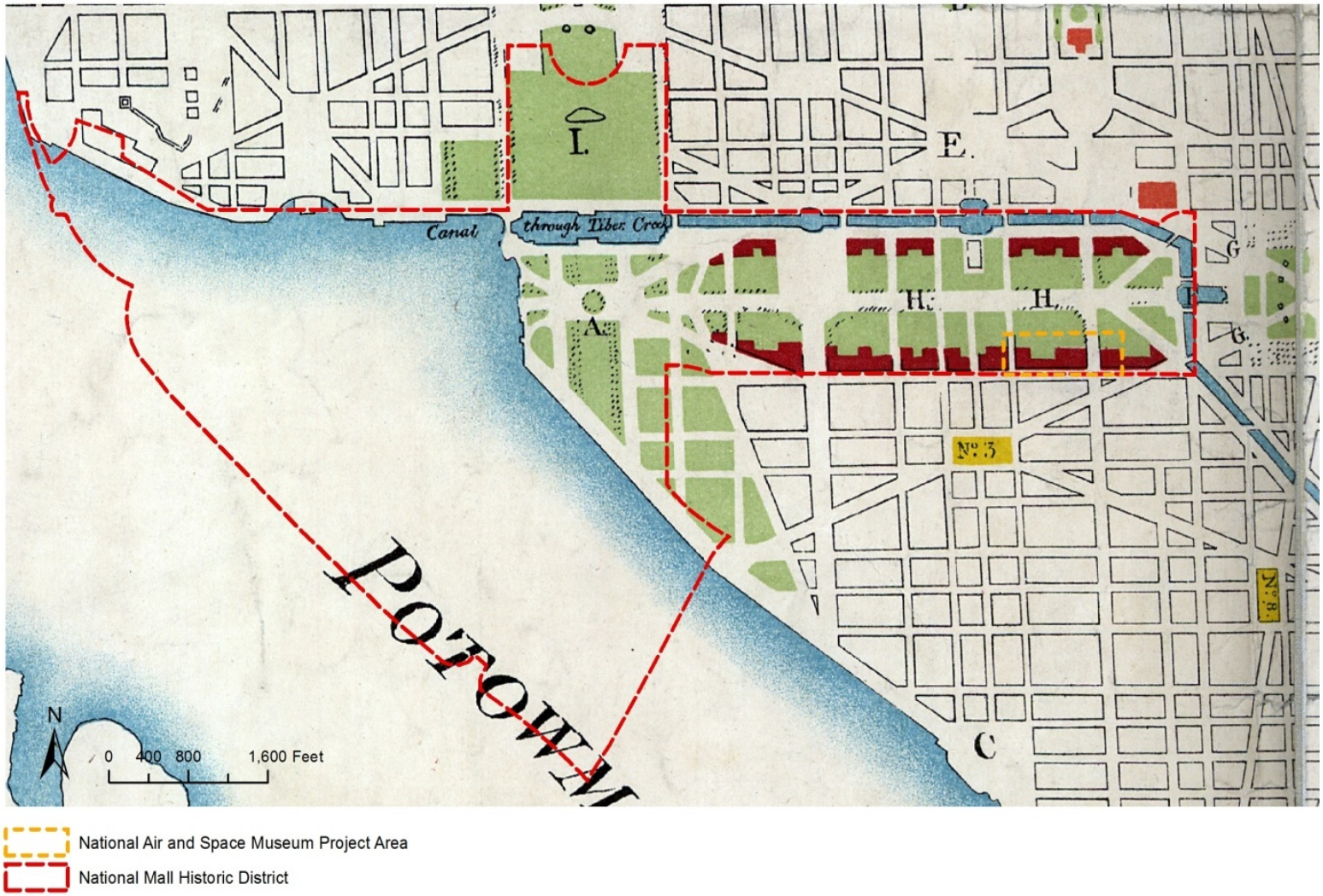


Figure 1. 5: The project area forms part of the built area intended to frame the National Mall in Pierre C. L'Enfant's 1791 Plan of the City of Washington (Source: Coast and Geodetic Survey, L'Enfant Plan, reproduction, 1887, LOC; and QEA.)

Historic Significance of the National Air and Space Museum

NASM became an important beacon of cultural and technological innovation in Washington, D.C. when it was added to the edge of the National Mall in 1976. With the largest collection of historic aircraft and spacecraft in the world, the design of this museum offered both unique architectural opportunities and complex challenges. Smithsonian is currently preparing a Determination of Eligibility to establish the building's eligibility for individual listing in the National Register of Historic Places. It is expected that the DOE will be finalized in Fall 2017.

Significant Characteristics

Significant characteristics of the NASM building have been identified including:

- **Siting of the Building:** Position in the Monumental Core defined by 4th to 7th Streets and Independence Avenue to Jefferson Drive. Alignment of the plan and entrances with the National Gallery West Building; axial views; symmetrical original plan; and ceremonial North Entrance.
- **Building Massing:** Defined rhythm of solid and void volumes with differentiated patterns on the north and south elevations; visual connection through solar gray glazing from interior to exterior; restaurant pavilion subservient in scale to the main building mass.
- **Detailing of Volumes:** Defined solids interspersed with glazed walls allows the smooth transition of volumes of stone to the interior; penetrations at upper volumes allow for sheltered balconies or open terraces behind parapet walls; smooth visual on roof with depressed HVAC. Crisp, clean, and simple lines to the building.
- **Articulation of Cladding Material:** Variegated effect of natural stone in 2.5 x 5 foot panels; soft rose color of sedimentary limestone (Tennessee Pink marble) with horizontal banding enlivens the façade and responds well to sun and cloud reflectivity. Cladding material is consistent with the National Gallery of Art (East and West Wings). Solar gray glazing curtain walls and skylights replaced in the 1990s are darker than historic solar gray glazing.
- **Vegetation:** Cascading planters as a plinth for access to the museum with west lawn composed of grass and grove of trees historically near a water feature along 7th Street as a portal to the National Mall; historic views of building are now masked by overgrown vegetation; street trees are a contributing feature.

  Sculpture: three pieces anchor the site; axial at North entrance; axial at 6th Street and Independence Avenue; southwest corner at pool with mobile sculpture.

Relation to Other Planning Projects

The NASM revitalization project has been developed in response to recommendations made by previous studies indicating the need to replace the failing exterior cladding and mechanical systems for the building. A Comprehensive Facilities Master Plan was completed by SI in 2013. The Master Plan was followed by three technical studies focused on the exterior envelope of the building, sustainability options related to the project, and a feasibility study. Other plans provide a broader context for the NASM revitalization project, including the NCPC Comprehensive Plan for the National Capital, the Monumental Core Framework Plan, the Southwest Ecodistrict Plan and the SI South Mall Campus Master Plan.

The NASM Exterior Envelope Study was completed in October 2013. The report provides extensive information to inform the design team as they work to develop high-performance envelope solutions that will be durable for a 100-year period. The NASM Sustainability Study was completed in October 2013. The report includes information related to the existing building systems and evaluation of new systems and technologies that could be incorporated. In addition, in conjunction with the Envelope Study, it also addresses the impact on energy use of the building envelope components: wall construction, curtain walls, roofs, and skylights. The NASM Feasibility Study was completed in December 2013. It combines recommendations from the Envelope and Sustainability Studies demonstrating that significant synergies can be leveraged between the systems replacement and necessary envelope upgrades and replacement. Included in the Smithsonian's first Climate Change Adaptation Plan (CCAP) goals are identification of climate change-related flood risks and measures for mitigating flood risks and increasing resilience. The plan includes strategies to integrate climate change adaptation measures into planning, decision making, and policy.[11]

The Comprehensive Plan for the National Capital, Federal Elements is the principal planning document adopted by NCPC for the planning of federal facilities.[12] The Plan contains goals, objectives, and

[11] Smithsonian Institution Climate Change Adaptation Working Group, *Roadmap for the Development of a Climate Change Adaptation Plan,* (September 2013), 11.

[12] National Capital Planning Commission, *Comprehensive Plan for the National Capital, Federal Elements* (Washington, DC, 1977 – 1984, updated 1990, 2004 and 2016).

planning policies for the growth and development of the Nation's Capital. The plan addresses eight Federal Elements including Urban Design, Federal Workplace, Foreign Missions and International Organizations, Transportation, Parks and Open Space, Federal Environment, Historic Preservation, and Visitors and Commemoration. In particular, the policies included in the Urban Design, Visitors and Commemoration, Historic Preservation and Federal Environment Elements provide guidance for the NASM revitalization project.[13]

The SI South Mall Campus Master Plan guides future short-term and long-term renovation and development of a 17-acre area known as the South Campus, which includes the Smithsonian Institution Building (the Castle), the Quadrangle Complex (the Ripley Center, the Arthur M. Sackler Gallery, the National Museum of African Art, and the rooftop Enid A. Haupt Garden), the Freer Gallery of Art, the Arts and Industries Building, the Hirshhorn Museum and Sculpture Garden, the Katherine Dulin Folger Rose Garden and the Mary Livingston Ripley Garden (see Figure 1.6). The Master Plan addresses the Smithsonian's long-term space requirements and physical and operational deficiencies across the campus that impact visitor use and experience as well as the Smithsonian's ability to effectively and safely implement its programs. The plan's focus on improvement of circulation throughout the campus and creation of pedestrian connections, access and visibility to the museums and education and event spaces is relevant for consideration related to planning for the NASM revitalization.

The Southwest Ecodistrict Plan was initiated by NCPC in 2009 to "transform an isolated federal precinct in the nation's capital into a highly sustainable workplace and livable neighborhood." The area of the study is comprised of a 15 block area in Southwest D.C., spanning from Independence Avenue SW as the northern boundary, 12th Street SW as the western boundary, Maine Avenue SW as the southern boundary, and 4th Street SW as the eastern boundary (see Figure 1.7). The plan guides contributions by federal assets toward the economic vitality and environmental health of Washington, D.C. It includes recommendations for district-scale sustainable practices focused on land use, transportation, environmental planning, high performance buildings, landscapes and infrastructures.

[13] National Capital Planning Commission, *Executive Director's Recommendation, NCPC File No. 7585* (Washington, DC, 7 July 2016), 7-19.

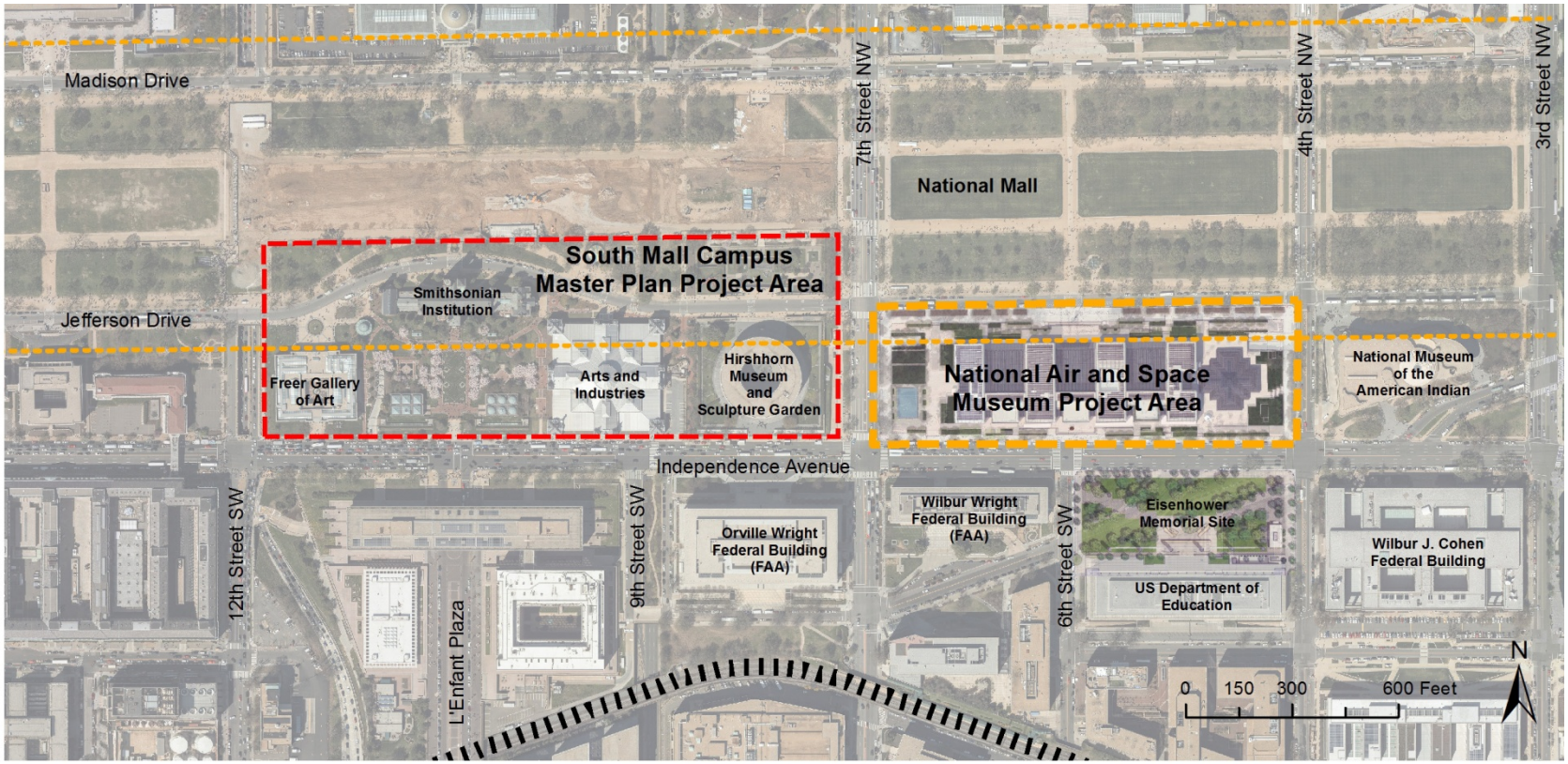


Figure 1. 6: The project area lies directly east of the Smithsonian Institution South Mall Campus Master Plan area. (Source: Stantec, "Project Site," SI South Mall Campus Master Public Scoping Report Plan, Appendix D: Public Meeting Presentation, Smithsonian South Mall Campus Master Plan Environmental Assessment & Section 106 Consultation Public Scoping Meeting, June 2015, p.6; and QEA.)

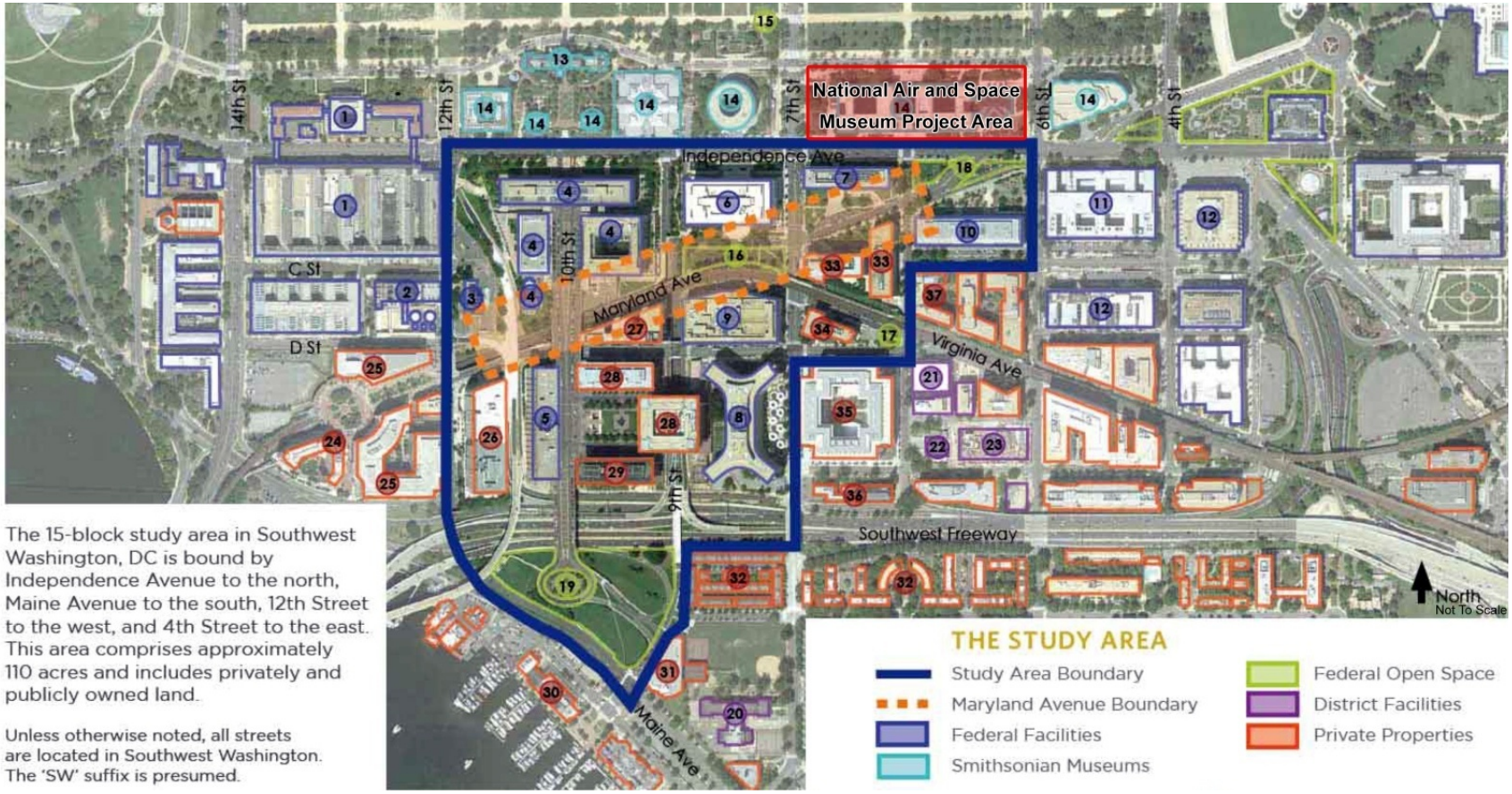


Figure 1. 7: The project area lies directly north of the Southwest Ecodistrict (Refer to the key on the next page; Source: NCPC, "SW Ecodistrict," The SW Ecodistrict: A Vision Plan for a More Sustainable Future, Jan. 2013, downloaded 3/16/2017: https://www.ncpc.gov/plans/swecodistrict.pdf; and QEA.)

1. U.S. Department of Agriculture (Whitten Building)
2. General Services Administration Central Utility Plant
3. Cotton Annex
4. U.S. Department of Energy (Forrestal Complex)
5. U.S. Postal Service
6. Federal Aviation Administration (Orville Wright Building)
7. Federal Aviation Administration (Wilbur Wright Building)
8. U.S. Department of Housing and Urban Development (Weaver Building)
9. General Services Administration (Regional Office Building)
10. U.S. Department of Education (Johnson Building)
11. Voice of America
12. U.S. Departments of Health and Human Services / Education
13. Smithsonian Castle
14. Smithsonian Institution
15. The National Mall
16. Reservation 113
17. Reservation 115
18. Proposed Eisenhower Memorial
19. Banneker Park
20. Jefferson Elementary School
21. DC Government Offices
22. DC Fire Department
23. DC Forensics Lab
24. Mandarin Oriental Hotel
25. Republic Properties
26. Potomac Center North, Inc.
27. CIM Urban Reit, LLC
28. L'Enfant Plaza Hotel
29. L'Enfant Colony, LLC
30. PN Hoffman/The Wharf
31. NBL Associates
32. Private Residential
33. Boston Properties
34. 300 7th Street, LLC
35. Constitution Center
36. St. Dominic's Church
37. Federal Center Hotel Association

Public Involvement and Agency Coordination

As part of on-going consultation for the project, SI met with or wrote to appropriate public agencies and national and local organizations. The purpose of the communications was to solicit comments on the proposed improvements, identify potential environmental concerns, and obtain other relevant information.

SI met with NCPC staff, CFA, and DC SHPO on numerous occasions and will continue to meet with them throughout the development of the design. SI and NCPC held an agencies scoping meeting on November 12, 2014 at NCPC. Agencies invited included: NCPC, CFA, DC SHPO, NPS, Washington, D.C. Office of Planning (DC OP), District Department of Transportation (DDOT), DOEE, Department of Public Works (DDPW), Washington Metropolitan Area Transit Authority, DC Fire and Emergency Medical Services Department, DC Water and Sewer Authority, US Environmental Protection Agency, Potomac Electric Power Company, Washington Gas, National Gallery of Art, Dwight D. Eisenhower Memorial Commission, General Services Administration (GSA), and United States Fish and Wildlife Service (USFWS). Agencies represented included SI, NCPC, CFA, and DDOT.

SI and NCPC held a public scoping meeting on November 12, 2014 at NCPC. The meeting was announced on the NCPC web site and announcements were sent to a list of potentially interested parties. The following review agencies and interested parties were directly invited to the meeting: CFA, DC SHPO, NPS, National Trust for Historic Preservation, Advisory Council on Historic Preservation, National Gallery of Art, Dwight D. Eisenhower Memorial Commission, GSA, DC OP, Advisory Neighborhood Commission 2C, Advisory Neighborhood Commission 6D, Committee of 100 on the Federal City, US Capitol Historical Society, DC Preservation League, The Guild of Professional Tour Guides of Washington, D.C., National Coalition to Save Our Mall, National Museum of the American Indian, Hirshhorn Museum and Sculpture Garden, Architect of the Capitol, HOK, Department of Education, Trust for the National Mall, DC Chapter of DOCOMOMO, AIA DC Chapter, District of Columbia City Council, Southwest Neighborhood Assembly, Voice of America, USFWS, Chesapeake Bay Field Office, DOEE. Attendees included representatives of SI, NCPC, GSA, HOK, QEA, and one interested individual.

Throughout the development of conceptual and schematic designs, informational submissions and briefings were provided to CFA, DC SHPO, and NCPC. The project was presented and discussed during a CFA concept design review meeting held on 18 June 2015 and a revised concept design review meeting on 16 June 2016. In its meeting of 18 June, the Commission approved the concept proposal for replacing the exterior facades and terraces of NASM, with numerous comments for further consideration as the design is developed, including the suggestion that that the design could go much further in expressing the technology of the museum's subject of flight and space exploration. CFA identified opportunities in this project to express innovative technologies such as photovoltaic panels in a more comprehensive way, fully integrating the new entrance canopies and photovoltaic arrays with each other and the building enclosure to transform the architecture to convey the critical role of technology in air and space travel. For the redesign of the building's landscape, the Commission members supported the proposal to simplify and open up the low terraces to accommodate modern requirements of accessibility and security.

At the 16 June 2016 meeting, CFA approved the proposed design for the terraces and provided comments for the designs of the vestibules. The Commission strongly favored the Smithsonian's preferred Scheme A, which would create an enhanced pedestrian environment with larger shade trees and sequence of public spaces, and suggested further refinement of the details of the freestanding barrier walls that line the pedestrian pathways. For the entrance pavilions, the Commission expressed support for the elegant, curvilinear forms in Scheme A, but indicated that full review of the design of the structures requires understanding their relationship to the building's new cladding material.

On 10 July 2014, an informational briefing was held with NCPC for the NASM Comprehensive Facilities Master Plan. The presentation included the NASM Mall Building improvements. The NASM revitalization project team presented the design to NCPC at a concept design review meeting held on 7 July 2016. The Commission commented favorably on the overall concept design for the Building Exterior, Vestibules, and Site Improvements. Regarding the Building Envelope, the Commission recommended that the team consider ways to achieve a seamless transition between the exterior cladding and interior stone treatment if Tennessee Pink marble (limestone) was determined to be infeasible. The Commission supported the Scheme A: Ground Plane option for Terrace Improvements, and recommended perimeter security improvements including minimizing the use of bollards and exploring integrated

perimeter security elements, adjusting use of bollards to avoid conflicts with the landscape and ensure to improve circulation and ease of maintenance, and further refinement of the design and material of the proposed perimeter security walls to complement the architectural character of NASM and the landscape approach. The Commission supported relocation of the existing *Continuum* sculpture along 4th Street, SW on the east terrace, and requested confirmation that exterior lighting will not detract from the setting of the National Mall. The design should explore opportunities to better accommodate existing street vendor venues and improve pedestrian and circulation routes on the site.

Additional review meetings are planned for Summer 2017. Following the completion of this Environmental Assessment (EA), the project will be presented to CFA during a revised concept design review meeting anticipated to occur on 20 April 2017. This will be followed by presentation of the preliminary design to NCPC, currently planned for July 2017.

Historic Preservation Consultation

NASM contributes to the National Mall Historic District.[14] As a result, a review of the potential effects of the project on historic resources is being undertaken consistent with Section 106 of the National Historic Preservation Act (NHPA). SI initiated Section 106 consultation with the DC SHPO during June and September 2014 in order to ensure appropriate historic preservation during the planning, design, and construction of the project. Consultation with NCPC and DC SHPO will continue throughout the design process. The current status of Section 106 consultation is explained in Chapter 4 of this EA.

[14] Smithsonian Institution, *Smithsonian Directive 418: Smithsonian Institution Historic Preservation Policy* (Washington, DC: April 18, 2005), Appendix C.

Cumulative Impact Projects

Several ongoing and planned projects in the area could generate cumulative impacts when considered together with the impacts of the proposed action. These projects include:

- SI is developing a Master Plan for the South Mall Campus located on the National Mall. The South Mall Campus encompasses the Smithsonian campus from the Freer Gallery of Art on the west to the Hirshhorn Gallery and Sculpture Garden on the east, between Independence Avenue and the National Mall. The purpose of the Master Plan is to improve the alignment between Smithsonian facilities and their strategic plan, increase public access, and realize benefits from the efficiencies of an integrated plan. A primary goal of the Master Plan is to improve and expand visitor services and education by providing spaces for public gatherings and programming as well as retail and food service. The proposed Master Plan will be implemented over a 10-to-20-year period following NCPC review of the final master plan expected in 2018.

- NPS, on behalf of the Dwight D. Eisenhower Memorial Commission, has developed a design for a Memorial to Dwight D. Eisenhower. The project includes sections of Maryland Avenue SW and is adjacent to Independence Avenue SW. The design concept for the memorial includes a commemorative object within a temple that establishes a layered experience to transition visitors through a series of defined spaces that move from the busy urban surroundings, through active and passive park spaces, and finally into an intimate commemorative core where the story of President Eisenhower is revealed. The project is located on a four-acre site in southwest Washington, D.C., directly south of NASM. The project was approved by CFA and NCPC in July 2015 and funds are being raised for its construction. CFA and NCPC provided comments on a revised concept design in January and February, 2017, respectively.

- NPS is planning to rehabilitate the Constitution Gardens on the National Mall. The purpose of the project is to improve the functionality, ecology, accessibility, recreation, and visitor services of the park as well as improve the condition of natural and cultural resources. NCPC approved the Constitution Gardens Rehabilitation in October, 2015.

- NPS is implementing the National Mall Plan / Environmental Impact Statement, which was approved by NCPC in December 2010 and was re-enforced by Secretarial Order 3326 (Jan 2013). The plan defines a 50 year future vision to respectfully rehabilitate the historic and symbolic National Mall so that very high levels of use can be perpetuated and the needs of visitors and users will be met in an attractive, universally accessible, convenient, high-quality, energy-efficient and sustainable manner. The plan protects and preserves memorials, improves resource conditions, and improves circulation, amenities and opportunities for pedestrians, bicyclists, tourists and other users. Projects such as Constitution Gardens, the Mall Turf, Circulator, and Capital BikeShare are examples of plan implementation.

- NPS completed a National Mall Turf and Soil Reconstruction project in 2016. This project removed and replaced the existing soil and irrigation system including cisterns and installed new curbs and gutters around the turf panels on the National Mall between Madison and Jefferson Drives and 3rd and 14th Streets, NW. Turf panel management strategies seeking to minimize turf damage and soil compaction were implemented.

- SI is undertaking a building envelope study for the Hirshhorn Museum and Sculpture Garden.

- DDOT is planning a north-south streetcar line that will potentially connect through the National Mall along 7th Street.

- SI is planning a Collections Storage Module at Dulles, proposed to be constructed adjacent to the NASM Steven F. Udvar-Hazy Center. It will provide temporary storage for artifacts from NASM during construction, and permanent storage for collections moving from outdated facilities at Suitland, Maryland. An EA was prepared for the project in coordination with the Metropolitan Washington Airports Authority (MWAA). The Federal Aviation Administration (FAA) is the lead responsible federal agency. It was available for public review 13 July through 11 August 2016. The EA and Finding of No Significant Impact (FONSI) were published in September 2016.

- NCPC prepared the Southwest Federal Center Heritage Trail Assessment Report, to advance the objectives of the *Monumental Core Framework Plan* and the *SW Ecodistrict Plan.* The Southwest Federal Center Heritage Trail will be a self-guided walking tour of the area between the National Mall and the Southwest waterfront. The tour will highlight art, architecture, local and federal history, and governmental functions within the predominantly federal enclave. The report proposes a trail route and fifteen potential locations for interpretive signs. NASM is visible from the proposed location of a sign at the SW corner of Maryland Avenue and Sixth Street SW.

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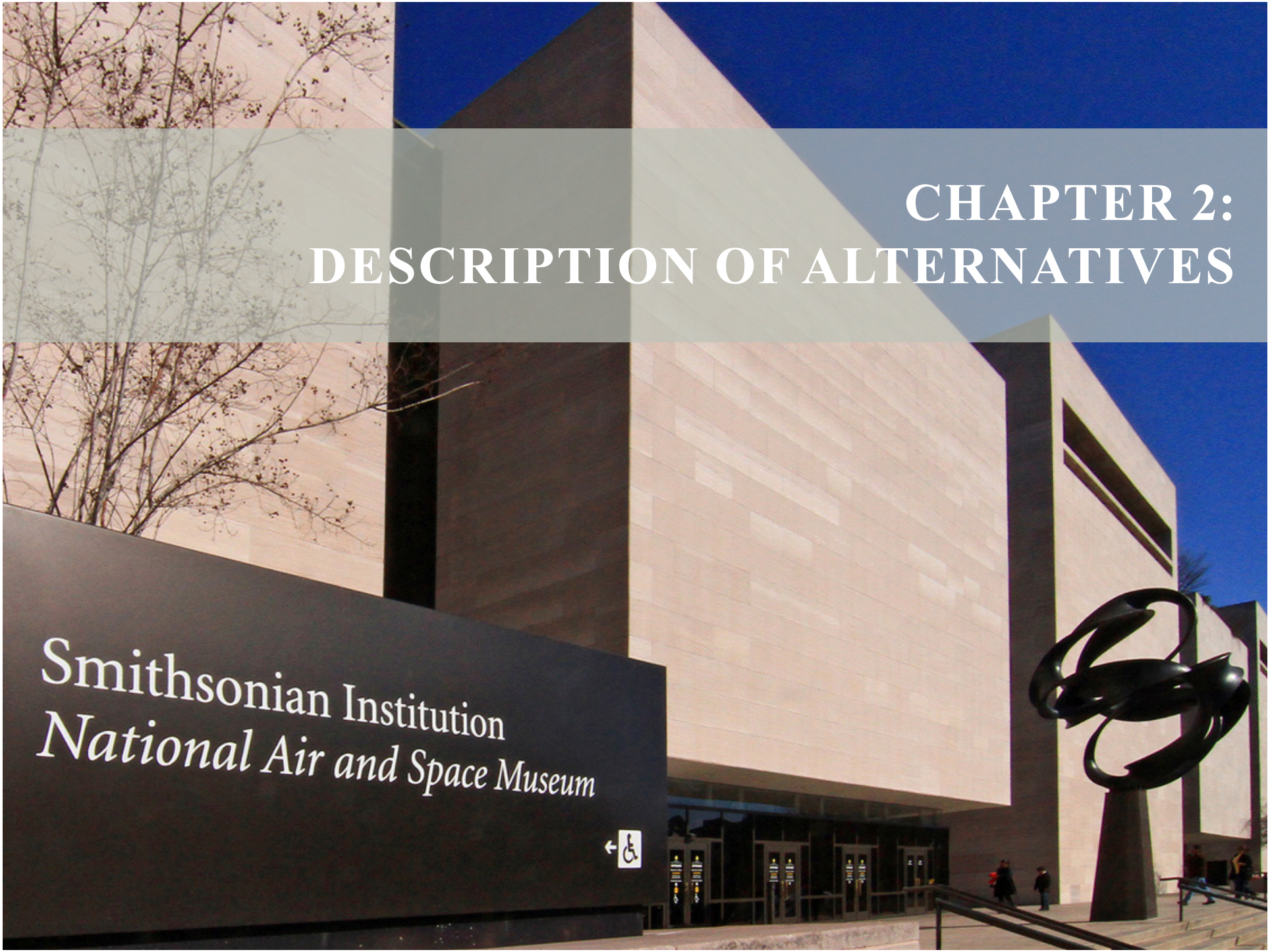
CHAPTER 2:
DESCRIPTION OF ALTERNATIVES



CHAPTER 2: DESCRIPTION OF ALTERNATIVES

Introduction

This Environmental Assessment (EA) evaluates alternative approaches to revitalize the National Air and Space Museum (NASM) building and its associated landscape. The revitalization is a complex project with numerous components that would provide improvements and address deficiencies associated with the building envelope, entrances, major building systems, and sitework. This chapter includes a description of the alternatives being assessed, including a no action alternative (Alternative A) and three action alternatives (Alternatives B, C, and D). Also described are other alternatives that were identified and evaluated, then dismissed from further consideration.

In order to preserve NASM's eligibility for potential future listing in the National Register of Historic Places, the revitalization project must maintain the existing character of the building. Obata's design for NASM creates a distinctive massing with a series of volumes that rely on the interplay between solid and void. The design includes strong visual connections between the interior and exterior. A continuous plane of stone extends from the exterior to the interior, separated by largely transparent skylights and curtain walls. These relationships must be carefully addressed in the selection of replacement cladding.

The Tennessee Pink marble (limestone) on the building displays a range of color from light cedar to medium rose (ranging from medium-pink to dark-pink, with some darker cedar-brown hued stone). The new cladding should match the existing stone color, pattern and panel size as closely as possible, have the longest service life possible, and ensure a minimal need for interim repairs. Retention of original design concepts and spatial relationships are primary to accomplishing a successful rehabilitation of the building.

Under Alternative A, the No Action Alternative, no improvements would be implemented. As a result, the current deficiencies would remain and conditions would continue to deteriorate. The deficiencies are described in Chapter 3. Alternatives B, C and D include common approaches to address deficiencies and improvements. The action alternatives differ only in their approach to replacement of the exterior stone cladding of the building. All action alternatives fulfill the purpose and need, as well as the performance criteria for the exterior wall assemblies addressing durability, strength, appearance, adherence to the

original design concept, prevention of water infiltration, and providing a continuous air barrier, and blast and fire resistance. Ultimately, the selection of the exterior wall cladding material will be based on the analysis of which best meets the longevity, performance, stewardship, and mission criteria.

The Smithsonian Institution has not selected a preferred alternative at this time, and is considering three action alternatives for the stone cladding. The Smithsonian's preferred alternative will be selected in Spring 2017.

Alternative B would replace the existing Tennessee Pink marble (limestone) with new Tennessee Pink marble matching the existing pattern and color range as closely as possible with thicker stone. In addition, renovations to address deficiencies and improve conditions and sustainability related to other aspects of the building envelope (including the curtain walls, skylights, roof and photovoltaics), entrances, major building systems, and sitework, would be implemented.

Under Alternative C, the existing Tennessee Pink marble (limestone) would be replaced with another natural stone that has a similar appearance to the original stone cladding. Also, Alternative C would include the same renovations as Alternative B, to address deficiencies and improve conditions and sustainability related to the building envelope, entrances, major building systems, and sitework.

Alternative D would replace the existing Tennessee Pink marble (limestone) with a manufactured material. The manufactured material, ultra high performance concrete (UHPC), would be custom designed to meet all of the performance requirements, including having a color and mineral quality that matches the original stone cladding as closely as possible.

Alternative A
No Action Alternative

Under Alternative A, the No Action Alternative, no major capital improvements would be implemented. As a result, the current deficiencies would remain and conditions would continue to deteriorate. A complete list of the deficiencies is provided in Chapter 3. Damaged panels would continue to be replaced with granite throughout the building.

The stone building cladding would become a hazard to visitors and the deterioration would impact the valuable collections housed in the museum. The experiences of visitors to the museum would continue to be diminished by the effects of distracting security screening that could be greatly improved (see Figure 2.1). Most importantly, the deficiencies would continue to detract from the ability of the museum to perform the mission for which it was created: to commemorate the national development of aviation and spaceflight, and to educate and inspire the nation. The Delta solar shallow pool would continue to be non-operational. The site would resemble its current conditions under Alternative A (see Figures 2.2-2.6).

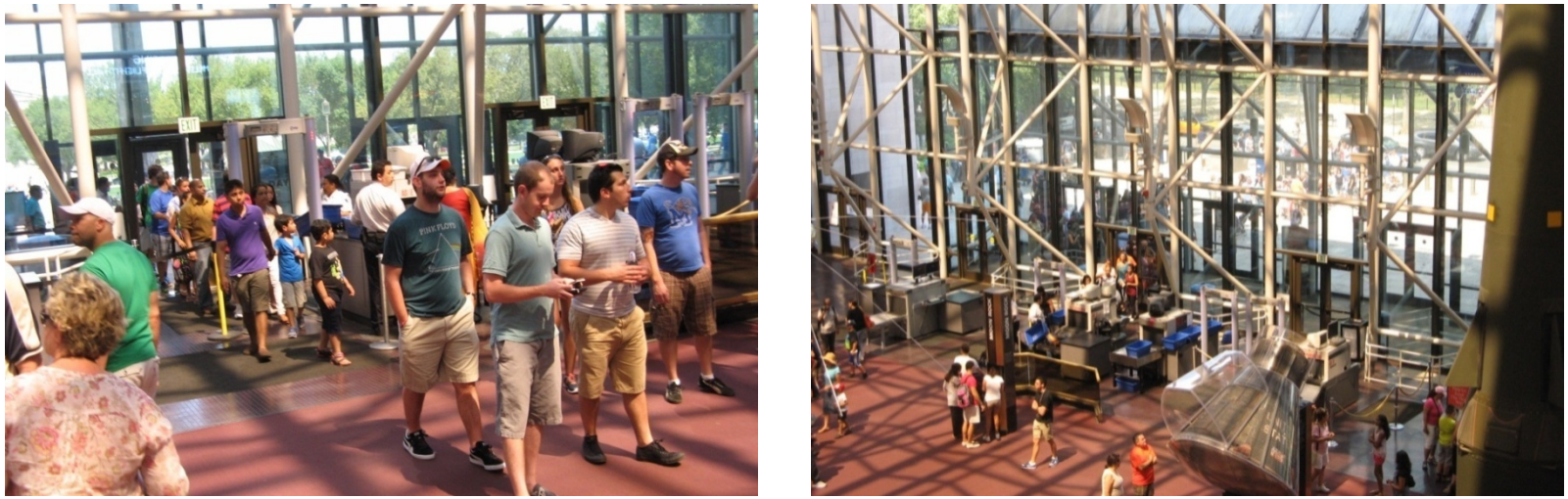


Figure 2. 1: Existing NASM Security Screening Gate. (Source: QEA.)

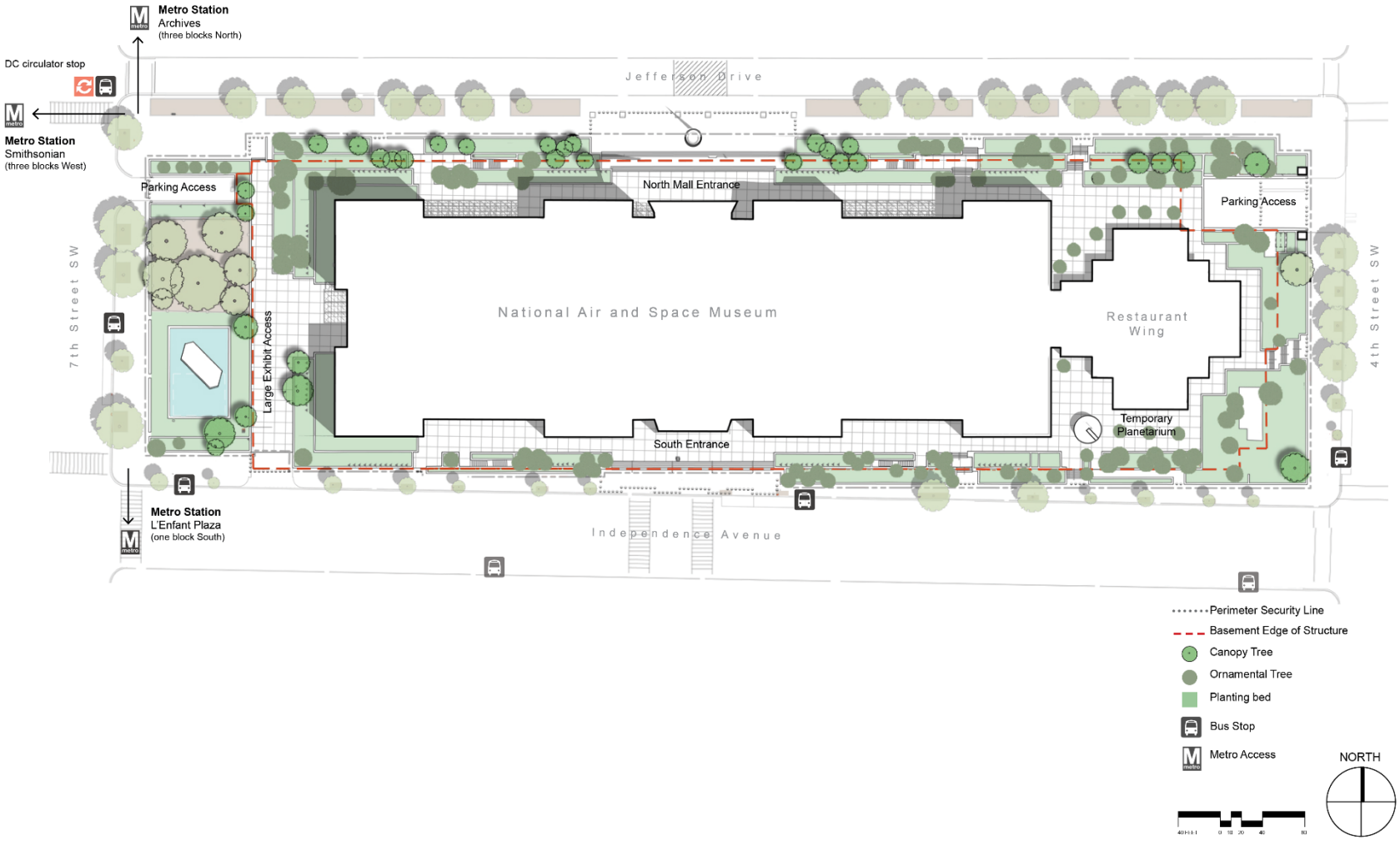


Figure 2. 2: Existing landscape condition. (Source: AECOM.)

Figure 2. 3: Existing north elevation along Jefferson Drive, SW. (Source: QEA.)

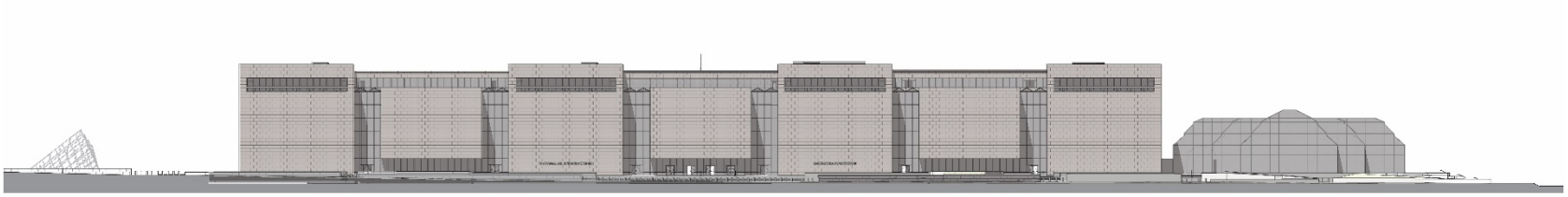


Figure 2. 4: Existing south elevation along Independence Avenue, SW.(Source: QEA.)

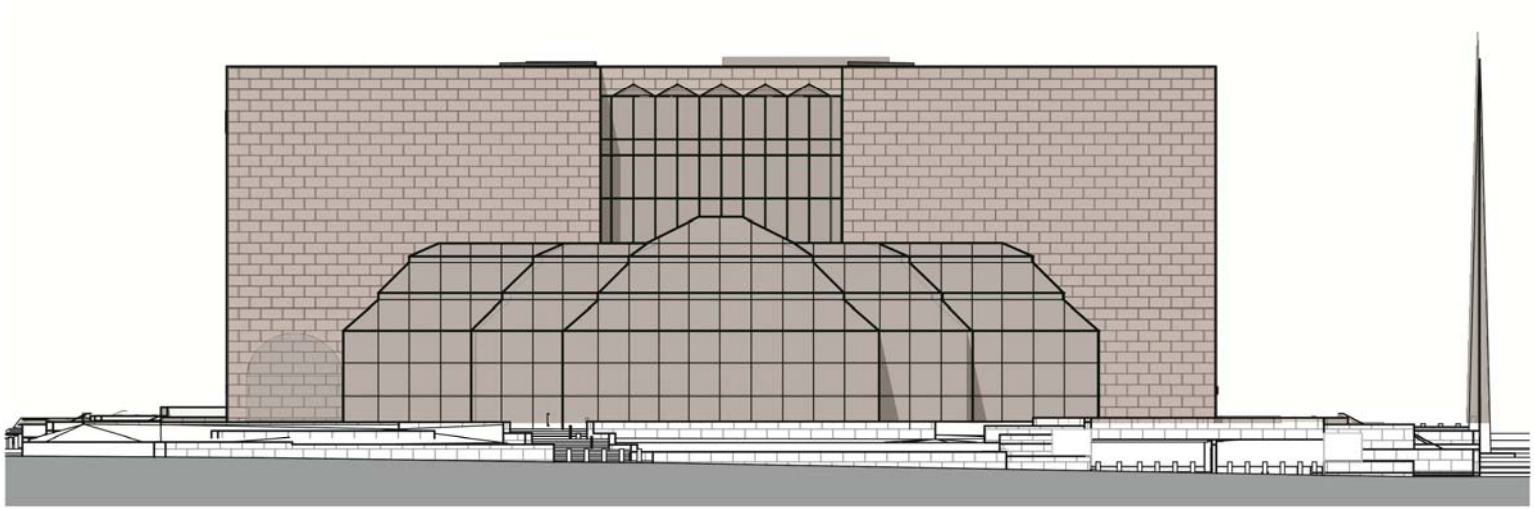


Figure 2. 5: Existing east elevation along 4th Street, SW.(Source: QEA.)

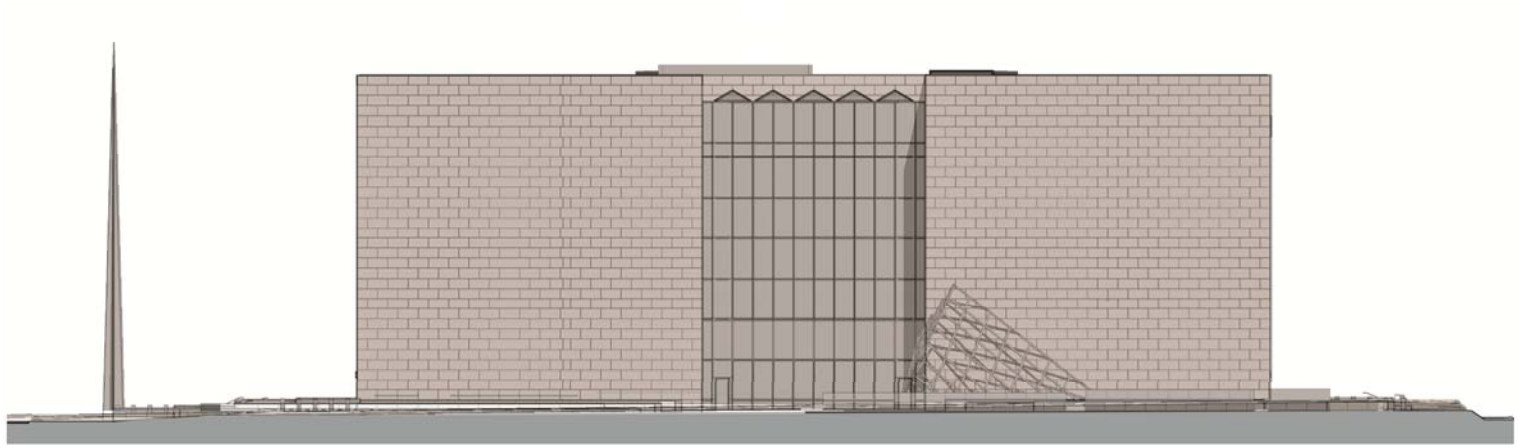


Figure 2. 6: Existing west elevation along 7th Street, SW.(Source: QEA.)

Alternative B
Tennessee Pink
Replacement Stone

Alternative B
Building Envelope

Stone Building Cladding

The stone building cladding would be replaced with new stone. Cladding Alternative B would replace the existing 1-1/4" thick Tennessee Pink marble (limestone) cladding with 3" thick Tennessee Pink marble matching the existing stone. The application would slightly increase the overall dimensions of the building plane. This alternative would provide the closest match to replacing the original stone panels in kind (see Figures 2.7-2.8). It has the potential to closely match the color range and pattern of the existing stone (see Figure 2.9). Replacement of damaged or otherwise deficient panels through the life of the wall system would be facilitated with the new attachment hardware.

The greatest disadvantage associated with this approach is the potential difficulty in procuring suitable material. The source geologic material is highly fractured and the geologic exploration of the quarry has not yet been completed. The fractured nature of Tennessee Pink marble presents further challenges in production in relation to expected yields of usable stone material. Time and energy spent extracting unusable rock for a quarry during productions of this scale could translate to significant material waste and schedule implications. The exterior wall assembly would be replaced to establish reliable water, air, vapor, and thermal barriers, as well as blast resistance components.

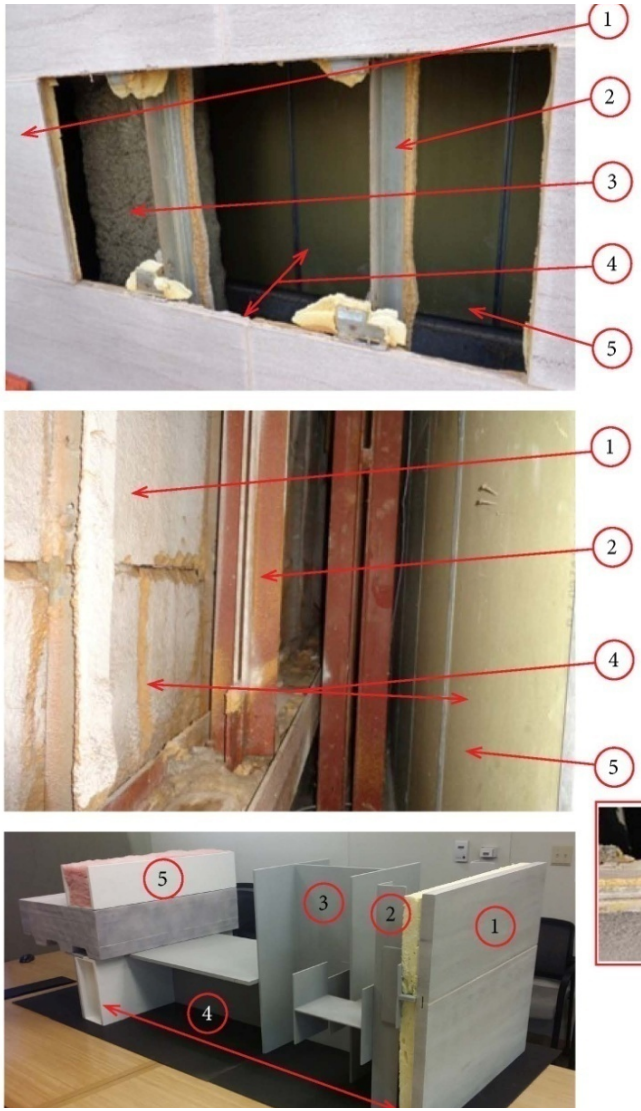
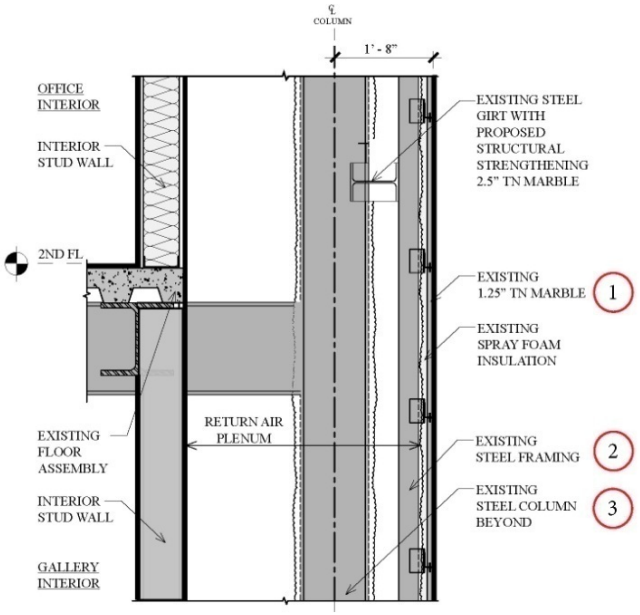


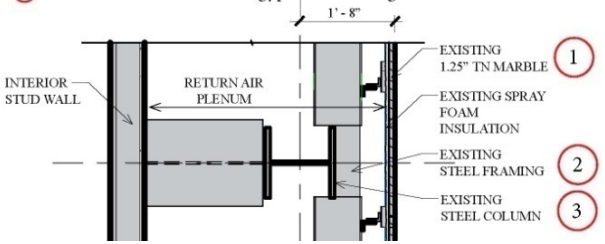
Figure 2. 7: Existing Exterior Wall. (Source: QEA.)



Existing Wall Section at East/West Facing Walls

The typical exterior wall construction consists of the following from exterior to interior:

1. 1.25" Tennessee Pink Stone panels with spray foam insulation on backside
2. Steel framing
3. Steel column
4. Air Cavity (Return Air Plenum)
5. Interior metal stud wall with gypsum sheathing



Existing Plan Detail at East/West Facing Walls

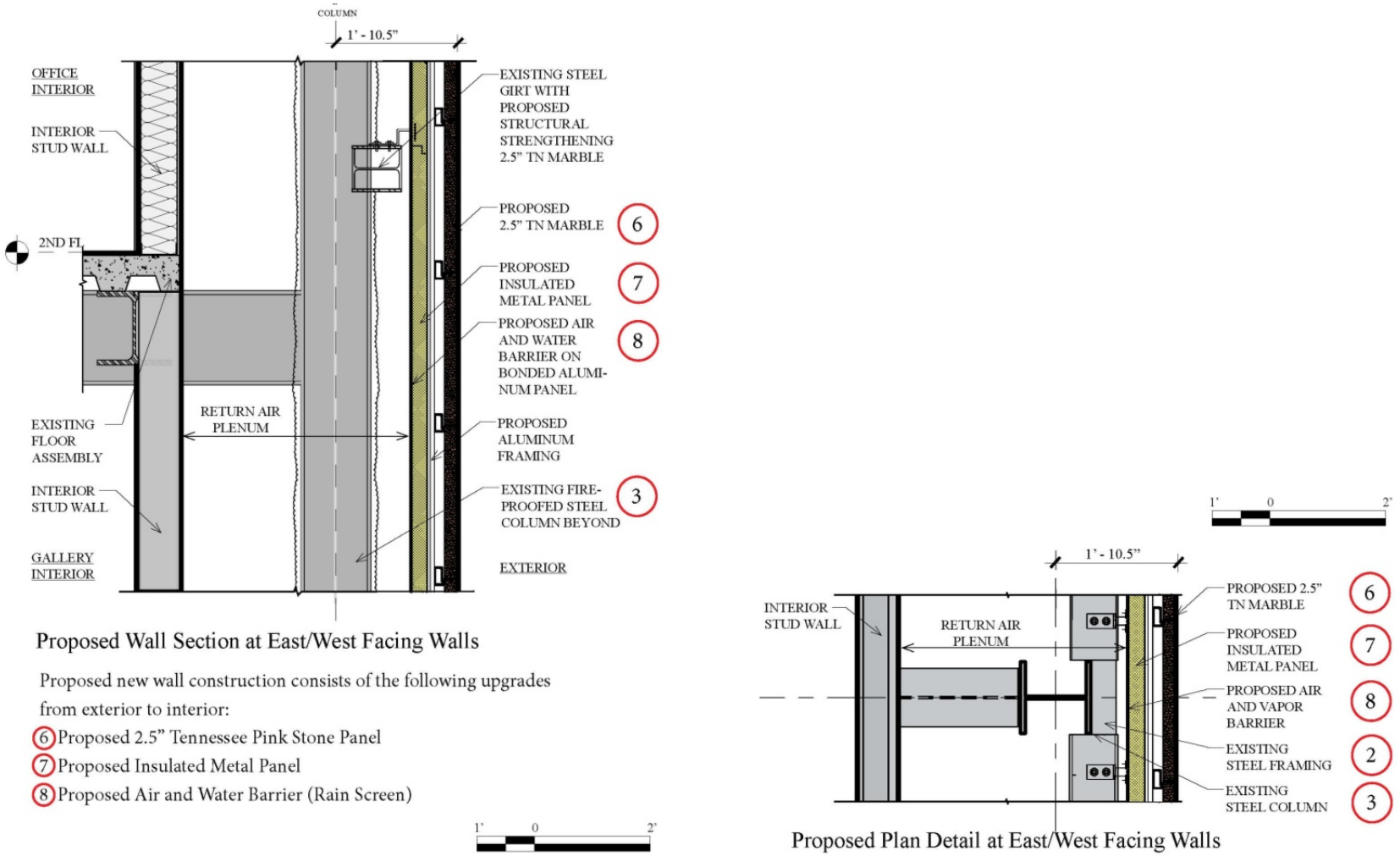


Figure 2. 8: Proposed Exterior Wall. (Source: QEA.)

Curtain Walls

The existing curtain wall would be replaced with a new aluminum-framed curtain wall system, designed to achieve project-specific performance criteria. The proposed replacement glazing would better protect the collection from exposure to harmful ultraviolet rays, and be thermally adequate and blast resistant. The proposed replacement glazing would increase visible light transmission, increasing visibility of the gallery interior from the Mall as originally intended. All of the existing curtain wall would be replaced. The overall quantity of curtain wall would expand only slightly due to the addition of the North vestibule.

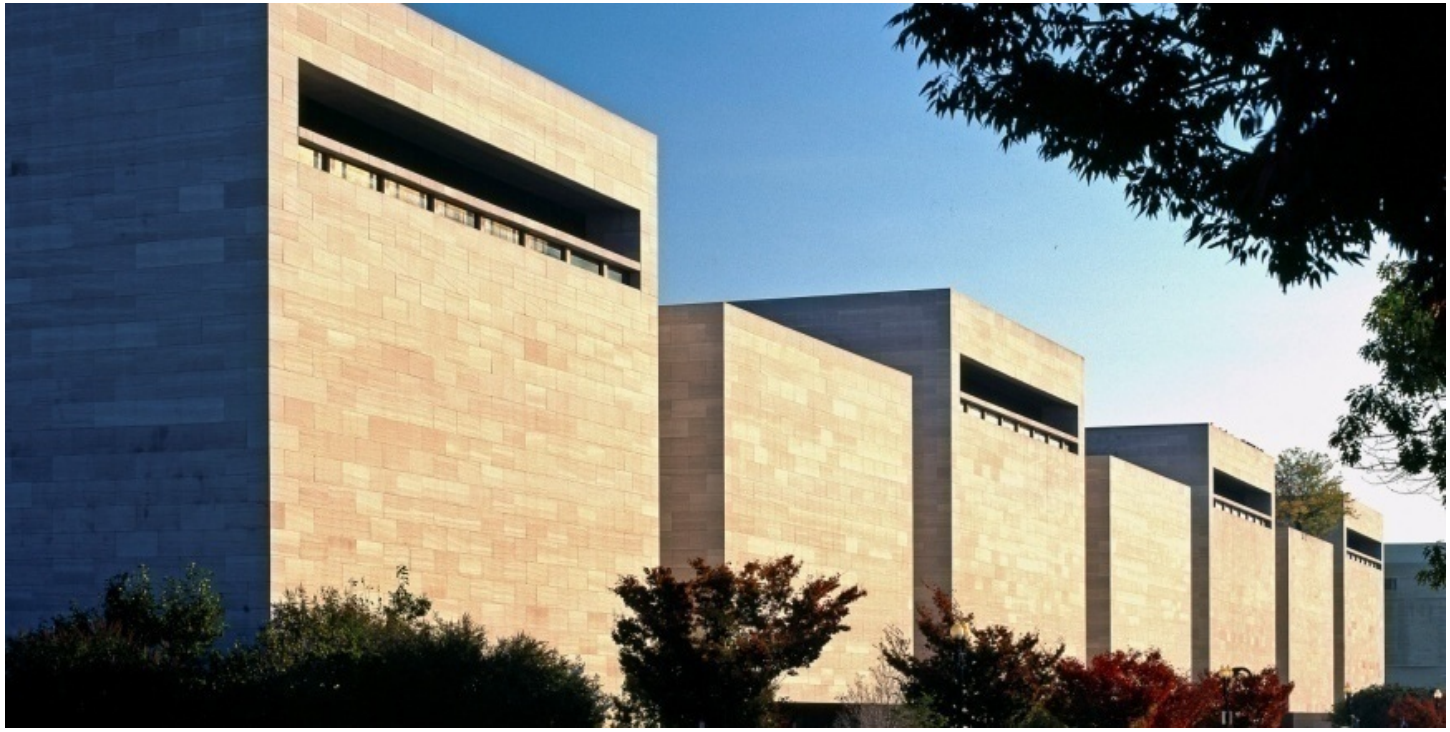


Figure 2. 9: Photo of existing building. Replacement of the stone cladding with new Tennessee Pink marble (limestone) would maintain the current visual appearance of the building to the greatest degree of any of the recladding options. (Source: QEA.)

Skylights

A new skylight system would be designed to achieve project-specific performance criteria. The general configuration and extent of the skylight area would remain unchanged. The new system would meet the blast resistance requirements for the project, establish water, air, and thermal barrier continuity with the new exterior wall assembly, and limit the potential for condensation on the system components with the re-introduction of mechanically-controlled humidity in the museum. The proposed replacement skylight glazing would better protect the collection from harmful ultraviolet rays, in addition to being thermally adequate and blast resistant. The skylight glazing would decrease light transmission.

Roof

A replacement roofing system including vapor retarders would be installed to replace the aging system and support reintroduction of mechanically-controlled humidification, which is necessary to protect artifacts in the building.

Alternative B
Building Entrances

New vestibules would be added at the north and south entrances of the building to enhance the visitor entry experience and improve the security screening process. The vestibules would be designed to respond to the original design of the building while serving the current needs for safety and comfort. Two design concepts are being considered for the vestibules. Both are similar in massing, scale, location, and function. The difference between the two designs is the form of the vestibules.

While the addition of the vestibules to the building would affect its visual appearance, the environmental consequences would not vary measurably between application of one or the other design. Therefore, for the purposes of this Environmental Assessment, the two conceptual designs are described here and their potential environmental consequences are evaluated as one component of the overall design in Chapter 4.

Both designs would place security screening for the building within a transitional space of reduced width and lower ceiling height, creating the impression of spatial compression before being "released" into the large expanse of the Milestones of Flight gallery, energizing the visitor experience.

They also both would provide enclosed vestibules to shelter and facilitate improved visitor flow at the building entrances. Throughput would be increased without adding security staff requirements by placement of "divest and composure" tables before and after the security equipment for visitor use.

Vestibule Design 'A' (Preferred Vestibule Design) Description

Vestibule design 'A' is the option preferred by SI. The vestibule would include a tensile roof in a form that abstractly represents the early flying machines of Leonardo da Vinci and the Wright Brothers exhibited within the building, evoking the mission of the museum "to educate, commemorate, and inspire." The integration of this form would respond to the architectural rhythm of the existing building, and contrast with the orthogonal building lines of the museum.

At the north entrance, the roof would enclose a 3,480 square foot curtain walled vestibule and provide protection for adjacent exterior queue areas (see Figures 2.10-2.13). As with other entry stairs, porches and porticoes on the Mall, the canopy extends 48 feet beyond the McMillan Line. The National Gallery West Building monumental stairs, the portico and stairs at the National Museum of Natural History, the porch of the National Museum of African American History and Culture, on the north side of the Mall, and the Freer Gallery portico, Ripley Building, Smithsonian Castle, Arts and Industries Building, and the Hirshhorn Museum and Sculpture Garden on the south side of the Mall, extend beyond the McMillan Line. At the south entrance, a tensile roof canopy would provide protection for the exterior queue along Independence Avenue SW (see Figures 2.14-2.17). The vestibule for the south entrance would be located within the footprint of the existing building. This would allow the Master Plan recommended vestibule area of 1,500 sf to be accommodated in a non-gallery interior space, while maintaining the limited exterior plaza area for visitors to gather before entering. A photovoltaic installation on the south canopy would be developed as a flexible PV film joined with the proposed tensile fabric roof in the vestibule A design to create a form that protects visitors from the sun while harnessing its energy. With visibility to visitors, the south canopy photovoltaic panels express the Museum's mission by demonstrating the application of space age technology.

Vestibule Design 'B' Description

Vestibule design 'B' at the north and south entrances would include a "glass box" containing security screening (see Figure 2.18). The new vestibule additions would be integrated with the existing building by mimicking the massing of the stone clad pavilions, but composed of glass to maintain the views of the exhibits with the glass atrium beyond per the original design concept (see Figures 2.19-2.22). As with other entry stairs, porches and porticoes on the Mall, the vestibule would extend 30 feet beyond the McMillan line. A photovoltaic installation on the south canopy would be integrated into the vestibule façade in the vestibule 'B' design. With visibility to visitors, the south canopy photovoltaic panels express the Museum's mission by demonstrating the application of space age technology.

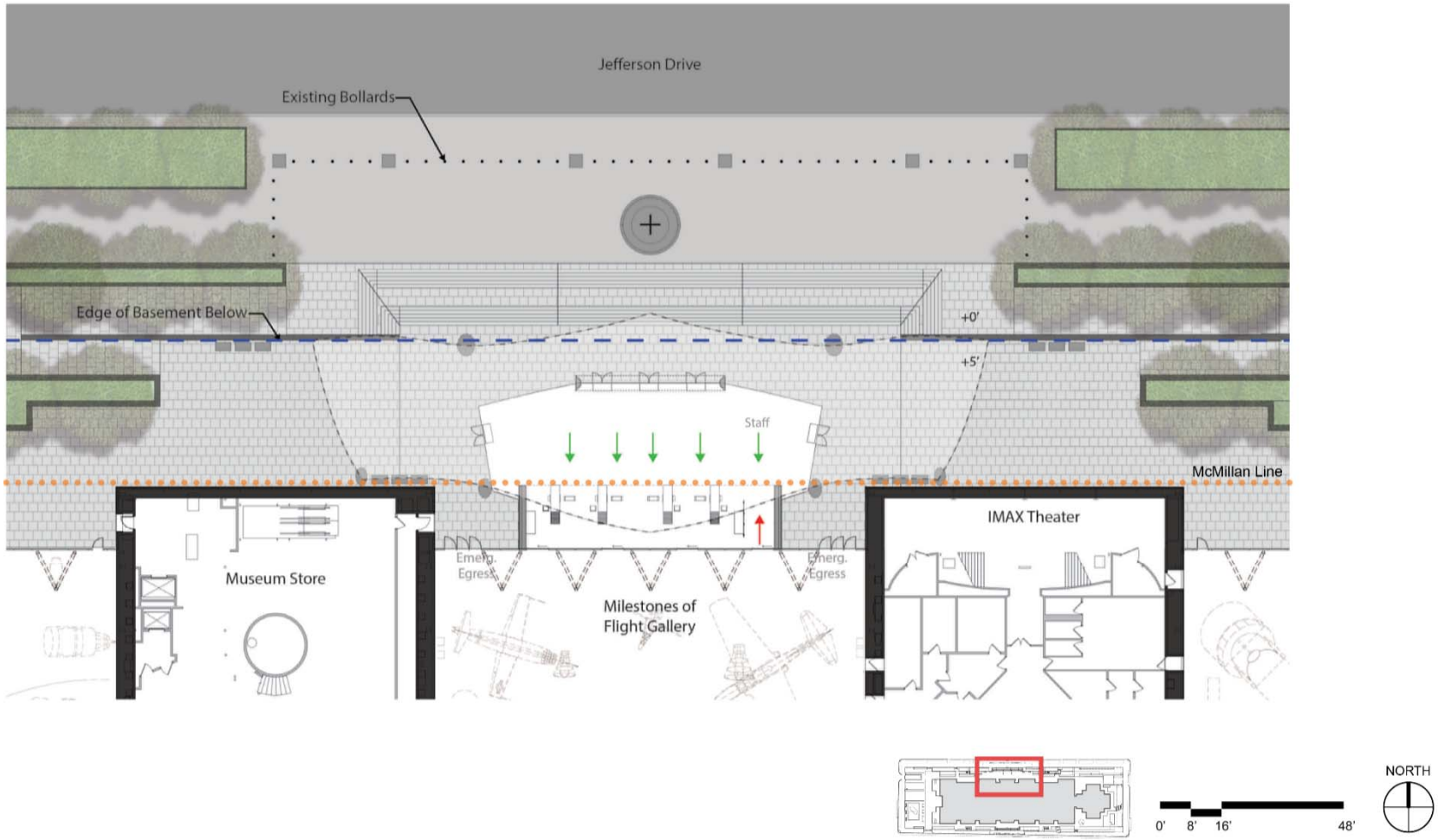


Figure 2. 10: North Vestibule Design 'A' Floor Plan.(Source: QEA.)

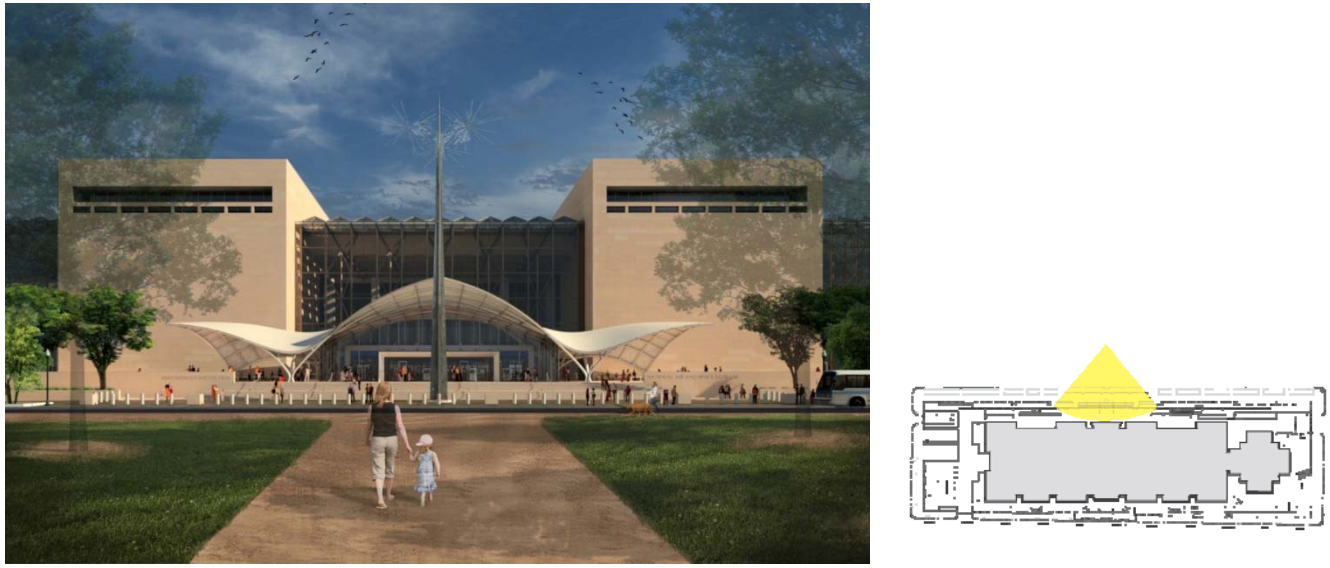


Figure 2. 11: North Vestibule Design 'A' Partial North Elevation.(Source: QEA.)

Figure 2. 12: North Vestibule Design 'A' Full North Elevation.(Source: QEA.)

Figure 2. 13: North Vestibule Design 'A' Exterior Perspective. (Source: QEA.)

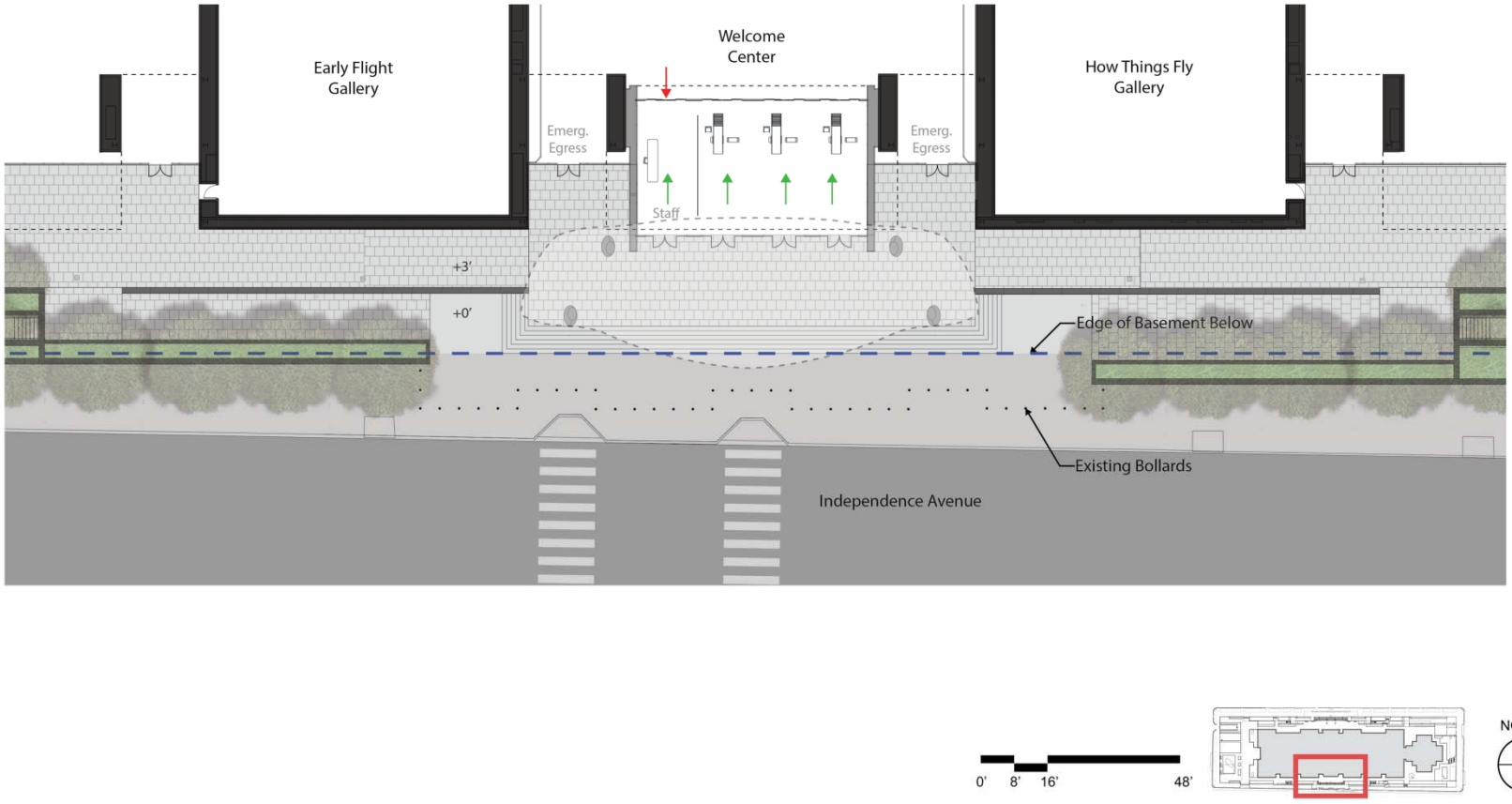


Figure 2. 14: South Vestibule Design 'A' Floor Plan. (Source: QEA.)

Figure 2. 15: South Vestibule Design 'A' Partial South Perspective Elevation. (Source: QEA.)

Figure 2. 16: South Vestibule Design 'A' Full South Perspective Elevation. (Source: QEA.)

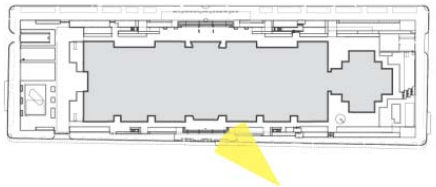
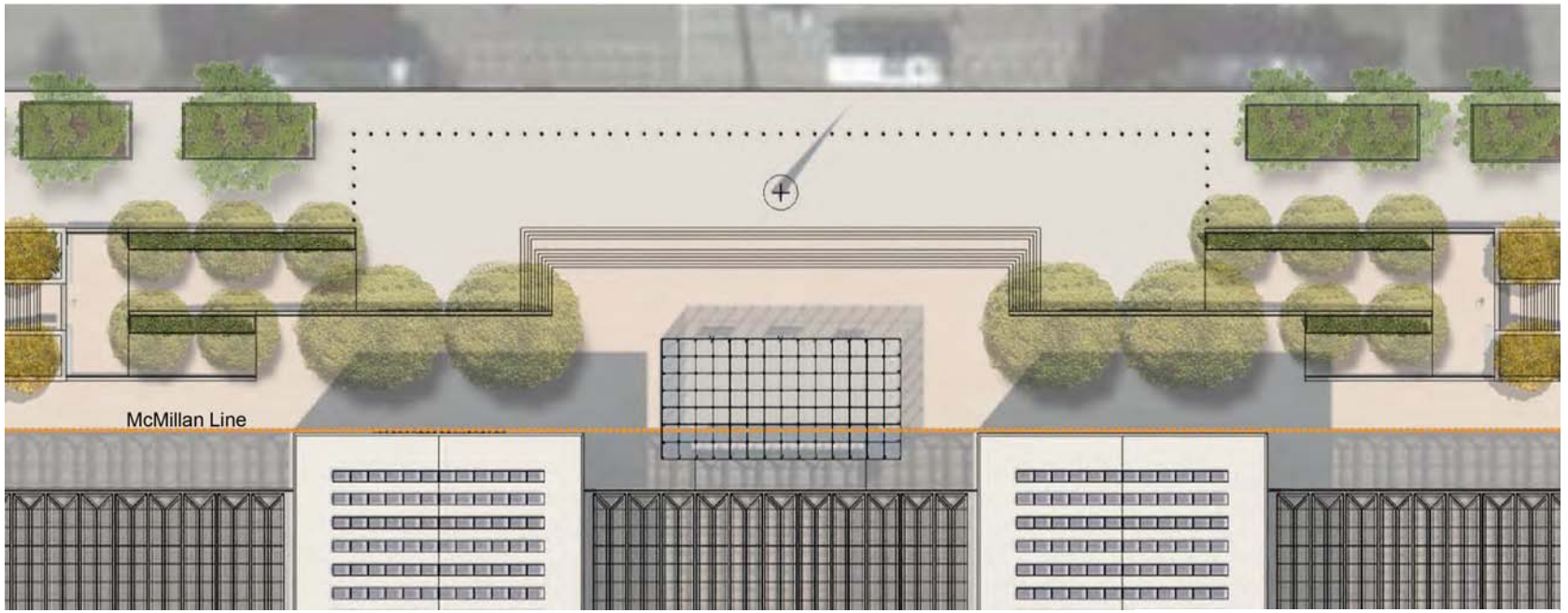


Figure 2. 17: South Vestibule Design 'A' Perspective from Southeast. (Source: QEA.)



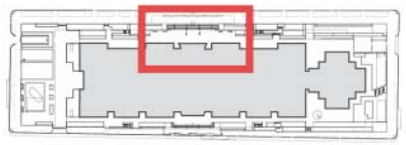


Figure 2. 18: North Vestibule Design 'B' Plan. (Source: QEA.)

Figure 2. 19: North Vestibule Design 'B' Partial Elevation. (Source: QEA.)

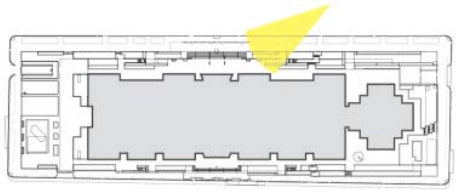


Figure 2. 20: North Vestibule Design 'B' Exterior Perspective. (Source: QEA.)

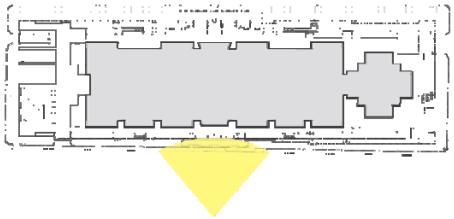


Figure 2. 21: South Vestibule Design 'B' Partial Elevation. (Source: QEA.)

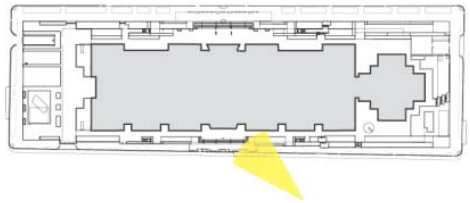


Figure 2. 22: South Vestibule Design 'B' Exterior Perspective. (Source: QEA.)

Alternative B Photovoltaics

A rooftop photovoltaic array system would be installed on the 70,000 square-foot flat roof (see Figure 2.23). The percentage of electricity contributions from the rooftop photovoltaics could be as high as 6300,000kWh/year, approximately 7% of the electricity load for the revitalized museum. The installation of the rooftop photovoltaic array would be designed to minimize visibility from the Mall (see Figure 2.24). The roof photovoltaics would be situated to be non-visible from public thoroughfares. A photovoltaic installation on the south canopy would be developed as a flexible PV film joined with the proposed tensile fabric roof in the vestibule 'A' design to create a form that protects visitors from the sun while harnessing its energy. Photovoltaics would be integrated into the vestibule façade in the vestibule 'B' design. With visibility to the visitors, the south canopy photovoltaic panels express the Museum's mission by demonstrating the application of space age technology. The percentage of electricity contributions from the south canopy photovoltaics of vestibule design 'A' could be as high as 70,000kWh/year, approximately 0.7% of the electricity load for the revitalized museum.

Figure 2. 23: Proposed Roof Photovoltaic (PV) Array, Plan. (Source: QEA.)

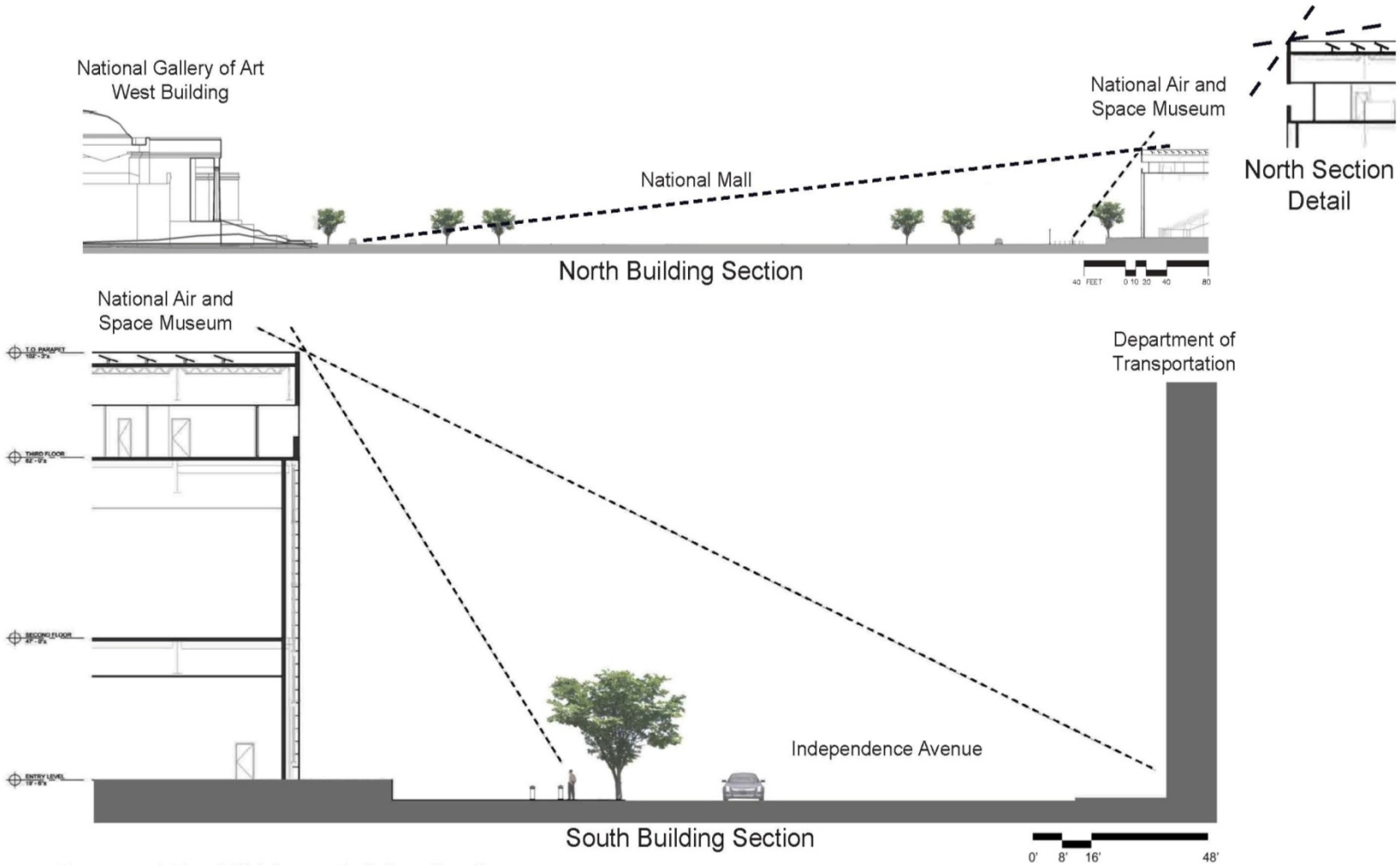


Figure 2. 24: Pedestrian views of proposed roof photovoltaic array. (Source: QEA.)

Alternative B
Building Systems

Implementation of a variety of strategies to improve energy efficiency would substantially reduce NASM's energy consumption, utility costs, and greenhouse gas emissions.

- The biggest single contribution to greater energy efficiency is allowing the interior temperature (degF) and relative humidity (RH) to be adjusted with a limited fluctuation with seasonal variation. Going from 70degF and 50% RH year-round, to 75degF and 50% RH in the summer (with the plus/minus values in the report) to 68 degF and 40% RH in the winter. This results in nearly a 20% energy savings over the existing.
- Adding a building water-cooled chiller plant using dedicated heat recovery chillers. This is a higher efficiency system than the GSA chilled water system, and the hot water generated from the DHRCs will be used to provide reheat and to supplement building hot water for hydronic heating.
- Energy-efficient all-LED lighting system with centralized dimming system (DMX512 A) using daylight harvesting and occupancy/vacancy sensors.
- High efficiency building hot water system—condensing boilers.
- Implementing variable air volume systems, energy recovery ventilation, demand control ventilation and airside economizers.
- Improved envelope conditions.
- Two 100,000 gallon underground cisterns would be incorporated into the design to satisfy code requirements for stormwater management. One cistern would sit beneath the existing fountain on the west side of the site and capture runoff from the west half of the building roof, terraces, and portions of the southern hardscape, and one cistern would be installed on the east side of the site and capture runoff from the remainder of the building roof, terraces, and portions of the hardscape (see Figure 2.25). One-hundred year storm events would continue to overflow into the city system.

Figure 2. 25: Stormwater management strategy. (Source: AECOM.)

Alternative B Landscape

The landscape revitalization that would be incorporated with the replacement of the plaza and planter waterproofing would include replacing plantings, paving, hardened planter walls, and ramps to improve views, access, security, structural conditions, and visitor experience (see Figure 2.26). An unobstructed, continuous and paved pedestrian loop would be provided for visitor access and service utility vehicles. Wider areas would allow for site furnishing, interpretation, and vendor venues. Public art and signs would provide way-finding and information about the mission of the museum.

At the main terrace level, the original seating-height elevation of the planter wall would be maintained, defining the edge of the main terrace paving at the upper level (see Figures 2.27-2.29). At the back of the sidewalk around the perimeter and grounds, a perimeter secure-height planter wall would be established. The wall elevation would change from west to east as the topography of the surrounding context drops from an at-grade relationship in varying rates and totals (for example, at the northeast corner grade drops some 2.9 meters (9.5 feet) from terrace to sidewalk). The horizontal planters step down along the back of the sidewalk, maintaining the minimum secure perimeter height requirement of 36 inches. The planter design and massing of the building platform would apply a 'ground level' approach to planters at six of the main museum ground entrances (north and south entrances, and the four corners), opening up the east and west ends of some planter massing (see Figures 30-41). Ground level planting beds would create soil root volume adequate for shade trees, connecting to continuous and contiguous sub-slab soil vaults (see Figure 2.42). The planter beds and retaining walls within the plaza would be constructed of the same cladding material selected for the facade to maintain their visual relationship and original design intent. Planting materials on the property would be designed to minimize visual impact on the building and views from the interior atriums as originally conceived. The *Delta Solar* sculpture would be moved slightly from its original location and the grove of trees north of the *Delta Solar* would be maintained. The *Ad Astra* sculpture would be shifted slightly to to north, remaining centered on the building. The *Continuum* sculpture, located at the south entrance and installed in 1976, would need to be moved if the south vestibule canopy is constructed, as the canopy would overalap with the sculpture in its current location. The sculpture would be relocated on the NASM site, in a location selected in consultation with the DC SHPO, U.S. Commission of Fine Arts, and National Capital Planning Commission. Alternative locations that are being considered are illustrated in Figure 2.43.

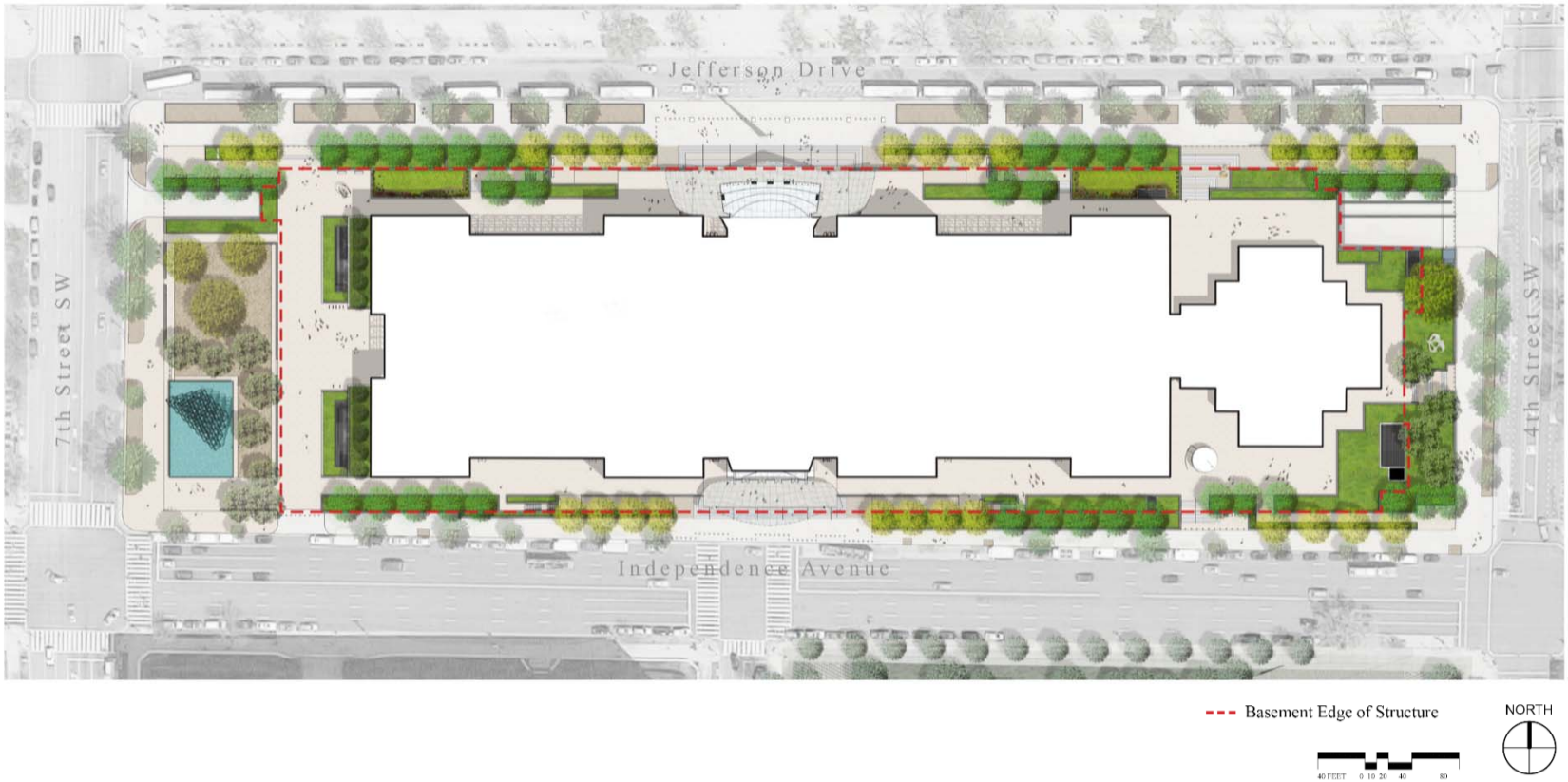


Figure 2. 26: Proposed Site Plan. (Source: AECOM.)

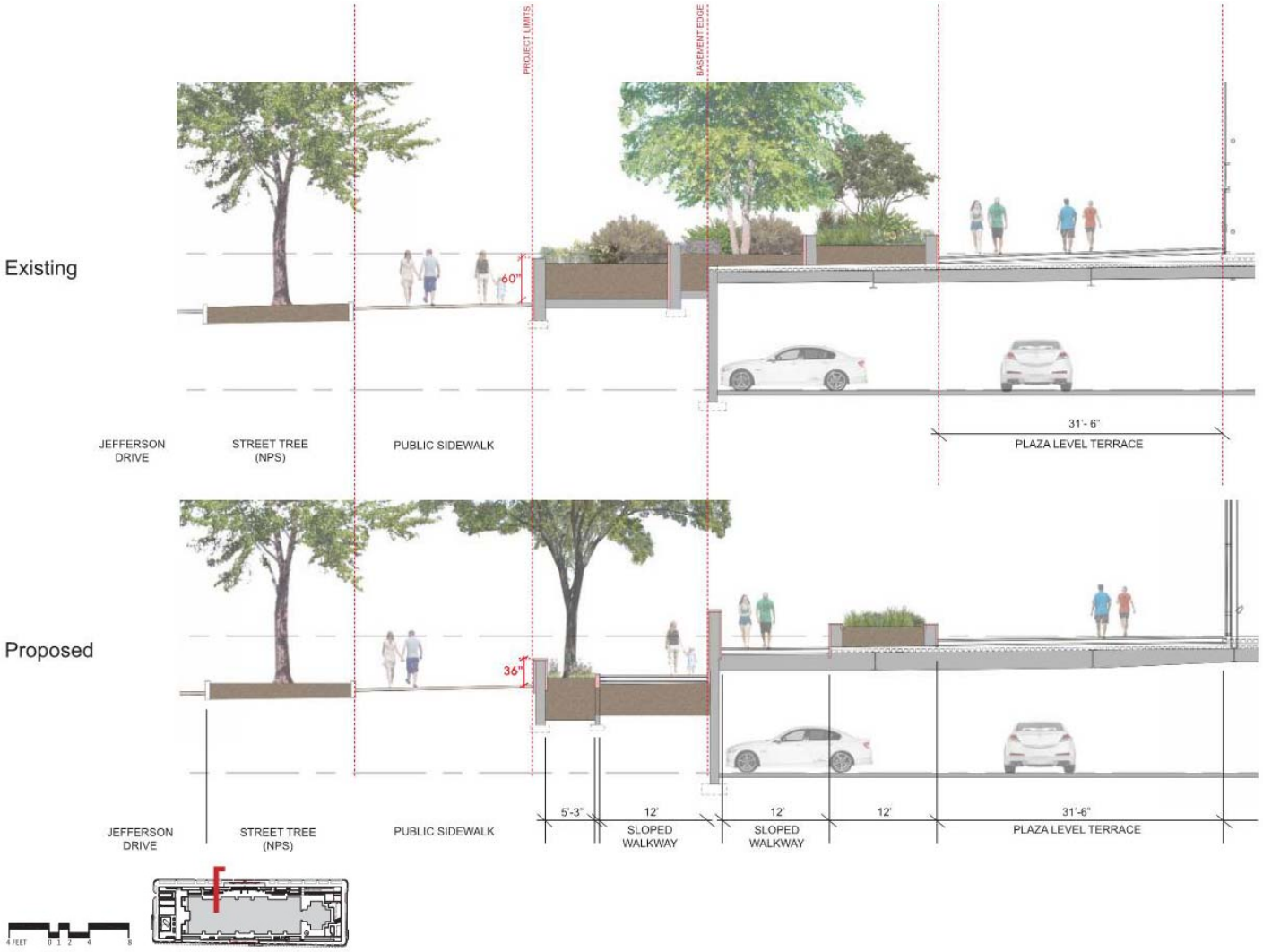


Figure 2. 27: North Entrance Section, Existing and Proposed Condition. (Source: AECOM.)

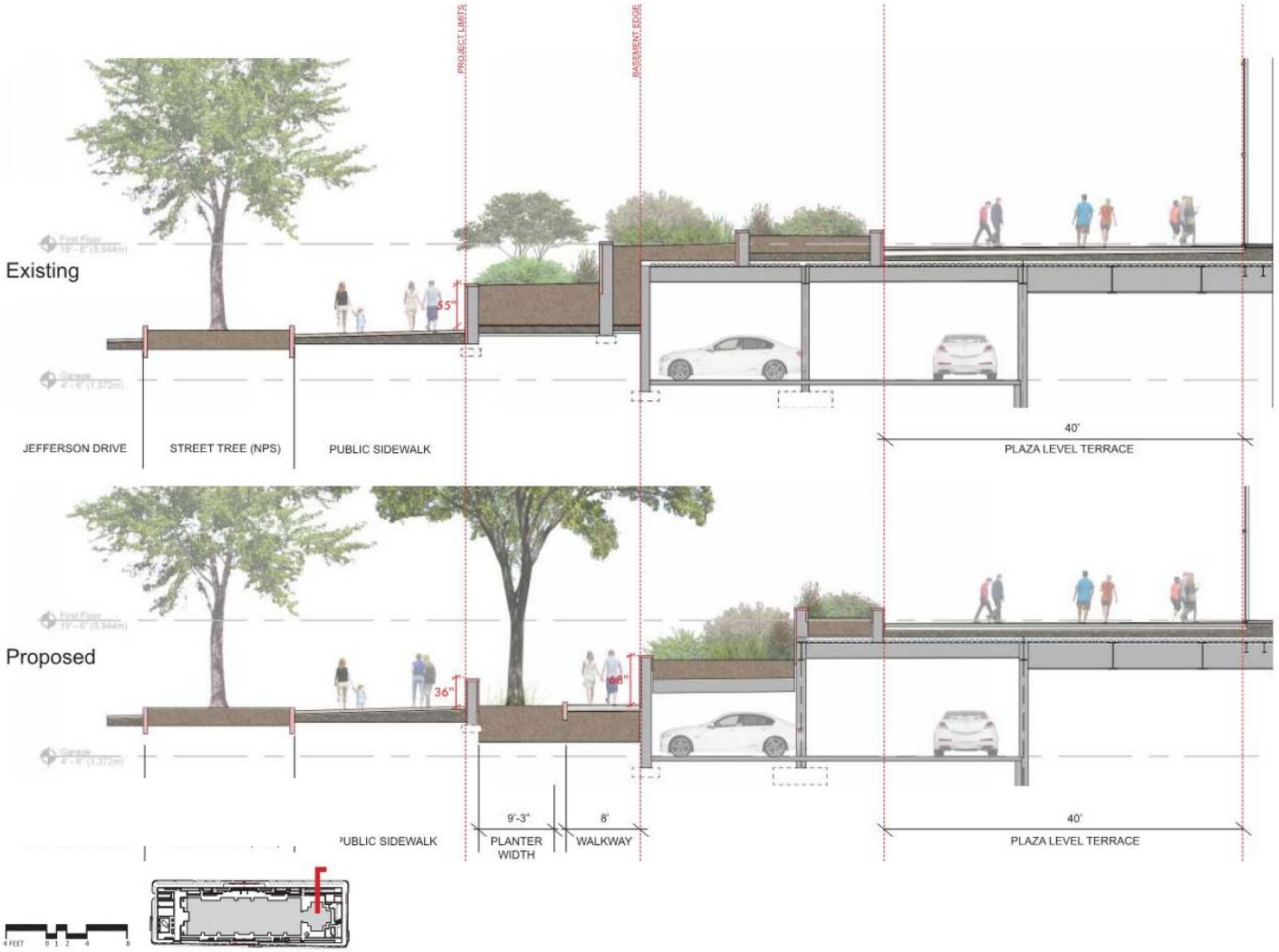


Figure 2. 28: Northeast Section, Existing and Proposed Condition. (Source: AECOM.)

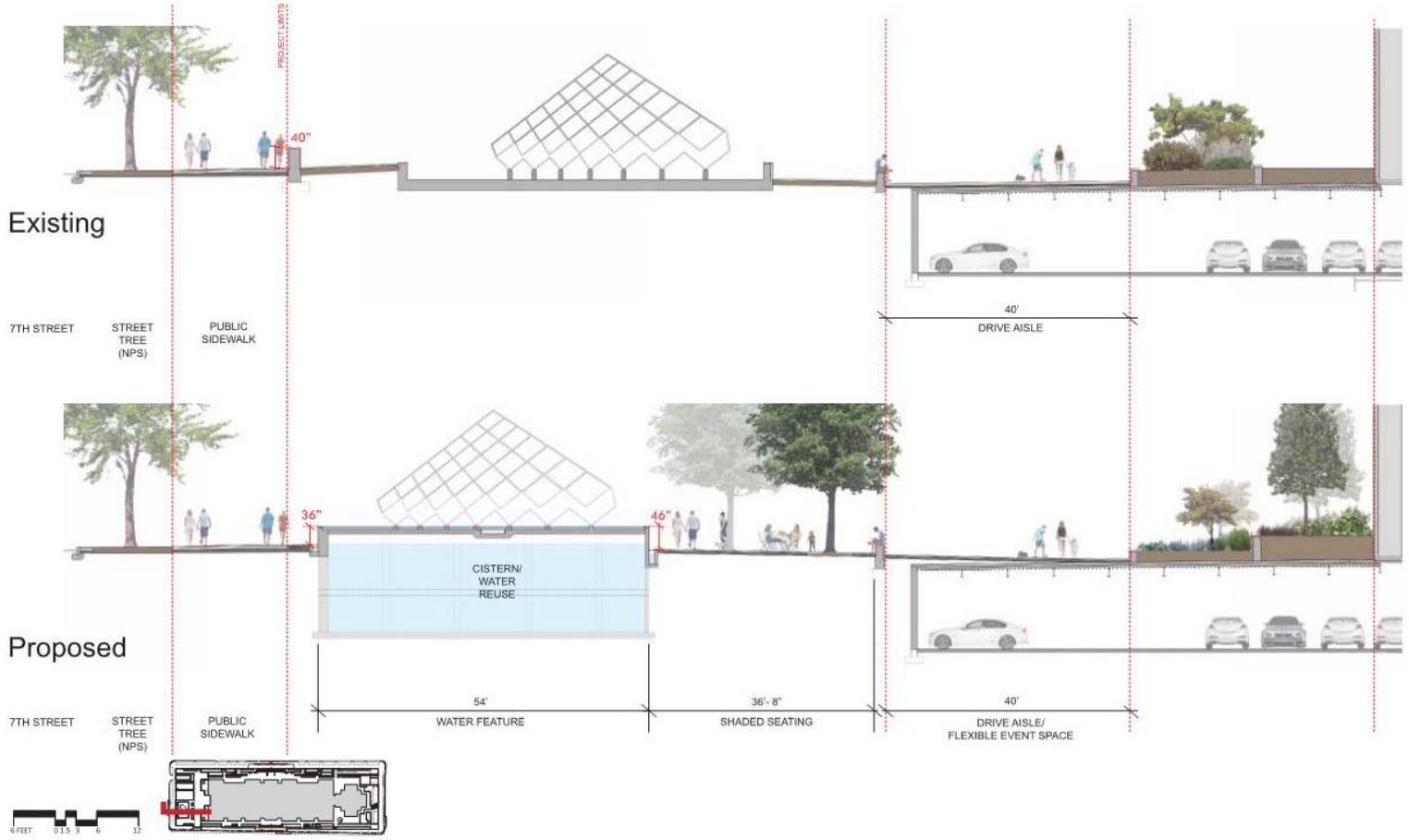


Figure 2. 29: Southwest Section, Existing and Proposed Condition (with Alternate Fountain). (Source: AECOM.)

Figure 2. 30: Existing northwest corner. (Source: AECOM.)

Figure 2. 31: Proposed northwest corner. (Source: AECOM.)

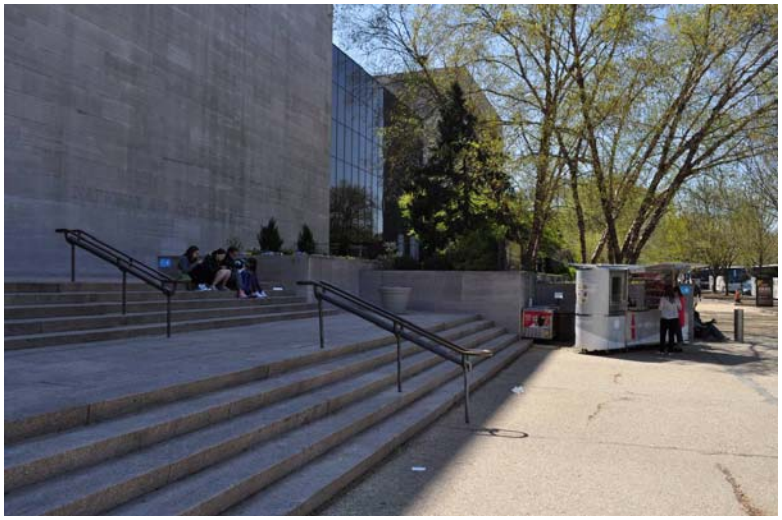


Figure 2. 32: Existing north entrance. (Source: AECOM.)

Figure 2. 33: Proposed north entrance. (Source: AECOM.)

Figure 2. 34: Existing northeast corner. (Source: AECOM.)

Figure 2. 35: Proposed northeast corner. (Source: AECOM.)

Figure 2. 36: Existing southeast corner. (Source: AECOM.)

Figure 2. 37: Proposed southeast corner. (Source: AECOM.)

Figure 2. 38: Existing south entrance. (Source: AECOM.)

Figure 2. 39: Proposed south entrance. (Source: AECOM.)

Figure 2. 40: Existing southwest corner. (Source: AECOM.)

Figure 2. 41: Proposed southwest corner. (Source: AECOM.)

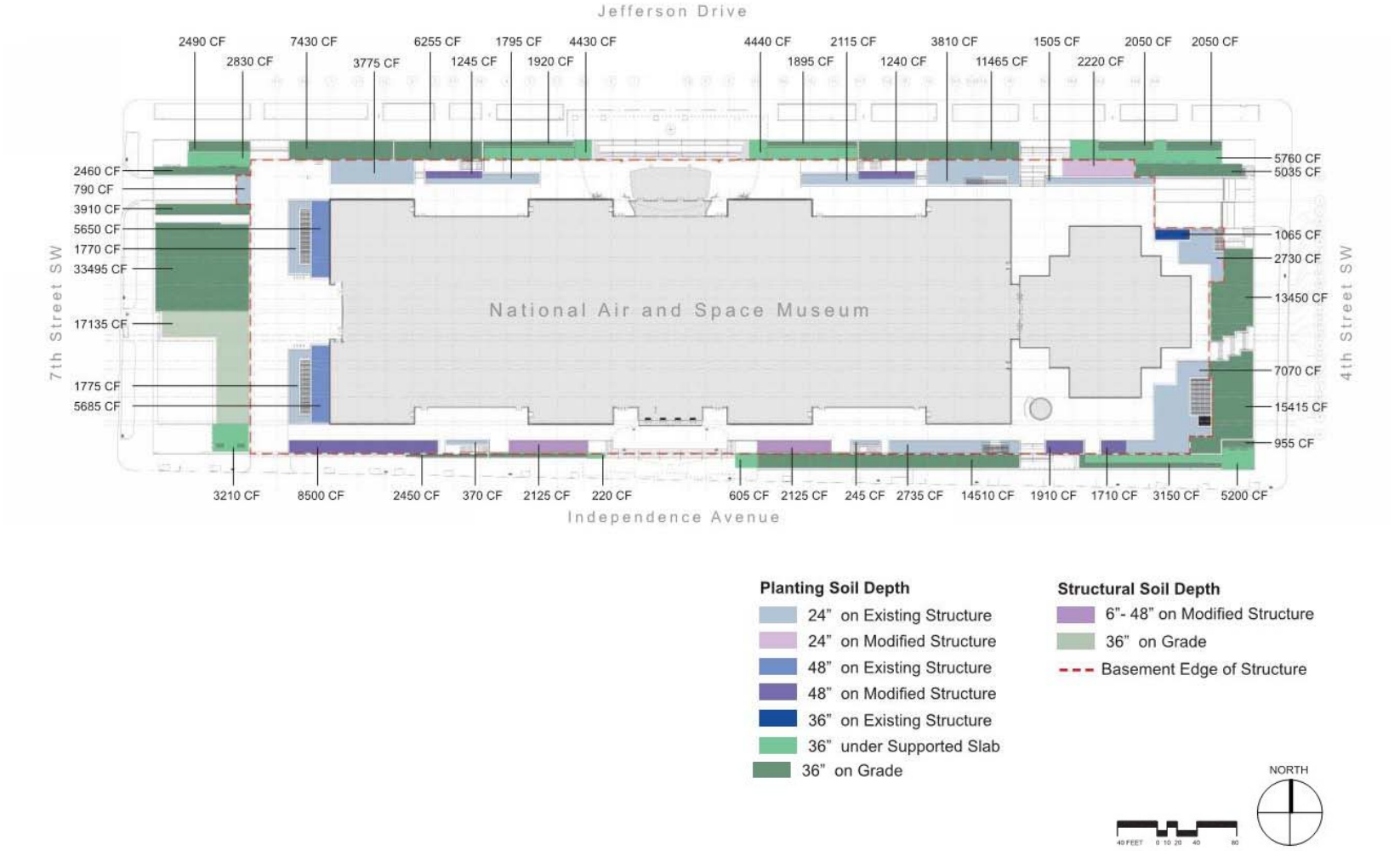


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Figure 2. 42: Planter Soil Depths and Volumes. (Source: AECOM.)

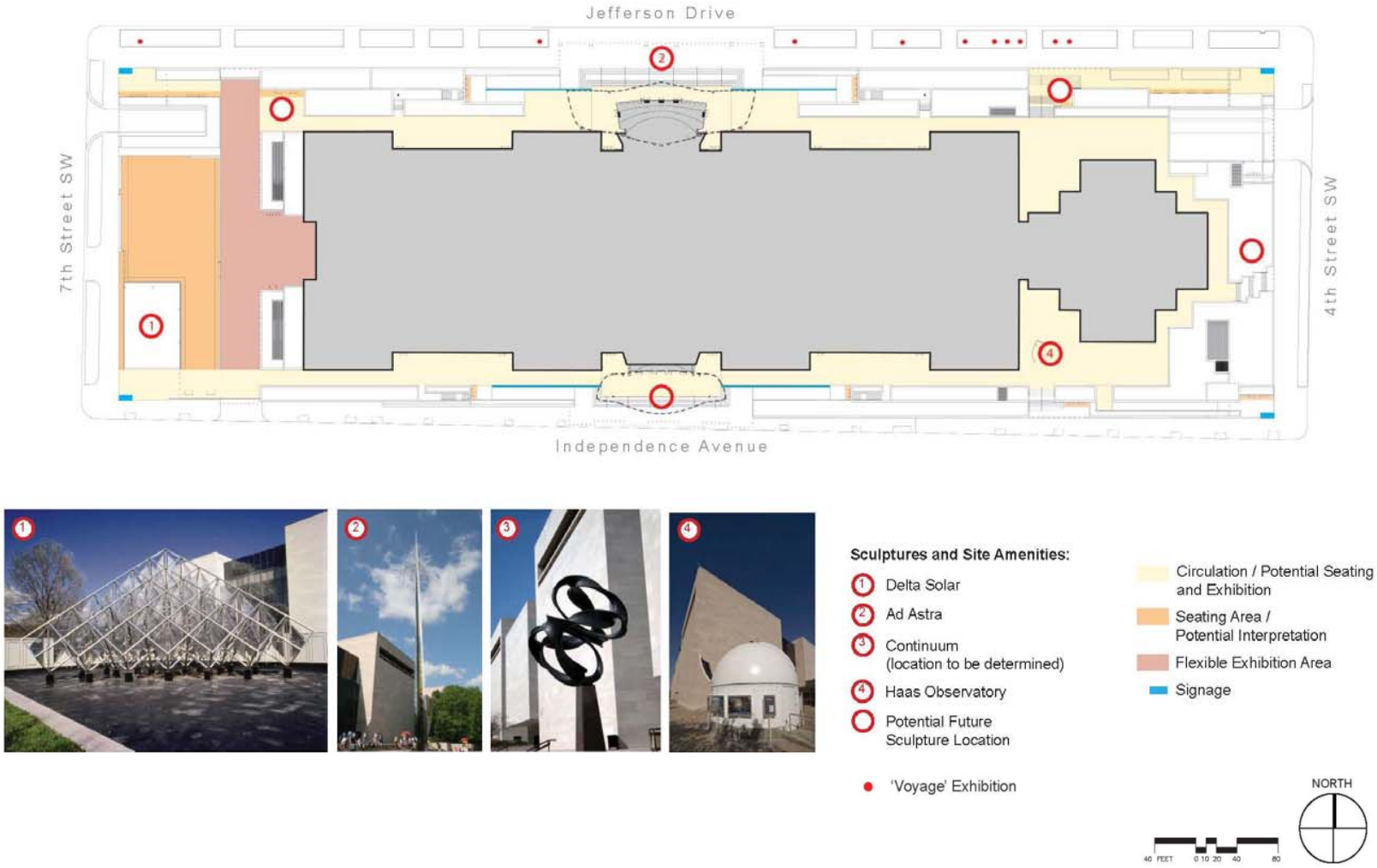

Figure 2. 43: Alternative locations being considered for *Continuum* sculpture relocation. (Source: QEA.)

Alternative C Replacement Cladding of Natural Stone

Alternative C Building Envelope

Alternative C would incorporate all of the building envelope revisions included in Alternative B, except that it would not replace the exterior cladding with Tennessee Pink marble to match the existing. Under Alternative C, the exterior cladding would be replaced with stone that has a color and pattern range similar to the existing cladding, and an appropriate thickness to ensure long-term durability, typically 3" for sedimentary stones under consideration (see Figure 2.44). Potential cladding options include limestone and granite. The existing Tennessee Pink marble would remain in the interior of the atriums, as is typical for all alternatives; therefore, the transition between the interior and exterior walls would require careful articulation.

From an aesthetic perspective, a limited number of alternatives have the striated patterns that closely resemble the sedimentary nature of the Tennessee Pink marble (limestone). The analysis will continue toward a recommendation of the most suitable alternate through a process including material testing, aesthetic mockup panels, and performance testing mockup.

Figure 2. 44: Rendering of replacement cladding of Natural Stone. (Source: QEA.)

Alternative B Building System

Alternative C would incorporate all of the building system revisions included in Alternative B.

Alternative C Landscape

Alternative C would incorporate all of the landscape revisions included in Alternative B.

Alternative D Replacement Cladding of Manufactured Material

Alternative D Building Envelope

Alternative D would incorporate all of the building envelope revisions included in Alternatives B and C, with the exception of the exterior cladding replacement stone. Under Alternative D, the exterior cladding would be replaced with a manufactured material, ultra high performance concrete (UHPC), designed to meet all of the performance requirements, including having a color and mineral quality that matches the original stone cladding as closely as possible (see Figure 4.45). Alternative D includes the reuse of a portion of the existing Tennessee Pink marble cladding as a fine aggregate in the UHPC that would be visible on the surface of the panel. The analysis will continue toward a recommendation of the most suitable alternate through a process including material testing, aesthetic mockup panels, and testing mockup panels.

Alternative D Building Systems

Alternative D would incorporate all of the building system revisions included in Alternatives B and C.

Alternative D Landscape

Alternative D would incorporate all of the landscape revisions included in Alternatives B and C.

Figure 2. 45: Rendering of replacement cladding of ultra high performance concrete (UHPC). (Source: QEA.)

Alternatives Considered and Dismissed

Exterior Cladding

The consideration of cladding alternatives included analysis of a wide range of options in order to find the material that best suits the extensive performance criteria. Both natural and man-made panel systems were studied, with metallic, ceramic, stone, engineered stone, and composites reviewed among others. Table 2.1: Exterior Wall Cladding Options contains data related to 15 options including eight stones, three metals (including titanium), two ceramics, and two concrete types. For each of the options, information related to aesthetics, structural performance, durability and maintenance, envelope performance, constructability, energy savings, and overall recommendations for use are presented.

Additional investigations led to the reduction of the list of exterior cladding options to five possibilities summarized in Table 2.2: Reduced List of Exterior Wall Cladding Options Considered. With the determination that some form of stone would be the most appropriate replacement material, the focus narrowed to consideration of the appearance of the applied material and its ability to most closely represent the original appearance. Alternatives addressing the color and pattern ranges of the stone were scrutinized. This process of elimination resulted in the action alternatives presented in this EA. The environmental effects of using stone are considered similar and thus, with the exception of the original Tennessee Pink marble (limestone) (Alternative B), are grouped together as Alternative C. Identification of manufactured materials that would closely emulate stone resulted in development of Alternative D.

Angled Plane Vestibules

The north vestibule design developed as part of an "Angled Plane" concept included an orthogonal curtain wall enclosed pavilion with a building integrated photovoltaic (BIPV) patterned skylight and flanking canopies with a green roof (see Figure 2.46). A south vestibule was similarly developed as part of this scheme. This option was dismissed in favor of the recommended vestibule design due to the greater expression of the mission of the museum in the latter design.

Figure 2. 46: Angled Plane Vestibule design concept rendering. (Source: QEA.)

South Wall Energy Harvesting

A variety of options for solar energy harvesting at the south wall of the building were explored. All south wall energy harvesting was dismissed as it was considered too much of a change in character to the existing building by DC SHPO.

One option proposed a coplanar application of BIPV's on the entire south facade. This was dismissed because it was considered aesthetically oppressive and inconsistent with the volumetric massing of the original design concept (see Figure 2.47).

The south wall energy harvesting option developed as part of the "Angled Plane" design consisted of a variety of methods by which BIPV's could be integrated into the building envelope. This included BIPV's being interspersed coplanar with the replacement stone panels, as well being installed on an offset frame the extended out to create a canopy that offered shade at the plaza level (see Figure 2.48). This option was dismissed because the panels created a form of ornament that would distract from the originally intended simple massing of the building

Other south wall energy harvesting options included individual offset panels that were installed at different angles to evoke the image of dynamic soaring (see Figures 2.49-50). The panels were supported by brackets that slotted between the stone panels to the rainscreen frame beyond. This option was dismissed because it required an investment in a full façade of stone cladding, as well as the cost of PV’s cantilevered from the building.

A predecessor of the recommended option proposed terra cotta colored BIPV’s on the partial height pavilions, alternating with the stone cladding to be applied on the adjacent full height pavilions (see Figure 2.51). This option was dismissed because the planar application was too much of a departure from the volumetric massing of the original design concept and the terra cotta color was incongruous with the adjacent cladding.

Figure 2. 47: Coplanar application of BIPV's on the entire south facade was dismissed because it was considered aesthetically oppressive and inconsistent with the volumetric massing of the original design concept. (Source: QEA.)

Figure 2. 48: The "Angled Plane" south wall energy harvesting concept included BIPV's interspersed with replacement stone panels, and installed on an offset frame the extended out to create a canopy that offered shade at the plaza level. This option was dismissed because the panels created a form of ornament that would distract from the originally intended simple massing of the building. (Source: QEA.)

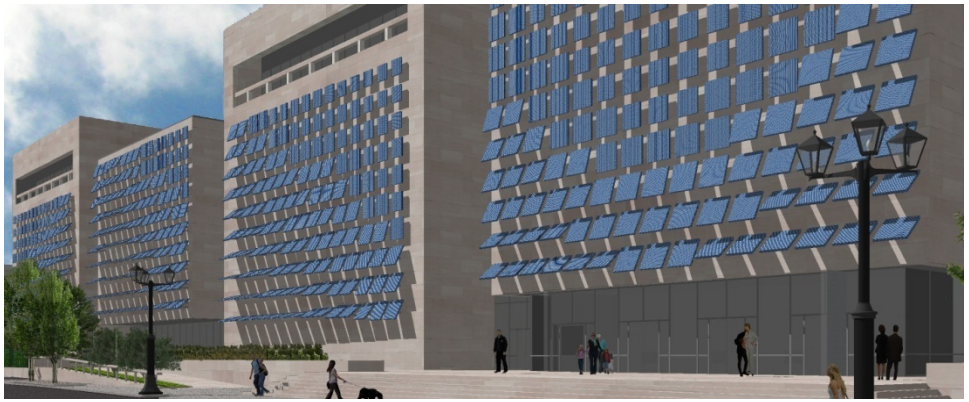

Figure 2. 49: Offset panels installed at different angles to evoke the image of dynamic soaring. This option was dismissed because it required an investment in a full façade of stone cladding, as well as the cost of PV's cantilevered from the building. (Source: QEA.)

Figure 2. 50: Terra cotta colored BIPV's on the partial height pavilions alternate with the stone cladding to be applied on the adjacent full height pavilions. This option was dismissed because the planar application was too much of a departure from the volumetric massing of the original design concept and the terra cotta color was incongruous with the adjacent cladding. (Source: QEA.)

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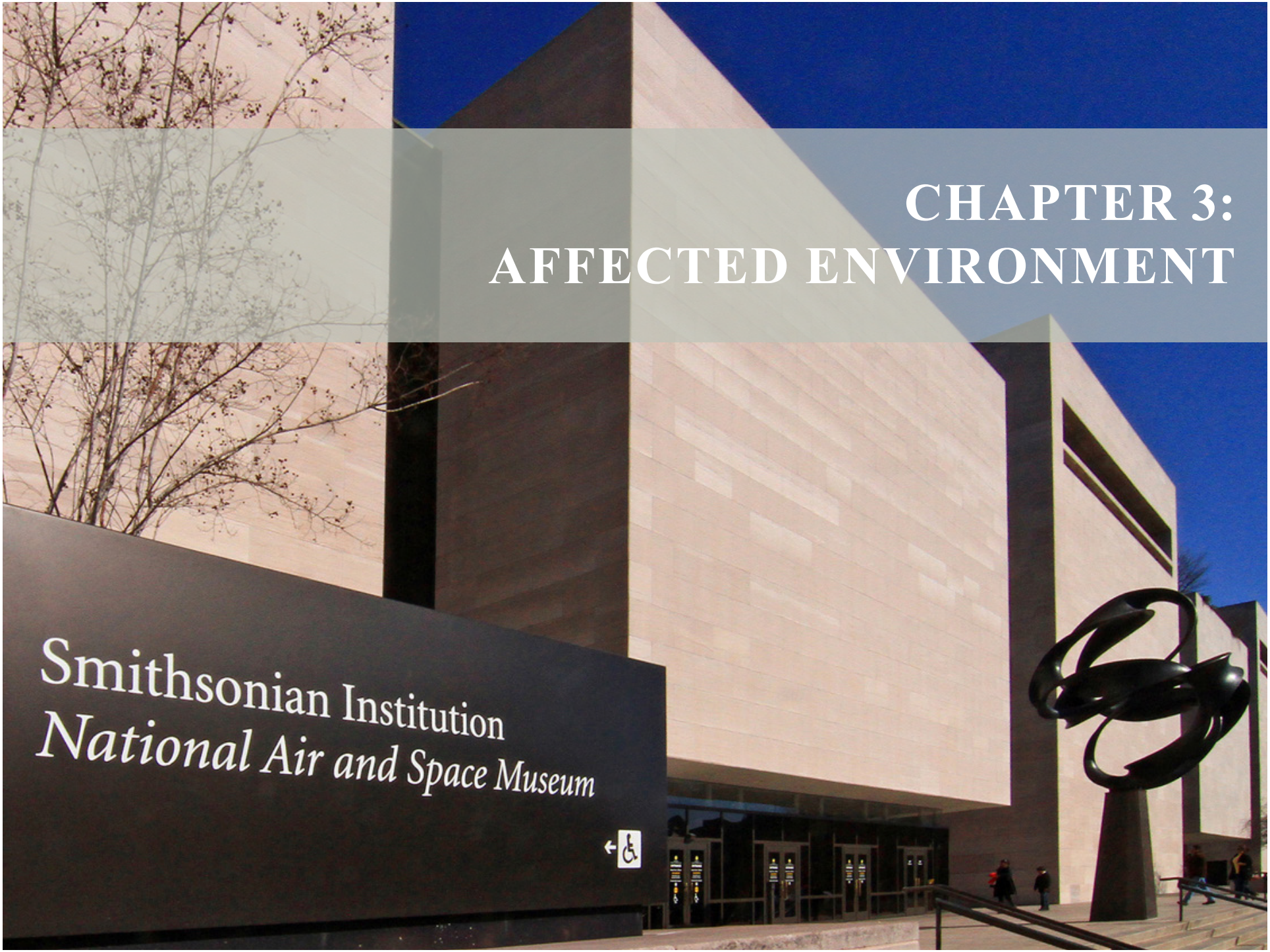
EXTERIOR WALL CLADDING OPTIONS															
	NATURAL MATERIALS								MAN-MADE MATERIALS						
	REPLACEMENT IN KIND	STONE							METALS			CERAMICS		CONCRETE	
	ENV-3B	ENV-3D			ENV-4	ENV-5	N/A	N/A	N/A	N/A	ENV-8	N/A	ENV-10	N/A	N/A
CLADDING MATERIAL	2 1/2" TN PINK MARBLE	ECHO LAKE GRANITE	STONY CREEK GRANITE	SALMON TROPICAL GRANITE	NEW STONE ON HONEYCOMB CORE	REMILLED EXISTING STONE ON HONEYCOMB CORE	GEORGIA PINK MARBLE	TUSCARORA SANDSTONE	ALUMINUM PANELS	PORCELAIN ENAMEL PANELS	TITANIUM PANELS	TERRA COTTA	PORCELAIN TILE	PRECAST CONCRETE	POLYMER-BASED CONCRETE
AESTHETICS															
MAINTAINS EXISTING APPEARANCE	YES	SIMILAR	SIMILAR	SIMILAR	SIMILAR	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO
2'-6 X 5'-0" MODULE AVAILABLE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES
ACCEPTABLE COLOR RANGE	LIKELY	YES	YES	LIKELY	SIMILAR	LIKELY	NO	NO	NO	SIMILAR	N/A	NO	SIMILAR	YES	NO
ACCEPTABLE TEXTURE	YES	YES	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	SIMILAR	SIMILAR
AGENCY APPROVAL PROCESS	LEAST CHALLENGING	MORE CHALLENGING	MORE CHALLENGING	MORE CHALLENGING	MORE CHALLENGING	LEAST CHALLENGING	MOST CHALLENGING	MOST CHALLENGING	MOST CHALLENGING	MOST CHALLENGING	MOST CHALLENGING	MOST CHALLENGING	MOST CHALLENGING	MOST CHALLENGING	MOST CHALLENGING
ANTICIPATED PLANE CHANGE (OUTSIDE EXISTING FACE)	3"	2 1/4"	2 1/4"	2 1/4"	2 - 1/8"	2 - 1/8"	YES	3"	1 3/4"	1 3/4	1 3/4"	YES	1 1/2"	2"+	2"+
STRUCTURAL PERFORMANCE															
CLADDING MEETS BLAST DESIGN CRITERIA	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO
OBTAINING SUFFICIENT FLEXURAL AND ANCHORAGE STRENGTH	VARIABLE – NATURAL MATERIAL	VARIABLE – NATURAL MATERIAL	VARIABLE – NATURAL MATERIAL	VARIABLE – NATURAL MATERIAL	CONTROLLED – MANUFACTURED MATERIAL	CONTROLLED – MANUFACTURED MATERIAL	VARIABLE – NATURAL MATERIAL	VARIABLE – NATURAL MATERIAL	CONTROLLED – MANUFACTURED MATERIAL	CONTROLLED – MANUFACTURED MATERIAL	CONTROLLED – MANUFACTURED MATERIAL	CONTROLLED – MANUFACTURED MATERIAL	CONTROLLED – MANUFACTURED MATERIAL	CONTROLLED – MANUFACTURED MATERIAL	CONTROLLED – MANUFACTURED MATERIAL
REINFORCEMENT FOR WEIGHT (CLADDING WIND PRESSURE INCLUDED)	REQUIRED	REQUIRED	REQUIRED	REQUIRED	NONE	NONE	REQUIRED	REQUIRED	NONE	NONE	NONE	REQUIRED	NONE	REQUIRED	REQUIRED
REINFORCEMENT FOR SEISMIC	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED
REINFORCEMENT FOR WIND	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED
DURABILTIY AND MAINTENANCE															
EXPECTED CLADDING MATERIAL LIFESPAN	100 YEARS	100 YEARS	100 YEARS	100 YEARS	>40 YEARS	UNKNOWN	100 YEARS	100 YEARS	50+ YEARS	50+ YEARS	UNKNOWN	50+ YEARS	40+ YEARS	50+ YEARS	50+ YEARS
EASE OF MAINTENANCE/SELECTIVE REPLACEMENT	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE
ENVELOPE PERFORMANCE															
INCORPORATING THERMAL BREAKS	TECHNICALLY CHALLENGING, WILL INCREASE WALL SECTION	TECHNICALLY CHALLENGING, WILL INCREASE WALL SECTION	TECHNICALLY CHALLENGING, WILL INCREASE WALL SECTION	TECHNICALLY CHALLENGING, WILL INCREASE WALL SECTION	SIMILAR TO OTHER BACKUP SYSTEMS	SIMILAR TO OTHER BACKUP SYSTEMS	TECHNICALLY CHALLENGING, WILL INCREASE WALL SECTION	TECHNICALLY CHALLENGING, WILL INCREASE WALL SECTION	SIMILAR TO OTHER BACKUP SYSTEMS	SIMILAR TO OTHER BACKUP SYSTEMS	SIMILAR TO OTHER BACKUP SYSTEMS	SIMILAR TO OTHER BACKUP SYSTEMS	SIMILAR TO OTHER BACKUP SYSTEMS	SIMILAR TO OTHER BACKUP SYSTEMS	SIMILAR TO OTHER BACKUP SYSTEMS
CONSTRUCTIBILITY															
EASE TO MEET MOUNTING TOLERANCES	DIFFICULT	MORE DIFFICULT	MORE DIFFICULT	MORE DIFFICULT	SYSTEM SHOULD PROVIDE FOR MORE ADJUSTABILITY	SYSTEM SHOULD PROVIDE FOR MORE ADJUSTABILITY	DIFFICULT	DIFFICULT	SYSTEM SHOULD PROVIDE FOR MORE ADJUSTABILITY	SYSTEM SHOULD PROVIDE FOR MORE ADJUSTABILITY	SYSTEM SHOULD PROVIDE FOR MORE ADJUSTABILITY	DIFFICULT	SYSTEM SHOULD PROVIDE FOR MORE ADJUSTABILITY	DIFFICULT	DIFFICULT
QUALITY CONTROL OF PANEL MATERIALS, FABRICATION, AND INSTALLATION	MOST CHALLENGING	CHALLENGING	CHALLENGING	CHALLENGING	CHALLENGING	MOST CHALLENGING	CHALLENGING	CHALLENGING	LEAST CHALLENGING	LEAST CHALLENGING	LEAST CHALLENGING	LEAST CHALLENGING	LEAST CHALLENGING	LEAST CHALLENGING	LEAST CHALLENGING
MATERIAL HANDLING ON-SITE	LIFTING AID	LIFTING AID	LIFTING AID	LIFTING AID	HAND CARRY	HAND CARRY	LIFTING AID	LIFTING AID	HAND CARRY	HAND CARRY	HAND CARRY	LIFTING AID	HAND CARRY	LIFTING AID	HAND CARRY
ENERGY SAVINGS (% OVER BASELINE)															
SITE (kBtu) %	1.0%	1.0%	NOT EVALUATED	NOT EVALUATED	1.3%	1.3%	NOT EVALUATED	NOT EVALUATED	NOT EVALUATED	NOT EVALUATED	1.0%	NOT EVALUATED	1.0%	NOT EVALUATED	NOT EVALUATED
SOURCE (kBtu) %	1.0%	1.0%	NOT EVALUATED	NOT EVALUATED	1.1%	1.1%	NOT EVALUATED	NOT EVALUATED	NOT EVALUATED	NOT EVALUATED	1.0%	NOT EVALUATED	1.0%	NOT EVALUATED	NOT EVALUATED
CO_2 (lbs CO_2) %	1.0%	1.0%	NOT EVALUATED	NOT EVALUATED	1.1%	1.1%	NOT EVALUATED	NOT EVALUATED	NOT EVALUATED	NOT EVALUATED	1.0%	NOT EVALUATED	1.0%	NOT EVALUATED	NOT EVALUATED
UTILITY COST ($) %	1.3%	1.3%	NOT EVALUATED	NOT EVALUATED	1.4%	1.4%	NOT EVALUATED	NOT EVALUATED	NOT EVALUATED	NOT EVALUATED	1.3%	NOT EVALUATED	1.3%	NOT EVALUATED	NOT EVALUATED
RECOMMENDATIONS															
VIABLE ENVELOPE SYSTEM	YES	YES	YES	YES	YES	UNKNOWN	YES	YES	YES	YES	YES	YES	YES	YES	YES
RECOMMENDED ENVELOPE SYSTEM	YES	YES	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO

Table 2. 1: Selected Exterior Wall Cladding Options Considered. (Source: QEA.)

EXTERIOR WALL CLADDING OPTIONS					
	ENV-3A	ENV-3B	ENV-3C	ENV-3D	ENV-8
CRITERIA	REPLACE EXISTING STONE W/ NEW 2" TN MARBLE	REPLACE EXISTING STONE W/ NEW 2 1/2" TN MARBLE	REPLACE EXISTING STONE W/ NEW 3" TN MARBLE	REPLACE EXISTING STONE W/ NEW 1 3/4" GRANITE	REPLACE EXISITNG STONE W/ TITANIUM PANELS
AESTHETICS					
MAINTAINS EXISTING APPEARANCE	YES	YES	YES	SIMILAR	NO
ACCEPTABLE COLOR RANGE	LIKELY	LIKELY	LIKELY	SIMILAR	N/A
AGENCY APPROVAL PROCESS	LEAST CHALLENGING	LEAST CHALLENGING	LEAST CHALLENGING	MORE CHALLENGING	MOST CHALLENGING
ANTICIPATED PLANE CHANGE (OUTSIDE EXISTING FACE)	2 1/2"	3"	3 1/2"	2 1/4"	1 3/4"
STRUCTURAL PERFORMANCE					
CLADDING MEETS BLAST DESIGN CRITERIA	NO	NO	NO	NO	NO
OBTAINING SUFFICIENT FLEXURAL AND ANCHORAGE STRENGTH	VARIABLE – NATURAL MATERIAL	VARIABLE – NATURAL MATERIAL	VARIABLE – NATURAL MATERIAL	VARIABLE – NATURAL MATERIAL	CONTROLLED – MANUFACTURED MATERIAL
REINFORCEMENT FOR WEIGHT (CLADDING WIND PRESSURE INCLUDED)	REQUIRED	REQUIRED	REQUIRED	REQUIRED	NONE
REINFORCEMENT FOR BLAST	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED
REINFORCEMENT FOR SEISMIC	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED
REINFORCEMENT FOR WIND	REQUIRED	REQUIRED	REQUIRED	REQUIRED	REQUIRED
DURABILTIY AND MAINTENANCE					
EXPECTED CLADDING MATERIAL LIFESPAN	100 YEARS	100 YEARS	100 YEARS	100 YEARS	UNKNOWN
EASE OF MAINTENANCE/SELECTIVE REPLACEMENT	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE	POSSIBLE
ENVELOPE PERFORMANCE					
INCORPORATING THERMAL BREAKS	TECHNICALLY CHALLENGING, WILL INCREASE WALL SECTION	TECHNICALLY CHALLENGING, WILL INCREASE WALL SECTION	TECHNICALLY CHALLENGING, WILL INCREASE WALL SECTION	TECHNICALLY CHALLENGING, WILL INCREASE WALL SECTION	SIMILAR TO OTHER BACKUP SYSTEMS
CONSTRUCTIBILITY					
HOW EASY IS IT TO MEET MOUNTING TOLERANCES	MORE DIFFICULT	DIFFICULT	DIFFICULT	MORE DIFFICULT	SYSTEM SHOULD PROVIDE FOR MORE ADJUSTABILITY
QUALITY CONTROL OF PANEL MATERAILS, FABRICATION, AND INSTALLATION	MOST CHALLENGING	CHALLENGING	CHALLENGING	CHALLENGING	LEAST CHALLENGING
MATERIAL HANDLING ON-SITE	LIFTING AID	LIFTING AID	LIFTING AID	LIFTING AID	HAND CARRY
ENERGY SAVINGS (% OVER BASELINE)					
SITE (kBtu) %	1.0%	1.0%	1.0%	1.0%	1.0%
SOURCE (kBtu) %	1.0%	1.0%	1.0%	1.0%	1.0%
CO_2 (lbs CO_2) %	1.0%	1.0%	1.0%	1.0%	1.0%
UTILITY COST ($) %	1.3%	1.3%	1.3%	1.3%	1.3%
RECOMMENDATIONS					
VIABLE ENVELOPE SYSTEM	YES	YES	YES	YES	YES
RECOMMENDED FOR ADDITIONAL STUDY	YES	YES	YES	YES	NO

Table 2. 2: Reduced List of Exterior Wall Cladding Options Considered. (Source: QEA.)

CHAPTER 3: AFFECTED ENVIRONMENT



CHAPTER 3: AFFECTED ENVIRONMENT

Introduction

Specific impact topics are identified in this chapter for analysis and to allow comparison of the environmental consequences of each treatment alternative. Impact topics that are analyzed for this project are: historic resources, visual resources, visitor experience, circulation, planning policies, sustainability, air quality, noise levels, vegetation, climate change, carbon footprint, stormwater management, floodplains, topography, solid waste, and hazardous materials and waste.

Impact topics that are likely to be dismissed from further analysis in this document are: land use, environmental justice, economic impact, archaeological resources, lightscape management, surface water, wetlands, geology, soils, wildlife, water supply, and special status species.

A brief rationale for the selection of each impact topic is given below, as well as the rationale for dismissing specific topics from further consideration.

Impact Topics Addressed

Impact topics are resources of concern that would be affected, either beneficially or adversely, by the range of alternatives. Impact topics were identified based on federal laws, regulations, Executive Orders, and Smithsonian Institution (SI) and National Capital Planning Commission (NCPC) knowledge of limited or easily impacted resources. Specific impacts were addressed to ensure the alternatives were compared based on the most relevant topics. Impact topics included in this document were analyzed to compare the environmental consequences of the No Action Alternative with the action alternatives.

Historic Resources

The National Air and Space Museum (NASM) contributes to the National Mall Historic District (see Figure 1.4).[1] SI is currently preparing a Determination of Eligibility (DOE) to establish the building's eligibility for individual listing. It is expected that the DOE will be finalized in Fall 2017. Changes to the building's overall appearance require careful scrutiny of potential impacts to the integrity of the building or the Mall.

[1] Smithsonian Institution, *Smithsonian Directive 418: Smithsonian Institution Historic Preservation Policy* (Washington, D.C., April 18, 2005).

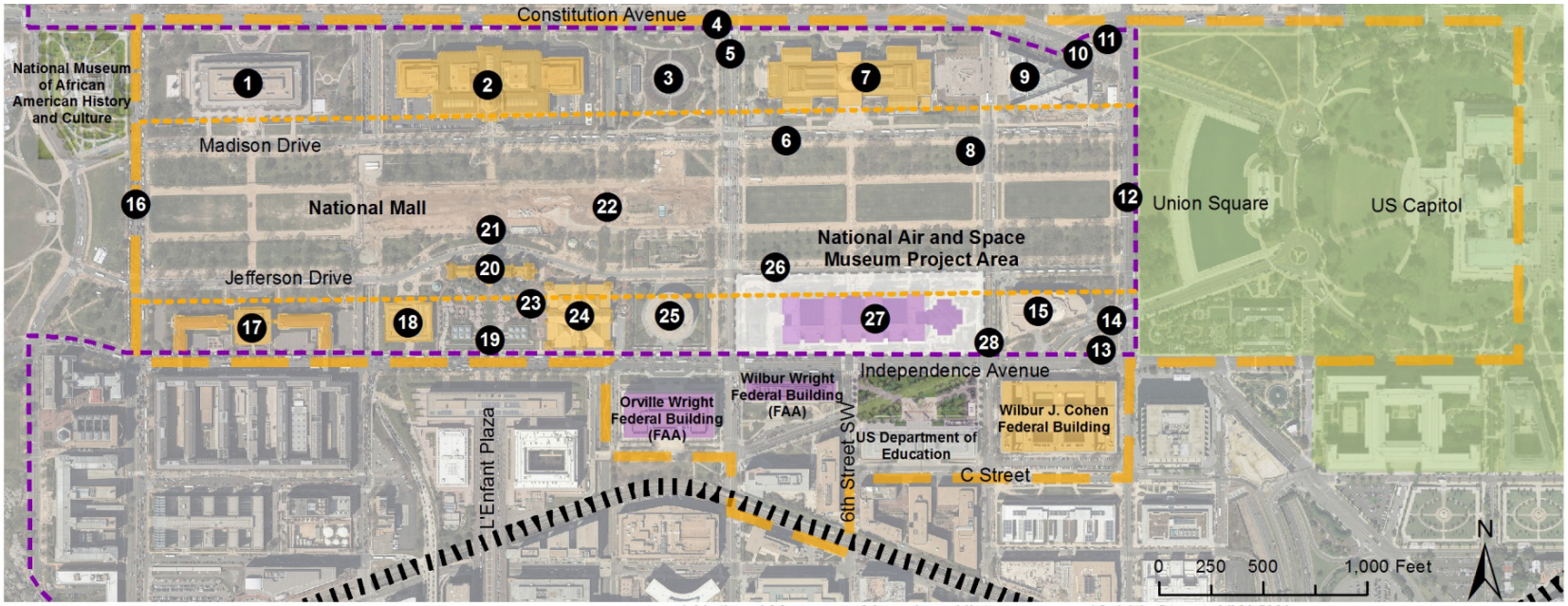
The intent of the original design was to create a building in harmony with the character of the National Mall, reflecting the architectural elements of the surrounding buildings, while also pursuing modern architectural principles. The concept of four large marble-clad pavilions separated by three recessed steel-and-glass atria reflects the neighboring buildings, in particular the National Galley West Building. The alteration of solids and voids are placed and proportioned to respond to corresponding projections and recesses of the National Gallery West, located directly across the Mall. The equivalent volumes facing Independence Avenue include cantilevered marble cubes flush with the south façade. Use of Tennessee Pink marble (limestone) cladding matches that used for the National Gallery West. The treatment of positive and negative space also relates to the Freer Gallery. The long slit of balconies and recessed windows create dramatic shadows that act like inverted cornice lines, responding to the form of the Hirshorn Museum.

Area of Potential Effects

The area of potential effects (APE) is the area in which eligible properties may be affected by an undertaking, including direct effects (such as destruction of the property) and indirect effects (such as visual, audible, and atmospheric changes which affect the character and setting of the property).[2]

The APE for historic resources encompasses the project area as well as adjacent areas in which views of the project could have an effect on historic resources. Therefore, the APE for historic resources related to NASM includes the area bounded on the north by Constitution Avenue NW, on the east by the east elevation of the U.S. Capitol Building, and on the west by 14th Street NW and SW. Independence Avenue SW defines the south boundary between 14th Street NW and 9th Street SW and again between 3rd Street NW and the east elevation of the U.S. Capitol Building. Between 9th Street SW and 3rd Street SW, the boundary shifts to the south to accommodate views from adjacent buildings and the elevated railroad track (see Figure 3.1).

[2] U.S. Department of the Interior, National Park Service, *National Register Bulletin: Defining Boundaries for National Register Properties* (Washington, D.C., 1997).



National Air and Space Museum Project Area
Area of Potential Effects
McMillan Line
Building Individually Listed on National Register
Building Determined Eligible for National Register
National Mall Historic District
Contributing feature to National Mall Historic District
Elevated Railroad
Exempt properties important to the historical extent and design of the National Mall

1 National Museum of American History
2 National Museum of Natural History
3 Natural Gallery of Art Sculpture Garden
4 Bulfinch Gatepost
5 7th Street, NW-SW
6 Madison Drive
7 National Gallery of Art West Building
8 National Grange Marker
10 Pennsylvania Avenue, NW
11 Reservation No. 553
12 3rd Street, SW
13 Reservation No. 201
14 Maryland Avenue, SW
15 National Museum of the American Indian
16 14th Street, NW-SW
17 US Department of Agriculture Administration Building
18 Freer Gallery of Art
19 Quadrangle
20 Smithsonian Institution Building (Castle)
21 Joseph Henry Memorial
22 Mall (Reservation Nos. 3-6A)
23 Downing Urn
24 Arts and Industries Building
25 Hirshhorn Museum and Sculpture Garden
26 Jefferson Drive
27 National Air and Space Museum
28 4th Street, SW

Figure 3. 1: Area of Potential Effects. (Source: Google Earth and QEA.)

Building Envelope Condition

Exterior Cladding Condition

The existing exterior walls consist of a 1 1/4" (32mm) thick Tennessee Pink Marble (limestone) barrier wall system with backer rod and sealant filling the joints between 2'-6" (610mm) tall x 5'-0" (1220mm) wide panels and spray-applied urethane foam insulation covering the back of the stone (see Figure 3.2). A vertical plenum within the wall cavity provides air flow through the interstitial space.

The stone facade must be removed for several reasons. Extensive warping ("hysteresis") and cracking is irreversible as exacerbated by the spray-foam insulation applied to the back of the stone panels, introducing a risk that some of the stone panels could fall from the building; temporary protection has been installed where needed to protect people from this risk (see Figure 3.3). The existing exterior wall construction does not provide adequate resistance to water penetration or air infiltration. It also lacks effective flashings and does not include any means for air barrier continuity between the exterior walls and other building envelope systems (curtain wall, skylight, roofing, or soffits).

Further, the reintroduction of mechanically-controlled humidification will create significant potential for condensation within the wall cavities inboard of the exterior wall assembly (particularly those used as return air plenums for the HVAC system) and this will drive certain design decisions related to the exterior wall concept.

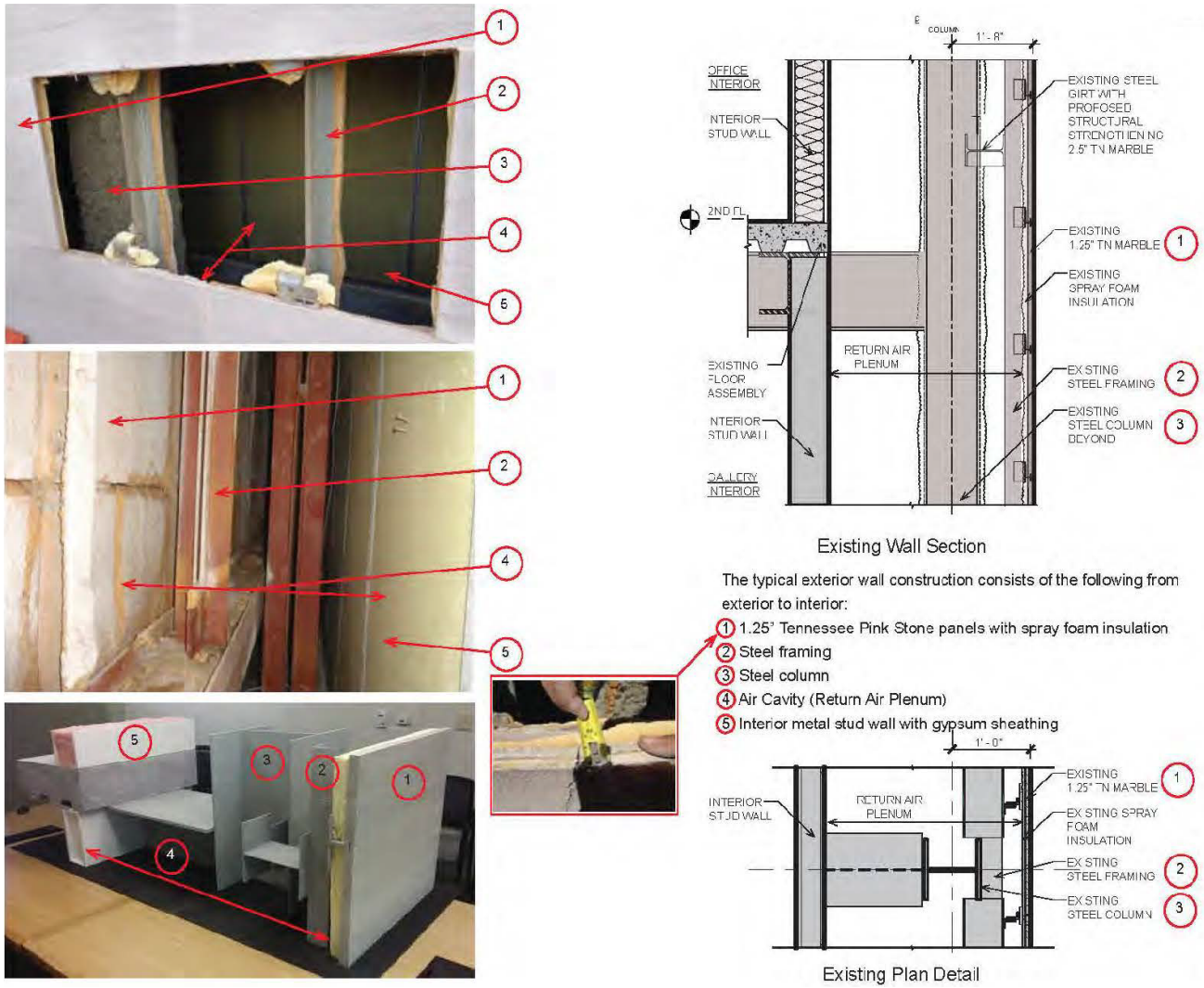


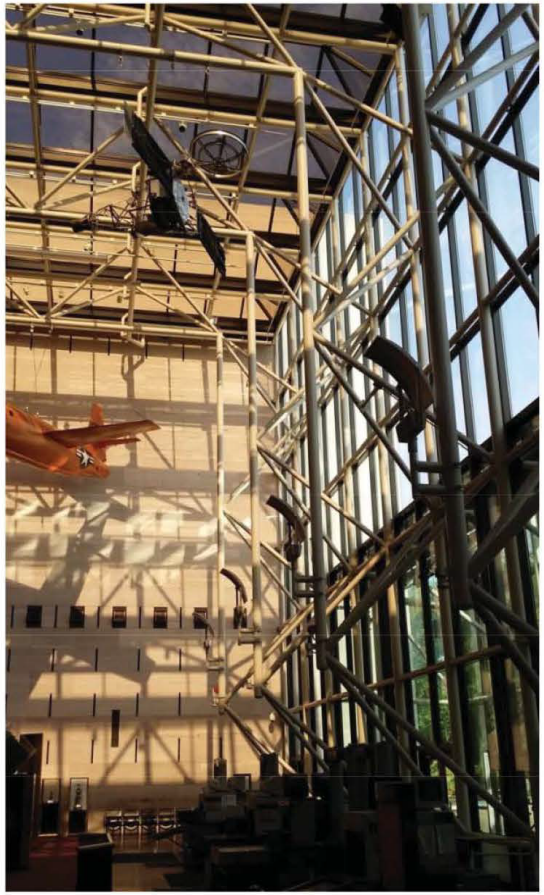
Figure 3. 2: Existing Wall Condition. (Source: QEA.)

Figure 3. 3: Warped Stone Panels on West façade. (Source: QEA.)

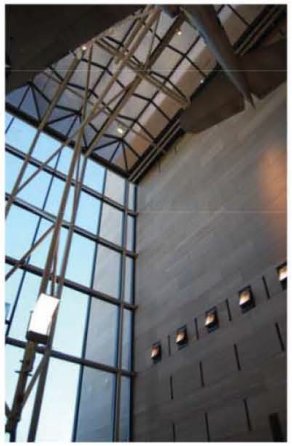
Glazing Condition

The building includes 60,215 square feet of curtain wall and 45,185 square feet of skylights. These glazed walls provide infill between the stone clad pavilions, allow access to daylight, and provide views to and from the museum galleries (see Figure 3.4). The original 47% visible light transmittance (VLT) curtain wall glazing and domed acrylic skylights were replaced in 2001 due to performance issues with solar heat gain, leaking, and excessive exposure to ultraviolet (UV) rays. The 2001 installation of 22% VLT curtain wall glazing and 8% VLT skylight glazing remains as the existing condition, but has been plagued with similar performance issues and needs to be replaced.

The problems include solar heat gain, leaking, and excessive exposure to UV rays. The dark appearance of the glazing lessens the views of the gallery interior from the Mall and to the sky above from within the gallery. Additionally, the humidification system that was designed to help protect the exhibits was deactivated due to condensation on the curtain wall and skylight as created by the lack of a thermally broken glazing assembly.



Existing skylight and curtain wall as seen from within a gallery



2001 curtain wall replacement included a reduction in visible light transmittance from 47% to 22% with the intent to protect the interior exhibit pieces from exposure to harmful UV rays. Since 2001, technology has continued to improve and it is now possible to prevent the sun's harmful effects to an even greater degree. The planned glazing replacement will enable the Museum to house and care for its treasures for years to come in Milestones Hall.

Existing skylight and curtain wall as seen from within a gallery

Existing curtain as seen from outside the north entrance

Figure 3. 4: Existing Curtain Wall and Skylight Glazing. (Source: QEA)

Visitor Entrance Condition

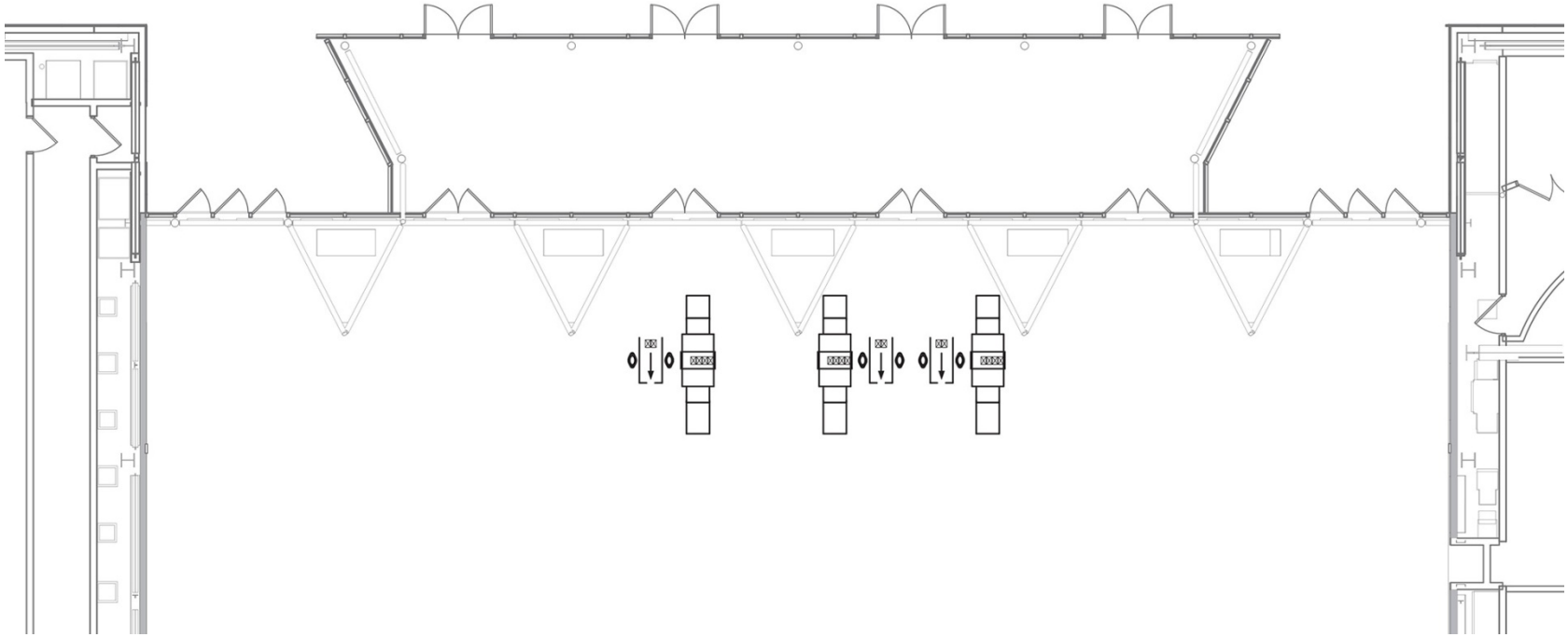
The existing entrance to NASM lacks sufficient wayfinding, protection from the elements, and the kind of welcoming, well organized, and logical flow more fitting to introduce the aviation and space treasures inside one of America's most visited museums. With an average of approximately seven million visitors per year, the existing physical security screening systems is incapable of allowing entrance to the museum fast enough to keep up with demand on a typical weekend in the summer or during holidays. This leads to extensive queues of several hundred people at the north and south entrances with wait times over 30 minutes in frequently oppressive weather conditions.

The security gates resemble airport security checkpoints, with magnetometers and x-ray machines (see Figures 3.5 through 3.7). There are no signs explaining the procedure which can exacerbate misunderstanding for all visitors, and is especially problematic due to the high number of foreign visitors and related language barriers. Because the security gates are located only eight-to-ten feet inside the inner vestibule doors, visitors do not see what they have to do until they are almost at the security gate itself (see Figures 3.8-3.9). Parents with strollers have to remove all the bags and other accoutrements from the strollers, place them in the bins, and then re-pack the strollers at the other end of the x-ray machine. Unlike at airports, there are no tables on which people can place their belongings as they approach the x-ray machines. The noise and visual clutter from the security activities, diminishes the visitor experience within the main exhibit areas.

Figure 3. 5: North entrance queue, facing east. (Source: QEA.)

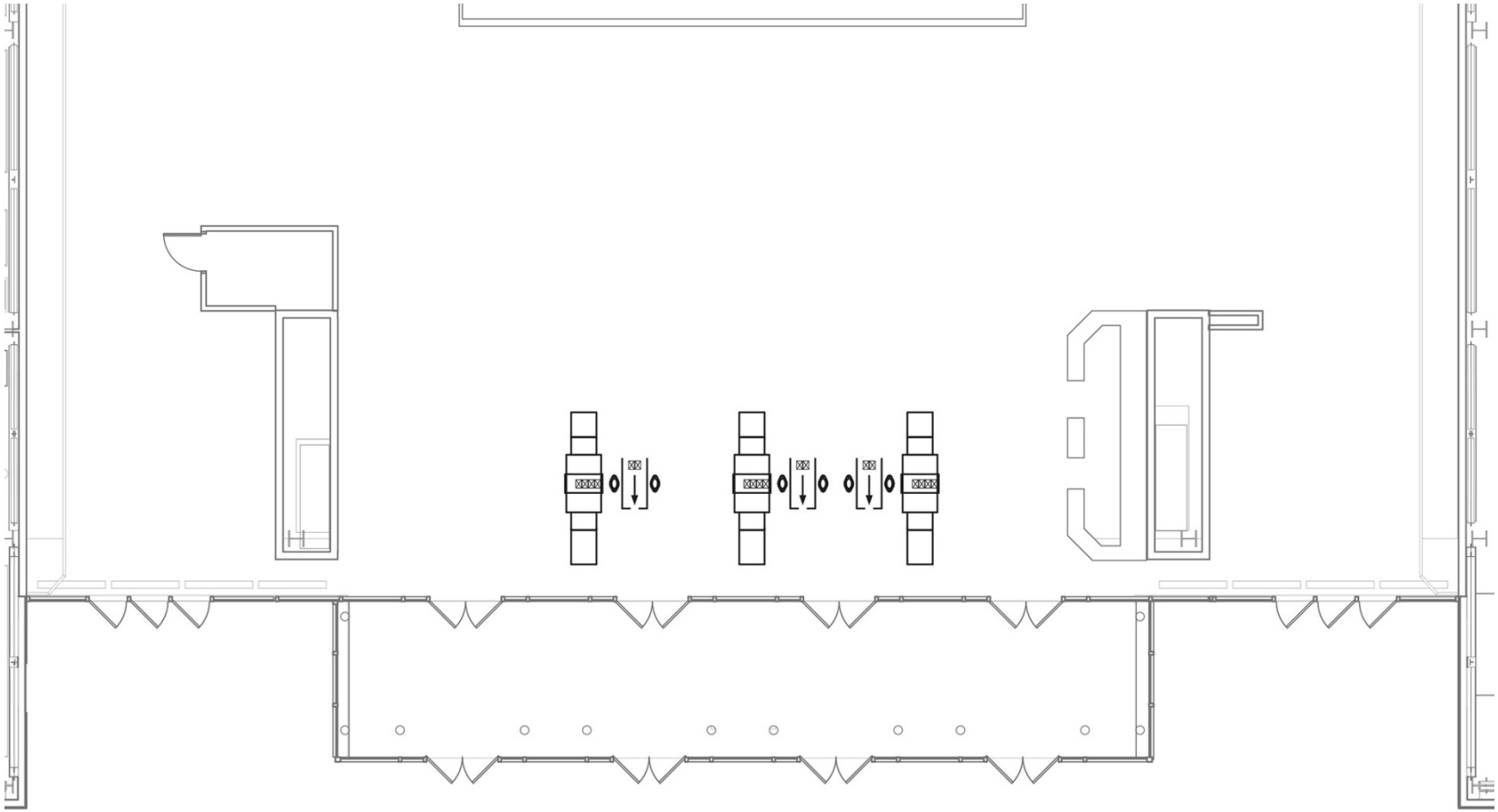
Figure 3. 6: North entrance queue, facing south. (Source: QEA.)

Figure 3. 7: Views of existing NASM Security Screening Gate. (Source: QEA.)



Not to Scale

Figure 3. 8: Existing North Entrance Vestibule. (Source: QEA.)



Not to Scale

Figure 3. 9: Existing South Entrance Security Screening Area. (Source: QEA.)

Summary of Building Envelope Deficiencies

- The stone cladding is deteriorating and in need of replacement. The panels across much of the exterior surfaces exhibit a significant degree of distortion that occurred since the original installation.[3] Some panels have been replaced.
- The existing exterior wall construction does not provide adequate resistance to water penetration or air infiltration resistance.
- The existing wall assembly would not support reintroduction of mechanically-controlled humidification, which is necessary to protect artifacts in the building.[4]
- The existing curtain wall system has limitations meeting required criteria for blast loading.[5]
- Current building entrances lack amenities and accessible ramps are situated in remote locations.
- Visitors are often exposed to harsh weather conditions when the entrance queue extends outside for a wait in excess of thirty minutes.
- Current building entrances house security screening staff and equipment within a gallery, which slows down the security screening process and compromises the visitor experience.
- It is difficult for visitors to locate the building entrances.
- The current conditions do not meet the program requirements of prescribed areas for vestibules and security lanes in the Master Plan, nor the incorporation of divest and composure tables for more efficient screening.
- The existing skylights will not perform well with the reintroduction of mechanically-controlled humidification.[6] The majority of the roofing system is reaching the end of its service life.
- No solar energy is harvested at the building.

[3] Quinn Evans Architects, *National Air and Space Museum Exterior Envelope Study*, prepared for the Smithsonian Institution (Washington, D.C., October, 2013), 3-4.

[4] Ibid., 9-10.

[5] Quinn Evans Architects, *National Air and Space Museum Concept Development Report*, prepared for the Smithsonian Institution (Washington, D.C., November, 2014), 4.57.

[6] Ibid., 4.75.

Building System Condition

The building's mechanical and energy systems are out of date, do not function efficiently, and do not comply with current codes. The lighting system does not function effectively and the storm water management system does not meet current local and federal requirements.

Summary of Building System Deficiencies

- The mechanical equipment serving the museum has reached the end of its useful service life, no longer functions as designed, lacks proper filtration, and cannot maintain design interior space conditions (temperature and relative humidity) in the galleries and office areas.
- The existing systems are not as energy efficient as new systems and do not comply with current mechanical and energy codes.[7]
- Portions of the building power distribution system are in fair to poor condition.[8]
- The emergency generator intake and exhaust air are vented directly into the garage in violation of NFPA 110.[9]
- Exhibit lights in the sky lit atriums are illuminated regardless of exterior light conditions, which wastes energy by producing excess heat in an environment already difficult to cool.[10]
- Existing lighting that uses significant energy is maintenance-intensive and is not tailored to exhibits.
- The existing storm water management system does not meet current DOEE or federal storm water management requirements,[11]

[7] Ibid., 5.5-5.6.
[8] Ibid., 2014, 6.1.
[9] Ibid., 2014, 6.9.
[10] Ibid., 6.21.
[11] Ibid., 7.1-7.2.

Landscape Condition

The terrace of NASM serves as the roof to the underground parking and basement which extend beyond the main building under approximately two-thirds of the terrace area (see Figure 3.10). Substantial waterproofing and related failures exist. In order to remedy the situation, the paving, soils, and planter systems need to be replaced.

The landscape also has significant museum and grounds concerns related to accessibility and circulation, wayfinding, human comfort, soil and plant materials, and aesthetic and programmatic concerns.

Summary of Landscape Deficiencies

- The terrace vegetation has grown substantially since installation of the last planting, blocking views of the building from many vantage points on the Mall.
- The pedestrian arrival to the building is unclear to many visitors and barrier-free access is indirect.
- The wheelchair accessible routes are very limited and located in remote locations that are not easily identified by visitors.
- The planters on the terrace function as the roof of the underground garage, acting as a green roof, which is leaking and in need of repair.
- There is extensive damage to the existing stone cladding on planter walls.
- The existing trees do not provide enough shade.

Sculptures

Three sculptures are located in prominent positions on the NASM site.

- The *Ad Astra* sculpture by Richard Lippold was purchased by the museum with building funds designated for architectural artwork. It was installed in 1976 at the north entrance of NASM, facing the National Mall. The three-sided narrow shaft of gold-colored and posished stainless steel stands 115 feet tall. The top tapers to a point upon which a triple star cluster rests. The sculpture symbolizes mankind's conquest of space.[12]
- Alejandro Otero's sculpture, *Delta Solar* was a gift to the people of the United States from the people and the government of Venezuela on the occasion of the U. S. Bicentennial. The sculptural fountain was installed in 1977 at the southwest terrace. As a work of kinetic art, the piece was

[12] Smithsonian Institution and John Milner Associates, *Smithsonian National Air and Space Museum, Comprehensive Facilities Master Plan, Historic Building and Landscape Report* (August 2013) 22.

designed to interact with the natural forces of wind and sun. The work is composed of a 27-foot by 40-foot geometric steel grid upon which stanless steel panels hang and turn when the wind blows. The sculpture is oriented to reflect the afternoon sun. Water was removed from the fountain by 1983 or 1984.[13]

- Charles O. Perry's *Continuum* sculpture was installed in 1976 at the south/Independence Avenue entrance of NASM. The sculpture was commissioned by NASM. The large bronze Mobius form is an artistic expression of the scientific principles and ideas respresented within the museum. The center symbolizes a black hole while the edges represent the flow of matter from positive to negative space in a continuum.[14]

[13] Ibid, 23.

[14] Charles O. Perry web site, http://www.charlesperry.com/Bio.html, accessed March 2017.

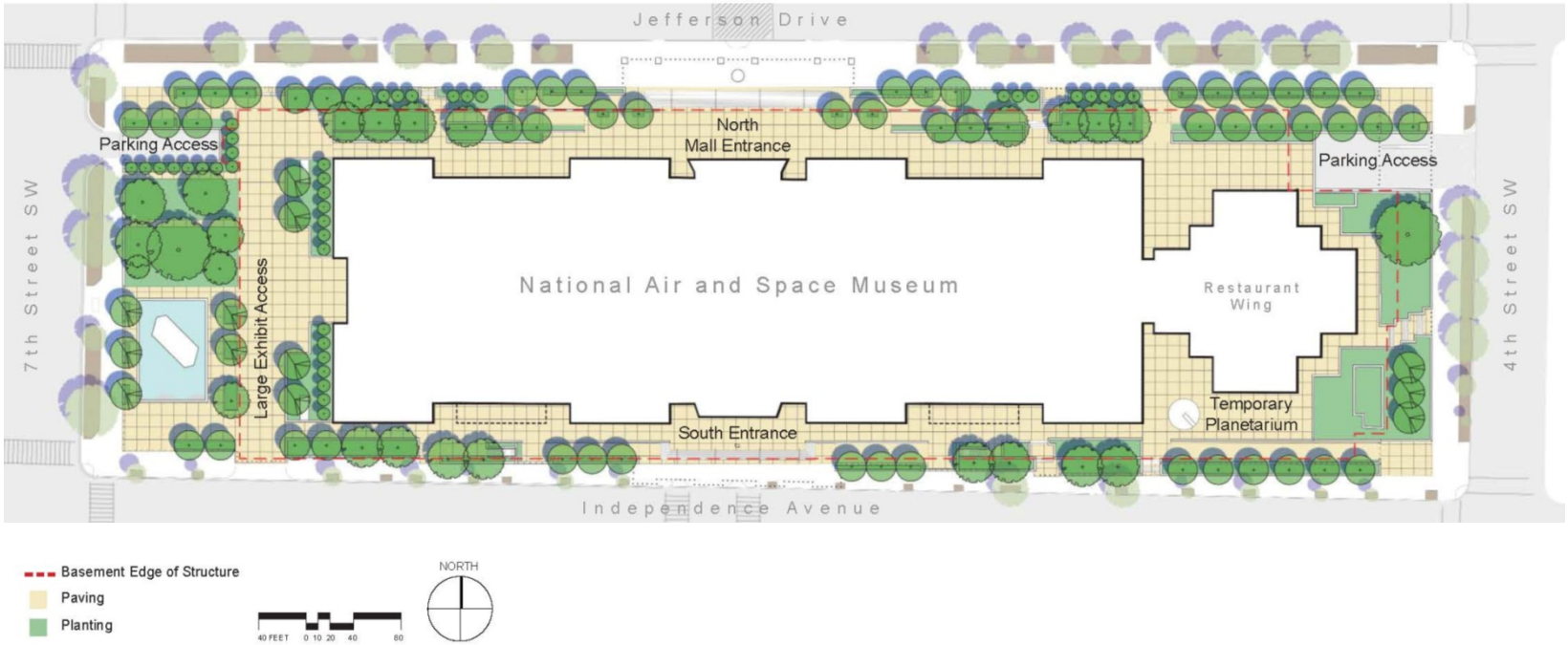


Figure 3. 10: Location of Basement related to site. (Source: AECOM.)

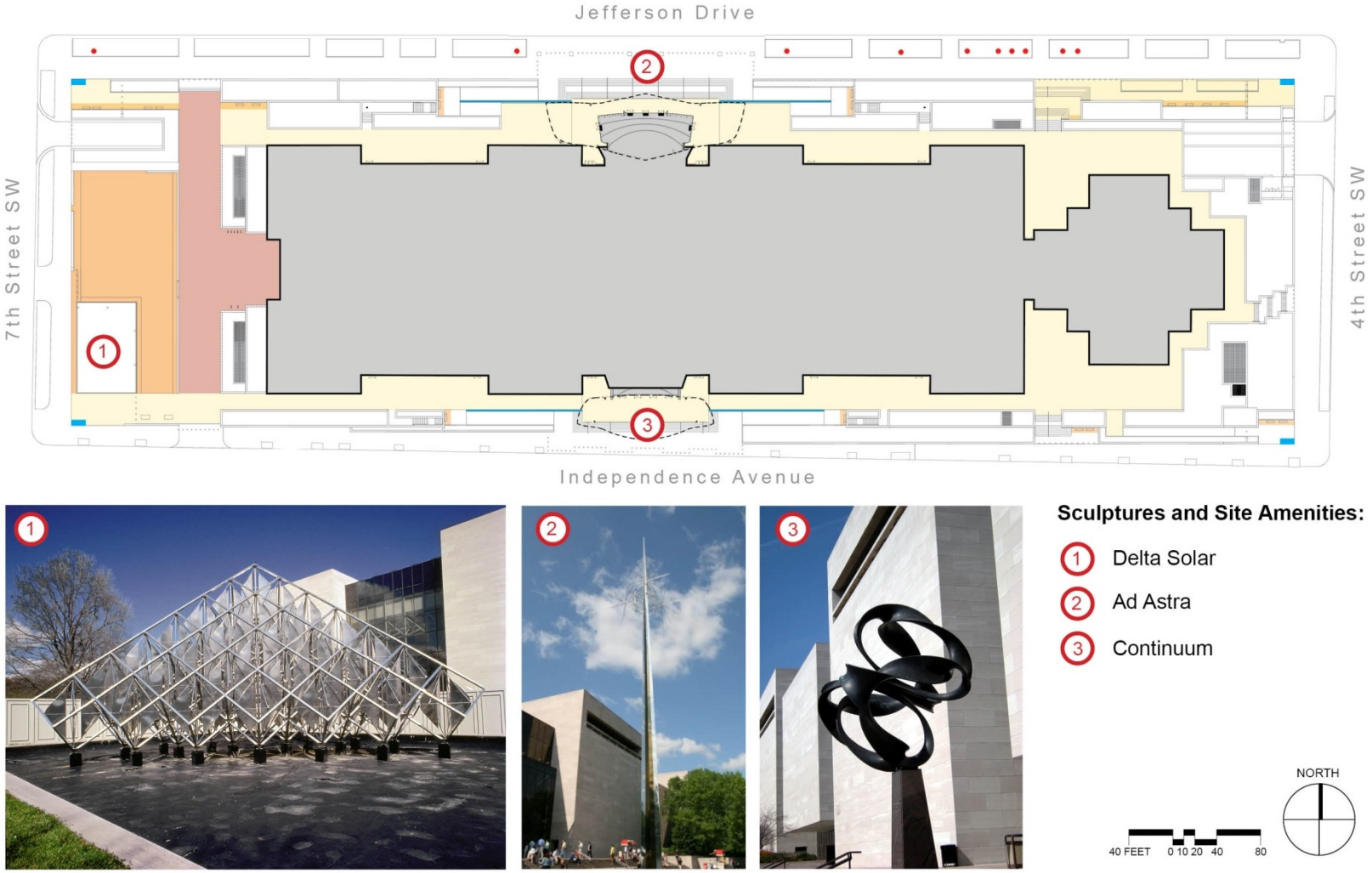


Figure 3. 11: Existing Sculptures. (Source: QEA.)

Visual Resources

The National Mall includes a mile-long uninterrupted vista of open lawn, monumentally anchored by the U.S. Capitol Building to the east and the Washington Monument to the west. The central grassed area of the Mall is lined on the north and south with formal allees of mature elm trees, major pedestrian and vehicular thoroughfares, and the gardens, monumental museums and visitor center of the SI. NASM is located on the south side of the Mall, across the Mall from the National Gallery West Building and in between the American Indian Museum and the Hirshhorn Museum and Sculpture Garden.

The locations of selected important views are illustrated in Figure 3.11. Illustrations and descriptions of these views are provided in Chapter 4 as part of the analysis of visual resources.

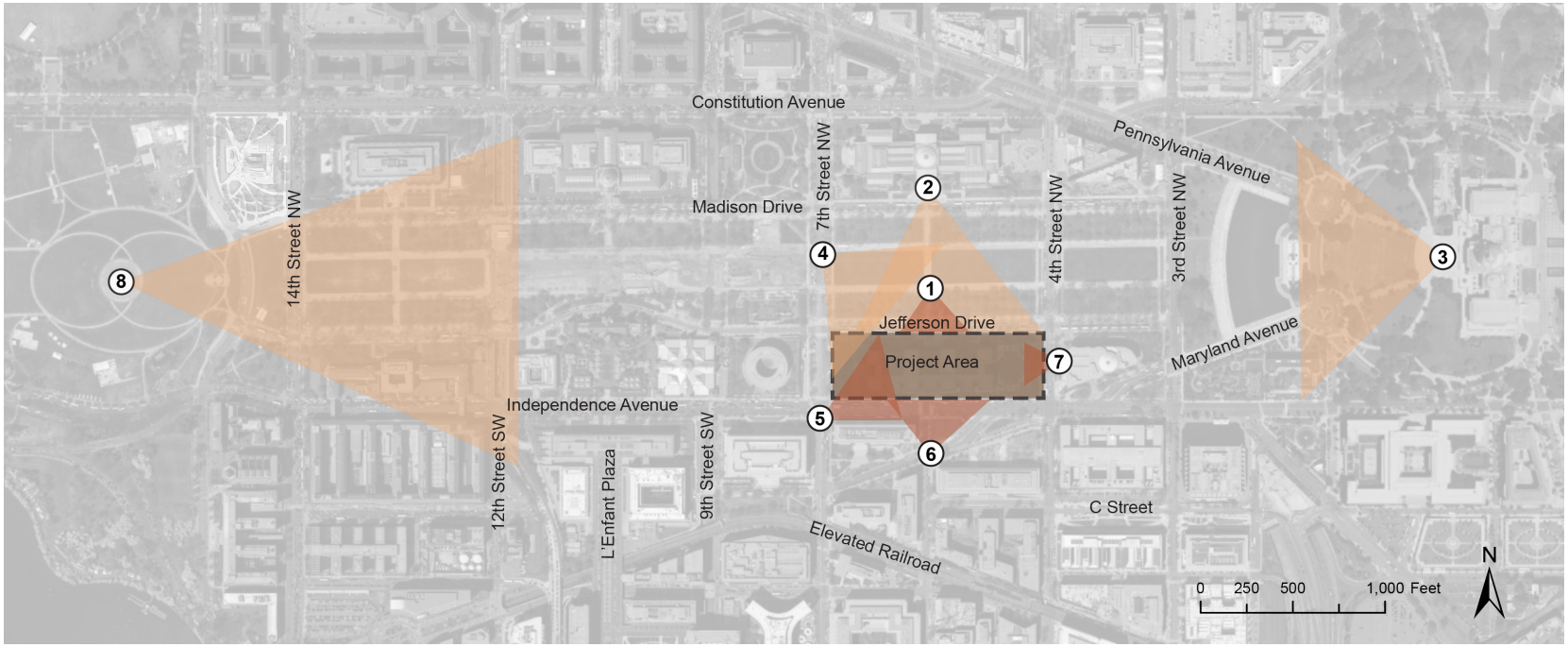


Figure 3. 12: View location plan. (Source: QEA.)

Visitor Experience

The visitor experience at NASM currently begins with an inadequate entry experience that lacks sufficient wayfinding from the streetscape, protection from the elements, and an appropriate welcoming that is well organized with a logical flow befitting of the aviation and space treasures housed inside the building (Figure 3.13). With an average of seven million visitors a year, NASM is one of the most visited museums in the world. The Museum houses some of the most iconic objects in the history of human flight and exploration, such as the *Wright Flyer*, the *Spirit of St. Louis*, and the Apollo 11 capsule *Columbia*. NASM draws visitors from all walks of life and from all over the world. In many ways, the Museum is a victim of its own success. Forty years after opening, the museum attracts an average of seven million people each year, and must adjust to changing programmatic requirements, especially the need for security screening. As a result, the Museum is struggling to provide a visitor experience worthy of the collection. The building and landscape condition deficiencies noted at the beginning of this chapter directly affect the experiences of visitors to the museum.

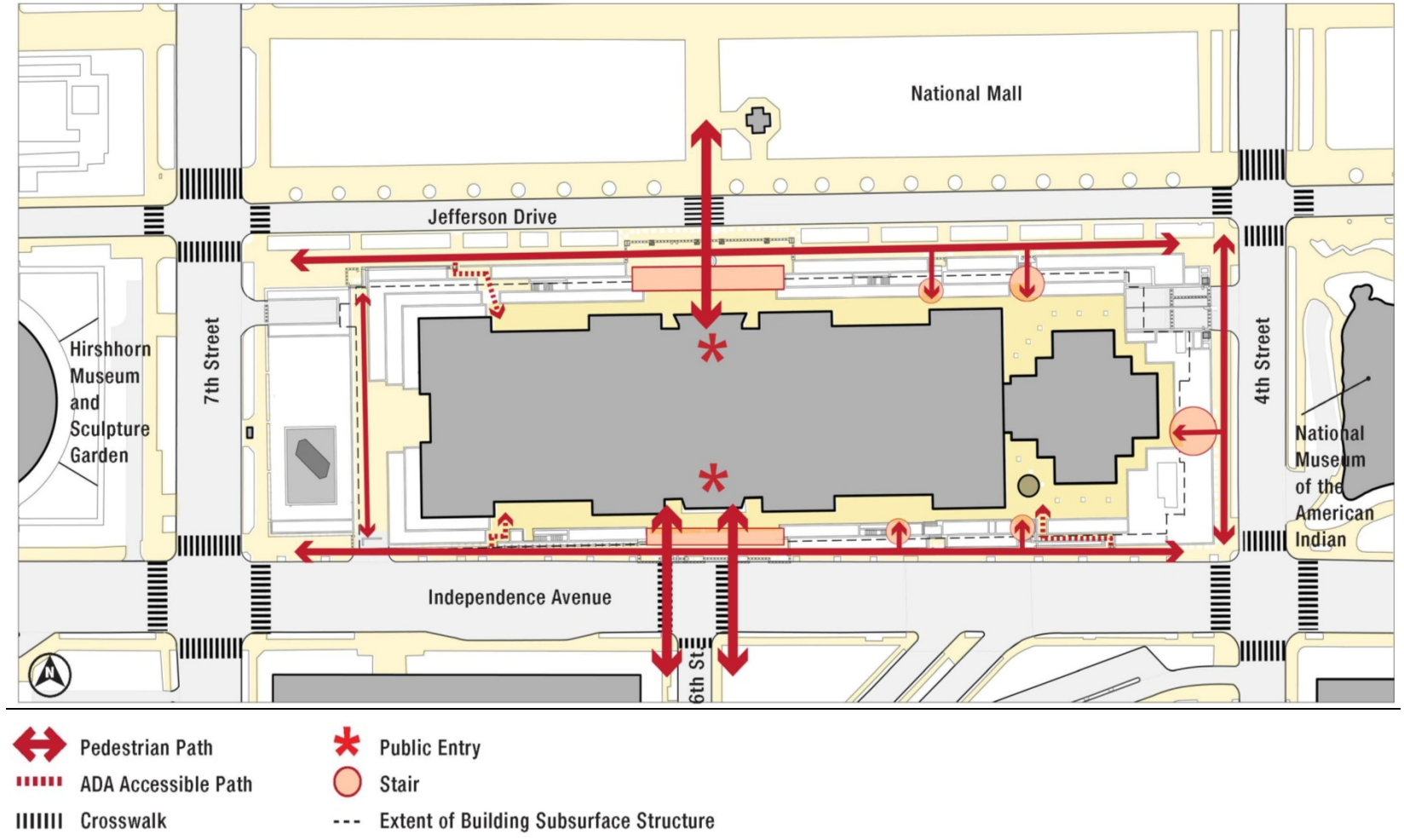


Figure 3. 13: Existing Pedestrian Circulation. (Source: 2013 Comprehensive Facilities Master Plan.)

Circulation

Vehicular Circulation and Parking

The National Mall is bounded by Constitution and Pennsylvania Avenues NW to the north; 3rd Street NW and SW to the east; Independence Avenue SW to the south; and 14th Street NW and SW to the west. The Mall is traversed by 4th and 7th Streets running north-south; Jefferson Drive SW running one way from west to east; and Madison Drive NW running one way from east to west. In addition, 6th and 10th Streets approach the Mall from the north and south, but terminate at the Mall boundary. Interstate 395 (I-395) is located south and east of the project site and can be accessed to the south via 9th, 12th, and 14th Streets. Regional access is provided by I-395 to northern Virginia and northern DC with connections to I-295 east into Maryland. These roadways connect to I-495 (the Capital Beltway) and I-95 to the north and south in the immediate vicinity of NASM. The District of Columbia has roadway jurisdiction over 7th and 4th Streets and Independence Avenue. NPS has jurisdiction over Jefferson Drive.

Approximately 420 parking spaces are currently provided in the underground level of NASM for Smithsonian employees and service vehicles. Access to the parking is provided via an entrance at 4th Street. Other commercial parking lots are located within walking distance. The closest parking facility to NASM is located at 6th and C Streets SW, one block south of the south entrance to the museum. On-street parking is very limited. Free on-street parking for cars, vans, and vehicles with handicapped permits is currently available on Jefferson and Madison Drives, but the NPS is planning to begin to charge for parking on the Mall in Spring 2017. Metered parking is available throughout the city. Regulations are posted.

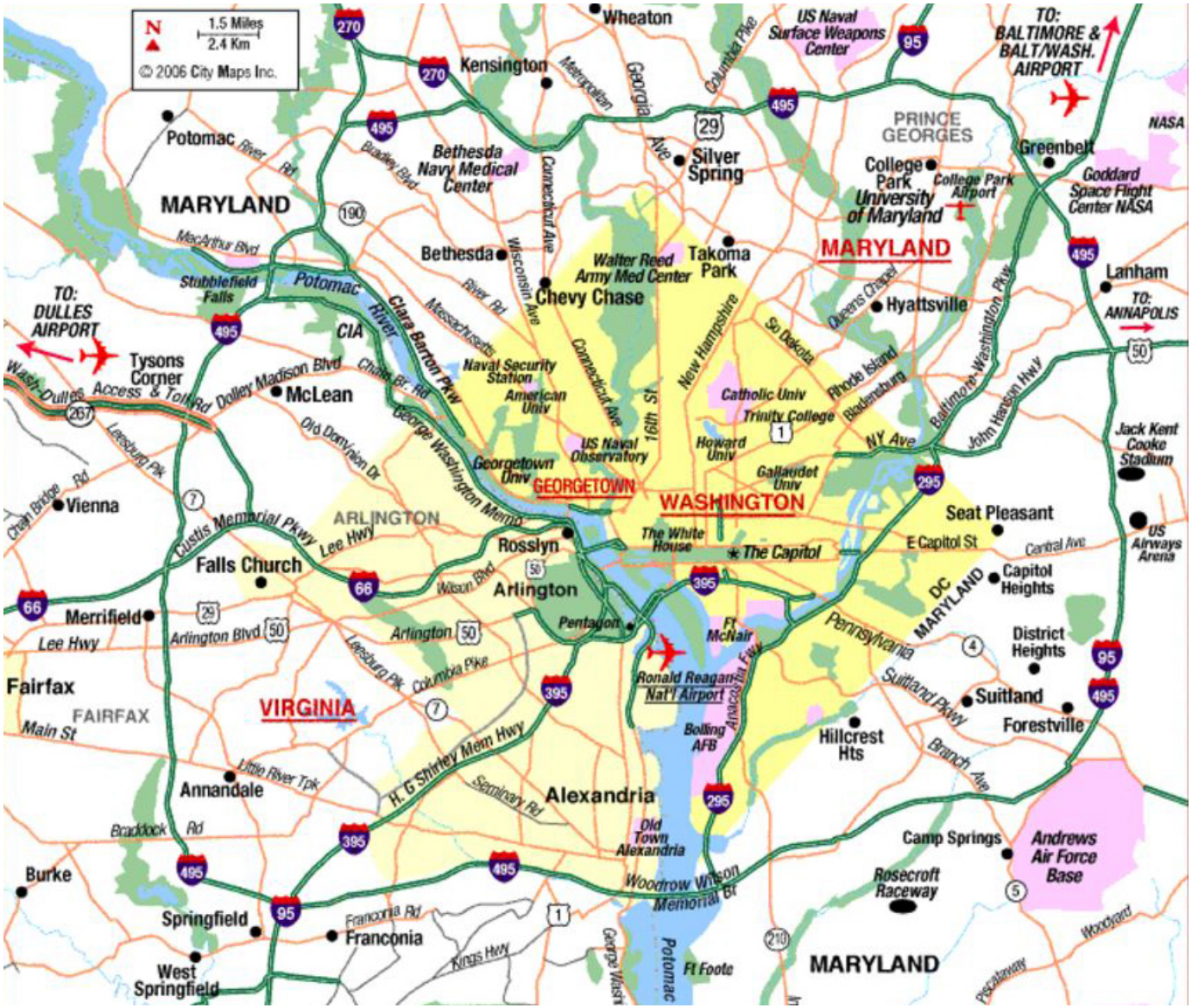


Figure 3. 14: Regional access in the immediate vicinity of NASM is provided by the I-495 (Capital Beltway) which connects other interstate highways to locations in Virginia and Maryland. (Source: City Maps, Inc., 2017.)

Transit and Pedestrian/Bicycle Circulation

Public transportation is available via Metrorail, Metrobus, DC Circulator, Capital Bikeshare, and taxi. Handicapped access is provided for Metrorail trains, Metrobuses, and their pick-up/drop-off locations. Tour bus, Metrobus, taxi, and visitor drop-off zones are located along the street curb in front of the building on Jefferson Drive. Commuter bus and tour bus stops are located along Independence Avenue. The L'Enfant Plaza Metro station is located two blocks south of NASM on 7th Street SW. A Capital Bikeshare dock is located directly across Independence Avenue SW from the south entrance of NASM; however, that dock is planned for relocation due to the proposed Eisenhower Memorial. Other Bikeshare stations nearby are located at C Street SW and 7th Street SW, Independence Avenue and L'Enfant Plaza SW, and 4th Street NW and Madison Drive NW.

The museum is primarily accessed by visitors and employees via walking. The east-west axis of the Mall is the most popular route for pedestrian traffic. Pedestrian entry points include the building entrances on Jefferson Drive SW and Independence Avenue SW. Approximately 70% of visitors to NASM use the north building entrance. Concrete sidewalks surround the building. Crosswalks are provided at the intersections of the four streets surrounding the building and at the mid-block entrances on Jefferson Drive SW and Independence Avenue SW. Sidewalks and crosswalks are compliant with the Americans with Disabilities Act (ADA) and include curb access at all crosswalks.

Identified bicycle circulation routes include a designated on-street bikeway on Independence Avenue SW and Jefferson Drive SW, which has been designated a bikeway by the Metropolitan Council of Governments. They connect with bikeways that continue to the east to the Rock Creek Trail and cross the Potomac River to the Mount Vernon Trail in Virginia. The pathways on the Mall accommodate bicycles.

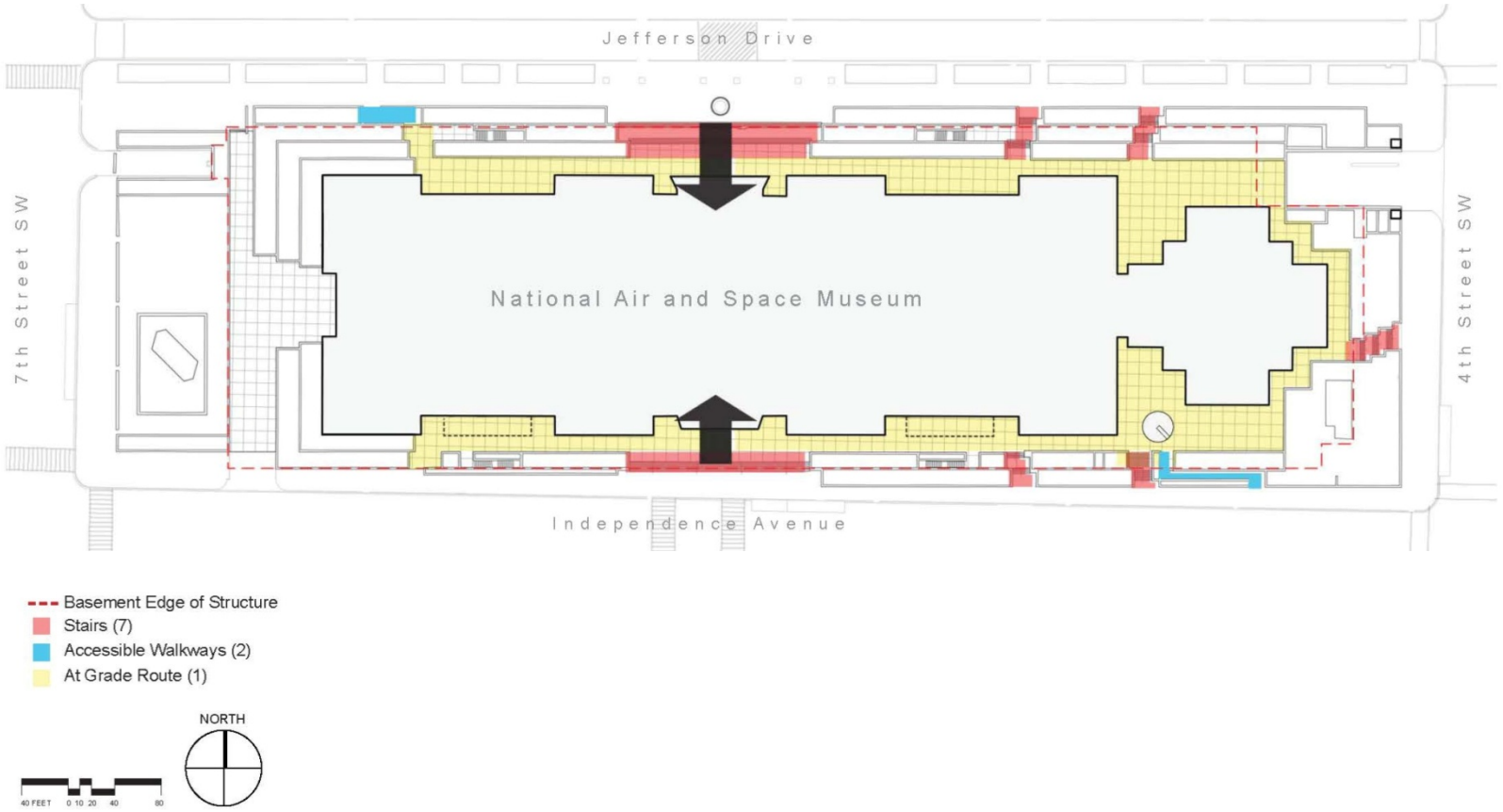


Figure 3. 15: Existing Pedestrian Access to the Museum. (Source: AECOM.)

Figure 3. 16: Bicycle circulation routes in the area. (Source: Washington, D.C. Bicycle Map, goDCgo-JMT Technology Group, DDOT, April 2016.)

Planning Policies

The Master Plan for the National Mall, approved in 1976, addressed open space and landscape design for the Mall, including removing some cross streets and surface parking, and identifying additional museum locations. The subsequent Comprehensive Plan for Smithsonian Mall Site Improvements, completed in 1994, introduces the concept of "spatial zones" surrounding the SI buildings and entrances. These zones include: the Streetscape Zone, consisting of the curb and sidewalk; the Building Grounds Zone, including the transition between the streetscape and specific architectural features; the Building Platform Zone, including those elements integral to the architecture; and the Special Area Zone, including public entrances. The SI developed a Master Plan for NASM in 2013 providing recommendations for improving the National Mall Building and site that serves as a basis for the current revitalization project.

The Comprehensive Plan for the National Capital, Federal Elements policies provides guidance for the development of the NASM revitalization project.[15] Among these, those of particular importance to the NASM project include:

- Urban Design Element policies that focus on the preservation and enhancement of the defining characteristics of Washington's monumental core as established by the L'Enfant Plan and the McMillan Plan.
    - UD.B.1.1 indicates that development should express the dignity befitting the national capital's image by adhering to high aesthetic standards.[16]
    - UD.B.1.5, directs the use of lighting to respect the "hierarchy of memorials, monuments, and important civic buildings and spaces…"[17]

[15] National Capital Planning Commission, *Comprehensive Plan for the National Capital, Federal Elements* (Washington, D.C., 1977 – 1984, updated 1990, 2004 and 2016).

[16] Ibid, *Urban Design Element UD.B.1.1*, 21.

[17] Ibid, *Urban Design Element UD.B.1.5*, 22.

- UD.B.2.6, addresses the expansion of the urban tree canopy to frame views, reinforce human scale and "provide critical shade and beauty."[18]
- UD.B.3.2, addresses design of pedestrian walkways and streetscape elements to provide "safe and appealing public access."[19]
- UD.B.3.9 indicates that "landscape treatments should enhance the settings around civic and cultural buildings and grounds."[20]
- UD.B.3.10 indicates that "streetscape furniture and other elements should be of high quality and design and enhance settings around cultural buildings and grounds."[21]
- UD.B.4.1 indicates that designs should "respect the National Mall's historic open space and monumental character for the benefit of future generations."[22]
- UD.B.4.3 provides for the strengthening of visual and functional connections to the rest of the city by reinforcing linkages with placemaking strategies; improvement of transitions between places and removal of visual and psychological barriers at major pedestrian thoroughfares and open spaces; and the maximization of opportunities to create high-quality, pedestrian-friendly public spaces and increase access to major destinations.[23]
- UD.B.4.4 directs the improvement of walkability and access to key destinations within the monumental core by enhancing pedestrian quality of secondary and tertiary connections, including those to 7th Street NW.[24]

[18] Ibid, *Urban Design Element UD.B.2.6*, 25.
[19] Ibid, *Urban Design Element UD.B.3.2*, 27.
[20] Ibid, *Urban Design Element UD.B.3.9*, 28.
[21] Ibid, *Urban Design Element UD.B.3.10*, 28.
[22] Ibid, *Urban Design Element UD.B.4.1, 29*.
[23] Ibid, *Urban Design Element UD.B.4.3, 30*.
[24] Ibid, *Urban Design Element UD.B.4.4, 31*.

  - UD.C.1.1 indicates that buildings should consist of quality, durable materials to protect public investment and reflect the city's image.[25]
  - UD.C.1.5 integrates accessibility to transit, bicycle, and pedestrian modes into the urban design and compliance with ADA and ABA requirements.[26]
  - UD.C.3 includes policies providing guidance related to urban design and security including direction for the placement and design of security barriers.[27]
- Federal Environment Element policies that address mitigation by reducing the amount of GHG emitted directly or indirectly by federal activities and adaptation by protecting federal assets from the impacts of climate change. Policies related to water resources and stormwater management, flooding, tree canopy and vegetation, energy, and decreasing energy use in federally owned buildings to reduce GHG emissions and mitigate climate change are directly relevant to the NASM project.[28]
- Historic Preservation Element policies that address preservation, protection and rehabilitation of historic properties and promote respectful design and development are directly relevant to the NASM project.[29]
- Visitors and Commemoration Element policies address enhancement of visitor experiences and destinations. Guidance related to visitor transportation modes reinforce pedestrian, bicycle and bicycle accessibility and encouragement of use of public transit.[30]

Sustainability

The NASM revitalization project provides a tremendous opportunity to improve the performance of NASM and for SI to enhance its leadership role in the field of sustainable museum buildings. Employing a holistic approach, where all interactions of building systems are considered along with the envelope components, can result in substantially higher energy savings than a typical mechanical upgrade project. Energy modeling studies indicate that the strategies proposed can substantially reduce NASM's energy

[25] Ibid, *Urban Design Element UD.C.1.1, 36.*

[26] Ibid, *Urban Design Element UD.C.1.5, 36.*

[27] Ibid, *Urban Design Element UD.C.3, 39-42*. Policies UD.C.3.3, UD.C.3.4, UD.C.3.5, UD.C.3.6, UD.C.3.8, UD.C.3.9 and UD.C.3.10.

[28] Ibid, *Federal Environment Element.*

[29] Ibid, *Historic Preservation Element, Sections A through E.*

[30] Ibid, *Visitors and Commemoration Element.*

consumption, utility costs, CO_2 emissions, and energy use intensity (EUI). There is no single strategy that produces these dramatic improvements. Rather, it is the interactions of the various systems in combination that have a cumulative effect. The US Green Building Council's (USGBC's) Leadership in Energy & Environmental Design (LEED®) certification program has become the de facto standard for sustainable design in the United States. The LEED certification program provides third-party verification of green buildings, establishing a uniform benchmark by which the sustainability of buildings may be measured.

According to Smithsonian Directive 422 "Sustainable Design of Smithsonian Facilities," dated 31 July 2014, the NASM revitalization project is required to meet Gold certification under the LEED program, at a minimum.[31] Because of the magnitude of the renovation scope, this project will fall under LEED's "New Construction and Renovation" program. At this stage, LEED Gold certification appears to be very achievable for this project. The inclusion of the supplemental HVAC systems and renewables in the design of the project remains the best way to ensure a Gold rating can be achieved. It is possible that a Platinum certification can be achieved for this project, this will be determined through continued development of the design.

Air Quality

In response to the Clean Air Act (CAA) of 1970 and the CAA Amendments of 1977 and 1990, the U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for the protection of human health and welfare. EPA established NAAQS for the six most common pollutants including ozone (O_3), particulate matter (particulates less than 10 micrometers in aerodynamic diameter (PM10) and particles less than 2.5 micrometers in diameter (PM2.5)), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), and lead (Pb). When ambient air quality in an area exceeds the NAAQS for a criteria pollutant, the area is in "nonattainment" for that pollutant.[32]

Washington, D.C. is an urban environment with very few industrial facilities. Air quality issues in the District are primarily due to emissions from vehicles and air pollution transported from other states.[33] Air

[31] Smithsonian Institution, *Smithsonian Directive 422: Sustainable Design of Smithsonian Facilities* (Washington, D.C., 31 July 2014).

[32] District of Columbia, *Ambient Air Quality Trends Report*, prepared by the Monitoring and Assessment Branch, Air Quality Division, District Department of the Environment (Washington, D.C., October, 2014).

[33] Ibid.

quality trends in DC as of 2014 include:

- O_3 – The District and the metropolitan area are in nonattainment of ground-level O_3 standards, and the NAAQS are expected to become even more stringent in the near future. Ozone continues to be the biggest air pollution challenge the region faces.
- PM2.5 – The EPA is redesignating the region as an attainment area for the 1997 annual standard. The monitored air quality levels in the recent several years were below the standards. Since the area previously was in nonattainment, demonstrations of continued maintenance with the standard are required for the next 20 years. A new fine particulate standard was finalized in 2012.
- CO – The District is in attainment for the CO standards and the ambient air quality levels have been below the standards since 1996. In February 2010, EPA proposed to retain the existing CO standard.
- SO_2, NO_2 – The District has always attained both the SO_2 and NO_2 standards, with monitored levels far below the NAAQS. New standards were developed for each pollutant in 2010. The District's monitoring networks are adding monitoring capacity to comply with the new NAAQS.
- Pb – In 2002, the District stopped monitoring for Pb because levels were consistently very low compared to the NAAQS. The new lead standard established in 2008 is 10 times more stringent than the previous standard. Monitoring for lead began in January 2012 to determine compliance with the new standard.

Noise Levels

Noise levels are usually measured and expressed in decibels (dB) that are weighted to sounds perceivable by the human ear, or A-weighted sound level (dBA). Although the A-weighted sound level may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a conglomeration of frequencies from distant sources, which create a relatively steady background noise in which no particular source is identifiable. Average noise levels over a period of time are usually expressed as dBA L_{eq}, or the equivalent noise level for that period of time. District noise regulations establish maximum permissible sound levels for an operation, activity, or noise source on a property. The regulations require that from 7:00 a.m. to 7:00 p.m. on any weekday, construction and demolition noise levels (excluding pile drivers) shall not exceed 80 dB(A) L_{eq} unless granted a variance. From 7:00 p.m. to 7:00 a.m., maximum noise levels of 60 dBA apply for commercial/institutional zoned areas, with no averaging time period specified. The noise limits of these

regulations are designed to protect human activities or land uses that may be interfered with by noise levels. These are considered to be sensitive noise receptors, which include residential dwellings, hotels, hospitals, nursing homes, educational facilities, and libraries. Sensitive noise receptors also include threatened or endangered biological species and habitat, especially during breeding seasons. The museums on the Mall are considered to be sensitive noise receptors since they serve an educational function. Other than museums, the vicinity includes commercial (office buildings) that are not considered to be sensitive to noise. The predominant existing noise source on the Mall is vehicle traffic on the roads on and adjacent to the Mall. Periodic elevated noise levels are generated by special events or concerts on the Mall.

Vegetation

The project area is located in an urban setting, in which the natural environment has been previously disturbed and developed. Vegetation consists of planters and turf areas containing shade and ornamental trees, shrubs, perennials and annuals (see Figures 3.17 through 3.22).

Overall tree conditions at NASM present a majority of healthy shade and ornamental tree species. Very few trees exhibit canopy or bark structure dieback, stress or deterioration. Tree canopies are relatively full, with the exception of a small percentage of ornamental trees that have experienced some selective pruning and or decline in health as a result of high sun and heat exposure around the main upper terrace. There are specimen quality oaks situated at the NE corner of the property along with exceptional quality understory flowering trees in the associated planters. Tree canopy clusters provide substantial shade of the ground plane beneath.

Existing ground plane materials (shrubs, perennials and annuals) range from relatively healthy specimens to areas of decline and sparseness resulting in barren exposed soil and mulch. The observed dieback and decline in the ground plane species occurs in planters and is likely a result of the high shade density from overhead tree canopies. Shrubs at stair egress areas provide a hedge-like condition, providing screening from the seat wall and planter areas while also creating habitat for rodents. Seasonal interest plants, annuals and tender perennials receive maintenance on a rotational basis, exhibiting detailed care and management. Seasonal interest plants are located at key building entrances and at several stairways.

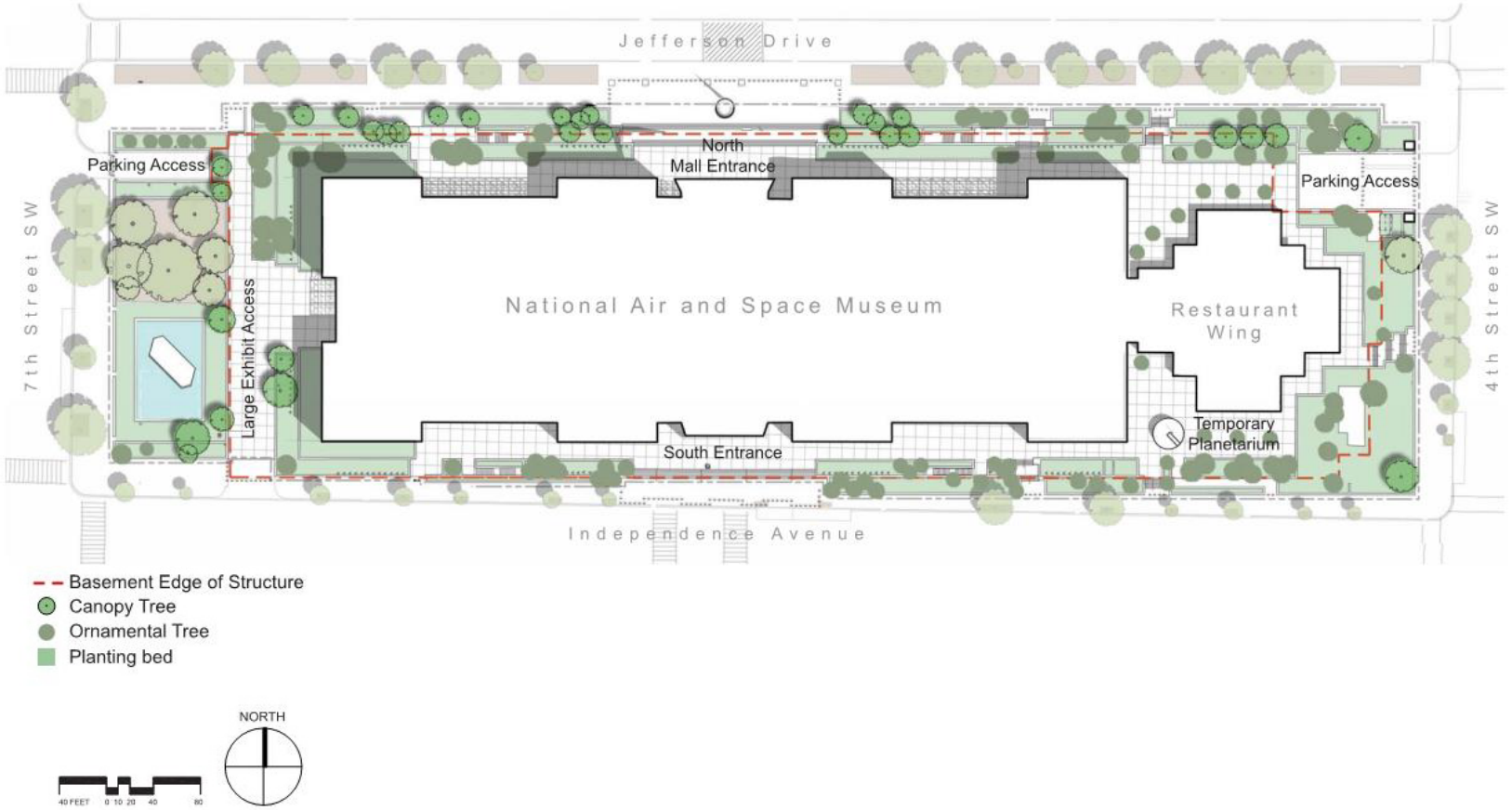


Figure 3. 17: Existing Vegetation. (Source: AECOM.)

Figure 3. 18: Existing Typical Planter Section. (Source: AECOM.)

Figure 3. 19: Existing vegetation at northwest corner of site. (Source: QEA.)

Figure 3. 20: Existing vegetation at southwest corner of site. (Source: QEA.)

Figure 3. 21: Existing vegetation at southeast corner of site. (Source: QEA.)

Figure 3. 22: Existing vegetation at northeast corner of site. (Source: QEA.)

Stormwater Management

Stormwater runoff infiltrates into soil not covered by impervious surfaces or drains to stormwater collection systems. Approximately 30 percent of the total site area is pervious surface. Stormwater from the project site is discharged to the District's combined storm and sanitary sewer system. The District's combined sewer interceptor lines lead to the Blue Plains Treatment Facility where combined stormwater and sewage are treated to standards in accordance with the Facility's National Pollutant Discharge Elimination System (NPDES) permit, prior to the release of effluent to the Potomac River.

Floodplains

The NASM is located immediately adjacent to, but not within, the 100-year floodplain of the Potomac River. The project area is adjacent to the 500 year (.2%) floodplain according to FEMA's National Flood Hazard map. The Smithsonian will take into account the site's potential to flood in its design. Accepted flood protection measures will be applied to protect the NASM building and collections. The building is subject to flooding from three situations: (1) local community water main breaks, (2) sewer and drain flooding caused by torrential rainfall, and (3) flooding of the Potomac River. The building is protected from riverine flooding and coastal flooding by an Army Corps of Engineers Federal Control Project of permanent and temporary levees. During a flood disaster, a series of temporary closures must be completed by the National Park Service.

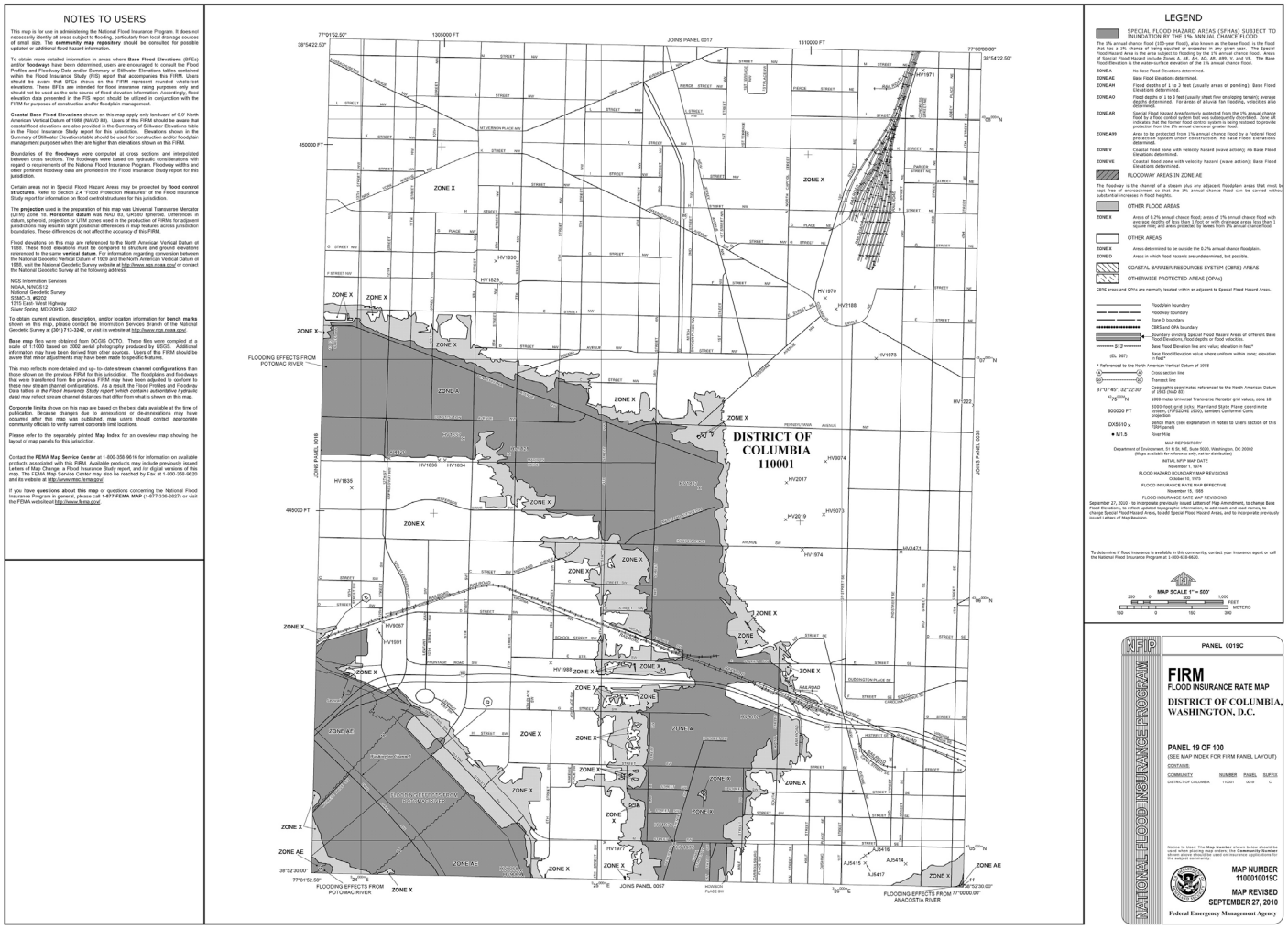


Figure 3. 23: FEMA flood zone map for area including the NASM site. (Source: FEMA.gov.)

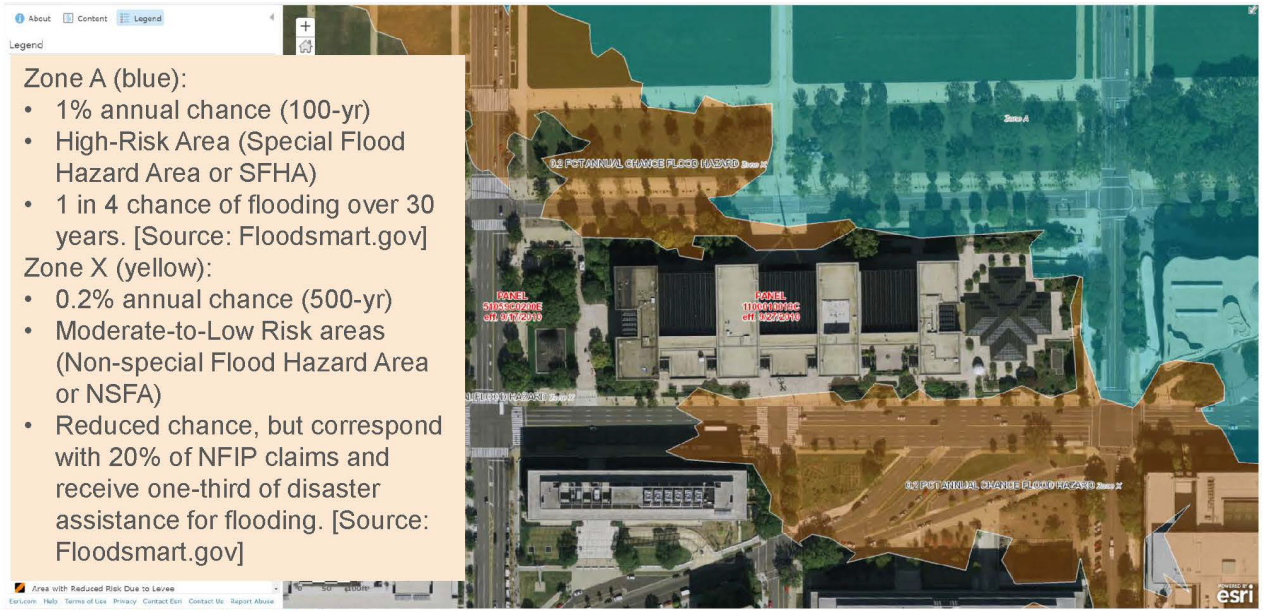


Figure 3. 24: NASM relationship to flood zones. (Source: Floodsmart.gov.)

Topography

The high point of the project area is located at the intersection of 7th Street SW and Independence Avenue SW. From that location, the site slopes gradually down to the east and north. Along 7th Street SW, from Independence Avenue SW to Jefferson Drive SW, the elevation decreases approximately 3'-5". The same block along 4th Street SW has a grade change of about 4'10". Along Independence Avenue SW, from 7th Street SW to 4th Street SW, the elevation decreases approximately 7'-4". The same block along Jefferson Drive SW has a grade change of about 9'-9". The north and south building entrances are elevated above the street level, requiring man-made terraces, steps and ramps to enter the building. The topography of the site was altered in the 1980's with construction of the restaurant addition. The current project will include minor changes to topography to revitalize the building entrances and improve accessibility.

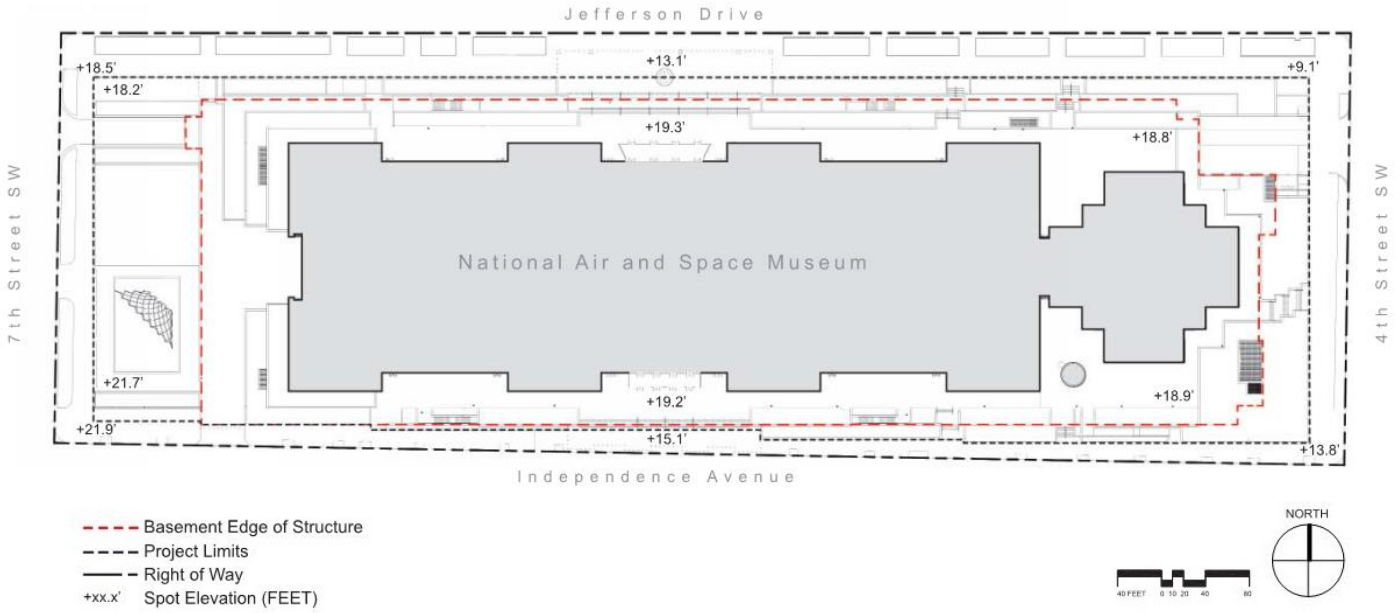


Figure 3. 25: Existing Site Elevations. (Source: AECOM.)

Solid Waste

NASM operations results in the generation of non-hazardous solid wastes on a daily basis. The waste material is removed for disposal at landfills or sent to recycling centers. Other activities such as restoration of artifacts or exhibits, facility maintenance, and construction activities generate solid wastes that are removed by waste haulers. Solid waste disposal would be done by external contracting agencies at a collective landfill consistent with disposal regulations. The specific locations would be decided by the construction contractor.

Hazardous Materials and Wastes

Lead paint and asbestos-containing drywall compound exist at NASM and need to be abated. These hazardous wastes require removal by licensed haulers and delivery to landfills permitted to receive this type of waste product. Due to potential presence of imported fill of unknown origin, soils of the project site may be contaminated by pollutants. If excavated, these soils may be unsuitable for reuse as fill, and/or may require treatment prior to disposal.

Climate Change and Carbon Footprint

Executive Order (EO) 13693 set goals for federal agencies to improve environmental, energy and economic performance.[34] SI is committed to the goals set by EO 13693 and is focused on making improvements in environmental, energy, and economic performance. The 2016 Smithsonian Strategic Sustainability Performance Plan documents sustainability at Smithsonian today and identifies strategies to be pursued to establish a sustainable future.[35]

In response to Executive Order 13693, SI has established a GHG reduction target for Scope 1 and 2 of 40% from 2008 to 2025 and a reduction goal of 20% for Scope 3 for the same period.[36] Scope 1 and 2 goals would be achieved through energy efficiency projects and Renewable Energy Credit (REC) purchasing. Scope 3 goals would be achieved through addressing commuter options available. Other goals that are relevant to the NASM revitalization project address improving building energy efficiency,

[34] Executive Order 13693, *Planning for Federal Sustainability in the Next Decade* (Federal Register, Volume 80, No. 57, 25 March 2015).

[35] Smithsonian Institution, *2016 Strategic Sustainability Performance Plan*, (30 June 2016), 4.

[36] Smithsonian Institution Climate Change Adaptation Working Group, *Roadmap for the Development of a Climate Change Adaptation Plan*, (September 2013), 14.

use of clean and renewable energy, pollution prevention and waste reduction, and climate change resilience.

Climate change projections are established through studies conducted by the United States Army Corps of Engineers (USACE), the National Oceanic and Atmospheric Administration (NOAA), the National Aeronautics and Space Administration (NASA). The Department of Energy and Environment (DOEE) Climate Change Adaptation Plan for the District of Columbia provides current local predictions for planning purposes.[37] SI is using the upper range of predictions for planning purposes.

The annual temperature in the Washington, D.C. metropolitan area will incrementally rise through the end of this century. Projected increases range from 2.5 to 3 degrees Fahrenheit (F) by the 2020's and as much as 6 to 10 degrees F by the 2080's.[38] Mean summer temperatures and quantity of days with heat index over 95 degrees F are also critical factors that are projected to rise in coming years. Urban heat island effects (UHI) in locations where building materials absorb and retain heat, as opposed to areas with vegetation providing shade, exacerbate the heat intensity.[39]

In association with projected increases in annual temperatures are predicted increases in precipitation and severity and frequency of storms. Currently, the District experiences an average of 10 days per year with rainfall events with greater than 1 inch of rain in a given 24-hour period. By 2020, this is expected to increase to 11 days per year and by the 2080s it is expected to average 13 days per year. Days with more than 2 inches of rainfall per 24-hour period are also expected increase by 3.5 days per year by the 2080s.[40]

[37] Department of Energy and Environment, *Climate Projections and Scenario Development: Climate Change Adaptation Plan for the District of Columbia, RFA: 2013-9-OPS,* (Washington, D.C., June 2015).

[38] Ibid, 61.

[39] Ibid, 27.

[40] Ibid, 32.

The projections of increased temperature, precipitation, and severity and frequency of storms have to be considered in conjunction with the projected rise in sea level, which has been projected to rise as much as 9 inches by the 2020's. Longer term projections range from 13 to 57 inches by the 2080's.[41] These changes combined with predicted frequency and severity of storms and sea level rise would result in more frequent flash-floods that overwhelm the stormwater infrastructure and reduce water quality for the Potomac and Anacostia Rivers.[42]

Impact Topics Dismissed

Land Use

The National Air and Space Museum is located on the National Mall in the center of Washington, D.C. It is one of 13 museums and galleries operated by the Smithsonian Institution on or near the Mall. The project area is used as a museum and the land use will not be changed or affected by the current project, therefore this impact topic was dismissed from further consideration.

Environmental Justice

The project area and its immediate surroundings do not contain sizeable residential populations. The project area is located within Ward 2, in Census Tract 62.2. According to the 2000 Census, Tract 62.2 contains only 12 residents, five identified as Black and seven identified as White. Thus, there should not be communities of concern with regard to environmental justice within the immediate area surrounding the project. Therefore, this impact topic was dismissed from further consideration.

[41] NASA, *Adapting to a Changing Climate: Federal Agencies in the Washington, D.C. Metro Area*, (2012).

[42] Department of Energy and Environment, *Climate Projections and Scenario Development: Climate Change Adaptation Plan for the District of Columbia, RFA: 2013-9-OPS*, (Washington, D.C., June 2015), 32.

Economic Impact

Washington, D.C. is among the top visitation locations within the U.S. In 2013, the metropolitan area hosted 17.4 million domestic visitors, and a total of 19 million visitors, setting a new record for the city.[43] In the same year, visitor spending totaled 6.69 billion dollars.[44] Travel and tourism in Washington, D.C. supports approximately 75,500 jobs annually totaling over $3.5 billion in wages. The most popular activity for visitors to DC is touring museums and historical sites.[45] Of the nine Smithsonian museums and one visitor's center on the Mall, NASM has generally had the highest annual visitation, with 7.0 million visitors recorded in 2013. This number decreased slightly, to 6.9 million, in 2015.[46] The NASM revitalization project will not result in measurable changes to visitation at the museum. The project implementation will be phased to ensure that the building will be open to visitors throughout construction. Therefore, this impact topic was dismissed from further consideration.

Archaeological Resources

The entire project area has been extensively disturbed previously. The museum includes below-grade parking and service areas that required excavation and disturbance of the project area during the original construction of NASM. Because the entire project area was disturbed previously, this impact topic was dismissed from further consideration.

Lightscape Management

The proposed action would require artificial outdoor lighting to the extent necessary to ensure safe conditions for visitors. Because the proposed action would negligibly impact or contribute to the natural ambient lightscapes of the NASM site, this impact topic was dismissed from further consideration.

[43] D.K. Shifflet & Associates, http://www.dksa.com; Travel Market Insights, http://www.travelmi.com/; National Travel and Tourism Office, http://tinet.ita.doc.gov/; International Trade Association, Department of Commerce, https://www.commerce.gov/; and Destination DC, https://washington.org/DC-information/about-destination-dc.

[44] HIS Global; and Destination DC, https://washington.org/DC-information/about-destination-dc.

[45] Washington, D.C. Convention and Tourism Corporation.

[46] Smithsonian Institution, "Visitor Statistics," newsdesk.si.edu/about/stats.

Surface Water

There are two man-made pools (one is the National Gallery Sculpture Garden fountain pool and the other is the U.S. Capitol Reflecting Pool) within the area of potential effect. Because the features are man-made reflecting pools that are closed systems, the proposed work will not affect any natural water body. Therefore, this impact topic was dismissed from further consideration.

Wetlands

The majority of the site is paved. The project site does not contain wetland vegetation; it is not inundated or saturated for greater than 12.5% of the growing season; and it does not contain hydric soils. Therefore, this impact topic was dismissed from further consideration.

Geology

The study area is located within the geological province of the Atlantic Coastal Plain Region, where natural sedimentary materials of sand, clay, and silt overlie crystalline bedrock. The project area is located on fill placed upon a geologic terrace above the Potomac River floodplain. The terrace deposits have been encountered at depths of 32 to 44 feet below the ground surface (SI 1993). Groundwater in the vicinity has previously been identified at a depth of 22 to 26 feet below the ground surface during a previous subsurface project on the Mall (SI 1993). The NASM revitalization will not affect geology in the project area. Therefore, this impact topic was dismissed from further consideration.

Soils

The soils of the project area are classified as Urban Land Association, which are soils that have been previously disturbed, cut, or filled, and may be covered by impervious surfaces. Existing fill material may be present on the project site at varying depths. The current project will include replacing soils in the planters on the terraces, but will not measurably affect soils in the project area. Therefore, this impact topic was dismissed from further consideration.

Wildlife

The project area is located in an urban environment, in which the natural environment has been previously disturbed and developed. Therefore, the area does not provide natural habitat for plant and animal species. The existing wildlife community likely includes common urban species of small mammals and birds, such as gray squirrels (*Sciurus carolinensus*), Norway rats (*Rattus norvegicus*), house sparrows (*Passer domesticus*), pigeons (*Columba livia*), and starlings (*Sturnus vulgaris*). The current project will not affect wildlife in the project area. Therefore, this impact topic was dismissed from further consideration.

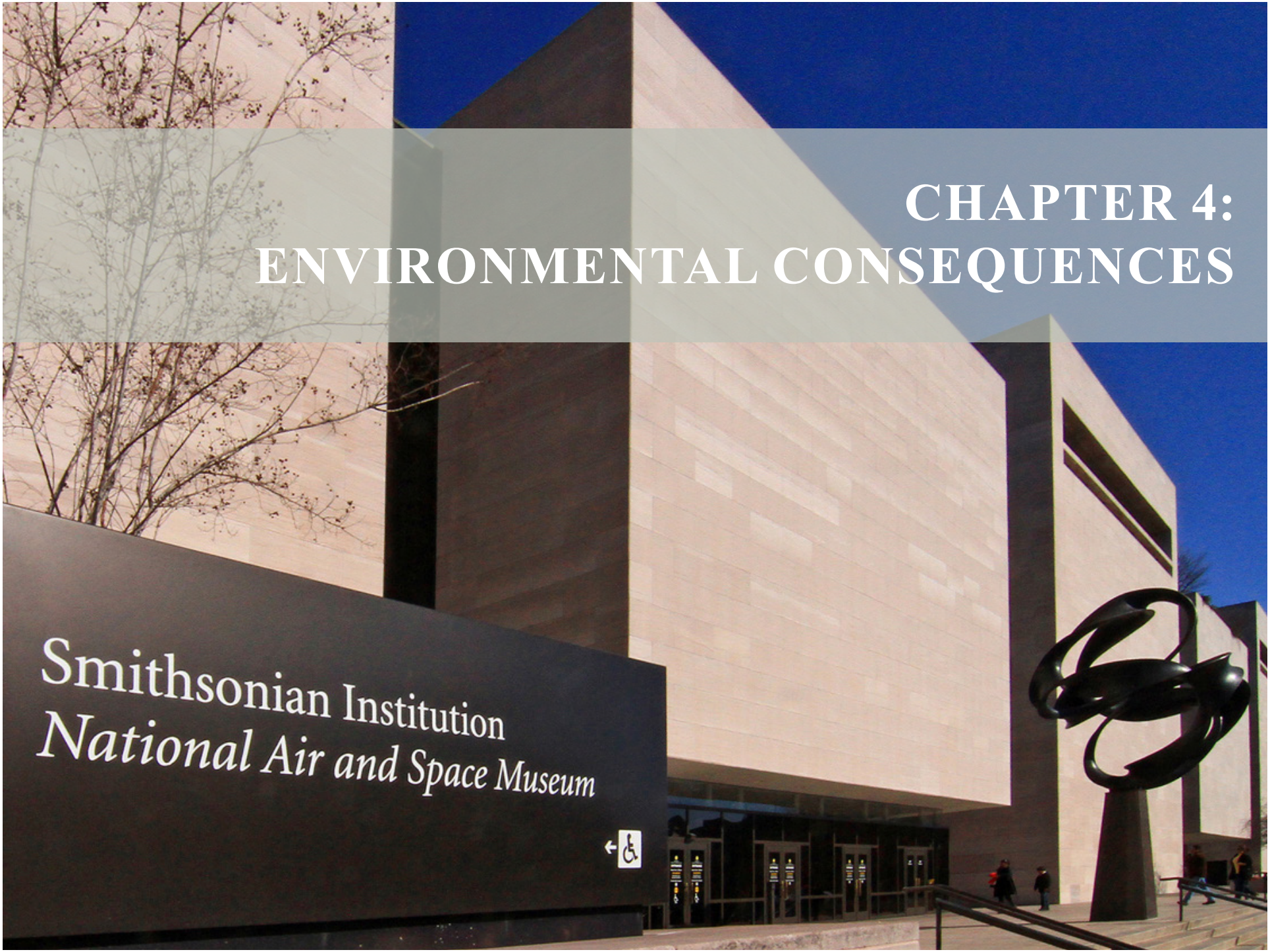
Water Supply

The DC-WASA provides water supply to the District. The source of the raw water comes from the Potomac River, which is treated via the Dalecarlia and McMillan Reservoirs (for sedimentation) and DC-WASA water treatment plants. Pump stations within the distribution system deliver water through mains and laterals to the NASM project site. The current project would not result changes to the water supply. Installation of cisterns would slightly reduce draws from the District water supply. Therefore, this topic was dismissed from further consideration.

Special Status Species

The United States Fish and Wildlife Service was contacted to determine whether any known critical habitats or listed rare, threatened, or endangered species have been documented in the project area. With the exception of occasional transient individuals, no proposed or federally listed endangered or threatened species are known to exist within the project area. Because of its highly urbanized environment in downtown Washington D.C., and the relatively small size and scope of the project, it is highly unlikely that the proposed work would affect the Migratory birds of concern. Therefore, this impact topic was dismissed from further consideration.

CHAPTER 4:
ENVIRONMENTAL CONSEQUENCES



CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

Introduction

This chapter evaluates the environmental consequences that would result from the implementation of each of the alternatives.

The assessment of impacts addresses potential changes that can be attributed to the proposed National Air and Space Museum (NASM) revitalization. Impacts are described according to intensity levels:

- No impact – the application of the Alternative would not change the condition of the topic addressed.
- Negligible impact – Impact(s) to the topic addressed would be at the lowest level of detection, or barely perceptible and not measurable.
- Minor impact – the proposed alterations would result in a small measurable impact to the topic addressed.
- Moderate impact – the proposed alterations would measurably alter the topic addressed but would not substantially diminish the integrity or condition of the topic addressed.
- Major impact – the proposed alterations would create a substantial, measurable impact to the topic addressed.

For the purposes of consultation under Section 106 of the National Historic Preservation Act (NHPA), actions identified to have an adverse effect are those that result in a loss of integrity. The DC Historic Preservation Officer (DC SHPO) has advised that there can be a range of degrees of adversity associated with adverse effects. To address adverse effects under Section 106, measures to minimize or mitigate adverse impacts are identified and a draft Memorandum of Agreement (MOA) attached to this Environmental Assessment (EA) as Appendix C. An adverse effect to historic resources does not necessarily result in a major impact under National Environmental Policy Act (NEPA), which occurs when an action would threaten the viability of the resource to achieve the purpose for which it was created.

The duration of impacts is also addressed in the evaluation.

- Short-term impacts are those that would occur during construction and establishment of the proposed action.
- Long-term impacts are those that would occur after the establishment of the proposed action and continue into the foreseeable future.

Impacts may be negative or beneficial. All impacts identified are negative, unless they are identified specifically as beneficial.

Historic Resources

Alternative A – No Action Alternative

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. Historic fabric, especially the exterior stone cladding, would continue to deteriorate and the conditions of the building and collections would continue to decline. The *Delta Solar* sculpture setting, consisting of a shallow pool, will continue to be non-operational. Alternative A, the No Action Alternative, would result in an adverse effect to historic resources under CFR 800.5(vi), as it constitutes neglect of the property causing its deterioration.

Action Alternatives

Throughout the concept design stage of the project, many alternatives to addressing deficiencies and improvements to the building envelope, major building systems, and site were rigorously researched and analyzed. Smithsonian shared information about the approaches with applicable agencies and interested individuals at agency staff meetings between November 2014 and March 2017 (see Appendix B).

In conformance with Section 106 of the NHPA, meetings and consultation sessions have been held with the DC SHPO to address historic resources. A full list of Section 106 consultation activities is provided in Appendix B of this EA. Every effort has been taken in the design process to minimize adverse impacts to historic resources resulting from the implementation of the action alternatives.

The Smithsonian Institute (SI) is continuing to consult with the DC SHPO and other consulting parties. Appendix C includes a draft MOA among NCPC, DC SHPO and SI. Exhibit E in the MOA is the draft

Assessment of Effects on Historic Resources (AOEHR) developed by the DC SHPO and SI. The AOEHR finds that use of a replacement material other than Tennessee Pink marble (limestone) for exterior cladding would have an adverse effect on the building and the National Mall Historic District, due to changing the exterior stone cladding, one of the most notable character defining features of the museum, and a strong visual connector to the similarly clad National Gallery of Art buildings across the National Mall. This change would also present an adverse effect by creating a contrast between the existing interior cladding and the alternate cladding where the two planes are visible together at the building atria (see Figure 4.1). The degree of the adverse effects related to replacement cladding would depend on how well the new material matches the color, quality of veining, and finish of the original stone. Replacement of glazing in the glass curtain walls and skylights would return the building closer to its original design intent, providing daylight in galleries and views to and from the museum galleries and the Mall as well as views of the sky. Therefore, the replacement of the curtain walls and skylights would not constitute an adverse effect. Other adverse effects would result from the addition of new vestibules, relocation of sculptures, and alterations to the terraces.[1] The MOA identifies mitigation measures to ameliorate the impacts resulting from the project.

[1] The National Air and Space Museum Revitalization Assessment of Effects on Historic Resources, DRAFT, 7 February 2017. Attached as Exhibit E in Appendix A of this EA.

Figure 4. 1: The existing interior and exterior cladding planes are visible together at the building atria. (Source: QEA.)

The National Mall

Renovations to NASM would have a moderate short-term impact and a moderate long-term impact on the greensward of the National Mall. Short term impacts will include construction activities, and removal of building materials and plants that will be replaced. Long-term impacts to historic resources include changes to views of the NASM from the National Mall comprised of the addition of the north vestibule, and replacement of plantings and planter walls on the north side of the building. Each of these alterations has been discussed at length with regulatory agencies and rigorous efforts have been made to ensure their impacts to views from the Mall are minimized.

NASM Building

A concerted effort has been made to respect the original design intent of Gyo Obata throughout the design process. The historic resources section of Chapter 3 includes a description of the original design intent. Necessary renovations to the building envelope, cladding, and landscape would require removal of historic fabric and replacement with new materials, in order to ensure the longevity of the building and collections, as well as the safety and enjoyment of museum visitors, into the future. Although the loss of historic fabric would have a negative impact on historic integrity, the correction of deficiencies would have a larger beneficial impact.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B would generate moderate negative impacts to historic resources with the incorporation of necessary, but adverse, effects to the appearance of the building and site. In addition to changes to the historic appearance (and therefore integrity) of the building and site, the implementation of Alternative B would also have a moderate beneficial impact due to correction of deficiencies, thereby providing a building envelope that would be durable for a 100-year period.

Envelope Replacement - Cladding Alternative B – Tennessee Pink Replacement Stone
In consultation with the DC SHPO, it has been determined that in-kind replacement of the Tennessee Pink marble (limestone) would not have an adverse effect on the historic integrity of the building, or the historic integrity of the National Mall (refer to Appendix B for DC SHPO correspondence).

Envelope Replacement - Glazing (All Action Alternatives)
The proposed replacement glazing would better protect the collection from exposure to harmful ultraviolet rays, in addition to being thermally adequate and blast resistant. The proposed replacement curtain wall and skylight replacement glazing would increase visible light transmission and increase visibility of the gallery interior from the Mall, preserve the integrity of the original design concept with views to the open sky and the National Gallery of Art from the interior. Therefore this change does not constitute an adverse effect.

Renovations that would be made to improve security, visitor experience, and sustainability—rather than correcting deficiencies—require separate consideration. They include the addition of vestibules at the

north and south entrances, additions of solar energy harvesting systems, and alterations to the site circulation and landscape, and setting of sculptures.

Addition of Vestibules (All Action Alternatives)

The DC SHPO understands the design departure proposed for the vestibules to provide improvements to visitor comfort, access and security. Although the appearance of the historic building would change with the addition of the vestibules, the design of the vestibules responds to the original physical building and supports the mission of the museum in function and form. The proposed vestibules are designed to correspond to the existing building bays and would not obstruct views from the interior of the building, maintaining the original design intent. The vestibules would not require removal of historic fabric and could be removed without damaging the historic building. Both vestibule designs include the installation of photovoltaics on the south canopy that would be visible to visitors, expressing the Museum's mission by demonstrating the application of space age technology. The south canopy photovoltaics would be an integral film type that would follow the alignment of the structure and would not vary above or disrupt the canopy. The vestibules would have an adverse effect on the appearance of the building, due to disrupting the geometric horizontality of the form of the building, resulting in a necessary but adverse effect on the historic building. The canopy of the south vestibule would extend over the stairs, with a setback of 15 feet from the back of the curb at Independence Avenue SW to avoid the sidewalk and road Right-of-Way (see Figure 4.2). Based on the District Department of Transportation (DDOT) Right-of-Way information provided by the D.C. Geographic Information System (DC GIS) of the D.C. Office of the Chief Technology Officer (OCTO), the Independence Avenue Right-of-Way is 112'-6" with a 17'-6" sidewalk west of 6th Street SW and 110' with a 15' sidewalk east of 6th Street SW. The north entrance vestibule would extend beyond the McMillan Line, resulting in an adverse effect on the National Mall Historic District.[2]

[2] Ibid.

Figure 4. 2: South Canopy overhang relative to Independence Avenue SW road and sidewalk rights-of-way. (Source: D.C. Office of the Chief Technology Officer (OCTO); and QEA).

Relocation of Sculptures (All Action Alternatives)
The proposed vestibule at the south entrance would require the relocation of the *Continuum* sculpture, which was installed in 1976, to another location on the NASM site, altering the original design and constituting an adverse effect (see Figure 4.3). The proposed vestibule at the north entrance would require relocation of the *Ad Astra* sculpture, which was also installed in 1976, by shifting to the north of its existing location. Because it would remain on access with the building entrance, this relocation would not constitute an adverse effect. Relocation of the *Delta Solar* sculptural fountain, installed in 1977, would alter the original design, resulting in an adverse effect on the site.[3]

Terrace Alterations (All Action Alternatives)
The DC SHPO has stated that the alterations to the site would constitute an adverse affect. The changes to the landscape addressing leaks to the garage would have a moderate beneficial effect on historic resources. The changes to the landscape that improve visibility of the building from the surrounding area would have a minor beneficial effect on historic resources, and a moderate beneficial impact on human comfort by providing shade canopy trees. Changes to the existing terraced planting beds and retaining walls will require removal of original materials. The cladding of the planter beds and retaining walls will be replaced to match the new cladding selected for the building. If the replacement cladding is not Tennessee Pink marble (limestone), the change will constitute an adverse effect. Alterations to the landscape and terrace would constitute an adverse effect on the character of the terrace and stairs due to removal of raised planters and installing flush planters and freestanding walls.[4]

Changes to the terrace would also result in an adverse effect to historic resources as the new design for planters and walls would contribute to changes to the overall site plan. The additions of new vestibules at the north and south entrances also present an adverse effect to historic resources, as they would break the clean lines of the original building's north and south elevations. Finally, the proposed relocation of the *Continuum* sculpture from the 6th Street (South) entrance to the museum may also constitute an adverse effect to historic resources.

[3] Ibid.
[4] Ibid.

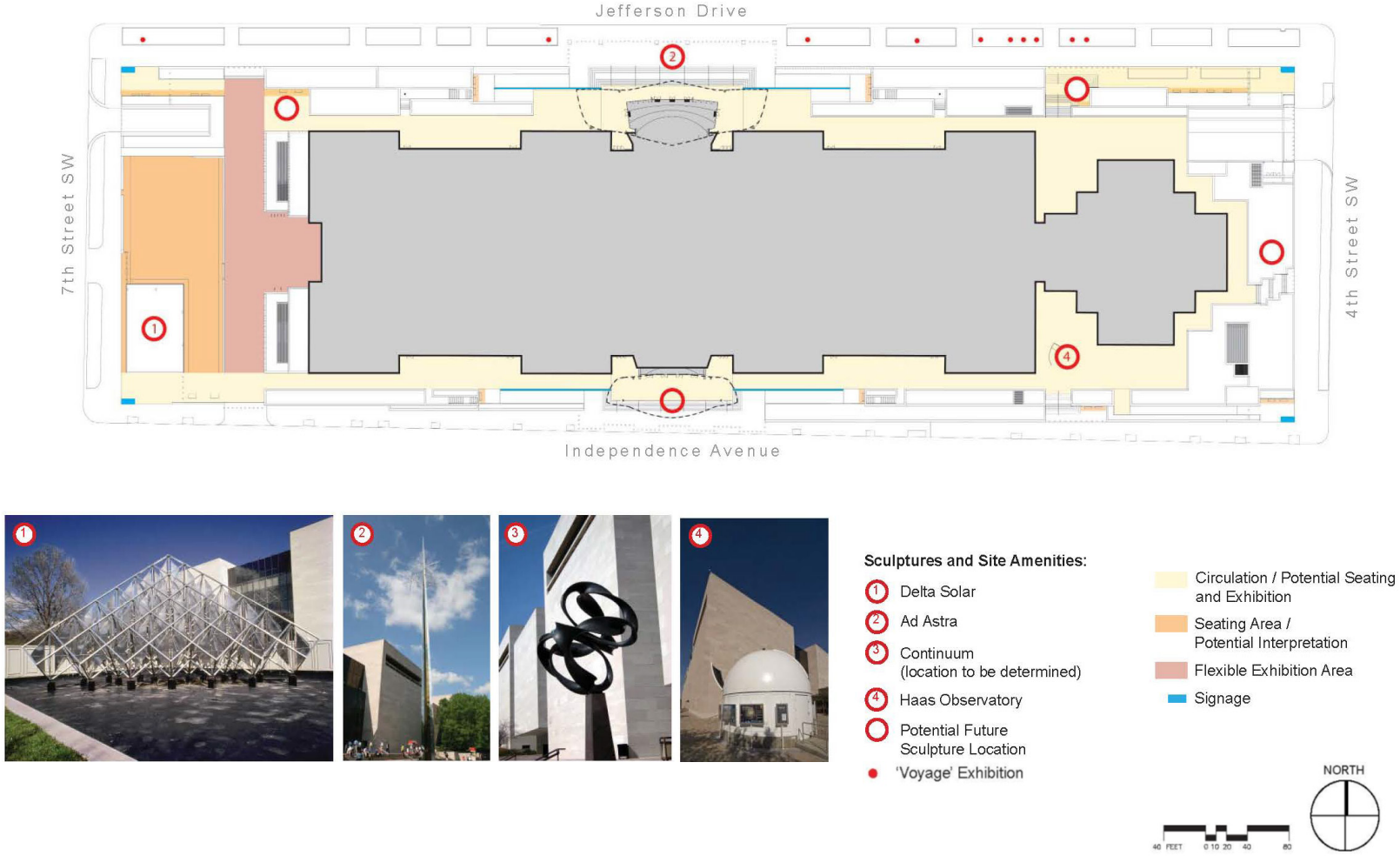


Figure 4. 3: Proposed Terrace Improvements. (Source: QEA.)

Addition of Solar Panels (All Action Alternatives)

The roof solar panels will be set back far enough from the edges of the NASM roof and field reviewed with DC SHPO to ensure that they are not visible from a public thoroughfare. Although the solar panels will be minimally visible from the top of the Washington Monument, this view is incidental due to the distance (see Figure 4.4 and View 8 Action Alternative in Visual Resources section of this chapter). Therefore, the roof solar panels will not have an adverse effect on the NASM or the National Mall Historic District. The installation of photovoltaics on the south canopy would be visible to visitors, expressing the Museum's mission by demonstrating the application of space age technology.

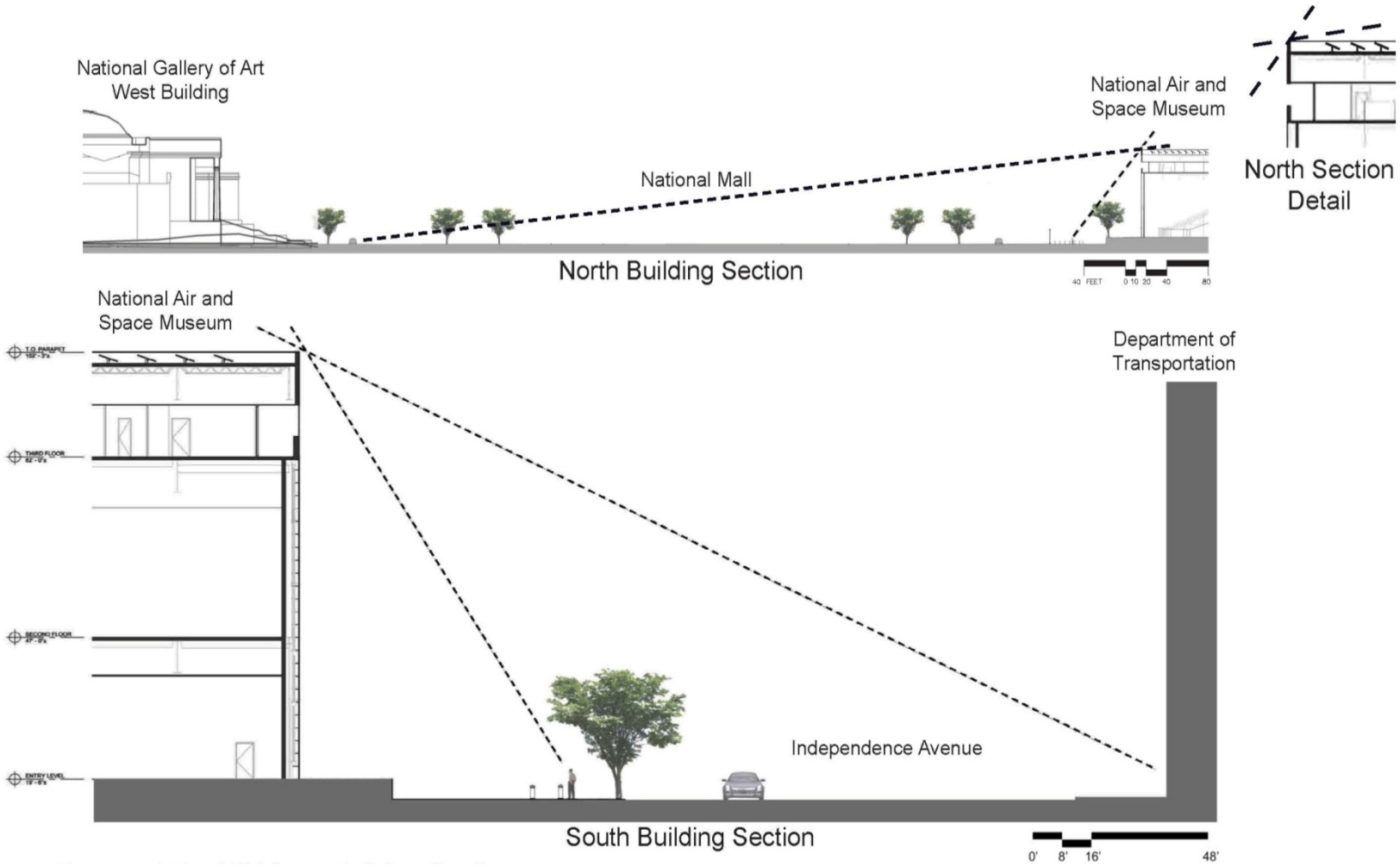


Figure 4. 4: Pedestrian views of proposed roof photovoltaic array. (Source: QEA.)

Cumulative Impacts to Historic Resources

Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B could generate short-term and long-term moderate impacts to historic resources. In particular, if construction of the NASM revitalization project occurs concurrently with the implementation of other construction projects along the Mall, the combined effects could temporarily change the overall appearance and character of the Mall during the construction activities.

Minimization and Mitigation of Impacts to Historic Resources

Rigorous efforts have been made to minimize impacts to historic resources through detailed consideration of design solutions. Use of durable systems and materials to ensure the longevity of the building and site would help to ensure that the building does not continue to deteriorate, and that it serves its role as a monumental national museum for generations to come. DC SHPO and consulting parties are involved in the development of minimization and mitigation measures.

Minimization Measures

a. The *Continuum* sculpture would remain on the NASM site, and the proposed site for relocation would be selected in consultation with the DC SHPO, CFA, and NCPC.
b. Planting materials on the property would be designed to minimize visual impact on the building and views from the interior atria as originally conceived. The grove of trees north of the *Delta Solar* sculpture would be maintained.
c. Rooftop photovoltaics would be situated to be non-visible from public thoroughfares. Physical mock-ups would be carried out with the DC SHPO in advance of installation to determine where solar panels would and would not be visible and identify the appropriate locations for installation.
d. The planter beds and retaining walls within the plaza would be constructed of the same cladding material selected for the facade to maintain their visual relationship and original design intent.

Mitigation Measures

a. SI would use Historic American Building Survey/Historic American Engineering Record/Historic American Landscape Survey (HABS/HAER/HALS) Level III standards to document the NASM building and its setting with exterior and interior photographs. Photographic documentation would also include the site sculptures known as *Ad Astra, Continuum, and Delta Solar* in their original locations.

b. SI would complete an Individual National Register Nomination for NASM.
c. A select portion of salvageable Tennessee Pink marble (limestone) from the exterior of the building would be saved for re-use in a SI collection area for any future work on the marble panels at the interior of the atria. If no salvageable material is recovered, the MOA Signatories would be notified.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Through consultation with the DC SHPO, it has been determined that implementation of Alternative C would result in adverse effects to historic resources generated through use of a cladding material other than Tennessee Pink marble (limestone). The degree of the adverse effect to historic resources would depend on how well the replacement cladding material matches the color, quality of veining, and finish of the original stone. Efforts are being made to select a replacement stone that would match the color and pattern of the existing stone as closely as possible, but it is expected that there would be a change to the overall appearance of the building. While there would be an adverse effect, there would also be a moderate beneficial impact due to correction of deficiencies, thereby providing a building envelope that would be durable for a 100-year period. In addition, Alternative C would have the same effects to historic resources as Alternative B related to replacing glazing, adding vestibules, relocating sculptures, altering terraces, and adding solar panels.

Cumulative Impacts to Historic Resources

Cumulative impacts associated with the ongoing and planned projects identified in Chapter 1, when considered with implementation of Alternative C, could also generate short-term and long-term moderate impacts to the National Mall Historic District. In particular, if construction of the NASM revitalization project occurs concurrently with the implementation of other construction projects along the Mall, the combined effects could temporarily change the appearance and character of the Mall during the construction activities.

Minimization and Mitigation of Impacts to Historic Resources

Rigorous efforts have been made to minimize impacts to historic resources through detailed consideration of design solutions. DC SHPO and consulting parties are involved in development of minimization and mitigation measures.

Minimization Measures

The same minimization measures from Alternative B apply to Alternative C, as explained in the MOA in Appendix C.

Mitigation Measures

In addition to the mitigation measures included in Alternative B, Alternative C includes the following mitigation measure, as explained in the MOA in Appendix C.

a. To mitigate the adverse effects associated with selection of a cladding material other than Tennessee Pink marble (limestone),
    a. SI would develop a technical report to establish the conditions of the original stone cladding, causes for the deficiencies that developed, and reasons that Tennessee Pink marble (limestone) was not a feasible option for procurement.
    b. SI would complete an Individual National Register Nomination for the Museum of Natural History.

Alternative D – Replacement Cladding of a Manufactured Material

Through consultation with the DC SHPO, it has been determined that implementation of Alternative D would result in strong adverse effects to historic resources generated through use of a cladding material that is neither Tennessee Pink marble (limestone) nor a natural stone. The degree of the adverse effect to historic resources would depend on how well the replacement cladding material matches the color, quality of veining, and finish of the original stone. Efforts are being made to select a replacement material that would match the color and pattern of the existing stone as closely as possible, but it is expected that there would be a change to the overall appearance of the building. A strong adverse effect to historic resources does not necessarily result in a major impact under NEPA, which occurs when an action would threaten the viability of the resource to achieve the purpose for which it was created. While there would be an adverse effect, there would also be a moderate beneficial impact due to correction of deficiencies, thereby providing a building envelope that would be durable for a 100-year period. Also, Alternative D would

have the same effects to historic resources as Alternative B related to replacing glazing, adding vestibules, relocating sculptures, altering terraces, and adding solar panels.

Cumulative Impacts to Historic Resources

Cumulative impacts associated with the ongoing and planned projects identified in Chapter 1, when considered with implementation of Alternative D, could also generate short-term moderate impacts to the National Mall Historic District. In particular, if construction of the NASM revitalization project occurs concurrently with the implementation of other construction projects along the Mall, the combined effects could temporarily change the appearance and character of the Mall during the construction activities.

Mitigation of Impacts to Historic Resources

Rigorous efforts have been made to minimize impacts to historic resources through detailed consideration of design solutions. DC SHPO and consulting parties are involved in development of minimization and mitigation measures.

Minimization Measures

The minimization measures for Alternative D are consistent for all the action alternatives and are also included in the MOA (see Appendix C).

Mitigation Measures

The mitigation measures for Alternative D are the same as Alternative C and are also included in the MOA (see Appendix C).

Visual Resources

An assessment of impacts to visual resources addresses potential changes to views and vistas that can be attributed to the proposed NASM rehabilitation. Visual impacts are described according to the following categories:

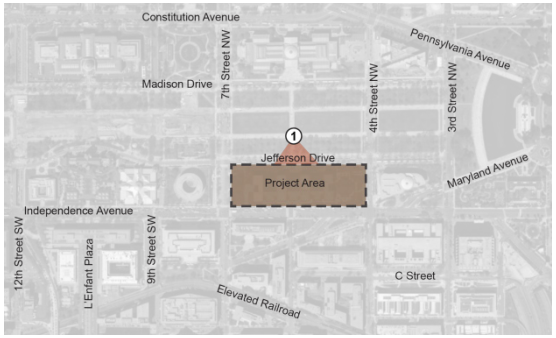
- No visual impact – the proposed alterations would not be visible from the viewpoint.
- Negligible visual impact – the proposed alterations would be barely visible from the viewpoint.
- Minor visual impact – the proposed alterations would be visible, but would not interfere with views and would not change the character of existing views.
- Moderate visual impact – The proposed alterations would be visible and would interfere with existing views, but would not change the character of existing views.
- Major visual impact – the proposed alterations would be visible as a contrasting or dominant element that interferes with views and substantially alters the character of existing views.

The locations of eight important views are illustrated below and evaluated in this section (see Views 1-8). Following the descriptions of the eight views and potential impacts, is an overall summary of cumulative visual impacts and mitigation approaches for each of the alternatives. The analysis of visual resources is based on the best available information regarding the cladding materials. Exterior cladding mockups will be available for viewing on site and joint public, Section 106, and NEPA meetings will occur on 6 and 7 April 2017. Additional information about the meetings is available at the NCPC website: www.ncpc.gov.

View 1: from the National Mall facing south toward the north elevation of NASM

No Action Alternative

View Location



No Action Alternative

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. This would result in continued deterioration of the building and its visual appearance, and long-term moderate impacts to view 1. As the existing stones become increasingly cupped or need to be removed from the building, patches would be visually apparent. Protective scaffolding would be needed around the base of the building to protect visitors and staff, further impacting view 1.

View 1: from the National Mall facing south toward the north elevation of NASM

Action Alternative

Public Meetings: Joint public, Section 106 and NEPA meetings will occur on 6 and 7 April 2017. Exterior cladding mockups will be available for viewing on site. See NCPC website for more information: www.ncpc.gov.

Alternative B

Implementation of Alternative B would have a short- and long-term moderate visual impact on view 1. In the short-term, construction activities and removal of plants would change the appearance from this view. In the long-term, the addition of the vestibule and changes to the landscape would affect the character of the existing view of the north entrance of the building.

Alternative C

Implementation of Alternative C would have a short- and long-term moderate visual impact on view 1. This would include all of the same impacts described under Alternative B. In addition, the exterior cladding of the building would not be the same stone as the original. The alternative stone would match the color, pattern, and panel size of the existing stone as closely as possible but it would not be an exact match and the overall appearance of the building would change. Also, the building would become visually separated from the National Gallery of Art West Building and East Wing, both of which are constructed of Tennessee Pink marble (limestone).

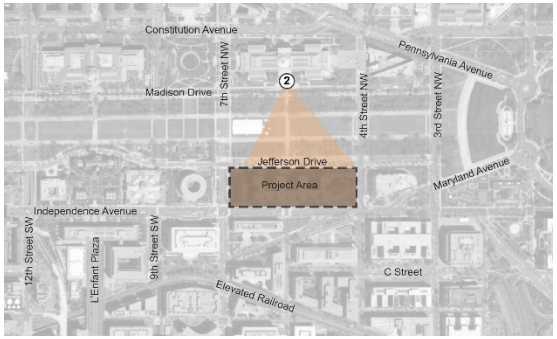
Alternative D

Implementation of Alternative D would have a short- and long-term moderate visual impact on view 1. This would include all of the same impacts described under Alternative B. In addition, the exterior cladding of the building would not be the same material as the original. The UHPC would be designed to match the color, pattern, and panel size of the existing stone as closely as possible but it would not be an exact match and the overall appearance of the building would change and affect the character and composition of the National Mall. Also, the building would become visually separated from the National Gallery of Art West Building and East Wing, both of which are constructed of Tennessee Pink marble (limestone).

View 2: from the National Gallery West Building facing south toward the north facade of NASM

No Action Alternative

View Location



No Action Alternative

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. This would result in continued deterioration of the building and its visual appearance, and long-term minor impacts to view 2. As the existing stones become increasingly cupped or need to be removed from the building, patches could become apparent.

View 2: from the National Gallery West Building facing south toward the north facade of NASM

Action Alternative with Vestibule Option A

Mock-up panels will be available for viewing on site during public meetings that will occur on 6 and 7 April 2017. See NCPC website for meeting times: www.ncpc.gov.

Alternative B

Implementation of Alternative B would have moderate short- and long-term visual impacts on view 2. In the short-term, construction activities and removal of plants would change the appearance from this view. In the long-term, the addition of the vestibule and changes to the landscape would be visible and change the existing view, but would not alter the overall character of view 2. From the perspective of view 2, vestibule option A would appear very much as a sculptural feature and would not compete with the dominant massing of the overall building façade. Vestibule option B would appear as a volume similar to the existing vestibule. In the long-term, the changes to the landscape might be discernible in the winter, but would not change the overall appearance of the building from view 2.

Alternative C

Implementation of Alternative C would have moderate short- and long-term visual impacts on view 2. This would include all of the same impacts described under Alternative B. In addition, the exterior cladding of the building would not be the same stone as the original. The alternative stone would match the color, pattern, and panel size of the existing stone as closely as possible but it would not be an exact match and the overall appearance of the building would change. Also, the building would become visually separated from the National Gallery of Art West Building and East Wing, both of which are constructed of Tennessee Pink marble (limestone).

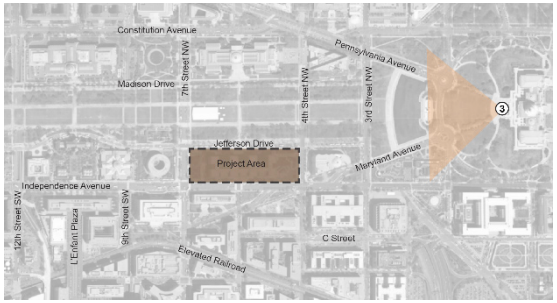
Alternative D

Implementation of Alternative D would have moderate short- and long-term visual impacts on view 2. This would include all of the same impacts described under Alternative B. In addition, the exterior cladding of the building would not be the same material as the original. The UHPC would be designed to match the color, pattern, and panel size of the existing stone as closely as possible but it would not be an exact match and the overall appearance of the building would change, and affect the character and composition of the National Mall. Also, the building would become visually separated from the National Gallery of Art West Building and East Wing, both of which are constructed of Tennessee Pink marble (limestone).

View 3: from the U.S. Capitol Building facing west toward the National Mall

No Action Alternative

View Location



No Action Alternative

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. This would result in continued deterioration of the building and its visual appearance, and long-term negligible impacts to view 3. As the existing stones become increasingly cupped or need to be removed from the building, patches could be visible from this vantage.

View 3: from the U.S. Capitol Building facing west toward the National Mall

Action Alternative

Alternative B

Currently, only the very top of NASM is visible from the U.S. Capitol Building in the summer when there are leaves on the trees. Although more visible in the winter, the distance and scale of the overall view are expansive and monumental. Implementation of Alternative B would have a minor short-term effect and no long-term impact on view 3. In the short-term, construction activities (especially cranes) and removal of plants could change the appearance from this view.

Alternative C

Implementation of Alternative C would have a minor short-term effect and a minor long-term impact on view 3. In the short-term, construction activities (especially cranes) and removal of plants could change the appearance of view 3. In the long-term, the replacement cladding stone would match the color and pattern of the existing stone as closely as possible, but the appearance of the portion of the building visible in view 3 may change.

Alternative D

Implementation of Alternative D would have a minor short-term effect and a moderate long-term impact on view 3. In the short-term, construction activities (especially cranes) and removal of plants could change the appearance of view 3. In the long-term, the replacement cladding material would match the color and pattern of the existing stone as closely as possible, but the appearance of the portion of the building visible in view 3 may change.

View 4: from the western portion of the National Mall toward NASM and beyond to the U.S. Capitol Building

No Action Alternative

View Location

No Action Alternative

Currently, only the top of NASM is visible from the vantage of view 4 in the summer when there are leaves on the trees. Although more visible in the winter, the distance and scale of the overall view are expansive and monumental. Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. This would result in continued deterioration of the building and its visual appearance, and long-term negligible impacts to view 4. As the existing stones become increasingly cupped or need to be removed from the building, patches could be visible from this vantage.

View 4: from the western portion of the National Mall toward NASM and beyond to the U.S. Capitol Building

Action Alternative

Alternative B

Currently, only the top of NASM is visible from the vantage of view 4 in the summer when there are leaves on the trees. Although more visible in the winter, the distance and scale of the overall view are expansive and monumental. Implementation of Alternative B would have a minor short-term effect and no long-term impact on view 4. In the short-term, construction activities (especially cranes) and removal of plants could change the appearance from this view.

Alternative C

Implementation of Alternative C would have a minor short-term effect and a minor long-term impact on view 4. In the short-term, construction activities (especially cranes) and removal of plants could change the appearance of view 4. In the long-term, the replacement cladding stone would match the color and pattern of the existing stone as closely as possible, but the appearance of the portion of the building visible in view 4 may change.

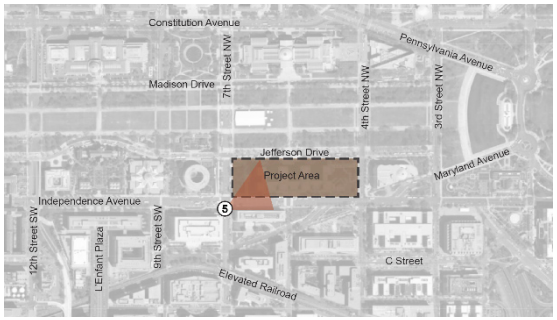
Alternative D

Implementation of Alternative D would have a minor short-term effect and a moderate long-term impact on view 4. In the short-term, construction activities (especially cranes) and removal of plants could change the appearance of view 4. In the long-term, the replacement cladding material would match the color and pattern of the existing stone as closely as possible, but the appearance of the portion of the building visible in view 4 may change.

View 5: from the intersection of 7th Street and Independence Avenue facing northeast toward the southwest corner of NASM

No Action Alternative

View Location



No Action Alternative

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. This would result in continued deterioration of the building and its visual appearance, and long-term moderate impacts to view 5. As the existing stones become increasingly cupped or need to be removed from the building, patches would be visually apparent. Protective scaffolding would be needed around the base of the building to protect visitors and staff, further impacting view 5.

View 5: from the intersection of 7th Street and Independence Avenue facing northeast toward the southwest corner of NASM

Action Alternative

Mock-up panels will be available for viewing on site during public meetings that will occur on 6 and 7 April 2017. See NCPC website for meeting times: www.ncpc.gov.

Alternative B

Implementation of Alternative B would have a moderate short-term effect and moderate beneficial long-term impact on view 5. In the short-term, construction activities and removal of plants would change the appearance from this view. In the long-term changes to the landscape would open views of the building and plaza.

Alternative C

Implementation of Alternative C would have a short- and long-term moderate visual impact on view 5. In the short-term, construction activities and removal of plants would change the appearance from this view. In the long-term, changes to the landscape would open views of the building and plaza. In addition, the exterior cladding of the building would not be the same stone as the original. The alternative stone would match the color, pattern, and panel size of the existing stone as closely as possible but it would not be an exact match and the overall appearance of the building would change.

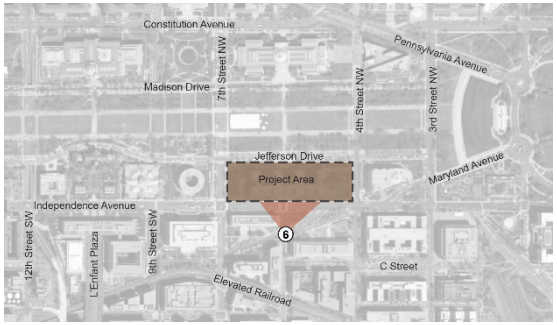
Alternative D

Implementation of Alternative D would have a short- and long-term moderate visual impact on view 5. In the short-term, construction activities and removal of plants would change the appearance from this view. In the long-term, changes to the landscape would open views of the building and plaza. The UHPC would be designed to match the color, pattern, and panel size of the existing stone as closely as possible but it would not be an exact match and the overall appearance of the building would change.

View 6: from the U.S. Capitol Building facing west toward the National Mall

No Action Alternative

View Location



No Action Alternative

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. This would result in continued deterioration of the building and its visual appearance, and long-term minor impacts to view 6. As the existing stones become increasingly cupped or need to be removed from the building, patches would be visually apparent. Protective scaffolding would be needed around the base of the building to protect visitors and staff, further impacting view 6.

View 6: from the U.S. Capitol Building facing west toward the National Mall

Action Alternative

Alternative B

Implementation of Alternative B would have a moderate short-term and moderate long-term impact on view 6. In the short-term, construction activities and removal of plants would change the appearance from this view. In the long-term, the addition of the vestibule and removal of the *Continuum* sculpture would be visible and change the existing view, altering the overall character of view 6. From the perspective of view 6, the vestibule would appear very much as a sculptural feature and would not compete with the dominant massing of the overall building façade.

Alternative C

Implementation of Alternative C would have a moderate short-term and moderate long-term impact on view 6. In the short-term, construction activities and removal of plants would change the appearance from this view. In the long-term, the addition of the vestibule and removal of the *Continuum* sculpture would be visible and change the existing view, altering the overall character of view 6. In addition, the exterior cladding of the building would not be the same stone as the original. The stone selected would match the color, pattern, and panel size of the existing stone as closely as possible but it is expected that there would be a change to the appearance of the portions of the building visible from view 6.

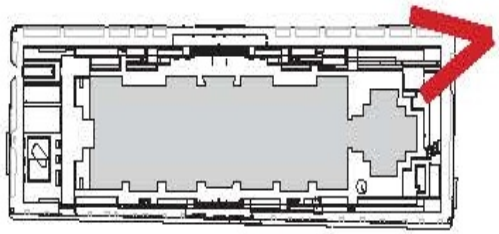
Alternative D

Implementation of Alternative D would have a moderate short-term and moderate long-term visual impact on view 6. In the short-term, construction activities and removal of plants would change the appearance from this view. In the long-term, the addition of the vestibule and removal of the *Continuum* sculpture would be visible and change the existing view, altering the overall character of view 6. In addition, the exterior cladding of the building would not be the same material as the original. The material selected would match the color, pattern, and panel size of the existing stone as closely as possible but it is expected that there would be a change to the appearance of the portions of the building visible from view 6.

View 7: from the corner of Jefferson Drive and 4th Street SW, facing southwest toward NASM

No Action Alternative

View Location



No Action Alternative

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. This would result in continued deterioration of the building, terrace, and visual appearance, and long-term negligible impacts to view 1.

View 7: from the corner of Jefferson Drive and 4th Street SW, facing southwest toward NASM

Action Alternative

Alternative B

Implementation of Alternative B would have a moderate short-term and minor long-term beneficial impact on view 7. In the short-term, construction activities and removal of plants would change the appearance from this view. In the long-term, the new Tennessee Pink stone may have a slightly different color range or pattern than the current stone but this change would not interfere with the view and would not change the character of the existing view. Changes to the landscape would open views to the walkways and building.

Alternative C

Implementation of Alternative C would have a moderate short-term and minor long-term beneficial impact on view 7. This would include the same impacts described under Alternative B. In addition, the exterior cladding of the building would not be the same stone as the original. The stone selected would match the color and pattern of the existing stone as closely as possible but it is expected that there would be a change to the appearance of the portions of the building visible from view 7.

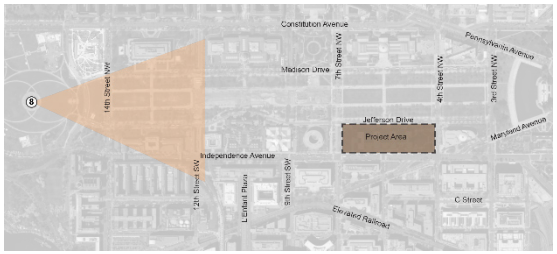
Alternative D

Implementation of Alternative D would have the same effect on view 7 as Alternative C, a moderate short-term and minor long-term beneficial impact. In addition, the exterior cladding of the building would not be the same material as the original. The material selected would match the color, pattern, and panel size of the existing stone as closely as possible but it is expected that there would be a change to the appearance of the portions of the building visible from view 7.

View 8: from the top of the Washington Monument toward the U.S. Capitol Building

No Action Alternative

View Location



No Action Alternative

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. This would result in continued deterioration of the building and its visual appearance, and long-term minor impacts to view 8. As the existing stones become increasingly cupped or need to be removed from the building, patches would be visually apparent.

View 8: from the top of the Washington Monument toward the U.S. Capitol Building

Action Alternative

Alternative B

Implementation of Alternative B would have a short-term moderate impact and a long-term minor impact on views of the Mall from the top of the Washington Monument. In the short-term, construction activities and removal of plants would change the appearance from this view. The changes to the landscape would have a short-term moderate effect on views, due to the removal of trees. Their replacement with new trees selected to thrive in the conditions would result in a long-term negligible beneficial impact to view 8. In the long-term, the majority of the changes to NASM, including the addition of photovoltaics and changes to building systems, would not be visually discernible from this vantage. In the long-term, the new Tennessee Pink stone may have a slightly different color range or pattern than the current stone but this change would not interfere with the view and would not change the character of the existing view. The north vestibule roof would be visible from the National Monument; however, the visibility of the front of NASM is limited from this distance.

Alternatives C and D

Implementation of Alternative C or D would have the same effect on view 8 as Alternative B, a moderate short-term and moderate long-term impact on views from the top of the Washington Monument. The exterior cladding of the building would not be the same as the original. The material selected would match the color, pattern, and panel size of the existing stone as closely as possible but it is possible that there would be a discernible change to the appearance of the portions of the building visible from view 8. The composition of the Mall and material relationship between the NASM the National Gallery will be affected.

Alternative A – No Action

Impacts to Visual Resources

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. This would result in continued deterioration of the building and its visual appearance, and long-term moderate impacts to Visual Resources. As the existing stones become increasingly cupped or need to be removed from the building, patches would be visually apparent. Protective scaffolding would be needed around the base of the building to protect visitors and staff, further impacting Visual Resources.

Alternative B – Tennessee Pink Replacement Stone

Cumulative Impacts to Visual Resources

Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B could generate short-term moderate and long-term minor cumulative impacts to visual resources. In the short-term, if construction of the NASM revitalization project occurs concurrently with the implementation of other construction projects along the Mall, the combined effects could temporarily alter the overall appearance and character of the Mall during the construction activities. Long-term cumulative positive impacts to views on the south side of NASM could result from the combination of the NASM revitalization with the implementation of the Dwight D. Eisenhower Memorial.

Mitigation of Impacts to Visual Resources

Rigorous efforts have been made to minimize impacts to visual resources through detailed consideration of design solutions. Under Alternative B, the use of Tennessee Pink marble (limestone) for replacement cladding would match the existing cladding appearance as closely as possible. Although the vestibules would alter views of the north and south entrances to the building, the design would be developed to respond to the mission of the museum. The scale of the vestibule roofs would defer to the building and its form would be purposefully developed to avoid presenting a false sense of history. The addition deemed necessary for visitor comfort and security, would also serve as a sculptural element and transitional feature between the monumental modern building and the visitors arriving to experience the museum. The new site walls would be clad with the existing panel sizes, and a material that matches the new cladding on the building to recreate the existing visual relationship between the two. The *Ad Astra* and *Delta Solar*

sculptures would be shifted slightly but would retain their original spatial relationships to the building and site. If it is necessary to relocate the *Continuum* sculpture (due to construction of the south canopy) a new location on the NASM site would be determined by SI working with consulting parties.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Cumulative Impacts to Visual Resources

Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative C would generate the same cumulative impacts to visual resources as Alternative B, short and long-term moderate cumulative impacts.

Mitigation of Impacts to Visual Resources

Rigorous efforts have been made to minimize impacts to visual resources through detailed consideration of design solutions. Under Alternative C, the use of a different stone than Tennessee Pink marble (limestone) for replacement cladding would be carefully selected to match the existing cladding appearance as closely as possible, in horizontal veining pattern, color and panel size. Although the vestibules would alter views of the north and south entrances to the building, the design would be developed to respond to the mission of the museum. The scale of the vestibule roofs would defer to the building and its form would be purposefully developed to avoid presenting a false sense of history. The addition deemed necessary for visitor comfort and security, would also serve as a sculptural element and transitional feature between the monumental modern building and the visitors arriving to experience the museum. The new site walls would be clad with the existing panel sizes, and a material that matches the new cladding on the building to recreate the existing visual relationship between the two.

Alternative D – Replacement Cladding of a Manufactured Material

Cumulative Impacts to Visual Resources

Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative D would generate the same cumulative impacts to visual resources as Alternative C, short and long-term moderate cumulative impacts.

Mitigation of Impacts to Visual Resources

Rigorous efforts have been made to minimize impacts to visual resources through detailed consideration of design solutions. Under Alternative D, the use of a different material than stone for replacement cladding would be carefully selected to match the existing cladding appearance as closely as possible. The re-use of portions of the Tennessee Pink marble (limestone) as aggregate in the UHPC would help to retain the visual characteristics of the building and site. Although the vestibules would alter views of the north and south entrances to the building, the design would be developed to respond to the mission of the museum. The scale of the vestibule roofs would defer to the building and its form would be purposefully developed to avoid presenting a false sense of history. The addition deemed necessary for visitor comfort and security, would also serve as a sculptural element and transitional feature between the monumental modern building and the visitors arriving to experience the museum. The new site walls would be clad with the existing panel sizes, and a material that matches the new cladding on the building to recreate the existing visual relationship between the two.

Visitor Experience

Alternative A – No Action Alternative

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. Visitors would continue to experience delays, discomfort, and an overall experience that is not at the level expected for this premier national museum. Because no changes would be implemented, there would be no change to the current visitor experience. As the building deteriorates, the visitor experience would be diminished. A deteriorated museum with scaffolding may eventually reduce visitation.

Alternative B – Tennessee Pink Replacement Stone

Implementation of recommendations under Alternative B would have minor short-term and moderate long-term beneficial impacts to visitor experience at NASM. In the short-term, there would be minor disruptions to visitor experience during construction. In the long-term, visitors would experience improved wayfinding, shade and safety in the landscape, shorter lines at museum entrances, and enhanced understanding of links between the NASM and its mission. Changes to the landscape would:

- Reduce the impact of planter massing on visual access and wayfinding by lowering and simplifying planter layout and massing, thus opening the planters to create needed circulation;
- Provide universal access conditions at entrances to the grounds and to the museum entrances on north and south by using ascending walkways - all of which are under 5 percent in slope;
- Create entrances to the museum grounds at the four arrival corners;
- Develop complete circulation of the grounds within the property, providing for thematic and museum-related activities on the grounds in the future;
- Improve visitor access and approach to plant materials by providing an architectonic massing of shade and small trees that integrates well with the National Mall setting and creates open view relationships between grounds and Mall and adding thematic and low groundcover planting design to animate entrances and create interpretive opportunities;
- Further integrate the prominent *Delta Solar* fountain at the southwest corner within its respective public realm in order to relocate the fountain as a more highly visible component of the perimeter, positioning it as an important 'signifier' of welcome on the 7th Street SW corridor; and conserve the west memorial grove of trees as an accessible and integral part of the *Delta Solar* setting.

Cumulative Impacts to Visitor Experience

Implementation of Alternative B combined with the implementation of the Dwight D. Eisenhower Memorial and the DDOT north-south streetcar line would have a moderate beneficial cumulative impact on visitor experiences associated with NASM.

Mitigation of Impacts to Visitor Experience

Construction would be phased to minimize disturbances to visitors and signage and flagging would be used to ensure that access to the museum is clearly marked and disruptions are limited.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Implementation of Alternative C would have the same effects to visitor experience as Alternative B, minor short-term and moderate long-term beneficial impacts.

Cumulative Impacts to Visitor Experience

Cumulative impacts under Alternative C would be the same as those under Alternative B.

Mitigation of Impacts to Visitor Experience

Mitigation under Alternative C would be the same as under Alternative B.

Alternative D – Replacement Cladding of a Manufactured Material

Implementation of Alternative D would have the same effects to visitor experience as Alternatives B and C, minor short-term and moderate long-term beneficial impacts.

Cumulative Impacts to Visitor Experience

Cumulative impacts under Alternative D would be the same as those under Alternatives B and C.

Mitigation of Impacts to Visitor Experience

Mitigation under Alternative D would be the same as under Alternatives B and C.

Circulation

Alternative A – No Action Alternative

Under the No Action Alternative, renovations would not be made to NASM and deficiencies would not be corrected. Because no changes would be implemented, there would be no improvements to deficient conditions related to visitor entrances, security screening, and accessibility. Therefore, existing negative impacts associated with circulation would continue.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B would result in moderate short-term increases in traffic congestion and delays during peak traffic periods. Trucks delivering construction materials to the site would access the project area via local roadways. Also, implementation of Alternative B may require use of roads or sidewalks around the building for temporary construction-related activities. This could result in temporary lane closures, occupation of parking spaces adjacent to construction areas or sidewalk closures. Proposed waterproofing of the planters would result in the removal of the paving system on the terrace and its approaches. The existing paving system would be replaced with new pavement and building access routes would be altered to improve accessibility. The new design would

1) Reduce the impact of planter massing on visual access and wayfinding by lowering and simplifying planter layout and massing, thus opening the planters to create needed circulation;
2) Provide universal access conditions at entrances to the grounds and to the museum entrances on north and south by using ascending walkways - all of which are under 5% in slope;
3) Create entrances to the museum grounds at the four arrival corners;
4) Develop complete circulation of the grounds within the property, providing for thematic and museum-related activities on the grounds in the future.

These changes would result in short-term moderate negative impacts during construction and long-term moderate beneficial impacts once complete. Curbside areas set aside for buses, taxis, and drop-off would not be impacted.

Cumulative Impacts to Circulation

Implementation of Alternative B combined with the implementation of the Dwight D. Eisenhower Memorial could have short-term increases in traffic and congestion, if construction of both projects occurs at the same time.

Mitigation of Impacts to Circulation

Construction would be phased to minimize disturbances to circulation and signage and flagging would be used to ensure that access to the museum is clearly marked and disruptions are limited.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Implementation of Alternative C would result in the same impacts to circulation as implementation of Alternative B.

Cumulative Impacts to Circulation

Cumulative impacts under Alternative C would be the same as those under Alternative B.

Mitigation of Impacts to Circulation

Mitigation under Alternative C would be the same as under Alternative B.

Alternative D – Replacement Cladding of a Manufactured Material

Implementation of Alternative D would result in the same impacts to circulation as implementation of Alternatives B and C.

Cumulative Impacts to Circulation

Cumulative impacts under Alternative D would be the same as those under Alternatives B and C.

Mitigation of Impacts to Circulation

Mitigation under Alternative D would be the same as under Alternatives B and C.

Planning Policies

Alternative A – No Action Alternative

Under the No Action Alternative, the renovations to NASM would not be implemented to correct deficiencies or make improvements, resulting in moderate long-term impacts to planning policies. Failure to correct deficiencies would be inconsistent with the 2013 Smithsonian Master Plan for NASM, which recommends improvements to the National Mall Building and site. It would also fail to reflect: the 2016 update of the Comprehensive Plan for the National Capital, Federal Elements, which supports the efficient and effective operation of NASM while providing a safe environment; the Monumental Core Framework Plan; and the Southwest Ecodistrict Plan.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B would result in minor long-term beneficial impacts to planning policies. Alternative B would be consistent with the 2013 Smithsonian Master Plan for NASM and the 2016 update of the Comprehensive Plan for the National Capital, Federal Elements, the Monumental Core Framework Plan, and the Southwest Ecodistrict Plan. Implementation of Alternative B would support the efficient and effective operation of NASM while contributing to the aesthetic character and quality of the National Mall and providing a safe environment within the Monumental Core. In addition, the terrace improvements would support Comprehensive Plan policies to enhance the 7th Street corridor between the southwest waterfront and the downtown north of the Mall.

Cumulative Impacts to Planning Policies

Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B would not generate cumulative impacts to planning policies.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Implementation of Alternative C would result in the same minor long-term beneficial impacts to planning policies as Alternative B.

Cumulative Impacts to Planning Policies

Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative C would not generate cumulative impacts to planning policies.

Alternative D – Replacement Cladding of a Manufactured Material

Implementation of Alternative D would result in the same minor long-term beneficial impacts to planning policies as Alternatives B and C.

Cumulative Impacts to Planning Policies

Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative D would not generate cumulative impacts to planning policies.

Sustainability

Alternative A – No Action Alternative

Under the No Action Alternative, building renovations would not be implemented at NASM. Therefore, there would be no improvements to sustainability. Therefore, current negative impacts associated with emissions, energy consumption, and energy use intensity would continue.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B could result in long-term moderate beneficial impacts to sustainability. Application of strategies to improve sustainability could substantially reduce NASM's energy consumption, CO_2 emissions and energy use intensity (EUI). Methods of responding to increased intensity and frequency of storms due to climate change are being incorporated with the increased height of flood walls and flood gates at vulnerable openings to the basement. Similarly, the proposed stormwater cisterns are being developed for stormwater retention and new planters would be designed to be more effective in retaining water with additional capacity to account for the long term forecast of longer droughts. The retention and reuse of over 50 percent of stormwater on site meets District of Columbia Department of Energy and Environment (DOEE) requirements established in July 2013. In addition, the project would comply with federal regulations and including Section 438 of the Energy Independence and Security Act (EISA).

Cumulative Impacts to Sustainability	Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B combined with implementation of the SW Ecodistrict Plan could have a long-term moderate beneficial impact on sustainability.
Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding	Implementation of Alternative C would have the same impacts to sustainability as Alternative B.
Cumulative Impacts to Sustainability	Under Alternative C, cumulative impacts related to sustainability would be the same as those under Alternative B.
Alternative D – Replacement Cladding of a Manufactured Material	Implementation of Alternative D would have the same impacts to sustainability as Alternatives B and C.
Cumulative Impacts to Sustainability	Under Alternative D, cumulative impacts related to sustainability would be the same as those under Alternatives B and C.

Air Quality

Alternative A – No Action Alternative

Under the No Action Alternative, building renovations would not be implemented at NASM. Therefore, there would be no impacts, beneficial or negative, to air quality.

Alternative B – Tennessee Pink Replacement Stone

Impacts associated with construction of the proposed action would have negligible short-term impacts to air quality due to fugitive air dust during construction. Implementation of Alternative B could result in short-term construction-related impacts to air quality including: (1) emissions from construction equipment and from trucks hauling construction materials to the site and removing waste materials from the site; (2) emissions from vehicles driven to and from the site by construction workers; and (3) fugitive dust from construction activities. Emissions produced during construction would vary daily depending on the type of activity. In particular, removal of the existing building cladding stone and delivery of new stone will involve transportation of large quantities of material.

Implementation of Alternative B could result in long-term minor beneficial impacts to air quality. Application of strategies to improve sustainability could substantially reduce NASM's energy consumption, CO2 emissions and energy use intensity (EUI). Also, the addition of approximately 111 new trees well suited to the site conditions would have a positive effect on air quality.

Cumulative Impacts to Air Quality

Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B combined with implementation of the SW Ecodistrict Plan would have a long-term minor beneficial impact on air quality.

Mitigation of Impacts to Air Quality

The project contractors would adhere to appropriate best management practices during construction to reduce, minimize, or eliminate construction vehicle dust emissions.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Implementation of Alternative C would have the same impacts to air quality as Alternative B.

Cumulative Impacts to Air Quality

Under Alternative C, cumulative impacts related to air quality would be the same as those under Alternative B.

Mitigation of Impacts to Air Quality

Mitigation under Alternative C would be the same as under Alternative B.

Alternative D – Replacement Cladding of a Manufactured Material

Implementation of Alternative D would have the same impacts to air quality as Alternatives B and C.

Cumulative Impacts to Air Quality

Under Alternative D, cumulative impacts related to air quality would be the same as those under Alternatives B and C.

Mitigation of Impacts to Air Quality

Mitigation under Alternative D would be the same as under Alternatives B and C.

Noise Levels

Alternative A – No Action Alternative

Under the No Action Alternative, building renovations would not be implemented at NASM. Therefore, there would be no impacts to noise levels.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B could have minor, short-term impacts to noise levels. The District of Columbia limits weekday construction and demolition noise to 80 dBA Leq from 7 a.m. and 7 p.m., unless granted a variance. The construction equipment anticipated to be used on-site has not yet been determined. It is possible that noise levels for specific tasks, such as jack hammering concrete along the terrace, will reach 80 dBA.

During the workday, pedestrians, motorists, office workers, and visitors at NASM would be subject to construction noise in the vicinity of the project. Visitors to the museum, which are considered to be sensitive noise receptors, may be affected by demolition and construction activities such as removal and hauling of materials and construction facilities. Overall, minor, short-term, construction noise impacts are anticipated.

The movement of heavy trucks transporting construction materials could create an adverse noise impact on residences adjacent to the designated travel routes; however, the use of haul routes is expected to be limited to the construction hours specified above, and the routes would comprise major traffic arterials and interstate highways. Constitution Avenue NW and Independence Avenue SW, 4th and 7th Streets SW would carry the greatest volumes of construction-related vehicle traffic. Therefore, there would be minor noise impacts associated with haul routes.

Since visitation is not anticipated to increase from implementation of the recommendations common to both action alternatives, there would be no long-term increase in traffic or traffic generated noise due to the implementation of the project. There may be a minor improvement of the noise levels in the gallery area directly adjacent to the vestibules if the security screening activities are separated from the exhibit areas. However this may be imperceptible due to the high number of visitors that would be in the area.

Cumulative Impacts to Noise Levels

Implementation of Alternative B, when considered with the ongoing a planned project identified in Chapter 1, could generate minor short-term cumulative impacts to noise levels during construction. There would be no long-term cumulative operational impacts to noise levels.

Mitigation of Impacts to Noise Levels

Short-term construction-related noise would be minimized by controlling noise at its source through implementation of appropriate best management practices, as necessary, to meet the District noise standards. Construction specifications will require the selection of truck routes that will minimize the potential for noise impacts to residences.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Implementation of Alternative C would have the same impacts to noise levels as Alternative B.

Cumulative Impacts to Noise Levels

Under Alternative C, cumulative impacts related to noise levels would be the same as those under Alternative B.

Mitigation of Impacts to Noise Levels

Mitigation related to noise levels under Alternative C would be the same as under Alternative B.

Alternative D – Replacement Cladding of a Manufactured Material

Implementation of Alternative D would have the same impacts to noise levels as Alternatives B and C.

Cumulative Impacts to Noise Levels

Under Alternative D, cumulative impacts related to noise levels would be the same as those under Alternatives B and C.

Mitigation of Impacts to Noise Levels

Mitigation related to noise levels under Alternative D would be the same as under Alternatives B and C.

Vegetation

Alternative A – No Action Alternative

Under the No Action Alternative, building renovations would not be implemented at NASM. Therefore, there would be no impacts to vegetation.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B would have moderate short-term negative impacts and minor long-term beneficial impacts to vegetation. The project includes replacement of vegetation in planters as part of the terrace revitalization. The short-term removal of existing vegetation during construction would be necessitated to implement terrace improvements and replacement vegetation. In the long-term the improvement of the planters to support plant growth, and replacement of trees with species selected specifically for the growing conditions would improve the conditions and health of the vegetation in the project area. Requirements of the Tree Canopy Amendment Protection Act of 2016, defining Special Trees as those between 44" and 99.9" in circumference, would be met. Based on the survey and demolition plans, approximately 296 inches of special tree total caliper will be removed. Approximately 111 new trees are proposed. Determination of the total caliper of proposed trees is pending confirmation of tree spacing and species. Canopy trees would be replaced with at least an equal caliper of new trees, resulting in increased canopy cover and shade around the museum to reduce sun-exposed areas, while re-establishing views to the building from below the canopy. Thematic and low groundcover plantings would be added to animate entrances and create interpretive opportunities. The west memorial grove of trees would be conserved as an accessible and integral part of the *Delta Solar* setting.

The project complies with Presidential Memo: Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators. The ground plane planting design includes only native plant species offering significant ecological habitat for flying insects. In particular pollinator attractants for flying insects and birds are emphasized.

Cumulative Impacts to Vegetation

Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B would generate minor long-term beneficial cumulative impacts to vegetation. The addition of trees at NASM combined with the implementation of the Eisenhower Memorial landscape design would improve the overall tree canopy in this area of the city.

Mitigation of Impacts to Vegetation	Improvement of plant material and growth medium would add to the longevity and health of the plants on site. A group of 'heritage' oak trees and street trees along Independence Avenue, 4th and 7th Streets would be protected from site alterations and construction impacts.
Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding	Implementation of Alternative C would have the same impacts to vegetation as Alternative B.
Cumulative Impacts to Vegetation	Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative C would not generate cumulative impacts to vegetation.
Mitigation of Impacts to Vegetation	Mitigation measures would be the same under Alternative C as under Alternative B.
Alternative D – Replacement Cladding of a Manufactured Material	Implementation of Alternative D would have the same impacts to vegetation as Alternatives B and C.
Cumulative Impacts to Vegetation	Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternative D would not generate cumulative impacts to vegetation.
Mitigation of Impacts to Vegetation	Mitigation measures would be the same under Alternative D as under Alternatives B and C.

Stormwater Management

Alternative A – No Action Alternative

Under the No Action Alternative, building renovations would not be implemented at NASM. Therefore, there would be no impacts to stormwater management.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B would have a minor long-term beneficial impact to stormwater management. The retention and reuse of over fifty percent of stormwater on site DOEE requirements established in July 2013. The project would comply with conditions of a General Permit for Discharges from Construction Activities under the National Pollutant Discharge Elimination System (NPDES). This is a standard permit required for construction activities exceeding one acre, and is mandated by the EPA.

Implementation of the stormwater plan would include new planters designed to detain stormwater and two new cisterns to collect water from the building roof. The proposed stormwater cisterns would retain stormwater for use in irrigation of plants, and the new planters would be designed to be more effective in retaining water with additional capacity to account for the long term forecast of more frequent droughts. Water would be stored in custom designed planter soils for eventual uptake during photosynthesis and other vegetative processes. A small amount will be evaporated from the surface. The remainder, slowed by moving through the soil, would help reduce peak discharge loading of the sewer system. Impervious surfaces (including the planters) are increased by approximately five percent, due to the resolution of a universally accessible approach to pedestrian circulation on the site. The design opens up the grounds so they can be easily accessed, making wayfinding to museum entrances and grounds possible for the magnitude of visitors the museum receives.

Cumulative Impacts to Stormwater Management

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B would not generate cumulative impacts for stormwater management.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Implementation of Alternative C would have the same beneficial impact to stormwater management as Alternative B.

Cumulative Impacts to Stormwater Management

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B would not generate cumulative impacts for stormwater management.

Alternative D – Replacement Cladding of a Manufactured Material

Implementation of Alternative D would have the same beneficial impact to stormwater management as Alternatives B and C.

Cumulative Impacts to Stormwater Management

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative D would not generate cumulative impacts for stormwater management.

Floodplains

Alternative A – No Action Alternative

Under the No Action Alternative, renovations would not be implemented at NASM. Therefore, there would be no impacts to floodplains.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B would have a negligible long-term beneficial impact to floodplains. The museum building is not within the 500-year floodplain, but the edges of the project site are. Flood zones are identified in Chapter 3 and flood protection measures are described in Chapter 2. The retention and reuse of over fifty percent of stormwater on site meets DOEE requirements established in July 2013. The new planters would be designed to accommodate stormwater and two new cisterns would be added to collect water from the building roof.

Cumulative Impacts to Floodplains

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B would not generate cumulative impacts for floodplains.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Implementation of Alternative C would have the same beneficial impact to floodplains as Alternative B.

Cumulative Impacts to Floodplains

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B would not generate cumulative impacts for floodplains.

Alternative D – Replacement Cladding of a Manufactured Material

Implementation of Alternative D would have the same beneficial impact to floodplains as Alternatives B and C.

Cumulative Impacts to Floodplains

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative D would not generate cumulative impacts for floodplains.

Topography

Alternative A – No Action Alternative

Under the No Action Alternative, renovations would not be implemented at NASM. Therefore, there would be no impacts to topography.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B would have a minor long-term beneficial impact to the existing man-made topography. Changes to the terraces and planters would be designed to provide improved accessibility for pedestrians. The landscape design re-establishes a pre-existing elevation datum point and introduces a new one. At the main terrace level, the original seating-height elevation of the planter wall is maintained and defines the edge of the main terrace paving at the upper level. At the back of the sidewalk around the perimeter and grounds, a perimeter secure-height planter wall establishes a second datum elevation. This elevation changes from west to east as the topography of the surrounding context drops from an at-grade relationship in varying rates and totals (for example, at the northeast corner grade drops

some 2.9 meters (9.5 feet) from terrace to sidewalk). The horizontal planters step down along the back of the sidewalk, maintaining the minimum secure perimeter height requirement.

Cumulative Impacts to Topography

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B would not generate cumulative impacts for topography.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Implementation of Alternative C would have the same beneficial impact to topography as Alternative B.

Cumulative Impacts to Topography

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative C would not generate cumulative impacts for topography.

Alternative D – Replacement Cladding of a Manufactured Material

Implementation of Alternative D would have the same beneficial impact to topography as Alternatives B and C.

Cumulative Impacts to Topography

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative D would not generate cumulative impacts for topography.

Solid Waste

Alternative A – No Action Alternative

Under the No Action Alternative, renovations would not be implemented at NASM. Therefore, there would be no impacts to solid waste.

Alternative B – Tennessee Pink Replacement Stone

Implementation of the Alternative B would have a minor long-term impact related to generation of non-hazardous solid waste in the form of existing building materials that must be removed.

Cumulative Impacts to Solid Waste

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B would generate minor cumulative impacts for solid waste. A portion of the existing Tennessee Pink marble (limestone) would be reused or salvaged for use in new construction on site. It is possible that 10% to 40% may be reused. Approximately 60% of the existing stone cladding would be removed.

Mitigation of Impacts to Solid Waste

Focused and diligent efforts are being made to find uses for the existing building materials, on site or elsewhere that will be removed as part of the project. As part of the requirements to meet a minimum LEED Gold certification, contractors would be required to reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing and recycling materials.

Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding

Implementation of Alternative C would have the same impacts related to the generation of non-hazardous solid waste as Alternative B.

Cumulative Impacts to Solid Waste

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative C would-generate minor cumulative impacts for solid waste. A portion of the existing Tennessee Pink stone would be reused or salvaged for use in new construction on site. It is possible that 10% to 40% may be reused. Approximately 60% of the existing stone cladding would be removed.

Mitigation of Impacts to Solid Waste

Mitigation under Alternative C would be the same as that for Alternative B.

Alternative D - Replacement Cladding of a Manufactured Material

Implementation of the Alternative D would have a minor long-term impact related to generation of non-hazardous solid waste in the form of existing building materials that must be removed.

Cumulative Impacts to Solid Waste

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative D would generate minor cumulative impacts for solid waste. A portion of the existing Tennessee Pink stone would be reused or salvaged for use in new construction on site. It is possible that 10% to 40% may be reused. Approximately 60% of the existing stone cladding would be removed. Alternative D would reuse the largest percentage of the existing stone, compared to the other alternatives.

Mitigation of Impacts to Solid Waste

Focused and diligent efforts are being made to find uses for the existing building materials, on site or elsewhere, which would be removed as part of the project. As part of the requirements to meet a minimum LEED Gold certification, contractors would be required to reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing and recycling materials. Also, implementation of Alternative D would include re-use of portions of the Tennessee Pink marble (limestone) removed from the building as an aggregate within the proposed ultra high performance cladding.

Hazardous Materials and Wastes

Alternative A – No Action Alternative

Under the No Action Alternative, building renovations would not be implemented at NASM. Therefore, there would be no impacts to hazardous materials and wastes.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B would include abatement of lead paint and asbestos-containing drywall compound, resulting in minor long-term impacts to production of hazardous wastes.

Cumulative Impacts to Hazardous Materials and Wastes

When considered in combination with the ongoing and planned projects identified in Chapter 1, implementation of Alternative B would result in negligible impacts to generation of hazardous materials and wastes.

Mitigation of Impacts to Hazardous Materials and Wastes	The full extent of asbestos and lead containing material would be abated with a disposal process that is compliant with applicable regulations.
Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding	Implementation of Alternative C would have the same impacts related to hazardous materials and wastes as Alternative B.
Cumulative Impacts to Hazardous Materials and Wastes	Alternative C would have the same cumulative impacts related to hazardous materials and wastes as Alternative B.
Mitigation of Impacts to Hazardous Materials & Wastes	Mitigation under Alternative C would be the same as that for Alternative B.
Alternative D - Replacement Cladding of a Manufactured Material	Implementation of Alternative D would have the same impacts related to hazardous materials and wastes as Alternatives B and C.
Cumulative Impacts to Hazardous Materials and Wastes	Alternative D would have the same cumulative impacts related to hazardous materials and wastes as Alternatives B and C.
Mitigation of Impacts to Hazardous Materials and Wastes	Mitigation under Alternative D would be the same as that for Alternatives B and C.

Climate Change and Carbon Footprint

Alternative A – No Action Alternative

Under the No Action Alternative, building renovations would not be implemented at NASM. Therefore, there would be no impacts to climate change or carbon footprint.

Alternative B – Tennessee Pink Replacement Stone

Implementation of Alternative B would have a long-term moderate beneficial impact on climate change and carbon footprint. The project would reduce electricity use by 35 percent, site energy use by 65 percent and CO_2 emissions by 54 percent. A variety of strategies will be used to achieve this result.

Allowing the temperature and relative humidity to experience seasonal variation by going from building temperatures of 70 degrees Fahrenheit (F) and 50 percent relative humidity year-round to approximately 75 F and 50 percent relative humidity in the summer and 68 F with 40 percent relative humidity in the winter would produce the biggest single contribution to greater energy efficiency. This change would result in an energy savings of almost 20 percent compared to the existing use.

The addition of a building water-cooled chiller plant using dedicated heat recovery chillers (DHRC) would provide higher efficiency compared to the current GSA chilled water system. In addition, the hot water generated from the DHRCs would be used to provide reheat and to supplement building hot water for hydronic heating, further reducing energy use.

The rooftop photovoltaic array system would produce over 7 percent of the total average electricity use of the building. Other strategies that would contribute to improved energy efficiency include: use of energy-efficient all-LED lighting with a centralized dimming system combined with use of daylight harvesting and occupancy/vacancy sensors; use of a high efficiency building hot water system with condensing boilers; implementation of variable air volume systems, energy recovery ventilation, demand control ventilation, and airside economizers; and improved envelope conditions.

Cumulative Impacts to Climate Change and Carbon Footprint	Considered with the ongoing and planned projects identified in Chapter 1, implementation of Alternatives B or C combined with implementation of the SW Ecodistrict Plan could have a long-term moderate beneficial impact on climate change and carbon footprint.
Alternative C – Alternate Natural Stone with Similar Appearance to Original Cladding	Implementation of Alternative C would have the same impacts related to climate change and carbon footprint as Alternative B.
Cumulative Impacts to Climate Change and Carbon Footprint	Under Alternative C cumulative impacts associated with carbon change and carbon footprint would be the same as under Alternative B.
Alternative D - Replacement Cladding of a Manufactured Material	Implementation of Alternative D would have the same impacts related to climate change and carbon footprint as Alternatives B and C.
Cumulative Impacts to Climate Change and Carbon Footprint	Under Alternative D cumulative impacts associated with carbon change and carbon footprint would be the same as under Alternatives B and C.

Table 4.1: Summary of Environmental Consequences. (Source: QEA.)

Impacted Resource	Alternative A No Action	Alternative B Tennessee Pink Replacement Stone	Alternative C Alternate Natural Stone with Similar Appearance to Original Cladding	Alternative D Replacement Cladding of a Manufactured Material
Historic Resources	**Adverse effect** under CFR 800.5(vi), as it constitutes neglect of the property causing deterioration.	**Moderate negative impacts** to historic resources with the incorporation of necessary, but adverse, effects to the appearance of the building and site. There would also be a **moderate beneficial impact** due to correction of deficiencies, thereby providing a building envelope that would be durable for a 100-year period.	**Adverse effects** to historic resources generated through use of a cladding material other than Tennessee Pink marble (limestone) and **Moderate negative impacts** due to incorporation of necessary, but adverse, effects to the appearance of the building and site. There would also be a **moderate beneficial impact** due to correction of deficiencies, thereby providing a building envelope that would be durable for a 100-year period.	**Strong adverse effects** to historic resources due to use of a cladding material that is neither Tennessee Pink marble (limestone) or a natural stone and **Moderate negative impacts** due to incorporation of necessary, but adverse, effects to the appearance of the building and site. There would also be a **moderate beneficial impact** due to correction of deficiencies, thereby providing a building envelope that would be durable for a 100-year period.
Visual Resources	**Long-term moderate impacts** to due to continued deterioration of the building and its visual appearance.	Overall **moderate short and long-term impacts**. Impacts to specific views are described under Visual Resources. **Moderate short-term and minor long-term cumulative** impacts.	Overall **moderate short and long-term impacts.** Impacts to specific views are described under Visual Resources. **Moderate short-term and minor long-term cumulative** impacts.	Overall **moderate short and long-term impacts.** Impacts to specific views are described under Visual Resources. **Moderate short-term and minor long-term cumulative** impacts.
Visitor Experience	**No impacts.** Visitors would continue to experience delays, discomfort, and an overall experience that is not at the level expected for this premier national museum. As the building deteriorates, the visitor experience would be diminished.	**Minor short-term and moderate long-term beneficial** impacts. **Moderate beneficial cumulative impact** combined with the implementation of the Dwight D. Eisenhower Memorial and the DDOT north-south streetcar line.	**Minor short-term and moderate long-term beneficial** impacts. **Moderate beneficial cumulative impact** combined with the implementation of the Dwight D. Eisenhower Memorial and the DDOT north-south streetcar line.	**Minor short-term and moderate long-term beneficial** impacts. **Moderate beneficial cumulative impact** combined with the implementation of the Dwight D. Eisenhower Memorial and the DDOT north-south streetcar line.

Impacted Resource	Alternative A No Action	Alternative B Tennessee Pink Replacement Stone	Alternative C Alternate Natural Stone with Similar Appearance to Original Cladding	Alternative D Replacement Cladding of a Manufactured Material
Circulation	**No impacts.** Because no changes would be implemented, there would be no improvements to deficient conditions related to visitor entrances, security screening, and accessibility.	**Moderate short-term negative impacts during construction** and **moderate long-term beneficial impacts** once complete. Possible **cumulative short-term moderate impacts** due to increases in traffic and congestion if the Dwight D. Eisenhower Memorial project is implemented at the same time as the NASM revitalization.	**Moderate short-term negative impacts during construction** and **moderate long-term beneficial impacts** once complete. Possible **cumulative short-term moderate impacts** due to increases in traffic and congestion if the Dwight D. Eisenhower Memorial project is implemented at the same time as the NASM revitalization.	**Moderate short-term negative impacts during construction** and **moderate long-term beneficial impacts** once complete. Possible **cumulative short-term moderate impacts** due to increases in traffic and congestion if the Dwight D. Eisenhower Memorial project is implemented at the same time as the NASM revitalization.
Planning Policies	**Moderate long-term impacts.** Failure to correct deficiencies would be inconsistent with the 2013 Smithsonian Master Plan for NASM, which recommends improvements to the National Mall Building and site. It would also fail to reflect: the 2016 update of the Comprehensive Plan for the National Capital, Federal Elements, which supports the efficient and effective operation of NASM while providing a safe environment; the Monumental Core Framework Plan; and the Southwest Ecodistrict Plan.	**Minor long-term beneficial impacts.** Implementation is consistent with the 2013 Smithsonian Master Plan for NASM and the 2016 update of the Comprehensive Plan for the National Capital, Federal Elements, the Monumental Core Framework Plan, and the Southwest Ecodistrict Plan. Implementation would support the efficient and effective operation of NASM while contributing to the aesthetic character and quality of the National Mall and providing a safe environment within the Monumental Core. In addition, the terrace improvements would support Comprehensive Plan policies to enhance the 7th Street corridor between the southwest waterfront and the downtown north of the Mall.	**Minor long-term beneficial impacts.** Implementation is consistent with the 2013 Smithsonian Master Plan for NASM and the 2016 update of the Comprehensive Plan for the National Capital, Federal Elements, the Monumental Core Framework Plan, and the Southwest Ecodistrict Plan. Implementation would support the efficient and effective operation of NASM while contributing to the aesthetic character and quality of the National Mall and providing a safe environment within the Monumental Core. In addition, the terrace improvements would support Comprehensive Plan policies to enhance the 7th Street corridor between the southwest waterfront and the downtown north of the Mall.	**Minor long-term beneficial impacts.** Implementation is consistent with the 2013 Smithsonian Master Plan for NASM and the 2016 update of the Comprehensive Plan for the National Capital, Federal Elements, the Monumental Core Framework Plan, and the Southwest Ecodistrict Plan. Implementation would support the efficient and effective operation of NASM while contributing to the aesthetic character and quality of the National Mall and providing a safe environment within the Monumental Core. In addition, the terrace improvements would support Comprehensive Plan policies to enhance the 7th Street corridor between the southwest waterfront and the downtown north of the Mall.

Impacted Resource	Alternative A No Action	Alternative B Tennessee Pink Replacement Stone	Alternative C Alternate Natural Stone with Similar Appearance to Original Cladding	Alternative D Replacement Cladding of a Manufactured Material
Sustainability	Current negative impacts associated with emissions, energy consumption, and energy use intensity would continue.	**Long-term moderate beneficial impacts** due to application of strategies to improve sustainability that could substantially reduce NASM's energy consumption, CO_2 emissions and energy use intensity. **Long-term moderate beneficial cumulative impacts** in combination with the SW Ecodistrict Plan implementation.	**Long-term moderate beneficial impacts** due to application of strategies to improve sustainability that could substantially reduce NASM's energy consumption, CO_2 emissions and energy use intensity. **Long-term moderate beneficial cumulative impacts** in combination with the SW Ecodistrict Plan implementation.	**Long-term moderate beneficial impacts** due to application of strategies to improve sustainability that could substantially reduce NASM's energy consumption, CO_2 emissions and energy use intensity. **Long-term moderate beneficial cumulative impacts** in combination with the SW Ecodistrict Plan implementation.
Air Quality	**No impacts.**	**Negligible short-term negative impacts** due to fugitive air dust and emissions during construction. Possible long-term minor beneficial impacts due to application of strategies to improve sustainability could substantially reduce NASM's energy consumption, CO_2 emissions, and energy use intensity. Also, the addition of new trees well suited to the site conditions would have a positive effect on air quality. **Long-term minor beneficial cumulative impact** in combination with the implementation of the Southwest Ecodistrict Plan.	**Negligible short-term negative impacts** due to fugitive air dust and emissions during construction. Possible long-term minor beneficial impacts due to application of strategies to improve sustainability could substantially reduce NASM's energy consumption, CO_2 emissions, and energy use intensity. Also, the addition of new trees well suited to the site conditions would have a positive effect on air quality. **Long-term minor beneficial cumulative impact** in combination with the implementation of the Southwest Ecodistrict Plan.	**Negligible short-term negative impacts** due to fugitive air dust and emissions during construction. Possible long-term minor beneficial impacts due to application of strategies to improve sustainability could substantially reduce NASM's energy consumption, CO_2 emissions, and energy use intensity. Also, the addition of new trees well suited to the site conditions would have a positive effect on air quality. **Long-term minor beneficial cumulative impact** in combination with the implementation of the Southwest Ecodistrict Plan.

Impacted Resource	Alternative A No Action	Alternative B Tennessee Pink Replacement Stone	Alternative C Alternate Natural Stone with Similar Appearance to Original Cladding	Alternative D Replacement Cladding of a Manufactured Material
Noise Levels	**No impacts.**	**Minor, short-term negative impacts** due to construction activities. **Minor short-term cumulative negative impacts.**	**Minor, short-term negative impacts** due to construction activities. **Minor short-term cumulative negative impacts.**	**Minor, short-term negative impacts** due to construction activities. **Minor short-term cumulative negative impacts.**
Vegetation	**No impacts.**	**Moderate short-term negative impacts** and **minor long-term beneficial impacts**. **Minor long-term beneficial cumulative impacts** combined with implementation of the Eisenhower Memorial landscape design, improving the overall tree canopy of the area and city.	**Moderate short-term negative impacts** and **minor long-term beneficial impacts**. **Minor long-term beneficial cumulative impacts** combined with implementation of the Eisenhower Memorial landscape design, improving the overall tree canopy of the area and city.	**Moderate short-term negative impacts** and **minor long-term beneficial impacts**. **Minor long-term beneficial cumulative impacts** combined with implementation of the Eisenhower Memorial landscape design, improving the overall tree canopy of the area and city.
Stormwater Management	**No impacts.**	**Minor long-term beneficial impacts** resulting from retention and reuse of over fifty percent of stormwater on site, meeting DOEE, NPDES, and EPA requirements.	**Minor long-term beneficial impacts** resulting from retention and reuse of over fifty percent of stormwater on site, meeting DOEE, NPDES, and EPA requirements.	**Minor long-term beneficial impacts** resulting from retention and reuse of over fifty percent of stormwater on site, meeting DOEE, NPDES, and EPA requirements.
Floodplains	**No impacts.**	**Negligible long-term beneficial** impact due to retention and reuse of over fifty percent of stormwater on site, meeting DOEE requirement.	**Negligible long-term beneficial** impact due to retention and reuse of over fifty percent of stormwater on site, meeting DOEE requirement.	**Negligible long-term beneficial** impact due to retention and reuse of over fifty percent of stormwater on site, meeting DOEE requirement.

Impacted Resource	Alternative A No Action	Alternative B Tennessee Pink Replacement Stone	Alternative C Alternate Natural Stone with Similar Appearance to Original Cladding	Alternative D Replacement Cladding of a Manufactured Material
Topography	**No impacts.**	**Minor long-term beneficial** impact due to improvements to accessibility for pedestrians.	**Minor long-term beneficial** impact due to improvements to accessibility for pedestrians.	**Minor long-term beneficial** impact due to improvements to accessibility for pedestrians.
Solid Waste	**No impacts.**	**Minor long-term** impact due to generation of non-hazardous solid waste in the form of existing building materials that must be removed. **Minor cumulative** impacts. A portion of the existing stone (between 10% and 40%) would be reused or salvaged for use in new construction on site.	**Minor long-term** impact due to generation of non-hazardous solid waste in the form of existing building materials that must be removed. **Minor cumulative** impacts. A portion of the existing stone (between 10% and 40%) would be reused or salvaged for use in new construction on site.	**Minor long-term** impact due to generation of non-hazardous solid waste in the form of existing building materials that must be removed. **Minor cumulative** impacts. A portion of the existing stone (between 10% and 40%) would be reused or salvaged for use in new construction on site. Alternative D would reuse the largest amount of the existing stone compared to the other alternatives.
Hazardous Materials and Wastes	**No impacts.**	**Minor long-term** impacts related to abatement of lead paint and asbestos-containing drywall compound. **Negligible cumulative** impacts.	**Minor long-term** impacts related to abatement of lead paint and asbestos-containing drywall compound. **Negligible cumulative** impacts.	**Minor long-term** impacts related to abatement of lead paint and asbestos-containing drywall compound. **Negligible cumulative** impacts.
Climate Change and Carbon Footprint	**No impacts.**	**Long-term moderate beneficial** impact due to reduction of electricity use by 35%, site energy use by 65%, and CO2 emissions by 54%.	**Long-term moderate beneficial** impact due to reduction of electricity use by 35%, site energy use by 65%, and CO2 emissions by 54%.	**Long-term moderate beneficial** impact due to reduction of electricity use by 35%, site energy use by 65%, and CO2 emissions by 54%.

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APPENDIX A: PUBLIC SCOPING

National Capital Planning Commission

Smithsonian Institution

NEPA/Section 106 Public Scoping Notice
National Air and Space Museum Building Revitalization and HVAC Replacement

October 29, 2014

Dear Interested Party:

The Smithsonian Institution (SI) and the National Capital Planning Commission (NCPC) would like to inform you of the public comment opportunity on potential exterior work at the National Air and Space Museum (NASM) located on the National Mall in Washington D.C. SI must replace the existing Tennessee Marble stone on the façade of NASM and is evaluating several options. SI is also considering changes to the entrance vestibules and renovations to the terraces surrounding the museum.

The proposed projects are subject to the review of the NCPC under the National Capital Planning Act. NCPC will serve as the lead and responsible federal agency and work in cooperation with SI to comply with the National Environmental Policy Act (NEPA). NCPC and SI will be preparing an Environmental Assessment (EA) to analyze the environmental impacts of a range of alternatives for this project, in accordance with NEPA. Concurrently, SI and NCPC will co-lead consultation under Section 106 of the National Historic Preservation Act.

The purpose of the proposed project is to replace the façade stone panels which are deteriorating. At the time the museum was constructed, the installation of the Tennessee marble (a limestone) was done in such a way that now, 38 years later, the stone panels are warping. To meet the purpose and need of the project, SI is exploring appropriate alternatives to re-clad the façade.

SI also proposes adding exterior vestibules to the north and south entrances to improve visitor experience. The vestibules would also meet security requirements to screen visitors and provide a buffer zone between the exterior environment and the stable interior conditions essential to preserving collections.

Renovations to the terraces, portions of which serve as the roof of the parking garage and loading dock below, may also be addressed as part of the building envelope improvements. This work is needed to address waterproofing to correct leaks into the lower level, the poor/deteriorating condition of the planters, the desire to improve accessibility and visitor experience, and to align the plantings with the mission of the museum (themed gardens), improve sustainability and stormwater management.

NCPC and SI are announcing the start of the public scoping period for the preparation of the Environmental Assessment (EA). The preparation of the EA will enable SI and NCPC to evaluate and analyze the environmental impacts of the project and alternatives under consideration. At the same time, SI and NCPC will be conducting consultation under Section 106 of the National Historic Preservation Act to take into account the effects of the project on historic properties.

SI and NCPC invite you to attend a joint NEPA/Section 106 meeting that will take place on November 12, 2014 at the National Capital Planning Commission from 5:00pm to 7:00pm. The meeting will be an "open house" format. A brief presentation about the project will begin at 6:00pm and will include a discussion of the purpose and need of the project, proposed project alternatives under consideration and issues to be analyzed in the EA.

For 30 days from the date of this notice, NCPC will accept comments concerning the scope of issues to address in the EA. Comments received during the scoping period will be used to refine alternatives and inform the EA analysis. SI and NCPC will be accepting comments at the public scoping meeting or comments can be submitted in writing via mail or email to:

National Capital Planning Commission
Attn: Cheryl Kelly
401 9th Street, NW
Suite 500
Washington, DC 20004
cheryl.kelly@ncpc.gov

We look forward to seeing you on November 12th at NCPC, located at 401 9th Street, N.W., North Lobby Suite 500, Washington, D.C. 20004. Your participation is greatly appreciated. If you have any questions or need additional information please contact Cheryl Kelly of NCPC at cheryl.kelly@ncpc.gov or at 202-482-7291.

To request accessibility services, please contact Cheryl Kelly of NCPC at cheryl.kelly@ncpc.gov or at 202-482-7291, one week in advance of the program.

To view the PowerPoint Presentation and video of the presentation given on November 12, 2014, please visit https://www.ncpc.gov/project/airandspace/

18 November 2014

MEMORANDUM

From: Brenda W. Williams, RLA, ASLA

To: Project Team

QUINN EVANS ARCHITECTS

2121 WARD PLACE, NW, 4TH FLOOR
WASHINGTON, DC 20037
202 295 6700

RE: NASM BUILDING EXTERIOR ENVELOPE STUDY AND HVAC REPLACEMENT
WASHINGTON, DC
QEA PROJECT No. 31301800
OFEO PROJECT No. 1206101

Subject: Meeting Notes—12 November 2014 – Agencies Scoping, 10:30am – 12:30pm

Invitees: The following agencies were invited to attend the meeting (a complete list of individuals invited is included in the attached spreadsheet):
NCPC, CFA, SHPO, NPS, DC OP, DDOT, DDOE, DDPW, Washington Metropolitan Area Transit Authority, DC Fire and Emergency Medical Services Department, DC Water and Sewer Authority, US Environmental Protection Agency, Potomac Electric Power Company, Washington Gas, National Gallery of Art, Dwight D. Eisenhower Memorial Commission, General Services Administration, USFWS.

Attendees: SI-OPDC: Michael Henry, Jane Passman, Ann Trowbridge, Amy Ballard
NCPC: Cheryl Kelly, Vivian Lee
CFA: Thomas Luebke
DDOT: Evelyn Israel
QEA: Larry Barr, Steven C. Jones, Tom Jester, Kendra Johanson, Brenda Williams

This meeting was held to notify the agencies about the project and gather early input to identify impact topics to be analyzed, determine impact topics to be dismissed, identify related projects and sources of information, and record input related to alternatives to be considered.

The meeting began with an overview of information about the project presented by Ann Trowbridge of the Smithsonian Institution (SI) and Larry Barr of Quinn Evans Architects (QEA). The powerpoint presentation will be posted on the NCPC website: http://www.ncpc.gov/ncpc/Main(T2)/PublicParticipation(Tr2)/Public%20Participation(Tr3)/PublicCommentOpportunities.html#7585.

The presentation was followed by comments, questions and discussion:

1. Evelyn Israel, DDOT, noted that the North-South Streetcar line is a potential cumulative project, as it potentially will connect through the mall at 7th Street. The NEPA component of the project is currently on hold. The project will be added to the list of potential cumulative impact projects.

2. Are PV arrays being considered for the roof and sides of the building? (Cheryl Kelly, NCPC)
   a. A variety of ways for adding the pvs are being considered but no decision has been made. (Larry Barr, QEA)
   b. It will not be easy to put pvs on the south side of the building. (Ann Trowbridge, SI)

3. Does titanium produce more heat than stone? This and many other criteria are being considered as part of the conceptual design process.

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4. Tennessee pink marble (limestone) comes from a small quarry in Tennessee. The quarry was closed in the late 1980s but reopened recently. It is not clear yet if the quantity and quality of stone necessary for this project will be available. This is another criteria being considered.

5. It was noted that the specification for the stone needs to be very tight in order to obtain the desired appearance. (Thomas Luebke, CFA)

6. Would any access to the building change? Will the loading area at the east wing be altered? (Evelyn Israel, DDOT)
   a. Revisions to the east wing are not included in the current project. (Ann Trowbridge, SI)
   b. If the vestibules project is included in the current project, the north and south entrances will be altered.

7. How much will the terraces change? (Evelyn Israel, DDOT)
   a. This will be determined based on the cost estimates, security needs and the changes necessary to repair the garage roof. (Ann Trowbridge, SI and Larry Barr, QEA)
      i. Some of the terrace planters and plants will have to be replaced because of the need to repair the garage roof membrane.
      ii. Since the terraces will need to be altered to repair the roof, it makes sense to improve the plantings and terraces at the same time. Terrace plantings have become a bit hodge-podge over time. The Smithsonian gardens would like to have gardens that are more directly reflective of the original design (rhythmic relationships with the building) and that incorporate more sustainable plantings.
      iii. Also, it is likely that the revisions to the terraces will include improvements to universally accessible routes/entrances.
      iv. If perimeter security needs to be changed, that will be included in the project.
      v. As much as possible, efforts are being made to take a comprehensive approach.

8. The big issue for the project is the cladding. Consideration of the cladding and the vestibules needs to respect the original design of the building as a play on solid and void massings. This rhythm of positive and negatives should be carefully observed and incorporated into any new enclosures (like the vestibules). There needs to be careful conceptual coordination with the whole building, avoiding a piecemeal approach as much as possible. (Thomas Luebke, CFA)
   a. We will prepare a matrix showing the criteria for the stone and the cladding. (Ann Trowbridge, SI)

9. Bike share and bike parking need to be considered in the design. (Cheryl Miller, NCPC)
   a. SI Director of Facilities met with bikeshare and NPS earlier (before this project). Bikeshare would like to put some bikeshare racks near 7th Street. The Director of Facilities prefers to focus on bike racks for SI staff in this location, rather than bikeshare. (Ann Trowbridge, SI)
   b. DDOT is considering adding bikeshare at the corner of Independence and 4th Street, adding the station in the right-of-way. This would replace the bikeshare station on the south side of Independence Avenue. (Evelyn Israel, DDOT)
   c. The location will probably be used for construction staging in the short term, but might be considered for a bikeshare station in the long term. (Ann Trowbridge, SI)
   d. Regarding bike racks for staff,
      i. Outside generally unsuccessful for employees, who want indoor bike racks. (Evelyn Israel, DDOT)

a. Possibly – we are not far enough along yet to know for sure. (Ann Trowbridge, SI)
b. We have load capacity issues on the existing plaza and cannot stack construction staging. The south side of the building will be especially tough due to load constraints. (Larry Barr, QEA)
c. On the west side of the building the mature trees need to be protected and will limit staging in that area. (Ann Trowbridge, SI)

Any discrepancies or disagreements with the author's interpretation of this meeting should be brought to the attention of Quinn Evans Architects in writing within seven working days from issuance of these notes.

END OF MEMORANDUM

18 November 2014

MEMORANDUM

From: Brenda W. Williams, RLA, ASLA

To: Project Team

QUINN EVANS ARCHITECTS

2121 WARD PLACE, NW, 4TH FLOOR
WASHINGTON, DC 20037
202 298 6700

RE: NASM BUILDING EXTERIOR ENVELOPE STUDY AND HVAC REPLACEMENT
WASHINGTON, DC
QEA PROJECT No. 31301800
OFEO PROJECT No. 1206101

Subject: Meeting Notes—12 November 2014 –Public Scoping Meeting (5-7pm)

Invitees: The following review agencies and interested parties were invited to attend the meeting (a complete list of individuals invited is included in the attached spreadsheet): NCPC, CFA, SHPO, NPS, National Trust for Historic Preservation, Advisory Council on Historic Preservation, National Gallery of Art, Dwight D. Eisenhower Memorial Commission, General Services Administration, DC OP, ANC 2C, ANC 6D, Committee of 100 on the Federal City, US Capitol Historical Society, DC Preservation League, The Guild of Professional Tour Guides of Washington, DC, National Coalition to Save Our Mall, National Museum of the American Indian, Hirshhorn Museum and Sculpture Garden, Architect of the Capitol, HOK, Department of Education, Trust for the National Mall, DC Chapter of DCOCMOMO, American Institute of Architects, DC Chapter, District of Columbia City Council, Southwest Neighborhood Assembly, Voice of America, USFWS, Chesapeake Bay Field Office, DC Department of the Environment.

Attendees: SI-OPDC: Charles Obi, Michael Henry, Jane Passman, Ann Trowbridge, Amy Ballard
NCPC: Cheryl Kelly, Vivian Lee
GSA: Stephanie Leedom
HOK: Duncan Kirk
David Anspack
QEA: Larry Barr, Steven C. Jones, Tom Jester, Colin MacKillop, Kendra Johanson, Brenda Williams

This meeting was held to notify the public about the project and gather early input to identify impact topics to be analyzed, determine impact topics to be dismissed, identify related projects and sources of information, and record input related to alternatives to be considered.

The meeting began with an open house during which project team members were available to answer questions and discuss issues related to the project. At 6:00pm, a presentation highlighted information about the project presented by Ann Trowbridge of the Smithsonian Institution (SI) and Larry Barr of Quinn Evans Architects (QEA). The powerpoint presentation will be posted on the NCPC website: http://www.ncpc.gov/ncpc/Main(T2)/PublicParticipation(Tr2)/Public%20Participation(Tr3)/PublicCommentOpportunities.html#7585.

The presentation was followed by comments, questions and discussion:

1. Is the roof original and what will you put back? (David Anspack)
    a. The roof is not original and we don't know yet what system will be used for replacement. The current roof is about 20 years old. (Larry Barr, QEA)

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Any discrepancies or disagreements with the author's interpretation of this meeting should be brought to the attention of Quinn Evans Architects in writing within seven working days from issuance of these notes.

END OF MEMORANDUM

QUINN EVANS ARCHITECTS

To view the PowerPoint Presentation and video of the presentation given on February 22, 2016, please visit https://www.ncpc.gov/project/airandspace/

National Capital Planning Commission

Smithsonian Institution

March 24, 2017

Subject: Public Meeting: National Air and Space Museum Revitalization – NEPA and Section 106/ Exterior Cladding Mockup

Dear Interested Party:

The National Capital Planning Commission (NCPC), as lead responsible federal agency for compliance with the National Environmental Policy Act (NEPA), and the Smithsonian Institution (SI), as project owner, are preparing an Environmental Assessment (EA) for the revitalization of the National Air and Space Museum National Mall building. Concurrently, SI and NCPC are conducting Section 106 consultation in accordance with the National Historic Preservation Act (NHPA). The project is subject to the NCPC's review under the National Capital Planning Act.

We invite interested parties to attend a joint meeting on Friday, April 7, from 10:00–11:00AM at the Smithsonian Facilities conference room, Suite 5001, Capital Gallery West Building, 600 Maryland Avenue, SW (closest Metro Station L'Enfant Plaza). Following the meeting, there will be an opportunity to view a mockup of cladding alternatives installed on the terrace of the National Air and Space Museum on the northeast (Jefferson Drive) side from 11:00–11:30AM.

The EA will analyze the potential environmental impacts of alternatives for the revitalization of the National Air and Space Museum, including replacement of the deteriorating Tennessee Pink Marble (limestone) stone cladding on the facade, skylights and curtain wall, building systems, vestibules, revitalization of the terrace and landscaping. The cladding alternatives under consideration include Tennessee Pink Marble, other natural stones such as granite and limestone, and a manufactured material. A separate announcement of availability of the EA will be forthcoming.

An additional opportunity to view the cladding mockup will be provided on Thursday, April 6, from 5:30–6:30PM.

Please RSVP to Carly Bond at BondC@si.edu.

For more information, please visit https://www.ncpc.gov/project/airandspace.

Sincerely,

Jane Passman
Senior Facilities Master Planner

600 Maryland Avenue SW Suite 5001 MRC 511
P O Box 37012
Washington DC 20013-7012
202.633.6549 Telephone

APPENDIX B:
AGENCY COORDINATION

Smithsonian Institution

Architectural History and Historic Preservation

3 September 2014

Mr. C. Andrew Lewis
Senior Historic Preservation Specialist
D.C. Historic Preservation Office
1100 4th Street, SW, Suite E650
Washington, D.C. 20024

Dear ~~Mr. Lewis,~~ Andrew

The Smithsonian's National Air and Space Museum was dedicated on 4 July 1976, just in time for the Bicentennial of the United States. To meet that deadline, new construction techniques and use of materials were used. These included the use of a thin Tennessee marble panel on a steel frame to create a curtain wall requiring less steel and marble.

Since that time, the marble has failed to the point where it needs to be entirely replaced. The Smithsonian is investigating if the original quarry can be reopened as well as using material that would closely match the original Tennessee marble in keeping with the *Secretary of the Interior's Standards for Treatment of Historic Buildings.*

Pursuant to 36 CFR 800.3(a), the Smithsonian has determined that the proposed replacement of the original Tennessee marble is an undertaking as defined in 800.16(y) and that is has the potential to cause effects on historic properties, in particular, the National Mall, a site listed on the National Register of Historic Places.

The Smithsonian wishes to initiate the Section 106 review process and seeks the assistance of the District of Columbia Historic Preservation Office (DCSHPO) in applying the criteria of adverse effect (800.5) to determine the effect the undertaking will have on historic properties.

The Smithsonian looks forward to working with you on this project, and will ensure that you receive proper documentation.

With kind regards

Amy Ballard
Senior Historic Preservation Specialist

cc: Jennifer Hirsch, National Capital Planning Commission

P.O. Box 37012 MRC 511
Washington. D.C. 20013-7012
Tel: 202-633-6535 direct

Smithsonian Institution

Architectural History and Historic Preservation

5 September 2014

Mr. C. Andrew Lewis
Senior Historic Preservation Specialist
D.C. Historic Preservation Office
1100 4th Street, SW, Suite E650
Washington, D.C. 20024

Dear Mr. Lewis, Andrew -

The Smithsonian's National Air and Space Museum is one of the most highly visited museums in the world. Since September 11, 2001 the threat level has increased to the museum, and security was elevated upon entering the museum. These security measures consist of magnetometers and x ray machines manned by security officers.

Presently the security screening is conducted just as one enters the museum at the north and south entry points. In the summer and during school holidays, this creates long lines outside the museum and overcrowding inside. During inclement weather there is no place for visitors to shelter. Moreover there is no transition point between the security screening and the museum.

Pursuant to 36 CFR 800.3(a), the Smithsonian has determined that the proposed addition of security pavilions on the north and south entries to the National Air and Space Museum is an undertaking as defined in 800.16(y) and that is has the potential to cause effects on historic properties, in particular, the National Mall, a site listed on the National Register of Historic Places.

The Smithsonian wishes to initiate the Section 106 review process and seeks the assistance of the District of Columbia Historic Preservation Office (DCSHPO) in applying the criteria of adverse effect (800.5) to determine the effect the undertaking will have on historic properties.

The Smithsonian looks forward to working with you on this project, and will ensure that you receive proper documentation.

With kind regards

Amy Ballard
Senior Historic Preservation Specialist

cc: Jennifer Hirsch, National Capital Planning Commission

P.O. Box 37012 MRC 511
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Tel: 202-633-6535 direct

GOVERNMENT OF THE DISTRICT OF COLUMBIA
STATE HISTORIC PRESERVATION OFFICER

October 3, 2014

Ms. Amy Ballard, Senior Historic Preservation Specialist
Smithsonian Institution
Architectural History and Historic Preservation
P.O. Box 37012 MRC 511
Washington, DC 20013-7012

RE: Initiation of Section 106 Consultation; National Museum of Air & Space Façade Replacement Project

Dear Ms. Ballard:

Thank you for formally initiating consultation with the District of Columbia State Historic Preservation Officer (SHPO) regarding the above-referenced undertaking. We are writing in accordance with Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR Part 800, to provide our initial comments regarding effects on historic properties.

As you are aware, the National Air & Space Museum is a contributing element of the National Register of Historic Places-listed National Mall Historic District. Based upon our review of the project submittal and our participation in the site visit and informal discussions held on June 17th and September 22nd of this year, we understand that the original, Tennessee marble panels that make up the exterior façades – and the museum's most prominent character-defining feature – are failing to the point that they must be completely replaced. Repair/reuse of the original marble is not an option because the panels are very thin and much of the deterioration consists of significant warping. However, we are encouraged that the Smithsonian Institution is actively investigating the possibility of reopening the original quarry and acquiring matching stone to complete the project. Since this approach has the potential to completely avoid adverse effects, we strongly encourage *in-kind* replacement if at all possible. Alternative materials such as granite, metal or synthetic panels are likely to result in adverse effects on the museum and the surrounding historic district.

Please keep us posted as more is learned about the possibility of obtaining matching marble panels. In the meantime, we look forward to continuing consultation with the Smithsonian Institution and other parties, including assisting in the preparation of an Area of Potential Effect (APE) and an initial list of potential consulting parties. If you should have any questions or comments regarding this matter, please contact me at andrew.lewis@dc.gov or 202-442-8841. Otherwise, thank you for providing this initial opportunity to comment.

Sincerely,

C. Andrew Lewis
Senior Historic Preservation Specialist
DC State Historic Preservation Office

14-433
cc: Jennifer Hirsch, NCPC

1100 4th Street, SW, Suite E650, Washington, DC 20024 Phone: 202-442-7600, Fax 202-442-7637

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MADISON, WI

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15 February 2016

MEMORANDUM

From: COLIN MACKILLOP, AIA

To: MICHAEL HENRY, PE – DESIGN MANAGER & COTR, SI-OFEO/OPDC
ALL ATTENDEES

RE: NASM-MB HVAC AND ENVELOPE REPLACEMENT
WASHINGTON, DC
OFEO# 1206101
QEA # 31301800

Subject: NCPC Site Review for Consulting Parties Presentation
12 February 2016 Meeting Agenda

Attendees: NCPC: Jennifer Hirsch, Vivian Lee, Matthew Flis
SI-OPDC: Ann Trowbridge, Charles Obi, Michael Henry, Jane Passman
SI-OPDC-AHHP: Sharon Park
QEA: Colin MacKillop
AECOM: Roger Courtenay, Claire Bedat, Reid Fellenbaum

1. Introductions/Objectives
   a. Update NCPC on the site design per the agency staff review comments
   b. Review the Consulting Parties meeting topics.
   c. Mr Courtenay noted that this is not a full presentation as it is progress, and that SI and the A/E are looking for feedback on how it can be improved.

2. Design Proposal: Mr. Courtenay presented the updated the site design, noting changes relative to the existing condition and the Jan 12 agency staff consultation presentation.
   a. North Entrance – incorporate ramps for accessibility
   b. Northeast Corner – open up, add stair way in historic location prior to 1988 east wing addition
   c. Southeast corner – lower planters to create inviting entrance to the site
      i. Ms. Trowbridge noted there may be more people entering the site from that corner following the completion of the Eisenhower Memorial.
   d. South Entrance – existing bollards remaining until sidewalk is expanded pending Independence Ave renovation project currently in development
   e. Southwest corner – existing condition defines an area that is not connected to the rest of the plaza, requiring visitors to exit the west terrace and enter at openings in perimeter further to the east.
      i. Proposal includes the repositioning of the existing fountain in a location that allows the raised walls of the pool to create an integrated perimeter security barrier with a softened appearance.
      ii. 7th Street is the de facto entrance to the Hirshhorn Museum
      iii. Proposal brings sculpture into public realm with greater access and visibility
      iv. The design develops the Southwest corner with the spirit of the Washington waterfront and the Southwest District redevelopment
   f. Northwest Corner – opened up with consistent character with the other four corners of the site.

3. Design Evolution: Mr. Courtenay presented how the design evolved from existing condition to current proposal
   a. Perimeter planters – numerous planters along the perimeter will be lowered relative to the existing condition, while existing planters on the upper plaza will remain at seating height
   b. Quadrant key plans
      i. Northwest corner – the existing wall heights are proposed to be adjusted upward in some areas to meet perimeter security requirements, but lower in many areas to increase visibility of planters. Wall height along sloped "gentle" walkway is established to meet code

ii. Northeast Corner – walls are proposed to be lowered along the perimeter while maintaining security requirements
iii. Southeast Corner – design intent is to optimize the planter presence, maintaining visibility without blocking views.
iv. Southwest Corner – access from existing basement egress stairs are proposed to be removed in order to maximize planter area. Ms. Trowbridge said removing the site entrances from the midpoints of the perimeter in order increase planters areas and provide access from the corners is an improvement.
v. Ms. Lee said the diagrams are strong, but the planters need to be more clearly identified in the presentation; Mr. Courtenay noted the planters are identified in other diagrams for clarity.

c. Planters wall studies
   i. Southeast Corner
      1. Raised planters does not allow viable trees to be planted there due to limited clearance for the root zone.
      2. The full extension of a sidewall closes entrance opening width while blocking the view of the planter.
      3. A partial extension of the planter sidewall looks unresolved and residual.
      4. Ms Trowbridge said the planar wall approach provides better visibility of the proposed thematic gardens. Mr. Courtenay said that improves the visitor experience along the entry sequence.
   ii. Northeast Corner -- Similar approach allows the entrance to appear more open
   iii. Northwest Corner -- Similar approach indicates a welcoming entrance
   iv. Southwest Corner -- Grade change in the area will be accommodated with a gentle walkway for safer condition.
d. North and South entrances
   i. Existing signage proposed to be moved from the low planter walls to the upper ramp walls
   ii. Integrate thematic content to the wall with the appearance of Martian surface with relief. Area of relief studied to balance with overall composition.
e. Planter axonometric diagrams
   i. Northwest corner – ADA access was added in the 90's. Ms. Trowbridge said the existing McDonald's vendor should be shown dashed in, with proposed location indicated per Sara Bachelor request. The currently proposed design simplifies the planters from previous proposal.
   ii. Northeast corner – The existing condition has high walls. The previous proposal was objected to by agency staff at the Jan 12 presentation due to the appearance of the perimeter security walls. The current proposal softens the appearance of perimeter security walls while lowering existing planter wall height.
   iii. Southeast corner – The needs to avoid disrupting the plaza structure above existing mechanical equipment in basement is a factor in planning the expanded ramp. The current proposal accommodates this with simplified ramp that remains outside the footprint of the basement.
   iv. Southwest corner
      1. Ms. Lee said existing openings in the walls are narrower than shown. Ms. Trowbridge said the existing condition of the grass around the fountain is frequently soggy.
      2. The previous proposal received comments of prominent location of bollards, with planters near the perimeter that prevented access to the fountain. The current proposal is per discussion with OPS to create an incursion into the existing perimeter of the site, allowing a more inviting entrance to the site and fountain area.
      3. Ms. Lee requested that the planter along the west side of fountain be widened. Mr. Courtenay said they are looking to add trees to provide shade and balance the

exposure to sunlight. Mr. Henry said that maintenance needs to be considered with likelihood of increased amount leaves falling into fountain if overhanging, while also creating an open area to allow wind to animate the Delta Solar sculpture.
      4. Ms. Passman requested that the edge of basement be indicated on the diagrams. Mr. Courtenay said there will be an ADA compliant trough to receive water, and that kids can sit on wall if they want to get wet.
      5. Ms. Lee asked for more grass areas, similar to the existing condition, while reducing the amount of paving. She added that the National Museum of Natural History (NMNH) has integrated security – benches and walls with openings create three different designs that provide variety and integration. Mr. Courtenay said the existing design of NASM doesn't have the type of detail that NMNH has that allows a similar integration of a bench into a wall; the simpler, pristine geometry at NASM has led the design to establish similar forms within the proposal. Ms. Lee said cables and dinosaur sculptures at NMNH provides more opportunities for variety.
      6. Mr. Henry asked if the west lawn can have less trees without a wall on the south side. Mr. Courtenay said the design is in progress, with the intent to establish a northern horizontal extension of fountain plaza plane; an additional area of green is proposed within the extension of the west lawn. Mr. Courtenay said the west lawn precedent is part of the original design, which was divorced from the rest of the NASM grounds; the existing condition is not accessible or inviting. The typology of urban fountains is typically paved to provide access. Ms. Bedat said shade is important to create more a comfortable space. Mr. Henry noted that goes against original design intent to animate sculpture with wind.
      7. Mr. Obi said the proposed geometry is not consistent with other corners, and suggested the lawn should be extended to fountain and not an entrance; Mr. Courtenay agreed and said that this is being reviewed.
   v. Access diagrams – the proposed introduction of new ramps decreases the area of planters in some locations on site.
   vi. Secure perimeter integration – the proposal includes the addition secure areas along the perimeter in some locations, but it is generally consistent.
   vii. Canopy tree palette – the shape of the proposed trees compliments the geology of the existing building and new site design
   viii. Thematic planting – Mr. Courtenay noted SI Gardens has been involved in the development of the proposed thematic gardens.
   ix. Planting palette theme – a variety of species integrates soft lunar imagery in some areas, with native regional species in other areas
   x. Storm water management – diagram is in progress
      1. Ms. Bedat noted that storm water is to be collected and reused from the plaza and the roof. Mr. Courtenay said bioretention will be introduced to slow the release of storm water peaks. There is a concern regarding the lack of water on site may direct the landscape plan towards the use of native plants. A soil specialist will help develop systems that integrate the retention of water.
      2. Water at fountain will be potable due to safety concerns. The water depth will be reduced to prohibit entrance to the fountain, and the water turned off in winter.

4. Consulting Parties Meeting Topics Confirmation
    a. Site
        i. Ms. Trowbridge said the two terrace alternatives would be to replace in kind or redesign. Mr. Henry said that similar to the fountain, the site has to be replaced – the question is how it is reconstituted. He added there is no "no action" alternative due to the need to replace the plaza waterproofing.
        ii. Mr. Henry asked if the site should be listed as multiple design options. Ms. Trowbridge said one option should be presented as the best possible way forward.
    b. Vestibules
        i. Ms. Park asked how many options should be presented. Ms. Hirsch stated the alternative should include the "Glass Box", but do not spend much time on it as agencies are on board with "Flight". Ms. Trowbridge said the EA will show both options.
        ii. Ms. Hirsch stated there isn't a strong basis to eliminate the glass box in her opinion, which should thus be shown to the public to let them comment.
    c. Cladding
        i. Ms. Hirsch stated at least three cladding options should be presented. Ms. Park suggested showing all 5 options, and omitting the three that were eliminated. Ms. Hirsch said the man-made options were shown last time, and that they can be listed without showing them graphically.
        ii. Ms. Trowbridge asked the extent to which the stone survey should be explained. Ms. Hirsch suggested it should be limited to a high level to show the criteria. Ms. Trowbridge said the green and red diagrams of the report are effective in clarifying the criteria, but can't shown publicly as it may affect the procurement of the stone. Mr. Henry suggested the names of the stone options could be omitted. Ms. Trowbridge said we don't want to eliminate a stone from consideration.
        iii. Ms. Trowbridge noted there are many options for different categories, similar to a Chinese menu. Ms. Hirsch said included options that are considered and dismissed section. Ms. Passman asked if the glass box can be listed as dismissed. Ms. Hirsch asked why glass box was dismissed. Ms Trowbridge said the visitor experience is not accomplished with the glass box as no shade is provided; Mr. Henry noted that it blurs line of historic preservation designation; Mr. MacKillop noted that it does not express mission of museum. Ms. Hirsch stated that the recommended approach is to list the alternatives as no action or two action options. Ms. Passman noted that including two vestibules options and multiple terrace options complicates the EA approach.
        iv. Cladding is the main issue for the review process.
    d. Glazing -- to be included as a high level summary.
    e. Solar Panels -- Ms. Park asked if the south wall PV's options should be included. Mr. Flis recommended that they should be included as considered and dismissed.

5. NEPA Process Update and NCPC Hearing
    a. Ms. Hirsch said the EA could include CFA comments as an appendix, but it is typically not provided. She recommended that the public scoping comments be included with the EA, but not letter from Commission of Fine Arts.
    b. Mr. Flis requested that the commission see stone panels at the concept hearing. Ms. Hirsch said the FONSI will not be issued prior to seeing proposed stone. Ms. Trowbridge said a September meeting could scheduled to review the mockups. Ms. Hirsch said a site meeting can be held separately. Ms. Lee noted that it would be beneficial to have commissioners conduct a site visit to review large stone samples. Ms. Trowbridge said they will try to be as up to date as possible.
    c. Ms. Passman said the EA could be provided within a month, and asked what is NCPC's preferred schedule. Ms. Hirsch said the FONSI is not

required until just prior to the preliminary review. The EA has no relation to the CFA review, but is based on the NCPC concept review; thus the EA is to be issued after the concept hearing.
    d. Ms. Hirsch asked the basis of the proposed commission hearing schedule. Ms. Trowbridge noted that shifting the hearing from June to May would limit the ability to incorporate feedback from the 22 March agency staff consultation prior to the report submission due the following week.

6. Next Steps
    a. The agency staff consultation scheduled for 22 March will be a forum to address these items further.
    b. The consulting parties meeting scheduled for 22 February will include the other agencies and can include the current proposal. The fountain replacement is in the budget. Mr. Henry will forward the proposal to OPS for review. Representatives from NASM have seen the revised fountain and have not commented to date.

ACTION ITEMS
1. SI and OEA to review and confirm the design review agency hearing schedule.
2. OPDC to issue the presentation to OPS for their review and comment.

Any discrepancies or disagreements with the author's interpretation of this meeting should be brought to the attention of Quinn Evans Architects in writing.

END OF MEMORANDUM

Smithsonian Institution

November 15, 2016

Reid Nelson, Director
Office of Federal Agency Programs
Advisory Council on Historic Preservation
401 F Street, Suite 308
Washington, DC 20001-2637

Dear Mr. Nelson:

The Smithsonian Institution is planning a revitalization of the National Air and Space Museum on the National Mall, to include updating mechanical systems, address building envelope deficiencies, improve visitor access and security to the site, construct vestibules to improve security and visitor experience, replace non-historic glazing to meet federal blast requirements, and to improve the building's energy efficiency and on-site storm water retention. The building is considered a contributing element of the National Mall Historic District. Pursuant to CFR 800.3(a), the Smithsonian has determined that the proposed project is an undertaking as defined in CFR 800.16(y) and that due to the cumulative impact of a number of changes the project will have an "adverse effect" on historic properties.

The National Air and Space Museum was designed by Hellmuth Obata & Kassabaum with Gyo Obata as the principal designer, and opened to the public in 1976. The Air and Space Museum is one of the most visited museums worldwide, welcoming over 7 million visitors per year. The building contributes to the National Mall Historic District listed on the National Register, and the Smithsonian is currently conducting a Determination of Eligibility for listing the building individually on the National Register.

The Smithsonian has been conducting an assessment of adverse effects on the property and Historic District with the State Historic Preservation Office in accordance with CFR 800.5(a). In accordance with CFR 800.6(a)(1) and 800.11(e), the Smithsonian is notifying the Advisory Council on Historic Preservation of the adverse effect findings, and to determine the Council's participation.

The Air and Space Museum's major character defining features consist of monumental blocks clad in Tennessee Pink marble panels and recessed glass bays. The building is on axis and is in dialogue with the National Gallery of Art West Building across the Mall which is also clad in Tennessee Pink marble. The original marble cladding due to thinness and an unusual construction system have resulted in warped panels that are not reusable and will need to be replaced. Should the Smithsonian not be able to replace the material in-kind, there will be an adverse effect on the building and the National Mall Historic District.

The Smithsonian is currently researching the availability of a cladding material that will maintain the existing color, pattern, and panel size of the existing Tennessee Pink marble. The light pink

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Smithsonian Institution

color of the marble found on the building does not appear to be available in the quantity necessary, and the Smithsonian is looking into quarry availability of a range of colors of Tennessee Pink marble, as well as alternate natural stone, and manufactured materials. The Smithsonian will be conducting physical mock-ups of the final materials considered for review in the spring of 2017.

The Smithsonian is coordinating the Section 106 review process with the National Environmental Policy Act process, and is still considering alternative designs for the changes to the overall site. The cumulative effect of the site changes will include altering the terrace walls and planting beds which will also have an adverse effect. Please refer to the attached site plans and building elevations in accordance with 800.11(e).

Please advise if the Advisory Council will join the consultation as the Smithsonian works toward resolution of these adverse effects. The Smithsonian looks forward to working with you on this important project.

Sincerely,

Carly Bond

Carly Bond
Historic Preservation Specialist

Enclosures

cc: Brian Lusher, ACHP
Andrew Lewis, DC HPO
Vivian Lee, NCPC
Sharon Park, SI
Debbie Nauta-Rodriguez, SI
Jane Passman, SI
Ann Trowbridge, SI

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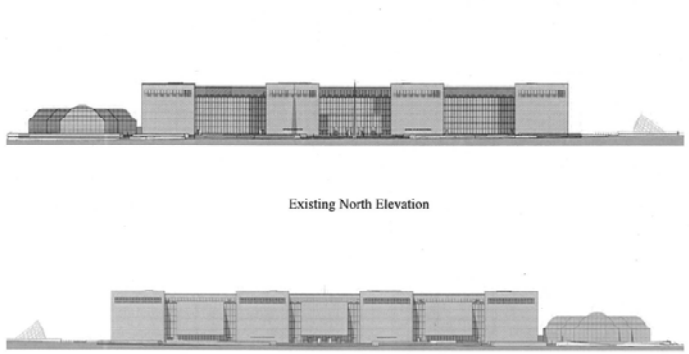
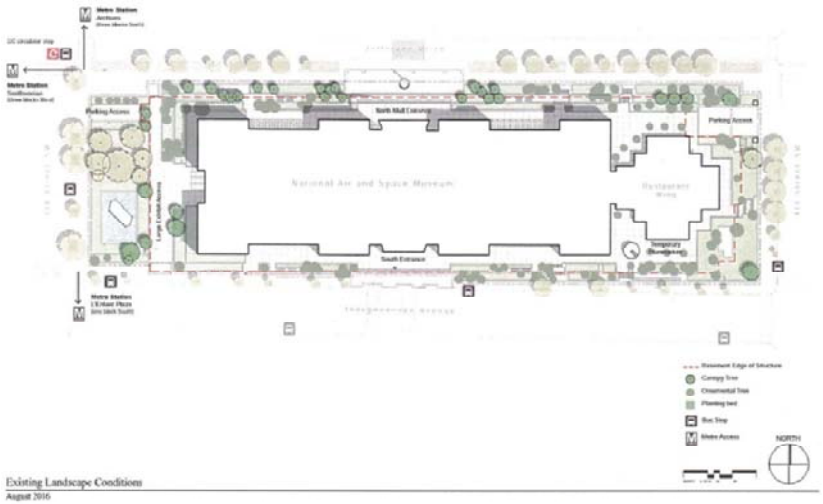
National Air and Space Museum - Environmental Assessment



Existing Elevations
August 2016

National Air and Space Museum - Environmental Assessment



Existing Landscape Coeditions
August 2016

South Vestibule Design 'A,' Full and Partial South Perspective Elevations
August 2016

National Air and Space Museum - Environmental Assessment

North Vestibule Design 'A,' Full and Partial North Elevation
August 2016

Preserving America's Heritage

November 28, 2016

Ms. Sharon Park
Associate Director
Architectural History and Historic Preservation
Smithsonian Institution
600 Maryland Avenue, SW, Suite 5001
MRC 511 PO Box 37012
Washington, DC 20013

Ref: *Proposed National Air and Space Museum Revitalization Project*
District of Columbia

Dear Ms. Park:

The Advisory Council on Historic Preservation (ACHP) has received your notification of adverse effect for the referenced undertaking that was submitted in accordance with Section 800.6(a)(1) of our regulations, "Protection of Historic Properties" (36 CFR Part 800). The background documentation included with your submission does not meet the specifications in Section 800.11(e) of the ACHP's regulations. We, therefore, are unable to determine whether Appendix A of the regulations, *Criteria for Council Involvement in Reviewing Individual Section 106* Cases, applies to this undertaking. Accordingly, we request that you submit the following additional information so that we can determine whether our participation in the consultation to resolve adverse effects is warranted.

- Copies or summaries of any views or comments provided by consulting parties, the public, and the District of Columbia State Historic Preservation Officer.
- Copies or summaries of any views or comments provided by any affected Indian tribe.

Upon receipt of the additional information, we will notify you within 15 days of our decision.

If you have any questions, please contact Mr. Brian Lusher at 202-517-0221 or via e-mail at blusher@achp.gov.

Sincerely,

Historic Preservation Technician
Office of Federal Agency Programs

ADVISORY COUNCIL ON HISTORIC PRESERVATION
401 F Street NW, Suite 308 • Washington, DC 20001-2637
Phone: 202-517-0200 • Fax: 202-517-6381 • achp@achp.gov • www.achp.gov

Smithsonian Institution

December 2, 2016

Brian Lusher
Office of Federal Agency Programs
Advisory Council on Historic Preservation
401 F Street NW, Suite 308
Washington, DC 20001

Dear Mr. Lusher:

Thank you for notifying the Smithsonian that certain documentation was absent from our notification of adverse effect sent to the Council in accordance with Section 800.6(a)(1). Please accept the below information as a summary of the meetings held to date with agencies, consulting parties and the public in accordance with the specifications in 800.11(e).

Agency Scoping Meeting – afternoon of November 12, 2014 held at the National Capital Planning Commission
Agencies invited included: NCPC, Commission of Fine Arts (CFA), Washington DC Historic Preservation Office (DC HPO), National Park Service (NPS), Washington DC Office of Planning (DC OP), District Department of Transportation (DDOT), District Department of Energy and Environment (DOEE), Department of Public Works (DDPW), Washington Metropolitan Area Transit Authority, DC Fire and Emergency Medical Services Department, DC Water and Sewer Authority, US Environmental Protection Agency, Potomac Electric Power Company, Washington Gas, National Gallery of Art, Eisenhower Memorial Commission, General Services Administration, and US Fish and Wildlife Service (USFWS)

Agencies represented at the meeting included: SI, NCPC, CFA and DDOT

The presentation material discussed included proposed terrace alterations, cladding options, potential for photovoltaics, vestibules at the entries, east loading dock access, and bike parking.

Public Scoping Meeting – evening of November 12, 2014 held at the National Capital Planning Commission
The meeting was announced on the NCPC web site and sent to a list of potentially interested parties. The following review agencies and interested parties directly invited: CFA, DC HPO, NPS, National Trust for Historic Preservation, Advisory Council on Historic Preservation, National Gallery of Art, Eisenhower Memorial Commission, General Services Administration, DC OP, ANC 2C, AND 6D, Committee of 100 on the Federal City, US Capitol Historical Society, DC Preservation League, The Guild of Professional Tour Guides of Washington DC, National Coalition to Save our Mall, National Museum of the American Indian, Hirshhorn Museum and Sculpture Garden, Architect of the Capitol, HOK, Department of Education, Trust for the National Mall, DC Chaper of Docomomo, American Institute of Architects DC Chapter, District of Columbia City Council, Southwest Neighborhood Assembly, Voice of America, USFWS, Chesapeake Bay Field Office, and DC Department of the Environment

Attendees: SI, NCPC, GSA, HOK, Quinn Evans Architects, and one interested individual

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Smithsonian Institution

There were was only one commenter with a question about the roof replacement.

Consulting Parties Meeting – February 22, 2016
Attendees, besides SI, included NPS, DCPL, DC SHPO, CFA, NCPC. There was discussion about Tennessee Pink cladding, terraces, and rendered views of NASM within the Area of Potential Effects. SI did not receive any formal written comments.

Agency Staff Meeting – January 12, 2016 held at NASM
Agencies represented: SI, DC SHPO, CFA, NCPC

Stone samples were viewed in direct sunlight against the facades, both wet and dry. Samples were selected for further consideration. The east side of the site was selected as an acceptable location for the full mock-up viewing. SI agreed to consult further with the agencies on the design of the mock-ups to meet any specific requirements.

Commission of Fine Arts Concept Design Review Meeting – June 18, 2015
Commission approved the concept proposal for replacing the exterior facades and terraces, with numerous comments for further consideration at the design is developed, including the suggestion that the design could go further in expressing the technology of the museum's subject of flight and space exploration. For the redesign of the building's landscape, the Commission members supported the proposal to simplify and open up the low terraces to accommodate modern requirements of accessibility and security.

Commission of Fine Arts Revised Concept Design Review Meeting – June 16, 2016
The Commission approved the proposed design for the terraces and provided comments for the designs of the vestibules. The Commission strongly favored the Smithsonian's preferred Scheme A, which would create an enhanced pedestrian environment with larger shade trees and sequence of public spaces, and suggested further refinement of the details of the freestanding barrier walls that line the pedestrian pathways. For the entrance pavilions, the Commission expressed support for the elegant, curvilinear forms, but indicated that full review of the design of the structures requires understanding their relationship to the building's new cladding material.

National Capital Planning Commission Concept Design Review Meeting – July 7, 2016
The Commission commented favorably on the overall concept design for the Building Exterior, Vestibules, and Site Improvements. Regarding the Building Envelope, the Commission recommended that the team consider ways to achieve a seamless transition between the exterior cladding and interior stone treatment if Tennessee Pink marble (limestone) is determined to be infeasible. The Commission supported the Scheme A: Ground Plane option for Terrace Improvements, and recommended perimeter security improvements including minimizing the use of bollards and exploring integrated perimeter security elements, and adjusting use of bollards to avoid conflicts with the landscape and ensure to improve circulation and ease of maintenance. The Commission supported relocation of the existing Continuum sculpture along 4th Street, SW on the east terrace, and requested confirmation that exterior lighting will not detract from the setting of the National Mall.

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Smithsonian Institution

Agency Staff Meeting – October 17, 2016 held at NASM
Agencies represented: SI, DC SHPO, CFA, NCPC

Meeting held to update design review agency staff on the status of the cladding selection process. Stone samples were viewed against the facades in full sunlight, both wet and dry, and selected for further consideration and inclusion in the mock-up planned for the spring of 2017.

DC SHPO indicated that the cumulative effect of the proposed exterior work is adverse. The methods of mitigation need to be identified, and the levels of mitigation required could change based on the material selected. If the replacement cladding material selected is not a natural stone, there will be an adverse effect on the Mall. SHPO indicated that the cladding material should have a pattern without relying on surface relief. SHPO expressed appreciation of the level of effort to date by SI in studying stone replacement options, material procurement risks, and quarry availability for the potential use of Tennessee Pink marble. SHPO requested that the during the mock-up period sufficient time be allowed for the public to comment on the existing cladding before the final material is selected.

Thank you for your consideration, and please let me know if any additional information or materials are required.

Sincerely,

Carly Bond

Carly Bond
Historic Preservation Specialist

cc: Sharon Park, Associate Director of Architectural History and Historic Preservation, SI
Ann Trowbridge, Associate Director of Planning, SI
Debbie Nauta-Rodriguez, Deputy Director for Planning and Program Management, SI
Jane Passman, Senior Facilities Master Planner, SI
Mike Henry, Design Manager, SI
Charles Obi, Program Manager, SI
Rick Flansburg, Director of Facilities and Operations, NASM
Vivian Lee, National Capital Planning Commission

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APPENDIX C:
SECTION 106 DRAFT
MEMORANDUM OF AGREEMENT

MEMORANDUM OF AGREEMENT
AMONG
THE SMITHSONIAN INSTITUTION,
THE NATIONAL CAPITAL PLANNING COMMISSION
AND
THE DISTRICT OF COLUMBIA STATE HISTORIC PRESERVATION OFFICER
REGARDING
THE REVITALIZATION OF THE NATIONAL AIR AND SPACE MUSEUM
AT THE NATIONAL MALL, WASHINGTON, DC

This Memorandum of Agreement ("MOA") is made as of this ___day of ____, 2017, by and among the Smithsonian Institution (SI), the National Capital Planning Commission (NCPC), and the District of Columbia State Historic Preservation Officer (DCSHPO) (referred to collectively herein as the "Parties" or "Signatories" or individually as a "Party" or "Signatory"), pursuant to Section 106 of the National Historic Preservation Act ("NHPA"), 54 U.S.C. §§ 306108, and its implementing regulations 36 CFR Part 800 ("Section 106") regarding the revitalization of the National Air and Space Museum in Washington, DC (Undertaking); and

WHEREAS, SI has jurisdiction over the National Air and Space Museum (NASM), located on Independence Avenue at Sixth Street SW, Washington, DC, which was designed by Gyo Obata, of Hellmuth Obata and Kassabaum (HOK) and built in 1972-1976 on the National Mall for the United States Bicentennial; and

WHEREAS, the NASM is a contributing element of the National Mall Historic District, which was listed in the National Register of Historic Places on October 15, 1966, and updated on December 8, 2016; and

WHEREAS, the SI has identified the need to replace the NASM building's exterior envelope and mechanical and fire protection systems to address building deficiencies, to alter the landscape, and to construct entrance vestibules; and

WHEREAS, the heating, ventilation, and air conditioning (HVAC), plumbing and fire protection systems are inadequate and at the end of their service lives; the Tennessee Pink marble cladding is experiencing significant warping and displacement and does not meet current requirements for energy performance and insulation; the skylights, curtain walls, and entrances do not provide the required interior environmental conditions necessary to protect the museum collections; and the entrances do not provide adequate queuing space and do not meet security screening requirements; and

WHEREAS, specific components of the undertaking include: removal of the original Tennessee Pink marble exterior cladding; replacement of building envelope components, including stone cladding, glazed curtain wall, skylights and roof systems, HVAC, plumbing, and fire protection systems. The project also includes alterations to the terraces, landscape and perimeter security; construction of security vestibules at the north and south entrances to improve accessibility and site security; and incorporation of photovoltaics on the roof (Exhibit A); and

WHEREAS, pursuant to Section 106 federal agencies must take into account the effects of their undertakings on any district, site, building, structure or object that is included in or eligible for inclusion in the National Register of Historic Places and afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity to comment; and

WHEREAS, pursuant to Public Law 108-72, 117 Stat. 888 (August 15, 2003), for projects in the District of Columbia that are subject to review and approval by National Capital Planning Commission (NCPC), the SI is deemed to be a federal agency for purposes of compliance with Section 106; and

WHEREAS, NCPC has approval review authority over federal projects in the District pursuant to the National Capital Planning Act of 1952, 40 U.S.C. § 8722(b)(1) and (d); and

WHEREAS, pursuant to 36 CFR § 800.3(a) and 800.16(y) the revitalization of NASM is an undertaking subject to the Section 106 process; and

WHEREAS, the SI and NCPC have agreed that SI will be the lead federal agency pursuant to 36 CFR 800.2(a)2 for the Undertaking to fulfill their collected Section 106 responsibilities; and

WHEREAS, the SI has consulted with the District of Columbia Historic Preservation Officer (DC SHPO) pursuant to 36 CFR Part 800; SI initiated Section 106 consultation with the DC SHPO by letters dated September 3, and September 5, 2014; and

WHEREAS, the SI defined the Area of Potential Effects (APE) on historic resources related to NASM as shown in Exhibit B, to include the area bounded on the north by Constitution Avenue NW, on the east by the east elevation of the U.S. Capitol Building, and on the west by 14th Street NW and SW. Independence Avenue SW defines the south boundary between 14th Street NW and 9th Street SW and again between 3rd Street NW and the east elevation of the U.S. Capitol Building. Between 9th Street SW and 3rd Street SW, the boundary shifts to the south to accommodate views from adjacent buildings and the elevated railroad track; and

WHEREAS, in accordance with 36 CFR § 800.2(a)(4), SI invited individuals and organizations with a demonstrated interest in the Undertaking and the public to participate as consulting parties in the Section 106 process. The full list of invitees and consulting parties is provided in Exhibit C; and

WHEREAS, the SI has conducted extensive study of over eighty cladding options, from procurement of Tennessee Pink marble, other natural stones, to manufactured materials, and has considered recommendations from the DC SHPO, review agencies and the consulting parties, and has selected XXXX to replace the existing Tennessee Pink marble; and

WHEREAS, on March 31, 2017, NCPC, in cooperation with SI, released for public review and comment the National Air and Space Museum Revitalization Environmental Assessment; and

WHEREAS, NCPC, in cooperation with the SI, has completed an Environmental Assessment (EA) and selected XXXX as the preferred alternative which consists of XXXX, and provided along with detailed project plans in Exhibit D; and

WHEREAS, the SI provided for public involvement in this MOA in accordance with 36 CFR § 800.8(a)(1) by coordinating Section 106 review with public review and consultation via an Environmental Assessment (EA) under the NEPA process; and

WHEREAS, the SI and NCPC notified the public and conducted a combined National Environmental Policy Act (NEPA) Scoping and Section 106 consultation meeting on November 12, 2014, in order to inform the

public of the Project and to solicit verbal and written comments; followed by a Section 106 consultation meeting held on February 22, 2016, and a combined NEPA and Section 106 consultation meeting on April 7, 2017; and

WHEREAS, the U.S. Commission of Fine Arts (CFA), pursuant to its authorities, approved a concept plan for the undertaking on June 18, 2015, and approved an updated concept plan on June 16, 2016; and

WHEREAS, in a public meeting, NCPC, in accordance with its authorities under the National Capital Planning Act, reviewed and commented on a concept plan for the Undertaking on July 7, 2016; and

WHEREAS, the SI, in consultation with the DC SHPO and consulting parties, has determined that the Undertaking will have an adverse effect, pursuant to 36 CFR § 800.5, on the NASM and the National Mall, as outlined in an assessment of the effects on historic resources as shown in Exhibit E; and

WHEREAS, in accordance with 36 CFR § 800.6(a)(1) the SI notified the Advisory Council on Historic Preservation (ACHP) of its adverse effects determination with the specified documentation and the ACHP has declined to participate in the consultation pursuant to 36 CFR § 800.6(a)(1)(iii); and

NOW, THEREFORE, the Signatories agree that the undertaking shall be implemented in accordance with the following stipulations in order to take into account the adverse effect of this undertaking on historic properties.

STIPULATIONS

The SI shall ensure that the following measures are carried out:

1. GENERAL REQUIREMENTS

A. Applicable Codes and Standards. The Undertaking shall be planned, developed, and executed by SI in consideration of the recommended approaches contained in the Secretary of the Interior's Standards for the Treatment of Historic Properties ("Secretary's Treatment Standards"), and other prevailing applicable codes.

B. Qualifications. SI shall ensure that all historic preservation and/or archaeological work performed on its behalf pursuant to this MOA shall be accomplished by, or under the direct supervision of a person or persons who meet(s) or exceed(s) the pertinent qualifications in the Secretary's Professional Standards (Archaeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines [As Amended and Annotated], formerly located at 36 CFR Part 61 in those areas in which the qualifications are applicable for the specific work performed.

2. MINIMIZATION MEASURES

The measures listed below will be incorporated into the design of the NASM revitalization project to minimize adverse effects:

a. The *Continuum* sculpture will remain on the NASM site, and the proposed site for relocation will be selected in consultation with the DC SHPO, CFA, and NCPC. The *Continuum* sculpture will be relocated to the selected site by the expiration date on this MOA.

b. Planting materials on the property will be designed to minimize visual impact on the building and views from the interior atriums as originally conceived. The grove of trees north of the *Delta Solar* will be maintained.

c. Photovoltaics will be limited to placement on the roof, and will be situated to be non-visible from public thoroughfares (Exhibit F). Physical mock-ups will be carried out with the DC SHPO in advance of installation to determine where solar panels will and will not be visible and identify the appropriate locations for installation. A physical sample of the photovoltaic film at the south canopy roof will be provided for consultation with the DC SHPO in advance of installation to minimize color variation of the film.

d. The planter beds and retaining walls within the plaza will be constructed of the same cladding material selected for the façade to maintain their visual relationship and original design intent.

3. MITIGATION MEASURES

The measures listed below will be implemented to mitigate adverse effects associated with the NASM revitalization project:

a. Within XX months of the execution of this MOA or prior to any construction or installation of construction related structures, such as trailers, on the site, SI shall use Historic American Building Survey/Historic American Engineering Record/Historic American Landscape Survey (HABS/HAER/HALS) Level III standards to document the NASM building and its setting with exterior and interior photographs. Photographic documentation shall also include the site sculptures known as *Ad Astra*, *Continuum*, and *Delta Solar* in their original locations. Documentation will be submitted for inclusion in the HABS/HAER collections. A draft recordation package will be submitted to HABS and revised according to any comments prior to being finalized and submitted. SI will submit the recordation to other repositories as directed in consultation with the DC SHPO.

b. Within two (2) years of the date of the signed MOA, SI will complete an Individual National Register Nomination for NASM. The Nomination shall be completed by an individual or individuals who meet *The Secretary of Interior's Qualification Standards*, and shall be carried out in consultation with the DC SHPO.

c. A select portion of salvageable Tennessee Pink marble from the exterior of the building will be saved for re-use in a SI collection area for any future work on the marble panels at the interior of the atriums. Salvageable material will need to be unstained, unwarped and otherwise in good condition. The end result of close-up inspection and disassembly may not result in any salvageable material, at which point all Signatories will be notified.

4. MITIGATION FOR ALTERNATE CLADDING MATERIAL SELECTION

The following measures shall be implemented to mitigate the adverse effects associated with selection of a cladding material other than Tennessee Pink marble and only if Tennessee Pink marble is not selected:

a. The SI will develop a technical report to establish the conditions of the original stone cladding, causes for the deficiencies that developed, and reasons that Tennessee Pink was not a feasible option for

procurement. The report will be distributed to the Signatories within three months of the date on the signed MOA.

b. Within two (2) years of the date on the signed MOA, SI will complete an Individual National Register Nomination for the National Museum of Natural History. The Nomination shall be completed by an individual or individuals who meet *The Secretary of Interior's Qualification Standards*, and shall be carried out in consultation with the DC SHPO.

5. **DESIGN CONSULTATION**
The Project plans included in Appendix X illustrate the design and site plan that are current as of the date of the last signature on this Agreement. Since refinements to the Project plans are anticipated after execution of this MOA, SI shall continue to consult with the signatories and consulting parties to further avoid, minimize, and mitigate adverse effects. Specific outstanding design elements the consultation shall address are identified below.

A. Outstanding Design Elements. Topics identified for additional consultation include, but are not limited to: a) building envelope and glazing treatment; b) security vestibules; c) lighting design; d) landscape design; e) signage; f) relocation of the Continuum sculpture.

B. SI will prepare 65% Construction Drawings as part of the CFA and NCPC preliminary and final submissions.

C. SI will distribute copies, in electronic format only unless requested otherwise by a Signatory, of both the CFA and NCPC final submissions to the Signatories. SI will distribute the CFA's Secretary correspondence and the NCPC's Action and Executive Director's Recommendation to all Signatories.

6. **POST-DESIGN REVIEW ARCHAEOLOGICAL DISCOVERIES**

A. Should cultural resources be unexpectedly identified during the implementation of the Undertaking or any actions taken pursuant to this MOA, SI shall ensure that reasonable efforts are made to avoid, minimize or mitigate adverse effects to such properties, and shall consult with the SHPO to resolve any unavoidable adverse effects pursuant to 36 CFR § 800.6. SI shall ensure that any resulting cultural resources work is accomplished in accordance with the relevant performance standards in Stipulation 1. SI and SHPO shall resolve any disputes over the evaluation or treatment of previously unidentified resources using the processes outlined in Stipulation X (Dispute Resolution) of this MOA.

B. Treatment of Human Remains - In the event that human remains, burials, or funerary objects are discovered during construction of the Undertaking or any action taken pursuant to this MOA, SI shall immediately halt subsurface construction disturbance in the area of the discovery and in the surrounding area where additional remains can reasonably be expected to occur. SI shall immediately notify SHPO and the District of Columbia Chief Medical Examiner (CME) of the discovery under DC Code Section 5-1406 and other applicable laws and regulations.

1. If CME determines that the human remains are not subject to a criminal investigation by federal or local authorities, DOS shall comply with the applicable federal or local laws and regulations governing the discovery and disposition of human remains and consider the ACHP's Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects (2007).

2. For actions involving Native American human remains or burials, SI shall comply with applicable laws. in accordance with provisions of the Native American Graves Protection and Repatriation Act, as amended (Public Law 101-601, 25 USC 3001 et seq.) and regulations of the Secretary of the Interior at 43 CFR Part 10. Should human remains or such objects be found, SI shall notify SHPO pursuant to 43 CFR Section 10.4(d).

7. **MONITORING AND REPORTING**
Each year, by the anniversary date of the last signature on this MOA until it expires or is terminated, the SI shall provide the Signatories a summary report detailing work undertaken pursuant to its terms. Such report shall include any scheduling changes proposed, any problems encountered, and any disputes and objections received in the SI's efforts to carry out the terms of this MOA. Failure to provide such summary report may be considered noncompliance with the terms of the MOA pursuant to the Amendments and Non-Compliance stipulation of this MOA.

8. **ANTI-DEFICIENCY ACT**
The SI's obligations under this MOA are subject to the availability of appropriated funds, and the stipulations of this MOA are subject to the provisions of the Anti-Deficiency Act. The SI shall make reasonable and good faith efforts to secure the necessary funds to implement its obligations under this MOA. If compliance with the Anti-Deficiency Act alters or impairs the SI's ability to implement its obligations under this MOA, the SI shall consult in accordance with the Amendments and Non-Compliance stipulations, and if necessary, the Termination stipulations.

9. **PLAN DEVELOPMENT**
The SI shall continue to consult with the DC SHPO regarding refinements to the plans shown in Exhibit A and shall not alter any plans or documents that have been reviewed and commented on, except to finalize documents that have been reviewed and commented on in draft, without first affording the DC SHPO an opportunity to review the proposed change and determine whether the SHPO will request further changes or that this MOA be amended.

10. **DISPUTE RESOLUTION**
Should any Signatory to this MOA object at any time to any action proposed or the manner in which the terms of this MOA are implemented, SI shall consult with such party to resolve the objection. If a resolution cannot be reached, the SI shall forward all documentation relevant to the dispute to the ACHP including the SI's proposed response to the objection. Within 45 days after receipt of all pertinent documentation, the ACHP shall exercise one of the following options:

a. Advise the SI that the ACHP concurs in the SI's proposed response to the objection;

b. Provide the SI with recommendations, which the SI shall take into account in reaching a final decision regarding its response to the objection; or

c. Notify the SI that the objection will be referred for comment pursuant to 36 CFR 800.7(c), and proceed for comment. The resulting comment shall be taken into account by the SI in accordance with 36 CFR 800.7(c)(4) with reference to the dispute.

The SI shall take into account any ACHP recommendation or comment provided in accordance with this stipulation with reference only to the subject of this objection; the SI's responsibility to carry out all actions under this MOA that are not subjects of the objection shall remain unchanged.

Should the ACHP not exercise one of the above options within 45 days after receipt of all documentation, the SI may assume the ACHP's concurrence in its proposed response to the objection.

11. **AMENDMENTS AND NON-COMPLIANCE**
This MOA may be amended when such an amendment is agreed to in writing by all Signatories. The amendment will be effective on the date a copy signed by all the Signatories is filed with the ACHP. The original amendment will be filed with the ACHP. If the Signatories cannot agree to appropriate terms to amend the MOA, any Signatory may terminate the MOA in accordance with the Termination stipulation of the MOA.

12. **TERMINATION**
If any Signatory to this MOA determines that its terms cannot or are not being properly implemented, that Signatory shall immediately consult with the other signatories to attempt to develop an amendment per Stipulation 11 above. If within thirty (30) days (or another time period agreed to be all signatories) an amendment cannot be reached, any signatory may terminate the MOA upon written notification to the other Signatories.

Once the MOA is terminated, and prior to work continuing on the undertaking, SI must either (a) execute a MOA pursuant to 36 CFR § 800.6 or (b) reinitiate Section 106 consultation on the unfinished components of the Undertaking pursuant to 36 CFR Part 800. SI shall notify the Signatories as to the course of action it will pursue.

13. **ELECTRONIC COPIES**
Within one week of the last signature on this MOA, the SI shall provide each Signatory with one legible, color, electronic copy of this fully-executed MOA and all of its attachments fully integrated into one, single document. Internet links shall not be used as a means to provide copies of attachments since web-based information often changes. If the electronic copy is too large to send by e-mail, the SI shall provide each signatory with a copy of this MOA on a compact disc.

14. **DURATION**
This MOA will expire if its terms are not carried out within fifteen (15) years from the date of its execution. Prior to such time, SI may consult with the other Signatories to reconsider the terms of the MOA and amend it in accordance with Stipulation 8.

Execution of this MOA by the Signatories, the filing of the MOA with the ACHP pursuant to 36 CFR § 800.6(b)(iv) and the implementation of its terms evidences that the SI has taken into account the effects of the revitalization of the NASM on historic properties and has provided the ACHP a reasonable opportunity to comment.

SIGNATURES AND ATTACHMENTS FOLLOW ON SEPARATE PAGE

SIGNATURE PAGE
MEMORANDUM OF AGREEMENT
REGARDING
THE REVITALIZATION OF THE NATIONAL AIR AND SPACE MUSEUM
AT THE NATIONAL MALL, WASHINGTON, DC

FOR THE SMITHSONIAN INSTITUTION

By: _____

Nancy Bechtol — Date
Director, Smithsonian Facilities

SIGNATURE PAGE
MEMORANDUM OF AGREEMENT
REGARDING
THE REVITALIZATION OF THE NATIONAL AIR AND SPACE MUSEUM
AT THE NATIONAL MALL, WASHINGTON, DC

FOR THE NATIONAL CAPITAL PLANNNING COMMISSION

By: _____

Marcel C. Acosta Date
Executive Director

DRAFT MOA 9

SIGNATURE PAGE
MEMORANDUM OF AGREEMENT
REGARDING
THE REVITALIZATION OF THE NATIONAL AIR AND SPACE MUSEUM
AT THE NATIONAL MALL, WASHINGTON, DC

FOR THE DISTRICT OF COLUMBIA STATE HISTORIC PRESERVATION OFFICER

By: _____

David Maloney Date
State Historic Preservation Officer, District of Columbia

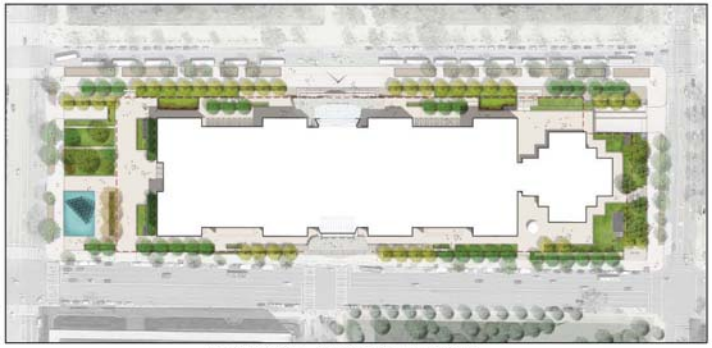
DRAFT MOA 10

EXHIBITS

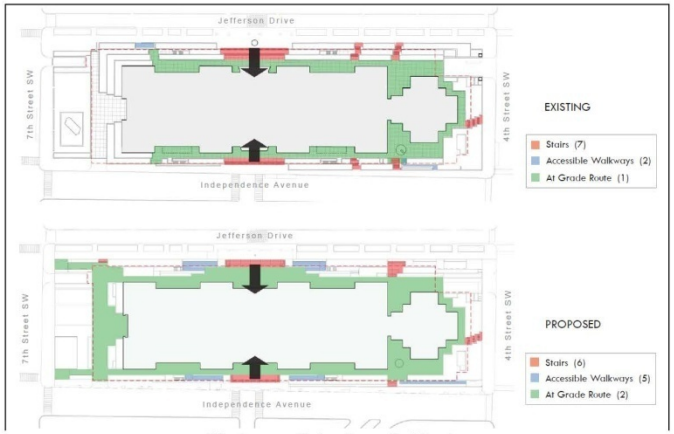
Exhibit A: Undertaking Proposed Elevations and Site Plans

Proposed South Elevation. Quinn Evans Architects

Proposed North Elevation. Quinn Evans Architects

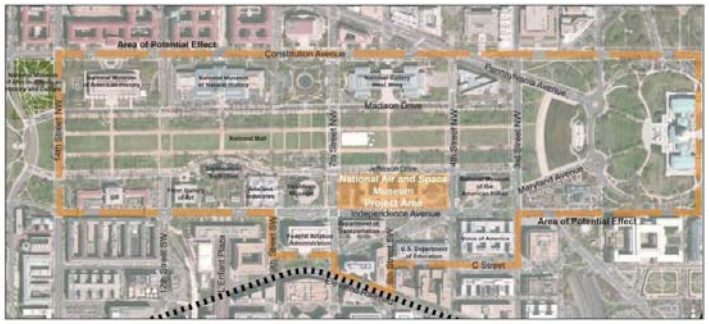


Proposed Plan. Quinn Evans Architects.



Site Access. Quinn Evans Architects.

Exhibit B: Area of Potential Effects



DRAFT MOA 13

Exhibit C: List of Invitees to Scoping and Consulting Parties Meetings

Invitees	Consulting Parties
National Capital Planning Commission	National Capital Planning Commission
Commission of Fine Arts	DC State Historic Preservation Office
Washington, DC State Historic Preservation Office	Commission of Fine Arts
National Park Service	General Services Administration
Washington, DC Office Planning	Hellmuth, Obata & Kassabuam
District Department of Transportation	National Park Service
District Department of Energy and Environment	District Department of Transportation
Department of Public Works	Chesapeake Bay Field Office
Washington Metropolitan Area Transit Authority	
DC Fire and Emergency Medical Services Department	
DC Water and Sewer Authority	
U.S. Environment Protection Agency	
Potomac Electric Power Company	
Washington Gas	
National Gallery of Art	
Dwight D. Eisenhower Memorial Commission	
General Services Administration	
United States Fish and Wildlife Service	
National Trust for Historic Preservation	
Advisory Council on Historic Preservation	
ANC 2C	
AND 6D	
Committee of 100 on the Federal City	
U.S. Capitol Historical Society	
DC Preservation League	
The Guild of Professional Tour Guides of Washington, DC	
National Coalition to Save Our Mall	
National Museum of the American Indian	
Hirshhorn Museum and Sculpture Garden	
Architect of the Capitol	
Hellmuth, Obata & Kassabaum	
Department of Education	
Trust for the National Mall	
DC Chapter of DOCOMOMO	
American Institute of Architects, DC Chapter	
District of Columbia City Council	
Southwest Neighborhood Assembly	
Voice of America	

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Exhibit D: Preferred Alternative

Exhibit E: Assessment of Effects on Historic Resources

Smithsonian Institution

The National Air and Space Museum Revitalization
Assessment of Effects on Historic Resources

Introduction

The National Air and Space Museum (NASM) was designed by Hellmuth, Obata & Kassabum (HOK), with Gyo Obata as the principal designer in 1972. The Museum opened to the public in 1976. NASM is a contributing building to the National Mall Historic District listed in the National Register of Historic Places. For purposes of Section 106 review of this undertaking, the Smithsonian Institution (SI), DC State Historic Preservation Office (DC SHPO) and the National Capital Planning Commission (NCPC) have agreed that NASM is individually eligible for listing in the National Register, and shall be treated as such to maintain its existing character.

NASM's most prominent character defining features consist of four monumental blocks clad in Tennessee Pink marble (limestone) panels separated by three recessed glass bays on the north side, and alternating large and small marble clad blocks on the south side separated by smaller bays of recessed glass. The alteration of solid and void on the north side was placed and proportioned to correspond to projections and recesses of the National Gallery of Art West Building, built in 1941, across the Mall, which is also clad in Tennessee Pink marble like the adjacent East Wing Building, built in 1978. NASM is situated on an elevated paved terrace, with a series of walled and stepped terraces with planters, stairs and ramps that also contribute to the character of the museum complex.

The SI is planning an undertaking to address specific deficiencies related to the building systems and envelope, to include replacing NASM's exterior wall cladding, curtain walls, skylights and roof systems, heating, ventilation, and air conditioning equipment, plumbing and fire protection systems. The project will also address related work including the revitalization of the landscape, addition of vestibules at the north and south entrances for security screening and improvement of visitor experience, and reductions to carbon emissions and energy consumption. The existing Tennessee Pink marble cladding is experiencing significant warping, and the material can't be reused. The exterior cladding is integrated with the mechanical air distribution system, and it is necessary to undertake these upgrades simultaneously. The last major work on the stone façade was completed in 1995-1997, and the skylights and exterior glazing were replaced in 2001.

Existing Building Elevations, Quinn Evans Architects.

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The purpose of this document is to assess the adverse effects of the project on the historic building and the National Mall Historic District in accordance with CFR 800.5(a) and in consultation with the DC SHPO.

This report finds that the project will have an adverse effect on the building and the Historic District, due to altering the exterior stone cladding which is one of the most notable character defining features of the museum and an element that establishes a strong visual connection to the similarly clad National Gallery of Art buildings across the National Mall. In addition, adverse effects will result from changing several other features of the property's setting that contribute to its historic significance, including alterations to the terraces, relocating original sculptures and introducing significant new vestibules. This document describes different aspects of the proposed project and assesses the effects, including the cumulative adverse effect that results from all of the proposed changes to the building and site. The proposed work was evaluated within the below Area of Potential Effects.

Area of Potential Effects, Quinn Evans Architects.

The SI is coordinating the Section 106 review process with the National Environmental Policy Act process, and is considering alternative designs for the changes to the building and site. The SI is considering a "No Action" alternative (Alternative A) of not undertaking any improvements to the envelope and building systems and three action alternatives: Tennessee Pink Replacement Stone (Alternative B), Alternate Natural Stone with Similar Appareance to Original Cladding (Alternative C), and Replacement Cladding of a Manufactured Material (Alternative D). As a result of implementing Alternative A, the current deficiencies would remain and the conditions would continue to deteriorate. This alternative and neglect of the property would be an adverse effect on the building and the Historic District.

Envelope Replacement - Cladding

NASM's stone cladding consists of Tennessee Pink marble panels measuring 2'6" by 5' in dimension. The marble barrier wall system is comprised of 1 ¼" thick panels with backer rod and sealant, and spray applied foam insulation on the back of the stone, with a vertical plenum in the wall cavity for air flow.

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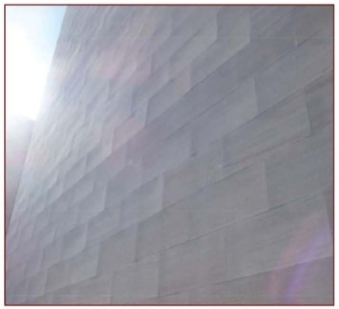
The foam insulation backing inhibits air and water flow, and combined with the existing non-traditional wall construction, has resulted in extensive warping and cracking of the stone panels.

The irreversible condition of the stone panels and the exterior wall construction do not provide adequate resistance to water penetration and air infiltration. For these reasons, the stone cladding must be replaced.



Tennessee Pink marble (limestone) warping, 2016.

The SI has extensively assessed over 80 different stone cladding options. The replacement cladding material must meet certain criteria such as strength, procurement of obtaining sufficient quantity and quality of material, adherence to the original design concept, blast resistance, and provide the longest service life possible. The assessment of cladding options evaluates in-kind replacement and the use of other materials for consistency with the appearance of the Tennessee Pink marble to maintain the existing characer of the building and to avoid or minimize adverse effects.

The existing stone is a light to medium pink with distintive horizontal striations. If a sufficient quantity of Tennessee Pink marble can be procured, and the cladding is able to be replaced in-kind, the cladding replacement aspect (Alternative B) of the project will result in no adverse effect on the building or the National Mall Historic District.

The SI is considering alternative cladding options, including natural stone and manufactured materials. The alternative cladding options will match certain aspects of the Tennessee Pink marble, but overall will not be an exact match, and therefore, Alternatives C and D will have an adverse effect on the building and the Historic District. NASM and the National Gallery of Art's West Building and East Wing were constructed of the same material, and if an alternative cladding material is selected, there will be an adverse effect in visually separating the connection between these three buildings. A physical mock-up

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of the selected cladding options will be conducted in the spring of 2017 for review by the consulting parties and the public.

The Tennessee Pink marble continues into the interior atriums on the stone clad volumes of the building. The existing marble panels on the interior are in good condition and will remain, and there will be an adverse effect from the contrast between the existing and an alternate cladding where the two planes are visible together in the atriums. If Tenneessee Pink marble is selected, this adverse effect will be avoided.

Interior and exterior stone cladding as seen from within an interior gallery, 2016.

The replacement stone will be a minimum of 3" thick to provide the best balance of strength and weight. The stone cladding and footprint of the building will slightly expand, but this change will not be discernible on the exterior at the pedestrian level. The change in thickness will also not be discernible on the interior of the building in the atriums where the remaining marble can be seen in proximity to the exterior due to detailing of the curtain wall mullion system, and will not have an adverse effect on the building.

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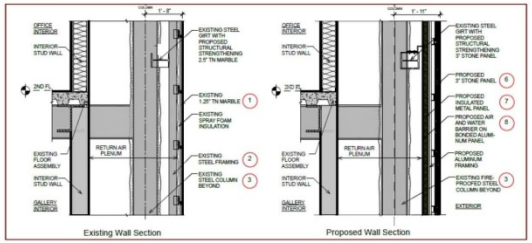

Wall Section, Quinn Evans Architects. Please note that the red circles refer to a photo key from submission material to the Commission of Fine Arts dated June 2016.

Envelope Replacement - Glazing

The glass curtan walls and skylights were replaced in 2001 due to performance issues with solar heat gain, leaking, and excessive exposure to ultraviolet rays. The dark appearance of the existing glazing diminishes the views of the gallery interior from the National Mall and to the sky above from within the galleries.

NASM, 1976.

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The proposed replacement glazing will better protect the collections from exposure to harmful ultraviolet rays, in addition to being thermally adequate and blast resistant. The proposed replacement glazing increases visible light transmission, and the skylight glazing decreases light transmission. The cumulative changes increase visibility of the gallery interior from the Mall, preserves the integrity of the original design concept, views to the open sky and the National Gallery of Art from the interior, and will return the building closer to its original design itent, and therefore does not constitute an adverse effect.

Vestibules

NASM has two public entrances at the center of the building on Jefferson Drive and Independence Avenue, which enter into the noth and south lobbies. Due to the high volume of 7 million Museum visitors on average per year, there is a need to provide improvements to visitor comfort, access and security. The vestibules will provide shelter for queuing to enter the Museum and security screening areas, improved security screening, and a buffer zone between the exterior environment and the stable interior conditions to better preserve the collection.

The proposed size and locations of the vestibules are scaled to the corresponding bay of the building, and will not obstruct views from the interior of the building in the atriums which maintains the original design intent. Two designs are under consideration, Vestibule Design option A proposes a tensile inspired structure with curvilinear forms which invoke a feel of flight and recalls the mission of the Museum; option B proposes a transparent glass box to maintain the views of the exhibits within the glass atrium beyond. The vestibules will not require the removal of historic fabric to construct, and could be readily reversible additions.

Proposed Curvilinear South Entrance Vestibule, Quinn Evans Architects.

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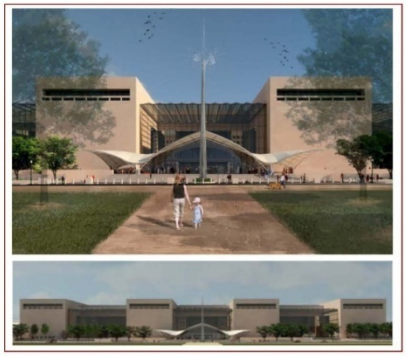

Proposed Curvilinear North Entrance Vestibule, Quinn Evans Architects.

Proposed Box North Entrance Vestibule, Quinn Evans Architects.

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Proposed Box North Entrance Vestibule, Quinn Evans Architects.

Although the design of the proposed vestibules supports the mission of the Museum in function and arrangement, they are an adverse effect on the appearance of the building, due to disrupting the clean geometric horizontality of the building's form. The south entrance canopy vestibule option that proposes a tensile structure with a curvilinear form will incorporate a flexible photovoltaic film integrated into the tensile fabric roof. The photovoltaic film will be visible from various viewpoints along Independence Avenue. A physical sample of the film will be reviewed with the DC SHPO to ensure that the gradation between the film cells and surrounding "grid" will not be too stark and call undue attention. The vestibule at the north entrance would extend beyond the McMillan line, between 30-48' depending on the selected design option, and interrupts the direct visual connection between NASM and the National Gallery of Art, thus resulting in an adverse effect on the National Mall Historic District.

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South Entrance with photovoltaics illustrated, Quinn Evans Architects.

The proposed vestibule at the south entrance will require the relocation of the *Continuum* sculpture, which is currently centered at the south entrance. Alternate locations for the sculpture on the site are under consideration. The relocation of *Continuum* will be an adverse effect on the site. The proposed vestibule at the north entrance will require the relocation of the *Ad Astra* sculpture. The proposed site for *Ad Astra* shifts slightly north of the existing toward Jefferson Drive. The sculpture will remain on axis with the main entrance, and will not be an adverse effect on the site.

Terrace Alterations

NASM's site consists of a granite paved terrace which surrounds the majority of the building at its base, which is elevated above-grade. A series of stepped walled terraces with planters, and an east and west lawn extend from the sidewalk level to the elevated terrace. The planter beds and retaining walls are clad in Tennessee Pink marble, and the existing pavers are Stony Creek granite installed in 1985 replacing the original precast concrete pavers. The terrace is accessed by a series of monumental granite stairs and ramps, some original to the site. Site alterations designed by HOK were completed in 1988, and the ramp at the northwest corner of the site and additional retaining walls were altered in 1991. Despite these changes, the setting of NASM retains sufficient integrity to convey its original design intent.

The existing planting bed walls and retaining walls range between 36" to approximately 60" in height which varies to address sloped conditions at grade. The project proposes to alter the terraced planting beds to improve perimeter security, visitor access to the site, and provide accessible walkways at the primary entrances. Accessible walkways are currently limited to two locations removed from the primary entrances.

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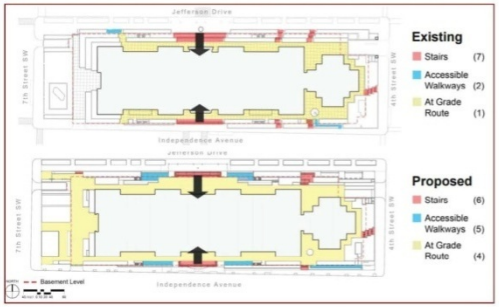
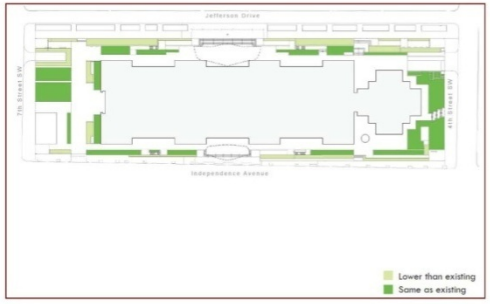


Existing and Proposed Site Circulation Routes, Quinn Evans Architects.

The proposed planter beds and retaining walls will maintain the existing 36-60" height range. New inclined walkways are planned at the north and south entrances, with high walls featuring engraved signage. The walkways are designed for universal access and are under 5% in slope.



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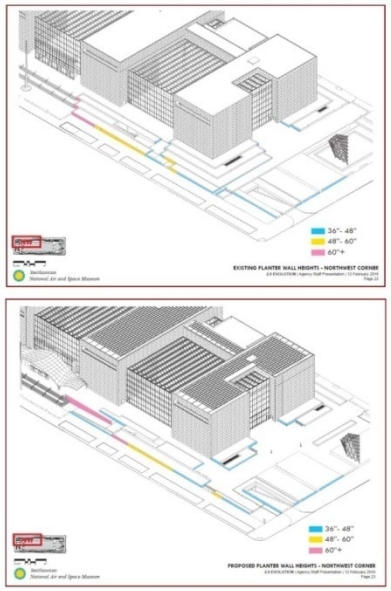
Proposed Grade Alterations, Quinn Evans Architects.



Existing and Proposed Planter Wall Heights, Northwest Corner, Quinn Evans Architects

The terrace paving is non-original granite, and the material will be replaced with natural stone. However, the planter beds and retaining walls are still faced in their original materials. The cladding of the planter beds and retaining walls will be replaced to match the stone cladding that is selected for the main building in order to maintain visual continuity between the site walls and the building.

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Replacement of cladding that is not in-kind will result in an adverse effect on the NASM and the National Mall Historic District.

The cumulative effect of the landscape and terrace alterations consistutes an adverse effect. Although the accessible walkways are well integrated into the terrace, there are adverse effects on the character of the terrace and stairs from removing the raised planters, installing flush planters and freestanding walls, which changes the character of the raised, volumetric planter and terrace configuration.

The introduction of engraved signage at the accessible walkway walls at the main entrances are in keeping with similar signage found on buildings on the National Mall and do not have an adverse effect. However, the introduction of decorative surface features such as "moon craters" or similar designs on the museum signage panels is likely to result in adverse effects.

Overall, effort has been made to maintain the horizontal aesthetic of the building's plinth, stepped configuration of the terrace and planter beds, and monumental stairs for circulation to minimize adverse effects. The *Delta Solar* sculptural fountain will be relocated closer to the sidewalk on 7th Street and elevated. This relocation and alteration of the original design results in an adverse effect on the site.

Proposed Accessible Walkway and Engraved Signage, Quinn Evans Architects.

The planting plan will provide shade trees, and has been designed to reinforce the visual connectivity between the building and the Mall, and the building and sidewalk. The plantings will enable views of the building from the Mall and from the interior of the buidling out to the Mall, which is consistent with Obata's original design intent and will serve to minimize the cumultive adverse effect on the site.

Solar Panels

The revitalization work plans solar panels for 70,000 square feet of area on the roof. The Building Integrated Photovoltaics (BIPVs) will generate approximately 7% of the electrical load for the revitalized building.

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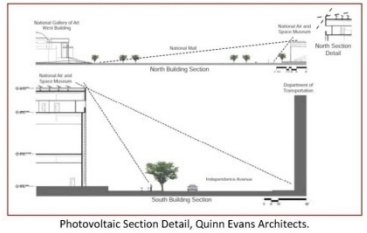

Photovoltaic Section Detail, Quinn Evans Architects.

The solar panels will be set back far enough from the edges of the NASM roof and field reviewed with the DC SHPO to ensure that they are not be visible from a public thoroughfare. Although the solar panels will be minimally visibile from the top of the Washington Monument, this view is incidental due to the distance. Therefore, provided the rooftop solar panels will not be visible from public thoroughfares, the solar panels will not have an adverse effect on the NASM or the National Mall Historic District.

View of the National Mall from the Washington Monument.

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Photovoltaic Array Roof Plan. Quinn Evans Architects

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March 2017

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