National Institute of Standards & Technology

Gaithersburg Campus Master Plan Environmental Assessment

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National Institute of Standards and Technology
Gaithersburg, Maryland

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Abstract:

The National Institute of Standards and Technology (NIST) has developed a 20-year Master Plan for the NIST Gaithersburg Campus located in Gaithersburg, Maryland. The need for the Master Plan, and the campus improvements prescribed therein, is driven by both institutional policy and the inability of existing facilities and infrastructure to support current and projected mission requirements at the NIST Gaithersburg Campus.

Two alternatives were considered in detail in the Environmental Assessment. The Proposed Action would implement the NIST Gaithersburg Campus Master Plan to guide the physical development of the campus to advance the agency's mission-related goals over the next 20 years. The Master Plan emphasizes quality and collaborative research in addition to sustainable and efficient operations. The Master Plan addresses current campus needs and delineates future development through broad phases delineated by priorities and logical implementation sequencing. When and if funding becomes available, NIST would execute new construction, additions, renovation, demolition, landscape improvements, utility improvements, and circulation improvements under the Master Plan. Implementation of the Master Plan would result in permanent minor to moderate impacts to a variety of resource areas including social and economic resources; open space; biological resources; topography, geology, and soils; water resources; utilities and infrastructure; solid and hazardous waste; circulation and transportation; air quality; climate change; cultural and historic resources; aesthetics and light pollution; and noise. Many of these impacts would be offset by related benefits and mitigation measures. The No-Action Alternative would continue current NIST operations and would not implement the Master Plan. The No-Action Alternative would ultimately result in a site that would no longer support the advanced research requirements of NIST and would render much of the campus obsolete.

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Abbreviations, Acronyms, and Symbols

ACHP	Advisory Council on Historic Preservation
ACSL	Advanced Chemical Sciences Laboratory
AML	Advanced Measurement Laboratory Complex
BGEPA	Bald and Golden Eagle Protection Act
BRT	Bus Rapid Transit
BWI	Baltimore/Washington International Thurgood Marshall Airport
CAA	Clean Air Act
CBPA	Community-Based Planning Areas
CCT	Corridor Cities Transitway
CDR	Construction, demolition, and renovation
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CHP	Combined Heat and Power System
CO	Carbon monoxide
COMAR	Code of Maryland Regulations
CWA	Clean Water Act
dBA	A-weighted decibel
DEP	Montgomery County Department of Environmental Protection
DoC	United States Department of Commerce
EA	Environmental Assessment
EAB	Emerald ash borer
EISA	Energy Independence and Security Act of 2007
EO	Executive Order
ESA	Endangered Species Act
ESC	Erosion and sediment control
ESD	Environmental Site Design
FEMA	Federal Emergency Management Agency
FY	Fiscal year
GCR	General Conformity Rule
GHG	Greenhouse gas
GPL	General Purpose Laboratories
GSF	Gross square feet
HVAC	Heating, ventilation, and air conditioning
IDA	International Dark Sky Association
IES	Illuminating Engineering Society
LEED	Leadership in Energy and Environmental Design
LID	Low impact development
LOS	Level of Service
MARC	Maryland Area Regional Commuter
MBTA	Migratory Bird Treaty Act
MCDOT	Montgomery County Department of Transportation
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MIHP	Maryland Inventory of Historic Properties
M-NCPPC	Maryland-National Capital Park and Planning Commission
MOU	Memorandum of Understanding
MTA	Maryland Transit Administration
MVA	Megavolt-amperes
MW	Megawatt
NAAQS	National Ambient Air Quality Standards
NCNR	NIST Center for Neutron Research
NCPC	National Capital Planning Commission
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NIST	National Institute of Standards and Technology
NO_2	Nitrogen Dioxide
NOA	Notice of Availability
NOx	Nitrogen oxides
NPDES	National Pollutant Discharge Elimination System

NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OFPM	Office of Facilities and Property Management
OSHA	Occupational Safety and Health Administration
OSHE	Office of Safety, Health and Environment
OU	Organizational Unit
Ppb	Parts per billion
PCB	Polychlorinated biphenyl
PEPCO	Potomac Electric Power Company
PM	Particulate matter
PPH	Pounds of steam per hour
PTC	Permit to construct
RCRA	Resource Conservation and Recovery Act
RHA	Rivers and Harbors Act
SF	Square feet
SHA	State Highway Administration
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	Sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SRM	Standard Reference Material
SSPP	Strategic Sustainability Performance Plan
SWM	Stormwater management
SWMP	Stormwater Management Plan
SWPPP	Stormwater Pollution Prevention Plan
TDM	Transportation Demand Management
TMDL	Total Maximum Daily Load
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	Volatile Organic Compounds
WLA	Wasteload allocation
WSSC	Washington Suburban Sanitary Commission

1 Executive Summary

Background

The 579-acre National Institute of Standards and Technology (NIST) Gaithersburg Campus, located in Gaithersburg, Maryland, is home to research programs of NIST, a non-regulatory federal agency within the U.S. Department of Commerce (DoC). A total of 4,007 researchers, affiliates, administrators, and support personnel work in 62 buildings and structures at the campus, of which 38 are occupied buildings. Approximately half of the permanent buildings are now more than 50 years old, although two substantial research facilities were built in the last 20 years: The Advanced Chemical Sciences Laboratory (ACSL) and the Advanced Measurement Laboratory Complex (AML). The roughly diamond-shaped, fenced campus is surrounded on three sides by major roadways with commercial and residential development opposite, and on the fourth side by a residential neighborhood and park. The main entrance gate is located on the north side along West Diamond Avenue, with three other active gates used by employees and for deliveries. The property is relatively flat, with some slightly rolling terrain towards the south. The central campus is characterized by separate buildings, some linked by enclosed concourses, surrounded by lawn and parking lots. To the east and west, there is open space, forested area, two ponds, and scattered buildings.

Purpose and Need for Action

The Master Plan analyzed in this Environmental Assessment (EA) reflects NIST's vision for the physical development of the campus and for a flexible strategy for implementation. The overall purpose of the Master Plan analyzed in this EA is to guide fulfillment of the following objectives:

- Establish a framework for future development (20-year horizon);
- Meet near and long-term needs of the campus in support of NIST's research mission;
- Maintain an attractive campus environment;
- Respect and embrace the campus status as an eligible historic district; and
- Advance NIST and DoC sustainable design goals.

The need for the Master Plan, and the campus improvements prescribed therein, is driven by both institutional policy and the inability of existing facilities and infrastructure (much of which dates to the initial campus construction in the 1960s) to support current and projected mission requirements. NIST is ever evolving and needs flexible, integrative, and collaborative support spaces to effectively promote scientific research. DoC recommends that its agencies have a physical master plan for their sites, reflecting both the anticipated special needs of the user groups and the impact of its activities on the surrounding community. The master plans are used to both define needed physical facilities and to advance the agency's mission-related goals.

Proposed Action

The Proposed Action is the implementation of a Master Plan to guide the physical development of the campus to advance the agency's mission-related goals over the next 20 years. The Master Plan emphasizes quality and collaborative research in addition to sustainable and efficient operations. The Master Plan addresses current campus needs and delineates future development through broad phases delineated by priorities and logical implementation sequencing. The Master Plan provides for the modernization of aging, inefficient buildings and accommodates the anticipated growth in research programs over the next 20 years. Full execution of the Master Plan would increase the employee population by approximately 27% from its current population of 4,007 to 5,106 and would result in a net increase in facility space (gross square footage) by approximately 40%.

NIST would execute new construction, additions, renovation, demolition, landscape improvements, utility improvements, and circulation improvements under the Master Plan. The Master Plan would focus on a core center of the campus and associated green space used to connect existing, renovated, and new laboratories. It

offers a framework for accomplishing NIST's goals of enhancing the campus, providing appropriate facilities, improving security, encouraging professional collaboration, and advancing sustainable practices. The emphasis is on research buildings—upgrading existing laboratory buildings and infrastructure to support current and future research, and adding new facilities needed for planned programs.

No-Action Alternative

The No-Action Alternative would not implement the Master Plan and would maintain the present course of action at the campus by continuing ongoing research, management, and maintenance activities. The No-Action Alternative would ultimately result in a site that would no longer support the advanced research requirements of NIST and would render much of the campus obsolete. The No-Action Alternative would not meet the purpose and need criteria for the campus. As a result, NIST considers the No-Action Alternative to be less desirable than the Proposed Action.

Decision to be Made

Based on environmental analysis, public comments on the Draft EA, and other considerations, NIST will decide whether to proceed with the Proposed Action or the No-Action Alternative. The EA scope is confined to issues and potential environmental consequences relevant to this decision.

Summary of Environmental Effects and Mitigation Measures

The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act require consideration of environmental effects and prescribe mitigation where practical to limit those effects.

The Proposed Action would result in temporary impacts from construction, renovation, and demolition activities, as well as some minor continuing impacts because of operation of the new facilities and the increase in NIST personnel over the course of 20 years. The No-Action Alternative would not result in temporary impacts, demolition activities, or other improvements under the Master Plan. The environmental effects and mitigation measures associated with the Proposed Action and No-Action Alternative are described in Table 1-1 (Summary of Environmental Effects and Mitigation Measures) below.

Table 1-1. Summary of Environmental Effects and Mitigation Measures

Resource	Proposed Action (Gaithersburg Campus Master Plan)	No-Action Alternative
Land Use and Socioeconomics		
Land Use and Regional Planning	Effects: • Improved connectivity, stronger campus identity, and encouraged collaboration amongst employees. • No impact on land use designations on the campus. Continued preservation of open space and natural features. • No impact on zoning or regional planning outside the campus. Mitigation: • No mitigation necessary.	Effects: • No impact on land use or regional planning.
Social and Economic Resources	Effects: • Minor long-term impact on population, housing, and education trends because of the projected increase of approximately 1,099 staff over the course of 20 years. • Minor long-term economic benefits associated with improved productivity and available resources as well as a marginal improvement to employment levels associated with increased staff on the campus. Staff increases would likely benefit the local economy and job market. • Temporary minor impact on the population and availability of housing during construction (because of potential influx of construction workers). • Temporary economic benefits to the local community during construction activities (e.g., meals and incidentals for construction workers). • No significant disproportionate impact on children, minorities, or low-income populations, but potential minor effect on sensitive populations southeast of campus because of relocation of commercial vehicle entrance to Gate F. Mitigation: • Incorporation of design features at Gate F to separate commercial vehicle and visitor traffic and to limit queueing of commercial vehicles as they enter the campus.	Effects: • No impact on social and economic resources. • No economic benefits to the region. Adverse economic impact because of obsolete facilities and infrastructure, compromising NIST's mission to promote industrial competitiveness on a national level.
Open Space and Recreation	Effects: • Expansion of active recreational areas and the network of walking paths through both open and wooded landscape. • Minor reduction in open areas because of new construction. Mitigation: • No mitigation necessary.	Effects: • No impact on open spaces.

Table 1-1. Summary of Environmental Effects and Mitigation Measures

Resource	Proposed Action (Gaithersburg Campus Master Plan)	No-Action Alternative
Biological Resources		
Vegetation	Effects: • Removal of vegetation because of construction in previously undeveloped areas. • No impact on rare, threatened, or endangered plant species or on vegetation in stream buffers or wetlands. • Improvement to urban landscape because of replacement of manicured lawns with no-mow meadows of native or adapted species (requiring less maintenance). • Expanded tree canopy cover because of reforestation efforts. Mitigation: • Reseeding native grasses and vegetative species in disturbed areas following completion of construction activities to the extent feasible. • Replacement of trees removed. • Implementation of trenchless methods where feasible to minimize vegetation removal associated with installation or relocation of underground utilities. • Management of hardwood trees to prevent the spread of the emerald ash borer.	Effects: • No impact on vegetation. • No improvement to urban landscape.
Wildlife	Effects: • Minor reduction in potential wildlife and pollinator habitat because of reduction in vegetated areas. • Temporary minor impact on wildlife, migratory birds, and pollinators during construction activities. • No expected impact on rare, threatened, and endangered species or forest interior dweller species. • Potential minor impact on aquatic life because of runoff of sediment or other contaminants. • Minor improvement to wildlife and pollinator habitat due tree canopy expansion and increased native vegetation. Mitigation: • Avoidance of tree clearing until it is verified that no migratory bird eggs and/or young are present. • Consultation with the U.S. Fish and Wildlife Service and implementation of appropriate mitigation measures if threatened or endangered species are discovered on campus. • Implementation of stormwater management and pollution prevention measures to reduce impact on aquatic life.	Effects: • No impact on wildlife or habitat. • No enhancement to habitats for native wildlife and pollinators.
Topography, Geology, and Soils		
Topography	Effects: • Minor impact on topography because of construction activities, which would require grading, excavation, and fill in previously disturbed areas. Mitigation: • No mitigation necessary.	Effects: • No grading or associated impact on topography.

Table 1-1. Summary of Environmental Effects and Mitigation Measures

Resource	Proposed Action (Gaithersburg Campus Master Plan)	No-Action Alternative
Geology and Soils	Effects: • Moderate soil disturbance because of construction, demolition, and renovation projects. • Potential for surface and subsurface compaction during construction and demolition activities. Mitigation: • Performance of geotechnical surveys to confirm soil constructability prior to new construction. • Implementation of erosion and sediment control (ESC) measures during earth disturbance. • Preparation and adherence to a Stormwater Pollution Prevention Plan (SWPPP) to minimize risk of soil contamination during construction activities. • Reuse of excavated soils within the campus whenever feasible. • Minimization of fugitive dust emissions and wind-thrown hazards during construction activities.	Effects: • No impact on geology or soils.
Water Resources		
Surface Waters	Effects: • Potential impact on surface waters because of runoff from construction activities and changes in the quality and quantity of post-construction stormwater runoff. • Potential long-term improvement to surface water quality via implementation of the mitigation measures summarized below. Mitigation: • Implementation of approved ESC and stormwater management (SWM) plans during construction activities. • Installation of stormwater best management practices (BMPs) for both existing and new impervious surfaces, in accordance with the campus stormwater permit and state and federal requirements.	Effects: • No impact on surface waters. • No implementation of an SWM strategy that would improve surface water quality and meet the intent of local, state, and federal rules and regulations.
Wetlands	Effects: • No construction, demolition, or renovation within designated wetlands or wetland buffers. • Potential wetland impacts because of construction and renovation activities proposed near wetlands or areas demonstrating wetland characteristics. • During peak storm events, potential increase in the quantity of stormwater runoff discharged to wetlands on campus following construction of the Visitor Center and Vehicle Inspection Facility at Gate A, NCNR, High Bay Facility, Strong Facility, Wind/Fire Facility, and the Gate F Visitor Center. Mitigation: • Installation of approved ESC and SWM plans during construction activities. • Implementation of surveys in areas with wetland characteristics to evaluate if construction activities would occur within wetlands or their buffers. If construction in a buffer area is determined, NIST would evaluate opportunities to reduce or avoid these impacts.	Effects: • No impact on wetlands.

Table 1-1. Summary of Environmental Effects and Mitigation Measures

Resource	Proposed Action (Gaithersburg Campus Master Plan)	No-Action Alternative
Floodplains	Effects: • No construction, demolition, or renovation within the 100-year floodplain or floodway. • During peak storm events, potential increase in the quantity of stormwater runoff from the campus because of overflow of stormwater management features. Mitigation: • Incorporation of various post-construction stormwater BMPs to reduce flooding potential.	Effects: • No impacts or changes within the 100-year floodplain or floodway.
Groundwater	Effects: • No impact on groundwater consumption. • Potential impact on groundwater quality during construction and demolition activities. • Potential for enhanced stormwater infiltration and groundwater recharge. Mitigation: • Implementation of appropriate pollution prevention measures during construction and demolition activities to avoid spills and exposure of groundwater to contamination.	Effects: • No impact on groundwater consumption. • No construction-related impact on groundwater. • No potential for enhanced groundwater recharge.
Utilities and Infrastructure		
Potable Water Supply	Effects: • Moderate increase in potable water demand. • Installation of new potable water lines to connect new facilities with the existing potable water infrastructure. • Potential relocation of existing water piping. Mitigation: • Installation of water-efficient fixtures and water conserving equipment in new and renovated buildings.	Effects: • No increase in potable water demand. • No water efficiency improvements.
Wastewater	Effects: • Moderate increase in wastewater generation. • Installation of new sanitary sewer lines to connect new facilities with the existing sanitary sewer infrastructure. Mitigation: • Installation of water-efficient fixtures in new and renovated buildings.	Effects: • No increase in wastewater discharge. • No impact on existing wastewater infrastructure.

Table 1-1. Summary of Environmental Effects and Mitigation Measures

Resource	Proposed Action (Gaithersburg Campus Master Plan)	No-Action Alternative
Stormwater Management	Effects: • Temporary impact on stormwater from sediment associated with renovation, demolition, and construction activities. • Increase in impervious areas within the campus by 16% with full implementation of the Master Plan. • Potential long-term improvement to stormwater quality and reduction in stormwater quantity via implementation of the mitigation measures summarized below. Mitigation: • Use of reforestation and approved SWM strategies to treat 20% of runoff from existing impervious surfaces. • Implementation of approved ESC and SWM plans during construction activities, including the use of Environmental Site Design BMPs in accordance with the campus stormwater permit and state and federal requirements. • Potential establishment of a Compensatory Stormwater Management program and Water Quality Bank through a Memorandum of Agreement with MDE.	Effects: • No impact on stormwater. • No improvement to SWM practices on the campus to meet the intent of state and federal rules and regulations.
Energy Systems - Electricity	Effects: • Moderate increase in electrical demand because of operation of lighting systems, laboratory equipment, and HVAC systems associated with new buildings. Construction of a new electrical switching station to support this increase in demand. • Assessment and replacement of existing ductbanks and feeders in the existing electrical distribution network. Mitigation: • Improved energy efficiency for new and renovated buildings, including potential net-zero facilities. • Installation of photovoltaic energy systems to reduce electrical demand from the grid.	Effects: • No impact on electrical infrastructure or demand. • No improvement to energy efficiency.
Energy Systems - Heating and Cooling	Effects: • Moderate increase in cooling and heating demand. • Installation of additional chillers, a cooling tower, and a new chilled water and steam supply main to support campus growth and increase utility system reliability. Mitigation: • Improvement to insulation and efficiency of heating and cooling for new and renovated facilities. • Potential for stand-alone buildings to achieve net-zero energy consumption via geothermal systems.	Effects: • No change in heating and cooling demand. • No improvement to energy efficiency.

Table 1-1. Summary of Environmental Effects and Mitigation Measures

Resource	Proposed Action (Gaithersburg Campus Master Plan)	No-Action Alternative
Sustainable Development		
--	Effects: • Moderate overall improvement to campus sustainability through renovation of existing facilities and replacement of inefficient facilities, improved energy efficiency, improved stormwater management, and sustainable landscaping. • Short-term and continuing generation of waste and commitment of resources (e.g., raw construction materials, fossil fuels) to support facility construction and operation. Mitigation: • Achievement of LEED Gold certification (or higher) for each new or renovated building. • Recycling of construction and demolition debris to the extent practicable. • Continued purchase of renewable energy credits (electrical power from renewable sources) to meet EO 13693 targets.	Effects: • No change in energy demand or infrastructure on the campus. • No improvement to energy efficiency, stormwater management, landscapes, or overall campus sustainability in accordance with EO 13693.
Solid and Hazardous Waste		
--	Effects: • Temporary generation of construction and demolition waste, potentially including materials containing polychlorinated biphenyls, lead, asbestos, or ozone-depleting substances. • Minor long-term increase in operational waste because of increase in staff and operational space. Mitigation: • Recycling of construction and demolition debris to the extent practicable. • Handling and disposal of wastes in accordance with state regulations.	Effects: • No change in the generation, storage, or disposal of solid or hazardous waste. • No removal of hazardous building materials.
Circulation and Transportation		
Vehicle Circulation and Parking	Effects: • Moderate increase in vehicles entering and exiting the campus because of personnel increase. • Minor increase in commercial vehicle traffic along Muddy Branch Road because of relocation of commercial vehicle entrance to Gate F, with corresponding decrease in traffic congestion along Quince Orchard Road. • Improved vehicle circulation and maneuvering on the campus and at points of entry. • Minor reduction in vehicle use within the campus because of improved pedestrian connectivity. • Gradual reduction in parking availability across campus. • Temporary increase in traffic and decrease in parking availability during construction activities. Mitigation: • Implementation of additional Transportation Demand Management policies to further encourage use of public transportation and bicycles. • Creation of separate entrance driveways at Gate F to mitigate congestion along Muddy Branch Road. • Creation of temporary parking and staging areas to avoid parking overflow during construction and demolition activities.	Effects: • No impact on the local transportation network or traffic levels. • No improvement to traffic congestion along Quince Orchard Road. • No change in vehicle use or parking availability within the campus. • No improvement to campus ingress or vehicle circulation within the campus.

Table 1-1. Summary of Environmental Effects and Mitigation Measures

Resource	Proposed Action (Gaithersburg Campus Master Plan)	No-Action Alternative
Public and Alternative Transportation	Effects: • Moderate increase in public transit ridership because of increase in employees. • Improved access to the campus from bus stops because of improved pedestrian walkways. • Improved accessibility for bicycle commuters. Mitigation: • No mitigation necessary.	Effects: • No impact on public and alternative transportation.
Pedestrian Circulation	Effects: • Improved pedestrian circulation on campus because of construction of new sidewalks, walkways, and a recreational walking path. • Increased emphasis on connectivity by focusing new laboratory and administrative space within the campus core. Mitigation: • No mitigation necessary.	Effects: • No improvement to pedestrian circulation.
Air Quality		
--	Effects: • Minor long-term increase in air emissions from boilers, emergency generators, and laboratory activities. • Moderate long-term increase in air emissions from mobile sources because of increase in campus population, which may be fully offset by continued improvements in vehicle emission standards. • Temporary increase in air emissions because of demolition, construction, and renovation activities. • Air emissions would be below the Clean Air Act General Conformity Rule *de minimis* thresholds. Mitigation: • Renovation and construction of more energy efficient facilities to reduce the amount of purchased electricity and the associated generation of greenhouse gas (GHG) emissions. • Continued use of low-NOx burners in new boilers. • Installation of pollution control devices at the proposed Wind/Fire Facility. • Configuration of Gate A and Gate F to reduce queuing and idling by commercial vehicles and other vehicles. • Minimization of fugitive dust emissions and wind-thrown hazards during construction activities. • Removal and disposal of lead-containing materials, asbestos-containing materials, and ozone-depleting substances in accordance with applicable regulations.	Effects: • No impact on air emissions from onsite stationary sources, mobile sources, or temporary activities.

Table 1-1. Summary of Environmental Effects and Mitigation Measures

Resource	Proposed Action (Gaithersburg Campus Master Plan)	No-Action Alternative
Climate Change		
--	Effects: • Minor long-term increase in direct and indirect GHG emissions from boilers, emergency generators, and operation of new facilities (including purchasing of electricity). • Temporary increase in GHG emissions because of construction, renovation, and demolition activities. • Potential contribution to effects of climate change through potential minor increase in cooling demand. • Improved resilience to intensified rainfall and drought events through reforestation and revegetation. Mitigation: • Renovation and construction of more energy efficient facilities and installation of photovoltaic systems to reduce the amount of purchased electricity and the associated generation of GHGs. • Continued purchase of renewable energy credits (electrical power from renewable sources) to meet EO 13693 targets.	Effects: • No impact on direct or indirect GHG emissions. • No change in contribution to climate change effects. • Potential susceptibility of landscape vegetation to climate change-induced drought.
Cultural and Historic Resources		
Architectural Resources	Effects: • Direct impact, but no adverse effect, to historic district and contributing resources because of construction and renovation. • New buildings would be architecturally compatible in scale, massing, and design approach with the original campus buildings to minimize adverse effects to the historic district. • No anticipated impacts on historic properties outside the campus. Mitigation: • Submittal of individual undertakings to the Maryland Historical Trust during the planning stage for Section 106 review. • Adherence to the *Secretary of the Interior's Standards for Rehabilitation* for future expansions and alterations.	Effects: • No impact on potentially historic properties.
Archeological Resources	Effects: • No adverse effects on known archeologically sensitive areas or previously identified archeological sites. • Potential to encounter archeological resources via earthwork in previously undisturbed areas. Mitigation: • Performance of a Phase I archeological survey.	Effects: • No adverse effects on archeologically sensitive areas or previously identified archeological sites.
Visual Impacts		
Aesthetics	Effects: • Improved aesthetics via reforestation and revegetation efforts. • New buildings are architecturally compatible with other buildings in the historic district. • Temporary impact on the viewscape from surrounding areas because of construction activities. Mitigation: • No mitigation necessary.	Effects: • No impact on aesthetics. • No enhancement of viewscapes on the campus.

Table 1-1. Summary of Environmental Effects and Mitigation Measures

Resource	Proposed Action (Gaithersburg Campus Master Plan)	No-Action Alternative
Light Pollution	Effects: • Installation of additional lighting systems for new and renovated facilities and pedestrian areas. • Potential increase in light trespass because of increased use of large windows for natural lighting. • Potential minor temporary light trespass from supplemental lighting during construction activities. • Potential increase in glare in the vicinity of the campus because of sunlight reflected from solar panels. Mitigation: • Compliance with current design guidance and city requirements for all new exterior lighting systems. • Screening with tree plantings on the campus to intercept light trespass outside the campus boundary. • Use of lighting control systems and tinted windows to mitigate light trespass from interior lighting. • Conducting construction work during daylight hours. • Incorporation of proper siting and glare reduction measures for solar panels.	Effects: • No impact on lighting at the campus. • No improvement to existing interior or exterior campus lighting.
Noise Levels		
--	Effects: • Minor impact on overall operational noise levels because of new laboratory activities, air handling units (including at the proposed Wind/Fire Facility), exhaust fans, emergency generators, and chillers. • Potential increase in off-campus noise near Gate F because of the added presence of commercial vehicles. • Temporary increase in noise during construction activities. Mitigation: • Continued evaluation of whether additional design and landscaping measures would be necessary to mitigate noise from the proposed Wind/Fire Facility, new chillers, and screening facilities at Gate F. • Expansion of the forest buffer around the campus perimeter and installation of vegetative screening at Gate F. • Configuration of Gate F to reduce queuing and idling by commercial vehicles and other vehicles. • Limitation of construction activities to normal daytime working hours.	Effects: • No impact on ambient or interior noise levels.

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2 Introduction

2.1 Campus Background

The 579-acre National Institute of Standards and Technology (NIST) Gaithersburg Campus, located in Gaithersburg, Maryland, is home to research programs of NIST. A total of 4,007 researchers, affiliates, administrators, and support personnel work in 62 buildings and structures at the campus, of which 38 are occupied buildings. Approximately half of the permanent buildings are now more than 50 years old, although two substantial research facilities were built in the last 20 years: The Advanced Chemical Sciences Laboratory (ACSL) and the Advanced Measurement Laboratory Complex (AML).

NIST was founded in 1901 as the National Bureau of Standards, and is a non-regulatory federal agency within the U.S. Department of Commerce (DoC). It promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. The NIST Laboratories conduct world-class research, often in close collaboration with industry, to advance the nation's technology infrastructure and help U.S. companies continually improve products and services. Today, NIST provides services and standard reference materials to industry, academia and government organizations, in addition to its diverse research programs. Its research areas include fields in biological sciences, chemistry, computer science, engineering, material sciences, mathematics, and physics.

The NIST Gaithersburg Campus was developed in the 1960s to relocate the facilities from Washington, DC. The original buildings in the District, constructed in the early part of the century, were antiquated, crowded, and far short of the laboratory standards of the 1960s. The Gaithersburg site was selected because it met the desired criteria—a large site allowing future buildings; a location near Washington, DC but not in the Baltimore-Washington corridor because of cold war security concerns; isolation from population centers and their associated mechanical, electrical, and atmospheric disturbance potential; and a location that would be convenient for personnel.

The roughly diamond-shaped, fenced campus is surrounded on three sides by major roadways with commercial and residential development opposite, and on the fourth side by a residential neighborhood and park. The main entrance gate is located on the north side along West Diamond Avenue, with three other active gates used by employees and for deliveries. The property is relatively flat, with some slightly rolling terrain towards the south. The central campus is characterized by separate buildings, some linked by enclosed concourses, surrounded by lawn and parking lots. To the east and west, there is open space, forested area, two ponds, and scattered buildings.

Organization of the Gaithersburg campus remains much as it was designed and built in the 1960s, with more recent development generally following the original patterns of use and location. A Laboratory Planning Committee of NIST representatives worked closely with the original architecture team to develop concepts and specific requirements. Their collaboration was influential in the development, and continues to shape the campus today. The following were among the recommendations:

- Multiple buildings in a campus, rather than a consolidated structure;
- Modular flexible General Purpose Laboratories (GPLs), and separate, special purpose laboratories;
- Central location for administration and shared/public services;
- Landscaped grounds, creating a contemplative environment; and
- Parking lots located to allow for additional buildings.

NIST is structured into twenty Organizational Units (OUs). These functional groupings are the building blocks for the Master Plan. Offices, laboratories, and support spaces are assigned to OUs, and this Master Plan continues to use that designation. The OUs are not necessarily consolidated in location, but specialized facilities and laboratory types may be grouped together for shared infrastructure. One goal of future development is to conveniently locate those specialized spaces that may be shared by several groups.

Figure 2-1 and Figure 2-2 illustrate the location and general features, respectively, of the NIST Gaithersburg Campus. Table 2-1 provides basic information regarding each of the buildings at the campus. Refer to the Master Plan for more background about the campus facilities, history, and evolution.

2.2 Purpose and Need for Action

The NIST Gaithersburg Campus Master Plan analyzed in this Environmental Assessment (EA)—hereafter referred to simply as the Master Plan—reflects NIST's vision for the physical development of the campus and for a flexible strategy for implementation.

The overall purpose of the Master Plan analyzed in this EA is to guide fulfillment of the following objectives:

- Establish a framework for future development (20-year horizon);
- Meet near and long-term needs of the campus in support of NIST's research mission;
- Maintain an attractive campus environment;
- Respect and embrace the campus status as an eligible historic district; and
- Advance NIST and DoC sustainable design goals.

The need for the Master Plan, and the campus improvements prescribed therein, is driven by both institutional policy and the inability of existing aging facilities and infrastructure to support current and projected mission requirements. NIST is ever evolving and needs flexible, integrative, and collaborative support spaces to effectively promote scientific research. DoC recommends that its agencies have a physical master plan for their sites, reflecting both the anticipated special needs of the user groups and the impact of its activities on the surrounding community. The master plans are used to both define needed physical facilities and to advance the agency's mission-related goals. The Master Plan for NIST in Gaithersburg was commissioned in response to institutional policy, to evaluate the space needs and facilities, to support the research functions, and to develop a more efficient and flexible campus. Additional factors driving the need for the Master Plan include the evolving mission of the labs, the greater demand for highly controllable research environments, and specific facility needs.

Significant development has occurred on the campus over the past decade and new facility requirements are frequently identified to support ongoing and new research objectives. Although the campus includes several buildings constructed within the past fifteen years, there continue to be many challenges with the existing facilities and infrastructure, including the following:

- **Aging buildings and infrastructure.** There are 25 buildings that remain from the initial campus construction in the 1960s. Although well maintained, these buildings and their engineering systems are well past their service life. Repairs are frequent and replacement parts are often unavailable.
- **Lack of laboratory environmental control.** Much of the advanced research taking place on the campus is based on precise performance and measurements, which demand very controlled environments—rigorous temperature and humidity control, vibration stability, air cleanliness, and quality electric power. These conditions are difficult to achieve in the older laboratory buildings.
- **Disparity in office utilization.** Overall campus office utilization is within the DoC's goal of 170 assignable square feet per person. However, there are disparities among OUs; some are well below and some are above the utilization goal. In many cases, these utilization rates are impacted by building configurations and traditional office layouts.
- **Outdated public facilities.** Conferences and professional visits bring many people to the campus and Building 101 facilities. The public facilities need to be expanded and updated to support larger conferences, modern research methods, collaboration, and campus security. A completed study proposes improvements to food service on campus, and a separate study has made recommendations for changes to the conference center, library, and visitor-use services.
- **Unconsolidated approach to stormwater management.** Regulations require NIST to control stormwater runoff. Future planning must reduce runoff from existing impervious surfaces and offset any addition, using structural or bioretention approaches. To date, the campus has utilized a variety of bioretention strategies. Moving forward, a more consolidated approach is desired.
- **Inefficient campus circulation.** Generally, congestion on the campus roads is not an issue. However, the entrance gates around the campus perimeter do experience frequent congestion at peak times with limited queuing and turnaround space. Visitors who are dropped off at the Gate A Visitor Center have very long walks to most points on campus.

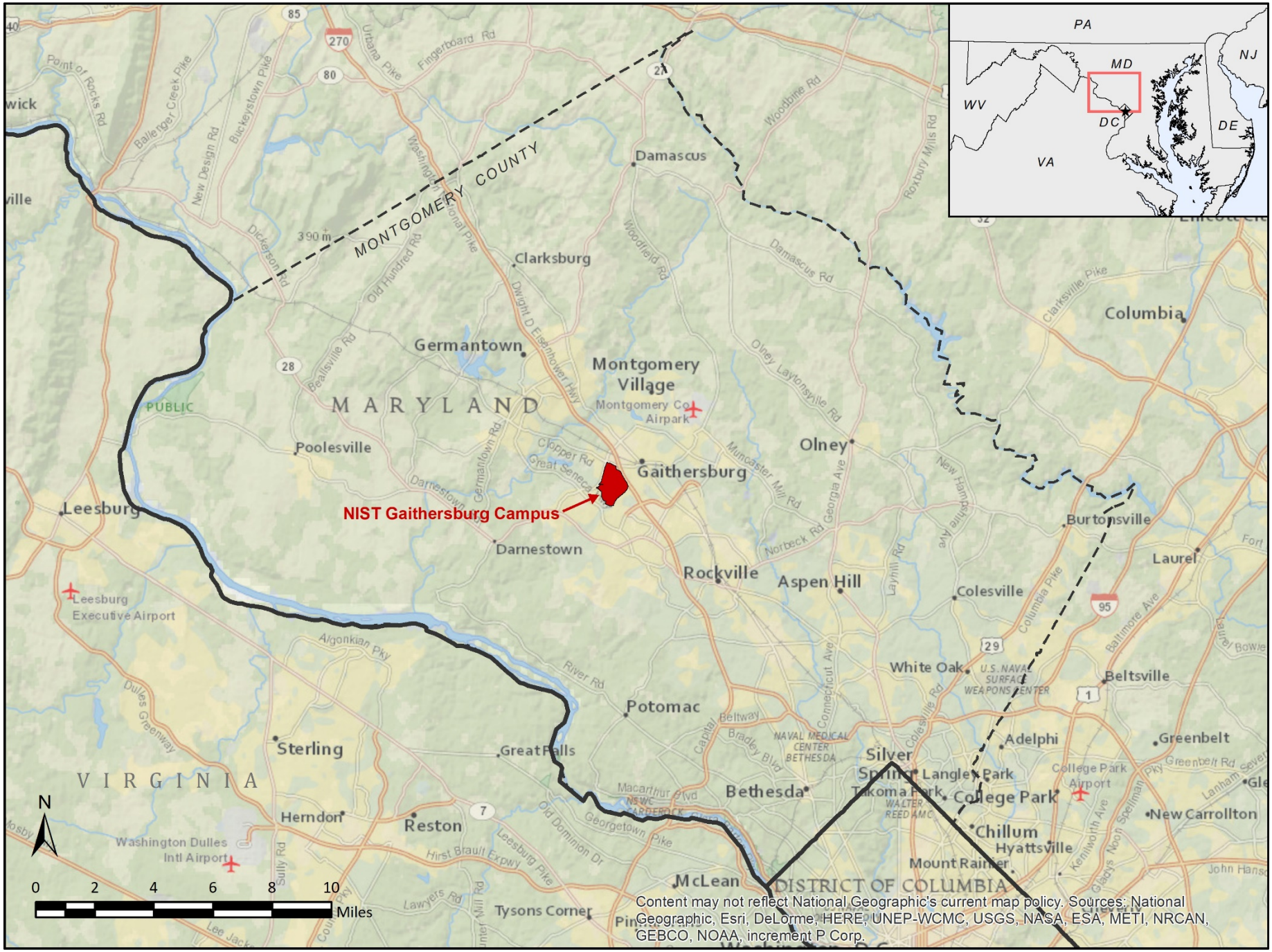


Figure 2-1. Location of NIST Gaithersburg Campus within Montgomery County, Maryland

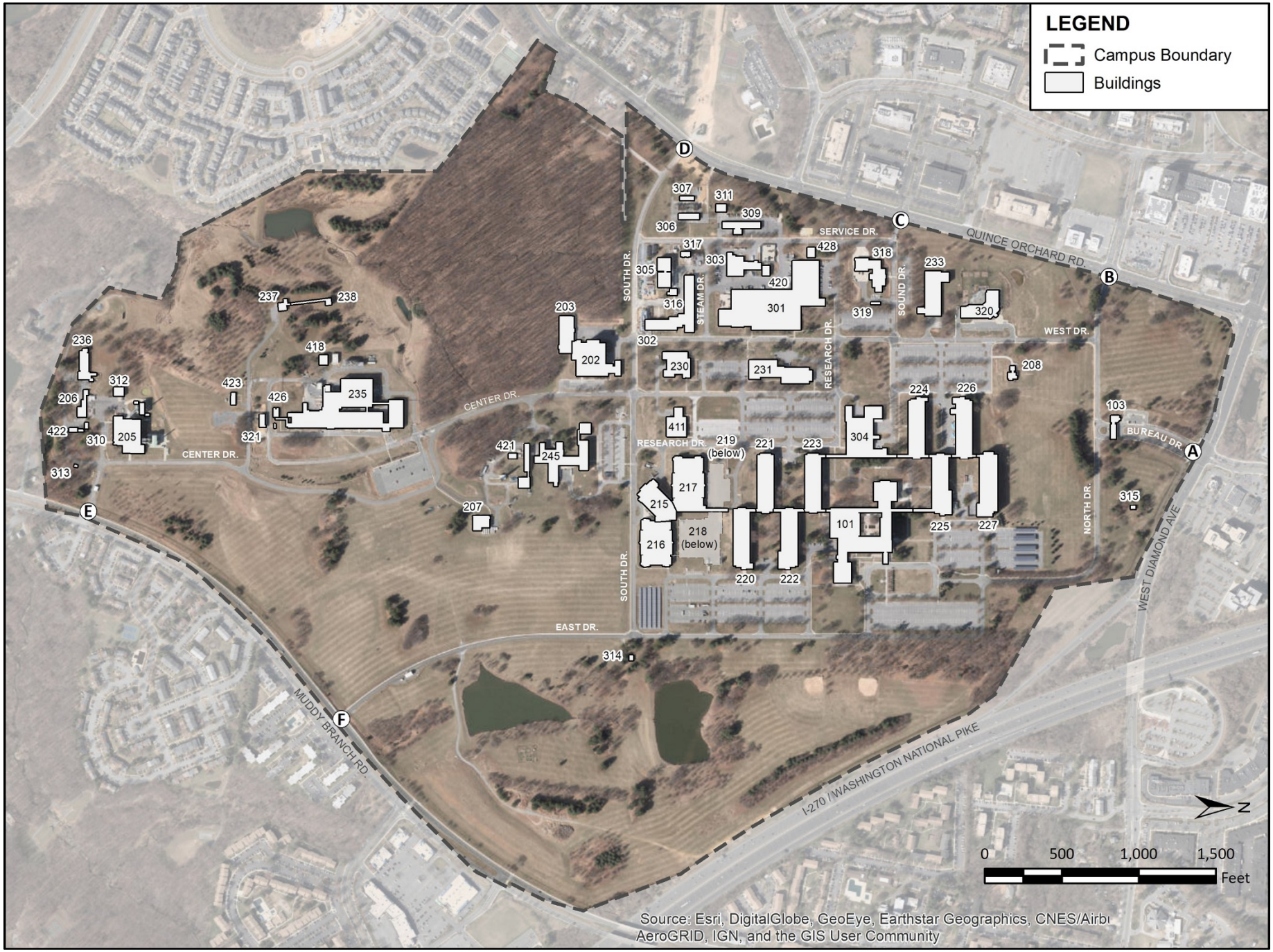


Figure 2-2. Overview of NIST Gaithersburg Campus

Table 2-1. Summary of Campus Buildings

Building Number and Name		Size (GSF)	Year Built
101	Administration Building	345,818	1965
103	Visitor Center	2,460	2009
202	Engineering Mechanics	78,575	1963
203	Standard Reference Materials Building	24,915	2012
205	Large Fire Facility	48,746	1974
205E	Emissions Control Electrical	260	2001
205M	Emissions Control Mechanical	322	2001
206	Concrete Materials Building	8,165	1968
207	Robot Test Facility	9,898	2012
208	Net-Zero Energy Residential Test Facility	7,374	2012
215	Nanofabrication Facility	109,376	2004
216	Center Nano Science & Technology	106,157	2004
217	Instrument West Building	129,358	2004
218	Metrology East Building	106,739	2004
219	Metrology West Building	84,882	2004
220	Metrology Building	216,040	1966
221	Physics Building	219,658	1966
222	Chemistry Building	166,089	1966
223	Materials Building	164,659	1966
224	Polymer Building	164,008	1966
225	Technology Building	204,333	1966
226	Building Research Building	142,800	1966
227	Advanced Chemical Sciences Laboratory	231,912	1999
230	Fluid Mechanics Building	38,366	1969
231	Industrial Building	75,131	1968
233	Sound Building	42,881	1968
235	NIST Center for Neutron Research	229,868	1965
236	Special Projects Building	13,221	1968
237	Non-Magnetic Building	3,100	1968
238	Non-Magnetic Building	3,961	1968
245	Radiation Physics Building	207,921	1964
301	Supply and Plant Building	163,765	1964
302	Steam and Chilled Water Generation Plant	60,053	1963
303	Service Building	14,572	1964
304	Shops Building	75,589	1964
305	Cooling Tower Building	16,162	1963
306	Electrical Sub-Station	4,532	1963
307	Materials Processing Storage	374	1972
309	Grounds Maintenance Building	11,701	1975
310	Plant Storage Building	505	1987
311	Grounds Storage Shed	2,511	1975
312	Materials Processing Building	3,877	1977
313	Site Effluent Neutralization Building	245	1997
314	Backflow Preventer Building - East	663	1998
315	Backflow Preventer Building - North	663	1998
316	Electrical Service Building	487	2011
317	Cooling Tower West	3,441	2011
318	Emergency Services Facility	22,123	2014
319	Emergency Services Storage Building	312	2014
320	Child Care Center	23,687	2012
321	NCNR Storage	1,900	2017
411	Temporary Relocatable Facility	17,362	1989
414	Janitorial Storage Building	803	1994
418	NCNR Storage Building	3,000	1995
420	OFPM Storage Building	2,615	1996
421	Radiation Physics Storage Building	1,499	1964
422	Concrete Materials Storage Building	1,200	2004
423	Research House	2,261	2004
425	NCNR Storage Building II	303	2007
426	NCNR Trailer 2	663	2008
427	NCNR Trailer 1	663	2008
428	Facilities Building	2,823	2010
N/A	Concourse	13,908	—
Total Gross Square Feet		**3,641,255**	

Acronyms: NCNR (NIST Center for Neutron Research); OFPM (Office of Facilities and Property Management).

- **Lack of security measures.** Commercial vehicles entering at Gates A and C are not screened at the campus entrance, but are brought into the campus to Building 301 for screening. The trucks are escorted, but travel campus roads before screening. None of the gates have adequate turnaround lanes, and rejected commercial vehicles must be escorted to another gate to exit. In addition, there are no facilities to screen visitors' or staff vehicles.
- **Inadequate design of pedestrian connections.** Pedestrian sidewalks are discontinuous across campus, and inconsistent in materials and crossings. There are few paths to provide access to the natural and landscaped areas of the campus for the enjoyment of staff.

Another need for the Master Plan is driven by the recent determination of the campus as being eligible for listing as a historic district on the National Register of Historic Places (NRHP). Because of this, NIST needs to take special considerations when planning any physical modifications. Refer to the Master Plan for additional discussion of these facility, infrastructure, and organizational deficiencies that drive the need for the NIST Gaithersburg Campus Master Plan.

2.3 Public Scoping

Scoping is an early and open process for determining the range of significant issues to be analyzed in a National Environmental Policy Act (NEPA) document. During the scoping period, the public can provide comments on the proposed action, alternatives, issues, and potential environmental impacts to be analyzed in the NEPA document. Scoping may involve public meetings and other means to obtain public comments.

While not required for a NEPA EA, an agency may choose to include public scoping as part of EA development to ensure that the analysis considers those issues that are of interest to the public. NIST held a public scoping meeting from 6:30 p.m. to 7:30 p.m. at the NIST National Cybersecurity Center of Excellence, located in Gaithersburg, MD, on May 11, 2017 to kick-off the public scoping period. The public scoping meeting was followed by a 31-day comment period. In addition, NIST held informational meetings on campus with campus staff on May 11, 2017 and May 15, 2017. Presentations of the Master Plan were also made to the Maryland Historical Trust on August 22, 2017 and to the National Capital Planning Commission (NCPC) and the City of Gaithersburg on August 23, 2017.

Outreach

For the public meeting, NIST published legal notices indicating the date, location, time, and a brief description of the scoping meeting in *The Washington Post* (April 28, 2017) and the *Gaithersburg Town Courier* (May 5, 2017). NIST also posted notices on the Gaithersburg Patch, the City of Gaithersburg website, and the NIST Gaithersburg Master Plan website. In addition, flyers were sent via email to the Izaak Walton League (which owns property immediately south of the campus) and any homeowner associations that abut NIST, as identified by City of Gaithersburg planning staff. For the staff informational meetings, emails were sent out to the staff and the date, location, time, and a brief description of each meeting were announced on the NIST intranet homepage. Follow-up announcements were posted on the NIST intranet homepage to provide links to the staff presentations and information on submitting comments. A news article was also posted in the NIST Connections online newsletter to supply staff with information about the Master Plan and how to provide comments.

Public Meeting

The public scoping meeting incorporated the following components:

- Posters with information for attendees to peruse before the meeting was underway – e.g., existing conditions, the preliminary development concepts, an overview of the NEPA process, and tips for providing effective public comments;
- A presentation that addressed the history of the campus and needs for improvement, the master planning process and goals, the preliminary development concepts being considered for incorporation in the Master Plan, and the NEPA process;
- An opportunity for members of the public to provide spoken comments for the record; and
- Handouts to send home with attendees.

Following the meeting, the presentation was made available to the public at https://www.nist.gov/sites/default/files/documents/2017/05/11/17-05-11_nist_master_plan_public_presentation.pdf.

Public Comments Received

Following the presentation, attendees were afforded the opportunity to provide oral comments and ask questions. Following the meeting, NIST accepted written comments until June 11, 2017. Thirty-three households and meeting attendees made comments (including NIST staff, local government, and members of the general public). Comments covered a range of topics related to traffic studies, transit linkages, solar panel installation, landscape vegetation, historic designation, campus circulation, and parking. NIST considered all public comments during development of the Draft Master Plan and Draft EA. Additional preliminary comments were received from NCPC staff regarding the development concepts and issues to consider.

Selection of Master Plan Concept

Prior to the public scoping period, NIST developed six preliminary Master Plan concepts, labelled Alternatives A through F, to meet the purpose and need for

action. These preliminary concepts are described in detail in Chapter 2 of the Master Plan, and were reduced to four concepts under consideration for the scoping period (B, C, D, and F). Based on input received during the scoping period from Organizational Unit (OU) representatives as well as NIST managers and planners, NIST selected Alternative F as the preferred concept for the Master Plan. Alternative F fully addressed the purpose and need for the action, while requiring less construction than the other concepts. The concepts were evaluated against facility, functional, and implementation factors, including the following: accommodation of research, support and staff activities; flexibility; energy and maintenance efficiency; campus character and image; and potential cost of implementation. Key elements selected for inclusion in the final concept include improved pedestrian connections, research-related construction, increases in GPL utilization through renovation, adherence to the original campus design intent, and improved screening of visitors and their vehicles. The final concept, described in Section 3.1 (Proposed Action), was selected as the preferred concept for the Master Plan and is evaluated as the Proposed Action in this EA. NIST determined that the potential environmental impacts associated with the other concepts would likely be similar to those associated with the final concept selected as the Master Plan.

2.4 Public Review of Draft Master Plan and Draft EA

The Draft Master Plan and Draft EA were made available for review by federal, state, and local agencies as well as the interested public. The subsections that follow summarize the procedures followed to conduct Government and public outreach while highlighting some examples of the types of comments received from each entity and how they were addressed. All comments received were taken into consideration during development of the Final Master Plan and Final EA.

Governmental Outreach

NIST distributed copies of the Draft Master Plan and Draft EA to the agencies and entities listed in Section 9 (Distribution List), including the NCPC, which in turn forwarded the documents to the Maryland State Clearinghouse for Intergovernmental Assistance. The Clearinghouse then forwarded the Draft Master Plan and Draft EA to the following Maryland agencies and entities for review and comment:

- Maryland Department of the Environment (MDE);
- Maryland Department of Transportation;
- Maryland Department of Natural Resources (MDNR);
- Maryland Military Department;
- Montgomery County;
- Maryland-National Capital Park and Planning Commission (M-NCPPC) in Montgomery County;
- Maryland Department of Planning; and
- Maryland Historical Trust.

NIST also sent copies of the Draft Master Plan and Draft EA directly to the City of Gaithersburg and the Maryland Historical Trust. Both entities responded with letters supportive of the Draft Master Plan (see Appendix B). According to NCPC, no comments were received from any of the other Maryland agencies that received copies through the Clearinghouse.

At the April 5, 2018 NCPC meeting, the Commissioners discussed the Draft Master Plan and provided comments that were supportive of the Draft Master Plan (see Appendix B). In these comments, NCPC requested that NIST adhere to the following during the implementation of the Master Plan:

- Continue to incorporate landscaping, access road reconfiguration, and light control measures to minimize impacts to the campus setting and off-site neighborhoods;
- Prioritize development of a detailed Travel Demand Management (TDM) plan to encourage more sustainable travel behavior by both federal and non-federal employees; and
- Submit a transportation progress report to NCPC for review prior to submitting the proposed parking garage and Building 411 parking lot expansion projects to NCPC for review.

Public Outreach

NIST initiated a public comment period on the Draft Master Plan and Draft EA on February 8, 2018 and accepted comments through March 31, 2018. The draft documents were available for public review on the NIST website. NIST's public outreach efforts for the review of the draft documents included the following:

- Publishing a Notice of Availability (NOA) of the Draft Master Plan and Draft EA in local publications, which initiated the public comment period. NOAs were published in the *Washington Post* (February 8, 2018) and the *Gaithersburg Town Courier* (February 16 – March 1, 2018);
- Publishing notices on the Gaithersburg Patch, the City of Gaithersburg website, and the NIST Gaithersburg Master Plan website;
- Sending flyers via email to the Izaak Walton League and any homeowner associations that abut NIST, as identified by City of Gaithersburg planning staff; and
- Presenting the Draft Master Plan to the Gaithersburg City Council on February 5, 2018.

In addition to the above, NIST conducted outreach to staff at the Gaithersburg Campus to encourage their feedback on the Draft Master Plan and EA. This outreach consisted of providing staff presentations on February 13 and 20, 2018; publishing notices on NIST internal websites; and publishing a news article in the "NIST Connections" online staff newsletter.

Public Comments Received

NIST received one set of public comments, which were supportive of the Draft Master Plan's incorporation of reforestation and solar photovoltaic energy systems. NIST also received comments from approximately 25 NIST staff. The majority of these comments pertained to the locations and adequacy of the proposed parking garage and lots; characterization of the existing utility infrastructure; recommendations related to bicycle racks, bicyclist entrances, and paths; and editorial comments. NIST considered all public and staff comments during development of the Final Master Plan and the Final EA.

3 Alternatives

3.1 Proposed Action

The Proposed Action is the implementation of a Master Plan to guide the physical development of the NIST Gaithersburg Campus in order to advance the agency's mission-related goals over the next 20 years. The Master Plan emphasizes quality and collaborative research in addition to sustainable and efficient operations. The Master Plan addresses current campus needs and delineates future development through broad phases delineated by priorities and logical implementation sequencing. The Master Plan provides for the modernization of aging, inefficient buildings and accommodates the anticipated growth in research programs over the next 20 years. Full execution of the Master Plan would increase the employee population by approximately 25% from its current population of 4,007 to 5,106.

Full implementation of the Master Plan would result in a net increase in facility space by approximately 40%, from 3,641,215 gross square feet (GSF) to 5,050,000 GSF, as well as the renovation of 15 buildings. The Master Plan offers a framework for accomplishing NIST's goals of enhancing the campus, providing appropriate facilities, improving security, encouraging professional collaboration, and advancing sustainable practices. The emphasis is on research buildings—upgrading existing laboratory buildings and infrastructure to support current and future research, and adding new facilities needed for planned programs.

The Master Plan concentrates new research buildings in the central campus core, where most of the existing laboratories buildings are located, including the seven original GPLs and the main administrative building. The building configurations follow a regular pattern, linked by an interior pedestrian concourse. The new building configurations and locations build upon that pattern, and connect into the interior pedestrian concourse. Other specialty laboratory buildings, located outside the core, plan for renovations and additions as part of the 20-year plan. Other campus recommendations improve security, upgrade infrastructure, and encourage collaboration.

Partial or entire realization of the Master Plan would depend on NIST priorities, government policy decisions, and budgetary considerations. The Master Plan represents neither the preapproval of any individual project nor the preapproval of the particular needs of specific programs to be accommodated on the campus.

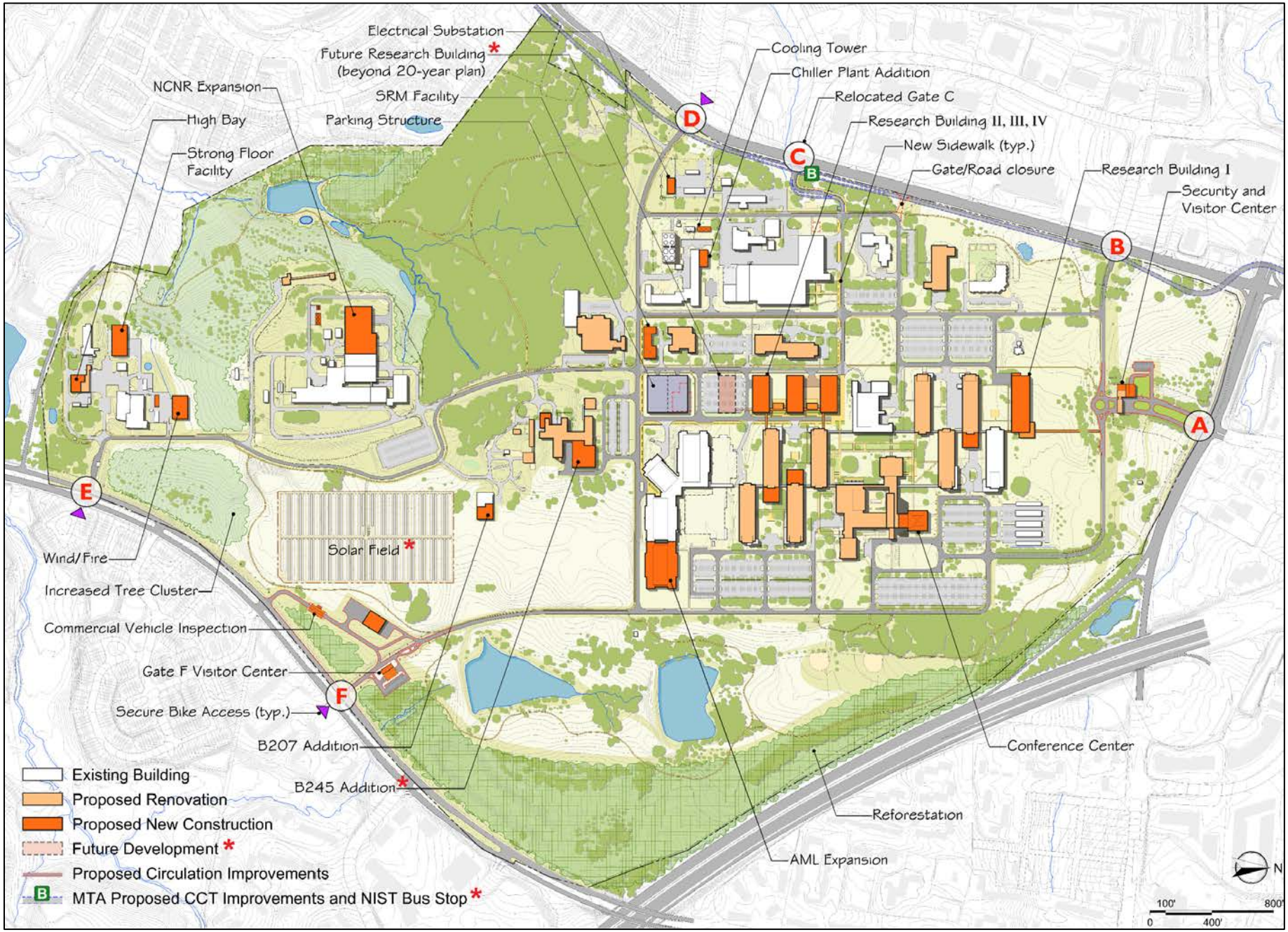
The financing of such projects and programs must be addressed within the annual NIST budget process and congressional budget approval. Furthermore, the Master Plan is not a commitment for the agency to build these facilities within a specific timeframe.

3.1.1 Components of the Proposed Action

Below is a summary of the new construction, demolition, and other improvements that NIST would execute under the Master Plan. Figure 3-1 presents the vision for the campus following completion of all components of the Master Plan. Refer to Chapter 4 of the Master Plan for additional details regarding the proposed scope of facility improvements.

New Construction, Additions, Renovation, and Demolition

- New Research Buildings. Research facilities are central to NIST's plan for growth. The Master Plan would add approximately 780,000 GSF of lab and support space to the central campus in four buildings, proximate to the GPLs and linking into the interior pedestrian concourse system. The new laboratories would provide the flexibility, infrastructure, and controlled environments needed to support advanced research and measurement science.
- New Facility for the Standard Reference Material (SRM) Program. This new 54,000-GSF facility would allow NIST to respond to 21st century demand for ultra-high purity materials. The facility would support the preparation and storage of ultra-high purity materials, with laboratories and refrigerated/frozen storage.
- New Special Purpose Facilities. The Master Plan would include construction of three small facilities to support specific programs. The 15,000-GSF Wind/Fire Facility would support experiments conducted by the Engineering Laboratory for wind and fire incidents. The 15,000-GSF strong floor laboratory would provide the Engineering Laboratory with a facility for structural research using full



Note: Elements marked with a red asterisk (*), while addressed in the Master Plan, are not considered part of the Proposed Action evaluated in this EA. These elements are addressed in separate NEPA analyses and/or are beyond the 20-year time horizon of the Master Plan. See Section 5 (Cumulative Effects).

Figure 3-1. Scope of Proposed Action (Master Plan Concept)

scale models of beams, columns, shear walls, and other elements. The 16,000-GSF high-bay laboratory addition and full renovation to Building 206 would augment the campus high-bay facilities and serve as swing space during renovation of the GPL buildings.

- GPL Renovation. The Master Plan would include complete renovation of these seven buildings. The buildings would be vacated and renovated to support three functions: flexible laboratories with new infrastructure systems and equipment galley spaces; advanced computer research facilities; and offices. The proposed layouts include small additions to three of the GPLs for offices and collaborative space, augmenting research offices within the GPLs.
- Specialty Laboratory Renovation. The Master Plan would include phased renovations of Buildings 202, 230, 231, 233, 237, and 238 to include modernization and infrastructure upgrades. These buildings would continue to support research programs in engineering mechanics, fluid mechanics, metallurgy, acoustics, manufacturing process metrology, and quantum measurements.
- Building 101 Renovation. Building 101 is the main administrative building, and the center for conferences and other public events. The Master Plan would include phased renovation, replacing major infrastructure that has exceeded its useful life, and upgrading the building envelope for energy conservation. The Master Plan would also renovate the two lower levels to enhance the public use functions, including construction of a small 50,000-GSF addition to augment the conference center and library.
- Specialty Research Building Additions. The Master Plan would construct additions to the following buildings to support specialty research: Buildings 235 (NIST Center for Neutron Research) and 207 (Robot Test Facility). The Building 235 addition would provide neutron measurement capabilities to the research community and it would allow for the installation of additional equipment and better maneuvering room. The Building 207 addition would accommodate planned expansion in robotics testing and research by the Engineering Laboratory. [Note: The Master Plan also includes the renovation and expansion of additions onto Building 245 (Radiation Physics), which would take place over a total of seven phases. The first of these phases is underway, while a separate NEPA EA is being prepared for the remaining phases. To avoid duplication of NEPA reviews, the Proposed Action evaluated in this Master Plan EA does not include the renovation and expansion of the additions onto Building 245. See Section 5 (Cumulative Effects).]
- Additions to Campus Gates. The Master Plan would implement security and safety requirements at the campus gates. Gate A, the main entrance, would receive an expanded Visitor Center and new security infrastructure to better screen visitors and their vehicles. Gate F would become the main commercial vehicle entrance for the campus. Supporting this, the Master Plan would construct new roads, screening facilities, and a new building for Shipping and Receiving, limiting most non-NIST commercial vehicle traffic on campus.
- Demolition. The Master Plan would include the demolition of Building 411 and Building 428, which were installed as temporary facilities, resulting in a total of 20,185 GSF of demolition. Building 411 is currently used as office space by the Office of Information Systems Management and the Office of Acquisition and Agreements Management, which the Master Plan would relocate to the renovated GPLs and Building 101. Building 428 houses the Office of Facilities and Property Management. The Master Plan would accommodate the building's occupants in the adjacent Building 301, where there would be space available after Shipping/Receiving moves to its new location at Gate F.

Landscape Framework Plan

The goal of the Landscape Plan is to enhance and preserve the setting and landscape features, while improving stormwater management, pedestrian connectivity, and outdoor use. Major design features and themes under the Landscape Plan include the following:

- Development of Outdoor Spaces – The plan establishes a hierarchy of outdoor spaces including meeting and social areas, outdoor dining opportunities, walking paths, and active recreation areas.
- Enhancement of Connectivity – New pedestrian links would connect the core research building with the west campus and its future Corridor Cities Transitway (CCT) transit stop, and with the main entry Gate A to the north.
- Reforestation – The canopy cover would be expanded to create a noise and visibility buffer from Interstate 270, slow wind speeds, and aid in the absorption of stormwater runoff. Figure 3-2 depicts the reforestation plan for the campus.
- Improvement to Stormwater Management – Meadow would replace mowed lawns outside of the campus core. Rainfall would also be managed with reforestation and the implementation of bioswales, and rain gardens integrated with parking and roadways.

Note: Elements marked with a red asterisk (*), while addressed in the Master Plan, are not considered part of the Proposed Action evaluated in this EA. These elements are addressed in separate NEPA analyses and/or are beyond the 20-year time horizon of the Master Plan. See Section 5 (Cumulative Effects).

Figure 3-2. Reforestation Plan for the NIST Gaithersburg Campus

Utility Infrastructure Plan

The goal of the Utility Framework Plan is to improve overall energy efficiency and sustainability, and to accommodate the anticipated growth and evolving research needs by replacing aging infrastructure and utility systems. The Utility Framework Plan prescribes the following:

- Extension of the existing Steam and Chilled Water Generation Plant services to the new and renovated NIST laboratory buildings under the Master Plan;
- Extension of normal domestic water, sanitary sewer, electrical power, and data communications services from the campus distribution and collection systems;
- Construction of a new electrical switchgear building to provide sufficient capacity for the new facilities to be constructed in Phase Three of the Master Plan;
- Assessment and replacement of existing ductbanks and feeders in the campus electrical distribution system;
- Installation of new emergency generators as new laboratories are renovated or constructed, with the goal of increasing the campus-wide backup capacity from approximately 4 megavolt-amperes (MVA) to 15 MVA upon completion of the Master Plan;
- Expansion of Building 302 (Steam and Chilled Water Generation Plant) to the northwest for the addition of two 3,500-ton chillers prior to Phase Three of the Master Plan, along with a new cooling tower adjacent to Building 317 and installation of an additional piping main to increase the chilled water flow capacity from the plant to the distribution system;
- Potential replacement of the existing dual-fuel Boiler 6 at Building 302, which has a nameplate capacity of 80,000 pounds of steam per hour (PPH), with a new dual-fuel boiler of similar capacity;
- Installation of a new chilled water and steam supply main to create a loop for improved service reliability to the south campus buildings, with the new main being routed along the east side of Building 245 complex and connected back to the existing main near Building 235;
- Installation of a new chilled water main in the northwest portion of the campus to serve new Research Building I and to create a loop for improved service reliability to the group of five northernmost GPLs;
- Investigation and correction of leaks in the compressed air distribution system; and
- Relocation of existing underground utilities prior to construction of new facilities.

The Utility Framework Plan also prescribes reduction of energy demand, selection of energy efficient equipment and systems, and provision of a clean renewable energy supply by promoting implementation of the following design strategies:

- Improved Envelope – New and renovated buildings would feature improved building envelopes to reduce air infiltration and enhance thermal performance and stability.
- Net-Zero Energy Consumption – The goal for new non-lab buildings, such as the new shipping/receiving facility and the Gate F screening building, is net-zero energy consumption.
- Solar Collection – Solar collection is recommended on new non-lab buildings, on GPLs renovated for office occupancy, on the new parking structure, and over the surface parking lots. [Note: The Master Plan also includes the construction of a 5-megawatt (MW) photovoltaic solar array on 15 acres at the south end of the campus. A separate NEPA EA is being prepared for this project. To avoid duplication of NEPA reviews, the Proposed Action evaluated in this Master Plan EA does not include construction of the solar array. See Section 5 (Cumulative Effects)]

Circulation Framework Plan

The goal of the Circulation Plan is to improve the circulation and parking on campus. The Master Plan would implement circulation modifications in phases, mimicking those of construction. Design proposals include the following:

- Reconfiguration of Gates A and F for visitor and commerical vehicle screening;
- Construction of new roadways, parking, and a roundabout at the Visitor Center;
- Shift in location of Gate C if the planned CCT project moves forward;
- Construction of a four-story parking structure with approximately 720 spaces on the site of former Building 411 (with the capacity to be re-evaluated when Research Buildings II, III, and IV are designed); and
- Expansion of the surface parking lot located north of Building 411 to include an additional 84 spaces.

3.1.2 Phasing of the Master Plan

Master Plan implementation is dependent on many factors, such as funding, direction of scientific research, and agency missions and priorities. Therefore, the Master Plan sets a framework that remains flexible and sensitive to the timing and composition of specific projects. Phasing for the implementation of the Master Plan involves an integrated approach that meets short-term needs and

provides steps for redevelopment and consolidation of the campus in the future. A brief overview of each phase of the Master Plan is listed below.

- Phase One projects are the immediate priorities. The first planned new building is Research Building I. Upon its completion, the GPL renovations can begin. Gate A modification also is considered a priority project, required to meet federal security policies. Gate F security and shipping/receiving improvements would follow the improvements to Gate A. This phase also includes several of the required upgrades and expansions of the campus utility networks. [Note: Phase One of the Master Plan also includes the construction of additions onto Building 245 (Radiation Physics). As noted previously, this project is excluded from the scope of the Proposed Action in this EA.]
- Phase Two is the anticipated next step. Building 101 addition and renovation is the primary project, improving the public access areas, office utilization, and building system performance. The addition would provide much needed conference facilities, library modernization, and security modifications to public-access areas. Its second-floor office space would provide swing space for Building 101 infrastructure replacement and office modernization.
- Phase Three adds new Research Buildings II, III, and IV, which would be constructed as growth and research projects dictate. The Steam and Chilled Water Plant would be expanded at this phase to meet the needs of the added research buildings. This expansion would include an addition to the existing plant (Building 302) and a new cooling tower installation adjacent to Building 317.
- The SRM Facility and specialty laboratory renovations, additions, and new construction are independent of other projects, and can be implemented in any desired order, as need and funding allow. Site and landscape improvements such as pedestrian walkways, stormwater management features, trails, meadow replacement, and reforestation could be implemented immediately, separately, or simultaneously with the phased construction projects.

Refer to Appendix A for a visual representation and detailed summary of each Master Plan phase.

3.2 No-Action Alternative

The No-Action Alternative would not implement the Master Plan. The No-Action Alternative would maintain the present course of action at the campus by continuing ongoing research, management, and maintenance activities. The No-Action Alternative would ultimately result in a site that would no longer support the advanced research requirements of NIST and would render much of the campus obsolete. The No-Action Alternative would not affect the number of employees at the campus. Section 4 (Affected Environment and Environmental Consequences) discusses the potential environmental impacts and consequences of the Proposed Action and the No-Action Alternative. The No-Action Alternative would not meet the purpose and need criteria defined in Section 2.2 (Purpose and Need for Action). As a result, NIST considers the No-Action Alternative to be less desirable than the Proposed Action.

4 Affected Environment and Environmental Consequences

4.1 Land Use and Socioeconomics

4.1.1 Land Use and Regional Planning

Affected Environment

Land use planning helps determine the best use for each parcel of land in a municipality with the goals of serving community needs, minimizing land use conflicts, and protecting natural resources. Proper land use planning can favorably impact development and sustainment costs, traffic congestion and commute times, air pollution, energy consumption, preservation of open space and habitat, equitable distribution of economic resources, and the sense of community.

Local government and independent entities operating in the region provide planning and development guidance, promoting economic development, administering transportation and infrastructure development, and facilitating intergovernmental cooperation. These include the Metropolitan Washington Council of Governments, an independent, nonprofit association that helps address and solve regional issues through the development of policy and programs; the NCPC, which serves as the central planning agency for the federal government in the National Capital Region; and the M-NCPPC, which acquires, develops, maintains, and administers a regional system of parks within Montgomery and Prince George's Counties and provides land use planning for the physical development of the two counties. Montgomery County is divided into 54 Community-Based Planning Areas (CBPA). The Campus is situated within the Great Seneca Science Corridor CBPA. Each planning area has developed a master plan that sets forth guidelines for development and growth in ways that protect existing features, including existing land uses, community facilities, the transportation network, and environmental and historic resources.

The NIST property is assigned a "General Government" use on the City's official housing and land use map, and is bordered by residential apartments and townhomes, commercial and office space, research and development uses, and public and private parklands. The NIST parcel does not have an assigned zoning designation in the City's official zoning map. Refer to Chapter 12 of the Master Plan for more details on local and regional planning entities and zoning.

Development on the campus is focused in the laboratories and administration area, which dominates the northern portion of the campus; the support area, located immediately west of the laboratories and administration area; and the specialized labs area, located in the south central portion of the campus. These areas comprise the majority of developed surfaces on the campus. Undeveloped areas on campus include a large forested area on the west side of the campus, large mowed meadows between building clusters, and recreation areas to the northeast of the main administration building. The NIST campus maintains a healthy buffer along its boundaries, as the majority of developed areas are focused around the center of the campus.

Environmental Consequences – Proposed Action

The Master Plan would continue to focus development on the campus in the laboratories and administration area, the support area, and the specialized labs area. The Master Plan would include a number of open space zones, each with distinctive features and functions that would characterize and define the areas. Proposed sidewalk and trail development under the Master Plan would provide connectivity between various areas on campus and would provide for a physical organization for new buildings. Through this improved land use, the Master Plan would allow for better connectivity, provide a stronger campus identity, and encourage collaboration amongst employees.

The Master Plan would not impact land use designations on the campus and would be consistent with the current institutional land use on the campus. The activation of open space on campus would continue through expansion of recreational areas and an increase in outdoor furnishings. The buildings proposed by the Master Plan

would not simply define or enclose an open space but would also actively engage them.

NIST provided copies of the Draft Master Plan and Draft EA to NCPC, who provided them to other review agencies through the Maryland State Clearinghouse for review and comment to ensure consistency with local and regional planning objectives. The City of Gaithersburg concurred with the goals and conclusions outlined in the Draft Master Plan, which they deemed to be compatible with the adjoining Master Plan of the City of Gaithersburg. Refer to Appendix B for the comment letters from NCPC and the City of Gaithersburg.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not impact land use.

4.1.2 Social and Economic Resources

Affected Environment

Social Resources

Social resources consist of elements of the environment integral to personal and community dynamics, including population, housing, education, and open spaces. Access to these resources is essential to maintaining sustainable communities.

According to the 2010 U.S. Census, Montgomery County has a population of 1,005,087. Overall population trends and demographic characteristics in Montgomery County show that the local population is increasing, but the rate of increase is slowing based on census data and Maryland Department of Planning projections.

Montgomery County and the City of Gaithersburg are home to a highly educated population, with approximately twice the percentage of college graduates as compared to the national average. Montgomery County schools are currently at capacity, and are projected to remain at capacity through 2023 because of continued increases in enrollment (Montgomery County, 2016). Montgomery County and the City of Gaithersburg have a housing stock with a much lower vacancy rate compared to the national average, resulting in a high housing cost for the immediate region. Refer to Chapter 12 of the Master Plan for additional details on housing and educational demographics.

A subset of social resources is environmental justice. Environmental justice considers sensitive populations, such as children, minorities, and low-income communities. Sensitive populations are identified in two Executive Orders (EOs):

- EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations*, serves to avoid the disproportionate placement of adverse environmental, economic, social, or health impacts from federal actions and policies on minority and low-income populations.
- EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, states that federal agencies will identify and address environmental health and safety risks from their activities, policies, or programs that may disproportionately affect children.

Sensitive populations, such as low-income families, minorities, and children are present within Montgomery County. Some of the areas bordering the campus have sensitive populations with higher minority and low-income populations than both the regional and state averages. Specifically, the area bordering Muddy Branch Road to the east of the campus has a significantly higher percentage of sensitive populations than both the state and regional averages. This neighborhood, located across Muddy Branch Road from the proposed Gate F development, is in the 92nd and 83rd percentiles of minority populations relative to the regional and state averages, respectively, according to the U.S. Environmental Protection Agency's (USEPA's) EJScreen tool (USEPA, 2017a). The neighborhood also has a slightly higher prevalence of low-income residents than the regional and state averages.

Economic Resources

Several major economic drivers in Montgomery County support a viable economy. Because of the county's proximity to Washington, DC, the federal government provides numerous employment and economic opportunities to the area through a variety of governmental agencies, such as the National Institutes of Health, the Food and Drug Administration, and NIST. Other industry sectors include information technology, communications and satellites, cyber security, and clean energy (Montgomery County DED, 2014). Refer to Chapter 12 of the Master Plan for more details on regional economics.

The leading industries in Montgomery County are professional, scientific, and management services and educational services, health care and social assistance. Refer to Chapter 12 of the Master Plan for more details on regional industries.

Economic indicators suggest an overall healthy economy in Montgomery County and in the area surrounding the campus, with high median incomes and low poverty rates—though, as noted previously in this section, some neighborhoods around the campus have relatively high prevalence of low-income residents. Overall, the area surrounding the campus is generally representative of the state in terms of the presence of sensitive populations.

Gaithersburg is in the Baltimore–Columbia–Towson Metropolitan Statistical Area, which has the fourth-highest median household income in the United States. The estimated unemployment rate in Montgomery County was 3.3% in 2015, which was lower than the state unemployment rate of 4.3%. With approximately 3,000 employees, NIST is the largest employer in the City of Gaithersburg.

Environmental Consequences – Proposed Action

Implementation of the Master Plan would allow for continued advancement of measurement standards and technology, thereby benefitting the national economy. Improvement of research facilities would facilitate achievement of NIST's mission to promote industrial competitiveness on a national level.

The Master Plan would have minor long-term economic benefits. The proposed campus reorganization and updated facilities would provide an economic benefit by improving productivity and available resources at the NIST Gaithersburg Campus. The increase in staff of approximately 1,099 over the projected 20-year period would improve employment levels and would not displace existing jobs in Montgomery County.

Implementation of the Master Plan would result in temporary minor impacts on the population and the availability of housing, because of construction workers who might temporarily relocate to the area. During construction of the Master Plan elements, construction jobs and related incidentals would temporarily add to the local economy.

The Master Plan would have minor impacts on population, housing, and education trends in the area. The projected increase of approximately 1,099 staff over the course of 20 years (equivalent to approximately 0.1% of the current population of Montgomery County) is not expected to negatively impact social or economic resources in the area. Any staff increases would likely benefit the local economy and job market.

Overall, the areas immediately surrounding the campus are generally representative of the state in terms of the prevalence of sensitive populations such as children, minorities, and low-income residents. Therefore, the Master Plan would not result in significant disproportional impacts on sensitive populations. However, the relocation of the commercial vehicle entrance to Gate F may have a minor effect on the sensitive populations southeast of the campus because of the increase in commercial vehicles in this area (approximately 75 deliveries per weekday) and the associated potential noise and traffic concerns. To mitigate this concern, the Master Plan would seek to limit overall congestion at Gate F by separating commercial vehicle and visitor traffic into separate entrances, thus reducing the potential for inspection and security activities to cause vehicle backups that would impact Muddy Branch Road. The design would also include noise mitigation measures as described in Section 4.13 (Noise Levels).

Environmental Consequences – No-Action Alternative

The No-Action Alternative would have no effects on the population, including sensitive populations. Jobs and population growth would continue as projected in the region. The No-Action Alternative would result in no improvements to employment or income in the area and would allow the campus facilities and infrastructure to become obsolete, thus compromising NIST's mission to benefit the national economy by promoting industrial competitiveness on a national level.

4.1.3 Open Space and Recreation

Affected Environment

Buildings and paved surfaces cover less than 20% of the campus, leaving the rest as lawn, landscaped area, and natural vegetation. This aligns with the initial pastoral and natural design intent. There is an approximately 150-foot-wide buffer zone around the site perimeter to limit development in a zero lot line fashion in keeping with the suburban character and density of the campus.

There are four prominent activated green spaces on campus: the internal courtyard behind the library; the plaza in front of the library; the Administration building; and the baseball fields and recreation area. The campus currently has several sports and recreation sites: baseball fields, a volleyball court, a playground, and a basketball court. One informal recreation area is the lawn area to the north of Building 227, where frisbee and soccer games occur.

There are several parks and recreation areas in the campus vicinity, including Malcolm King Park, Diamond Farms Park, Christman Park, Walder Park, Robertson Park, Muddy Branch Park, Lake Varuna Park, International Latitude Observatory Park, Crown Woods, Bohrer Park, and Morris Park. There is a variety of outdoor facilities and parklands designed for both active and passive recreational activities. Public park services in the area are provided by the City of Gaithersburg, the City of Rockville, and Montgomery County.

Environmental Consequences – Proposed Action

Certain elements of the Master Plan (e.g., construction of Research Building I, the Building 207 addition, and the Commercial Vehicle Inspection Complex) would develop portions of existing open spaces within the campus. However, this minor reduction in open areas would be offset by improvements to recreational areas under the Master Plan. Campus open space would be maintained in a natural state. The Master Plan would avoid placement of new buildings within the buffer zone around the campus perimeter, although some new roads and pavement would be associated with the new vehicle screening facilities near Gate F. Implementation of the Master Plan would expand active recreation areas through a network of walking paths through both open and wooded landscape.

Temporary construction-related noise levels would be minor and would not affect the recreational use of nearby parks and open spaces; refer to Section 4.13 (Noise Levels) for more information. Air emissions from operations and construction activities would not be expected to affect ambient air quality within nearby parks and open spaces; refer to Section 4.9 (Air Quality) for more information.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not affect open spaces or recreational areas on, or in the vicinity of, the NIST Gaithersburg Campus.

4.2 Biological Resources

4.2.1 Vegetation

Affected Environment

Vegetation performs the following important functions:

- Slows the flow of stormwater runoff, allowing water to soak into the ground to replenish aquifers;
- Helps maintain the water quality of nearby waterways by filtering runoff and removing harmful sediment and pollutants;
- Prevents erosion by reducing the impact of rain on soil and by holding soil in position with roots;
- Shades paved surfaces, reducing heat island effect and stormwater runoff temperatures that affect aquatic habitats; and
- Provides habitat for a variety of organisms.

A diversity of plant species is necessary to maintain a functioning habitat or ecosystem. Plant species within a particular ecosystem may compete with one another for water, light, and overall sustenance. Therefore, the loss of a particular species may negatively affect an ecosystem. The Endangered Species Act was enacted in 1973 to protect species in danger of extinction. This act requires federal agencies to ensure that their actions will not jeopardize the continued existence of any threatened or endangered species or result in the destruction or adverse modification of the critical habitat associated with these species.

The federal government is charged with protecting and enhancing vegetation and habitat on its properties. The NCPC has issued the following guidelines in *The Comprehensive Plan for the National Capital* to aid in achieving these goals:

- Incorporate trees and vegetation in all federal developments to moderate temperatures and minimize energy consumption;
- Encourage the use of street trees to enhance visual and aesthetic features;
- Avoid removal of woodland and vegetation from steep slopes and areas with high erosion potential; and
- Preserve existing vegetation, especially large stands of trees to the extent possible.

Non-native invasive plant species present an ecological concern because they may be capable of colonizing natural areas and outcompeting native species, threatening biological diversity in the process. EO 13751, signed in 2016 to amend EO 13112, directs agencies to coordinate federal prevention and control efforts to minimize the harm to the economy, the environment, and human health caused by invasive species. Among other actions, EO 13751 maintains the National Invasive Species Council and the Invasive Species Advisory Committee. At the state level, Code of Maryland Regulations (COMAR) 15.06.04 establishes a risk assessment protocol to determine the harm and impact caused by invasive plants and reduce their propagation.

The Maryland Forest Conservation Act of 1991 and Montgomery County Forest Conservation Law (Chapter 22A) established a program for conserving forest and tree resources. Effective July 1, 1992, all applications for subdivision, grading permits, or sediment control permits on tracts of land 40,000 square feet (SF) or larger must be accompanied by a Natural Resources Inventory/Forest Stand Delineation (a detailed summary of existing man-made and natural conditions of a site) and a Forest Conservation Plan or a Tree Save Plan. Exemptions include governmental projects reviewed for forest conservation purposes by the MDNR.

The City of Gaithersburg, in the Environment and Sustainability section of its Master Plan (draft, September 2014), lays out a plan to support and increase the urban forest and tree canopy in the city. Plans are to increase the tree canopy to the State's recommended 40% by the year 2025. Measures include increasing diversity, supporting private efforts, controlling pests, and promoting cross-agency coordination.

The majority of the NIST Gaithersburg campus consists of gently rolling terrain, with grass lawns, landscaping, and open meadows. Recreation fields and picnic areas are interspersed. Tree cover across the campus consists of a wide variety of native and ornamental trees. A grove of "state trees" (as of the 1960s) is located on the east side of the campus. Approximately 120 large trees (24" diameter or greater) are scattered throughout the campus. Three trees from the campus are the largest of their species in the state, and were thus included in the 2017-2018 Maryland register of State Champion Trees. The trees include the Ohio buckeye (*Aesculus glabra*) located between the two ponds; the weeping beech (*Fagus sylvatica 'Pendula'*) located in the Building 101 courtyard; and the "Flower of Kent" apple tree (*Malus pumila*)—also known as the "Newton apple tree"—located between the Building 101 library and Building 225.

The campus retains two stands of forest, summing to approximately 56 acres according to the 1995 *Forest Conservation Plan*. The largest area, consisting of approximately 52 acres, occupies the southwestern portion of the property, west and south of Building 202. The 1995 *Forest Conservation Plan* was prepared as

part of the planning for construction of the AML and Advanced Chemical Science Laboratory. The plan proposes preserving existing forest area and increasing the forest cover on the campus by planting an additional 29 acres of new forest. NIST has been working toward this goal by expanding the forest areas at the south end of the property between Building 235 and 202, west of Building 235, and around the two ponds on the east side of the campus. Additionally, NIST is coordinating with MDNR to develop a Memorandum of Understanding (MOU) for the renovation and expansion of Building 245 (Radiation Physics). This MOU designates a 2.22-acre Forest Area adjacent to Building 245 that NIST will reforest, afforest, or retain as mitigation for that project and potential future projects, in compliance with the Maryland Forest Conservation Act and project-specific Forest Conservation Plans.

NIST has established a tree replacement program to replace trees that are removed during construction. Under this program, trees less than 18 inches in diameter have a 1:1 replacement ratio; trees between 18 and 24 inches have a 2:1 replacement ratio; and trees greater than 24 inches have a 3:1 replacement ratio. Trees are typically planted in the eastern area of the campus to mitigate removal from construction.

As part of this EA, NIST consulted with the United States Fish and Wildlife Service (USFWS) and the MDNR to obtain records of rare, threatened, or endangered plant species on the campus. The Official Species List, provided by the USFWS Chesapeake Bay Ecological Services Field Office, indicates that no species of federally threatened or endangered plants are expected to occur on the campus. Likewise, the MDNR determined that there are no official state records of listed plant species within the NIST campus (Appendix B).

The emerald ash borer (EAB), a federally quarantined, invasive tree pest responsible for the death or decline of more than 50 million ash trees in 25 states, has recently been confirmed in ash trees just outside the Gaithersburg City Limits. The City is being proactive in treating its healthy ash trees now to prevent infestation (City of Gaithersburg, 2017b).

Environmental Consequences – Proposed Action

While construction activities under the Master Plan would directly impact vegetation within the campus, these impacts would be minimized by consolidating facilities within previously developed areas. The Master Plan concentrates new research buildings on sites that have already held paved areas, with the exception of Research Building I (at the north end of campus) and the GPL office additions. Planned additions to existing lab buildings would be kept compact to minimize impacts. The NIST Center for Neutron Research (NCNR) Expansion and the new specialty laboratories near Gate E would impact vegetated areas and require limited tree removal. The proposed screening facilities and roadways at Gate F, the new SRM Facility, and the addition to Building 207 would not disturb forested land, but would be constructed on open vegetated land. Grasses and similar vegetative species, however, would be re-seeded in the disturbed areas following completion of construction activities to the extent feasible.

Installation or relocation of underground utilities, including the new chilled water and steam supply mains, would generally be performed via open trenching and require vegetation removal. NIST would consider trenchless methods where feasible and where necessary to avoid impacts to wetlands and forested areas, such as the MOU forested area adjacent to Building 245 (Radiation Physics).

Implementation of the Master Plan would result in expanded tree canopy cover by promoting reforestation and increasing tree clusters throughout the campus. Reforestation would continue along existing efforts on the eastern side of the campus and extending the western forest to the south. The addition of a dense forest on the east side of the campus would create a barrier from the noise and visual impact from the adjacent Interstate 270. Separated clusters of trees would be planted surrounding existing Buildings 205, 235, and 236 to expand existing planting patterns. More tree clusters could also be planted to help stabilize the slope of the earth infill adjacent to Building 205. Adding new trees within the campus core would help to moderate temperatures, shade the buildings, enhance stormwater management, provide wildlife and pollinator habitat, and absorb pollutants. Refer to Exhibit 47 in the Master Plan for a map depicting the reforestation plan.

Implementation of the Master Plan would promote transition from existing manicured lawns to establishment of no-mow meadows of native or adapted species on the more open site areas to reduce maintenance requirements, reduce fertilizer and pesticide use, and promote stormwater management. Water-dependent landscapes and water intensive plantings that require irrigation would be minimized.

Implementation of the Master Plan is not expected to impact rare, threatened, or endangered plant species or vegetation in stream buffers or wetlands on the campus. NIST would manage any removed hardwood trees in accordance with Maryland Department of Agriculture guidance to prevent the spread of the EAB, and would replace any removed trees in accordance with the NIST tree replacement program. All areas where champion trees are located are protected under the landscape plan, so impacts on champion trees are not anticipated.

Environmental Consequences – No Action Alternative

The No-Action Alternative would not result in the disturbance of vegetated areas. However, the potential to improve the existing landscape and expand forested areas in accordance with state and local guidelines would not be realized under the No-Action Alternative.

4.2.2 Wildlife

Affected Environment

According to the USFWS, all living things are part of a complex, often delicately balanced network, with a great diversity of species that rely upon one another for survival. Wildlife not only plays a significant role in maintaining the equilibrium of an ecosystem, but also provides an effective way to assess the quality of the environment, and provides benefits for medicine, agriculture, economics, and other resources. In recognition of the vital role wildlife plays in supporting functional ecosystems, U.S. Congress enacted the Endangered Species Act of 1973 to protect wildlife from extinction and in turn, protect natural ecosystems as a whole.

The Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA) afford protection to birds. Any intentional or unintentional activity that results in the killing of migratory birds, including eagles, is unlawful unless permitted by the USFWS. As required by the Fish and Wildlife Conservation Act (amended in 1998), USFWS published the 2008 Birds of Conservation Concern report, which includes listings of bird species of conservation concern throughout the U.S., including some that are not otherwise protected under the MBTA (USFWS, 2015). Additionally, MDNR's 2005 Wildlife Diversity Conservation Plan identifies species of greatest conservation need, conservation priorities, threats, and conservation actions for wildlife species and their habitats.

Because of recent and severe declines in pollinators (such as honeybees) and the potential for associated devastating effects on ecosystems and the economy, President Barack Obama issued a Presidential Memorandum on June 20, 2014 requiring that executive departments and agencies (including NIST) take immediate measures to support pollinators (The White House, 2014). Prescribed measures include planting pollinator-friendly vegetation and increasing flower diversity in plantings, limiting mowing practices, and avoiding the use of pesticides in sensitive pollinator habitats.

As part of this EA, to fulfill the requirement under section 7(c) of the ESA, NIST submitted a request to USFWS for an official list of federally protected rare, threatened, or endangered species likely to occur on the NIST Gaithersburg Campus. The Official Species List, provided by the USFWS Chesapeake Bay Ecological Services Field Office, indicates that no rare, threatened, or endangered wildlife species or critical habitats are expected to inhabit the campus. NIST also consulted with the MDNR Wildlife and Heritage Service to obtain a list of state-protected species. The MDNR determined that there are no official state or federal records for listed animal species within the campus (Appendix B).

The trees, ponds, wetlands, and meadow areas on the campus create an inviting habitat for wildlife, including deer, birds, reptiles, and other small animals. White tailed deer are common on the campus and have been noted since its establishment in the 1960s. Canada geese are attracted to the two eastern ponds. The campus has been modified over time by human activity, and wildlife that resides on the campus have grown accustomed to the presence of humans. The 52-acre forested area in the southwestern portion of the campus may have sufficient interior space to support forest interior dwelling species, which are bird species that require large tracts of relatively undisturbed forests to maintain viable populations (MD iMAP, 2017).

Environmental Consequences – Proposed Action

Implementation of the Master Plan could result in minor impacts on wildlife. The reduction in vegetated areas discussed in Section 4.2.1 (Vegetation) represents a minor reduction in potential wildlife and pollinator habitat. The Master Plan aims to minimize impacts on wildlife by consolidating facilities within previously developed areas. Much of the affected grassy areas to be disturbed under the Master Plan are routinely landscaped and currently offer less foraging and habitat value than other vegetated areas (e.g., large contiguous tracts and stream buffers) around the campus. Construction of the proposed additions to specialty labs in the southern portion of the campus could have a slightly higher potential for impacts on wildlife and habitat because of their proximity to forested areas. Since the proposed construction is located adjacent to existing development, impacts are expected to be minor.

The removal of some trees may temporarily affect migratory bird populations and pollinators on the campus. Trees to be cleared may need to be surveyed to comply with the MBTA (16 U.S.C. §703). NIST would verify that no bird eggs and/or young protected under the MBTA are present. If NIST determines that eggs and/or young are present, tree clearing would proceed only after it is verified that the young have fledged.

Installation of proposed bioswales and rain gardens along with conversion of existing tracts of mowed turf grass to native no-mow meadows would increase the amount of native vegetation and support wildlife and pollinators on the campus. Reforestation and tree canopy expansion would also increase wildlife and pollinator habitat on the campus. Refer to Section 4.2.1 (Vegetation) for additional information regarding revegetation.

Noise emissions from the construction activities conducted under the Master Plan may disturb wildlife in and around the project sites, including nesting migratory birds; however, these impacts would be temporary. As explained in Section 4.13 (Noise Levels), after the completion of construction, only minor changes in operational noise levels on the campus would be expected because of minor upgrades and expansions to campus facilities. Construction and operational activities would comply with all applicable local, state, and federal noise regulations.

Impacts on rare, threatened, or endangered species are unlikely. The Proposed Action would also not disturb forested areas of sufficient size to support forest interior dwelling species. If, during the course of planning or execution of any of

the project elements in the Master Plan, threatened or endangered species are discovered on the campus, NIST would consult with USFWS and implement appropriate mitigation measures.

As discussed in Section 4.4.1 (Surface Waters) and Section 4.4.2 (Wetlands), implementation of the Master Plan could result in minor impacts on campus streams and wetlands because of runoff from construction sites. Runoff to streams could include sediment or other contaminants, which have the potential to adversely impact aquatic organisms that dwell in the streams. As discussed in Section 4.5.3 (Stormwater Management), NIST would implement stormwater management and pollution prevention measures during construction to reduce impacts on aquatic species that inhabit the campus streams.

Environmental Consequences – No Action Alternative

The No-Action Alternative would not result in any impacts on wildlife or habitat. The potential to improve the campus by enhancing habitats for native wildlife and pollinators, however, would also not be realized under the No-Action Alternative.

4.3 Topography, Geology, and Soils

4.3.1 Topography

Affected Environment

Topography indicates the relative position and elevation of natural and man-made features within an area. Changes to the topography of an area can affect surface and subsurface water pathways and quantities, result in increased sedimentation, impact stormwater runoff, and ultimately affect water quality in nearby waterways and wetlands. Topography can also influence viewscape, landscape, noise trespass, and land use.

The Gaithersburg campus is relatively flat in the northern section where most of the buildings are located, with an average elevation of 450 feet. The majority of the campus, including nearly all of the developed northern half, is gently sloped (less than 5% slope). Beyond South Drive, the terrain is more characteristic of the Piedmont region, with gentle rolling hills, an intermittent stream, and small areas of wetland. Refer to the Master Plan for more background about the Piedmont region. The southern half of the campus includes pockets of steeply sloped areas, including several areas exceeding 15-20% slope around the wetlands west of Building 235 and west of Building 205. Figure 4-1 illustrates the topographic contours of the campus.

Environmental Consequences – Proposed Action

Implementation of the Master Plan would result in localized changes to the site topography. These impacts would be minor, since construction would be concentrated in developed areas in the core of the campus. Grading, excavation, and fill may be required for construction of new facilities including the Strong Facility, NCNR Expansion, Research Building I, SRM Facility, Wind/Fire Facility, and the new screening facilities associated with Gate F. Construction of the Strong Facility would require leveling portions of an existing berm that surrounds Building 236. Refer to Section 4.3.2 (Geology and Soils) for discussion of potential impacts associated with soil disturbance.

Overall, the Master Plan would preserve the existing campus topography. The site topography would continue to mitigate visual impacts outside of the campus (e.g., along portions of Muddy Branch Road). For additional discussion of Master Plan impacts on viewscapes, refer to Section 4.12.1 (Aesthetics).

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not involve grading, excavation, or fill activities, and therefore, would not impact topography at the campus.

4.3.2 Geology and Soils

Affected Environment

The geology of an area encompasses characteristic rocks, sediments, and land features and the forces affecting them. These geologic features provide the parent material for overlying soils through weathering and supplying of minerals and nutrients. Assessing the soil resources in an area can provide insight on environmental impacts of potential actions on that area and its surroundings. Alterations to the physical makeup of an area can lead to soil contamination, soil erosion, and detrimental impacts on water bodies in or near the area.

The physical characteristics of soil can affect the suitability of the site for development and can present various pollution and safety concerns upon disturbance, such as high water erosion rates, wind-thrown hazards, and emissions of particulate matter (PM). These concerns may require the establishment of mitigation and precautionary measures.

The Gaithersburg campus is located in the Piedmont physiographic region of Maryland, which is made up of hard, crystalline igneous and metamorphic rocks. The underlying bedrock in the eastern part of the Piedmont consists of schist, gneiss, gabbro, and other highly metamorphosed sedimentary and igneous rocks of probable volcanic origin. The campus and the majority of the City of Gaithersburg is part of the Hampstead Upland District. The district has a mix of rolling and hilly uplands that are interrupted by steep walled gorges. It also has distinctive ridges, hills, barrens and valleys caused by differential weathering of adjacent, contrasting lithologies.

The predominant soil type on the Gaithersburg campus is Glenelg silt loam, which covers over 75% of the site, including the majority of the central campus, from North Drive to South Drive. Gaila silt loam covers approximately 11% of the campus and is present along the southern and northern edges of the campus, including the areas around Building 205 and the Visitor Center. Glenelg and

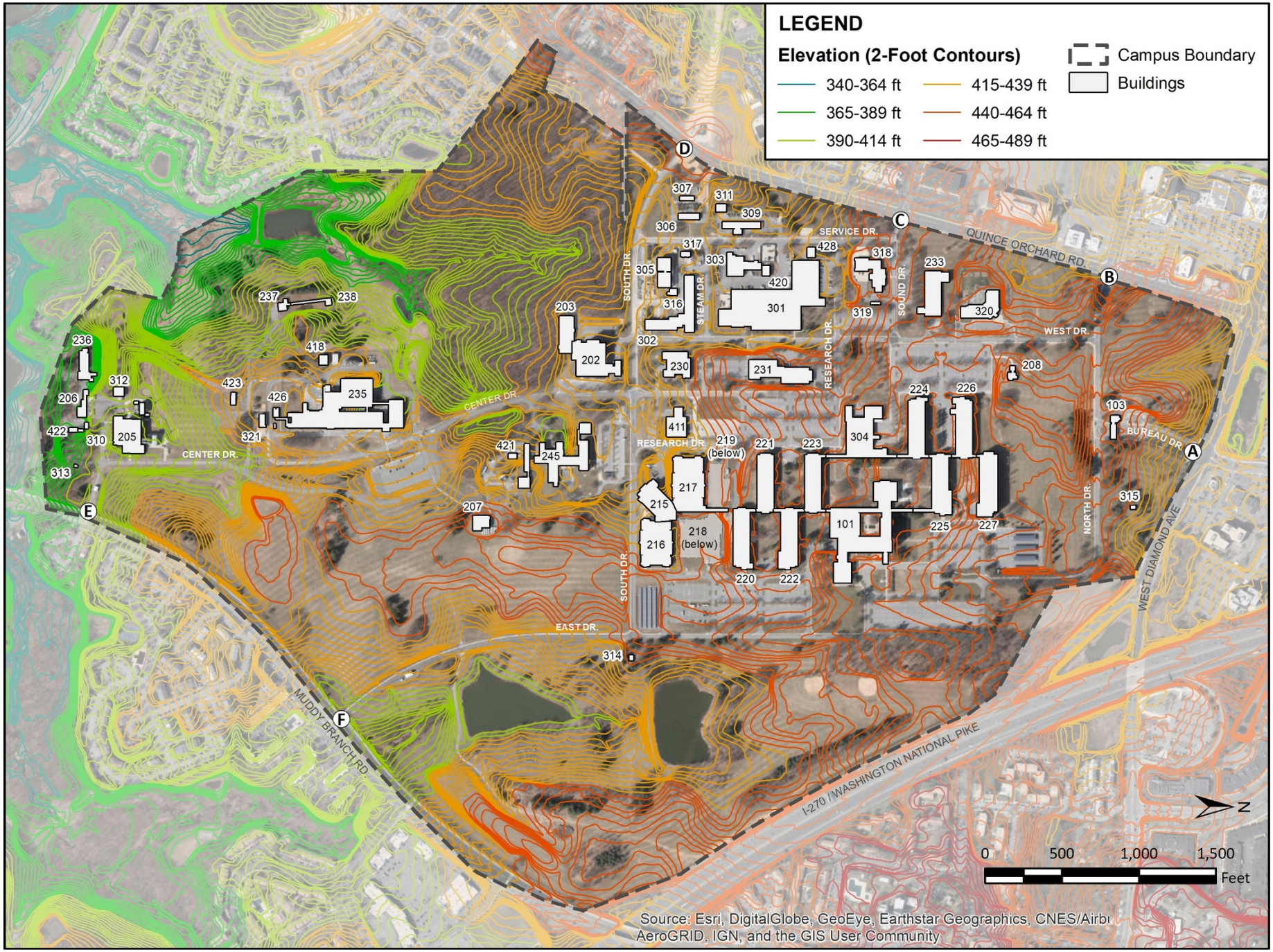


Figure 4-1. Topographic Contours at the NIST Gaithersburg Campus

Gaila soils are deep and well-drained soils and are generally conducive to development. On steeper slopes (greater than 8%), these soils could have a high potential for erosion given a certain combination of precipitation, management practices, and slope length. Construction in these steeper areas may be somewhat limited because of slope (NRCS, 2016).

On the southern campus, Baile and Glenville soils are present in the lowland area along the stream north of Building 235. Baile is also a deep soil, but poorly drained. Glenville, a moderately well-drained soil, is also present to the west and north of Building 205. The Baile and Glenville soils at the campus have a mild slope (0% to 8%) and a moderate potential for erosion (NRCS, 2016). Exhibits 103 and 105 in the Master Plan present the campus soils and slopes, respectively.

Environmental Consequences – Proposed Action

The Master Plan would result in moderate soil disturbance associated with construction, demolition, and renovation projects that would primarily impact previously disturbed soil. Soil surface and subsurface compaction may result from heavy machinery traffic around the campus as a result of Master Plan implementation. Geotechnical surveys would be performed to confirm soil constructability prior to construction of new buildings.

Construction of the Master Plan project elements described in Section 4.3.1 (Topography) may require soil relocation because of excavation and construction activities. The Master Plan would also construct underground laboratory space between Research Buildings II and III, which would require soil excavation. However, the Master Plan would not require extensive grading since construction would be concentrated in developed areas in the core of the campus. NIST would pursue the reuse of excavated soils within the campus whenever feasible.

NIST would prepare and adhere to a Stormwater Pollution Prevention Plan (SWPPP) to minimize risk of soil contamination during construction activities. NIST would also implement soil erosion and sediment control measures during earth disturbance to minimize impacts on soil and water resources. Refer to Section 4.5.3 (Stormwater Management) for additional information regarding stormwater management.

NIST would implement control measures to minimize fugitive dust emissions and wind-thrown hazards during construction activities. Refer to Section 4.9 (Air Quality) for additional information regarding emissions during construction activities.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not result in construction or demolition activities and thus would not result in additional soil disturbance or potential soil contamination, erosion, or compaction.

4.4 Water Resources

4.4.1 Surface Waters

Affected Environment

Natural conditions (e.g., interactions with soil, sediments, rocks, groundwater, and the atmosphere) and human activities can impact the quality of surface water by affecting its chemical, physical, and biological characteristics. Human actions that may affect surface water quality include agricultural, industrial, and urban activities. Stormwater runoff from surrounding watersheds directly impacts surface water quality.

The NIST Gaithersburg Campus is situated within two watersheds. The southern portion of the campus, which drains to Muddy Branch, is located within the Potomac River Montgomery County watershed while the northern portion is within the Seneca Creek watershed. Both watersheds discharge into the Potomac River and eventually the Chesapeake Bay, making them part of the larger Chesapeake Bay watershed.

The Chesapeake Bay is the largest estuary in the United States and is home to more than 3,700 species of plants and animals. One of the major tributaries to the Bay is the Potomac River, a major river running through the metropolitan area of Washington, DC. The Potomac River is designated an American Heritage River and provides drinking water for more than 80% of the four million residents of the National Capital Region. Protecting the Potomac River and the Chesapeake Bay has become a federal, state, and regional effort with programs, such as the Chesapeake Bay Program, that set stringent goals to promote the Bay's restoration and protection. Federal surface water regulations, including the Clean Water Act (CWA), Safe Drinking Water Act (SDWA), and the Rivers and Harbors Act (RHA), also aid this effort with their focus on rights to water usage and the protection of water quality.

The USEPA and MDE have identified the waters of the Potomac River Montgomery County watershed, Seneca Creek watershed, and Chesapeake Bay watershed as impaired by specific problem pollutants such as phosphorus, sediments, and PCBs. As a result, the USEPA and MDE have established Total Maximum Daily Loads (TMDLs) for waters within these watersheds. TMDLs define the maximum amounts of pollutants that a specific water body can receive while meeting water quality criteria. Some of the TMDLs for the Potomac River Montgomery County watershed and the Seneca Creek watershed are still in the process of being developed.

In December 2010, USEPA established the Chesapeake Bay TMDL, which guides actions to restore clean waters in the Chesapeake Bay Watershed. The Chesapeake Bay TMDL sets annual watershed limits for nitrogen, phosphorus, and sediment. Accordingly, USEPA has established 2017 and 2025 goals for reduction of these pollutants flowing into the Chesapeake Bay. These reductions have been established in an effort to improve water quality, prevent erosion and

disruption of natural ecosystems, and reinstate recreational uses (e.g., swimming and fishing) for the public.

The Potomac River Montgomery County watershed, which includes the southern half of the campus, covers approximately 140 square miles with impervious surfaces totaling 7%. This watershed has seen a very rapid pace of development, with most of the development outside the City of Gaithersburg having occurred since 1972. The watershed hydrology is still adjusting to these relatively new land use changes, and areas of instability are common. The watershed has been cited by MDE as impaired by specific problem pollutants, including phosphorous (1996), sediments (1996), impacts to biological communities (2006), and PCBs in fish tissue (2008) (MDE, 2012). As a result, MDE established TMDLs for each of these constituents for waters within the Potomac River Montgomery County watershed. Additionally, MDE has classified the Potomac River as impaired for chlorides and sulfates (2012) and high pH (2014) but has not yet established TMDLs to address these impairments (MDE, 2014b).

The Seneca Creek watershed, which includes the northern half of the campus, covers approximately 129 square miles with impervious surfaces totaling 7.5%. Long Draught Branch, which directly receives runoff from the campus, is a major tributary of the Seneca Creek watershed. Specifically, both branches of Long Draught Branch just outside the campus (north and west) flow into Clopper Lake, an impoundment constructed for flood control and recreation located approximately one mile west of the campus. Outflow from Clopper Lake joins with Seneca Creek and flows west, then south to the Potomac River. MDE identified the waters of the Seneca Creek watershed as impaired by sediments and phosphorus (1996), chlorides (2010), and temperature (2014). During 2002, a TMDL was approved and applied to Clopper Lake for sediments and phosphorus. Seneca Creek remains impaired for chlorides and temperature, likely attributed to urban stormwater runoff, and TMDLs still need to be developed to address these impairments (MDE, 2014a).

The campus' 2005 stormwater permit includes requirements for controlling stormwater pollution to meet the wasteload allocations (WLAs) specified in the impaired water body TMDLs. WLAs are the maximum load of pollutants each discharger may release into a particular waterway. For TMDLs that have not yet been developed, efforts should be made to reduce the pollutant load to the surrounding water bodies to the maximum extent possible. Additionally, as discussed in Section 4.5.3 (Stormwater Management), NIST's stormwater permit renewal is expected to include a requirement to reduce nutrient and sediment loads by treating at least 20% of runoff from existing untreated impervious surfaces by 2025 (MDE, 2017).

Ponds are the most notable water bodies on campus. There are two connected man-made ponds on the east side of the campus, which drain to the southeast through an unnamed tributary to Muddy Branch. Several other stormwater management ponds are located at the southern side of the campus, the largest at 1.3 acres in size. This pond, which drains south to Muddy Branch through a marshy area known as Elysium Lake, receives flow from an intermittent stream that originates in the forested area of the campus. This stream receives groundwater that is recovered and discharged by sump pumps at Building 245 (Radiation Physics Building), as well as stormwater that drains from portions of the campus core and the areas around Buildings 202 (Engineering Mechanics), 235 (NIST Center for Neutron Research), and 245 (Radiation Physics Building).

Figure 4-2 depicts surface water bodies and other hydrologic features at the campus. Refer to Exhibit 106 in the Master Plan for a figure depicting the local watersheds.

The City of Gaithersburg is actively working to establish measures toward better stream and watershed conditions, with a Stormwater Management Program based on detailed studies of watershed conditions with recommended practices and the implementation of a stormwater program fee to fund projects and initiatives. In the 2014 *Muddy Branch Watershed Study*, the City of Gaithersburg suggests coordination and partnering between the city and NIST on projects that could improve water quality in both jurisdictions (City of Gaithersburg, 2014).

Environmental Consequences – Proposed Action

Implementation of the Master Plan would have the potential to impact surface waters because of runoff from construction activities and changes in the quality and quantity of post-construction stormwater runoff.

Under the Master Plan, the Wind/Fire Facility would be constructed in the southern area of the campus, north of Building 205. A drainage swale in this area flows west to an outfall in the southwestern area of the campus, ultimately leading to Muddy Branch. Additional general construction activities would occur in the northern areas of the campus, in the vicinity of outfalls leading to Long Draught Branch. NIST would implement erosion and sediment control (ESC) measures during all construction activities to prevent sediment transport to Muddy Branch and the Long Draught Branch (of the Lower Great Seneca Creek).

To meet the requirements of the campus stormwater permit and state and federal regulations, the Master Plan would incorporate various best management practices (BMPs) to manage the quantity and quality of stormwater runoff from both existing and new impervious surfaces. These measures would aid in the capture of stormwater, infiltration, and groundwater recharge, ultimately reducing runoff and improving surface water quality. Refer to Section 4.5.3 (Stormwater Management) for additional discussion.

The increased campus population under the Master Plan (approximately 27% over a 20-year period), along with the increased cooling demand for new and expanded facilities, could result in an overall increase in the volume of sanitary and industrial wastewater discharged to the Washington Suburban Sanitary

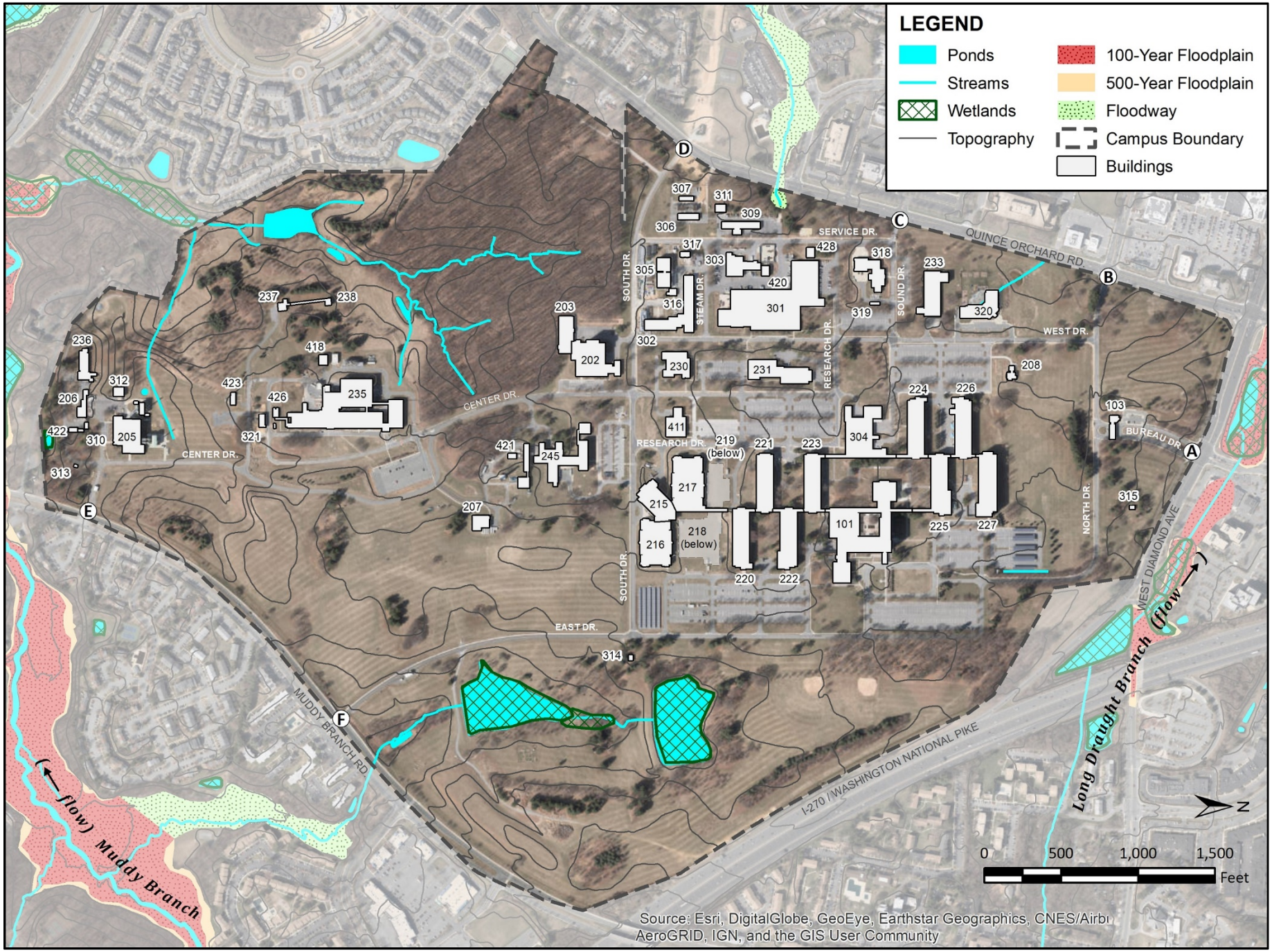


Figure 4-2. Hydrologic Features at the NIST Gaithersburg Campus

Commission (WSSC) sewer system, which ultimately discharges to the Potomac River following treatment. This potential increase should not affect water quality within receiving waters as WSSC would continue treating the sanitary wastewater in accordance with the applicable MDE permit.

Refer to Sections 4.5.2 (Wastewater) and 4.5.3 (Stormwater Management) for additional discussion of discharges to surface waters.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would have no impact on surface waters. However, the No-Action Alternative would not provide a strategy for managing the quantity and quality of stormwater runoff to improve surface water quality and meet the intent of local, state, and federal rules and regulations.

4.4.2 Wetlands

Affected Environment

Wetlands provide important ecological services, including the following:

- Filtering nutrients, sediment, and pollutants from surface and groundwater;
- Absorbing excess floodwater and rainwater;
- Protecting shorelines from erosion; and
- Providing habitat for numerous plants and animals.

Wetlands are federally protected by Section 404 of the CWA, EO 11990 (Wetland Protection), the RHA, and applicable state regulations and permit programs such as the Maryland Non-Tidal Protection Act, Maryland Tidal Wetlands Act, and the Waterway and 100-Year Floodplain Construction Regulations. Section 404 of the CWA prohibits the discharge of dredged or fill material into wetlands or other waters of the U.S. if a practicable alternative exists that is less damaging to the aquatic environment or if the nation's water would be significantly degraded by such discharge. A permit review process administered by the United States Army Corps of Engineers controls regulated activities. Developers must avoid direct impacts to wetlands to the maximum extent possible. EO 11990, implemented in 1977, protects wetlands and their associated ecosystem services. This EO directs each federal agency to avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds that 1) there is no practicable alternative to such construction, and 2) the agency will take all practicable measures to minimize impacts to the wetlands.

To afford additional protection for jurisdictional wetlands (as defined under the CWA), MDE requires maintaining vegetated wetland buffers. COMAR 26.23 establishes regulations for activities that may disturb or occur within a non-tidal wetland or surrounding buffer. COMAR 26.23.01.01 defines a buffer as "a regulated area, 25 feet in width, surrounding a nontidal wetland, measured from the outer edge of the nontidal wetland." According to COMAR 26.23.01.04, there is an expanded, 100-foot buffer around wetlands of special state concern and wetlands with adjacent areas containing steep slopes or highly erodible soils. MDE requires the action proponent to obtain a Non-Tidal Wetlands and Waterways Permit for any activity that alters a non-tidal wetland or its buffer. Note that additional requirements and regulations may apply to tidal streams and wetlands.

The USFWS developed the National Wetlands Inventory (NWI), a wetland classification system used to identify wetlands throughout the U.S. The NWI is a very useful system for obtaining a large-scale understanding of approximate wetland locations. Since aerial photography forms the basis for the NWI, instead of field surveys, the data may include omission errors depending on seasonal and climatic variability.

Between 2005 and 2007, M-NCPPC performed wetland inventories and functional wetland assessments in portions of the Middle Great Seneca, Little Seneca, and Lower Great Seneca watersheds using a combination of NWI data and field investigations. Figure 4-3 illustrates the wetlands identified in that effort within and surrounding the campus, along with their corresponding NWI classifications. Identified wetland features within the campus include the two ponds in the eastern portion of the campus, the flow pathway between the two ponds, and the small pond at the extreme southern tip of the campus. Several additional wetland areas were identified along Muddy Branch and Long Draught Branch outside the campus boundary.

The campus may include additional areas with wetland characteristics (i.e., wetland hydrology, hydrophytic vegetation, and hydric soils) beyond those identified in the M-NCPPC effort. Examples include the network of streams, swales, and ponds that drain the southwest portion of the campus to Muddy Branch; the swale between Gates C and D that drains off campus to the west; and numerous stormwater bioretention features and swales throughout the campus. A formal wetland survey and U.S. Army Corps of Engineers jurisdictional determination would be necessary to assess whether these or any other areas within the campus should be considered wetlands and protected accordingly.

Environmental Consequences – Proposed Action

Construction, demolition, and renovation activities under the Master Plan would not occur within wetlands or wetland buffers. However, several construction and renovation activities are proposed within approximately 500 feet of wetlands or areas demonstrating wetland characteristics. NIST would survey various areas of the campus that appear to have wetland characteristics to evaluate if construction activities would occur within the wetlands or their buffers. If construction in a buffer area is determined, NIST would evaluate opportunities to reduce or avoid these impacts (e.g., by shifting work locations to avoid

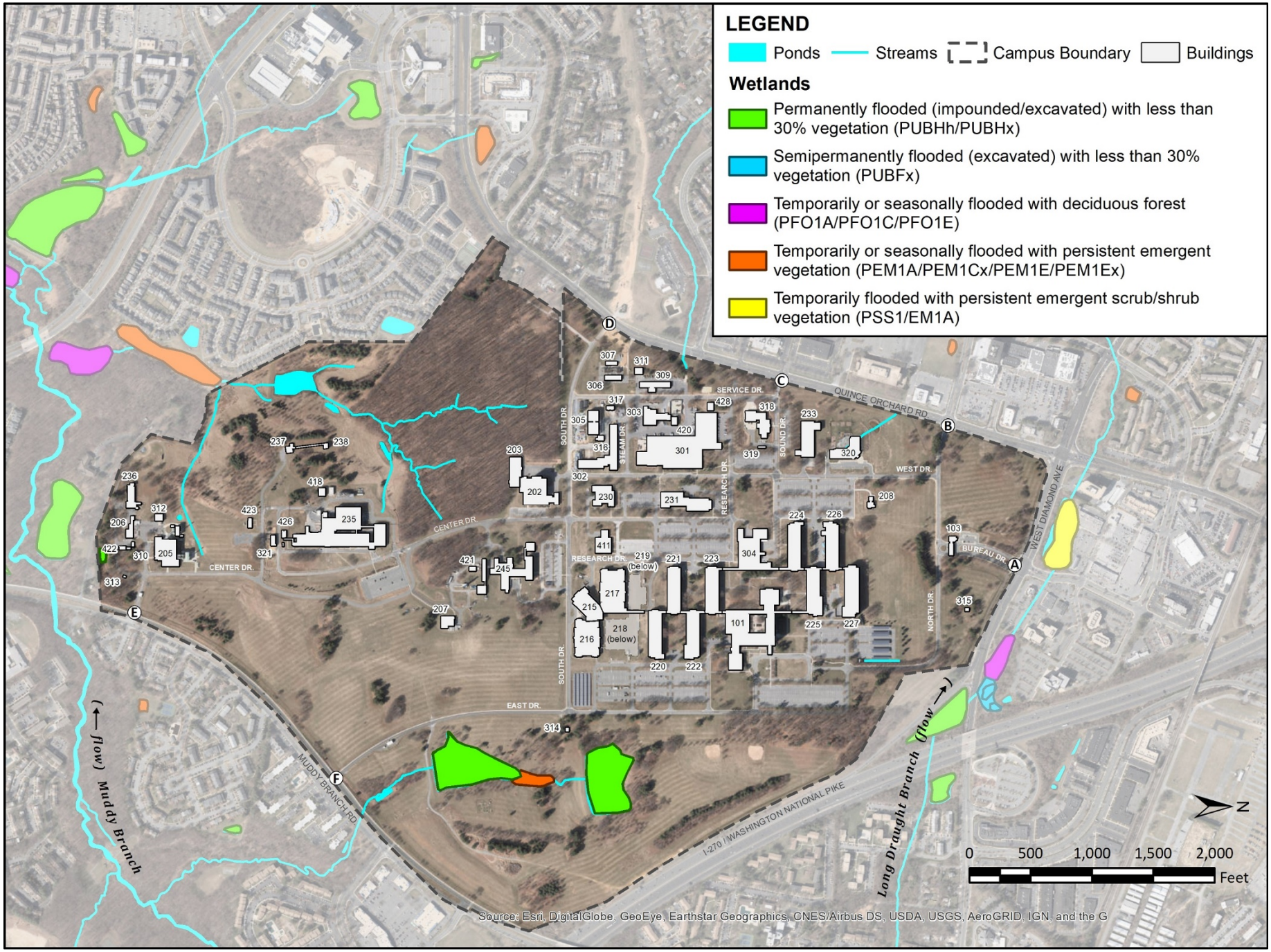


Figure 4-3. Wetlands Within and Surrounding the NIST Gaithersburg Campus

construction within the buffer) and would ensure adherence to permitting requirements and local, state, and federal regulations. Under the Master Plan, the following activities could have the potential to directly or indirectly affect wetland areas:

- Construction of the expanded Visitor Center and Vehicle Inspection Facility at Gate A, located across the street from wetlands within Long Draught Branch;
- Construction of the NCNR expansion of Building 235, located uphill from areas with potential wetland characteristics;
- Construction of the High Bay Facility, located uphill from the small wetland in the extreme southern tip of the campus;
- Construction of the Strong Facility and the Wind/Fire Facility, located near a drainage swale that may have wetland characteristics; and
- Construction of the Gate F Visitor Center, located near the swale that conveys flow from the south pond to Muddy Branch.

These temporary construction activities and permanent campus modifications could potentially result in an increase in the quantity of stormwater runoff discharged to the wetlands on campus during peak storm events. As discussed in Section 4.5.3 (Stormwater Management), NIST would employ and maintain adequate erosion and sediment controls to mitigate the discharges of sediment-laden waters to the wetlands. Additionally, installation of post-construction stormwater BMPs would encourage infiltration and would improve the overall surface water quality and wetland health of the campus. NIST would install stormwater BMPs to comply with federal requirements and EOs for sustainable stormwater management, mitigating the potential impact of construction activities to wetlands.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not impact wetlands.

4.4.3 Floodplains

Affected Environment

Floodplains perform important natural functions, including moderating peak flows, maintaining water quality, recharging groundwater, and preventing erosion. In addition, floodplains provide wildlife habitat, recreational opportunities, and aesthetic benefits. The 100-year floodplain is defined as an area that is subject to a 1% or greater chance of flooding in any given year.

To protect floodplains and minimize future flood damage, the federal regulations at 44 Code of Federal Regulations (CFR) 9 and EO 11988 (as amended by EO 12148) restrict development within the 100-year floodplain. Under EO 11988, all federal agencies must 1) determine if any of their actions would occur within a floodplain, 2) evaluate the potential effects of these actions, and 3) analyze alternatives to these actions.

The Federal Emergency Management Agency (FEMA) is the official source for Flood Insurance Rate Maps, which identify areas subject to flooding for flood management planning and insurance underwriting. These maps are developed by studying data for river and stream flow, storm tides, hydrology, topography and rainfall. The FEMA map for the NIST Gaithersburg Campus shows a very small area in the 100-year floodway, located on the western edge of the property behind Building 309. A floodway is defined as a channel or watercourse that collects floodwaters of a river or other channel. According to FEMA, floodways must be reserved in order to discharge base flood loads without increasing water surface elevation. It is critical for communities to regulate development in floodways to ensure there are no increases in upstream flood elevations.

The FEMA maps also identify the 100-year floodplain and 500-year floodplain to the north and south of the campus, along Long Draught Branch and Muddy Branch, respectively. Existing commercial development has occurred within the Long Draught Branch floodplain north of the campus, while there is little to no development within the Muddy Branch floodplain south of the campus.

Environmental Consequences – Proposed Action

No construction, renovation, or demolition proposed under the Master Plan would occur within the 100-year floodplain or floodway. As discussed in Section 4.5.3 (Stormwater Management), the Master Plan would result in an overall increase in impervious surfaces within the campus. This could lead to a potential increase in the quantity of stormwater runoff from the campus to Muddy Branch or Long Draught Branch during peak storm events because of overflow of stormwater management features, thereby contributing to downstream flooding concerns.

The Master Plan would mitigate this concern by incorporating various stormwater management features and encouraging groundwater infiltration to reduce the potential for flooding during peak precipitation events. NIST would continue to assess its stormwater management practices to meet the intent of local, state, and federal rules and regulations regarding sustainable management of stormwater.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not involve any impacts or changes in activities within the 100-year floodplain or floodway.

4.4.4 Groundwater

Affected Environment

In many areas, groundwater is the most prevalent source of available freshwater to support potable, agricultural, and industrial uses. Groundwater quality is

impacted by interactions with soil, sediments, rocks, surface waters, and the atmosphere. Groundwater quality may also be significantly affected by agricultural, industrial, urban, and other human actions.

The campus does not receive its domestic water from onsite wells. The cooling tower, which uses groundwater that is recovered from Buildings 218 and 219 (the underground portions of the Advanced Measurement Laboratory), is the campus's only groundwater use. Sump pumps at Building 245 (Radiation Physics Building) also recover groundwater, which is then discharged to a nearby stream. The City of Gaithersburg's potable water is provided by WSSC from the Potomac River. For more information regarding potable water at the campus, refer to Section 4.5.1 (Potable Water Supply).

There are two aquifers in Montgomery County, the Ijamsville Formation (MO, Cc 14) and Loch Raven Formation (MO Eh 20). In September 2017, groundwater in the Ijamsville and Loch Raven Formations was measured at approximately 33 feet and 16 feet below ground surface, respectively, while capacities were measured at 76-90% and <10%, respectively (USGS, 2017). Depth to groundwater varies across the campus but has been observed between 16 and 32 feet below ground surface. Surface topography is typically an indicator of groundwater flow, with groundwater flowing from higher to lower elevations. Based on the topography of the campus, groundwater is generally expected to flow southward. The campus is not located within 1,000 meters of a designated sole source aquifer (USEPA, 2017b).

A consideration of concern to surface water and groundwater quality is the potential for releases of hazardous substances that might affect water resources. NIST facilities employ a variety of hazardous substances in research and other functions. To mitigate risks of a hazardous substance release, NIST employs a spill prevention, control, and countermeasure (SPCC) plan for petroleum products and has a comprehensive occupational safety and hazard safety program that oversees the safe handling, use, transportation, storage, and disposal of hazardous materials and wastes.

Environmental Consequences – Proposed Action

Implementation of the Master Plan would not impact groundwater consumption.

Construction and demolition activities associated with implementation of the Master Plan have the potential to impact groundwater. NIST would implement appropriate pollution prevention measures during the execution of the Master Plan to avoid spills and exposure of groundwater to contamination. Certain elements of the Master Plan, such as emergency generators (with diesel fuel tanks) and the Strong Facility (with a hydraulic system that could potentially contain large amounts of oil), may require updates to and compliance with campus SPCC plan to ensure that the potential for impacts to groundwater is minimized.

The Master Plan would incorporate various BMPs to manage the quantity and quality of stormwater runoff from both existing and new impervious surfaces. These measures would aid in the capture of stormwater and promote infiltration, which may contribute to enhanced groundwater recharge during storm events. Refer to Section 4.5.3 (Stormwater Management) for additional discussion.

Environmental Consequences – No Action Alternative

Under the No-Action Alternative, there would be no change in groundwater consumption and no potential for impacts during construction. Stormwater management improvements and subsequent enhanced groundwater recharge on the campus would also not be realized under the No-Action Alternative.

4.5 Utilities and Infrastructure

4.5.1 Potable Water Supply

Affected Environment

The NIST Gaithersburg Campus is supplied domestic water by the WSSC through two metered connections at the north and east sides of campus. In fiscal year (FY) 2017, average daily water consumption at the campus was estimated to be approximately 518,000 gallons. The primary drivers of potable water consumption at the campus include domestic water use by occupants, cooling tower make-up water, boiler feed water, and process/laboratory water. Domestic water consumption varies seasonally with the highest peak demands generally occurring in the summer months. Refer to Exhibit 149 in the Master Plan for a summary of historical domestic water usage and peak demands.

EO 13693 mandates federal agencies to reduce potable water use intensity by 2% annually through FY 2025 as compared to the FY 2007 baseline year. This translates to agency-wide reductions of 16%, 26%, and 36% by FY 2015, FY 2020, and FY 2025, respectively. In FY 2015, DoC achieved a department-wide 31.2% reduction in potable water use intensity compared to 2007, surpassing both the FY 2015 and 2020 targets (DoC, 2016).

NIST operates an extensive distribution system consisting of approximately 8.3 miles of ductile iron piping and 56 fire hydrants, a majority of which was originally installed in the 1960s. A leak detection and condition assessment report, published in 2013, indicated that the existing potable water piping system is likely to remain structurally sound for the duration of the Master Plan. The existing potable water system has available capacity to service more than two times the current load. While the system is reported to be in generally good condition, it is also recognized that, like the original buildings, the potable water system is more than fifty years old and approaching the end of its useful life. As a result, failures are occurring with increasing frequency throughout the campus. NIST intends to perform a detailed evaluation and subsequent phased replacement of the potable water system, to be addressed under a separate

NEPA review. A summary of the estimated peak domestic water demand for each building is presented in Exhibit 148 in the Master Plan.

Environmental Consequences – Proposed Action

The Master Plan is expected to generate an overall increase in potable water demand. Increased potable water consumption associated with the construction of new facilities and corresponding increases in campus population, laboratory activities, steam load, and cooling load, would be partially offset by the installation of water-efficient fixtures and water conserving equipment in new and renovated buildings. These water-efficiency improvements would help DoC achieve its goal of reducing water use intensity department-wide.

The existing potable water system is adequately sized for increased demand associated with the Master Plan. New potable water lines would need to be installed to connect new facilities with the existing potable water infrastructure. Existing direct-buried domestic water piping may need to be relocated out of proposed construction locations.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not increase potable water consumption but would not result in any water efficiency improvements within the campus.

4.5.2 Wastewater

Affected Environment

Sanitary and industrial wastewater generated at the campus is discharged to the WSSC sanitary sewer system for treatment. NIST holds a permit (Industry Identification Number 05813) from the WSSC, allowing the discharge of wastewater from the campus to the WSSC sewer system. The permit limits the allowable discharge of pollutants from wastewater-generating activities, including process wastewater from research activities. The permit also covers discharges of non-contact cooling water, boiler blowdown, sanitary wastewater, and wastewater from the cafeteria and maintenance garage.

Prior to discharge to the WSSC sewer, these wastewaters are collected within the campus and conveyed through an extensive wastewater collection system owned and maintained by NIST. This system consists of approximately 26,300 linear feet of sewer pipe, the majority of which was installed in the 1960s. Generally, the existing sewer system is in good condition. The hydraulic capacity of the existing sewer system was assessed utilizing peak daily flows. This assessment concluded that the existing system has the capacity to handle approximately twice its existing load. However, as with the potable water system, the sewer system is more than fifty years old, approaching the end of its useful life, and experiencing failures at an increasing frequency. NIST intends to perform a detailed evaluation and subsequent phased replacement of the sewer system, to be addressed under a separate NEPA review.

NIST operates building-specific wastewater neutralization systems at three laboratories (Buildings 215, 227, and 235) and a final monitoring and neutralization system at Building 313 (Site Effluent Neutralization Building) to perform a final pH adjustment, if necessary, prior to discharge to the WSSC sewer. Refer to Chapter 8 of the Master Plan for more information regarding the existing campus sanitary sewer system.

Environmental Consequences – Proposed Action

The Master Plan is expected to generate an overall increase in wastewater generation related to expected increases in potable water demand discussed in Section 4.5.1 (Potable Water Supply). Increases in sanitary wastewater generation are expected because of the increased campus population, increases in process wastewater are expected from the renovated GPLs and support facilities, and increases in wastewater from heating and cooling processes are expected associated with new and expanded buildings. These increases would be partially offset by the installation of water-efficient fixtures and water conserving equipment in new and renovated buildings. Under the third phase of the Master Plan, additional chillers would be added to the campus, which could further increase the volume of wastewater discharged to WSSC. Installation of more efficient heating, ventilation, and air conditioning (HVAC) systems and renovations to improve building envelopes, however, would improve overall cooling efficiencies, thus helping to offset the increase in discharge from the new chillers.

Activities in the AML expansion and other laboratories could increase the generation of hazardous wastewaters, including acids and organic waste. Depending on the source and type of hazardous wastewater generated, NIST would either neutralize the wastewater prior to discharge to the WSSC sewer or would manage the waste in accordance with the hazardous waste procedures described in Section 4.7 (Solid and Hazardous Waste).

The existing sewer collection system is adequately sized to support future implementation of the Master Plan. New sanitary sewer lines would need to be installed to connect new facilities with the existing sanitary sewer infrastructure. Existing direct-buried sanitary sewer lines may need to be relocated out of proposed construction locations. Installation of sewer lines associated with implementation of the Master Plan would not occur in wetlands or floodplains. Refer to Chapter 8 of the Master Plan for more information regarding proposed upgrades to the campus sanitary sewer system.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not increase wastewater generation, but would not replace existing features with more water-efficient equipment and fixtures.

4.5.3 Stormwater Management

Affected Environment

Stormwater runoff is generated when precipitation flows off land and impervious areas such as paved streets, parking lots, and building rooftops. Stormwater runoff can collect and transport pollutants such as oil and grease, chemicals, nutrients, metals, sediment, and bacteria as it travels across these surfaces. Soil erosion occurs when stormwater travels at velocities sufficient to transport sediment particles. Excessive stormwater runoff may also lead to flooding and infrastructure damage. Stormwater is typically managed on site by using conventional practices such as infiltration devices and sustainable practices such as low impact development (LID) techniques (USEPA, 2004). LID practices aim to maintain and restore the hydrologic and ecological functions of watersheds by managing stormwater as close to its source as possible.

Impervious surfaces collect and accumulate pollutants and during high storm events, these pollutants are quickly washed off and rapidly delivered to aquatic systems. Monitoring and modeling studies have consistently indicated that urban pollutant loads are directly related to watershed imperviousness. Pervious surfaces allow for the absorption of stormwater and ultimately allow for recharging of the groundwater table.

The campus has several existing stormwater management features to detain stormwater and promote its infiltration into the ground. Bioretention, micro-bioretention, swales, rain gardens, and ponds are used for stormwater management at the campus. Refer to Figure 4-4 for a map depicting the locations of these features.

Stormwater is directed from impervious surfaces through seven drainage areas into the municipal system. There is an extensive underground storm drain system around the buildings and parking lots in the central area of the campus and the larger specialty laboratories in the southern area of the campus. In the less developed areas, stormwater flows overland or through grass channels. Several ponds within the campus receive stormwater and hold or slowly release water to the outfalls. As depicted in Figure 4-4, outfalls from drainage areas 1 through 4 discharge to Long Draught Branch and outfalls from drainage areas 5-7 discharge to Muddy Branch.

For federal facilities located in Maryland, the USEPA delegates its authority under the CWA to MDE for the permitting and enforcement of the National Pollutant Discharge Elimination System (NPDES) program. Under this authority, MDE issued NIST a permit (General Discharge Permit No. 05-SF-5501, MDR055501) authorizing discharges from all municipal separate storm sewer system (MS4) outfalls on the campus to receiving waters including Muddy Branch and Long Draught Branch. This permit also allows the discharge of air conditioning condensate and irrigation water to the MS4. Stormwater associated with industrial activity, or discharges associated with construction activities, may also be authorized to discharge to the MS4 if such discharges are specifically authorized under an applicable NPDES discharge permit or are identified by and in compliance with the general permit.

As a component of the campus' permit coverage, NIST is required to develop and implement a SWPPP that details how stormwater will be managed and the efforts that will be taken to reduce pollutants in stormwater runoff from the campus. Additionally, MDE's proposed reissue of the MS4 General Discharge Permit includes a requirement to reduce nutrient and sediment loads by providing water quality treatment of runoff from at least 20% of existing untreated impervious surfaces that were constructed prior to 2006 (MDE, 2017). NIST is required to comply with the updated MS4 permit, the Chesapeake Bay TMDL, and the Final Maryland Watershed Implementation Plan.

Per the February 2015 *Maryland Stormwater Management and Erosion Sediment Control Guidelines for State and Federal Projects*, no state or federal agency shall clear, grade, develop, or redevelop any land without implementing an approved plan that provides ESC measures. In most cases, ESC plans are reviewed and approved by MDE for state and federal construction projects, but county regulations may also apply. According to the Montgomery County Code, a permit is required for activities that would disturb greater than or equal to 5,000 SF of land within the county. The application must include an approved ESC Plan and Stormwater Management Plan (SWMP) prior to commencement of construction.

Maryland's 2007 Stormwater Act requires that Environmental Site Design (ESD) BMPs (e.g., LID technologies, rain gardens, bio-swales, and landscape infiltration) be employed for new development and redevelopment. If ESD BMPs are impractical, conventional stormwater management features (e.g., ponds, detention basins) may be installed in lieu of the ESD BMPs. Montgomery County requires that new development result in no net increase in stormwater runoff.

NIST must comply with Section 438 of the Energy Independence and Security Act of 2007 (EISA). Under EISA, federal agencies must "use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow" for any project with a footprint greater than 5,000 SF. Guidance on how to meet EISA is provided in the *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act* (USEPA, 2009).

EO 13693 section 3(f) requires that, beginning in FY 2016, agencies shall improve water use efficiency and management (including stormwater management) where life-cycle cost-effective. Specifically, the EO prescribes the installation of appropriate green infrastructure features on federally owned property to help with stormwater management. DoC's August 2013 *Handbook*

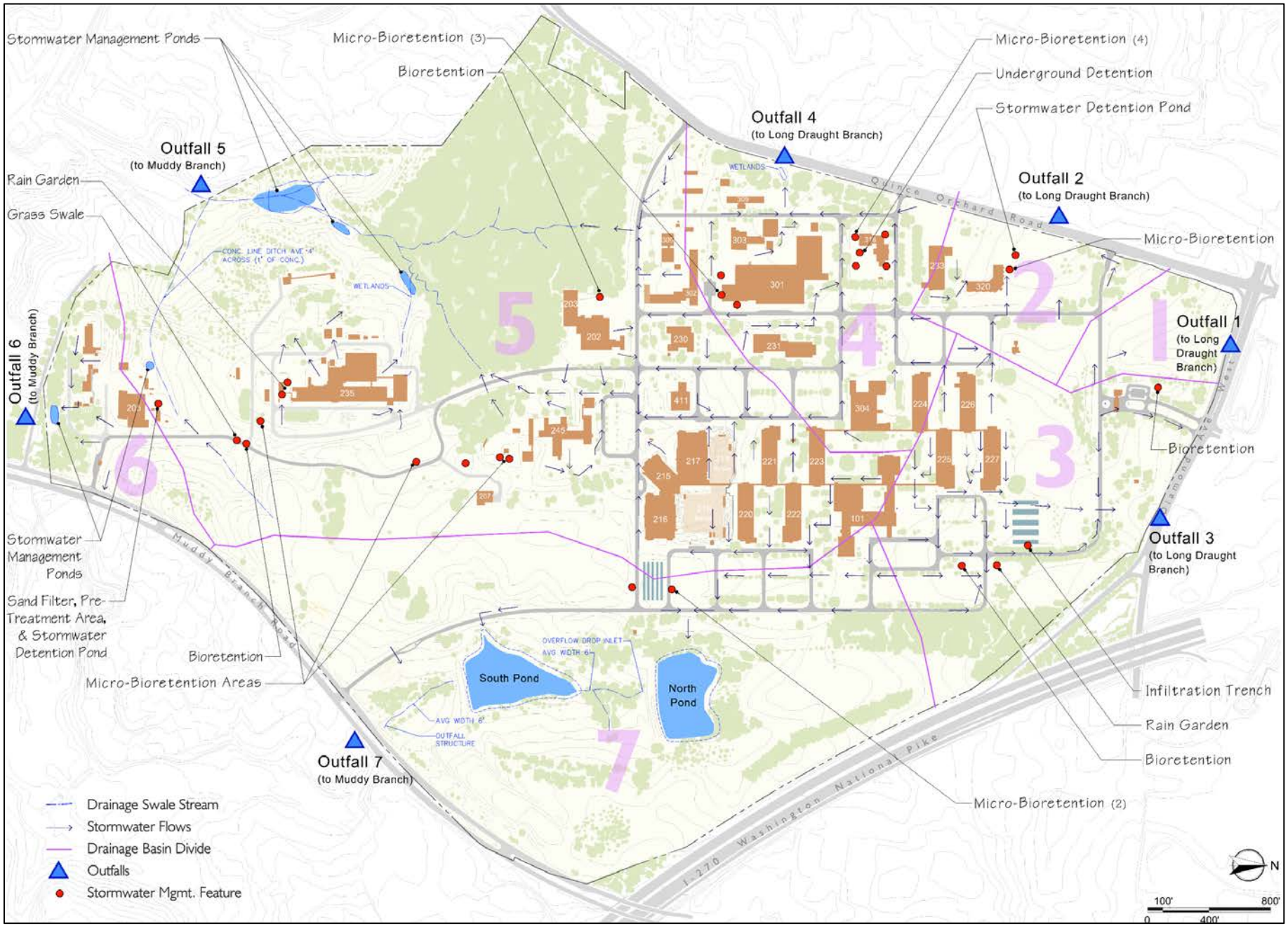


Figure 4-4. Stormwater Management Features at the NIST Gaithersburg Campus

for Strategic Sustainability Performance Plan provides additional guidance for complying with EO 13693.

Environmental Consequences – Proposed Action

Temporary Construction Impacts

Under the Master Plan, construction and demolition activities at the campus would disturb land, creating the potential for erosion and sediment-laden discharges to Long Draught Branch and Muddy Branch. NIST would comply with all state and federal laws, regulations, ordinances, and procedures relating to stormwater management for construction activities. Demolition and construction projects identified in the Master Plan would be subject to these requirements. NIST would develop all appropriate ESC plans and SWMPs, and obtain all necessary permits, to ensure that potential impacts are minimized during earth disturbance.

Long-Term Stormwater Management

Treatment of Existing Impervious Surfaces

Under the Master Plan, NIST would employ various MDE-approved stormwater management strategies to meet MDE's stormwater restoration requirements. Currently, MDE requires planning for the treatment of runoff from 20% of existing, untreated impervious surfaces that were constructed prior to 2006. As discussed in Chapter 6 of the Master Plan, NIST would accomplish this primarily through reforestation and the use of stormwater management (SWM) strategies specified in the *Maryland Stormwater Design Manual* (2009) and *Accounting for Stormwater Wasteload Allocations and Impervious Acres Treated* (2014). SWM strategies to be considered, in addition to reforestation, include bioswales, rain gardens, planter boxes, and other methods. These SWM strategies would promote stormwater infiltration throughout the campus, reduce nutrient and sediment loads to both Muddy Branch and Long Draught Branch, and contribute to improved water quality within the Potomac River Montgomery County watershed and the Seneca Creek watershed. Refer to Chapter 6 of the Master Plan for more information regarding the function and benefits of these proposed features.

Treatment of New Impervious Surfaces

For new construction, the Master Plan acknowledges NIST's commitment to meet state and federal requirements regarding the use of green SWM infrastructure (e.g., ESD) while also attempting to minimize routine maintenance needs. The SWM approach would be unique to each project, responding to its location and immediate surroundings, while seeking to avoid high-maintenance landscape approaches that are susceptible to grazing by the campus-wide deer population. NIST would consider various ESD strategies in determining the SWM approach for each project, including the following:

- Reforestation through a combination of a) planting seedlings and performing adaptive management to expand and increase the density of existing forested areas, and b) planting smaller, separate tree clusters;
- Bioswales, which are grassy swales that promote infiltration and convey non-infiltrated runoff to storm sewer inlets or surface waters;
- Rain gardens and planter boxes, which absorb runoff from adjacent impervious surfaces and hold water during heavy storm events;
- Meadows (created by reducing mowing frequency in existing maintained grasslands), which increase sheet flow infiltration;
- Permeable paving, which allows stormwater to infiltrate to a stone base layer and into the ground;
- Dry wells, which are underground structural facilities that collect roof top stormwater or surface runoff and allow it to percolate slowly into the ground; and
- Building-based strategies, such as cisterns for collection and reuse of rainwater and green roofs on non-laboratory buildings, including the GPLs that will be renovated for office-type occupancy.

Each project would maximize ESD to control its runoff quantity and quality, in accordance with MDE requirements. However, if measures available for certain projects do not satisfy MDE requirements, NIST would employ a compensatory stormwater management approach. NIST may establish a Water Quality Bank (WQB) to serve as the basis for a Compensatory Stormwater Management program as described in the Maryland Stormwater Management and Erosion Sediment Control Guidelines for State and Federal Projects. NIST would add credits to the WQB through various SWM strategies (e.g., removing impervious surfaces, constructing a pond, implementing ESD measures). These credits would be available for application to later development in cases where typical ESD cannot be implemented because of space limitations or other impediments. For example, Exhibit 51 in the Master Plan identifies two potential locations for a consolidated SWM facility (i.e., a retention pond) that NIST is considering for the first development phase of the Master Plan, which would allow NIST to acquire WQB credits that could be debited for development in later phases. If NIST opts to establish a Compensatory Stormwater Management program and WQB, NIST would do so through an agreement with MDE.

Regardless of the specific SWM approach taken, NIST would ensure the design, development, and installation of post-construction BMPs comply with state and federal laws, including state design manuals. NIST would also ensure that selected BMPs are properly designed and maintained to mitigate the potential health and nuisance concerns associated with the detention of standing water.

As described in Section 3.1 (Proposed Action), development under the Master Plan is conceptualized as four phases, and the possibility exists that only certain phases could be implemented. Depending on which phases are completed, the net change in impervious areas within the campus could range anywhere from an approximately 4% increase (if only Phase 1 packages are completed) to an approximately 16% increase (if the full scope of the Master Plan is completed). Refer to Exhibit 78 in the Master Plan for a table describing the changes in impervious area on the campus associated with each phase. Completion of the full Master Plan would increase the impervious surfaces on the campus by approximately 17 acres (from 108 acres to 125 acres).

The increase in impervious surfaces on the campus would have the potential to reduce infiltration and groundwater recharge and potentially increase the velocity (thus increasing soil erosion) of stormwater discharged from the campus. However, by implementing post-construction BMPs as described above and treating 20% of runoff from existing, untreated impervious surfaces, the Master Plan would be expected to reduce the quantity and improve the quality of stormwater discharges to Long Draught Branch and Muddy Branch. Throughout implementation of the Master Plan, the efficacy of the new and existing SWM features and piping conveying stormwater to the MS4 and receiving waters may need to be assessed and upgraded to support campus modifications, as needed.

Environmental Consequences – No Action Alternative

Implementation of the No-Action Alternative would not involve construction, renovation, or demolition; therefore, no additional stormwater impact would occur at the campus. The No-Action Alternative would not improve existing SWM practices to meet the intent of local and federal rules and regulations regarding sustainable management of stormwater.

4.5.4 Energy Systems

The electrical infrastructure at the NIST Gaithersburg Campus provides the energy needed to operate the facilities on campus, while heating and cooling systems consume energy sources in the form of electricity and fossil fuels. EO 13693 establishes a target to reduce energy-use intensity by 25% by FY 2025 from an FY 2015 baseline. DoC Departmental Administrative Order 217-16: *Sustainability and Environmental Management* establishes this target as DoC policy.

4.5.4.1 Electricity

Affected Environment

The primary uses of electricity at the campus are to operate the cooling towers and chillers at Building 302 (Steam and Chilled Water Generation Plant); lighting systems; laboratory equipment; and ventilation and air conditioning systems. A new Combined Heat and Power (CHP) system addition was recently completed that should provide greater efficiency and lower emissions by simultaneously producing heat and power. The system includes an 8.0-MW gas turbine generator package that is anticipated to provide approximately 41% of the annual electricity consumed by the campus. NIST also generates renewable energy using three grid-connected solar arrays ranging in size from 73 kilowatts (kW) to 271 kW. Refer to Section 4.6 (Sustainable Development) for more information regarding the existing solar arrays.

The electrical needs of the campus are served by a four-bus solidly grounded 15 kilovolt (kV) substation, housed in Building 306. The substation is fed from three 69-kV utility feeders via three step down transformers owned by the local utility provider, the Potomac Electric Power Company (PEPCO). Backup power is provided by 17 individual generators that provide limited life safety and standby power supply for specific programmatic needs. These generators are fueled by natural gas or diesel and range in size from 25 kW to 1,000 kW.

Many of the older laboratory and support buildings on the campus are more than 50 years old and need upgrades or replacement of their engineering systems to prolong their useful lives and improve their efficiency. These facilities, as well as newer temporary structures, lack energy efficiency in their infrastructure systems and building envelopes.

Environmental Consequences – Proposed Action

Under the Master Plan, the NIST Gaithersburg Campus electrical demand is expected to increase because of the operation of lighting systems, laboratory equipment, and HVAC systems associated with the new buildings and corresponding increased operation of cooling towers and chillers at the Steam and Chilled Water Generation Plant. The Master Plan includes upgrades to the campus electrical infrastructure (new switchgear building, assessment and replacement of ductbanks and feeders) to support this growth. As new laboratories are renovated or constructed, the Master Plan would install new emergency generators to increase the campus-wide backup capacity from approximately 4 MVA to 15 MVA upon completion of the Master Plan. Normal electrical power service would be extended from the campus distribution system to the new facilities. Electrical ductbanks would be relocated, as necessary, to accommodate new construction. The CHP addition is expected to help reduce the quantity of electricity consumed from the grid. See Section 5 (Cumulative Effects) for additional information regarding the CHP project.

The Master Plan recommends that site-wide projects incorporate energy conserving and solar technologies that will continue to evolve over the life of the Master Plan. Increases in electrical demand would be offset somewhat by renovating aging, inefficient facilities. The Master Plan prioritizes the replacement of aging mechanical and electrical components with more energy efficient equipment and the upgrading of building envelopes to conserve energy.

The renovation of existing buildings, removal of energy inefficient buildings, and construction of new energy efficient facilities would help DoC meet its agency-wide goal of reducing energy intensity at facilities. NIST would target

the new buildings at Gate F (the Visitor Center and the Shipping & Receiving Building at the Commercial Vehicle Inspection Complex) to achieve net-zero energy consumption through reduced energy demand, efficient systems, and solar energy production. Furthermore, the Master Plan includes solar photovoltaic energy systems on selected building roofs, on the new parking structure, and over canopies shielding the parking areas. The Master Plan would also include relocation of the solar array currently next to Building 216 when the AML is expanded and if the conditions of the solar array warrant its relocation. The solar energy systems would further reduce the quantity of electricity consumed from the grid. Refer to Section 4.6 (Sustainable Development) for additional information regarding sustainable design strategies.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not impact electrical infrastructure or demand. Under the No-Action Alternative, NIST would continue to operate energy inefficient facilities and, therefore, would not improve energy efficiency throughout the campus.

4.5.4.2 Heating and Cooling

Affected Environment

Building 302 (Steam and Chilled Water Generation Plant) provides chilled water and steam via a network of direct buried piping to the general and special purpose laboratories, the Administration Building, and many support buildings. Other buildings are supplied with these services locally, as needed. While the steam/condensate distribution piping throughout the campus has recently undergone complete replacement, most of the major equipment and piping systems in the Plant are in good condition with several years of useful life. The north buildings are serviced by a utility loop, which allows for isolation of sections of the piping system without significantly interrupting service to large groups of buildings. The south buildings, on the other hand, are served by a single main which does not provide the same level of utility availability.

The chilled water generating system consists of seven 3,500-ton chillers with an installed capacity of 24,500 tons and a firm capacity of 21,000 tons. *[Note: One ton of refrigeration is equivalent to the energy removal rate that will freeze one ton of water at 32 degrees Fahrenheit in one day, or approximately 12,000 British thermal units per hour (Btu/hr).]* The firm capacity represents the system output without the availability of the largest single generation unit (e.g., with six of the seven chillers in operation). The peak cooling load is estimated to be 17,000 tons. This indicates an available additional capacity of 4,000 tons for future load additions.

The existing steam generating system consists of six boilers with a total nameplate capacity of 336,000 PPH, provided by four 44,000-PPH boilers and two 80,000-PPH boilers. Firm capacity of the plant with the largest boiler out of service is 251,000 PPH when natural gas is available and 160,000 PPH when natural gas is curtailed. All boilers are dual fuel (natural gas and ultra-low sulfur diesel) fired, water-tube boilers with stack economizers. The peak steam load is estimated to be 160,000 PPH. This indicates an available additional capacity of 96,000 PPH for future load additions. After implementation of the CHP project, the final output of the steam generation system will remain unchanged.

Building 101 (Administration Building) and the seven original GPLs are in need of significant modernization and HVAC replacement in the near future. In addition, some of the specialty laboratories also require upgrades to the HVAC system and upgrades to the interior environment for improved efficiency and function.

As discussed in Section 4.5.1 (Potable Water Supply), potable water is used for make-up water in the steam production and cooling tower systems.

Environmental Consequences – Proposed Action

Under the Master Plan, Building 302 (Steam and Chilled Water Generation Plant) would supply the new and renovated NIST laboratory facilities with chilled water and steam. Chilled water and steam piping systems would be extended to most of the new and renovated buildings in the Master Plan. Existing underground steam piping would be relocated, as necessary, to accommodate new construction.

Increases in heating and cooling demand associated with new buildings would be offset somewhat by the removal of Buildings 411 and 428 and renovation of inefficient and under-insulated buildings. The renovated buildings would feature improved insulation and HVAC efficiency. NIST would use natural and passive ventilation, heat recovery systems, and decoupled ventilation/cooling, where feasible, to improve HVAC energy efficiency. This would help DoC meet its agency-wide goal of reducing energy intensity at facilities. The existing buildings to be retained in the rest of the campus would continue to have dedicated HVAC systems.

The existing steam generation system capacity is expected to be adequate to support the Master Plan growth. However, enhancements to the chiller capacity would be required during the mid-to-late Master Plan construction to support the campus growth. Specifically, the Master Plan would include installation of two additional 3,500-ton chillers, a new cooling tower, and an additional piping main from Building 302 to the distribution system. The Master Plan also would establish a new chilled water and steam supply main for the south buildings to create a looped supply and increase the utility system reliability, and would install a new chilled water main to create a looped supply for Research Building I and the five northernmost GPLs.

For stand-alone buildings that are remote from the campus thermal utility grid, such as the new facilities at Gate F, the Master Plan proposes the use of ground source heat pumps for space cooling and heating. Deep well geothermal systems

can provide required cooling and heating capacity for the anticipated building loads while supporting the net-zero energy goals of these buildings.

Impacts on potable water demands because of increased heating and cooling loads are discussed in Section 4.5.1 (Potable Water Supply). Impacts on air emissions and greenhouse gases (GHGs) are discussed in Sections 4.9 (Air Quality) and 4.10 (Climate Change).

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not implement the facility space expansion associated with the Proposed Action and therefore would not impact heating and cooling demand or systems. However, the NIST Gaithersburg Campus would continue to operate facilities with energy inefficient building envelopes and HVAC systems.

4.6 Sustainable Development

Affected Environment

Sustainable development is the practice of modifying or creating structures and processes that are environmentally responsible and resource-efficient throughout their lifecycles. Environmental stewardship and sustainable development are crucial to DoC's ability to fulfill its mission of creating conditions for economic growth and opportunity by promoting innovation, entrepreneurship, competitiveness, and stewardship (DoC, 2013).

EO 13693, issued March 19, 2015, requires that 15% of existing buildings greater than 5,000 SF meet the revised Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings (Guiding Principles) by FY 2025 and that federal agencies continue towards 100% compliance for the complete building inventory. The Guiding Principles require buildings to implement or achieve a combination of sustainable requirements such as optimizing energy performance, protecting and conserving water, enhancing the indoor environmental quality, and reducing the environmental impacts of materials. NIST must also comply with the requirements of the NIST *Sustainable Design Manual* (July 31, 2014) and the DoC *Real Property Management Manual* (rev. March 2017), which include the NIST and DoC policies regarding sustainable design of federal facilities.

DoC strives to achieve sustainable development by installing high-performance facilities and utilizing low-impact development principles (DoC, 2013). DoC annually updates its Strategic Sustainability Performance Plan (SSPP) in accordance with EO 13693. The SSPP identifies how DoC incorporates sustainability into its goal of growing the national economy, furthering energy security, and protecting the health of the environment (DoC, 2013). Topics addressed in the SSPP include greenhouse gases, sustainable development and acquisition, water efficiency, pollution prevention and waste elimination, electronics stewardship, and innovation (DoC, 2013).

The City of Gaithersburg 2009 Master Plan: *Environment and Sustainability* outlines the City's approach to sustainable growth and development. Recommended sustainable development efforts include expanding the City's tree canopy to be consistent with the State's canopy coverage goals by 2025, engaging in watershed planning to allow for local water resource protection, and addressing local effects of climate change, among other items (City of Gaithersburg, 2015a). Additionally, Montgomery County guidelines recommend forest cover on at least 15% of a site's acreage.

Montgomery County has developed a *Climate Protection Plan* which includes 58 recommendations for addressing climate change. In April 2008, the County adopted Bill 32-07, codifying the goals to reduce county-wide greenhouse gas emissions to 80% below FY 2005 levels, stop increasing county-wide greenhouse gas emissions by 2010, and achieve a 10% reduction every five years through 2050.

The NIST Gaithersburg Campus currently embraces many of the principles of sustainable design in both operations and research, including stormwater management, whole-house energy research, and utilizing open space as a significant campus resource. NIST also studies, utilizes, and assesses energy output for solar panels in various configurations. Currently, a canopy array (243 kW) faces east-west over a parking lot. A surface array (271 kW) is mounted in an open area east of the AML, and a north-south facing roof array (73 kW) is located on a flat roof area of Building 101. In addition, as discussed in Section 5 (Cumulative Effects), a project is underway to develop a 15-acre, 5-MW solar array near the south end of campus to provide approximately 5% of the campus electrical power requirements. NIST also purchases renewable energy certificates (RECs) for the campus to meet one of the sustainability goals of EO 13693. In FY 2017, NIST exceeded the EO 13693 target by purchasing more than 64,000 megawatt-hours of RECs.

The campus manages its stormwater runoff with several retention ponds, bioretention areas, and rain gardens. Construction of all recent buildings has included new micro-bioretention areas, and erosion and sedimentation plans are implemented during construction to improve water quality and enhance groundwater recharge. Refer to Section 4.5.3 (Stormwater Management) for additional information regarding sustainable stormwater management practices at the campus.

Environmental Consequences – Proposed Action

The Master Plan would result in an overall improvement to campus sustainability. As a core component of the Master Plan, NIST would strive to increase the efficiency of the campus by retrofitting current inefficient buildings and upgrading outdated equipment. Construction and renovation under the Master Plan would be conducted in compliance with EOs, federal requirements,

and NIST sustainability goals. A goal of the Master Plan is to achieve Leadership in Energy and Environmental Design (LEED) Gold certification (or higher) for each new or renovated building. Furthermore, NIST would target the new buildings at Gate F (the Visitor Center and the Shipping & Receiving Building at the Commercial Vehicle Inspection Complex) to achieve net-zero energy consumption through reduced energy demand, efficient systems, and solar energy production.

The Master Plan promotes sustainable development by proposing the renovation of existing buildings (e.g., the GPLs and Building 101) instead of pursuing new construction and redevelopment to provide all new laboratory and administrative space. Benefits of this approach can include reduced need for raw construction materials and reduced generation of construction-related waste via the reuse of structural elements and recycling of building materials.

The Master Plan prioritizes the replacement of aging mechanical and electrical components with more energy efficient equipment and the upgrading of building envelopes to conserve energy. The Master Plan may also install geothermal systems at stand-alone buildings, which would provide sustainable sources of heating and cooling. For more information regarding updates to the campus energy systems, refer to Section 4.5.4 (Energy Systems).

The Master Plan would design new and renovated buildings to include clustered building functions for efficient HVAC use, daylighting, high performance building envelopes, on-site photovoltaic systems, natural ventilation, and implementation of energy conservation approaches (i.e., demand controls, energy recovery, fume hood controls, air-side and water-side economizers) to achieve overall energy demand and use reductions. Implementation of the Master Plan would involve replacing existing water fixtures to aid in achieving NIST's goal of reducing water consumption. Over the 20-year timeframe of the Master Plan, NIST would continue to assess and incorporate emerging technologies to promote improved sustainability, where feasible. NIST would also continue to purchase RECs in accordance with EO 13693.

As previously mentioned, implementation of the Master Plan would include execution of the landscape plan, which proposes conducting reforestation efforts on the south and east sides of the campus. Execution of the landscape plan would provide enjoyable outdoor spaces while simultaneously absorbing atmospheric pollutants and providing shade for buildings, thus moderating temperatures. The landscape plan also involves replacing grasslands with native meadows, which would require less maintenance and would aid in stormwater management. Under the Master Plan, disturbance of landscape features would be minimized during construction and additional LID BMPs would be installed throughout the campus, which would reduce soil erosion and improve surface water quality.

Construction activities at the campus would temporarily impact soil and vegetation, and would generate waste. However, NIST would recycle construction and demolition debris to the extent practicable and ensure the proper disposal of other non-recyclable materials. Construction would require the commitment of a wide range of raw materials, which will involve the fabrication and manufacture of construction materials requiring large quantities of energy and natural resources. In general, construction materials are readily available, and the construction of new facilities would not have an adverse effect on continued availability of these resources.

Operation of the proposed facilities and transportation of additional employees to the campus would also require the commitment of fossil fuels to operate generators, vehicles, and other fuel-burning equipment. Overall, the long-term improvements in sustainability of the campus associated with implementation of the Master Plan, combined with the continued preservation of open spaces on the campus, are expected to greatly outweigh short-term and continuing commitments of readily available resources.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not result in any changes to campus infrastructure. The energy demand at the campus would not change. The potential to increase energy efficiency, improve stormwater management, landscapes, and improve the overall sustainability of the campus in accordance with EO 13693 (in addition to County and City goals) would not be realized under the No-Action Alternative.

4.7 Solid and Hazardous Waste

Affected Environment

Solid waste is defined as any garbage, refuse, sludge, or other discarded material including solid, liquid, semisolid, or contained gaseous materials resulting from industrial, commercial, agricultural, or community activities. USEPA defines hazardous waste as a solid waste that exhibits a characteristic of ignitability, corrosivity, reactivity, or toxicity, or is specifically listed as a hazardous waste.

Hazardous and nonhazardous solid wastes are regulated by federal, state, and Montgomery County laws. The Resource Conservation and Recovery Act (RCRA) authorizes USEPA to control hazardous waste from "cradle to grave." This lifecycle includes the generation, transportation, treatment, storage, and disposal of waste. Subtitle D of RCRA encourages states to initiate and oversee the implementation of solid waste management plans in order to promote recycling practices. USEPA has delegated authority to MDE to implement hazardous waste regulations and oversight. As a result, MDE has developed solid waste regulations (COMAR 26.04.07) and hazardous waste regulations (COMAR 26.13).

EO 13693 (*Planning for Federal Sustainability in the Next Decade*) and EO 12873 (*Federal Acquisition, Recycling, and Waste Prevention*) set goals for the federal government to conduct operations in a manner that is sound in terms of

energy efficiency, toxic chemical reduction, recycling, sustainability, and water conservation. In addition, USEPA's *Guidelines for Thermal Processing of Solid Wastes* (40 CFR 240) and *Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste* (40 CFR 243) provide specifications for the treatment and disposal of municipal solid waste.

NIST reviewed available databases for solid and hazardous waste sites in the general area around the NIST Gaithersburg Campus. Environmental databases used in this review include the National Priorities List database; Comprehensive Environmental Response, Compensation, and Liability Information System database; RCRA Information database; and USEPA's NEPAssist mapping tool. This review revealed that there are no nearby solid or hazardous waste sites with potential to impact the campus.

Facilities at the NIST Gaithersburg Campus generate various types of hazardous, non-hazardous, radioactive, medical, and universal wastes (which are hazardous wastes that are very commonly used and have less stringent disposal requirements). NIST's policy concerning the management of these wastes is to protect human health, property, and the environment, while complying with all state, federal, and local laws regarding their use, transportation, storage, treatment, and ultimate disposal. As a component of this responsibility, the NIST Office of Safety, Health, and Environment (OSHE) oversees the storage of waste in Building 312 (Materials Processing Facility), which is a 90-day accumulation site for hazardous, medical, and universal waste. Radioactive waste is managed in Building 235 by a staff of radiation safety specialists in accordance with requirements of the Nuclear Regulatory Commission. Non-hazardous waste is accumulated in dumpsters to be collected by a local waste hauler. Each facility on campus is also required to collect their recyclable waste in separate containers specified for white paper, mixed paper, and bottles and cans. Other solid waste that is recycled by NIST includes construction and demolition debris, fluorescent tubes, batteries, electronic waste, and used oils. In 2016, NIST recycled more than one million pounds of material collected within the campus (NIST, 2017).

Because of the quantity of hazardous waste generated, the NIST Gaithersburg Campus has been registered with USEPA for over twenty years as a large-quantity generator of hazardous wastes (USEPA ID No. MD 5 1215 31811), defined by 40 CFR 262 as a facility that generates 1,000 kilograms per month or more of hazardous waste, or more than 1 kilogram per month of acutely hazardous waste. To manage this hazardous waste, NIST has a comprehensive occupational safety and hazard safety program to oversee the safe handling, use, transportation, storage, and disposal of hazardous materials and wastes. Hazardous substances are handled, bulked, and made ready for shipment off-site in Building 312. The NIST Waste Disposal Procedures, which are maintained by the NIST OSHE, cover chemical waste, radioactive waste, and special medical waste, as well as procedures for recycling within the campus. Biennially, NIST submits a Hazardous Waste Report to USEPA that describes the type, quantity, and disposal sites for all hazardous wastes produced at the campus.

In accordance with the Emergency Planning and Community Right-to-Know Act (EPCRA, 40 CFR Parts 350-372), a statute designed to improve community access to information about chemical hazards and to facilitate the development of chemical emergency response plans by state and local governments, NIST annually submits a Hazardous Chemical Inventory, Tier II Report, to the State of Maryland and USEPA. For the period January 1, 2016 to December 31, 2016, NIST reported 13 chemicals stored at the campus above EPCRA threshold quantities. Thousands of other hazardous chemicals/materials are utilized on the NIST campus, but these chemicals are primarily used in laboratory-scale research and in quantities that do not meet the threshold requirements for annual reporting. These chemicals are known by USEPA to exist on campus. If quantities of these chemicals increase in use beyond the EPCRA thresholds, they would be reported by NIST in the annual Tier II reports.

Environmental Consequences – Proposed Action

The implementation of the Master Plan would generate construction and demolition waste, which would require collection, staging, and removal from the campus. Wastes would be handled and disposed of in accordance with MDE regulations. Recycling of construction and demolition debris would be implemented to the extent practicable. Demolition of older facilities may involve the removal of materials or equipment containing polychlorinated biphenyls (PCBs), lead, asbestos, or ozone-depleting substances. Demolition or renovation of older facilities could result in the removal of PCB-containing transformers. Disposal methods would be addressed under the construction permit, including the cost of sampling, transporting, and discharging of said wastes to an appropriate facility in compliance with MDE regulations.

The Master Plan would retain Building 312 as the hazardous waste storage building. Operations in the various proposed administrative, support, and laboratory facilities would be expected to generate similar types of hazardous wastes as existing operations within the campus. Given the projected increase in staff and operational space, the quantity of these wastes would increase slightly. Specifically, the expansion of the AML and renovations to the GPLs would increase the generation of acids and organic waste. However, Building 312 would have adequate capacity for these modifications as well as all other proposed laboratory expansions and renovations that would generate hazardous waste. The new SRM Facility would include storage of reference materials, including biologic (animal/human) materials and high purity chemicals. NIST would continue to manage any hazardous and medical waste resulting from activities at the campus in accordance with NIST Waste Disposal Procedures. As of now, the Master Plan is not expected to result in the introduction of any chemicals that have not been previously documented and used on the NIST Gaithersburg Campus. However, if new chemicals would be introduced, NIST has suitable practices in place to manage the resultant wastes appropriately. The Master Plan would not change the amount of radioactive waste generation, thus the existing management practices on campus for radioactive waste are adequate.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would result in no changes in the generation, storage, or disposal of solid or hazardous waste. The No-Action Alternative would not involve the removal of hazardous building materials including asbestos, lead, and PCBs.

4.8 Circulation and Transportation

4.8.1 Vehicle Circulation and Parking

Affected Environment

Gaithersburg is located northwest of Washington, DC and southwest of Baltimore, two heavily trafficked metropolitan areas. Various roadways surround the campus and bring vehicular traffic within a half mile of the campus. Located off Interstate 270, the campus is bounded by MD Route 124 (Quince Orchard Road) to the west, MD Route 117 (West Diamond Avenue) to the north, Interstate 270 and Muddy Branch Road to the east, and residential areas to the south.

The campus is served by six gates, four of which (Gates A, B, C, and F) are routinely used, while the other two (Gates D and E) are not. Gate A is located off West Diamond Avenue at Bureau Drive. This gate serves as the main entrance to the campus and is used by staff and all visitors, except attendees of major conferences. As such, the areas surrounding Gate A can become congested at peak ingress and egress times. Gates B, C, and D are located along Quince Orchard Road and Gates E and F are located along Muddy Branch Road. Commercial vehicles enter the campus at Gate C and are directed to the screening point at Building 301. Based on data from September and October 2016, approximately 75 commercial vehicles enter the campus per weekday, with approximately 75% of deliveries taking place in the morning. The peak hour for deliveries is from 6 to 7 a.m., with an average of 15 deliveries during this hour on a typical weekday. This can result in traffic congestion on southbound Quince Orchard Road as commercial vehicles wait in the center lane to make a left turn into Gate C. Commercial vehicles have also been known to stage in this center lane prior to the daily opening of Gate C.

Within the campus, a network of streets organized in a grid pattern, running north-south and east-west connects the facilities. North Drive and South Drive are the primary east-west connector roads within the campus, while East Drive, Center Drive, West Drive, and Service Drive are the main north-south connector roads.

The campus contains 3,704 parking spaces, 229 of which are reserved for service vehicles and 3,475 of which are available for campus staff and visitors. Based on a current campus employee population of 4,007, the parking-to-employee ratio is approximately 1:1.2. NCPC guidelines suggest parking-to-employee ratios between 1:1.5 to 1:2 for federal facilities, such as NIST, that are located in suburban areas beyond 2,000 feet of Metrorails. The suggested parking ratio applies only to federal employees, exempting service vehicles, visitors, conference attendees, and non-federal employees, such as associates and guest researchers. According to a 2016 NIST employee survey, demand for parking increases during conferences, but on an average weekday demand is approximately one space per 1.67 employees. The survey revealed that most employees (84% of current staff) drive to work alone in a personal automobile.

NIST facilitated a traffic study in 2015, which reviewed the campus transportation infrastructure for appropriate design and compliance with local and state transportation standards. Roadway widths, curbs, signage, controls, and sidewalks were reviewed, and most were deemed in compliance. Traffic counts were also collected on and around the campus revealing that the on-campus intersections operated within accepted standards, while capacity concerns were noted at several intersections feeding the campus. In particular, the following three intersections near the campus were found to provide a Level of Service (LOS) below acceptable levels, especially during morning rush hour:

- West Diamond Avenue (MD Route 117) and Quince Orchard Road (MD Route 124), immediately northwest of the campus;
- Great Seneca Highway (MD Route 119) and Quince Orchard Road (MD Route 124), approximately 0.6 miles southwest of the campus; and
- Great Seneca Highway (MD Route 119) and Muddy Branch Road, approximately 0.8 miles south of the campus.

NIST staff also mention that the ramp from MD Route 117 to southbound Interstate 270 can become very congested during peak hours. The most notable recommendations resulting from the 2015 study were roadway modification around Gate A for safety and congestion and at Gate C for commercial vehicle screening (NIST, 2015). Refer to Exhibit 142 in the Master Plan for a list of other recommendations that resulted from the study.

NIST currently utilizes TDM, which involves the application of policies and strategies to reduce travel demand or to redistribute demand to other times, spaces, or modes. Refer to Chapter 7 of the Master plan for additional information on campus parking, transportation, and TDM strategies.

Environmental Consequences – Proposed Action

Implementation of the Master Plan would result in improved traffic circulation on the campus and at points of entry. Circulation improvements at Gate A would include new roadways, parking, a roundabout, a drop-off lane, and an exit lane for staff or visitors who are rejected in the screening process. These improvements would help to reduce queueing during rush hour and conflicts between visitor and employee vehicles. The Master Plan would relocate the commercial vehicle entrance from Gate C to Gate F; construction of the

Commercial Vehicle Inspection Complex at this location would eliminate the need for most commercial vehicles to drive onto the campus, which would reduce unnecessary traffic within the campus. In addition, it would eliminate traffic congestion along the center lane of Quince Orchard Road where commercial vehicles tend to get backed up making a left turn into Gate C. Relocation of the commercial vehicle entrance to Gate F, if not designed properly, could result in congestion along Muddy Branch Road because of queueing and conflicts with conference attendees also entering for screening at Gate F. The Master Plan would mitigate this concern by providing separate entrance driveways at Gate F for commercial vehicle traffic and passenger vehicles and providing sufficient space for commercial vehicles to stage for screening just inside the campus, before the security checkpoint.

However, because of an increase of approximately 1,099 NIST personnel over the course of the Master Plan, there would likely be an increase in privately owned vehicles (POVs) entering and exiting the campus during peak hours, which could affect the existing congested intersections surrounding the campus. The relocation of the commercial vehicle entrance to Gate F would also have the potential to increase traffic along Muddy Branch Road and Diamondback Drive (located southeast of the campus) as commercial vehicle drivers follow different routes to access the campus from Interstates 270 and 370. To mitigate this concern, the Master Plan proposes specific new TDM policies to further encourage use of public transportation and bicycles, and thereby reduce the use of single occupancy vehicles. See Chapter 7 of the Master Plan for details on the proposed TDM policies. Additionally, as discussed in Section 5 (Cumulative Effects), numerous residential construction and public transportation projects are planned in the immediate vicinity of the campus. These developments would be expected to allow a greater proportion of NIST employees to live near the campus and to use public or other alternative methods of transportation (e.g., biking or walking), thus helping to offset the potential increase in POV use. The rapidly changing technology of autonomous vehicles and ridesharing services could also influence, and potentially reduce, the use of POVs by campus employees over the course of the Master Plan.

While the Master Plan anticipates an increase in personnel, there would be a potential reduction in intra-campus POV use because of improved pedestrian connectivity, as discussed in Section 4.8.3 (Pedestrian Circulation).

Under the Master Plan, NIST would gradually reduce the available parking per employee. While the number of campus personnel is expected to increase by 27% over the course of the Master Plan, parking spaces would increase by only approximately 7%. Following full implementation of the Master Plan, the parking-space-per-employee ratio would be reduced to 1:2, which falls within the NCPC guidelines. The reduced parking availability would serve to further encourage staff to use public and alternative methods of transportation and reduce traffic congestion outside the campus.

The Master Plan would result in temporary increases in traffic during construction and demolition activities. Construction activities could also temporarily affect parking availability by closing off lots or occupying lots with construction vehicles and equipment. NIST would coordinate construction activities and create temporary parking and staging areas to ensure that vehicles are not forced to park off campus, park in grassy areas, or cause other impacts because of a temporary lack of parking capacity.

Environmental Consequences – No-Action Alternative

Because the No-Action Alternative would not change the number of employees at the NIST Gaithersburg Campus, it would not impact the local transportation network or traffic levels and would not change vehicle use or parking availability within the campus. There would, however, be no improvement to campus ingress or vehicle circulation within the campus, and the No-Action Alternative would not alleviate traffic concerns along Quince Orchard Road that result from commercial vehicles turning into Gate C. The employee to parking ratio would remain out of compliance with NCPC guidelines as well.

4.8.2 Public and Alternative Transportation

Affected Environment

The City of Gaithersburg has a strong public transportation network. The campus is currently served by four RideOn bus routes with stops along West Diamond Avenue, Quince Orchard Boulevard, Firstfield Road, and Quince Orchard Road. These four RideOn routes service the site with 40 buses during the morning peak hour and 42 buses during the afternoon peak hour. Additionally, Building 101 (Administration Building) is served directly by the 54 route, which runs from Lakeforest Mall to the Rockville Metrorail Station. It services the campus with one bus in each direction during the morning and afternoon peak hours.

The Maryland Transit Administration (MTA) Commuter Bus provides service between the north end of campus and areas west and north of the campus, including the Shady Grove Metrorail station, the Dorsey MARC station, and the Baltimore/Washington International Thurgood Marshall Airport (BWI). Hourly service is provided during weekdays. The closest MARC stations to the campus are the Metropolitan Grove and Gaithersburg stations, which are located approximately one mile northwest and 1.5 miles northeast, respectively, from the campus. The nearest Metrorail station is Shady Grove, located approximately four miles southeast of the campus. The CCT is a planned 15-mile Bus Rapid Transit (BRT) line in Montgomery County. Phase 1 of the project would link the Shady Grove Metrorail station to the Metropolitan Grove MARC station, and would include a stop at the campus (along Quince Orchard Road). See Section 5 (Cumulative Effects) for further discussion of the planned CCT project.

A summer 2016 NIST employee survey revealed that less than 4% of employees commute to the campus via public transportation. Out of respondents who commute to the campus using public transportation, 73% use the Metrorail, 16% use RideOn services, 11% use MARC, and none use the MTA Commuter Bus. Of the 815 employees who responded to the survey, 95% indicated that they do not expect to change their primary mode of commute to the campus following opening of the CCT.

As discussed in Section 4.8.1 (Vehicle Circulation and Parking), NIST uses TDM to reduce travel demand or to redistribute demand to other times, spaces, or modes. Elements of the TDM program currently implemented by NIST include encouraging public transportation usage through operation of a shuttle to the Shady Grove Metrorail station, a shuttle to the Metropolitan Grove and Gaithersburg MARC stations, and providing transit subsidies. Refer to Chapter 7 of the Master Plan for additional details on TDM.

The campus is accessible to nearby on-street bicycle facilities. Shared-use paths are present along Clopper Road and West Diamond Avenue, which provide east-west connectivity between the Metropolitan Grove MARC station and Gate A. A shared-use path to the south of the campus provides southern connectivity to the Great Seneca Highway, with bicycle access to areas northwest and southeast of the site. Also, as discussed in Section 5 (Cumulative Effects), a new shared-use path is planned along the west boundary of the campus. Bicyclists within the campus use a combination of on-campus roadways and sidewalks, because of a lack of bicycle lanes. There are few bike racks on campus, except for those near Building 235.

Environmental Consequences – Proposed Action

Because of an increase of approximately 1,099 NIST personnel over the course of the Master Plan, public transportation ridership to and from the campus is expected to increase. The Master Plan proposes developing a more robust TDM program to make the campus more accessible, multi-modal, and efficient. Specifically, the Master Plan proposes additional paved pedestrian corridors to provide better connectivity to bus stops; identifying a TDM Coordinator; providing a shuttle interior to the campus; improving bicycle storage (racks and lockers) and access opportunities; and identifying locations for potential Capitol Bikeshare stations. These improvements are expected to result in an increase in proportion of campus staff who use public and alternative transit options. Implementation of the CCT, discussed in Section 5 (Cumulative Effects), could also result in an increase in public transportation ridership to and from the campus.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not result in expansion of the TDM program and improvements to campus infrastructure to promote use of public and alternative transportation.

4.8.3 Pedestrian Circulation

Affected Environment

Pedestrian circulation on the campus is a dual system. One is an interior concourse system that connects the laboratories in the center of campus, and the other is an outside sidewalk system along the roadways. The interior concourse has over three-quarters of a mile of corridor, and connects Building 101 (Administration Building), Building 304 (Shops Building), and thirteen of the laboratory buildings. A covered walkway connects GPL Building 225 to Building 101. The concourse is convenient for staff, but disorienting for newcomers because of changes in orientation and levels and a lack in visual or signage cues. The outside sidewalk system is not continuous throughout campus and the 2015 traffic study identified issues with curbs and crosswalks.

Some areas on campus lack pedestrian connectivity. Some of the feeder roads do not have sidewalks, causing pedestrians to walk in the street when using several of the parking lots. Walkways on campus are limited to sidewalks along the roads and a trail in the large forest conservation area. Most landscape features on the campus are not connected with walkways for easy staff access. Also, the pedestrian connection from the main Gate A to center campus is not direct, requiring pedestrians to walk far to the east or west along the roadways. This is an annoyance for visitors who come by public transportation, because the shuttle bus drops them at the gate, and to staff who enter Gate A as pedestrians. NIST has undertaken a phased sidewalk improvement program where the existing asphalt sidewalks are being replaced, and new walks are being installed to complete needed connections.

Some of the sidewalks and curbs on the campus do not meet City of Gaithersburg, Montgomery County Department of Transportation (MCDOT), and State Highway Administration (SHA) standards because of width, curbs, pavement materials, and distance from the street. Refer to Chapter 7 of the Master Plan for more information.

Environmental Consequences – Proposed Action

Implementation of the Master Plan would improve pedestrian circulation on the campus by establishing an east-west pedestrian promenade, adding new sidewalks, connecting discontinuous sidewalks, constructing a walkway from the core buildings to Building 301 (Supply and Plant Building) and the planned CCT transit stop, adding a walkway to connect Building 103 (Visitor Center) to the campus core, and developing a recreational walking path that would encircle the campus. Focusing new laboratory and administrative space within the existing campus core would also help to emphasize connectivity. New buildings constructed under the Master Plan would be connected by new pedestrian corridors, which may also serve to improve connectivity among existing facilities. The Master Plan also suggests dedicated walkways through the parking lots and parking garage.

Implementation of the Master Plan would allow NIST to ensure that pedestrian access complies with MCDOT and SHA standards.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not improve the existing pedestrian infrastructure or facilitate achievement of compliance with local standards.

4.9 Air Quality

Affected Environment

Air quality refers to the degree of pollution in the air, often assessed by measuring concentrations of pollutants and comparing them to health-based limits set by the USEPA. Airborne pollutants originate from a variety of sources including anthropogenic (man-made) or natural (e.g., forest fires). Most anthropogenic emissions arise from fossil fuel combustion.

National Ambient Air Quality Standards

The Clean Air Act (CAA) designated USEPA the authority to set National Ambient Air Quality Standards (NAAQS) to limit the concentration of pollutants considered harmful to public health and the environment (40 CFR Part 50). The NAAQS regulate six specific pollutants, commonly referred to as "criteria pollutants" that include ozone, particulate matter (PM), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead. The NAAQS limit PM levels according to particle size, with separate standards for coarse (PM_{10}) and fine ($PM_{2.5}$) particulate matter. Refer to Appendix C, Table C-1 for the current NAAQS as of November 2017 (USEPA, 2017c).

If a region's air pollutant concentrations are not in violation of the NAAQS, USEPA designates the area to be in *attainment*. For areas USEPA designates as *nonattainment*, there are several categories from *marginal* to *severe* that USEPA could assign depending on the severity of the exceedance. A nonattainment designation requires that a region submit a State Implementation Plan (SIP) that addresses how the NAAQS will be met in a future year. USEPA later determines whether the region has met the SIP goals, and if so, USEPA changes the designation from nonattainment area to *maintenance area*.

The CAA requires that the USEPA regularly review the NAAQS in the context of the latest science and health studies to determine whether the NAAQS still adequately protect human health and the environment. As such, USEPA has lowered the NAAQS periodically since the program's inception. Designations from previous NAAQS levels still apply until the nonattainment area successfully demonstrates attainment and USEPA agrees to re-designate the area.

The USEPA has designated the Metropolitan Washington region, which includes Montgomery County, as a "marginal" nonattainment area for the 2008 ozone standard of 75 parts per billion (ppb) and a "moderate" nonattainment area for the previous 1997 ozone standard of 80 ppb. Montgomery County is an attainment area for PM, CO, SO_2, NO_2, and lead (40 CFR 81.321). Part of Montgomery County is a CO maintenance area, but the campus is not located within this area (USEPA, 2017d).

The CAA General Conformity Rule (GCR) requires that federal actions taking place in nonattainment areas must conform to the region's SIP for reducing airborne concentrations of the nonattainment pollutant(s). Because the campus is located in an ozone nonattainment area, this EA includes a review of the emissions that would be expected from the construction and operational activities under the Proposed Action to determine whether they would exceed *de minimis* levels and trigger a SIP conformity determination. The *de minimis* level for the precursors of ozone [nitrogen oxides (NOx) and volatile organic compounds (VOCs)] is 100 tons per year.

Emission Sources

Operations at the NIST Gaithersburg Campus generate air emissions from multiple sources, including the following:

- Regulated stationary sources including boilers, large emergency electric generators (>500 horsepower), a fire lab, and a gasoline tank;
- Insignificant emission sources including fume hoods, cooling towers, and smaller emergency electric generators (< 500 horsepower); and
- Mobile sources including various maintenance vehicles and commuter vehicles.

NIST holds a Part 70 permit (24-031-00323) from the MDE Air and Radiation Management Administration to operate its emission sources on campus, as required under COMAR 26.11.03. This permit consolidates all applicable state and federal air quality requirements, including emissions limits and monitoring, operational limits, recordkeeping, and reporting requirements. The permit includes specific requirements for 10 emission units: six boilers, two emergency generators, Building 205 (Large Fire Facility), and one underground storage tank. These are described in more detail below:

- The largest stationary emission sources at the campus are the six boilers at Building 302 (Steam and Chilled Water Generation Plant). Four boilers have heat input ratings of 55 million Btu (MMBtu) per hour and the other two boilers have heat input ratings of 99.8 MMBtu per hour. The boilers produce emissions of NOx, CO, VOC, SO_2, and PM during regular operation. All the boilers are equipped with low-NOx burners and use natural gas as their primary fuel with No. 2 fuel oil as a backup fuel. The two larger and newer boilers are subject to opacity standards and SO_2 limitations under the New Source Performance Standards for Small Industrial-Commercial-Institutional Steam Generating Units (40

CFR Part 60 Subpart Dc). In 2016, the six boilers consumed a total of 727 million standard cubic feet (MM scf) of natural gas.

- The two permitted emergency generators are rated at 500 kW (supporting Building 227) and 1,000 kW (supporting Building 215). The permit limits the annual operation of the generators to 100 hours each. The emergency generators are to subject to operational limitations and requirements under the National Emissions Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines (40 CFR 63, Subpart ZZZZ). NIST operates 15 other emergency generators (portable and stationary) not subject to permitting requirements that are fueled by natural gas or diesel that range in size from 25 kW to 880 kW.
- In Building 205, NIST conducts large-scale tests and experiments involving fire occurrences in buildings, which require combustion of a variety of materials using natural gas burners. Emissions from Building 205 are controlled using four preheaters, four air scrubbers, and four baghouse filters. The permit requires no visible emissions from the stack during combustion.
- The permitted 6,000-gallon gasoline underground storage tank at Building 303 (Service Building) is subject to operational and recordkeeping requirements under the NESHAP for Gasoline Dispensing Facilities (40 CFR 63, Subpart CCCCCC). NIST also operates eight 30,000-gallon underground storage tanks containing heating oil and several other tanks throughout the campus that contain diesel to support the emergency generator systems.

Other minor stationary emissions sources include fume hoods, which provide ventilation for laboratory spaces in multiple buildings. To avoid accidental releases of ozone-depleting substances, NIST maintains and disposes of refrigerant-containing equipment in accordance with the requirements of 40 CFR 82, Subpart F.

In Maryland, a permit to construct (PTC) from MDE is required before construction or modification of an emission source (COMAR 26.11.02.09), including emergency generators and boilers, unless that source is listed under COMAR 26.11.02.10 as being exempt from PTC requirements. As part of the ongoing CHP addition at Building 302, NIST has obtained a PTC for an 88-MMbtu natural gas-fired combustion turbine and a 51 MMbtu natural gas-fired heat recovery steam generator equipped with low-NOx duct burners.

Mobile emission sources associated with the campus include personal vehicles for ongoing employee commuting to and from work as well as intra-campus travel, and grounds maintenance equipment and vehicles.

Environmental Consequences – Proposed Action

The Master Plan would have the potential to directly and indirectly affect air quality at the NIST Gaithersburg Campus as a result of the following activities:

- Onsite stationary sources: Changes in operation of boilers and emergency generators, and new or relocated laboratory activities.
- Mobile sources: Changes in employee commuting.
- Temporary activities: Construction, demolition, and renovation activities.

The following subsections describe these air quality impacts in more detail, followed by a summary of NIST's review of the CAA GCR for this action.

Onsite Stationary Sources

Under the Master Plan, there is expected to be a minor increase in air emissions of NOx, CO, VOC, SO_2, and PM from boilers at the Steam and Chilled Water Generation Plant associated with expanded service to new facilities. The existing boilers have adequate capacity to service a potential increase in steam load from the new facilities. The boiler output and fuel consumption are expected to increase proportionally with the steam load changes. Operation of the boilers would comply with the existing (or subsequent) operating permit. Increased air emissions from the boilers would be partially offset by the renovation and construction of more energy efficient facilities. The boilers would continue to use low-NOx burners. If Boiler 6 at the Steam and Chilled Water Generation Plant is found to require removal and replacement, NIST would obtain a PTC prior to installation and would update the operating permit accordingly.

As new laboratories are renovated or constructed, the Master Plan would install new emergency generators to increase the campus-wide backup capacity from approximately 4 MVA to 15 MVA upon completion of the Master Plan. Diesel generators with an output of 373 kW or greater would be required to obtain a PTC prior to installation and would need to be added to the operating permit. Testing and operation of the new generators would increase criteria pollutant emissions. However, emissions from the emergency generators would only occur during testing once a week and during occasional power outages.

The Master Plan would construct a new Wind/Fire Facility with emissions similar to those from Building 205. This new facility would require a PTC prior to construction and would include pollution control devices similar to those installed at Building 205.

The new SRM Facility would include refrigeration equipment for the storage of reference materials. All new and existing refrigeration equipment would continue to be managed in accordance with the requirements of 40 CFR 82, Subpart F.

The emission units at the campus would continue to comply with all regulatory requirements and emission standards. The permitted emission units are not expected to exceed the operational or emission limits established in the Part 70 operating permit. Air emission increases under the Master Plan are not expected to cause exceedances of the NAAQS within or outside of the campus. In addition to pollution control devices and operational limitations, the undeveloped vegetated buffer surrounding the campus (which would be expanded under the Master Plan) would also help absorb pollutants and mitigate expected emissions increases.

Increased electricity consumption associated with new facilities and increased chilled water demand would result in increased fuel consumption by the sources that supply electricity to the regional network and lead to off-site increases in air emissions. However, this would be offset by improved building envelope and mechanical efficiencies. The electricity consumption impacts would be further offset by increased onsite electricity production from the CHP addition and the installation of solar arrays, as discussed in Section 5 (Cumulative Effects).

It is expected that changes in VOC emissions because of the installation of additional fume hoods in various labs would be negligible.

Mobile Sources

The Master Plan would increase the number of personnel commuting to and working at the NIST Gaithersburg Campus by approximately 27% (from 4,007 to 5,106) over the course of a 20-year period. POV use could increase by approximately this same percentage, resulting in a corresponding increase in criteria pollutant emissions relative to the No-Action Alternative. However, emissions from personnel commuting to the campus would be expected to decrease in the future because of USEPA's Tier 3 emission standards and fuel program. The Tier 3 program mandates lower sulfur gasoline, evaporative emission standards, and exhaust emission standards that reduce NOx, VOC, $PM_{2.5}$, CO, and air toxics. Compared to 2014 fleet-average emission standards, the new Tier 3 standards represent an 80% reduction in light-duty vehicle emissions of non-methane organic gas and NOx, and a 70% reduction in per-vehicle PM standards. The vehicle emissions standards component of Tier 3 phases in over years 2017-2025, and the transition to 10 parts per million (ppm) sulfur gasoline occurred in 2017. Additionally, as discussed in Sections 4.8.1 (Vehicle Circulation and Parking) and 5 (Cumulative Effects), the POV use resulting from this personnel increase would likely be at least partially offset by improved housing availability near the campus (resulting in shorter commutes), increased availability of public and other alternative methods of transportation, and continued innovation in autonomous vehicles and ridesharing services. As a result, the net employee commuting emissions over the course of the Master Plan may actually decrease relative to current levels, despite the increase in campus population. Refer to Section 4.8 (Circulation and Transportation) for details regarding efforts to encourage the use of public and alternative transit to help offset projected increases in commuting-related emissions.

The relocation of the commercial vehicle entrance to Gate F could have a minor effect on air quality near sensitive populations east of the campus. To mitigate this concern, the Master Plan would seek to limit commercial vehicle congestion in this area by separating commercial vehicle and visitor traffic into separate entrances at Gate F, limiting the build-up of commercial vehicles as they enter the campus. NIST would also reconfigure Gate A to reduce queuing and vehicle idling at this gate. By enhancing the central core of the campus, the need for intra-campus travel is expected to decrease. Refer to Section 4.8 (Circulation and Transportation) for details regarding the expected changes in vehicular use resulting from the Master Plan.

Temporary Activities

Construction, demolition, and renovation (CDR) activities required for the Master Plan would result in temporary minor emissions of NOx, VOC, CO, PM, and SO_2 from the use of on-road vehicles, such as delivery vehicles, tractor trailers, and dump trucks, as well as nonroad construction vehicles, such as excavators, cranes, track loaders, backhoes, and bulldozers over the course of an approximately 20-year period. The maximum annual projected NOx, VOC, CO, PM, and SO_2 emissions from construction activities and the methodology used to calculate these emissions can be found in Appendix C.

CDR activities often cause fugitive dust (PM) emissions that could have a temporary impact on local air quality. Dust emissions during building construction are associated with land clearing, ground excavation, grading, and the construction of the building itself. Emissions may vary substantially from day to day, depending upon the level of activity, specific type of activity, and weather conditions. The quantity of dust emissions from construction operations is proportional to the area of land where the activity is taking place, as well as the level of construction activity. NIST would employ dust suppression control measures to minimize fugitive dust emissions in accordance with state requirements.

If any lead-containing materials, asbestos-containing materials, or equipment that contains ozone-depleting substances are encountered during construction, NIST would remove and dispose of these materials and equipment in accordance with all applicable regulations to ensure air quality is not impacted.

GCR Analysis and Emissions Summary

NIST has prepared a GCR Applicability Analysis for the Master Plan (Appendix C). This analysis conservatively estimates the emissions of nonattainment criteria pollutants using a worst-case scenario construction schedule. Because of more stringent emission standards and improving vehicle efficiencies, emission rates are expected to decrease over the course of the Master Plan. Therefore, emissions from construction activities and operation of the affected facilities were modeled using 2019 as the construction year to provide a conservative estimate. This analysis demonstrates that the Master Plan would result in emissions well below the *de minimis* thresholds for nonattainment criteria

pollutants and their precursors (NOx and VOC). The Master Plan is therefore not subject to GCR requirements and a conformity determination is not required. The air quality effects of criteria pollutants at the NIST Gaithersburg Campus and beyond the campus boundary would be minimal under the Master Plan and would not interfere with regional efforts to meet the NAAQS.

Environmental Consequences - No-Action Alternative

The No-Action Alternative would result in no changes in campus air quality compared to the baseline. The existing emissions-producing operations would continue at their current locations in accordance with the installation's operating permit and applicable standards. Emissions from personnel commuting to the campus would be expected to decrease in the future because of enhanced emission standards.

4.10 Climate Change

Affected Environment

Climate change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer. This occurs naturally over time, but evidence has shown that climate change is occurring at an accelerated rate because of the increase of the average global surface temperature, also known as global warming. The evidence for rapid climate change includes the rate of sea level rise, global temperature rise, warming oceans, shrinking ice sheets, declining Arctic sea ice, glacial retreat, extreme weather events, ocean acidification, and decreased snow cover (NASA, 2017).

Greenhouse Gas Emissions

The recent and ongoing warming of Earth's atmosphere is largely caused by human activities. The burning of fossil fuels and other industrial processes release significant amounts of carbon dioxide (CO2) and other GHGs into the lower atmosphere. GHGs contribute to global warming by absorbing infrared radiation emitted from the earth's surface and then radiating much of this energy back to the earth's surface.

USEPA classifies GHG emissions and reduction targets as Scope 1 (direct emissions), Scope 2 (indirect emissions from purchased energy), or Scope 3 (other indirect emissions). Scope 1 emissions include emissions from direct fossil fuel combustion such as in the operation of boilers, generators, incinerators, and vehicles operated by the organization, as well as fugitive emissions of refrigerants and other GHGs (e.g., fire suppressants). Scope 2 emissions include upstream emissions from purchased electricity, steam, heating, and cooling. Scope 3 emissions include all other indirect emissions not included in Scope 2, such as emissions from employee commuting, employee business travel, transmission and distribution losses associated with purchased electricity, methane emissions from contracted solid waste disposal, methane and nitrous oxide emissions from contracted wastewater treatment, and upstream emissions associated with purchased products and services.

Operations at the NIST Gaithersburg Campus generate GHG emissions from multiple sources, including operation of boilers, emergency generators, and NIST fleet vehicles (Scope 1); purchase of electricity (Scope 2); and employee commuting and business travel, transmission and distribution losses from purchased electricity, and methane emissions from contracted solid waste disposal (Scope 3). NIST purchases electricity for the campus from the PEPCO, which has a power supply portfolio consisting of a mix of coal-fired and natural gas-fired generation (60.8%) and carbon-free generation (39.2%) (PEPCO, 2016).

Effects of Climate Change

General climate change effects that have been observed and are projected in the future include more frequent and heavier rains and storms, increased flooding and drought, more severe and frequent heat waves, worsened air quality, sea-level rise, and negative impacts on ecosystems and wildlife (CEQ, 2016). Maryland is currently being affected by climate change in the following ways: longer droughts and heat waves during the summer months; higher risk of flooding because of intensified rainfall events; health problems related to air pollution; and coastal flooding as a result of rising sea levels (Montgomery County, 2009). While current and future emission control measures should help to reduce future impacts on climate change, GHGs already in the atmosphere will continue to cause climate change for many years to come (CEQ, 2016). In Maryland, this is expected to result in progressively hotter and more severe weather conditions, further exacerbating the effects described above and straining both natural and urban environments (USGCRP, 2017).

Accordingly, climate change adaptation and resilience, which are defined as adjustments to natural or human systems in response to actual or expected climate changes, are important considerations when planning an action (CEQ, 2016). Climate change impacts of particular relevance to the NIST Gaithersburg Campus include more severe and frequent heat waves, which would affect cooling demand on Building 302 (Steam and Chilled Water Generation Plant); prolonged droughts, which would affect vegetation on campus; and intensified storm and rainfall events, which affect vegetation and buildings and would put the campus at higher risk of flooding. NIST considers these climate change factors when planning future actions at the campus.

Environmental Consequences – Proposed Action

Greenhouse Gas Emissions

Under the Master Plan, steam generation activities and operation of the new facilities, including increased electricity consumption and periodic emergency

generator use, would generate recurring direct and indirect (Scope 1, 2, and 3) GHG emissions. The overall increase in climate-controlled floor space would require an increase in the campus steam load, emergency generator capacity, and purchases of electricity. This would result in more fuel consumption by boilers and generators throughout the campus, and potentially could result in increased fuel consumption by the sources that supply electricity to the PEPCO regional network, leading to increases in direct and indirect GHG emissions. These increases would be mitigated by the construction of more energy efficient facilities and the potential reduction in the overall energy intensity of campus facilities. The Master Plan would include installation, where feasible, of renewable energy photovoltaic energy systems on top of new and renovated building structures as well as over the canopies shielding the parking areas. In addition, as discussed in Section 5 (Cumulative Effects), separate projects are underway to construct a new CHP plant within Building 302 (Steam and Chilled Water Generation Plant) and to develop a new 5-MW photovoltaic solar array on 15 acres at the south end of campus. These projects would further offset GHG emissions from the campus by reducing campus reliance on purchased electricity. Also, as discussed in Section 4.6 (Sustainable Development), NIST would continue to purchase RECs to reduce campus reliance on non-renewable sources of electricity in accordance with EO 13693.

Construction, renovation, and demolition activities under the Master Plan would temporarily generate direct (Scope 1) GHG emissions from construction equipment and indirect (Scope 3) GHG emissions from contracted solid waste disposal.

While the Master Plan would increase the number of personnel commuting to and working at the campus, NIST assumes that this represents a relocation of existing commuter-related GHG emissions (i.e., the Master Plan would not "create" new commuters). Details regarding the current and future commuting methods and routes of these new campus personnel do not exist, and the increase or decrease in associated GHG emissions cannot be calculated. However, as discussed in Sections 4.8.1 (Vehicle Circulation and Parking) and 5 (Cumulative Effects), the POV use and GHG emissions resulting from this personnel increase would likely be at least partially offset by improved housing availability near the campus (resulting in shorter commutes), increased availability of public and other alternative methods of transportation, and continued innovation in autonomous vehicles and ridesharing services.

Effects of Climate Change

As discussed in Section 4.2 (Biological Resources) and Section 4.5.3 (Stormwater Management), the Master Plan would incorporate various landscaping improvements, including reforestation and revegetation efforts. These efforts would increase runoff infiltration and uptake, thereby putting the campus at lower risk of flooding during intensified rainfall events. Replacing existing plants with low-maintenance grasses and other native vegetation would also avoid creating a new irrigation demand within the campus. The use of drought-resistant landscaping would improve the resilience of the campus vegetation during prolonged droughts, thus reducing localized climate change effects within the campus.

As discussed in Section 4.5.4 (Energy Systems), the Master Plan could result in an increased demand for chilled water from Building 302 (Steam and Chilled Water Generation Plant). More severe and frequent heat waves because of continued climate change could further increase this projected cooling need, leading to additional electrical demand and the associated GHG emissions and potentially contributing to further climate change.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would result in no changes in GHG emissions at the campus and would not increase contributions to climate change. However, the No-Action Alternative would not achieve the potential improvements in energy and water efficiency described under the Master Plan and would not reduce the potential impacts of climate change-driven droughts and heat waves within the campus.

Localized climate change effects within the campus are expected to increase over time. Under the No-Action Alternative, the existing landscape vegetation would remain relatively more drought-prone and therefore become less resilient as droughts associated with climate change become more prolonged and severe.

4.11 Cultural and Historic Resources

4.11.1 Architectural Resources

Affected Environment

Historic properties include prehistoric or historic districts, sites, buildings, structures, or objects that are significant in American history, architecture, archeology, engineering, and culture. Historic properties serve as resources, as they provide valuable information about the history of human life and cultures.

To ensure the protection of historic resources, the U.S. Congress passed the National Historic Preservation Act (NHPA) in 1966 and then amended the NHPA in 1976, 1980, 1992, and 2016. The NHPA established the Advisory Council on Historic Preservation (ACHP) and authorized the creation and maintenance of the NRHP The NRHP is composed of districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture.

Typically, properties considered eligible for inclusion in the NRHP are at least 50 years old. A property is eligible for inclusion in the NRHP if it 1) possesses the integrity of location, design, setting, materials, workmanship, feeling, and association, and 2) meets at least one of the following NRHP Criteria for Evaluation (NPS, 2002):

A. It is associated with events that have made a significant contribution to the broad pattern of U.S. history (Criterion A).

B. It is associated with the lives of persons significant in our past (Criterion B).

C. It embodies the distinctive characteristics of a type, period, or method of construction; it represents the work of a master; it possesses high artistic values; or it represents a significant and distinguishable entity whose components may lack individual distinction (Criterion C).

D. It has yielded or may be likely to yield important information in prehistory or history (Criterion D).

Section 106 of the NHPA, which is implemented under 36 CFR 800, requires federal agencies to consider the effects of undertakings (i.e., actions) on any historic property, and to afford the ACHP a reasonable opportunity to comment on such undertakings. An adverse effect is anything that could alter the historic fabric (i.e., characteristics) that makes the property eligible. Examples of adverse effects may include changes to the property or alterations to landscape, noise levels, visual characteristics, traffic patterns, or land use near the property, depending on how these changes specifically impact the property.

The NHPA also authorized the creation of a State Historic Preservation Officer (SHPO) for each state. The SHPO participates in statewide historic preservation planning and surveying activities; nominates properties for the NRHP; provides advice, assistance, training, and public outreach; and participates in Section 106 undertaking reviews. In Maryland, the Maryland Historical Trust (a division of the Maryland Department of Planning) serves as the SHPO.

Additionally, the Maryland SHPO administers its own program for properties that are of significance to American history and culture. The Maryland Inventory of Historic Properties (MIHP) includes all properties from the NRHP that are located in Maryland, plus additional properties that are considered significant in Maryland history and culture. Properties listed in the MIHP are protected under the Historic Preservation Ordinance (Chapter 24A of the Montgomery County Code), which provides certain controls regarding alteration, demolition, and maintenance of the property.

The NIST Gaithersburg Campus was constructed in the 1960's to relocate NIST (then known as the National Bureau of Standards) from its overcrowded campus in Washington, DC. Prior to becoming the campus, the site was used for agricultural purposes. Even with a few newer facilities constructed over the decades, the campus remains today much as originally developed except for several building additions and facility upgrades. Buildings completed in the initial campus development have begun to reach 50 years of age. The major buildings of this period established a campus architectural identity, designed in the International Style with character-defining features of curtain-wall construction, ample use of glass, clean monolithic forms, and minimal ornamentation. The suburban setting, formal landscape, ample parking, large-scale monumental buildings, and general and specialized laboratories are hallmarks of postwar research campus design. Building 101 (Administration Building) is the central campus focus and the destination for public, professional, and social events. It is an example of the International Style applied to a principal building in a campus setting. Together with Building 101, eight other buildings and their surroundings form a cohesive architectural precinct within the campus.

In 2015, NIST performed a historic assessment of the campus in accordance with the NHPA. The Historic Assessment recommended the central campus precinct eligible as a historic district, significant under Criterion A for its association with events that made important contributions to the broad patterns of history under the Science and Technology and Postwar Research Campus Design themes, and under Criterion C as a recognizable entity that embodies the characteristic of Post War Research Campus design. That district included nine contributory buildings completed between 1965 and 1966, and one non-contributing building (Building 227) completed in 1999. The campus landscape plan, including the Newton Apple Tree and the flag pole (both located near Building 101), were also determined contributing resources. Building 101 was recommended individually eligible for inclusion in the NRHP as a representative example of the International Style (Criterion C).

Upon review and evaluation of NIST's determination and recommendation for the above described historic district at the campus core, the Maryland SHPO concluded that the entire 579-acre campus is eligible for listing on the NRHP as a historic district. The Maryland SHPO further recommended that all 26 resources constructed between 1960 and 1969 were contributing resources to the NRHP-eligible district. The 47 resources constructed after 1970 were identified as non-contributing resources. NIST subsequently requested a formal determination by the Keeper of the NRHP pursuant to 36 CFR Part 63. On June 22, 2016, The Keeper of the NRHP responded with a formal, non-appealable determination, namely: that the entire 579-acre NIST campus is eligible for listing on the NRHP as a historic district under National Register Criteria A and C for its historic and architectural importance. The historic district's period of significance corresponds to the initial period of construction of the campus in 1960-1969. Outside of the campus, no extant properties listed in the NRHP or the Maryland Register of Historic Places are located in the immediate vicinity of the campus, with the nearest property (the Gaithersburg Latitude Observatory, a National Historic Landmark) being located more than a half-mile east of the campus (Maryland Historical Trust, 2017).

Environmental Consequences – Proposed Action

NIST understands and acknowledges that the Master Plan, because it recommends changes within an NRHP-eligible historic district, is an undertaking as defined by the NHPA. Accordingly, NIST has consulted with and sought input from the Maryland SHPO on its development.

The Master Plan embraces the campus status as an eligible historic district and proposes new buildings that would be architecturally compatible in scale, massing, and design approach with the original campus buildings. In accordance with Section 106 of the NHPA, NIST consulted with the Maryland SHPO to determine if any new construction, renovations, additions, or demolition under the Master Plan would cause adverse effects. On March 16, 2018, the Maryland SHPO agreed with NIST's determination that the Master Plan would have no adverse effect on historic properties. This finding is contingent on NIST submitting individual undertakings to the SHPO during the planning stage for review. NIST acknowledges that future expansions and alterations under the Master Plan would be governed by the NHPA and the *Secretary of the Interior's Standards for Rehabilitation* (36 CFR 67). No impacts on historic properties outside the campus are anticipated. Refer to Appendix B for NIST's correspondence with the Maryland SHPO regarding the Master Plan.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not involve direct or indirect impacts on potentially historic properties at NIST or in the surrounding area. Therefore, there would be no adverse effect to historic resources.

4.11.2 Archeological Resources

Affected Environment

Archeological resources are material remains of past life or activities. Some examples include pottery, bottles, weapons, tools, rock carvings, gravesites, and other evidence of prior inhabitation. Archeological sites that retain sufficient integrity may be eligible for the NRHP under Criterion D.

In June 2014, the MTA conducted a Phase I archeological survey for the CCT project in Rockville and Gaithersburg, Maryland, a portion of which encompassed 9.9 acres of the western portion of the NIST Gaithersburg Campus along Quince Orchard Road. The survey identified a cluster of late nineteenth- to twentieth-century domestic and architectural refuse associated with disposal activities; however, MTA was unable to determine the function and period(s) of deposition for these artifacts because of the disturbed context of the artifacts, limited date range with the artifact assemblage, and lack of features. Excavations in the area also found evidence of graded fill associated with landscaping and contouring of the campus during construction activities. Therefore, MTA concluded that the study area was unlikely to contribute new research into late nineteenth- to early twentieth-century domestic activities in Montgomery County because of varying levels of disturbance associated with agricultural and grading activities (MTA, 2014).

While no other archeological surveys have been performed to date within the campus, the campus is generally believed to have been extensively disturbed from agricultural use and subsequent development, resulting in a low potential for significant archeological resources. NIST is currently coordinating plans for a Phase I archeological survey of the campus, which will include a literature review and fieldwork at selected locations to investigate the archeological potential throughout the campus.

Environmental Consequences – Proposed Action

According to all current and available records, the Master Plan would not involve any earth disturbance within known archeologically sensitive areas or any previously identified archeological sites. However, certain elements of the Master Plan may have higher potential to encounter archeological resources because of more extensive grading and earthwork that could impact previously undisturbed areas. In particular, a Phase I survey should be conducted at the proposed site of the NCNR expansion because of the extensive amount of earthwork that would be required for its construction.

Environmental Consequences – No-Action Alternative

Under the No-Action Alternative, NIST would not perform any earth disturbance. The No-Action Alternative would not adversely affect any archeological sites listed or eligible for listing on the NRHP.

4.12 Visual Impacts

4.12.1 Aesthetics

Affected Environment

Aesthetics of a site are affected by physical characteristics, including the following:

- Vegetation, which may conceal or complement views;
- Building characteristics, such as height and architectural features; and
- Topography.

Development projects have the potential to modify aesthetics by changing one or more of these physical characteristics.

The viewscape of the NIST Gaithersburg Campus is characterized by rolling terrain and an open atmosphere, complemented by wooded areas. The campus is visually connected, with low-scale brick buildings in a suburban setting. Building 101 (Administration Building) is the central focus of the campus, with an eleven-story tower and public spaces arranged around the first floor. Figure 4-5 demonstrates a view of Building 101 from within the campus. The research buildings are mainly buff-colored brick and the support buildings are red brick. The remaining campus laboratories and associated support facilities have a similar look, but are designed to accommodate designated research purposes.

As noted in Chapter 2 of the Master Plan, the beautiful campus and open green space were among the key positives highlighted in the results of a 2016 employee survey.

The Maryland SHPO and the Keeper of the NRHP have determined that the campus is eligible for listing on the NRHP because of its historical and architectural significance. The planning of any new construction or renovation projects within the campus must therefore take into account the potential aesthetic effects on, and compatibility with, the identified historic resources within the campus. Refer to Section 4.11.1 (Architectural Resources) for additional information.

Environmental Consequences – Proposed Action

The Master Plan seeks to complement the aesthetics of the historic campus by preserving the exteriors of old buildings while replacing the infrastructure of those in poor repair with new mechanical, electrical, plumbing, and security features. Proposed new facilities would be designed to be architecturally compatible in scale, massing, and design approach with the original campus buildings in accord with the principles of the *Secretary of the Interior's Standards for the Treatment of Historic Structures*. These buildings will be three stories above grade to match the existing GPLs. Limiting the height of the conference addition to Building 101 would ensure that the office areas in the tower retain unobstructed natural views of the northern area of the campus. Prescribed heights and set-backs for new and renovated facilities are described in Exhibit 88 in the Master Plan.

The Master Plan would plant additional forested areas and smaller focused clusters of trees, which would enhance the natural look and feel of the campus. The reforestation efforts would occur on the eastern side of the campus, extending to the west and to the south. These forested areas would assist in creating a barrier for the campus from the noise and visual presence of Interstate 270, but would not adversely affect or obscure historic views of the campus structures. The tree clusters would buffer the visual impact of the campus parking lots. The Master Plan would also replace mowed lawns with native meadows, which would provide for a complementary view to the natural landscape.

During implementation of the Master Plan, construction equipment may temporarily impact the viewscape from surrounding areas.

Environmental Consequences – No-Action Alternative

The No-Action Alternative would not impact the campus aesthetic. The No-Action Alternative would also not enhance the viewscape on the campus and its surroundings. While the No-Action Alternative would preserve the current aesthetics of historic resources within the campus, it would fail to replace older, temporary buildings with newer, more aesthetically pleasing architecture.

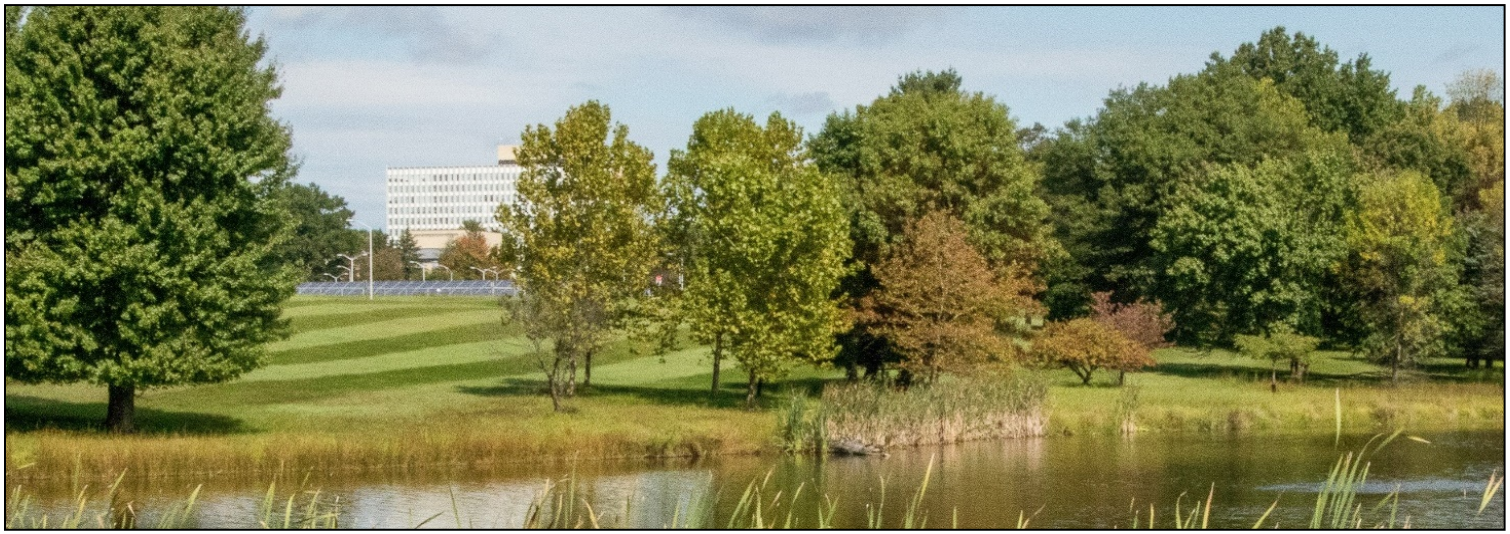


Figure 4-5. View of Building 101 from the Southeast

4.12.2 Light Pollution

Affected Environment

Exterior lighting of parking lots, roads, buildings, and pathways is often used to enhance the safety and security of persons and property. Exterior lighting may also be used to emphasize features of architectural and historic significance and enhance the enjoyment of outdoor areas.

Excessive and inappropriate exterior lighting, however, can generate light pollution. The International Dark Sky Association (IDA) identifies four main elements of light pollution (IDA, 2016):

- Urban Sky Glow – the brightening of night sky over inhabited areas, reducing the visibility of stars;
- Light Trespass – light falling where it is not intended, wanted, or needed, such as light from a streetlight entering a residential window;
- Glare – excessive brightness that can cause visual discomfort and decreased visibility; and
- Clutter – bright, confusing, and excessive groupings of light sources. Clutter contributes to urban sky glow, light trespass, and glare.

Furthermore, light pollution associated with over-illumination or inefficient fixtures can contribute to excess energy consumption.

Several standards and guidelines exist for designing effective and appropriate exterior lighting systems, as follows: the IDA *Outdoor Lighting Code Handbook* (version 1.14, December 2000/September 2002), the Illuminating Engineering Society (IES) *Lighting Handbook* (tenth edition, 2011), the United States Green Building Council, and the *LEED Reference Guide for Green Building Design and Construction* (2009).

Section 24.220(d) of the City of Gaithersburg Municipal Code requires that adequate lighting be provided for parking lots, areas, or facilities that will be used at night. The Code also requires that lighting be installed in a manner not to reflect or cause glare into abutting or facing residential premises. There are overhead streetlights installed throughout the campus, along streets, pathways, and parking lots for safety and security purposes. This lighting is directed downward and complies with the City's applicable lighting requirements. NIST also employs low-rise light bollards along pedestrian walkways in multiple locations around the campus, which were recently converted or replaced with light-emitting diode fixtures. The use of the bollards also minimizes light trespass from the campus to the surrounding communities.

One of the main aspects of energy efficient lighting involves the use of daylighting, which focuses on organizing buildings to maximize the use of natural light for illuminating spaces and increasing employee comfort. The NIST Sustainable Design Manual sets a minimum goal of a 2% daylighting factor for 75% of the campus' regularly occupied buildings. The use of daylighting, however, can increase the potential for light trespass from interior lighting during nighttime hours.

Environmental Consequences – Proposed Action

The Master Plan is not expected to generate any substantial changes in light trespass outside the campus boundary from new exterior lighting. The Master Plan would incorporate a sustainable design approach. As described below, redesigned lighting features would be energy efficient and would minimize impacts on light pollution.

The construction, renovation, or replacement of new facilities, the east-west pedestrian walkway, and parking areas under the Master Plan would require the installation of additional lighting systems for these areas to ensure that the safety and security of the campus is maintained. To minimize light pollution impacts, NIST would ensure that all new exterior lighting systems installed under the Master Plan are designed in accordance with current IES and IDA guidance and City of Gaithersburg requirements. The Master Plan also incorporates strategic tree plantings in the eastern portion of the campus to intercept light trespass outside the campus boundary.

The Master Plan would increase the use of natural lighting throughout the campus to the extent feasible. This would involve redevelopment with large windows oriented north to south, to minimize glare. While new windows would increase the potential for light trespass from interior lighting, this would be mitigated through the use of comprehensive lighting control systems for appropriate spaces and tinting of some windows during specific hours of the day. The intensity of light would be accurately tailored to the task requirements of the users, with little or no excess capacity. Similar to existing operations, interior lighting would be reduced after hours, and would turn off when spaces are not being used.

The new lighting would have a minor impact on on-campus users. The lighting characteristics mentioned above would mitigate the potential impacts.

The Master Plan could result in minor temporary impacts on light trespass because of the use of supplemental lighting (e.g., temporary portable lighting) during construction activities. NIST would conduct construction activities during daylight hours, primarily to limit noise during off hours. Temporary construction lighting may be used to illuminate work areas in the nighttime to ensure safety and security at unoccupied work sites. If applicable, NIST would mitigate this temporary lighting by ensuring construction contractors direct lighting away from the campus boundary whenever feasible.

The Master Plan would provide solar collection on new non-laboratory facilities, GPLs, the new parking structure, and over the surface parking lots. Reflected sunlight from solar panels installed under the Master Plan would have the

potential to cause glare, creating a potential nuisance in the vicinity of the campus if the panels are not sited and designed appropriately. When designing specific solar panels under the Master Plan, NIST would ensure that the designs incorporate glare reduction measures (e.g., anti-reflective coatings and textured glass) and that the panels are sited in a manner to avoid creating excessive glare within or outside of the campus.

Environmental Consequences – No Action Alternative

The No-Action Alternative would not impact lighting at the campus. The No-Action Alternative would also not improve existing interior or exterior campus lighting and efficiency.

4.13 Noise Levels

Affected Environment

High noise levels that occur over a long duration can impact the health of exposed populations and be a nuisance to the surrounding community. The A-weighted decibel scale (dBA) is a logarithmic scale generally used to measure noise levels because it can account for the sensitivity of the human ear across the frequency spectrum. Table 4-1 compares decibel noise levels, common noise sources, and the relative perception of these noise levels.

The Occupational Safety and Health Administration (OSHA) regulates workplace noise with standards for two different types of noise: constant and impulse. The OSHA limit for constant noise is 90 dBA for eight hours; however, the National Institute for Occupational Safety and Health recommends a constant noise limit of 85 dBA for eight hours to minimize occupational noise induced hearing loss. The OSHA maximum sound level for impulse noise is 140 dBA. In areas where workplace noise exceeds these sound levels, employers must provide workers with personal protective equipment to reduce noise exposure.

State and local government agencies regulate noise within the community. Noise standards set by the state under COMAR 26.02.03 limit the 24-hour average sound levels for residential, commercial, and industrial zones to 55, 64, and 70 dBA, respectively. The Montgomery County Noise Control Ordinance (Chapter 31B of the County Code) established maximum allowable noise levels in the county. The Montgomery County noise exposure limits for residential and non-residential properties are summarized in Table 4-2. At the source, noise levels from construction activities must not exceed 75 dBA between 7:00 am and 5:00 pm, with higher allowances if the Montgomery County Department of Environmental Protection (DEP) has approved a noise suppression plan.

The campus is surrounded on three sides by busy secondary roads and an interstate highway, with commercial and residential developments beyond. Residential areas approach or border the campus to the west, across Quince Orchard Road near Gate D; to the south and southwest, through forested areas with rolling topography; and to the southeast, across Muddy Branch Road between Gates E and F. Ambient noise levels at the campus are affected by noise generated both onsite and offsite. Minor noise associated with vehicular traffic on nearby roads is the primary source of noise in the area immediately surrounding the campus. Sources of noise within the campus include chillers at Buildings 235 (NIST Center for Neutron Research) and 302 (Steam and Chilled Water Generation Plant), an outdoor metal grinding facility west of Building 301 (Supply and Plant Building), exhaust fans at Building 205 (Large Fire Facility), emergency generators, and commercial vehicles and other vehicles entering and exiting the campus. NIST personnel report that the campus has no history of recurring noise complaints from neighbors.

Table 4-1. Perception of Noise

Noise Level (dBA)	Common Noise Source	Subjective Evaluation
100	Automobile horn 10 feet away.	Very Loud
90	Diesel truck 50 feet away.	
80	Very loud speech 3 feet away.	Loud
70	Outdoors in a commercial area.	
60	Average of normal speech three feet away.	Moderate
50	Open office background noise.	
40	Quiet suburban environment at night.	Faint
30	Quiet rural environment at night.	
20	Concert hall background noise.	Very Faint
10	Human breathing.	
0	Threshold of hearing or audibility.	Inaudible

Sources: Egan 1988, Cavanaugh 1998, and Burge 2002.

Table 4-2. Montgomery County Maximum Allowable Noise

Receiving Noise Area	Daytime	Nighttime
Residential	65 dBA	55 dBA
Non-Residential	67 dBA	62 dBA

Source: DEP, 2014. Montgomery County Noise Control Ordinance (Chapter 31B of the County Code).
Note: Daytime hours are 7:00 am to 9:00 pm on weekdays and 9:00 am to 9:00 pm on weekends and holidays.

Environmental Consequences – Proposed Action

Under the Master Plan, the overall change to operational noise levels is expected to be minor. The upgrade and expansion of facilities would introduce new minor noise sources on campus, including new laboratory activities, air-handling units, exhaust fans, and emergency generators. The majority of new development would be focused around the center of the campus, although some development would be closer to the boundary and could have the potential to have a minor increase in noise levels. Under the Master Plan, the increased operational ambient noise levels at the NIST Gaithersburg Campus would remain within Maryland and Montgomery County noise thresholds and would not adversely affect the character of the site.

The proposed Wind/Fire Facility has the potential to create a minor increase in noise because of the large blowers that would be used to simulate strong wind environments inside the building. Prior to design, NIST would conduct a more detailed noise study to assess the potential need for noise mitigation measures (e.g., baffles, or additional tree screening around the building) and would ensure that ambient noise levels remain below relevant state and county noise thresholds. In addition, the overall impacts would be mitigated by an anticipated low frequency of use and only during daytime.

The Master Plan would also include the addition of two 3,500-ton chillers at Building 302 (Steam and Chilled Water Generation Plant). As with the Wind/Fire Facility, NIST would determine appropriate noise mitigation measures as this project enters the design phase, but increases in ambient noise are expected to be minor.

As new laboratories are renovated or constructed, the Master Plan would install new emergency generators to increase the campus-wide backup capacity from approximately 4 MVA to 15 MVA upon completion of the Master Plan. Noise increases outside of the campus from generator testing are expected to be minimal, because of the infrequency of their operation (automatically tested once per week during daytime hours, with additional manual testing performed once per month) and the presence of the expanded forest buffer around the campus perimeter under the Master Plan.

On-campus noise from commercial vehicles would be shifted from the Gate C/Building 301 area (west campus) to the area around Gate F, where the new Commercial Vehicle Inspection Complex would be located. This would decrease overall on-campus noise because of fewer commercial vehicles driving on the campus but would increase off-campus noise near Gate F because of the added presence of commercial vehicles entering the campus. Proposed Gate F developments under the Master Plan would seek to mitigate off-campus noise by placing vegetative screening between the complex and the campus boundary and by establishing a separate commercial vehicle entrance to limit the presence of commercial vehicles idling on the perimeter of the campus. As the Commercial Vehicle Inspection Complex project enters the design phase and additional details become available regarding potential noise-generating activities, NIST would evaluate whether additional design and landscaping measures would be necessary to mitigate noise trespass into adjacent residential properties.

Construction activities associated with the Master Plan would temporarily increase environmental noise levels in the vicinity of the project sites, primarily because of the use of heavy equipment. Equipment that may be used includes backhoes, bulldozers, and excavators. Construction equipment noise emission levels generally range between 74 to 101 dBA at a distance of 50 feet from the source, depending on the type of equipment (FHWA, 2014). The construction noise would be temporary and would dissipate as the distance from the source increases. Thus, it is expected that residents in surrounding neighborhoods and visitors to nearby parks would not experience noise louder than the applicable noise limit. To further limit impacts on nearby residences, NIST would limit disruptive noise-generating construction activities to normal daytime working hours (beginning no earlier than 7:00 a.m.). Construction personnel would take the necessary precautions (e.g., hearing protection) to ensure that they would not be exposed to noise louder than the OSHA standard of 90 dBA for 8 hours.

Environmental Consequences – No Action Alternative

The No-Action Alternative would not affect ambient or interior noise levels associated with routine activities. The No-Action Alternative would not generate any temporary noise associated with construction activities.

5 Cumulative Effects

The Master Plan, in combination with the other past, present, or reasonably foreseeable actions at or near the campus, could contribute to cumulative improvements and impacts on certain environmental resources. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.

5.1 Evaluated Actions

This section identifies the other past, present, or reasonably foreseeable actions at or near the NIST Gaithersburg Campus that were considered and evaluated in this cumulative improvements and impacts analysis.

5.1.1 Projects Within the Campus

Past Actions

The following actions were completed within the NIST Gaithersburg Campus within the five years spanning from January 2013 through May 2018:

- **Large Fire Facility Renovation/Expansion.** See parcel 1 on Figure 5-1. Building 205 (Large Fire Facility) is an above-grade, two-level structure that was constructed in 1974 to provide for expanded testing needs in fire research. The building was recently expanded to 48,750 GSF, over twice its original size, to include a post-tensioned reinforced strong floor and strong wall for construction of large-scale burn props. Adjoining the test area are calibration and test equipment spaces, offices, and an observation overlook. This project also constructed a new emissions control system (afterburners, dry scrubbers, and a baghouse) on the north side of the building.
- **NCNR Storage Construction (Building 321).** See parcel 2 on Figure 5-1. Building 321 (NCNR Storage) is a 1,900-GSF facility completed in 2017 for storage of equipment to support NCNR operations.
- **Road and Sidewalk Construction at Building 207.** See parcel 3 on Figure 5-1. An approximately 350-foot roadway and 450-foot sidewalk were constructed to connect Building 207 (Robotics Test Facility), which was completed in 2010, to Center Drive.
- **Consolidated Logistics Center Addition to Building 301.** See parcel 4 on Figure 5-1. Building 301 (Supply and Plant Building) is a single-level, above-grade structure occupied in 1964 as a hub for several campus-wide facility operations and logistics support services. In 2013, NIST constructed a 30,000-GSF addition to the southern end of the building to house the new Consolidated Logistics Center. The expansion included renovation of interior spaces and addition of a new high bay warehouse and receiving area.
- **Emergency Services Facility Construction (Buildings 318 and 319).** See parcels 5 and 6 on Figure 5-1. Building 318 (Emergency Services Facility) and Building 319 (Emergency Services Storage Building) were constructed in 2014 to allow for relocation of NIST Fire and Emergency Services from Building 303 (Service Building). Building 318 is an approximately 22,125-GSF structure that supports the NIST police and fire departments. Building 319 is a 312-GSF concrete block structure with no heating, ventilation, cooling, or plumbing services.

Ongoing Actions

The following actions within the campus are ongoing as of May 2018 and will be completed independently of any decisions regarding implementation of the Master Plan:

Building 245 Renovation/Expansion (Phase 1). See parcel 7 on Figure 5-1. Building 245 (Radiation Physics) is a 207,908-SF facility consisting of laboratory, office, storage, and facility support space. Renovation and expansion of Building 245 is a multi-phase project. Construction of Phase 1, which involves an addition to the east side of the building, began in 2017.

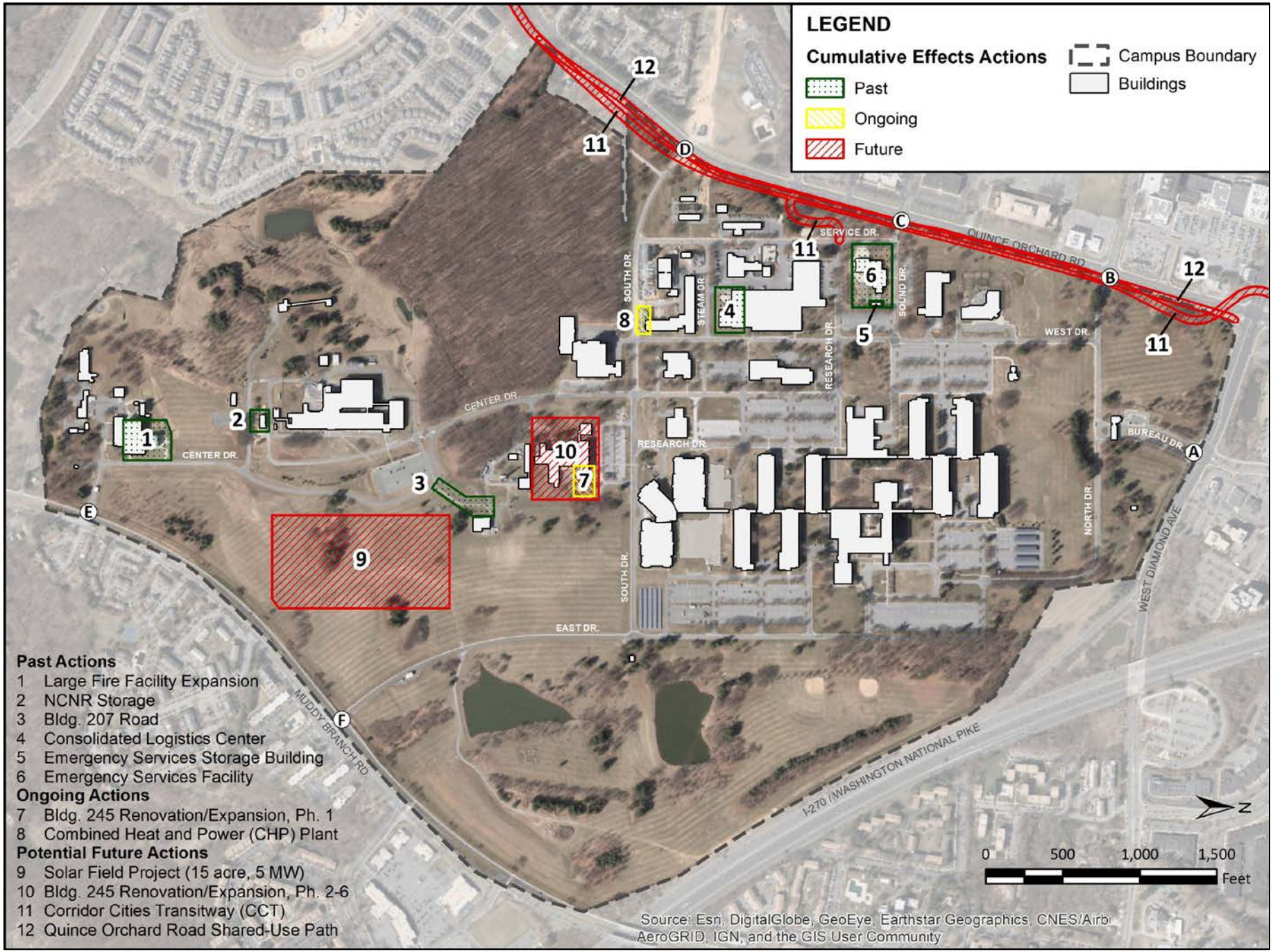


Figure 5-1. Past, Ongoing, and Potential Future Actions within the NIST Gaithersburg Campus

- **Combined Heat and Power Plant Construction.** See parcel 8 on Figure 5-1. The new CHP plant is housed within a 4,000-SF addition to Building 302 (Steam and Chilled Water Generation Plant) and includes an 8-MW gas turbine electricity generator, a heat recovery steam generator, new electrical equipment, and a new fuel gas compressor. New electric transformers and a fuel gas compressor enclosure are located outside the building addition. The CHP plant, which is expected to become fully operational by the end of 2018, will fulfill approximately 41% and 80% of the campus' electricity and steam requirements, respectively.

Potential Future Actions

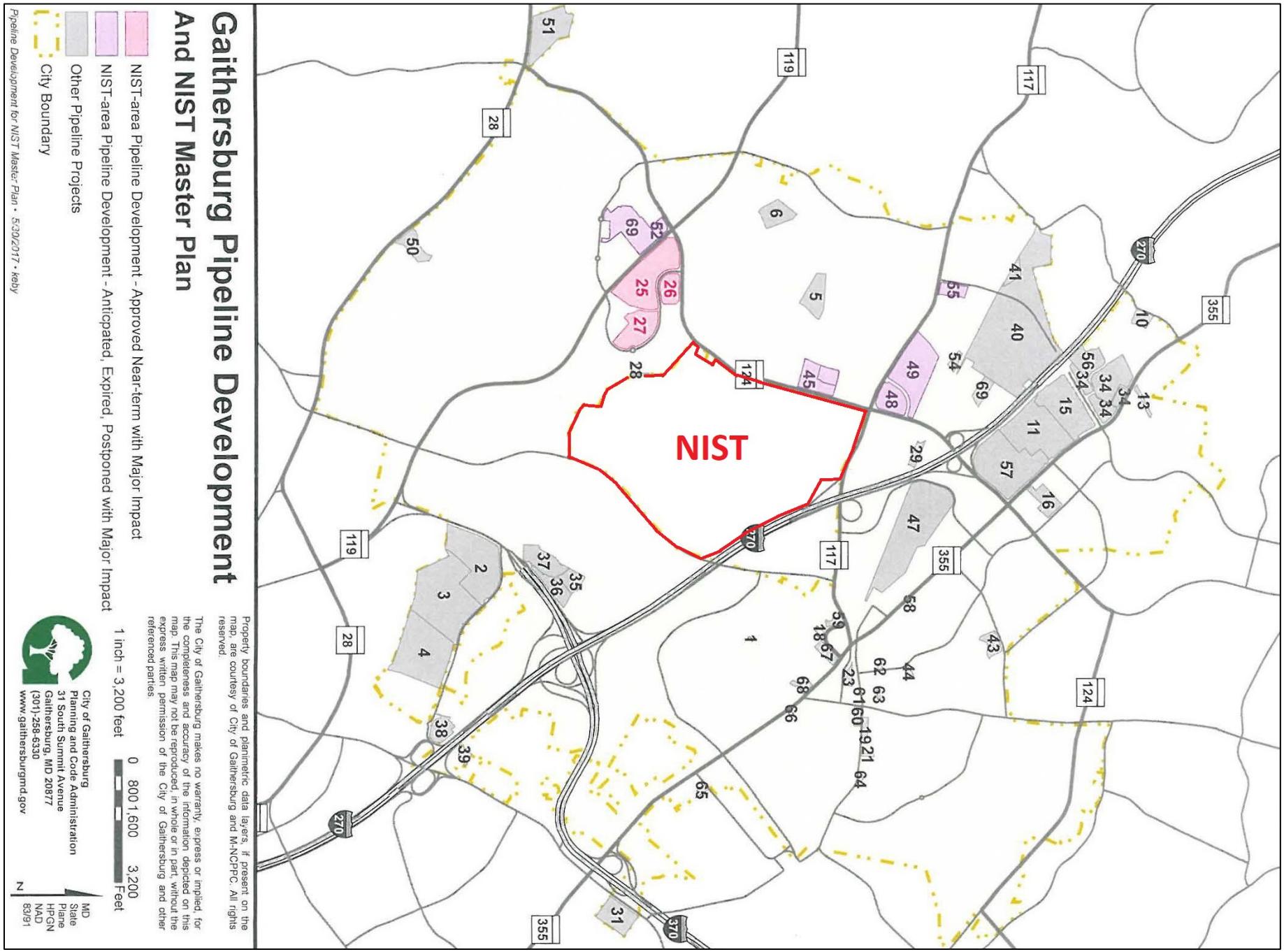
The following actions within the campus are reasonably foreseeable and are expected to be completed independently of any decisions regarding implementation of the Master Plan:

- **Solar Field Installation.** See parcel 9 on Figure 5-1. NIST plans to install a 5-MW direct current array of solar photovoltaic panels spanning 15.4 acres in a field to the east of Building 235 (NIST Center for Neutron Research). The array would be constructed under an Energy Savings Performance Contract and would consist of 14,700 solar panels installed on steel support structures; electrical inverters and transformers installed on concrete pads; underground electric conduits; gravel maintenance roads; and an eight-foot perimeter fence. It would connect directly to the campus electrical distribution system and would fulfill approximately 5% of the campus' electricity requirements.
- **Building 245 Renovation/Expansion (Phases 2-6).** See parcel 10 on Figure 5-1. Renovation and expansion of Building 245 (Radiation Physics) is a multi-phase project, which would involve expansion and modernization of the B/C Wings, including utility upgrades and modification; an addition to D Wing; a mechanical penthouse to serve the A Wing basement and sub-basement; and a new service drive and landscape modifications. Completion of construction is anticipated in 2027.
- **Corridor Cities Transitway Project.** See parcel 11 on Figure 5-1. The CCT is a planned 15-mile Bus Rapid Transit (BRT) line in Montgomery County initiated by the Maryland Transit Administration. The CCT would use dedicated bus lanes to connect the Shady Grove Metro Station and the Metropolitan Grove MARC train station, with potential for future route extension. The transit station at the NIST Gaithersburg Campus would be constructed on the west side of the campus at the intersection of Quince Orchard Road and Quince Orchard Boulevard. This project would require acquisition and development of 14 acres of right-of-way from within the campus, as well as closure and relocation of Gate C to move it further south to accommodate the transit station. Funding for the CCT has been deferred to at least 2022.
- **Quince Orchard Road Shared-Use Path Construction.** See parcel 12 on Figure 5-1. The Quince Orchard Road Shared-Use Path would be an extension of the existing path along the east side of Quince Orchard Road that currently terminates approximately one-quarter mile south of Gate D across from Dosh Drive, leaving an approximately one-mile gap in the trail between that point and the West Diamond Avenue intersection to the north. The new 10-foot wide trail would fill this gap, facilitating safer pedestrian access to the campus. It would require acquisition of minor amounts of right-of-way from within the campus and relocation of a chain link fence.

5.1.2 Development Projects External to the Campus

During the scoping phase of the Master Plan, NIST consulted with staff from the City of Gaithersburg Planning Division to identify any planned projects that could potentially combine with the Master Plan to result in adverse cumulative effects (e.g., traffic congestion). The City of Gaithersburg staff provided NIST with a map and list of proximate development projects, which are illustrated in Figure 5-2 and summarized in Table 5-1. Among these, the following projects were highlighted by City of Gaithersburg staff for consideration during development of the Gaithersburg Campus Master Plan because of their proximity to the campus and potential to contribute to traffic concerns:

- **Quince Orchard Park – MedImmune/AstraZeneca Campus Development.** See parcels 25, 26, and 27 on Figure 5-2. MedImmune, a bioscience company that is the second largest employer in the City of Gaithersburg, is constructing a parking garage that will include approximately 1,400 parking spaces with seven tiers above ground. The parking garage is located on Great Seneca Highway south of Quince Orchard Road and will include bicycle parking. The parking garage will support approximately 1.5 million SF of new office and laboratory space at the campus, development of which has been approved by the City of Gaithersburg.
- **Construction at Diamond Farms (700 Quince Orchard Road)**. See parcel 45 on Figure 5-2. This project would redevelop the existing commercially developed parcel across Quince Orchard Road from the campus, between Gates B and C. It would construct a mixed-use development containing 175 residential units and 300,000 SF of commercial and office spaces on approximately 15.4 acres.
- **Construction at The Gateway (Orchard Pond)**. See parcels 48 and 49 on Figure 5-2. This project, located at the intersection of West Diamond Avenue and Quince Orchard Road northwest of the campus, would redevelop a medium-density residential complex (formerly the Orchard Pond Apartments and now named The Gateway Apartments)



Source: City of Gaithersburg, 2017a.

Figure 5-2. Potential Future Development Actions within the City of Gaithersburg

Table 5-1. Potential Future Development Actions within the City of Gaithersburg

Subdivision	Dwelling Units		Population			Projected Commercial/Other Development (SF)	Key to Figure 5-2
	Complete	Projected	Current	Growth	Projected		
Projects with Approved Conceptual, Preliminary, or Final Site Plans							
Brown's Addition	1	2	3	3	6	--	1
Crown	360	1,712	1,042	3,370	4,412	52,317	2, 3, 4
Diamond Farms	--	--	--	--	--	71,020	5, 6
North Frederick Avenue	--	300	--	458	458	696,761	10, 11, 15, 16, 56, 57, 58
Observatory Heights	--	1	--	3	3	--	18
Olde Towne	52	542	128	1,083	1,211	31,630	21, 23, 59, 60, 61, 62, 63, 64
Quince Orchard Park	***--***	***--***	***--***	***--***	***--***	***1,506,782***	***25, 26, 27,*** 28
Quince Tree Executive Center	--	--	--	--	--	5,154	29
Sears Addition to Shady Grove	--	--	--	--	--	225,000	31
The Spectrum at Watkins Mill (Casey East)	--	202	--	499	499	213,903	34
Washingtonian Center	--	365	--	902	902	571,336	35, 36, 37, 38
Washingtonian Industrial Park	--	--	--	--	--	-192	39
Watkins Mill Town Center	4	732	12	1,316	1,328	1,152,583	40, 41, 69
Asbury	--	63	--	158	158	--	43, 44
Fairgrounds	--	1,350	--	3,336	3,336	1,150,000	47
GE Tech Park/GBURG Aquatic Center	--	--	--	--	--	62,897	50
Johnson Property	--	110	--	339	339	10,000	51
Metropolitan Grove Park	--	--	--	--	--	152,200	54, 55
Rashidian Estates	1	4	3	10	13	--	65
South Frederick Avenue	87	265	216	430	647	23,752	66, 67, 68
Subtotal	**505**	**5,648**	**1,404**	**11,907**	**13,312**	**5,925,143**	
Anticipated (Not Yet Submitted or Approved), Expired, and Postponed Development							
Diamond Farms (700 Quince Orchard Rd.)	***--***	***175***	***--***	***531***	***531***	***300,814***	***45***
The Gateway (Orchard Pond)	***747***	***1,410***	***1,846***	***1,638***	***3,484***	***1,425,571***	***48, 49***
Kentlands	***--***	***1,745***	***--***	***4,312***	***4,312***	***--***	***52, 69***
Total (Approved + Anticipated/Expired/ Postponed)	**1,252**	**8,978**	**3,250**	**18,388**	**21,639**	**7,651,528**	

Source: City of Gaithersburg, 2017a.

Note: Many of these development estimates represent projects with conceptual approvals that are unlikely to be constructed in the near future. Projects in ***blue text*** were highlighted by City of Gaithersburg staff for consideration during development of the Gaithersburg Campus Master Plan.

containing 747 apartments constructed in the mid-1970s. It would construct a four-story residential building containing 410 units on approximately 11 acres during the first of two phases. The second phase of the project covers approximately 32 acres and would include 1.4 million SF of retail, office, and hotel space, and 1,000 additional residential units.

- **Kentlands Apartments Construction**. See parcel 52 on Figure 5-2. This project, located at the intersection of Great Seneca Highway and Quince Orchard Road southwest of the campus, would redevelop a parcel currently occupied by a restaurant and construct two six-story apartment buildings and a seven-level parking garage on approximately 3.1 acres. The apartment buildings would contain 295 residential units.
- **Kentlands Square Construction**. See parcel 69 on Figure 5-2. This project, also located at the intersection of Great Seneca Highway and Quince Orchard Road southwest of the campus, would redevelop the Kentlands Square shopping center with up to 1,450 residential units on approximately 12 acres.

Each of the above projects, with the exception of the Quince Orchard Park – MedImmune/AstraZeneca Campus Development, is listed by the City of Gaithersburg as "Anticipated (Not Yet Submitted or Approved), Expired, and Postponed Development."

5.1.3 Transportation Projects External to the Campus

In addition to the above development efforts, several major transportation projects are planned or underway in and around the City of Gaithersburg. These projects, which include the following, are intended to reduce traffic congestion, improve connectivity, and encourage the use of public transit:

- **Corridor Cities Transitway Project.** See the project description in Section 5.1.1.
- **Maryland 355 Bus Rapid Transit Project.** The Montgomery County Department of Transportation (DOT), in partnership with Maryland DOT, is planning the implementation of bus rapid transit on MD Route 355 (North Frederick Road, Rockville Pike, and Wisconsin Ave) as part of the Countywide Transit Corridors Functional Master Plan. This project would span from Clarksburg through Gaithersburg to Bethesda, mostly along MD Route 355. The project is currently in the conceptual stage, including solicitation of public input on the conceptual alternatives.
- **Maryland 355 Express Bus ("RideOn ExtRa").** This project established a limited-stop (and thereby faster) bus service operating during peak periods along MD Route 355. The bus service runs between Gaithersburg (Lakeforest Transit Center) and North Bethesda (Medical Center Metro) and commenced operation in October 2017.
- **Watkins Mill Interchange at Interstate 270.** This project will construct a four-lane bridge to connect Watkins Mill Road over Interstate 270 with connecting entry and exit ramps to the interstate. It is currently under construction with completion anticipated by 2020.

5.2 Cumulative Effects Analysis

NIST focused this cumulative effects analysis on those resource areas that could reasonably be expected to experience a perceptible, continuing (non-temporary) adverse effect outside the campus boundaries as a result of implementation of the Master Plan. NIST then considered whether any of the past, ongoing, or potential future actions described in Section 5.1 (Evaluated Actions) would have the potential to combine with the Master Plan to present cumulative effects (whether adverse or beneficial) to these resource areas. Specifically, this analysis evaluates potential cumulative effects on the following resource areas:

- Transportation (vehicle circulation and public and alternative transportation);
- Light pollution; and
- Noise levels.

Transportation

As discussed in Section 4.8.1 (Vehicle Circulation and Parking), a NIST traffic study in 2015 found that the following three intersections near the campus currently provide a LOS below acceptable levels, especially during morning rush hour:

- West Diamond Avenue (MD Route 117) and Quince Orchard Road (MD Route 124), immediately northwest of the campus;
- Great Seneca Highway (MD Route 119) and Quince Orchard Road (MD Route 124), approximately 0.6 miles southwest of the campus; and
- Great Seneca Highway (MD Route 119) and Muddy Branch Road, approximately 0.8 miles south of the campus.

NIST staff also mention that the ramp from MD Route 117 to southbound Interstate 270 can become very congested during peak hours.

Site-generated traffic from the projected growth in the Master Plan would exacerbate traffic conditions at these intersections unless substantial changes are made to the roadway geometry. Additionally, the relocation of the commercial vehicle entrance to Gate F would also have the potential to increase traffic along Muddy Branch Road and Diamondback Drive (located southeast of the campus) as commercial vehicle drivers follow different routes to access the campus from Interstates 270 and 370. However, this shift in commercial vehicle traffic would be expected to reduce traffic along West Diamond Avenue and Quince Orchard

Road, and is not expected to result in an increase in commercial vehicle traffic along Great Seneca Highway.

Of the on-campus projects described in Section 5.1.1, only the CCT Project and the Quince Orchard Road Shared-Use Path would have the potential to affect traffic levels outside the campus. Both projects would be expected to reduce personal vehicle use and traffic congestion along Quince Orchard Road, including the congested intersections with West Diamond Avenue and Great Seneca Highway, by encouraging the use of alternative methods of transportation to and from the campus and the surrounding areas.

Many of the off-campus projects described in Section 5.1.2 would have the potential to affect traffic levels in the roads that border the campus by encouraging population growth and increasing commercial and office space. However, traffic studies have already been completed for the Quince Orchard Park – MedImmune/AstraZeneca Campus, the Gateway (Orchard Pond), and the Kentlands Apartments projects. Those studies concluded that the projects would not have negative impacts on the adjacent public road network (City of Gaithersburg, 2010, 2015b, and 2017c); however, NIST has not attempted to update or validate those findings. The remaining projects, 700 Quince Orchard Road and Kentlands Square, would be subject to future traffic studies as required by the City of Gaithersburg to minimize any unnecessary traffic impact. Residents in these new developments who work at the NIST Gaithersburg Campus would be able to walk or bike to work, potentially offsetting some of the increased vehicle traffic. All of these development efforts are located west of the campus, away from the relocated commercial vehicle entrance at Gate F along Muddy Branch Road under the Master Plan. As a result, none of these development efforts is expected to result in adverse cumulative traffic impacts along Muddy Branch Road.

The transportation projects described in Section 5.1.3 would also help to reduce traffic congestion around the campus and prevent adverse cumulative traffic impacts. The CCT Project would help to relieve high demand for parking facilities at the Shady Grove Metrorail and Metropolitan Grove MARC rail stations; reduce cut-through traffic in some neighborhoods and communities; and offset the increased traffic congestion associated with the planned commercial and residential developments (MTA, 2017). The Maryland 355 Bus Rapid Transit Project and Express Bus ("RideOn ExtRa") projects along MD Route 355 are expected to encourage the use of public transportation along that corridor, which may help to offset any increase in traffic congestion associated the Master Plan or other development. The Watkins Mill Interchange at Interstate 270 will allow commuters from the interstate to more directly access current and proposed residential development at the Watkins Mill Town Center and The Spectrum at Watkins Mill, bypassing MD Routes 117 and 124 (including the congested intersection immediately northwest of the campus). This connection will reduce congestion at the MD Route 124/Interstate 270 interchange and the MD Route 124/MD Route 355 intersection.

Based on the above, and based on the additional mitigation measures described in Section 4.8.1 (Vehicle Circulation and Parking) to reduce vehicle conflicts and further encourage use of public transportation and bicycles, the Master Plan is not expected to contribute to significant adverse cumulative traffic impacts in the road network surrounding the campus.

Light Pollution

As discussed in Section 4.12.2 (Light Pollution), the Master Plan incorporates numerous mitigation measures to reduce potential glare and light trespass from new interior and exterior lighting. These measures include ensuring consistency with current IES and IDA guidance and City of Gaithersburg requirements; incorporating vegetative screening; and using comprehensive interior lighting control systems. Despite these mitigation measures, there is some potential that the Master Plan could increase nighttime light trespass outside the campus boundary.

Of the on-campus projects described in Section 5.1.1, only the CCT Project would have the potential to affect nighttime light trespass outside the campus. According to MTA, lighting for the new bus stations under that project would be designed to minimize light pollution to surrounding residential communities (MTA, 2017). NIST does not have enough information regarding the off-campus projects described in Section 5.1.2 or the transportation projects described in Section 5.1.3 to perform a detailed assessment of potential light pollution concerns. However, given the projected increase in the density of residential, commercial, and office development near the campus, it is reasonable to expect that these projects would result in an overall increase in nighttime light trespass as compared to current conditions. This increase could be partially offset by replacement of existing exterior lighting systems that do not comply with City of Gaithersburg requirements (if any such lighting systems exist in the affected areas).

These potential light pollution concerns serve to emphasize the importance of the mitigation measures described in Section 4.12.2 (Light Pollution) for the Master Plan. The Master Plan is not expected to contribute to significant adverse cumulative light pollution impacts provided that the designs of new facilities and interior and exterior lighting systems incorporate these mitigation measures to reduce or eliminate nighttime light trespass.

Noise Levels

As discussed in Section 4.13 (Noise Levels), the Master Plan would have the potential to slightly increase ambient noise levels in some off-campus areas because of the operation of new laboratory activities, air-handling units, exhaust fans, and emergency generators, and relocation of the commercial vehicle entrance from Gate C to Gate F. These projects would incorporate design and landscaping measures as appropriate to ensure that ambient noise levels remain below relevant state and county noise thresholds.

Some of the on-campus projects described in Section 5.1.1 also have the potential to affect ambient noise levels outside the campus. The Large Fire Facility Renovation/Expansion (Building 205) resulted in a slight increase in noise because of the addition of a second emissions control system; however, this increase is not believed to be perceptible in off-campus residential areas. Operation of the CHP plant is expected to result in a slight increase in ambient noise; however, NIST estimates that noise levels would remain below relevant state and county thresholds and has incorporated numerous design mitigation measures to reduce interior and exterior operational noise levels. The CCT Project would increase noise levels because of transitway operations, including along Quince Orchard Road; however, MTA performed a quantitative noise assessment and determined that future noise levels associated with the CCT project would have "No Impact" to receptors near the campus boundary along Quince Orchard Road (MTA, 2017).

Of the off-campus projects described in Section 5.1.2 and the transportation projects described in Section 5.1.3, the Construction at Diamond Farms (700 Quince Orchard Road) appears to be the only project with the potential to present cumulative ambient noise impacts when viewed in combination with the Master Plan and other on-campus projects. This is due to its location on Quince Orchard Road, near the CHP plant and the proposed CCT Project. However, the project consists of redevelopment of an existing commercial parcel and does not appear to involve introduction of a new noise-generating industrial use of the site.

Based on the above, and based on the mitigation measures described in Section 4.13 (Noise Levels) to reduce ambient noise levels, the Master Plan is not expected to contribute to significant adverse cumulative noise impacts outside the campus.

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7 List of Preparers

Name:	Patrick Goodwin
Position:	Project Manager
Firm:	Eastern Research Group, Inc.
Items:	Overall EA coordination, analysis, review, and documentation
Experience:	B.A. Environmental Science; 16 years of experience in environmental and cultural resource studies and documentation

Name:	April Eilers
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Name:	JJ Johnson
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Name:	Allison Harding
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Name:	Kettie Holland Rupnik
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Name:	Alec Lambert
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Experience:	B.A. Environmental Science; 6 years of experience in environmental science, focus on habitat assessments, aquatic biology, geomorphology, and water sampling frameworks

Name:	Doug Jackson
Position:	Staff Engineer
Firm:	Eastern Research Group, Inc.
Items:	GCR analysis
Experience:	PhD Ecology and Evolutionary Biology/B.S. Mechanical Engineering; 17 years of experience in biophysical modeling, ecology, and mobile source emissions modeling

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8 List of Agencies and Persons Consulted

Agency: U.S. Fish and Wildlife Service, Chesapeake Bay Ecological Services Field Office

Reason: Potential presence of rare, threatened, or endangered species on the campus.

Agency: Maryland Department of Natural Resources, Wildlife and Heritage Service

Reason: Potential presence of rare, threatened, or endangered species on the campus.

Agency: Maryland Historical Trust

Reason: Potential impacts on historic resources.

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9 Distribution List

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APPENDIX A
PHASING OF THE MASTER PLAN

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Table A-1. Summary of Phasing Packages and Associated Major Components under the NIST Gaithersburg Campus Master Plan

Phasing Packages	Major Components	Comments
Phase 1: Immediate Priorities		
Building 245 Addition/Renovation*	• Laboratory additions (3) construction • Renovation of existing building	Ongoing phased construction
Utility Upgrades	• Utility loop to the south campus • New electrical substation • Detailed study of underground utilities • Replace feeders, ductbanks	To provide redundancy/back-up Aging, failing electrical infrastructure
Gate A Modification	• Building 103 addition/renovation • Canopy construction • Roadway/parking modifications • Security equipment installation	Modifications in response to security policies
Research Building I	• Laboratory building construction • Connection to campus concourse • Pedestrian path to Gate A • Stormwater management facility	To facilitate start of GPL renovations
GPL Renovations	• Building renovations • New office additions to Buildings 221, 222, 226 • Construction of high-bay addition and renovation of Building 206 • Demolition of Building 411 • New electrical switch gear • Courtyard activation	Multi-step process, proceeding building-by-building
Gate F Modification	• Visitor screening construction • Commercial vehicle screening facility and shipping/receiving facility construction • New roadway, curb cut, parking • Renovation in Building 301 for Building 428 occupants	Modifications in response to security policies
Phase 2: Next-Step Projects		
Building 101 Addition	• Building addition construction • Renovation: public access areas • Renovation: offices • Upgrades: building systems and facade	Office renovation will improve utilization, free-up space for additional administrative staff
Phase 3: Program Expansion Projects		
Center Campus New Research Buildings II, III, IV	• Laboratory building construction • Connection to campus concourse • Parking structure construction • Chiller plant expansion • Roadway/parking modifications • Courtyard landscape/social spaces	Added as needed May overlap GPL renovations to enable early office occupancy of one GPL

Table A-1. Summary of Phasing Packages and Associated Major Components under the NIST Gaithersburg Campus Master Plan

Phasing Packages	Major Components	Comments
Steam and Chilled Water Plant Expansion	• Chilled water addition to Building 302 • New cooling tower installation	Coordinated with timing of new research building needs
Independent Projects or Beyond Phase 3		
Site and Landscape Improvements	• East-West pedestrian walkway/planting • Activation of courtyards • Stormwater management features • Walking/multi-use trails • Meadow replacement of lawns • Reforestation	These should be implemented immediately, separately or in concert with construction projects
Standard Reference Material Facility	• Laboratory building construction • Access road/loading modifications • Relocation of associated staff from Building 222	This will proceed as mission priorities dictate
Specialty Laboratory—Additions/New	• Addition/renovation to Buildings 207, 235 • Construction of Strong Facility, Wind/Fire Facility • Access drive/parking modifications	Each will proceed as mission priorities dictate
Specialty Laboratory Renovations	• Upgrades to Buildings 202, 230, 231, 233, 237/238	Phased renovations, protecting ongoing research programs
Advanced Measurement Laboratory	• Laboratory building construction • Tie in to Building 216 • Solar panel removal/replacement • Parking removal/roadway modification	This will proceed as mission priorities dictate

Note:

* The renovation and expansion of Building 245 (Radiation Physics) would take place over a total of seven phases. The first of these phases is underway, while a separate NEPA EA is being prepared for the remaining phases. To avoid duplication of NEPA reviews, the Proposed Action evaluated in this Master Plan EA does not include the renovation and expansion of Building 245.

Note: Elements marked with a red asterisk (*), while addressed in the Master Plan, are not considered part of the Proposed Action evaluated in this EA. These elements are addressed in separate NEPA analyses and/or are beyond the 20-year time horizon of the Master Plan. See Section 5 (Cumulative Effects).

Figure A-1. Phase 1 — Immediate Priorities

Note: Elements marked with a red asterisk (*), while addressed in the Master Plan, are not considered part of the Proposed Action evaluated in this EA. These elements are addressed in separate NEPA analyses and/or are beyond the 20-year time horizon of the Master Plan. See Section 5 (Cumulative Effects).

Figure A-2. Phase 2 — Anticipated Next-Step Projects

Note: Elements marked with a red asterisk (*), while addressed in the Master Plan, are not considered part of the Proposed Action evaluated in this EA. These elements are addressed in separate NEPA analyses and/or are beyond the 20-year time horizon of the Master Plan. See Section 5 (Cumulative Effects).

Figure A-3. Phase 3 — Anticipated Mid-Plan Projects

Note: Elements marked with a red asterisk (*), while addressed in the Master Plan, are not considered part of the Proposed Action evaluated in this EA. These elements are addressed in separate NEPA analyses and/or are beyond the 20-year time horizon of the Master Plan. See Section 5 (Cumulative Effects).

Figure A-4. Independent Projects or Beyond Phase 3

APPENDIX B
CORRESPONDENCE

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
Phone: (410) 573-4599 Fax: (410) 266-9127
http://www.fws.gov/chesapeakebay/
http://www.fws.gov/chesapeakebay/endsppweb/ProjectReview/Index.html

In Reply Refer To:
Consultation Code: 05E2CB00-2017-SLI-1466
Event Code: 05E2CB00-2017-E-03061
Project Name: NIST Gaithersburg

June 22, 2017

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. This species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 et seq.), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having

similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries
- Wetlands

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Chesapeake Bay Ecological Services Field Office
177 Admiral Cochrane Drive
Annapolis, MD 21401-7307
(410) 573-4599

Project Summary

Consultation Code: 05E2CB00-2017-SLI-1466

Event Code: 05E2CB00-2017-E-03061

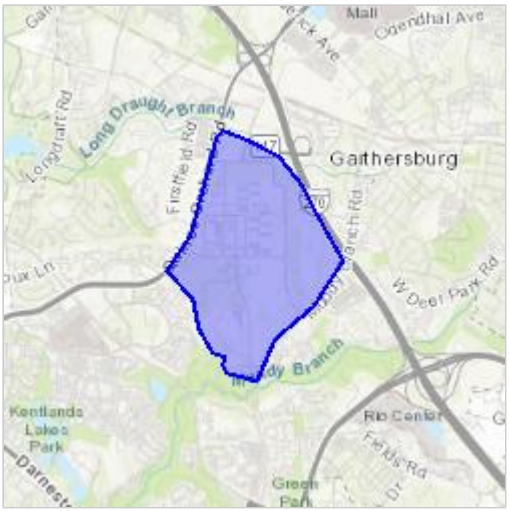
Project Name: NIST Gaithersburg

Project Type: ** OTHER **

Project Description: NIST Gaithersburg EA

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/39.13159072849467N77.21640750779213W



Counties: Montgomery, MD

Endangered Species Act Species

There is a total of 0 threatened, endangered, or candidate species on your species list. Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species. See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area. Please contact the designated FWS office if you have questions.

Critical habitats

There are no critical habitats within your project area.

USFWS National Wildlife Refuges And Fish Hatcheries

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

There are no refuges or fish hatcheries within your project area.

Wetlands

Impacts to NWI wetlands and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local U.S. Army Corps of Engineers District.

FRESHWATER POND

- PUBHh

MARYLAND
DEPARTMENT OF
NATURAL RESOURCES

Larry Hogan, Governor
Boyd Rutherford, Lt. Governor
Mark Belton, Secretary
Joanne Throwe, Deputy Secretary

August 21, 2017

Mr. Alec Lambert
PG Environmental, LLC
1113 Washington Avenue
Suite 200
Golden, CO 80401

RE: Environmental Review for National Institure of Standards and Technology (NIST) Campus located at 100 Bureau Drive, Gaithersburg, Montgomery County, Maryland.

Dear Mr. Lambert:

The Wildlife and Heritage Service has determined that there are no official State or Federal records for listed plant or animal species within the delineated area shown on the map provided. As a result, we have no specific concerns regarding potential impacts or recommendations for protection measures at this time. Please let us know however if the limits of proposed disturbance or overall site boundaries change and we will provide you with an updated evaluation.

Thank you for allowing us the opportunity to review this project. If you should have any further questions regarding this information, please contact me at (410) 260-8573.

Sincerely,

Lori A. Byrne

Lori A. Byrne,
Environmental Review Coordinator
Wildlife and Heritage Service
MD Dept. of Natural Resources

ER# 2017.1218.mo

UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-

May 9, 2016

Mr. Paul Loether, Chief
National Register of Historic Places
National Park Service
1201 Eye Street, NW (2280)
Washington, DC 20005
ATTN: Mr. Patrick Andrus

RE: National Register Determination of Eligibility of the National Institute of Standards and Technology Campus, Gaithersburg, Maryland

Dear Mr. Andrus:

The National Institute of Standards and Technology (NIST) is requesting a formal determination of eligibility by the Keeper of the National Register of Historic Places pursuant to 36 CFR part 63 regarding its 579-acre campus in Gaithersburg, Maryland.

Since 1901, NIST (known as the National Bureau of Standards until 1988) has developed and maintained key standards for the Nation, a role that the U.S. Constitution assigns to the Federal government, and has been supplying the measurements and tools to help U.S. industry compete. The attached report entitled, *Historic Assessment. National Institute of Standards and Technology, Gaithersburg, Maryland* (R. Christopher Goodwin & Associates, Inc. 2015), hereafter referred to as the *Assessment* was prepared by NIST in compliance with 54 U.S.C. 306108 and 306102 (formerly Sections 106 and 110 respectively) of the National Historic Preservation Act of 1966, as amended. It provides a thorough summary of the acquisition, planning, design, and construction of the Gaithersburg campus, as well as a discussion of the scientific research undertaken, and related principles applied to postwar research campus design. Finally, it identifies property types associated with the NIST campus (see **ATTACHMENT I**).

A total of 74 buildings, structures, objects, and landscapes were documented as part of the attached Assessment. Analysis of archival and architectural data applying the National Register of Historic Places (NRHP) Criteria for Evaluation (36 CFR 60.4[a-d]) resulted in our identification of a cohesive collection of thirteen resources (buildings, structures, and landscapes) that represent a recognizable historic district located within the center of the campus, all united by design and historical association within the initial construction period of the campus (1961–1969). Our recommended NRHP eligible district summarized in the attached table and corresponding Historic District Boundary Map (**ATTACHMENTS III** and **IV**), includes the original seven (7) interconnected General Purpose Laboratories (Bldgs. 220-226) of 1963-1966, the Shops (Bldg. 304) of 1962-1964 as well as the architecturally prominent administrative office tower building (Bldg. 101). Other contributory resources include the flag pole and the surrounding designed landscape. Non-contributory resources include the relocated (1976) Entrance Gates and the attached, but much later (1999) Advanced Chemical Sciences Laboratory (Bldg. 227). Eligibility Determinations were made using NRHP Criterion A and C (see the *Assessment* for details) and all contributing resources in the proposed NIST historic district were completed between 1965 and 1966.

Upon review of our 2015 *Assessment* and corresponding Determination of Eligibility, the Maryland Historical Trust (MHT) SHPO Elizabeth Hughes, in a letter dated 10/29/2016, proposed the entire 579-acre campus as an eligible National Register Historic District (see **ATTACHMENT V**). Please note that in this letter the SHPO somewhat misconstrues a DOE made by the FTA in conjunction with the Maryland Transit Authority (MTA) for a 2014 Section 106 review of the Montgomery County Corridor Cities Transit way (CCT) project. At that time, realizing the highly generalized nature of the MTA's survey and assessment (Section 106 Finding Assessment), NIST's Chief Facilities Management Officer Stephen Salber requested that a formal DOE be delayed until NIST could undertake a more comprehensive assessment of its resources (see **ATTACHMENTS VIII**, **IX,** and **X**).

NIST and its consultants, Metropolitan Architects & Planners and R. Christopher Goodwin, met with MHT staff to discuss the disputed boundary issues late last year on 12/ 2/2015 and Minutes of that meeting are attached (**ATTACHMENT VI**). It was then that MHT staff reminded us that NIST may request final determination of eligibility from the Keeper of the National Register of Historic Places. Finally, in an e-mail dated 2/12/2016, Beth Cole of the MHT, further recommended that all 26 resources constructed between 1960 and 1969 were contributing resources to their proposed 579-acre National Register-eligible district. The 47 resources constructed after 1970 were identified as non-contributing resources. To be clear, NIST disagreed with the MHT's recommendations (see **ATTACHMENT VII**)

I have attempted to provide you with a complete package of information, but invariably I may inadvertently omitted information you find necessary to review and analyze. If so, please do not hesitate to contact me by telephone: (301)975-6940 or by e-mail: phillip.neuberg@nist.gov.

Thank you in advance for your time and effort. We look forward to your response.

Sincerely,

Phillip W. Neuberg

Phillip W. Neuberg, AIA
Federal Preservation Officer

Enclosures

cc: all with enclosures
Ms. Elizabeth Hughes, MHT
Ms. Beth Cole, MHT
Mr. Stephen Salber, NIST
Ms. Susan Cantilli, NIST
Ms. Amber Hayes, NIST
Mr. Sanjay Arora, MAP
Ms. Kirsten Peeler, R Christopher Goodwin & Assoc.

NIST proposed NRHP District
List of ATTACHMENTS
For Review by Keeper of the NRHP
According to 36 CFR part 63

May 2016

I. *Historic Assessment, National Institute of Standards and Technology, Gaithersburg, MD* prepared for Metropolitan Architects and Planners by R. Christopher Goodwin & Associates, Frederick, MD 6/25/2015

II. Quad Locator (USGS) Map showing 579 acre NIST Campus in Gaithersburg Maryland

III. NIST proposed NRHP eligible Historic District

IV. List of Contributing and Non-Contributing Resources within the NIST proposed NRHP eligible Historic District

V. 10/29/2015 Letter from Elizabeth Hughes, MD SHPO (MHT) to Stephen Salber of NIST, rejecting NIST's recommended NRHP eligible District for a much larger district whose boundaries would be inclusive of the 579-acre campus grounds.

VI. Minutes from 12/2/2015 Meeting between MHT staff, NIST staff, and consultants

VII. E-mail dated 2/12/2016 from MHT's Beth Cole to Kirsten Peeler (NIST consultant @ R. Christopher Goodwin & Associates) with Addendum to the MIHP (Maryland Inventory of Historic Places) form itemizing contributory (26) and non-contributory (47) resources across an expanded 579 acre NRHP District as recommended by MHT

VIII. Letter dated 12/11/2014 from Steven Salber to MHT's Rodney Little, then MD SHPO

IX. Letter dated 10/23/2014 from federal DOT to Rodney Little, then MD SHPO including Section 106 *Findings of Effects*

X. E-mail dated 01/09/2015 from MHT's Jonathan Sager to NIST's Susan Cantilli, stating that NIST's *Assessment* will supersede and\or expand on the conclusions of FTA's limited analysis because it (the *Assessment*) "will be based on the more holistic and up-to-date information."

United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, DC 20240

IN REPLY REFER TO:

DETERMINATION OF ELIGIBILITY NOTIFICATION

National Register of Historic Places

National Park Service

Name of Property: National Institute of Standards and Technology Campus Historic District

Location: Gaithersburg, Montgomery County State: MD

Request submitted by: Philip W. Neuberg, AIA, Federal Preservation Officer, US Department of Commerce, National Institute of Standards and Technology (NIST), Gaithersburg, MD

Date received: 05/11/2016 Additional information received

Opinion of the State Historic Preservation Officer:

_X_ Eligible __Not Eligible _No Response __Need More Information

Comments:

The Secretary of the Interior has determined that this property is:

X Eligible ___Not Eligible

Applicable criteria: A and C

Comment: The entire 579-acre NIST campus is eligible for the National Register of Historic Places as a historic district under National Register Criteria A and C for its historic and architectural importance. The historic district's period of significance corresponds to the initial period of construction of the NIST campus in the early 1960s.

See attached for a detailed explanation of this determination of eligibility.

Patrick Andrus

Keeper of the National Register

6/22/2016

Date

WASO-28

United States Department of the Interior

NATIONAL PARK SERVICE
1849 C Street, N.W.
Washington, DC 20240

IN REPLY REFER TO:

DETERMINATION OF ELIGIBILITY NOTIFICATION
NATIONAL REGISTER OF HISTORIC PLACES
NATIONAL PARK SERVICE

Name of Property: National Institute of Standards and Technology Campus Historic District
Location: Gaithersburg, Montgomery County, MD

On May 11, 2016, the Federal Preservation Officer (FPO) for the National Institute of Standards and Technology (NIST) requested that the National Register of Historic Places issue a formal Determination of Eligibility (DOE) under Federal regulations 36 CFR Part 63, for properties located on the NIST campus. This DOE request resulted from a disagreement between the FPO and the Maryland State Historic Preservation Officer (SHPO) over the boundaries of the proposed district.

The documentation on the proposed district is found in the June 12, 2015, report "Historic Assessment, National Institute of Standards and Technology, Gaithersburg, Maryland," prepared for NIST by R. Christopher Goodwin & Associates, Inc., and a "Maryland Historical Trust, Maryland Inventory of Historic Properties Form," prepared by the same firm in June 2015. The FPO has recommended a historic district encompassing 57.89 acres, while the MD SHPO has proposed that the entire 579-acre campus is eligible for the National Register as a historic district.

The area encompassing the NIST campus was bought and developed by the Federal government in the late 1950s and 1960s to replace the overcrowded NIST facility in Washington, DC. The documentation defines three periods of development of the campus: the Initial Construction Period (1961-1969); the Second Period (1970-1999); and the Third Period (2000-2015). FPO and SHPO agree that only properties dating from the Initial Construction Period would contribute to the historic district and that not enough time has elapsed to evaluate the eligibility of the Second and Third Period properties. The documentation establishes the historic importance of the NIST campus under National Register Criterion A for its association with developments in science and technology, and the architectural importance of the campus under National Register Criterion C as a significant example of post-World War II research campus design.

The FPO-recommended boundary for the historic district includes the contributing original seven interconnected General Purpose Laboratories (Buildings 220-226) built 1963-1966, the Administration Building (Building 101) constructed 1962-1965, the Shops (Building 304), constructed 1962-1964, the flagpole (1965) and designed landscape elements. This boundary excludes some 15 or so buildings constructed during the Initial Construction Period, many of which are located immediately adjacent to the FPO-proposed district. These buildings include Special Purpose Laboratories and other

DETERMINATION OF ELIGIBILITY NOTIFICATION
NATIONAL REGISTER OF HISTORIC PLACES
NATIONAL PARK SERVICE

Name of Property: National Institute of Standards and Technology Campus Historic District
Location: Gaithersburg, Montgomery County, MD

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buildings which were used in the investigation of fluid mechanics, radiation physics, engineering mechanics, non-magnetic studies, the study of the properties of concrete, etc. They are associated with the same historic and architectural importance as the properties included within the FPO-recommended district and they contribute to the more expansive historic district found eligible here.

The entire NIST campus is eligible for the National Register of Historic Places. The boundary of the eligible historic district is the same as that shown as the "NIST Campus Boundary" in Figure 7.1 on page 70 of the "Historic Assessment" report, and the list of contributing and non-contributing properties is that shown in the "Addendum to Maryland Historical Trust, Maryland Inventory of Historic Properties Form," dated February 12, 2016, and included as "Attachment 7," submitted by the FPO with the Determination of Eligibility request.

UNITED STATES DEPARTMENT OF COMMERCE
National Institute of Standards and Technology
Gaithersburg, Maryland 20899-

January 2018

Ms. Beth Cole

Administrator, Project Review and Compliance
Maryland Historical Trust
Maryland Department of Planning
100 Community Way
Crownsville, MD 21032

RE: MHT Review of the Master Plan prepared for the National Institute of Standards and Technology (NIST), Gaithersburg, Montgomery County, Maryland

Dear Ms. Cole:

The National Institute of Standards and Technology (NIST) is pleased to submit a hard and electronic copy of the Draft Master Plan and Environmental Assessment for our Gaithersburg campus to the Maryland Historical Trust. As you know, the campus master plan was identified as a federal undertaking pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended. The Area of Potential Effect (APE) for the undertaking encompasses the 579-acre NIST campus and neighborhoods immediately adjacent to the historic property. The NIST Gaithersburg campus was determined eligible for listing in The National Register of Historic Places in June 2016; NIST currently is pursuing formal listing of the historic district. Our agency consulted with the Maryland Historical Trust (MHT) during the development of the Draft Master Plan through an August 2017 site meeting and in subsequent e-mail correspondence.

Project Location and Description

The NIST campus is located in the City of Gaithersburg. Interstate 270 adjoins the eastern boundary of the campus, Muddy Branch Road is located along the southeast boundary, and Quince Orchard Road is located along the western boundary. The existing road network separates the campus from surrounding commercial and residential development constructed during the late twentieth century. Residential development consists of single-family dwellings and townhouses. Commercial development consists of strip malls, big-box retailers, and office buildings.

The Draft Master Plan was developed in accordance with Department of Commerce requirements to anticipate agency needs and to identify potential impacts upon surrounding communities. The result of the collaborative efforts of NIST and stakeholders are presented in the Draft Master Plan, which identifies the following goals:

- A plan that creates a comprehensive and coordinated framework for future physical development of the Gaithersburg campus;
- A plan that develops appropriate facilities and infrastructure for the evolving and advancing scientific research meeting both near and long-term needs;
- A plan that maintains the attractive campus environment;
- A plan that respects and embraces the designation of the campus as a historic district;
- A plan that supports and advances the sustainable design and environmental goals of NIST and the Department of Commerce; and,
- A plan for gradual change, complete at each step (Metropolitan Architects and Planners, Inc. 2017:10).

Key components of the draft plan include the appropriate treatment of the historic property; building modernization; construction of new research buildings and additions to existing structures; modifications to campus gates; removal of temporary buildings and, landscape and open space, utility infrastructure, and parking improvements.

Summary of Master Plan Alternatives

As part of the master planning process, the NIST campus was divided into three functional areas: the central core, Gates A and F, and the southern campus. The central core comprises the main administrative hub (Building 101); it is the location of the seven original General Purpose Laboratories (GPL). The southern campus located below South Drive houses the various specialty laboratories. The master planning process developed six alternatives for addressing these Master Plan goals for the central core, Gates A and F, and additions to the specialty laboratories. Six alternatives were developed and analyzed for compatibility with mission requirements, programming needs, and consistency with the Secretary of the Interior's *Standards for the Treatment of Historic Properties* (Secretary's *Standards*).

- **Alternative A**
  Alternative A considers the creation of two new courtyards through the construction of new research buildings in the central core of the campus. The two new courtyards would be created in the vicinity of the Advanced Measurement Laboratory and around Buildings 227 and 226. A new administrative building adjacent to Building 304 also would be constructed. Finally, the GPLs would be modernized and expanded under this alternative.

- **Alternative B**
  Alternative B takes into consideration the important role of the internal concourses in the overall function of the campus. Under this alternative, all new buildings would be tied to the concourses, augmenting the existing central spine. This central spine would be elongated through the construction of two new GPLs at the northern end of the complex. The Advanced Measurement Laboratory also would be expanded under this alternative. A new administrative building to be located on an existing parking lot would be constructed, and modernization of and new additions to the GPLs would be completed.

- **Alternative C**
  A new administrative and research neighborhood would be created under Alternative C. Located below South Drive and south of the Advanced Measurement Laboratory, the new neighborhood would share amenities and services with specialized laboratory occupants and research and administrative functions. The new complex would be attached to the internal concourse. No additions would be constructed; however, the GPLs would be modernized.

- **Alternative D**
  Alternative D concentrates new construction in the center of the campus and emphasizes proximity and assignment flexibility in research, administrative, and service functions. New construction connected to the central concourse would occur south of Building 304 on the existing parking lots. In addition, a portion of the existing roadway would be removed to accommodate a new pedestrian

walkway to the administrative office building. Under this alternative, the GPLs would be modernized and additions would be constructed. An addition also would be constructed to the Advanced Measurement Laboratory.

- **Alternative E**
  Alternative E concentrates laboratory and office-only functions in new buildings, with office space for researchers to be provided in the adjacent GPLs. Non-laboratory functions currently housed in the GPLs would be relocated to a new administrative building. New construction in the campus core would emphasize administrative rather than laboratory uses.

- **Alternative F**
  Research buildings would be concentrated in the campus center and the GPLs would be modernized and expanded to accommodate both laboratory and office functions. New construction would be for laboratory purposes with related support and office requirements. The new laboratories would be linked with new internal concourses; and a new research building also would be constructed at the northern end of the existing concourse. An addition to the Advanced Measurement Laboratory would be completed. The GPLs would be renovated to accommodate administrative office needs, as well as modernized laboratories, resulting in greater usable square footage.

Alternative F was selected as the preferred option to address programming, space needs and mission objectives while complying with the Secretary's *Standards*. Among its other advantages, Alternative F calls for more office space in the GPLs, an approach that requires a smaller amount of new construction to achieve the overall Master Plan goals.

The Draft Master Plan takes into consideration NIST's programming and mission needs while emphasizing stewardship of the historic property by applying the Secretary's *Standards*. Our agency requests MHT's concurrence with our finding that the Master Plan will have no adverse effect to historic properties. Of course, once they are funded, we anticipate future review of individual projects by your office to consider possible effects to historic properties and consistency with the *Standards* pursuant to 800.5 of 36 CFR Part 800.

Please contact me at 301-975-6940 if you have any questions regarding this submittal. Thank you in advance for your thoughtful consideration.

Sincerely,

Phillip W. Neuberg, FAIA
Federal Preservation Officer
Enclosures

cc: Ms. Natalie Loukianoff, Preservation Officer, MHT w/ enclosures

Mr. Michael Weil, NCPC w/ enclosures

MARYLAND DEPARTMENT OF
PLANNING
MARYLAND HISTORICAL TRUST

Larry Hogan, Governor
Boyd Rutherford, Lt. Governor

Robert S. McCord, Acting Secretary

March 16, 2018

Phillip W. Neuberg
Federal Preservation Officer
National Institute of Standards and Technology
100 Bureau Dr.
Gaithersburg, MD 20899

Re: MHT Review of Draft Master Plan for NIST
Montgomery County, Maryland
MD20180109-0007

Dear Mr. Neuberg:

Thank you for providing the Maryland Historical Trust (Trust), Maryland's State Historic Preservation Office, with copies of the draft Master Plan and Environmental Assessment for the NIST Gaithersburg Campus. The Trust is reviewing the undertaking with respect to potential effects on historic properties, pursuant to Section 106 of the National Historic Preservation Act and we are writing to provide our comments.

The NIST Gaithersburg campus was determined eligible for listing in the National Register of Historic Places (National Register). The Master Plan is well written and incorporated the Design Guidelines (Chapter 11) which NIST and the Trust had previously discussed. The Trust concurs with NIST's determination that the Master Plan will have **No Adverse Effect** on Historic Properties on the condition that NIST will submit individual undertakings to the Trust to review for effects on historic properties pursuant to 36 C.F.R. § 800.5, when planning proceeds for those undertakings.

The Trust applauds NIST efforts in pursuing a formal listing in the National Register. We also appreciate NIST's proactive efforts to take historic properties into account during your planning process. We look forward to future consultation regarding a Programmatic Agreement for the campus. Thank you for providing us this opportunity to comment. If you have any questions or we may be of assistance, please contact me at natalie.loukianoff@maryland.gov or 410-697-9587.

Sincerely,

Natalie Loukianoff
Preservation Officer
Maryland Historical Trust

NSL/EJC/201800123
CC: Michael Weil (NCPC)
Christopher Wilson (ACHP)
Rebecca Ballo (Montgomery County)
Rita Pritchett (Clearinghouse)

Patrick Goodwin

From: Cantilli, Susan P (Fed) <susan.cantilli@nist.gov>
Sent: Wednesday, March 14, 2018 3:40 PM
To: Susan Drew; Debargha Sengupta
Subject: FW: NIST Campus Plan Comments

FYI

From: Laura Howell [mailto:Laura.Howell@gaithersburgmd.gov]
Sent: Wednesday, March 14, 2018 3:23 PM
To: Weil, Michael <michael.weil@ncpc.gov>
Cc: Trudy Schwarz <Trudy.Schwarz@gaithersburgmd.gov>; Cantilli, Susan P (Fed) <susan.cantilli@nist.gov>
Subject: RE: NIST Campus Plan Comments

Hi Michael,

The City of Gaithersburg offers the following comments on the NIST Master Plan:

The City of Gaithersburg is supportive of the National Institute of Standards and Technology's Draft Master Plan for the Gaithersburg Campus. NIST submitted a copy of the draft Master Plan and which was reviewed by staff. Representatives of NIST then presented the plan to the Mayor and City Council on February 5, 2018. As evidenced by feedback from the Mayor and City Council following the presentation, the City greatly values NIST's presence, and views this plan as a great model of sustainability and environmental consciousness. In particular, the City appreciates the plan's focus on pedestrian and green infrastructure, as well as traffic flow and entrance queuing improvements. City Staff had the opportunity to provide comments during the development of the draft, and is of the opinion that the plan is compatible with the adjoining Master Plan of the City of Gaithersburg and concurs with the goals and conclusions outlined in the draft plan.

Thank you,
Laura

Laura Howell
Long Range Planner
City of Gaithersburg|Planning and Code Administration
31 S. Summit Avenue Gaithersburg, MD 20877
(240)805-1153

From: Weil, Michael [mailto:michael.weil@ncpc.gov]
Sent: Friday, March 09, 2018 8:27 AM
To: Laura Howell
Subject: NIST Campus Plan Comments

Hi Laura – I spoke to Susan Cantilli from NIST, who gave me your contact information.

I am currently reviewing the draft NIST master plan for our federal planning commission, and will present the plan to our Commission in April (5th), and I was interested in getting any sort of written comments that your department would like to provide for our consideration as part of our review. I spoke to Phil Neuberg, and he told me that they presented their draft master plan to the Gaithersburg planning board, and he characterized your board as being generally supportive of their plan. So in follow-up, we wanted to give your department an opportunity to provide written comments to us – either via more formal letter, or by e-mail. Also, if interested, you and/or other planners from your department are welcome to attend our April meeting (April 5th @ 1:00 PM) and either watch the meeting only, or also testify in front of our Commission.

Please contact me if you have any questions, and thanks for your consideration.

Michael W. Weil
Urban Planner
National Capital Planning Commission
401 9th Street, NW
Suite 500
Washington, DC 20004
(t) 202.482.7253
(f) 202.482.7272

National Capital Planning Commission

401 9th Street, NW North Lobby, Suite 500 Washington, DC 20004 Tel 202.482.7200 Fax 202.482.7272 www.ncpc.gov

IN REPLY REFER TO:
NCPC FILE No. MP23

APR 11 2018

Mr. Robert C. Vaughn, Director
National Institute of Standards and Technology
US Department of Commerce
Office of Facilities and Property Management
Chief Facilities Management Officer
100 Bureau Drive
Gaithersburg, Maryland 20708

Dear Mr. McKee:

The National Capital Planning Commission, at its April 5, 2018 meeting, approved the enclosed comments on the draft master plan for the National Institute of Standards and Technology (NIST), Draft Gaithersburg Campus Master Plan. A copy of the Executive Director's Recommendation for the project is also enclosed.

Sincerely,

Marcel C. Acosta
Executive Director

Enclosures

cc: Ms. Gwen Wright, Director of Planning, Maryland-National Capital Park and Planning Commission, Montgomery County

National Capital Planning Commission

Commission Action

April 5, 2018

PROJECT
Draft Gaithersburg Campus Master Plan
National Institute of Standards
and Technology
100 Bureau Drive
Gaithersburg, Maryland

SUBMITTED BY
United States Department of Commerce

REVIEW AUTHORITY
Advisory
per 40 U.S.C. § 8722(a) and (b)(1)

NCPC FILE NUMBER
MP23

NCPC MAP FILE NUMBER
3115.10(05.00)44725

APPLICANT'S REQUEST
Approval of comments on draft master plan

ACTION TAKEN
Approved comments on draft master plan

The Commission:

Approves the following comments on the draft campus plan for the National Institute of Standards and Technology (NIST) Gaithersburg campus.

Supports the Alternative F development concept, which concentrates new development in the campus center (historic core) to facilitate research; preserves the campus's open space character; and adds more programmable outdoor spaces to facilitate professional collaboration.

Finds that Alternative F most successfully provides for NIST's research mission, while preserving the historic campus core and integrating new sustainable development measures.

Historic Preservation

Notes that the Maryland Historic Trust (State Historic Preservation Office) has determined the campus is eligible for inclusion in the National Register of Historic Places "for its association with events that made important contributions to the broad patterns of history under the Science and Technology and Postwar Research Campus Design themes, and as a recognizable entity that embodies the characteristic of Post War Research Campus design."

Finds that Alternative F best preserves the campus core's existing grid pattern of development, formal landscape, large-scale monumental buildings, and general/specialized laboratories, identified as hallmarks of postwar research campus design.

Commends NIST's careful consideration of the campus's unique historic character throughout the planning and design process.

Sustainability

Supports the National Institute of Standards & Technology's effort to meet federal and State sustainability goals at its Gaithersburg campus through integrated, campus-wide strategies related to stormwater management, landscaping, and energy-efficiency.

Finds that all of the proposed alternatives, including Alternative F, convert significant amounts of manicured property to new forests and meadows; identify a campus-wide system of rain gardens, bioswales, and planter boxes; and identify future solar panel installations and net-zero energy buildings.

Access/Transportation

Supports NIST's plans to develop a new pedestrian promenade between the adjacent Corridor Cities Transitway station and campus core, new interior campus trail network, additional sidewalks/crosswalks, bikeshare stations, and new external bicycle trails to encourage pedestrian, bicycle, and transit travel.

Supports the planned development of Gate F to accommodate future commercial vehicle inspections, shipping/receiving, and conference visitor screening based on site compatibility.

Requests that NIST continue refining the project's design to minimize impacts to the campus setting and off-site neighborhoods through landscaping, reconfiguring access roads, and light control measures.

Notes that NIST will improve its overall parking ratio from 1:1.5 to 1:1.9 with the implementation of the campus plan. The proposed ratio for federal employees, who comprise approximately 70 percent of the total population on campus, is 1:2. The proposed ratio for non-federal employees (contractors, guest researchers), who comprise 30 percent of the total population, is 1:1.7.

Requests that NIST prioritize development of a detailed Travel Demand Management plan with future mode share goals, program implementation steps/schedules, and regular commuter travel monitoring program for both federal and non-federal employees. The TDM plan should contain programs, strategies, goals, and implementation information specifically directed at encouraging more sustainable travel behavior by non-federal employees.

Requests that NIST submit a transportation progress report to NCPC for review prior to submitting the new parking garage and Building 411 lot expansion projects with the following information:

- Status of programs included in the future NIST Travel Demand Management plan, which demonstrate progress towards attaining future non-single occupant vehicle mode share goals; and
- Travel trend information based on commuter surveys given between 2016 and most recent survey prior to submission of the new garage and Building 411 lot expansion projects.

Julia A. Koster — 04/05/2018

Julia A. Koster — Date

Secretary to the National Capital Planning Commission

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APPENDIX C
GENERAL CONFORMITY RULE APPLICABILITY ANALYSIS

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Executive Summary

The General Conformity Rule (GCR) was established to ensure that federal activities do not hamper local efforts to control air pollution. In particular, the GCR implements Section 176(c) of the Clean Air Act, which prohibits federal agencies, departments, or instrumentalities from engaging in, supporting, licensing, or approving any action that does not conform to an approved state or federal implementation plan. The purpose of the GCR Applicability Analysis is to determine whether the Proposed Action—execution of a Master Plan for the NIST Gaithersburg Campus—is subject to the federal GCR.

Under the Proposed Action, NIST would execute new construction and additions to existing facilities totaling approximately 1,417,000 gross square feet (GSF), the renovation of approximately 2,608,000 GSF, and demolition of two temporary facilities totaling approximately 20,000 GSF. The Proposed Action would also construct a four-story parking garage and reconfigure pavement and sidewalks throughout the campus to support the new facilities. These activities would result in emissions because of the use of equipment and vehicles during construction activities and building demolition. In addition, the construction of new facilities that would be serviced by the campus Steam and Chilled Water Generation Plant (the Plant) would result in annual operating emissions from increased heating and cooling demand. The Proposed Action would occur in multiple phasing packages over a 20-year period. The number of personnel working at and commuting to the NIST Gaithersburg Campus during this period would increase by approximately 1,109 (from 4,007 to 5,106). The additional personnel commuting to campus would generate mobile source emissions. Using USEPA's *Motor Vehicle Emission Simulator*, this analysis estimated the resulting emissions of nitrogen oxides and volatile organic compounds. This analysis conservatively estimates the emissions of nonattainment criteria pollutants using a worst-case scenario construction schedule. Because of more stringent emission standards and improving vehicle efficiencies, emission rates are expected to decrease over the course of the Master Plan. Therefore, emissions from construction activities, employee commuting, and operation of the affected facilities were modeled using 2019 as the construction year to provide a conservative estimate. These calculations demonstrate that the emissions resulting from the Proposed Action would be below the *de minimis* levels defined for those pollutants in the Applicability Section of the GCR for the year 2019. Therefore, the GCR is not applicable to the Proposed Action.

Introduction

The purpose of this analysis is to determine whether the Proposed Action—execution of a Master Plan for the National Institute of Standards and Technology Campus in Gaithersburg, Maryland—is subject to the federal General Conformity Rule (GCR) established in 40 Code of Federal Regulations (CFR), Part 51, Subpart W, *Determining Conformity of General Federal Actions to State or Federal Implementation Plans*. The GCR was established to ensure that federal activities do not hamper local efforts to control air pollution. In particular, Section 176(c) of the Clean Air Act (CAA) prohibits federal agencies, departments, or instrumentalities from engaging in, supporting, licensing, or approving any action that does not conform to an approved state or federal implementation plan. This analysis will determine under which of the following areas the Proposed Action will fall:

- Not subject to the rule – The action does not emit criteria pollutants or precursors for which the area is designated as a nonattainment or maintenance area—all procurement actions are excluded from the GCR.
- Exempt or below *de minimis* levels – Emissions from the action are below *de minimis* levels and are not regionally significant, or the action is exempt.
- Does not meet *de minimis* levels or is regionally significant – Emissions from the action exceed *de minimis* levels—a Conformity Determination must be prepared for such actions.

This analysis is organized into the following sections:

- Background – Information on applicable air emission programs and limitations, including *de minimis* levels.
- Proposed Action – A description of the Master Plan at the NIST Gaithersburg Campus.
- Emissions Calculation Methods and Results – Procedures and results for estimating emissions associated with the Proposed Action.
- Conclusion – Assessment of whether the GCR is applicable to the Proposed Action.

Background

As part of the implementation of the CAA Amendments, the United States Environmental Protection Agency (USEPA) issued National Ambient Air Quality Standards (NAAQS) for six criteria air pollutants: carbon monoxide (CO), sulfur dioxide (SO_2), particulate matter with an aerodynamic diameter less

than or equal to a nominal 10 micrometers (PM_{10}) and 2.5 micrometers ($PM_{2.5}$), ozone (O_3), nitrogen dioxide (NO_2), and lead (Pb) (USEPA, 2017a). USEPA defines ambient air in 40 CFR Part 50.1(e) as "that portion of the atmosphere, external to buildings, to which the general public has access." Table C-1 shows the current NAAQS concentration limits as of November 2017 (USEPA, 2017a).

Table C-1. National Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Level [a]
Ozone (O_3)	8-hour	0.070 ppm [b]
Particulate Matter ($PM_{2.5}$)	24-hour	35.0 ug/m^3
	Annual Mean	12.0 ug/m^3
Particulate Matter (PM_{10})	24-hour	150 ug/m^3
Carbon Monoxide (CO)	1-hour	35.0 ppm
	8-hour	9.0 ppm
Lead (Pb)	3-month	0.15 ug/m^3
Nitrogen Dioxide (NO_2)	1-hour	100 ppb
	Annual Mean	53 ppb
Sulfur Dioxide (SO_2)	1-hour	75 ppb
	3-hour	0.5 ppm

Notes:
a – All of the standards are primary standards, which provide public health protection, except for the 3-hour SO_2 limit, which is a secondary standard and provides public welfare protection. Units of measure are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air (ug/m^3).
b – A final rule signed October 1, 2015, and effective December 28, 2015 established a more stringent 8-hour standard of 0.070 ppm. The previous (2008) ozone standards of 0.075 ppm remain in effect in some areas.

The CAA divides the U.S. into geographic areas called "air quality control regions" (AQCRs). These AQCRs are established areas such as counties, urbanized areas, and consolidated metropolitan statistical areas. An AQCR in which levels of a criteria air pollutant meet the health-based NAAQS is designated an *attainment* area for the pollutant, while an area that does not meet the NAAQS is designated a *nonattainment* area for the pollutant. An area that was once designated a nonattainment area but was later reclassified as an attainment area is known as a *maintenance* area. Nonattainment and maintenance areas can be further classified as extreme, severe, serious, moderate, or marginal. An AQCR may have an acceptable level for one criteria air pollutant but may have unacceptable levels for other criteria air pollutants. Thus, an area could be attainment, maintenance, and/or nonattainment at the same time for different pollutants.

Each nonattainment AQCR is responsible for submitting a State Implementation Plan (SIP), which specifies the manner in which NAAQS will be achieved and maintained. Maintenance areas must adhere to a maintenance plan for the specific pollutant for which the area was initially designated nonattainment.

The NIST Gaithersburg Campus is located in Montgomery County, Maryland. Montgomery County is part of the Metropolitan Washington AQCR, which is managed by the Metropolitan Washington Air Quality Committee (MWAQC). The Washington, DC-MD-VA Metropolitan Area is also included in the larger North-East/Mid-Atlantic Ozone Transport Region. The USEPA has designated Montgomery County as nonattainment for the ozone NAAQS. Montgomery County is an attainment area for PM, CO, SO_2, NO_2, and lead (40 CFR 81.321). Part of Montgomery County is a CO maintenance area, but the campus is not located within this area (USEPA, 2017b).

The Applicability Analysis Section of the GCR, 40 CFR 93.153, states that Federal actions are required to perform a conformity determination for each nonattainment criteria pollutant (or precursor to those pollutants) if the total of direct and indirect emissions of those pollutants would equal or exceed the *de minimis* levels defined in that section. Table C-2 identifies the *de minimis* levels that would apply to actions at the NIST Gaithersburg Campus in Montgomery County, Maryland. This GCR applicability analysis will determine whether the Proposed Action has the potential to result in emissions above the levels listed in Table C-2.

USEPA promulgated revisions to the GCR on March 24, 2010. The revised rule removes requirements for federal agencies to conduct conformity determinations for "regionally significant" actions that have emissions greater than 10% of the emissions inventory for a nonattainment area if expected pollutant emissions do not exceed *de minimis* levels. Therefore, this applicability analysis does not evaluate the Proposed Action for "regional significance."

Table C-2. Montgomery County Attainment Status and General Conformity Rule *De Minimis* Thresholds

Criteria Pollutant	Classification of Montgomery County	Pollutant or Precursor of Concern	*De Minimis* Emission Rate (tons/yr) [a, b]
Ozone (O_3)	Nonattainment of the 1997 standard (moderate) Nonattainment of the 2008 standard (marginal)	NOx	100
		VOC	50
Carbon Monoxide (CO)	Attainment	CO	N/A
Particulate Matter (PM_{10})	Attainment	PM_{10}	N/A
Particulate Matter ($PM_{2.5}$)	Attainment	$PM_{2.5}$	N/A
		NOx	N/A
		SO_2	N/A
Lead (Pb)	Attainment	Pb	N/A
Nitrogen Dioxide (NO_2)	Attainment	NO_2	N/A
Sulfur Dioxide (SO_2)	Attainment	SO_2	N/A

Notes:
a – *De minimis* levels are emission rates specified in 40 CFR 93.153(b), which may not be exceeded by federal actions taking place in nonattainment and maintenance areas.
b – N/A designates that Montgomery County is an attainment area for that pollutant and *de minimis* levels are therefore not applicable for that pollutant.

Proposed Action

The need for the NIST Gaithersburg Campus Master Plan, and the campus improvements prescribed therein, is driven by both institutional policy and the inability of existing facilities to support current and projected mission requirements at the campus. The Master Plan emphasizes quality and collaborative research in addition to sustainable and efficient operations. The Master Plan addresses current campus needs and delineates future development through phasing packages. The Master Plan provides for the modernization of aging, inefficient buildings and accommodates the anticipated growth in research programs over the next 20 years. Under the Master Plan, NIST would execute new construction and additions to existing facilities totaling approximately 1,417,000 GSF, the renovation of approximately 2,608,000 GSF, and demolition of two temporary facilities totaling approximately 20,000 GSF. The Proposed Action would also construct a four-story parking garage and reconfigure pavement and sidewalks throughout the campus to support the new facilities. The Proposed Action would occur in multiple phasing packages over a 20-year period.

To ensure a conservative analysis, NIST assumed a very aggressive construction schedule for the year 2019. See Table C-3 for a summary of construction and demolition activities, including the associated square footage assumed for this worst-case scenario construction year. Because of more stringent emission standards and improving vehicle efficiencies, emission rates are expected to decrease over the course of the Master Plan. Therefore, emissions from construction activities and operation of the affected facilities were modeled using 2019 as the construction year to provide a conservative estimate.

Table C-3. Summary of Construction and Demolition Activities for Worst-Case Construction Year under the Master Plan

2019 Construction and Demolition Activities	Total (SF)
Construction	
Buildings (New)	250,000
Buildings (Renovation)	200,000
Pavement/ Sidewalks	15,000
Demolition	
Buildings	20,000
Pavement/ Sidewalks	15,000

Notes:
This is an assumed construction schedule, specifically for the purposes of this GCR applicability analysis.

Emissions Calculation Methods and Results

Because USEPA has designated the Washington, DC-MD-VA area a nonattainment area for ozone, this applicability analysis estimates emissions of ozone precursors (NOx and VOC) associated with the Master Plan. This analysis considers the changes in emissions resulting from temporary construction and demolition activities (including equipment and vehicle use and painting activities); operation of campus boilers and generators; and relocation of new staff to the NIST Gaithersburg Campus.

Construction and Demolition Equipment Emissions

Emissions associated with construction and demolition under the Master Plan would originate from mobile sources such as excavators, bulldozers, loaders, dump trucks, and privately owned vehicles (POVs). Emissions from these vehicles were estimated using USEPA's MOtor Vehicle Emission Simulator (MOVES), which models both on-road (e.g., dump trucks and POVs) and nonroad vehicles (e.g., excavators, bulldozers, loaders). USEPA developed MOVES to help states develop estimates of current and future emission inventories for on-road motor vehicles and nonroad equipment. MOVES can calculate emission inventories from the default database or user inputs at the county or sub-county scale. For this analysis, MOVES was used to develop emission factors outside the model in units of either grams of pollutant per mile traveled for on-road vehicles or grams of pollutant per horsepower-hour for nonroad equipment. These emission factors reflect all US mobile source emissions regulations specific to the 2019 calendar year.

MOVES requires the user to select settings in an input file (termed a "run specification" file) through the following navigation panels of the model's graphical user interface:

- Scale: On-road or Nonroad model; National, County, or Project scale; and Inventory or Emission Rate calculation mode.
- Time Spans: Year(s), month(s), day(s), and hour(s).
- Geographic Bounds: Nation, state(s), and county(ies).
- Vehicles/Equipment: Fuels and source use type (on-road) or sector (nonroad).
- Road Type: Road type(s) for on-road only.
- Pollutants and Processes: Combinations of pollutants and emission processes (e.g., VOC from running exhaust).
- Manage Input Datasets: Optional input database tables to override default data.
- Strategies: Optional checkbox to compute Rate-of-Progress "No Clean Air Act Amendments" Emissions.
- General Output: Create output database name, select units, and choose activity types to report.
- Output Emissions Detail: Choose aggregation options for the output.
- Advanced Performance Features: These options are not needed for most analyses.

The MOVES selections for this GCR analysis are specified in Table C-4.

The activity and emissions corresponding to the on-road and nonroad fleets for the Master Plan are shown in Table C-5 and Table C-6, below. The model year of the vehicles used in construction and demolition was assumed to be five years before the 2019 construction year. The model years of the passenger fleet associated with new employees reflects the national average mix of vehicle ages for the 2019 calendar year. The emission standards, technology types, and fleet turnover effects are all built into MOVES and result in reduced emissions on a per unit activity basis in future years. The vehicle types, number of vehicles, mileage, and operating hours were based on information gathered from comparable federal demolition and construction projects. On-road and nonroad input files were created for the 2019 calendar year to model the described scenario.

Total estimated temporary emissions under the Master Plan from construction and demolition activities for the 2019 calendar year are shown in Table C-7.

Painting Activities (VOC Emissions)

VOCs are emitted as gases from a variety of construction materials, including paints and coatings. For the purposes of this analysis, it is conservatively assumed that the interior surface area requiring painting is three times the total building footprint, three coats of paint would be applied (one primer and two finish), and the average VOC content of the paint would be 1 pound of VOC per gallon of paint.

VOC emissions from painting activities for 2019 are summarized in Table C-8.

Operating Emissions

Operating emissions changes were assessed by comparing the total emissions generated from boilers in FY 2016 with the projected annual emissions from the boilers following completion of the 2019 construction activities under the Master Plan.

In 2016, the boilers at the Steam and Chilled Water Generation Plant consumed 727 million standard cubic feet (MM scf) of natural gas, while servicing the NIST Gaithersburg Campus consisting of 3,641,215 gross square feet (GSF) of facility space. For this analysis, NIST assumed that the change in campus-wide boiler emissions would be proportional to the increase in facility space. These fuel consumption estimates and associated total and net change in operating emissions are shown in Table C-9. This approach likely overestimates fuel consumption under the Master Plan, which would incorporate energy efficiency improvements through renovation activities.

Individual emergency generators are located throughout the campus to provide emergency power for life safety and standby power. As new laboratories are renovated or constructed, the Master Plan would install new emergency generators to increase the campus-wide backup capacity from approximately 4 MVA to 15 MVA upon completion of the Master Plan. The emergency generators operate up to one hour per week for regular testing to ensure system functionality. For this analysis, it is conservatively assumed that two additional emergency generators, rated at 100 kilowatts (kW) and 1,000 kW, would be installed to support new facilities associated with the assumed 2019 construction activities under the Master Plan. It is assumed that the generators would each operate 1 hour per week and up to 48 hours during emergencies for a total of 100 hours per year. Estimated operating emissions associated with these new generators are summarized in Table C-10.

The Master Plan could result in a minor increase in VOC emissions because of the installation of additional fume hoods in various laboratories. Emissions estimates for fume hoods are not available. For this analysis, NIST assumed that any changes in VOC emissions associated with fume hoods would be negligible and would not influence the conclusion of this GCR applicability analysis.

Employee Commuting Emissions

The Master Plan would increase the number of personnel working at and commuting to the NIST Gaithersburg Campus by approximately 27% (from 4,007 to 5,106) over the course of a 20-year period. The assumed 2019 construction activities would increase the number of personnel working at the campus by approximately 220. However, emissions from personnel commuting to the campus would be expected to decrease in the future because of USEPA's Tier 3 emission standards and fuel program. The Tier 3 program mandates lower sulfur gasoline, evaporative emission standards, and exhaust emission standards that reduce NOx, VOC, $PM_{2.5}$, CO, and air toxics. Compared to 2014 fleet-average emission standards, the new Tier 3 standards represent an 80% reduction in light-duty vehicle emissions of non-methane organic gas and NOx, and a 70% reduction in per-vehicle PM standards. The vehicle emissions standards component of Tier 3 phases in over years 2017-2025, and the transition to 10 parts per million (ppm) sulfur gasoline occurred in 2017. As a result, the net employee commuting emissions over the course of the Master Plan may actually decrease relative to current levels, despite the increase in campus population.

The MOVES model was used to estimate the emissions associated with the additional personnel commuting to and from work. Approximately 84% of personnel commute to the NIST Gaithersburg Campus via personal vehicles and the remainder of the personnel commute via bicycle, transit bus, carpool/vanpool, or walking. To develop a worst-case scenario emissions estimate, it is assumed that all 220 personnel would relocate to Montgomery County from outside the Metropolitan Washington AQCR, and that all 220 personnel would commute via personal vehicles without carpooling.

According to Montgomery County census data, the average commute time for Montgomery County residents in 2015 was 34.5 minutes (NIST, 2017). Assuming an average commute speed of 30 miles per hour, yields a commute distance of 17.25 miles. Therefore, each new employee is assumed to drive

17.25 miles one-way from their residence in the Metropolitan Washington AQCR to the campus, for a total of 34.5 miles per weekday, 260 days per year. Using these assumptions, the 2019 staff increase of 220 people translates to a total of approximately 2.0 million more vehicle miles traveled (VMT) annually from personnel commuting to work at the campus.

Table C-11 summarizes the VMT and emissions associated with additional employee commuting under the Master Plan.

Conclusion

The projected levels of emissions generated by the Master Plan, resulting from construction and demolition activities and operating changes, would be below *de minimis* thresholds for the assumed 2019 worst-case construction year, as summarized in Table C-12. Therefore, the GCR is not applicable to the Master Plan.

References

1. NIST. 2017. *Living in Montgomery County*. https://www.nist.gov/ohrm/living-montgomery-county-md. Accessed 13 November 2017.

2. USEPA. 2017a. NAAQS Table. https://www.epa.gov/criteria-air-pollutants/naaqs-table. Accessed 15 November 2017.

3. USEPA. 2017b. Carbon Monoxide (1971) Maintenance Area/State/County Report (Redesignated from Nonattainment). Current as of September 30, 2017. http://www.epa.gov/airquality/greenbook/cmca.html. Accessed 15 November 2017.

4. USEPA. 2017c. *De Minimis* Tables. https://www.epa.gov/general-conformity/de-minimis-tables. Accessed 15 November 2017.

Table C-4. MOVES Input File Selections

MOVES Navigation Panel	Model Parameter	GCR Analysis Setting
Scale	Model	On-road, Nonroad
	Domain/Scale	National
	Calculation Type	Inventory
Time Spans	Time Aggregation Level	Year (on-road) and Day (nonroad)
	Years	2019
	Months	All 12
	Days	Weekday and Weekend
	Hours	All 24
Geographic Bounds	Region	County
	States and Counties	Montgomery, Maryland
Vehicles/Equipment	Fuels	Gasoline, E85, Diesel, and Nonroad Diesel
	Source Use Types (on-road)	Passenger Car, Passenger Truck, Light
	Sectors (nonroad)	Commercial, Construction
Road Type	Selected Road Types	All (on-road)
Manage Input Datasets	Database/tables input	N/A
Strategies	Rate-of-Progress	N/A
Output	Units	Grams, Joules, Miles
	Activity (on-road)	Distance Traveled, Population
	Time	Year (on-road), Day (nonroad)
	Location	County
	Aggregation Levels	Model Year, Source Use Type (on-road), SCC
Advanced Performance Features	N/A	N/A

Acronyms: Horsepower (HP), not applicable (N/A), source classification code (SCC).

Table C-5. On-Road Construction and Demolition Vehicle Activity and Estimated Emissions (Based on Assumed 2019 Activities)

MOVES Vehicle Class	Annual Miles	Emissions (tons/year)	
		NOx	VOC
Light Commercial Truck	1,096,317	0.19	0.14
Single Unit Short-haul Truck	456,192	0.44	0.06
Combination Unit Short-haul Truck	32,319	0.05	0.00
Total	**1,584,828**	**0.68**	**0.21**

Table C-6. Nonroad Equipment Activity and Estimated Emissions (Based on Assumed 2019 Activities)

Equipment Type	SCC	Max HP	Load Factor	Annual Hours	Emissions (tons/year)	
					NOx	VOC
Air Compressor	2270006015	16	0.43	108,000	3.66	0.41
Asphalt Paver	2270002021	175	0.59	120	0.00	0.00
Backhoe	2270002066	175	0.21	5,404	0.06	0.03
Bulldozer	2270002069	175	0.59	5,644	0.18	0.10
Crane	2270002045	175	0.43	16,136	0.38	0.21
Excavator	2270002036	600	0.59	5,000	0.55	0.30
Generator	2270006005	40	0.43	108,000	6.16	0.30
Loader	2270002066	175	0.21	264	0.00	0.00
Roller	2270002015	100	0.59	5,000	0.09	0.05
Skid Steer Loader	2270002072	75	0.21	5,540	0.29	0.01
Steel Track Loader	2270002066	50	0.21	1,040	0.04	0.00
Vibratory Compactor	2270002015	6	0.59	5,000	0.09	0.05
Total				**265,148**	**11.50**	**1.47**

Table C-7. Total Estimated Construction and Demolition Equipment Emissions (Based on Assumed 2019 Activities)

Emission Source	Emissions (tons)	
	NOx	VOC
On-road	0.68	0.21
Nonroad	11.50	1.47
Total	**12.19**	**1.68**

Table C-8. Total Estimated VOC Emissions from Painting Activities (Based on Assumed 2019 Activities)

Interior Surfaces (SF)	Coats of Paint	VOC Content (lb/gal)	Paint Coverage (SF/gal)	Total VOC Emissions (tons)
1,350,000	3	1.0	300	6.8

Table C-9. Summary of Existing and Projected Boiler Fuel Consumption (Based on Assumed 2019 Activities)

Metric		Existing (2016)	Projected (2019)	Net Change
Steam and Chilled Water Generation Plant Boilers				
Proposed Construction (GSF)		N/A	250,000	N/A
Proposed Demolition (GSF)		N/A	20,000	N/A
Total Building Area (GSF)		3,641,215	3,911,215	270,000
Annual Fuel Consumption (MM scf)		727	781	54
Operating Emissions (tons/year)	**NOx**	**19.4**	**20.8**	**1.4**
	VOC	**2.02**	**2.16**	**0.14**

Notes:
The projected annual fuel consumption represents the expected annual emissions once the assumed 2019 construction is completed. Although these emissions would not occur until after the 2019 construction is completed, these emissions are counted toward the 2019 emission totals to provide a conservative analysis. Existing gross square footage (GSF) data was obtained from the Draft NIST Gaithersburg Campus Master Plan, Exhibit 3.

Table C-10. Projected Emissions from Operation of New Diesel Generators (Based on Assumed 2019 Activities)

Generators				Projected Emissions (tons/year)	
Capacity (kW)	Model Year	Count	Operation (hrs/yr)	NOx	VOC
1,000	2018	1	100	1.61	0.05
100	2018	1	100	0.21	0.02
Total				**1.82**	**0.07**

Table C-11. Vehicle Miles Traveled and Emissions from On-road Vehicles of New Personnel (Based on Assumed 2019 Activities)

		Emissions (tons/year)	
Personnel Added	VMT Added	NOx	PM_{10}
220	1,973,400	0.66	0.63

Notes:
Personnel data were extrapolated from the Draft NIST Gaithersburg Campus Master Plan, Exhibit 3.

Table C-12. Estimated Emissions from the Worst-Case Construction Year under the Master Plan Compared to GCR *De Minimis* Thresholds

Pollutant	Construction and Demolition Activities		Net Change in Operating Emissions (tons)	Net Change in Employee Commuting Emissions (tons)	Total Net Change in Emissions under Proposed Action (tons)	*De Minimis* Level (tons)
	Construction and Demolition Equipment Emissions (tons)	Painting Activity Emissions (tons)				
NOx	12.2	-	3.3	0.7	**16.1**	100
VOC	1.7	6.8	0.2	0.6	**9.3**	50

Metropolitan Architects & Planners, Inc.
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