U.S. Department of Health and Human Services

NIH National Institutes of Health

2014 DRAFT Environmental Impact Statement

NIH Bethesda Campus

01 24 2014

Concept: *Together, an environmental impact statement and master plan examine current and desired conditions and relationships in a systems-view of constituencies, context, and (built) environment.*

Cover Image: "This image integrates the thousands of known molecular and genetic interactions happening inside our bodies using a computer program called Cytoscape. Images like this are known as network wiring diagrams, but Cytoscape creator Trey Ideker somewhat jokingly calls them "hairballs" because they can be so complicated, intricate and hard to tease apart. Cytoscape comes with tools to help scientists study specific interactions, such as differences between species or between sick and diseased cells. - Featured in the June 16, 2010, issue of *Biomedical Beat*."

Image Credit: "Hairballs of data". Keiichiro Ono, University of California, San Diego. NIH National Institute of General Medical Sciences. http://images.nigms.nih.gov/index.cfm?event=viewDetail&imageID=2749. Accessed 19 Jan 2012.

Sustainability Statement. This document is printed on Sustainable Forestry Initiative (SFI) Certified paper. The SFI Standard promotes sustainable forest management in North America through 14 core principles that promote sustainable forest management, including measures to protect water quality, biodiversity, wildlife habitat, species at risk, and Forests with Exceptional Conservation Value.

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

PROPOSED 2013 MASTER PLAN

NATIONAL INSTITUTES OF HEALTH
BETHESDA CAMPUS

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ABSTRACT

The National Institutes of Health (NIH) is preparing a 20-year Master Plan for the NIH Bethesda Campus, which provides a planning framework for siting and development of facilities. The Master Plan is part of a broader long-term planning effort required by the Department of Health and Human Services (HHS). The NIH Bethesda campus is a 310-acre Federal Government facility located in Montgomery County, Maryland, in the Washington, D.C. metropolitan area. This environmental impact statement addresses baseline or existing conditions present on the campus in the year 2012/2013 and the conditions as proposed by the 2013 NIH Master Plan Alternatives.

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EXECUTIVE SUMMARY

GENERAL

This Environmental Impact Statement (EIS) evaluates the potential environmental effects associated with the Proposed Action – Redevelopment Alternative, for the National Institutes of Health (NIH) 2013 Master Plan for the Bethesda Campus in Bethesda, Maryland.

Three alternatives are under consideration:

Proposed Action Alternative: for incremental growth, using obsolete research buildings to house administrative functions; replacing the unusable or outdated facilities with new facilities

No Action Alternative

Maximum Development Alternative: plan for maximum growth to meet currently assigned and future mission requirements projected through 2033

The NIH 2013 Environmental Impact Statement was developed following guidelines in the National Environmental Policy Act (42 United States Code (U.S.C.) 4332 (2)(A)) and the Council on Environmental Quality regulations (40 Code of Federal Regulations (CFR) §1500 et sequential). Government review agencies, utility companies, NIH management and employees, residential neighborhood representatives, citizens, and interested parties were involved in the decision making process through a series of scoping and information meetings. Revisions to the Master Plan were developed in consultation with community working groups, which were open to representatives from residential communities and civic organizations near the campus.

A public scoping hearing was held on February 28, 2012 at 6001 Executive Boulevard, Rockville, Maryland.

MAJOR CONCLUSIONS

The three alternative actions assessed represent varied levels of modernization and growth within the existing NIH Bethesda campus, which are needed to support the NIH mission and goals. Growth includes varied levels of consolidation back to the campus of workers currently located in NIH leased space elsewhere in Montgomery County, Maryland. As leased space is the largest single operating cost for NIH, the Master Plan's intent is to reduce leased space and relocate functions back to government-owned facilities at a level that avoids additional negative effects to the local community and to the regional economy. New facilities proposed under each alternative are shown in Table 1.

Based on the assessments of this report, the Proposed Action is for redevelopment. The basis for this conclusion is shown in Table 2, which summarizes the impacts of each alternative, and

in Table 3, which summarizes the mitigation measures for each these impacts. As these tables illustrate, the Redevelopment Alternative achieves NIH goals better than the No Action Alternative and impacts the surrounding community less than the Considered Action Maximum Development Alternative.

PROPOSED ACTION

This plan is the NIH Proposed Action in the 2013 Master Plan. The current NIH Bethesda campus employee and on site contractor population is approximately 20,594 people. The new employee and on site contractor population projected in the 2013 Master Plan for the Proposed Action, would be approximately 23,594.

Executive Order 13327 Federal Real Property Asset Management is addressed in the 2013 Master Plan, which also follows the Federal Real Property Council's performance measures. These requirements focus on mission critical and mission dependent facilities. Secondary objectives include improving the condition and use of NIH facilities, and reducing the NIH real property lease portfolio. The Master Plan Proposed Action reduces the NIH lease portfolio by backfilling vacated obsolete research space on campus, with relocated administrative functions from leased space. Approximately 3,000 of these workers would be relocated from leased space in the Proposed Action. Some quasi-commercial research functions would remain in leased space off-campus. NIH plans to dispose of all unneeded real property assets.

Approximately 10,000 personnel are housed in leased space in Montgomery County. Leased space is the largest single operating cost for NIH. The 2013 NIH Master Plan intent is to reduce leased space and relocate the functions back to government-owned facilities. NIH does not propose to vacate all leased spaces, as that would have a negative economic impact on Montgomery County and additional negative effects on the regional economy.

The majority of NIH Bethesda Campus facilities are mission critical (76 percent), which means there are no tolerances for facility related failure or downtime. A significant number of NIH Bethesda Campus facilities do not meet the acceptable facility condition index (36 percent). A few of NIH Bethesda Campus' facilities are considered functionally obsolete (5 percent) and additional facilities are considered marginally obsolete (11 percent). This assessment underscores the need for facility redevelopment and replacement.

Proposed facilities and planning criteria are detailed within the Master Plan document, and are summarized elsewhere in this Draft EIS.

The principal actions proposed in the Master Plan Proposed Action are:

- Relocate laboratories from older and historic buildings to new research laboratory buildings.
- Convert Buildings 4, 5, 8, and 30 to administrative space.

- Construct an estimated seventeen new structures for administrative and support space for an approximate additional 4.5 million Gross Square Feet (GSF). This includes three new parking garages and the No Action Alternative new construction totals.
- Stabilize approximately 500,000 GSF of space in the old Clinical Center Complex to prepare it for adaptive reuse, in addition to the 2,900,000 GSF scheduled to be renovated in the No Action Alternative.
- Construct about five new buildings for intramural research. The new buildings are projected to be approximately 1.6 million GSF of new laboratory and research support space.
- Continue upgrading and modernizing program for support utilities and infrastructure, particularly the Central Heating and Refrigeration Plant, campus steam, chilled water, and electric power distribution systems.
- Replace housing and care facilities for animals used in research with state of the art facilities that satisfy modern design, accreditation, and program requirements.
- Consolidate surface parking into multiple level parking structures. Maintain current agreement principles from the Memorandum of Understanding (MOU) between NIH and National Capital Planning Commission (NCPC).
- Reorganize the physical facilities on campus to improve research programmatic functions, raise the aesthetic level or ambience, and protect older campus buildings of historic value.
- Manage stormwater runoff through a site Institutional Stormwater Management Plan (ISMP) that would meet the new State of Maryland standards throughout the campus.
- Construct expanded childcare facilities for employees, and other amenities for campus employees including small-scale retail and food services.
- Demolish an approximate 1.5 million GSF including the Building 21 campus waste Treatment, Storage and Disposal (TSD) facilities included in the Proposed Action demolition.
- Enhance the natural buffer zone around the periphery of the campus by removing surface parking and increasing landscape plantings. The zone buffers residential neighborhoods surrounding the campus from NIH facilities and activities.
- Include the renovation, demolition and new construction totals of the No Action Alternative.

NO ACTION ALTERNATIVE

This plan includes no net growth or change in employee numbers or facilities in relation to baseline or existing conditions. Current NIH Bethesda campus employee and on site contractor population is approximately 20,594. No new consolidation of workers from leased space would occur in the No Action Alternative. Facilities would be replaced or rehabilitated as necessary to maintain site functions. NIH is already committed to a number of projects that would be implemented under either the 2013 Master Plan the No Action Alternative or Proposed Action. A number of buildings are in various stages of planning, design and construction, and are expected to proceed. These projects are included in the No Action Alternative.

MAXIMUM DEVELOPMENT ALTERNATIVE

This plan is the NIH Maximum Development Alternative in the 2013 Master Plan. The new employee and on site contractor population projected in the 2013 Master Plan for Maximum Development Alternate, would be approximately 30,594 people.

This Master Plan Alternative assumes that laboratories constructed during the mid-20th century on the NIH Bethesda Campus, would be replaced with new state of the art laboratories. Current older research buildings that can be adapted to new uses such as office space, physician offices, space for instruments, or systems biology are to be re-purposed. The maximum alternative, if pursued, would bring back to campus all leased laboratory and office space except for the quasi-commercial leases. Similar to the redevelopment alternative, the maximum alternative includes replacement and modernization of the campus waste transfer and storage facilities. This plan also calls for the replacement of Building-31 and Building-12 complexes.

The proposed employee population increase at the Bethesda Campus would be 10,000 under this alternative.

The principal features of the Maximum Development Alternative are:

- Include the features and development from Alternatives 1 and 2.
- Relocate laboratories from older and historic building to new buildings.
- Demolish Buildings 4, 5, 8, 16 and 16A for new development.
- Construct up to seven additional new buildings for administrative and support space, which would total approximately 2.6 million GSF, including parking structures.
- The maximum development including the Proposed Action and the No Action Alternatives will provide a total of 7,084,498 GSF.

SUMMARY OF PROPOSED DEVELOPMENT

Proposed Action: Redevelopment = (No Action + Proposed Action)

Demolition:	2,225,807 GSF	
New Construction:	4,451,798 GSF	
Disturbed Site:	2,225,991 GSF	(Demolition + Construction)

No Action Alternative

Demolition:	80,960 GSF	
New Construction:	535,690 GSF	
Disturbed Site:	454,730 GSF	(Demolition + Construction)

Maximum Development Alternative: = (No Action + Proposed Action + Considered Action)

Demolition:	2,552,895 GSF	
New Construction:	7,084,498 GSF	
Disturbed Site:	4,531,603 GSF	(Demolition + Construction)

Note: NIH proposes to provide protective redundancy to the campus with the addition of spare fuel tanks and water storage that would allow mission critical functions to operate in the case of emergencies.

It is also important to note that not all of the growth and changes approved in the 2003 Master Plan have occurred and there are several implementation projects and programs currently in progress, which will be part of the No Action Alternative. Table 1 lists the new development and renovation proposed for each action. Following Table 1 is Figure 1, which is a colored illustration of the campus plan showing the campus development with new and remaining existing buildings envisioned by the 2013 Master Plan.

Table 1 charts the three actions and the total square foot area affected by each alternative.

Table 1: Proposed Development–List of Proposed New Facilities by Alternative

Building Name	#	GSF	Proposed Action	No Action Alternative	Maximum Development Alternative
Northwest Childcare Center	N23	21,335	✓	✓	✓
Porter Neuroscience Research Center	35	514,355	✓	✓	✓
Cafeteria & Conference	1A	26,000	✓		✓

Building Name	#	GSF	Proposed Action	No Action Alternative	Maximum Development Alternative
NIH Data Center	N7	118,664	✓		✓
Central ARC	N9	299,891	✓		✓
Addition to CUP	N11B	16,700	✓		✓
Research	N12	256,538	✓		✓
Research Laboratory	N14	774,504	✓		✓
Police Station	N18	45,000	✓		✓
Radiation Safety & Process Laboratories	N19	36,123	✓		✓
Chemical Waste Storage	N19A	6,300	✓		✓
Mixed (MPW) Waste	N19B	2,371	✓		✓
Bio Medical Waste	N19C	11,700	✓		✓
Grounds Maintenance	N20	22,218	✓		✓
New IC Headquarters	N21	601,039	✓		✓
Research Lab	N22	287,808	✓		✓
Large Animal Center	N24	10,391	✓		✓
Building 40A	N40A	46,200	✓		✓
Natcher II	A45	87,461	✓		✓
West Satellite Switching Station	48	4,500	✓		✓
Parking Garage	MLP-N12	420,900	✓		✓
Parking Garage	MLP-N13	420,900	✓		✓
Parking Garage	MLP-N14	420,900	✓		✓
New Administrative	NF1	240,000			✓
New Administrative	NF2	240,000			✓
New Administrative	NF3	480,000			✓
New Administrative	NF4	311,350			✓
New Administrative	NF5	311,350			✓
New Parking Structure	NMLP	525,000			✓
New Parking Structure	NMLP	525,000			✓
TOTALS - NEW GSF			**4,451,798**	**535,690**	**7,084,498**

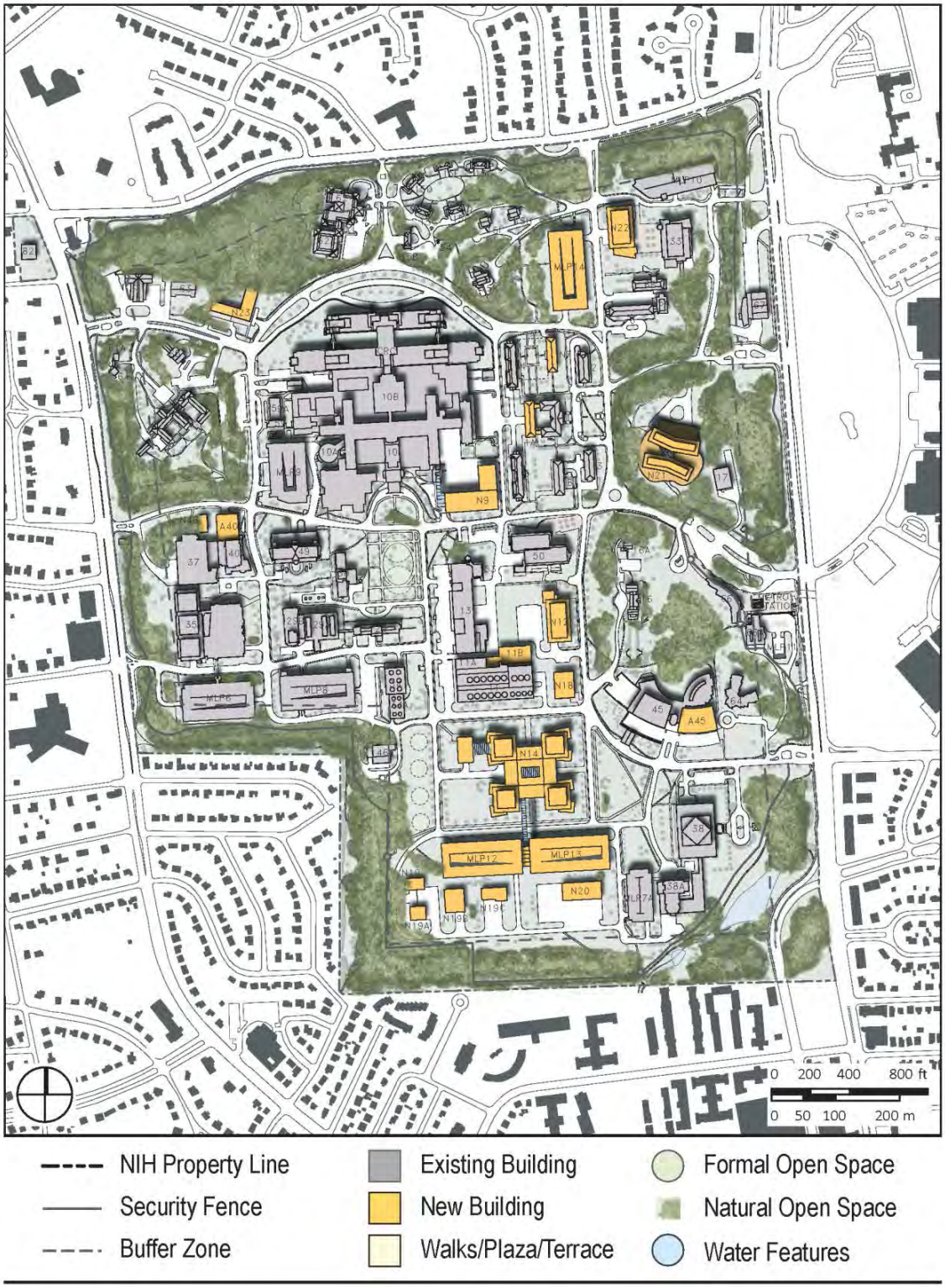

Figure 1: Development Site Plan Envisioned by 2013 NIH Campus Master Plan

Table 2: Summary of Potential Impacts Proposed Action; No Action Alternative and Maximum Development Alternative

Category	Proposed Action	No Action Alternative	Maximum Development Alternative
Social and Economic Land Use	Positive short and long impact expected economic impact due to construction activity in Proposed Action would have a significant long-term impact on the local economy with the state of the art upgrades to NIH research facilities, and private company infill of former NIH leased space	Beneficial short-term economic effects to the local economy would be expected as a result of construction activity in the. This would not have a significant long-term impact on the local economy	Positive short and long impact expected economic impact due to construction activity in this Alternative, which would have a significant long-term impact on the local economy with the state of the art upgrades to NIH research facilities and private company infill of former NIH leased space
Environmental Justice	No disproportionate impact to minority or low income populations	No disproportionate impact to minority or low income populations	No disproportionate impact to minority or low income populations
NIH Traffic Impact	NIH AM and PM traffic generation increases by 12.1 percent with the addition of 3,000 employees to the campus	No significant increase in AM and PM traffic generation is anticipated	NIH AM and PM traffic generation increases by 31.5 percent with 10,000 additional employees
Intersection Congestion	Impacts would be mitigated by BRAC planned improvements	No Impact Anticipated	Impacts would be mitigated by BRAC planned improvements
Parking	Maintain 0.50 parking spaces per employee ratio per existing MOU	Maintain 0.50 parking spaces per employee ratio per existing MOU	Maintain 0.50 parking spaces per employee ratio per existing MOU
Buffer	All parking removed from the buffer areas	2.51 acres of parking would remain in the southern buffer	All parking removed from the buffer areas

Category	Proposed Action	No Action Alternative	Maximum Development Alternative
Steam Demand	Peak day demand increases to 1,099,200 pounds per hour	Peak Steam demand is 880,600 pounds per hour	Peak day demand increases to 1,204,900 pounds per hour
Chilled Water Demand	Peak demand increases to 71,500 tons	Peak demand is 58,100 tons	Peak demand increases to 79,492 tons
Electric Power Demand	Maximum demand to 92,100 Kilovolt Ampere (KVA)	Maximum demand is 74,300 KVA	Maximum demand to 98,000 KVA
Peak Water Demand	Peak workday demand increases from 3,840,000 to 4,600,000 gallons per day	Peak workday demand increases from 3,840,000 to 4,040,000 gallons per day	Peak workday demand increases from 3,840,000 to 4,610,000 gallons per day
Sanitary Sewer	Peak workday demand increases from 4,410 to 5,708 Gallons per Minute (GPM)	Peak workday demand increases from 4,410 to 4,751 GPM	Peak workday demand increases from 4,410 to 5,725 GPM
Natural Gas	Peak demand increases to 836,500 cubic feet per hour (cf/hr)	Peak demand remains 739,500 cf/hr	Peak demand increases to 934,500 cf/hr
Noise			
Traffic	Equivalent Continuous Sound Level (Leq) noise levels assumed to increase by 2 dBA or less (Expression of A-weighted Decibels (dBA) measures the relative loudness of sound)	Leq noise levels assumed to increase by 2 dBA or less	Leq noise levels assumed to increase by 2 dBA or less
Parking	No impact anticipated as new garages are provided for the staff increase	No impact anticipated	No impact anticipated as new garages are provided for the staff increase

Category	Proposed Action	No Action Alternative	Maximum Development Alternative
Chiller Plant	Night time Leq noise level is maintained at 45 dBA or less peak chiller use is during daytime hours	Night time Leq noise level is maintained at 45 dBA or less	Night time Leq noise level is maintained at 45 dBA or less, peak chiller use is during daytime hours
Building Fans	Night time Leq noise level of 55 to 58 dBA is maintained	Night time Leq noise level of 55 to 58 dBA is maintained	Night time Leq noise level of 55 to 58 dBA is maintained
Air Quality			
Traffic	No impact anticipated. Proposed Action Redevelopment should meet Air Quality Standards	No impact anticipated. Proposed No Action Alternative should meet Air Quality Standards	No impact anticipated. Proposed Maximum Development should be within the Air Quality Standards
Parking	No impact anticipated. Proposed minimum growth alternate should meet the Air Quality Standards	No impact anticipated. Proposed moderate growth alternate should meet Air Quality Standards	No impact anticipated. Proposed maximum growth alternate should meet the Air Quality Standards
Boiler Stacks	Existing permit limits would be increased by 40 percent with the addition of two boilers	Existing permit limits would be increased by 20 percent by the addition of one boiler	Existing permit limits would be increased by 60 percent by the addition of three boilers
Waste			
Solid Waste	Generation relatively constant. Continue to increase recycling rate. Construction Waste would increase for the years when buildings are demolished and constructed	Generation relatively constant. Continue to increase recycling rate. Construction Waste for remodeling of existing facilities is a continuing effort and would remain constant	Generation relatively constant. Continue to increase recycling rate. Construction Waste would increase for the years when buildings are demolished and constructed

Category	Proposed Action	No Action Alternative	Maximum Development Alternative
Medical and Research Waste	Reduction in generation per researcher, offsets growth in researchers, with increased implementation of recycling	Reduction in generation per researcher, offsets growth in researchers, with increased implementation of recycling	Reduction in generation per researcher, offsets growth in researchers, with increased implementation of recycling
Chemical Waste	May have an increase in chemical waste due to an increase in chemical labs	Generation relatively constant	May have an increase in chemical waste due to an increase in chemical labs
Cultural Resources			
Historic Resources	Minor to moderate adverse impact on historic resources	Minor impact on historic resources	Major impact on historic resources. This alternative requires the demolition of the George Freeland Peter Estate and Buildings 4 and 5 within the NIH Historic Core Historic District
Archaeological	May encroach on archaeological sensitive area located on the southern portion of the campus	No potential impacts	May encroach on archaeological sensitive area located on the southern portion of the campus
Trees	Potential loss of existing trees	Potential loss of existing trees	Potential loss of existing trees
Terrestrial and Aquatic Impact	No significant impact	No significant impact	No significant impact
Aesthetics: Campus Buffer	The campus 250-foot buffer is maintained in open space	Majority of the campus 250-foot buffer is maintained in open space	The campus 250-foot buffer is maintained in open space

Category	Proposed Action	No Action Alternative	Maximum Development Alternative
Energy	Energy consumption increases by 20 percent based due to increased building space	Energy consumption remains at current level	Energy consumption increases by 40 percent based due to increased building space
Construction Temporary Impacts: Schedule	The Proposed Action schedule has phasing impacts that require decommissioning, provision of utilities and agency approvals prior to construction or demolition of proposed new facilities	The schedule for the No Action Alternative does not present an adverse impact	The Maximum Development schedule has phasing impacts that require decommissioning, provision of utilities and agency approvals to demolish facilities prior to construction of proposed new facilities
Construction Noise	Localized major noise impact in vicinity of projects	Localized major noise impact in vicinity of projects	Localized major noise impact in vicinity of projects
Construction Fugitive Dust	Localized major impacts for demolition and moderate impacts with renovation and new construction to be mitigated with standard dust reduction measures	Localized major impacts for demolition and moderate impacts with renovation and new construction to be mitigated with standard dust reduction measures	Localized major impacts for demolition and moderate impacts with renovation and new construction to be mitigated with standard dust reduction measures
Construction Waste	Construction is expected to generate 8,600 tons/year of construction waste per 100,000 SF of demolished buildings and 4, 425 tons/year of construction waste per 100,000 SF of renovated or new buildings. This would be a temporary major impact	Construction is expected to generate 8,600 tons/year of construction waste per 100,000 SF of demolished buildings and 4, 425 tons/year of construction waste per 100,000 SF of renovated or new buildings. This would be a temporary major impact	Construction is expected to generate 8,600 tons/year of construction waste per 100,000 SF of demolished buildings and 4, 425 tons/year of construction waste per 100,000 SF of renovated or new buildings. This would be a temporary major impact

Table 3: Summary of Mitigation Measures – Describes Impact Mitigation

Context	Mitigation Measures
Traffic	• Within legislative and budgetary constraints, implement Transportation Management Plan (TMP) measures that would maintain NIH trip generation within the established MOU AM inbound and PM outbound peak hour goals • Continue TMP measures that reduce NIH Employee single occupancy vehicle mode trips. Possible measures may include expansion of alternate work schedules and telecommuting programs, reorganization of NIH transportation/parking management, increase the level of traffic and parking monitoring, encourage bicycle use, improve intra facility and internal campus shuttle service, establish an Emergency Ride Home Program • Continue semiannual surveys of NIH traffic generation
Neighborhood Parking	• Maintain employee awareness of neighborhood parking situation • Incorporate restrictions in construction contracts that discourage contractors from parking in surrounding residential areas
Parking	• Continuation of Traffic Management Plan measures for car and van pooling, work adjustments to reduce demand
Lighting	• Follow Master Plan lighting concept plan to increase safety and security for NIH campus occupants while controlling intrusive illumination into residential areas
Solid Waste	• Recycling program is maintained at NIH with similar goals as Montgomery County • Continue and augment ongoing program to minimize solid waste as is feasible

Context	Mitigation Measures
Mixed/Hazardous Waste	• Continue and expand ongoing program for minimization of such wastes as is feasible • Develop an Environmental Management System that includes hazardous waste minimization as a key element • Maintain and augment NIH safety program for hazardous waste handling, including meeting regulated standards for each class of hazardous waste
Mixed/Hazardous Waste	• Conduct environmental assessments of each building scheduled for demolition to identify asbestos containing materials (ACM) and other hazardous building materials before demolition and remove identified hazardous materials per regulations prior to demolition • Building 21 TSD would follow Nuclear Regulatory Commission (NRC) Environmental Protection Agency (EPA) and Maryland Department of the Environment (MDE) requirements and procedures for decommissioning
Medical/Pathological Waste	• Continue and expand ongoing program for minimization of such wastes as is feasible • Maintain and augment NIH safety programs for medical and pathological waste handling, including meeting regulated standards for medical and bio-hazard waste
Energy	• Incorporate energy conservation designs and features into new and renovated facilities. Upgrade and add capacity to address increased demand • Continue energy conservation measures associated with steam and chilled water production
Cultural, Historic and Architectural Resources	• Continue to identify properties that are eligible for listing on the National Register of Historic Places • Complete a Section 106 process in the planning and design phase for major projects that may affect potentially historic structures

Context	Mitigation Measures
Archaeological	• Complete Phase I, and if necessary, Phase II and III Surveys prior to construction of projects proposed for archeological sensitive areas
Terrestrial Vegetation	• Comply with the campus wide Urban Forest Stand Delineation and Conservation Plan • Complete Conservation and Protection Plans for construction projects that affect mature trees • Maintain 15 percent tree canopy cover on a campus wide basis to the extent feasible
Aesthetics	• Provide additional plantings in perimeter buffer area on north, west, and south sides of the campus to screen residential neighborhood • Ensure that all major projects are reviewed by the NIH Architectural Design Review Board
Building Fan Noise	• Assess mitigation on a case-by-case basis to reduce noise
Construction Noise	• Use electric driven equipment, where feasible • Use hydraulic instead of pneumatic tools, where feasible • Schedule noisy operations to coincide with high ambient noise • Turn off idling equipment when not in use • Provide enclosures around stationary equipment, where feasible. • Require silencers on compressors

Context	Mitigation Measures
Fugitive Dust	• Contractors comply with State regulations • Seed and stabilize disturbed areas • Provide stabilized stone construction entrances • Sprinkle or wet high dust areas as appropriate • Provide MERV filters on all air systems during building renovation • Provide plastic sheeting and other measures to trap dust within building renovation areas • Limit dust during demolition by dismantling buildings through deconstruction where economically and physically feasible
Scheduling Traffic	• When feasible, limit work to 7 AM to 4 PM, Monday through Friday • Route construction traffic to NIH entrances away from adjacent residential neighborhoods • Include provisions for contractor employee use of transit system, in the contract documents
Sustainability	• Environmental Quality • Reduce campus waste – goal to achieve 100 percent solid waste recycling; recycling of research materials • Reduce Environmental Impact of Construction Materials; use sustainable materials, require recycling of up to 100 percent of construction waste if possible

SUMMARY OF IMPACTS AND MITIGATION

The Master Plan is a document for long range planning guidance and would not generate direct physical changes or impacts that would occur with construction projects. The Master Plan is to be flexible to meet changes in NIH needs and campus conditions. The EIS furnishes information, which is supplementary to the Master Plan, and identifies potential environmental impacts that could occur with implementation of portions or all of the Master Plan.

Some impacts would be temporary or interim, however, the delineated Master Plan impacts are based on, or assume, full implementation of the Master Plan Maximum Development Alternative: Building space would increase an approximate 7—8 million gsf, campus population would grow from 20,000 to approximately 30,000 personnel, and all plan elements and features would be implemented. The delineated impacts, therefore, indicate the potential cumulative effects of the Master Plan. This can be viewed as an impact framework or envelope within which the incremental impacts of individual projects would fall, if and when they are implemented. The delineated potential impacts are conditional or contingent upon actual implementation. Actual cumulative impacts would fall in the range between those indicated for the No Action and the Maximum Development Alternative. The potential impacts of the No Action Alternative, Proposed Action and Maximum Development Alternative, are summarized in Table 2.

- The three alternatives have been developed on the basis of a one parking space per two employees (0.50) parking ratio goal, which is the current NIH standard. The current National Capital Planning Commission (NCPC) Comprehensive Plan for the National Capital has a new and different standard. The NCPC Comprehensive Plan lowered the federal employee parking ratio goal for NIH to one space per three employees, or 0.33. NIH views the NCPC goal as unrealistic for NIH because of the high concentration of employees at the Bethesda Campus, and the wide geographical dispersion of its employees throughout the region. A Metro Station (Medical Center) is located on the campus; however, it does not adequately serve NIH's employees' transportation needs as many live beyond the areas served by mass transit alternatives.
- Employees who live beyond the range of the radial Metro system do not have economical or efficient means of transportation alternatives. For example, east of the campus there is no mass transit cross connection between eastern Montgomery County and Prince George's County where a significant number NIH employees live. Similarly, the significant numbers of employees who reside in Frederick, Howard, Carroll, Anne Arundel, Calvert or St. Mary's Counties, Baltimore, or Northern Virginia, have few, if any, mass transportation options. There are also a number of NIH employees that commute from West Virginia and Pennsylvania. NIH is committed to the previously accepted Transportation Management Plan and would continue to promote the reduction of traffic in the Bethesda area.
- Mitigation measures for various contexts are shown in Table 3 above.

ISSUES RAISED AND COMMENTS

National Capital Planning Commission (NCPC) and Scoping Comments:

Parking

- The NIH-Bethesda Campus Plan should adhere to a minimum ratio goal of one employee parking space for every three employees per the NCPC Comprehensive Plan
- The NIH Campus Plan should evolve the campus to the 1:3 ratio through a phased approach linked to the planned improvements
- The Master Plan should be supported by a detailed, up-to-date Transportation Management Plan (TMP), which is reflected in the EIS analysis

Transportation Demand Management

- Encourage ridesharing, biking, walking and other non-single-occupant vehicle modes of transportation for federal commuters
- Maximize telecommuting strategies for employees
- Employ compressed and variable work schedules for employees
- Support pedestrian and transit commuting
- Increase transit subsidies rates

Parks and Open Space

- Conserve and maintain the essential open space character of areas in the region
- Maintain and conserve trees and other vegetation in the landscaped buffer areas
- Protect and enhance the green landscape and park-like character
- Retain natural wooded buffer areas

Air Quality

- Encourage usage of alternative fuels or clean-burning fuels
- Minimize power generation requirements
- Utilizing non-polluting sources of energy
- Indoor air quality (to be improved) by using environmentally friendly building materials, construction methods and designs

Water Quality

- Upgrade water supply and sewage treatment systems, to avoid discharge of pollutants into waterways
- Avoid thermal pollution of waterways and maintain adequate vegetated buffers adjacent to bodies of water
- Minimize tree cutting and other vegetation removal to reduce soil disturbance and erosion, particularly near waterways. When tree removal is necessary, trees should be replaced
- Use pervious surfaces and retention ponds to reduce stormwater run-off
- Encourage use of innovative an environmentally friendly site and building design and construction practice
- Encourage implementation of water reclamation programs

Land Resources

- Coordinate wetland activities with federal, state and local government programs
- Discourage development in areas identifies as high erosion potential; excessive slopes (25 percent and above) should remain undeveloped
- Limit uses on unstable soils to recreation and open space
- Locate and design buildings to be sensitive to natural groundwater flows
- Preserve existing vegetation especially large stands of trees
- Incorporate new trees and vegetation to minimize energy consumption and storm-water runoff
- Discourage land use impact to wildlife habitats
- Encourage design and landscaping that provide habitat for native wildlife
- Discourage development of areas used by migratory wildlife
- Encourage restoration of degraded water and land habitats
- Consider impacts of environmental changes on wildlife habitats and biodiversity of ecosystem

Human Activities

- Avoid locating activities that produce excessive noise near sensitive natural resources or sensitive human uses (residential areas, hospitals and schools)
- Design roadway and parking lot location and construction sensitive to adjacent land use
- Ensure that noise-generating activities are sited and scheduled with
- Practice "prudent avoidance" of radio frequency (rf) exposure
- Use advances in (communication) technology

This report recommends coordination between the Walter Reed National Military Medical Center (WRNMMC) and NIH-Bethesda Campus.

APPROVALS/ACTIONS REQUIRED BY OTHER GOVERNMENT AGENCIES

Section 5(a) of the National Capital Planning Act of 1952, as amended (40 U.S.C. § 71d(a)), provides that each federal agency in the National Capital Region shall advise and consult with the National Capital Planning Commission (NCPC) in the preparation of plans and programs which affect the National Capital prior to preparation of construction plans. NCPC defines a master plan as an integrated series of documents in graphic, narrative, and/or tabular form that present a plan for the orderly and long range development of an installation, generally over a period of 20 years. NCPC maintains that a master plan approved by the Commission is a required preliminary stage for the preparation of building and site plans for specific projects. If the installation is in the Maryland portion of the National Capital Region, then the Maryland-National Capital Park and Planning Commission (M-NCPPC) acts in an advisory capacity to NCPC.

In accordance with Section 102(2)(A) of the National Environmental Policy Act of 1969 (NEPA), as amended (42 U.S.C. § 4332(2)(A)), federal agencies must utilize a systematic, interdisciplinary approach which would ensure the integrated use of natural and social sciences in planning and decision making that may have an impact on the human environment. Regulations of the Council on Environmental Quality (CEQ) (40 C.F.R. Parts 1500-1508) require that agencies assess the environmental effects of their actions, document studies and identify impacts. Documents can take the form of Categorical Exclusions, Environmental Assessments, or Environmental Impact Statements and their supporting documents (Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act, Council on Environmental Quality, 1978).

The HHS Facility Capital Investment Review Board (CIRB) was established on June 9, 2003 to make recommendations for strategic management of HHS real property assets and to advise the Assistant Secretary for Administration (ASA) and the Secretary on major facility capital investment issues. The CIRB also advises, assists, consults with, and makes recommendations

to the ASA, the Secretary, and when appropriate, the Assistant Secretary for Budget Technology and Finance (ASBTF), regarding the broad range of responsibilities.

The ASA has delegated oversight authority and provides direction to all HHS Operating Divisions (OPDIV) with facility acquisition and operation responsibilities and land acquisition authority. The CIRB would implement the responsibilities assigned the “cross functional executive review committee.”

The CIRB provides advice and makes recommendations to the Secretary, the ASA and the ASBTF on a range of issues to include: 1) the development of facility capital investment guidelines; 2) the development of guidelines to implement an investment review process that provides strategic planning for and oversight and guidance of facility investments; and 3) regular monitoring and proper management of these investments, once funded. One of the outputs of the investment review process is a regular update of HHS’ investment portfolio or plan that supports HHS strategic objectives.

This EIS is prepared according to the Sections 102(2) (A) of NEPA and Regulations of the Council on Environmental Quality (CEQ) (40 C.F.R. Parts 1500-1508).

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1 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the continued growth and facility improvement at the National Institutes of Health (NIH) is to support NIH's mission as the national center for leading biomedical and clinical research. The following information identifies in more detail the purpose and need for the proposed action.

1.1 CAMPUS MASTER PLAN

The mission of NIH, as mandated by Congressional and Presidential decisions, is to conduct biomedical research, educate and train researchers, assist in the transfer of technology, and disseminate information in the biomedical and associated sciences on behalf of the health and welfare of American citizens. This mission is delineated in the original and amended Federal Government legislation directing the agency's activities. While NIH has over a dozen facilities around the country and leases large amounts of private space in this region, the Bethesda Campus serves as the administrative center and headquarters for NIH's national and regional research activities.

The NIH Bethesda Campus is unique. It has the largest concentration of biomedical scientists and clinical researchers in the world. A considerable portion of the clinical research that occurs in the U.S. occurs on this campus. A state of the art campus with cutting edge facilities and a premier critical mass of activities located together on this campus is essential to the successful conduct of the U.S. biomedical research program. This is true for the Bethesda Campus of NIH and throughout NIH, and for collaborating private related companies throughout the U.S. The 2013 Master Plan is the key-planning element in the modernization of the physical facilities of the Bethesda Campus. Improvements to the physical plant and utilities support the missions carried out by NIH at the Bethesda Campus.

The 2013 Bethesda Campus Master Plan is a document and planning tool that provides long-term guidance for orderly growth on the campus, in support of the NIH mission and goals.

The Master Plan is broad and general in scope. It is also flexible, and not a fixed document. Variances within the constraints established in the Master Plan are expected to occur. Small projects needed for immediate operations, routine maintenance and repair projects, and other renovation projects that produce no significant permanent impact, are not necessarily included. Personnel and space estimates covering the next five years, including projects now under design or construction are established with some degree of confidence. However, projections for the next 10-year planning period, and beyond, become increasingly speculative and contingent.

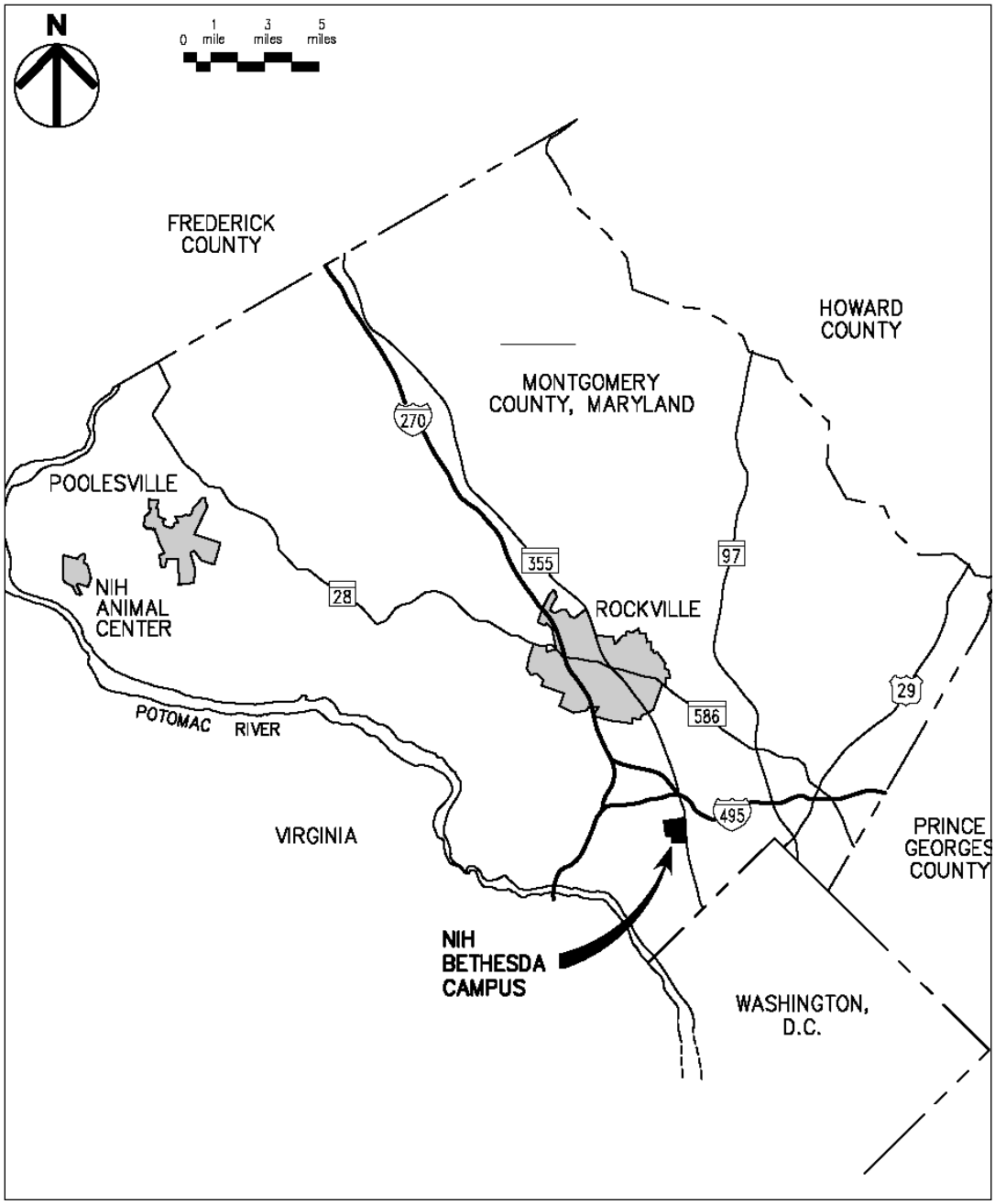

Figure 1-1: Location Map of NIH in Montgomery County, Maryland

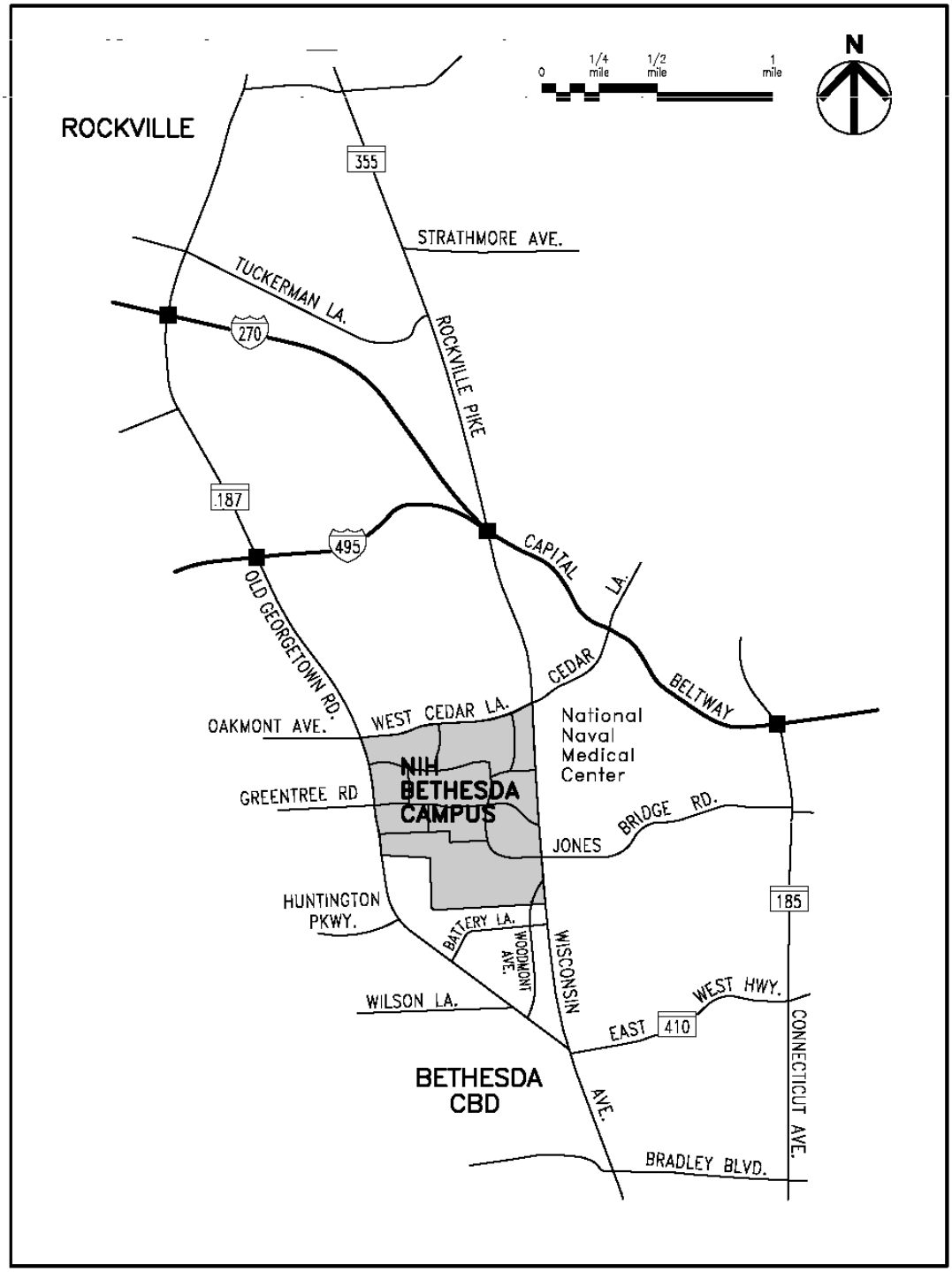

Figure 1-2: NIH Street Location Map and Bethesda Central Business District

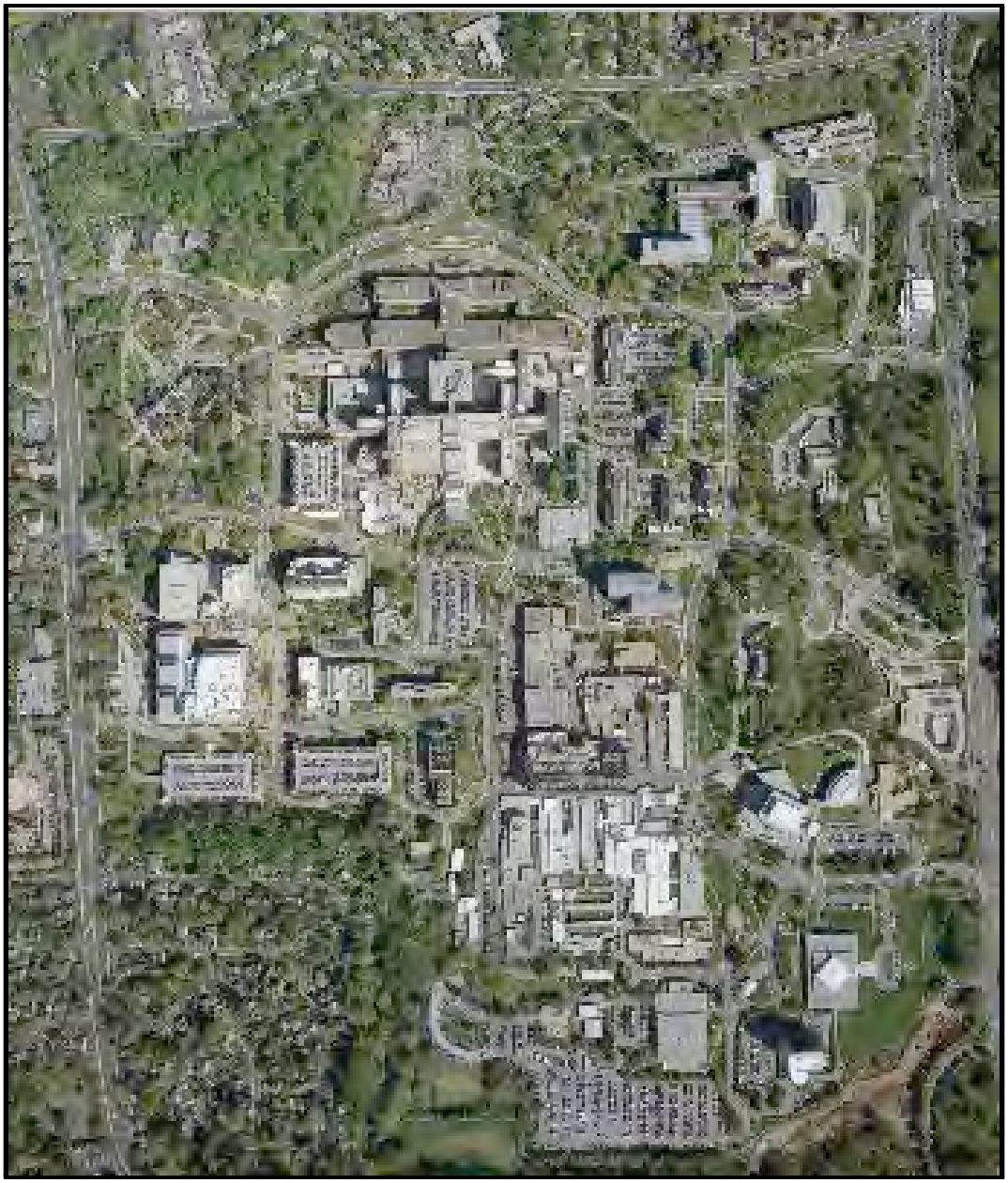

Exhibit 1-1: Aerial Photograph of the NIH Bethesda Campus, March 2012

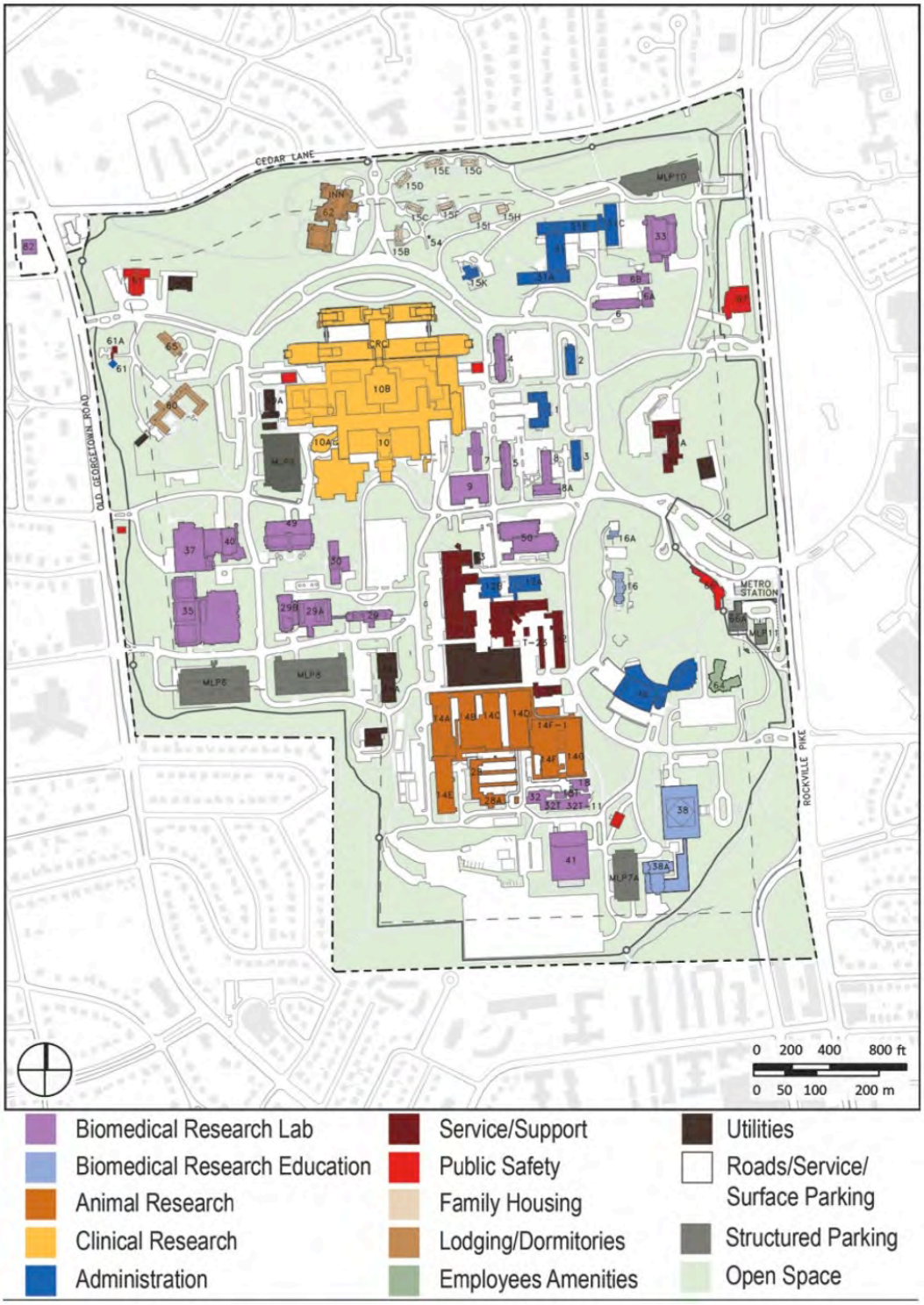

Figure 1-3: Color Coded Plan of the NIH Bethesda Campus Showing Existing Buildings by Location and Use

The Master Plan outlines a coordinated long-term land use strategy for the campus. It establishes a conceptual integrated framework for physical development that allows NIH to organize the use and reuse of existing buildings, the arrangement of potential future buildings, necessary supporting infrastructure such as roads and utilities, access, and open areas cohesively. Potential development sites and natural areas to be protected are identified. General conditions, criteria, and constraints are delineated. An approximate sequence of steps leading to implementation of the plans and development objectives is outlined. It is also the intent of the Master Plan to encourage active dialogue among NIH management, the NIH scientific and support community, and the general public and citizens by fostering a better understanding of the ramifications of proposed policies and plans.

NIH administrators, planners, architects and engineers, when implementing individual projects, would use information and recommendations in the Master Plan. Local jurisdictions and utilities can use this same source to anticipate and plan for the effects that NIH proposals may potentially have on their infrastructure and systems.

1.2 PROPOSED ACTION

The 2013 Bethesda Campus Master Plan identifies one plan as the Proposed Action. Two alternative actions are reviewed in this report and assessed in the Purpose and Needs section of this document. This section provides an overall assessment of how the three actions meet the stated mission and goals of NIH and compares the positive and negative impacts of the proposed action and the other considered alternative actions.

The Proposed Action renovates eight existing buildings, repurposing former research areas into administrative functions. Five new research buildings and three new administrative buildings are planned, as well as ten support buildings, three new parking garages and the necessary infrastructure for the redevelopment. In addition, the Proposed Action will incorporate the No Action construction of a new research building, a new childcare center and scheduled renovations Building 10.

Approximately twenty outdated buildings and service structures are scheduled for demolition, providing building sites for redevelopment of the proposed new facilities. The Proposed Action is scheduled for a twenty year period, phased to allow organized relocations, renovations, demolition and redevelopment to occur gradually to reduce the construction impact at any one time.

1.3 NEED

The proposed development at NIH meets the need to replace aging and inadequate infrastructure and buildings that compromise the NIH goals and mission. The development also allows consolidation of dispersed operational spaces from off-campus locations, which meets Executive Order 13327 “Federal Real Property Asset Management” requirements.

The 2013 Master Plan for the Bethesda Campus is needed at this time for many reasons. The key reasons, as summarized below, include both updates based on the passing of time as well significant changes to past thinking and to NIH approaches to research.

1.3.1 Key Reasons:

1.3.1.1 *Scheduled Update:*

NIH has made a commitment to prepare a facilities master plan for the Bethesda campus and to regularly review and update the master plan every five years. A new plan is due, as the current planning review interval since the last plan has been eight years; this master plan iteration represents more than a minor update. It provides an extensive review and update of the campus vision and growth plans.

1.3.1.2 *Adjusted Growth Targets and Mandated Consolidation:*

The size of the on-campus employee population is one key measurement that NIH uses to plan for campus growth and each master plan includes a twenty-year projection for population. There is a critical need to set a new population target. The current 2033 population target would be met in 2013 with the completion and occupation two buildings now under construction. Other key projects and programs are currently stages of the planning process. A significant expansion of NIH programs is not currently anticipated in this planning period, the new population target needs to accommodate a significant number of NIH employees who are currently housed in leased space off-campus and who would be relocated back to the NIH campus.

This consolidation of NIH functions is based on Executive Order 13327 “Federal Real Property Asset Management”. The previous population growth target was restricted due, in part, to limited campus utility capacities. These limitations contributed to an increase in the number of NIH employees located off-campus. The critical utility limitations are being addressed.

1.3.1.3 *Traffic Management and Travel Behavior:*

Since 1992 campus growth is tied to a limited level of traffic established in a Memorandum of Understanding (MOU) between NIH and National Capital Planning Commission (NCPC). This MOU limits the number of vehicle trips entering and exiting the campus. In order to accommodate an increased on-campus employee population without exceeding these limits, a Master Plan update is needed to alter the physical campus design and certain campus policies in ways that that would help change travel behaviors and promote further increases in the already significant numbers of trips taken by mass transit, bicycle, and foot.

1.3.1.4 *Recruitment Driven Enhancements:*

There is a strong need to enhance the campus facilities and environment in order to attract and retain the highly qualified senior scientists and promising young investigators that NIH programs

are dependent on. NIH competes with universities, research institutes, hospitals, and the private biomedical research sector for these scientific personnel, the numbers of which have been declining nationwide for some time. Success in recruiting is significantly influenced by the quality of the campus's physical facilities, its amenities and its aesthetic character. High quality facilities permit research at the cutting edge of scientific investigation and attract world-class talent. A sufficient critical mass of talent and quality research draws other top scientists into the organization. Achieving this is a high priority for NIH.

1.3.1.5 *Research Collaboration Driven Adaptations:*

Since the last master plan was issued modern biomedical research has become increasingly complicated and interdisciplinary. Collaboration among various NIH research groups has increased significantly as the distinctions between disciplines of study and pure scientific research, both clinical and laboratory become blurred. Additionally, the relationship between complex administrative and research activities has become more intricate. The campus facilities and physical environment were designed before these relationships developed and need to adapt to support these changes. To continue to attract internationally respected researchers for collaboration and employment, the campus must continue to upgrade older facilities and provide new facilities that reflect the cutting edge of technology.

1.3.1.6 *Opportunity and Need to Reorganize, Reuse, Renovate and Redevelop:*

A new plan is needed to guide the development of campus facilities into the 21st Century. The development of the new plan occurs just as significant new buildings are preparing to open, and renovations of others proceed, as does the scheduled departure of certain Food and Drug Administration research functions from the campus, creating a favorable window of opportunity for change. Additionally, certain elements of the physical infrastructure and a growing number of older and historic buildings are no longer able to support state of the art research activities. New guidance is needed regarding the best use for these buildings and to ensure that the state of the art physical infrastructure is provided to support research activities for another 20 years.

1.3.2 Mission Driven Priorities and Needs

The specifics of the new mission driven priorities are expressed and directed by the five key research themes that were issued in 2009 by the current NIH Director. These are stated in full within the Master Plan document and are summarized below. The key needs of each of the operational activities that occur on the campus are also summarized. These key activities are Biomedical Research, NIH Administration, Biomedical Researcher Training, and Essential and Specialized Support.

1.3.3 Mission Driven Priorities and Operational Activity Needs

Since the 2003 Master Plan was approved, advances in science have changed the focus of, and approach to research at NIH. These advances require a new master plan to alter the physical environment in ways that would facilitate and support major changes and new areas of research. Collaborative research efforts are increasing rapidly and are expected to continue to do so, with a growing emphasis on genetic research and therapies. The need to provide adequate support for increasing interdisciplinary collaboration significantly affects how the campus should be physically organized and how future NIH research facilities should be planned and designed. The underlying campus and building support systems also need to advance and be upgraded to meet new technological advances from communications, electronics, medical and research equipment, power, energy efficiency to building technologies, new materials and system infrastructure.

1.3.3.1 *Needs Related to Biomedical Research Activities:*

Biomedical research is the largest sector of activity at the Bethesda Campus. The Master Plan's adjusted campus population growth projection is primarily due to the need to accommodate added research capacity at this location. The key reasons for this increase are the needs for; a physical critical research mass, proximity to the clinical center, Institute and Center collocation and interconnectivity, and the relationship between on and off-campus research.

1.3.3.2 *Need for a Critical Research Mass:*

The NIH Bethesda Campus is, as previously noted, one of the largest research facilities for biomedical scientists and clinical researchers in the world. The benefits to this concentration of scientists at one location include shared laboratory space, equipment, chemicals, biological agents, and other support facilities. Collaboration of diverse experts accelerates research at NIH. In a few cases, NIH is the only location in the world with a specific resource. Internationally recognized experts who are working on the latest advances on various science, medicine, and research protocols are present at the Bethesda campus. This master plan supports the ongoing need to advance the physical facilities that are required to house this research.

1.3.3.3 *Need for Proximity to the Clinical Center:*

Research activity at the NIH Bethesda Campus centers at the Mark Hatfield Clinical Research Center and on the Intramural clinical trials, which are conducted in the facilities. This is a unique facility where biomedical science and research at the laboratory bench is applied as practical treatments to human patients. With more than 2.3 million square feet of floor space, it is the world's largest clinical research complex. The 2013 Master Plan provides continued support and updates of this critical research complex.

1.3.3.4 *Need for Institute and Center Collocation and Interconnectivity:*

Biomedical research is the responsibility of the numerous Institutes and Centers (ICs) within NIH. There are currently twenty-seven ICs. Each Institute or Center is responsible for specific

areas of biomedical research and training, and all are closely tied to the Mark Hatfield Clinical Research Center. The ICs forms a network that is operationally tied to the laboratories and facilities in the Clinical Center Complex, both on and off-campus. Individual scientists and clinical physicians may transfer back and forth between laboratories in other buildings and the Clinical Center as experimental conditions dictate.

Research in any one of a number of parallel programs among the Institutes may trigger an insight leading to cure or control of the affliction. Researchers attend NIH sponsored formal and informal seminars and conferences on the campus, which reveal final results or results in progress. Conferences reveal the results of extramural research as well as that done on campus.

The trend in collaboration among the Institutes has increased significantly. Modern biomedical research has become increasingly complex and interdisciplinary. Work is progressing from microscopic to the molecular, from the study of bacteria and viruses to genes. While individual institutes have the strongest ties to their own programs, there are also complex administrative and research relationships among the ICs. For example, researchers from a number of institutes now share facilities in Building 40, the Vaccine Research Center, which opened in 1999. Researchers from 10 individual NIH institutes would occupy the Porter Neuroscience Research Center; Phase 2 is now under construction, to conduct unified biomedical research involving the head, brain, and neurological systems. The proposed action in the Master Plan supports research collaboration and interdisciplinary research.

1.3.3.5 *Need for Administrative Activities at NIH Bethesda Campus:*

The Bethesda Campus is the administrative center and headquarters for NIH research activities. This Master Plan includes actions related to improving the facilities for efficient and collaborative NIH administrative activities. The Office of the Director is located at this campus. All Institutes and Centers (IC) have a respective IC Office of the Director here that provides immediate access to the NIH Director.

IC directors need to be in close proximity to one another, and to the Director, in order to run their respective extramural programs. When mandates or requirements for biomedical research first reach NIH the routes taken to find solutions are not necessarily self-evident. Institute directors, along with laboratory and research directors and other appropriate scientific personnel, make decisions on whether to complete work intramurally or extramurally. If intramurally, decisions are made on which institutes would do the work. Several research programs or initiatives may begin in parallel. When an extramural research need is identified at NIH, and private outside researchers or facilities are used, the work is handled by grant, contract, or agreement.

Each year NIH receives thousands of requests for extramural biomedical research grants from universities, research hospitals and research centers. On the average, only about 20 percent of

all research fund requests are funded. Proposals may be related to ongoing research at NIH, may be directed to independent research by outside specialists, or may pursue an idea uncovered in the course of other ongoing research.

The Office of Extramural Research (OER) is the gateway for all extramural research and training programs. It operates several computer-based data systems for managing, tracking, and evaluating research. Since 1946, NIH has employed a two-tier peer review system to ensure that the best science is funded. The first level of peer review is performed three times each year by more than 150 Initial Review Groups (IRGs) that assess applications for scientific and technical merit. The IRG members include respected and knowledgeable extramural scientists. Their assessments of the grant requests are compiled by OER in a summary statement that critiques the proposed work and gives it a priority score and percentile ranking. Thousands of individual reviewers participate in this program each year.

Discussions occur between institutes to avoid duplication of work and to coordinate extramural programs, both with intramural studies and among the different Institute extramural programs. The NIH campus provides the administrative and conferencing facilities to support this effort. The 2013 Master Plan provides the long-range plan to continue the operations in state of the art facilities.

1.3.3.6 *Training of Biomedical Researchers:*

NIH has mandated missions to train and educate biomedical researchers and provide an exchange of biomedical research information. Graduates of the NIH program have helped the inception of the U.S. biotechnology industry. NIH alumni have fostered NIH intramural programs throughout the academic and institutional world. High quality facilities that permit research at the cutting edge of scientific investigation attract world-class talent.

The critical mass of tenured senior scientists and clinical physicians, at the largest combined clinical facilities and laboratories in the world, make the NIH Bethesda Campus an unparalleled education center and training ground for young researchers. About half of the researchers on the campus are postdoctoral fellows, special volunteers and guest researchers. Most of these researchers work at NIH for two or three years and then deploy to universities and medical research centers worldwide. NIH is the primary training center for third-world researchers, who stand to be leaders in developing their countries' national health programs. The intramural research program has trained tens of thousands of M.D.s and Ph.D.’s, in particular, M.D.s who are clinical physicians bridging the gap between science and bedside care. NIH alumni in diverse programs worldwide have recreated NIH intramural programs.

The quality of the training at NIH is exemplary. Over 121 Nobel Prizes have been awarded to investigators supported by NIH. This includes five NIH staff scientists and many other researchers who have earned the Nobel Prize in physics, chemistry, and medicine for work associated with the NIH extramural program. Many other Nobel laureates have worked at one

time or another in the intramural program. Over one hundred members of the National Academy of Sciences have worked in the intramural program. NIH intramural program scientists have also won Lasker Foundation Awards. Many of the world's most frequently cited biomedical research scientists work at NIH. Although NIH intramural researchers receive only a small fraction of the nation's biomedical research budget, they are responsible for a significant portion of the most influential research based on frequency of citation of work by others.

Retaining top-level research staff and leading-edge facilities is essential if the U.S. intends to remain competitive in biomedical research. The number of research physicians is declining nationwide. This is due to economics; medical school tuition is prohibitively costly. Young physicians are driven to more lucrative areas of practice rather than research, to pay off financially ruinous education debts. The NIH intramural program offers an opportunity to overcome these difficulties.

1.3.3.7 *Need for Essential and Specialized Support:*

On the NIH campus there is a complex network of organizations facilities that provide essential support services to the NIH scientific programs. The proposed 2013 Master Plan anticipates and accommodates improvements to many of these organizations and facilities. Following is partial listing of the support functions provided on the campus.

- Training of researchers in laboratory safety
- Training of employees in fire protection and evacuation
- Police and fire protection
- Emergency response to incidents with special expertise in biomedical research and hospital conditions
- Planning, engineering, architectural, and construction services for new facilities and those undergoing alteration
- Renovation and modification of research and hospital spaces on the average, over 500 hundred such projects are underway at any given time
- Supply of laboratory and hospital items such as equipment, furnishings, chemicals, biological, and radioactive materials, and consumable materials
- Design and fabrication of research and hospital equipment; in electronics, machine, carpentry, plastics, and glass that is not available as off the shelf items
- Maintenance of repositories of viruses, bacteria, molds, yeasts, fungi, and healthy and diseased tissue for study and replication of experiments
- Maintenance and care of animals used in research

- Supply of steam and chilled water for heating and cooling buildings and use at the laboratory bench
- Maintenance and operation of campus utilities such as water, electric power, communications, natural gas, and sanitary waste
- Management and inspection of facilities for compliance to applicable laws, regulations, and NIH Bethesda site permits
- Management, marshaling, treatment, and disposal of general, chemical, radioactive, and hazardous waste

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2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

2.1 INTRODUCTION AND BACKGROUND

The National Institutes of Health (NIH) has developed a new long-range master plan in order to continue to address the issues of facility requirements, prudent land use, planning, and orderly future development necessary to accomplish the current NIH mission and have capacity to respond to future assignments. Master plans produced by NIH have a twenty-year planning horizon, and are to be updated every five years. To date there has been one original NIH master plan, approved in 1996, and two updates. NIH is now proposing a second twenty-year Master Plan.

This section describes NIH's seven current master plan goals and three possible master plan actions as defined in the 2013 Master Plan. This section identifies the proposed Master Plan action (Proposed Action) that best supports the seven NIH master plan goals.

This plan is not intended to be a specific design and construction program, but rather a framework within which design and construction can occur for actual projects over the life of the master plan as the programmatic needs upon which the plan is based arise. Nor does it attempt to anticipate unpredictable budgets, or congressional and presidential priorities and mandates. The objective has been to base the master plan solely on the NIH's best estimate of where the science is going on the premise that the more inclusive the plan, the more receptive it would be to a variety of future development possibilities.

The NIH Master Plan has been developed for a 20-year planning period, beginning in 2013. NIH intends to continue to update its master plans as required during the annual update of the NIH 5-year Strategic Facilities Plan.

The NIH is the nation's medical research agency, whose mission is to seek knowledge about the nature and behavior of living systems and to apply that knowledge to benefit human health and longevity, with the intent of reducing the burdens of illness and disability. The primary activity at NIH Bethesda is biomedical and clinical research. The NIH is the largest medical research facility in the world. About 10 percent of all NIH research is conducted directly on the campus through the NIH intramural research program. Individuals and institutions outside NIH complete the remaining research, under the NIH extramural research grant and contract program, which is managed through the NIH Office of the Director.

The NIH is a component of the U.S. Department of Health and Human Services (HHS). NIH is comprised of the Office of the Director and twenty-seven (27) Institutes and Centers (ICs), all which either conduct or support scientific research. The ICs are managed and coordinated by the Office of the Director, NIH.

Employees and contractors work on the campus in over 75 buildings with a cumulative gross floor area of approximately 7.1 million gross square feet (gsf) excluding parking. The Office of the Director of NIH and headquarters administration is located on the campus which has an administrative staff of 27 individual and independent research Institutes and Centers, (ICs), including the National Cancer Institute (NCI), National Eye Institute (NEI), National Institute of Mental Health (NIMH), National Institute of Aging (NIA), National Heart, Lung, and Blood Institute (NHLBI), The National Library of Medicine (NLM), The Clinical Center (CC), and twenty other Institutes or Centers (ICs) that comprise the NIH.

The focal facility on the campus is the Clinical Center Complex. The Clinical Center is the largest facility in the United States (U.S.) devoted exclusively to biomedical and clinical research. Clinical research includes investigating disease pathogens, conducting first-in-human clinical trials, developing state of the art diagnostic, preventive and therapeutic interventions, and training clinical researchers. The Clinical Center admits approximately 10,000 new patients annually, 6,000 as inpatients, with an average stay of 9 to10 days. Outpatient visits are about 95,000 per year. The Center includes over 1,600 laboratories supporting clinical research.

The original section of the Clinical Center, Building 10, was built in 1953. Many additions and wings have been built in response to the research mission of NIH. The Institutes' supporting research facilities include many buildings constructed prior to 1955. Design and layout of the older buildings could not foresee the exponential growth of use of electronic laboratory equipment and the changes in research laboratories, which have made them obsolete. The complexity and variety of biological, radiological, and chemical materials used in research has also increased, which in turn demands up-to-date facilities. Similarly, older buildings for office use have experienced major changes with open office layouts using systems furniture, instead of closed offices. Some older buildings are adaptable to the changing uses and others are not.

Current construction FY2012-2013 includes Building 35 - Phase 2 Porter Neuroscience Research Center, Building 23 Northwest Child Care Center, Renovations to the Clinical Center (Building 10), and Building 3 renovations.

Administrative headquarters for NIH are located on the 310-acre Bethesda campus. The Bethesda NIH campus is also the focus for clinical research conducted by NIH scientists and physicians. About 20,000 people work on the campus including NIH employees, visiting research fellows, intramural research trainees, and contractor personnel who operate cafeterias, banks, and other services, collect wastes of all types, and provide janitorial services. Approximately 60 percent of all NIH employees in the U.S. work on campus. Over 8,000 of the workers are scientists/physicians or postdoctoral trainees involved directly with research. The NIH employees work in about 50 major and 25 minor buildings that have a floor area of about 7,400,000 gross square feet (gsf). This area would increase with the completion of the Porter Complex and other projects that are under construction or in design from the prior 2003 Master Plan.

The Clinical Center Complex encompasses facilities in Building 10, the Ambulatory Care Research Facility and the Mark Hatfield Clinical Research Center. It is surrounded on the east and southwest sides by Institute buildings that conduct basic research and support clinical research in the Clinical Center. The buildings to the east of the Clinical Center Complex that are three to five stories in height, are part of the original NIH development which is now an historic district. Buildings on southwest part of the campus are newer, and are six to eight stories in height.

Most of the campus administrative offices are located in the eastern sector of the campus. The largest concentration of offices is in Building 31, a complex of 3 to 11 stories in height, located in the northeast corner of the campus. Building 45, the Natcher Building, on the east side of the campus provides 245,000 gsf for administration and conference space in a six-story structure. The National Library of Medicine is located to the south of the Natcher Complex. Building 82, which is not included in the master planning process, is located in the southwest quadrant of the West Cedar Lane/Old Georgetown Road intersection, outside the limits of the Bethesda Campus. Building 82 is a small two-story office building used for administration of cancer research.

Animal holding and care facilities are primarily concentrated in Buildings 14 and 28 on the south side of the campus. These buildings are single-story structures. Many newer research buildings constructed since 1995 also contain animal holding areas. Research laboratories and mixed offices and research comprise most of the remainder of the buildings on campus.

The central heating and refrigeration plant is the largest support facility, located in Building 11 (central utility plant or CUP), which is in the core area of the campus. Building 11 houses boilers generating steam for heating most of the campus. It also contains chillers and cooling towers producing chilled water for air conditioning of buildings and laboratories. Building 34 houses six older chillers installed in 1952, which have been decommissioned and are not available for use. NIH service shops, support personnel offices, and warehouse storage are located in Building 13, a three-story structure, north of the power plant. The Building 21 complex on the east side of the campus south of Wilson Drive houses treatment, storage, and disposal facilities for radioactive, chemical, and mixed wastes. Building 21 is two stories with a penthouse, with a below grade enclosed vault for storage tanks. The entire complex is situated in a ravine, remote and not visible from the surrounding public streets.

The north central portion of the campus is a residential area. Children and adolescents who are long-term patients at the Clinical Center obtain temporary relief from the hospital environment by housing with their families in the Children's Inn on the west side of West Drive. NIH senior staff residences are located to the east of the Children's Inn. The newly constructed Safer Family Lodge also provides temporary housing and support for adult patient’s families.

These building projects are currently in various stages of construction, planning or funding:

- Building 10 Renovations: 2,658,891 gsf
- Building 3 Renovations: 48,860 gsf
- Building 35 Phase 2 Porter Neuroscience Research Center (2013): 514,355 gsf
- Building 29 Renovations (2015): 89,028 gsf
- Building 29A Renovations: 106,694 gsf
- Building 23 North West Child Care Center: 21,335 gsf
- North Drive Bridge

2.2 NIH BETHESDA CAMPUS

2.2.1 Location

The NIH Bethesda campus is located in Montgomery County, Maryland, approximately three miles north of Washington, D.C. (Figure 1-1 in Section 1). The Bethesda Central Business District is situated immediately to the south of the campus. On the east side of the campus, NIH is bounded by and fronts on the west side of Rockville Pike (Maryland Route 355), a six-lane arterial road that passes through a commercial corridor extending northwest from Washington, District of Columbia line in Friendship Heights to Frederick, Maryland, which is 28 miles north of Rockville. NIH is bounded by Old Georgetown Road (Maryland Route 187) on the west side of campus and on the north side by West Cedar Lane (Figure 1-2 in Section 1).

The campus is in the Baltimore -Washington Combined Metropolitan Statistical Area. It is surrounded in all directions by urban and suburban development. This development extends four miles to the west of the campus, and greater distances in other directions. The Walter Reed National Military Medical Center fronts on the east side of Rockville Pike for most of NIH's eastern boundary. Single and multifamily residential neighborhoods are on the other three sides. The Washington Metropolitan Area Transit Authority (Metrorail) Red Line aligns with Rockville Pike as it passes underground through the Bethesda area. The Medical Center underground rail station, which also has surface bus transit service, is located on the east side of the campus.

The campus core is an area of varying topography. The southern portion of the core is located on fill placed in the original NIH stream valley. Existing buildings and utilities are densely concentrated in the core area. Virtually all of the core area has been disturbed by prior construction, or is located on an extensive fill that has buried the NIH stream valley as it crosses the central part of the campus. Stream branches appear on the north side of the campus and in the northeast corner by the Building 21 complex.

2.2.2 Issues and Growth Variables Explored

Within the objective of the new NIH Bethesda Campus Master Plan to provide a format for the reasoned and orderly development of the Bethesda Campus; four growth variables have emerged as key to determining the growth of this campus; campus size, traffic capacity, parking availability, and utility capacity. The effect of these variables on the ability of NIH to accomplish the seven goals is considered, and plays a large part in determining the preferred alternative.

2.2.2.1 *Campus Size*

Growth of the campus population in the 20 years covered by the first master plan was anticipated to be limited by mandated reductions in staff through the year 2000, but was offset by a small growth largely from consolidation of intramural staff on campus from locations off-site. The total increase of personnel on campus over the next 20 years was anticipated to be not more than 10 percent over the 1993 population of 16,350, which were 17,985. This was the population premise for the 1995 Master Plan.

In actuality, campus employment has grown faster than previously anticipated. Over the last decade, Congress and two administrations have provided increased support for NIH programs at unexpectedly high levels. This has resulted in a growth of personnel on the Bethesda Campus and of off-campus leased space, increasing the population to 17,639 in 2000. The 1995 Master Plan forecast comparable levels to be reached by 2020.

In 2000 the population increased to 17,639, with a small amount of growth largely from consolidation of intramural staff back onto the campus from off-site locations. Three new Institutes and Centers (I.C.s) were added to the NIH mission.

Growth was impacted by a 2004 Executive Order (E.O.) 13327 “Federal Real Property Asset Management,” signed by President George W. Bush, which strives to reduce the national debt by decreasing leased space and reducing the Federal Real Property portfolio by encouraging telework and hoteling. This has a major effect on the 2013 Bethesda Master Plan.

By 2011, the on-campus population had grown to 20,594 with a projected population increase of another 3,000 for the Proposed Action (Preferred Redevelopment Alternative) or 10,000 (if a maximum development is anticipated) for a combined total of 30,594.

In 2011, NIH had approximately 3.1 million square feet under lease, just in surrounding Montgomery County. The square footage off-campus population was equal to one half of the on-campus population.

The 2013 Master Plan alternatives assume the current population of 20,594 would grow, and this new growth would be the basis of the 2013 EIS. The growth assumptions of the Bethesda Campus through 2033 should be assumed to be in addition to all currently utilized space, plus all space currently under renovation or construction as these have been assumed and allocated

to currently funded programs. The projected campus populations for the three development alternatives are as follows:

- Proposed Action
- On Campus: 23,594-projected population
- Off Campus (within Montgomery County): 9,660 projected population
- No Action Alternative
- On Campus: 20,594-projected population
- Off Campus (within Montgomery County): 11,885 projected population
- Maximum Development Alternative
- On Campus: 30,594-projected population
- Off Campus (within Montgomery County): 1,885 projected population

2.2.2.2 *Campus Traffic*

Campus Traffic Capacity is defined in the trilateral Memorandum of Understanding (MOU) and caps the number of trips the campus should generate. The number of trips allotted to NIH has been defined in the MOU dated May 1992 (based on a 1992 survey). The allotted trip number was 5,888 AM peak hour trips, and 5,772 PM peak hour trips. This MOU and the 1992 survey offer no distinction or allocation based on alternative growth scenarios. As noted in the 2013 Master Plan, in May of 2012, NIH undertook a traffic survey to understand the effectiveness of its Transportation Management Plan (TMP) and found 2,695 AM peak hour trips and 2,201 PM peak hour trips. This is within the 1992 allotted trip numbers.

2.2.2.3 *Campus Parking*

Campus Parking has a target ratio of 0.50 parking spaces per employee (or one space per every two employees) as stipulated by the NIH Memorandum of Understanding and the Traffic Management Plan. This ratio is intended to relieve congestion within the immediate area of the NIH Bethesda campus by limiting commuter-parking options on campus. As of 2012 there were 10,528 parking spaces on campus. Using the projected campus populations from the 2013 NIH Bethesda Campus Master Plan:

- **Proposed Action** projects the following number of parking spaces:
  On Campus: 11,797 total parking spaces for the projected campus population of 23,594; this would achieve a ratio of approximately 0.50 per employee.
- **No Action Alternative** maintains the following number of parking spaces:
  On Campus: 10,528 total parking spaces for the projected campus population of 20,594. This would achieve a ratio of approximately 0.50 per employee.
- **Maximum Development Alternative** may provide the following number of parking spaces:
  On Campus: 15,297 for the projected campus population of 30,594. This assumes a 0.50 ratio of spaces to employee.

2.2.2.4 *Utility Capacity*

Utility Capacity is the ability to support the campus' needs as defined by the Master Utility Plan (MUP), which is currently being updated (2012-2014). In order to accomplish the NIH mission, it is imperative that NIH develops a new long-range master plan to continue to address the issues of facility requirements, land use, planning and orderly future development.

While considering projections it is important to note that in 2011-2013 there are large projects and programs, planned, underway, or soon to be completed, including three previously authorized I.C.'s. The projects include Building 35: John Porter Neuroscience Research Center (PNRC-II), Building N23 Northwest Child Care Center, Building 10 Clinical Center renovations, adaptive reuse and renovation of the Building 29 complex, the Animal Research Center; and expansion of the Central Utilities Plant, (Buildings 11 and 34). These planned developments would add over 768,598 square feet of new building space, and significant renovated areas. The projects are included herein as existing conditions, under the No Action Alternate.

Additionally, about 683,000 square feet of building floor space, or about 5 percent of the campus built space, is considered functionally obsolete. The following Table 2-1 summarizes the projected utility demands for each alternative.

Table 2-1: Peak Demand Summary (Peak Demand for Steam, Chilled Water and Electrical Power)

Considered Alternatives	**Steam** Force pounds per hour (pph)	**Chilled Water** (Tons)	**Electricity** Kilowatts (kW)
Proposed Action	1,099,179	71,527	92,079
No Action	880,641	58,120	74,325
Maximum Development	1,204,903	79,492	98,007

The Master Plan Proposed Action would require the addition of two boilers similar in capacity to the existing Boilers 1 to 4 at 150,000 pph steam each. The Proposed Action would also require the addition of three chillers at 5000-ton capacity each. The Considered Action - Maximum Development would require the addition of three boilers and the addition of five chillers for a total capacity increase of 450,000 pph of steam and 50,000 tons of chilled water.

The Master Plan Alternatives would require this additional utility equipment in order to meet the projected steam and chilled water demands. For reliability, the installed equipment capacity should be adequate to support the campus peak demands even if the largest single unit is not operating, which is noted below as Chiller Firm Capacity or N+1 capacity.

The additional equipment needed for each alternative is summarized below in Table 2-2. While the installed capacity shown is slightly less than the peak demand, in some cases it is within the acceptable range for operation during short-term peak periods. These are Firm Capacities and in normal conditions with all boilers and chillers available, the system capacities would be well above the peak demands.

Table 2-2: Summary of Utility Capacities by Each Alternative and Additional Equipment Needed

Considered Alternatives	**Boilers Firm Capacity** Force pounds per hour (pph)	**Additional Boiler Quantity**	**Chiller Firm Capacity** (Tons)	**Additional Chiller Quantity**
Proposed Action	1,007,000	2	70,000	3
No Action	857,000	1	60,000	1
Maximum Development	1,157,000	3	80,000	5

2.3 MASTER PLAN GOALS AND OBJECTIVES

The 2013 Bethesda Campus Master Plan proposed campus improvements would support the NIH mission by:

- Assisting in fundamental discoveries, innovative research, and respective application of such, to advance the nation's capability to protect and improve health,
- Developing, maintaining, and renewing the human and physical resources that are vital to continue improving the nations' ability to prevent disease, benefit health, and enhance quality of life,
- Supporting expansion of the knowledge base in biomedical and associated sciences to enhance the public's economic well-being and ensure a continued high return on the public investment in research,
- Assisting in the promotion of a high level of scientific integrity, public accountability, and social responsibility in the conduct of science.

The 2013 NIH Bethesda Campus Master Plan supports these mission implementation strategies with the following planning goals: (See the 2013 NIH Master Plan for a detailed discussion on these goals and objectives.)

- **Goal 1**: Foster innovative research to improve the nation's health
- **Goal 2**: Support the evolving requirements for biomedical research and education
- **Goal 3**: Provide a secure and supportive environment for the people involved in NIH activities, including scientists and professional/administrative staff, visitors and other non-NIH users, patients and their families, and residents and students
- **Goal 4**: Respect the stability and integrity of the surrounding residential community
- **Goal 5**: Protect the environment of the NIH campus and the region
- **Goal 6**: Foster communication about NIH goals and policies
- **Goal 7**: Meet the Federal Real Property Council's Performance Measures

2.4 PLANNING PRINCIPLES

These planning principles are the first step toward conceptual designs, and represent broad physical design objectives developed for the site. The 2013 NIH Bethesda Campus Master Plan contains a detailed description of the following Planning Principles. The following Planning Principles are derived from the 2013 Master Plan Goals and Objectives:

- Focus on Facilities: Replace obsolete biomedical facilities with state of the art facilities and where possible reuse obsolete facilities for administrative purposes. Assure that adequate utilities are available for the planned facilities.
- Promote Sustainability: Plan with the environment and climate in mind, utilizing climate, site orientation, location, vegetation, green space and topography.
- Campus Structure and Organization: Respect existing character of the campus landscape with a planning goal of developing the campus into related research community clusters.
- Landscape and Open Space: Enhance and preserve the informal landscape of the campus perimeter and where possible enhance open space in the campus interior.
- Development Proximity to Metro: Encourage public transit use by locating development within close walking distance of the Metrorail facility.
- Functional Relationships: Cluster biomedical research into “Centers of Science,” and administrative and education functions along the east side of campus, near Metrorail.
- Clinical Centre Stabilization and Renovation Program: Building 10 remains highest building within new Clinical Center Cluster with appropriately scaled open spaces surrounding it. The Clinical Center (public) face of campus is on the north side at Cedar Lane. The research entry to the campus comes primarily from the other entry points.
- Public Access and Orientation: Reinforce Rockville Pike and Old Georgetown Road corridors as the primary and secondary regional public frontages. Provide Emphasis for two public campus entries at Cedar Lane and Rockville Pike; provide vehicular ingress and egress at both to reduce congestion.
- Parking: Reduce surface parking on campus; concentrate parking in existing or new parking receptors.

2.5 ALTERNATIVES UNDER CONSIDERATION

This section briefly describes the three alternative development options and discusses some of the broader impacts associated with each alternative. Findings are suggested at the end of each alternative section.

The three alternative actions represent three different approaches to the modernization and growth for the future NIH Bethesda campus, which are needed to support the NIH mission and goals. A primary goal includes consolidation back to the campus of workers currently located in leased off the Bethesda campus, since leased space is the largest single operating cost for NIH. Another goal is to update research facilities by repurposing or demolishing aged facilities and building new state of the art research facilities in the redeveloped sites.

2.5.1 Proposed Action

The Master Plan Proposed Action addresses the main goals for the NIH Bethesda Campus by relocating laboratories from older and historic buildings to new research laboratory buildings. Converting aged historic and usable existing facilities to administrative or support functions. New construction includes seventeen buildings for research, administrative offices, amenities and other support facilities. Three new parking garages and significant renovations are included.

As the development proceeds the utilities and roadways are to be upgraded to properly support the new and renovated facilities. This includes additions to the Central Heating and Refrigeration Plant, campus steam, chilled water, and electric power distribution systems. The stormwater runoff would be improved to meet the new State of Maryland standards throughout the campus. Proposed amenities include expanded childcare facilities for employees, and small-scale retail and food services. The natural buffer zone around the periphery of the campus would be enhanced by removing surface parking and landscape plantings would be increased. Residential neighborhoods surrounding the campus from NIH facilities and activities would benefit from the increased buffer.

2.5.2 No Action Alternative

This plan includes no net new growth or change in employee numbers or facilities in relation to baseline or existing conditions. Projects that are already planned would be implemented under either the Proposed Action the No Action or the Maximum Development Alternative. These projects are included in the No Action Alternative as renovations and new construction.

2.5.3 Maximum Development Alternative

This considered Maximum Development Alternative assumes additional replacement of older campus buildings. Both the No Action Alternative and the Proposed Action new, repurposed and redevelopment projects are included in the Maximum Development Alternative. The maximum alternative would bring back to campus all leased laboratory and office space with a few exceptions. Similar to the redevelopment alternative, the maximum alternative includes additional parking garages.

The proposed employee population increase at the Bethesda Campus would be 10,000 under this alternative.

2.6 PROPOSED ACTION

The Proposed Action assumes that the laboratories that were constructed during the mid-20th century on the campus would be replaced with new state of the art laboratories. Existing 'older' laboratories would be adapted to new uses such as office space, physician offices or space for systems biology. This alternative would bring back to campus some of the leased laboratory space. It would replace and modernize the campus waste transfer and storage facilities. This alternative calls for the replacement of the Building 31, Building 14, Building 21 and Building 12 complexes. This action is cumulative including the development that occurs in the No Action Alternative.

2.6.1 Impacts to the ability of NIH to accomplish the Master Plan Goals

2.6.1.1 *Goal 1*

- Proposed Action would allow NIH's Bethesda Campus to support innovative research through the period of current and projected redevelopment in a comprehensive and coordinated approach. The Redevelopment Proposed Action would:
- Support quality research, through physical facility improvements
- Improve opportunities for interdisciplinary collaboration through aesthetic and functional enhancements of building development that provides formal and informal meeting and gathering spaces on campus; and
- Affords NIH the opportunity to create a flexible development plan that would allow for changing program needs in the future. NIH would be able to adequately address or consider potential impacts of new technologies and advances in research processes

2.6.1.2 *Goal 2*

Proposed Action would allow NIH's Bethesda campus to support evolving requirements of biomedical research and education. The Redevelopment alternative would:

- Provide opportunities to develop building sites, open space, and transportation and circulation systems that would promote appropriate campus facility utilization, functional land use and efficient accommodation of future program requirements in a coordinated development strategy.

2.6.1.3 *Goal 3*

Proposed Action would allow NIH's Bethesda Campus to provide a secure and supportive environment for the NIH community. This alternative would allow for appropriate and adequate campus amenities such as childcare, recreational resources, fitness facilities, convenience retail, etc. This alternative provides facilities that enhance the security, safety and well-being of

those who work, visit, or reside at NIH. This can be accomplished by maintaining site perimeter barriers and controlled entrances, effectively screening for contraband and mitigating vulnerabilities through campus and building design. The Proposed Action - Redevelopment would:

- Preserve the architectural integrity, and build upon the visual character of the NIH campus. It would continue to preserve structures with established historic and cultural value, and protect and document important archeological finds;
- Improve the physical landscape that enhances the quality and character of the campus; increase the ease of orientation and direction finding around the campus, and improve pedestrian and bicycle movement on campus.
- Provide for the convenience and safety of employees and the neighborhood through site lighting and security.

2.6.1.4 *Goal 4*

Proposed Action would allow NIH's Bethesda campus to respect the stability and integrity of the greater NIH community. The Redevelopment Alternative would conserve the campus perimeter buffer zones, especially bordering the residential areas. The Redevelopment alternative would:

- Maintain the scale and height of existing NIH facilities and ensure that they have no adverse impact on adjoining neighborhoods or cultural resources
- Minimize future construction near the adjoining residential neighborhoods
- Protect adjoining neighborhoods from intrusion of NIH traffic, parking, noise, and intrusive lighting
- It would continue to foster effective transportation solutions to minimize traffic and parking problems both external and internal.

2.6.1.5 *Goal 5*

Proposed Action would provide opportunities to promote national environmental remediation and sustainability goals. Redevelopment, Proposed Action, would:

- Continue to maximize the use of public transportation and shared transportation, and reduce the use of the single occupancy vehicle; provide opportunities to enhance campus design to encourage greater NIH employee use of bicycles and walking as commuting modes;
- Improve and enhance bikeways and bicycle circulation on the campus; there would be opportunities to promote energy efficiency; it would maintain current management of

stormwater runoff quality and quantity above minimal State requirements, where possible;

- Maintain ambient noise levels in adjacent residential areas caused by campus sources;
- Improve and enhance facilities for storage and handling of hazardous materials;
- Encourage an environmentally sound and developmentally sensitive relationship to surrounding neighborhoods and responsive to optimizing the campus' close proximity to the Medical Center Metro Station.

2.6.1.6 *Goal 6*

Proposed Action would enhance communication about NIH goals and policies as it:

- Encourages dialog among NIH management, staff, the scientific community and visitors to foster a better understanding of the ramifications of proposed policies and plans with updated facilities; and
- Affords opportunities to exchange ideas and create an environment of active dialog between NIH and the surrounding community, local, state and federal agencies to work together on issues that affect NIH, the surrounding community and region.

2.6.1.7 *Goal 7*

Proposed Action would meet the Federal Real Property Council's Performance Measures. Under this alternative the number of "mission-critical" and "mission-dependent" structures would increase and the condition index would improve. Under Proposed Action Redevelopment;

- The rate of over-utilized facilities would decrease under and operating costs are expected to trend downward due to new and efficient space uses and decrease in research leases;
- The NIH would be able to dispose of unneeded real property and functionally obsolete space, as well as adaptively reuse existing buildings.

2.6.2 Summation of Findings for Proposed Action

If the Proposed Action were accepted, NIH would continue to guide the evolution of the Bethesda Campus to meet currently assigned but not future mission requirements. This redevelopment and expansion is limited to the staffing levels and building requirements of the currently assigned or anticipated mission requirements. However, any expansion beyond this limited capacity would require an off-site campus to continue to meet mission requirements or an authorization to increase staffing and building limits.

The following Table 2-3 summarizes the Proposed Action development by building, with the amounts of proposed new building areas, the disturbed site areas and the amount of demolition and renovation quantified in square foot areas. The No Action Alternative totals are included in the summary calculations.

Table 2-3: Summation Proposed Action – Gross Square Foot Areas of New Construction, Demolition Disturbed Site Area and Renovation

Proposed Action Facility Name & Number	Construction: Building and Footprint Areas	Construction: Disturbed Site Area (Footprint x 1.8 Factor)	Demolition: Building Area	Demolition: Disturbed Site Area (Footprint x 1.8 Factor)	Renovation : Building Area
Building 1A	Building 26,000 GSF Footprint 6,500 GSF	11,700 GSF	N/A	N/A	N/A
Building 4	N/A	N/A	N/A	N/A	98,103 GSF
Building 5	N/A	N/A	N/A	N/A	99,849 GSF
Building N7	Building 118,664 GSF Footprint 19,777 GSF	35,599 GSF	N/A	N/A	N/A
Building 8	N/A	N/A	N/A	N/A	99,471 GSF
Building N9	Building 299,891 GSF Footprint 49,982 FP	89,967 GSF	Building 7 & Building 9 demolished No Action Alternative	Building 7 & Building 9 demolished No Action Alternative	N/A
Building 11B Power Plant Addition	Building 16,700 GSF Footprint 16,700 GSF	30,060 GSF	N/A	N/A	N/A
Building N12	Building 256,538 GSF Footprint 42,758 GSF	76,961 GSF	Building D12,12A & 12B 64,387 Total GSF	Site Area of Building 12, 12A & 12B 115,897 GSF	N/A
Building N14	Building 774,504 GSF Footprint 154,901 GSF	278,821 GSF	Building 14, 25 & 28 434,972 Total GSF	Site Area of Buildings 14, 25 & 28 782,950 Total GSF	N/A

Proposed Action Facility Name & Number	Construction: Building and Footprint Areas	Construction: Disturbed Site Area (Footprint x 1.8 Factor)	Demolition: Building Area	Demolition: Disturbed Site Area (Footprint x 1.8 Factor)	Renovation : Building Area
Building N18	Building 45,000 GSF Footprint 9,000 GSF	16,200 GSF	Building 22 16,095 GSF	Site Area of Building 22 28,971 GSF	N/A
Building N19 Complex **N19** **N19** **N19B** **N19C**	Building 56,494 GSF Footprint 38,433 GSF	69,179 GSF	Trailer (T) 41, T39, T46 & Bldg 41 160,715 GSF Total GSF	Site T41, T39, T46 & Bldg 41 289, 287 GSF	N/A
Building N20	Building 22,218 GSF Footprint 22,218 GSF	39,992 GSF	N/A	N/A	N/A
Building N21	Building 601,039 GSF Footprint 46,234 GSF	83,221 GSF	Building 21 17,014 GSF	Site Building 21 30,625 GSF	N/A
Building N22	Building 287,808 GSF Footprint 47,968 GSF	86,342 GSF	Building 31 47,527 GSF Demolition	Site Building 31 85,549 GSF	N/A
Building N24	Building 10,391 GSF Footprint 10,391 GSF	18,704 GSF	(Included in N14 total)	(Included in N14 total)	N/A
Building 30	N/A	N/A	N/A	N/A	110,240 GSF
Building 40A	Building 46,200 GSF Footprint 23,100 GSF	41,580 GSF	N/A	N/A	N/A
Building 45A	Building 87,461 GSF Footprint 12,494 GSF	22,490 GSF	N/A	N/A	N/A

Proposed Action Facility Name & Number	Construction: Building and Footprint Areas	Construction: Disturbed Site Area (Footprint x 1.8 Factor)	Demolition: Building Area	Demolition: Disturbed Site Area (Footprint x 1.8 Factor)	Renovation : Building Area
Building 48 Satellite Switching Station	Building 4,500 GSF Footprint 4,500 GSF	8,100 GSF	N/A	N/A	N/A
MLP12 Parking	Building 420,900 GSF Footprint 60,129 GSF	108,231 GSF	Building 41 135,137 GSF	Site Building 41 243,247 GSF	N/A
MLP13 Parking	Building 420,900 GSF Footprint 60,129 GSF	108,231 GSF	Included in Building 41 Demolition above	Included in Building 41 Demolition above	N/A
MLP14 Parking	Building 420,900 GSF Footprint 60,129 GSF	108,231 GSF	Building 31 570,000 GSF	Site Building 31 1,026,000 GSF	N/A
PROPOSED ACTION TOTAL	3,916,108 GSF 685,343 GSF	1,233,627 GSF	1,445,847 GSF	2,602,526 GSF	407,663 GSF
NO ACTION ALTERNATE TOTALS	535,690 GSF	223,641 GSF	80,960 GSF 25,415 FP	45,747 GSF	2,903,473 GSF
GRAND TOTAL PROPOSED ACTION + NO ACTION GSF	4,451,798 GSF	1,457,268 GSF	2,225,807 GSF	2,648,273 GSF	3,311,136 GSF

2.7 NO ACTION ALTERNATIVE

The No Action Alternative caps the expansion of the Bethesda Campus of NIH at current levels. Minimum development assumes that the NIH Bethesda Campus is optimally built out and there would be no demolition of existing structures and only limited new construction. One of two sites available for new construction is east of the existing Natcher Building; the other site available is where the Northwest Childcare Center is proposed, northwest of Building 10. Any improvements above the current thresholds would be dependent on budget adjustments.

Projects that are proceeding and have been in planning since the 2003 NIH Bethesda Campus Master Plan include the John Porter Neuroscience Research Center, the Northwest Childcare Center and renovations to Buildings 10, 3, 29 and 29A. As part of these planned projects, Buildings 7 and 9 are scheduled for demolition.

2.7.1 Impacts to the ability of NIH to accomplish the Master Plan Goals

The Minimum Development Alternative would eventually limit the ability of NIH's Bethesda Campus to support innovative research. Under this alternative eventually, NIH would not be able to maintain a comprehensive and coordinated approach to physical development of the NIH Bethesda Campus.

2.7.1.1 *Goal 1*

No Action Alternative limits growth in the future. NIH may not be able to adequately address or consider potential impacts of changes in technology and advances for innovative research processes.

2.7.1.2 *Goal 2*

No Action Alternative limits the opportunity to develop building sites, open space, and transportation systems that would ensure appropriate campus facility utilization, functional land use, and efficient accommodation of future program requirements, NIH would not be as able to address the evolving requirements for biomedical research and education.

2.7.1.3 *Goal 3*

No Action Alternative by limiting growth restricts the ability of NIH to provide a secure and supportive environment for people involved in NIH activities, NIH may be less able to provide campus amenities such as child care, recreational resources, fitness facilities, convenience retail or similar in the future. On-site security through perimeter fencing, vehicle screening, and provision of buffers is accomplished with this Alternative. This Alternative would continue to preserve structures with established historic and cultural value, and would continue to protect and document important archeological finds.

2.7.1.4 *Goal 4*

No Action Alternative would conserve the campus perimeter buffer zones, especially bordering the residential areas. This alternative would also maintain the scale and height of existing NIH facilities ensuring that they have no adverse impact on adjoining neighborhoods or cultural resources. The alternative should continue to support transportation solutions that minimize traffic and parking problems both external and internal. This Alternative would continue to maximize the use of public transportation and shared transportation, would provide limited ability to reduce the use of the single occupancy vehicle; and would encourage greater NIH employee use of bicycles and walking as commuting modes.

2.7.1.5 *Goal 5*

No Action Alternative would maintain the current level of support for campus and regional environmental protection by maintaining stormwater runoff management, ambient noise levels and maintaining current facilities for handing and storing hazardous waste. This Alternative would continue to encourage environmentally sound policies, sensitive to surrounding neighborhoods.

2.7.1.6 *Goal 6*

No Action Alternative would maintain current capability to communicate NIH goals and policies. This includes opportunities to promote energy efficiency; encouraging communications among NIH management and staff and the scientific community; and allow NIH to continue (at current levels) dialog with local, state and federal agencies to work on issues that affect the community.

2.7.1.7 *Goal 7*

No Action Alternative would take longer to meet the Federal Real Property Council's Performance Measures. Under the No Action Alternative the number of mission critical, mission dependent, and or mission dependent structures would remain the same; the condition index would improve at a modest rate; the rate of over-utilized facilities may increase due the inability to grow under this alternative. Operating costs would be expected to trend upward due to the need to maintain and operate inefficient space and an increase in leases due to unavailability of space on campus would be expected. This Alternative would limit NIH's ability to dispose of functionally obsolete space.

2.7.2 Summation of Findings for No Action Alternative

The No Action Alternative would continue existing projects that are now in planning, making modest upgrades to the campus buildings and infrastructure. The existing buffer will remain unchanged and there would be additional environmental mitigation. Selection of the No Action Alternative would continue the current level of point source loads from NIH of stormwater discharge. The No Action Alternative would necessitate that any expansion of NIH mission

beyond current staffing levels would need off-site location for staffing increases or not fulfill mission objectives. The No Action Alternative would necessitate expansion of the NIH mission requiring new laboratory or office facilities would need off-site locations for facility space increases or not fulfill mission objectives. Table 2-4 summarizes the No Action Alternative.

Table 2-4: No Action Alternative - Current Planned Facility Development Area Summary in Gross Square Feet (GSF)

No Action Facility Name & Number	Construction: Building and Footprint Areas	Construction: Disturbed Site Area (Footprint x 1.8 Factor)	Demolition: Building and Footprint Areas	Demolition: Disturbed Site Area (Footprint x 1.8 Factor)	Renovation: Building Area
Building 7	N/A	N/A	Building 48,460 GSF Footprint 9,165 GSF	16,497 GSF	N/A
Building 9	N/A	N/A	Building 32,500 GSF Footprint 16,250 GSF	29,250 GSF	N/A
Building 10	N/A	N/A			2,658,891 GSF
Building 3	N/A	N/A			48,860 GSF
Building 35 (Porter Neuro-Science)	Building 514,355 GSF Footprint 102,910 GSF	185,238 GSF	N/A	N/A	N/A
Building 29	N/A	N/A	N/A	N/A	89,028 GSF
Building 29A	N/A	N/A	N/A	N/A	106,694 GSF
Building 23 Childcare	21,335 GSF	38,403 GSF	N/A	N/A	N/A
NO ACTION ALTERNATIVE TOTALS	**535,690 GSF**	**223,641 GSF**	**80,960 GSF 25,415 FP**	**45,747 GSF**	**2,903,473 GSF**

2.8 ALTERNATIVES CONSIDERED – MAXIMUM DEVELOPMENT

The Maximum Development Alternative allows for an increase in total space at the Bethesda campus of NIH to a level that can meet currently assigned and projected needs for the next twenty years. The Maximum Development Alternative assumes laboratories constructed during the mid-20th century on the NIH Bethesda Campus would be replaced with new state of the art laboratories. Older laboratories would be adapted to uses suited to the older buildings, such as office space, physician offices or space for systems biology. Maximum Development would bring back to the Bethesda campus all leased laboratory and office space except for designated commercial leases. It would replace and update the campus waste transfer and storage facilities. This alternative calls for the replacement of the Buildings: 4, 5, 8, 12, 14, 16, 21 and 31 complexes and is cumulative, including the development in the Proposed Action and No Action.

2.8.1 Impacts to the ability of NIH to accomplish Master Plan Goals

2.8.1.1 *Goal 1*

Maximum Development would support innovative research to improve the nation's health. NIH would be able to establish a comprehensive and coordinated approach to physical development of the NIH Bethesda Campus that is based on cost effective, incremental options for growth while ensuring orderly development of the campus. The Maximum Development Alternative would:

- Stimulate interaction and communications among scientists and staff to enhance quality of research and opportunities for interdisciplinary collaboration through adjacency of uses and the creation of formal and informal meeting and gathering spaces on campus;
- Afford NIH the opportunity to create a flexible development plan that would allow for changing program needs in the future allowing NIH to adequately address or consider potential impacts of changes in technology and advances in research processes; and
- Provide NIH with the ability to keep up with advancement in technology.

2.8.1.2 *Goal 2*

Maximum Development would support evolving requirements for biomedical research and education. Under this alternative there would be a comprehensive and coordinated approach to physical development at NIH that would ensure the orderly growth of NIH facilities. There would be opportunities to develop building sites, open space, and transportation and circulation systems that would ensure appropriate campus facility utilization, functional land use as well as efficient accommodation of future program requirements. Maximum Development would:

- Provide an opportunity to enhance campus function, efficiency, and character through better definition of land use and functional relationships;

- Enhance opportunities to identify patterns of existing development and factors, which potentially limit future development and therefore define an achievable development strategy.

2.8.1.3 *Goal 3*

Maximum Development would provide a supportive and secure environment for the NIH community. This alternative would allow for appropriate and adequate campus amenities such as childcare, recreational resources, fitness facilities, convenience retail, etc. It would also facilitate the security, safety and well-being of those who work, visit, or reside at NIH by maintaining site perimeter barriers, effectively screening for contraband and mitigating vulnerabilities through campus and building design. Maximum Development would:

- Preserve the integrity, and build upon the character of the NIH campus by continuing to preserve structures with established historic and cultural value, and protect and document important archeological finds;
- Improve the system of landscape that enhances the quality and character of the campus, and would increase the ease of orientation and direction-finding around the campus and improve pedestrian and bicycle movement on campus;
- Provide for the convenience and safety of employees and the neighborhood through site lighting and security.

2.8.1.4 *Goal 4*

Maximum Development would provide stability and integrity to the surrounding residential community. This alternative would conserve the campus perimeter buffer zones, especially bordering the residential areas. It would endeavor to ensure that NIH and its activities do not contribute to security or safety issues in adjoining neighborhoods. It would continue to foster effective transportation solutions to manage traffic and parking problems both external and internal. However, adding 10,000 full time employees will significantly impact currently congested roadways.

2.8.1.5 *Goal 5*

Maximum Development would protect and enhance the surrounding residential community. This alternative would provide opportunities to promote national sustainability goals. It would provide opportunities to identify and build upon the unique environmental qualities of the campus and enhance existing landscaping and vegetation. This Alternative would continue to maximize the use of public transportation and shared transportation, and reduce the use of the single occupancy vehicles. The population increase and the amount of proposed development could significantly increase the impact on the environment that would require mitigation efforts. The Maximum Development Alternative would:

- Provide opportunities to enhance campus design to encourage greater NIH employee use of bicycles and walking and improve and enhance bikeways and bicycle circulation on the campus;
- Provide opportunities to promote energy efficiency and maintain current management of stormwater runoff quality and quantity above minimal State requirements, where possible;
- Maintain ambient noise levels in adjacent residential areas caused by campus sources;
- Improve and enhance facilities for storage and handling of hazardous materials;
- Encourage environmentally sound development sensitive to surrounding neighborhoods and responsive to optimizing the campus' close proximity to the Medical Center Metro Station.
- Impact the environment with the proposed number of new buildings and grading. This impact would require mitigation.

2.8.1.6 *Goal 6*

Maximum Development would enhance communication about NIH goals and policies as it:

- Can encourage dialog among NIH management, staff, the scientific community and visitors to foster a better understanding of the ramifications of proposed policies and plans; and
- Affords opportunities to exchange ideas and create an environment of active dialog between NIH and the surrounding community, local, state and Federal agencies to work together on issues that affect NIH, the surrounding community and region.

2.8.1.7 *Goal 7*

Maximum Development would meet the Federal Real Property Council's Performance Measures. Under this alternative the number of mission critical and mission dependent structures would increase, and the condition index would improve.

- The rate of over-utilized facilities would decrease, and operating cost is expected to trend downward due to new and efficient space and decrease in leases; and
- NIH would be able to dispose of unneeded real property and functionally obsolete space, and adaptively reuse existing buildings.

2.8.2 Summation of Finding for Maximum Development Alternative

If the Maximum Development Alternative were accepted, NIH would continue to allow the Bethesda Campus to evolve, to meet currently assigned and future mission requirements. This redevelopment and expansion could continue until the currently designated site capacity is reached. However, any expansion beyond this designated capacity would require an off-site campus to continue to meet mission requirements.

The following Table 2-5 and Table 2-6 summarize the gross square foot areas for the Maximum Development Proposed Buildings, the amount of disturbed site area for both the new construction and the demolition of existing buildings and renovated totals from the Proposed Action and the No Action Alternatives, which are part of the Maximum Development totals.

Table 2-5: Maximum Development Alternative – Gross Square Foot Areas of New Construction, Demolition Disturbed Site Area and Renovation

Maximum Development Facility Name & Number	Construction: Building and Footprint Areas	Construction: Disturbed Site Area (Footprint x 1.8 Factor)	Demolition: Building and Footprint Areas	Demolition: Disturbed Site Area (Footprint x 1.8 Factor)	Renovation: Building Area
Building 4	N/A	N/A	Building 98,103 GSF Footprint 24,526 GSF	44,146 GSF	N/A
Building 5	N/A	N/A	Building 99,849 GSF Footprint 24,962 GSF	44,932 GSF	N/A
Building 8	N/A	N/A	Building 99,471 GSF Footprint 24,868 GSF	44,762 GSF	N/A
Building 16	N/A	N/A	Building 24,843 GSF Footprint 14,588 GSF	26,258GSF	N/A
Building 16A	N/A	N/A	Building 4,822 GSF Footprint 2,411 GSF	4,340 GSF	N/A

Maximum Development Facility Name & Number	Construction: Building and Footprint Areas	Construction: Disturbed Site Area (Footprint x 1.8 Factor)	Demolition: Building and Footprint Areas	Demolition: Disturbed Site Area (Footprint x 1.8 Factor)	Renovation: Building Area
New Administrative Building	240,000 GSF Plan 6 stories 40,000 GSF footprint	72,000 GSF	N/A	N/A	N/A
New Administrative Building	240,000 GSF Plan 6 stories 40,000 GSF footprint	72,000 GSF	N/A	N/A	N/A
New Administrative Building	480,000 GSF Plan 6 stories 80,000 GSF footprint	144,000 GSF	N/A	N/A	N/A
New Administrative Building	311,350 GSF Plan 6 stories 52,000 GSF footprint	93,600 GSF	N/A	N/A	N/A
New Administrative Building	311,350 GSF Plan 6 stories 52,000 GSF footprint	93,600 GSF	N/A	N/A	N/A
New Parking	525,000 GSF Building 105,000 GSF footprint	189,000 GSF	N/A	N/A	N/A
New Parking	525,000 GSF Building 105,000 GSF footprint	189,000 GSF	N/A	N/A	N/A

Table 2-6: Total Areas for Maximum Development Alternative

TOTALS	New GSF	Disturbed Site	Demolition	Demo Site	Renovation
Total Area	2,632,700 GSF	853,200 GSF	327,088 GSF	164,438 GSF	N/A
Footprint	474,000 GSF		91,355 GSF		
+ No Action & Proposed Action	4,451,798 GSF	1,457,268 GSF	2,225,807 GSF	2,648,273 GSF	3,311,136 GSF
Footprint	809,588 GSF		778,937 GSF		
GRAND TOTAL	**7,084,498 GSF**	**2,310,468 GSF**	**2,552,895 GSF**	**2,812,711 GSF**	**3,311,136 GSF**

3 AFFECTED ENVIRONMENT

3.1 EXISTING TOPOGRAPHY, GEOLOGY AND SOILS

This subsection describes the topography, geology and soils in the areas for the proposed actions. Assessment of the existing soils is based on the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service 2007 Soil Survey for Montgomery County, Maryland (USDA, 2007a).

3.1.1 Topography

NIH Bethesda Campus is located on the eastern side of the Piedmont physiographic province. The Piedmont lies between the Atlantic Coastal Plain, which begins about 5 miles to the southeast within Washington D.C., and the Blue Ridge Province, which begins at Catoctin Mountain about 30 miles to the northwest. The Piedmont Province extends from New York to Georgia and traverses a 30- to 45-mile wide swath through Maryland.

The NIH Bethesda Campus is situated on the undulating topography of the uppermost stream valleys of two small independent tributaries of Rock Creek, which flow from southwest to northeast across the campus. The campus is divided into three watersheds that drain to the 1) North Branch, 2) NIH Stream and 3) the Stony Creek. The 2012 topography is shown on Figure 3-1 and the major drainage divides are indicated on Figure 3-2.

In general, Old Georgetown Road is the western drainage divide of the campus as well as the divide between the Rock Creek and Booze Creek watersheds. A portion of the campus actually drains westerly towards Old Georgetown Road and the Booze Creek watershed. The peak site ground elevation of the campus, 384 feet, is located on the south side of South Drive on the ridgeline. The lowest elevation on the campus is 232 feet located at the northeast corner of the property where a drainage culvert, located just south of Cedar Lane, crosses under MD Route 355.

The watershed for the North Branch consists of the northern portion of the NIH campus as well as surrounding community area located north of West Cedar Lane as well as portion of Old Georgetown Road (northwest quadrant of the campus). Slopes are generally 5 to 10 percent throughout this area. Slopes increase to 15 percent and more in the stream valley areas. The elevation of this watershed ranges from 375 feet around Building 60 and 304 feet around Building 17. Run-off enters the campus at an elevation of approximately 360 feet. The run-off then travels in a concrete drainage ditch prior to entering into the storm drainage system located southwest of the Children’s Inn (Building 62). This run-off continues to travel to the east in a piped storm drainage system where it eventually outfalls into a culvert at an elevation of 232 feet, located just south of Cedar Drive, that crosses under MD Route 355.

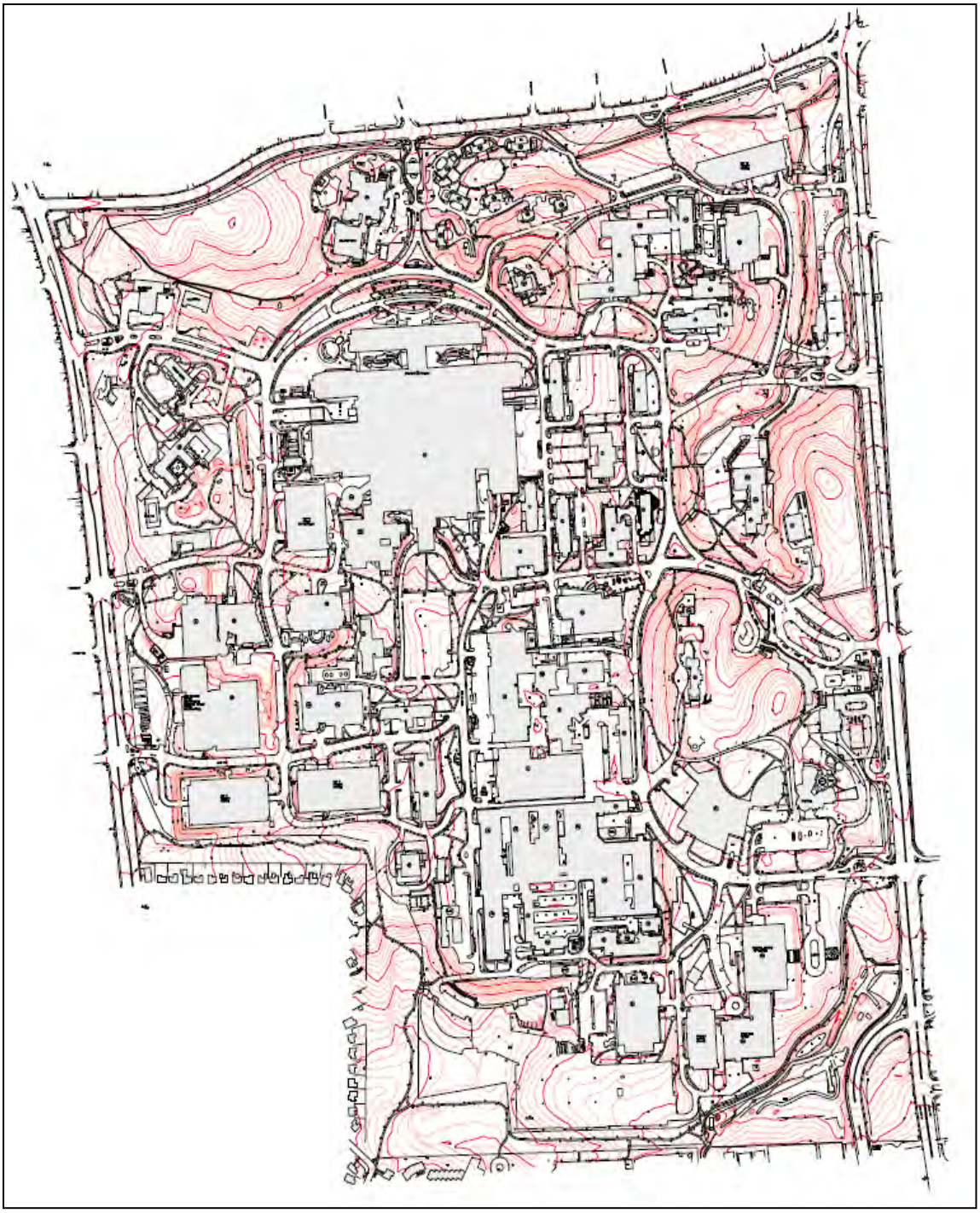


Figure 3-1: Overall 2012 NIH Bethesda Campus Topography

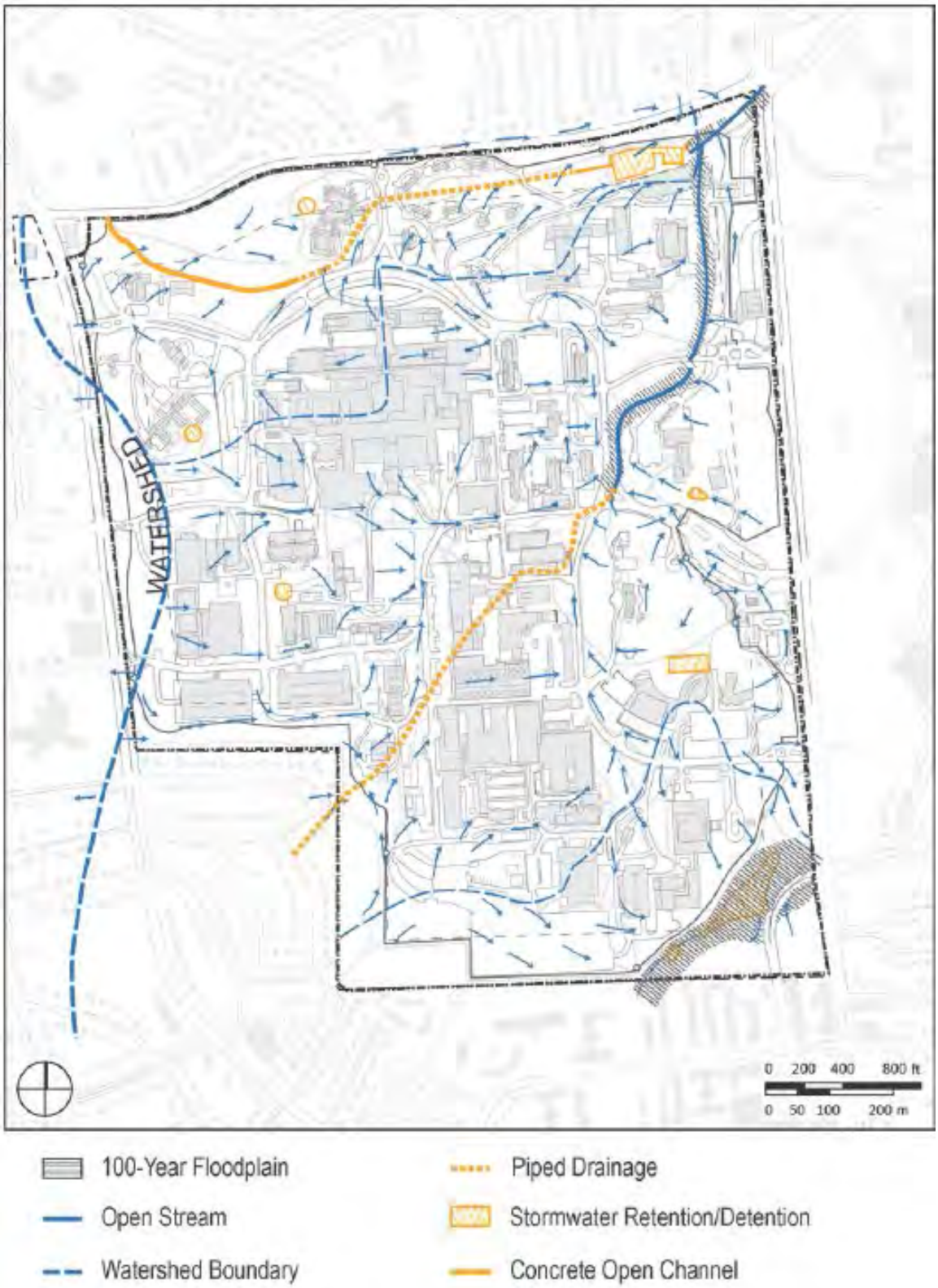


Figure 3-2: Natural Features and Drainage Sheds

The watershed for the NIH Stream consists of the majority of the central, southwestern and eastern portions of the campus. The elevations of this watershed range from 370 feet around MLP-6, 315 feet around Buildings 10, 310 feet around Building 62 and 252 feet around MLP-10. Off-site run-off from the residential area located southwest of the campus enters this watershed.

Slopes are generally 5 to 10 percent throughout this area. Slopes increase to 15 percent and more in the stream valley areas. The upper section of the NIH stream valley has been buried by 10 to 30 feet of fill and the course of the stream and natural topography is only barely perceptible at some locations in the core area of development. The run-off enters into a storm drain system at an elevation of approximately 312 feet and then travels approximately 2,200 linear feet northeast through the campus where it eventually outfalls into a stream channel, northeast of the intersection of South Drive and Center Drive, at an elevation of 266 feet. The stream channel flows northward where it eventually outfalls into a culvert at an elevation of 232 feet, located just south of Cedar Drive, which crosses under MD Route 355. More than half the campus is located on the east facing side slope between the ridgeline along the western periphery of the property and the NIH Stream. Between West Cedar Lane and South Drive, a tributary ravine is incised into the general slope along the east-west axis, forming a separate valley up to 40 to 50 feet deep.

The watershed for the Stony Creek consists of the southern and southeastern portions of the campus. The elevations in this watershed range from 350 feet southwest of the parking lots, 330 feet around Building 45, and 304 feet at the Stony Creek Pond (currently under construction as of July 2012) located northwest of Woodmont Avenue. Slopes are generally 5 to 10 percent throughout this area. Slopes increase to 15 percent and more around the Stony Creek Pond. The run-off enters into the campus at an elevation of 310 feet via a storm drain outfall that drains the residential and business districts located south the campus. This run-off currently makes outfall directly into the Stony Creek Pond.

3.1.2 Geology and Soils

Bedrock under the Bethesda Campus is composed of the Lower Pelitic Schist of the Sykesville Formation. (**Figure 3-4**) In older geology literature and mapping, the schist is also identified as the oligoclase facies (a crystalline variety of feldspar) of the Wissahickon Formation or as the eastern sequence of the Wissahickon Formation (The Crystalline Rocks of Howard and Montgomery Counties, C.A. Hopson, in The Geology of Howard and Montgomery Counties, Maryland Geological Survey, 1964).

The Lower Pelitic Schist is a member of the Glenarm Series of formations, which are, exposed on the surface over the eastern half of the Piedmont Plateau. It is composed of interlaced beds of medium to coarse-grained pelitic (originally depositional mud) schist and fine to medium grained psammatic (originally sand) beds with the latter more predominant near the top of formation. Its age has not been fixed but is estimated to be late Precambrian. It has been intensely folded, dislocated, and metamorphosed. The formation is approximately 5,500 feet

thick. Bedrock on the campus is generally 55 to 65 feet below the surface but it may be at half this depth in the northeast sector of the site where the NIH stream has eroded the surface geologically.

The bedrock is overlain by about 15 to 40 feet of saprolite subsurface material. The boundary is a gradual transition, and not a distinct interface. The saprolite is composed of the decomposed and weathered residual crystalline rocks of the base formation. Three distinct saprolites are found under the campus: Saprolite 5B a predominantly well-drained micaceous schist; Saprolite 5D a predominantly well drained, silty, bouldery, gneiss; and Saprolite 5F a predominantly poorly drained with intermixed clays and mafic rock.

In general, the saprolites consist of sand, silt, clay, angular rock fragments and residual soft red brown to gray earthy porous materials derived from the decomposed crystalline rock. Hard quartzic intrusions may be encountered at widely separated intervals. The saprolites are oriented in the north-south direction. A geologic syncline runs along the axis of Rockville Pike, or just to the west of it so that the surface saprolites on the Walter Reed National Military Medical Center (WRNMMC) are mirror images of those in NIH.

Radon is a naturally occurring gaseous substance resulting from the radioactive decay of uranium (U) to radium (Ra) and then to radon (Rn). Uranium is a common element found in many geologic formations and substrates, particularly igneous and metamorphic rocks. Radon has a half-life of only 3.8 days and decays to its daughter elements (polonium (Po) 218, polonium 214, bismuth 214 and lead 214). It is these daughter elements, which represent the health hazard commonly associated with radon.

Radon gas levels are directly influenced by the radon gas concentration and the overall permeability of the soil or rock medium. Generally, the highest radon gas levels are associated with the igneous and metamorphic rock sequences of the Piedmont. In these regions, radon gas tends to accumulate in below grade areas of building where the air circulation is restricted. Therefore, radon abatement systems commonly employ air evacuation units to prevent the accumulation of radon gas. Radon also dissolves readily in groundwater; therefore, wells have the potential to release radon gas.

Based on radon information published by the EPA, the action level is listed as 4 picocuries per liter (pCi/L or more) for indoor environments through proper testing protocols. Further testing and/or mitigation efforts are recommended for radon levels above 4 pCi/L. Radon gas is not limited to structures built in or on soil and rock types with high geologic potential for radon release. Bethesda is located within an area defined by EPA as Zone 1 and Zone 2. Zone 1 is listed as the highest potential areas predicted to have an average indoor radon screening level greater than 4 pCi/L. Zone 2 is listed moderate potential areas predicted to have a radon screening level between 2 and 4 pCi/L. Actual concentrations of radon can only be determined through on-site testing in the structure(s).

It is also recommended that after development of a new structure, renovation of existing structures, or ventilation system changes or upgrades that radon testing be performed for new structures and reevaluated for existing structures as pressures within the buildings may have altered due to adjustments or renovations to the foundations or air handling systems. Due to the development of the campus, the depth of soils has been altered. Information in regards to fill materials is also not available. Based on the National Cooperative Soil Survey for Montgomery County, Maryland, seven soil series have been identified for the campus. The Soil Survey Map and soils identified are included in the following Figure 3-3. The soils are primarily classified as silt loams and urban land with slopes ranging from 0 to 15 percent.

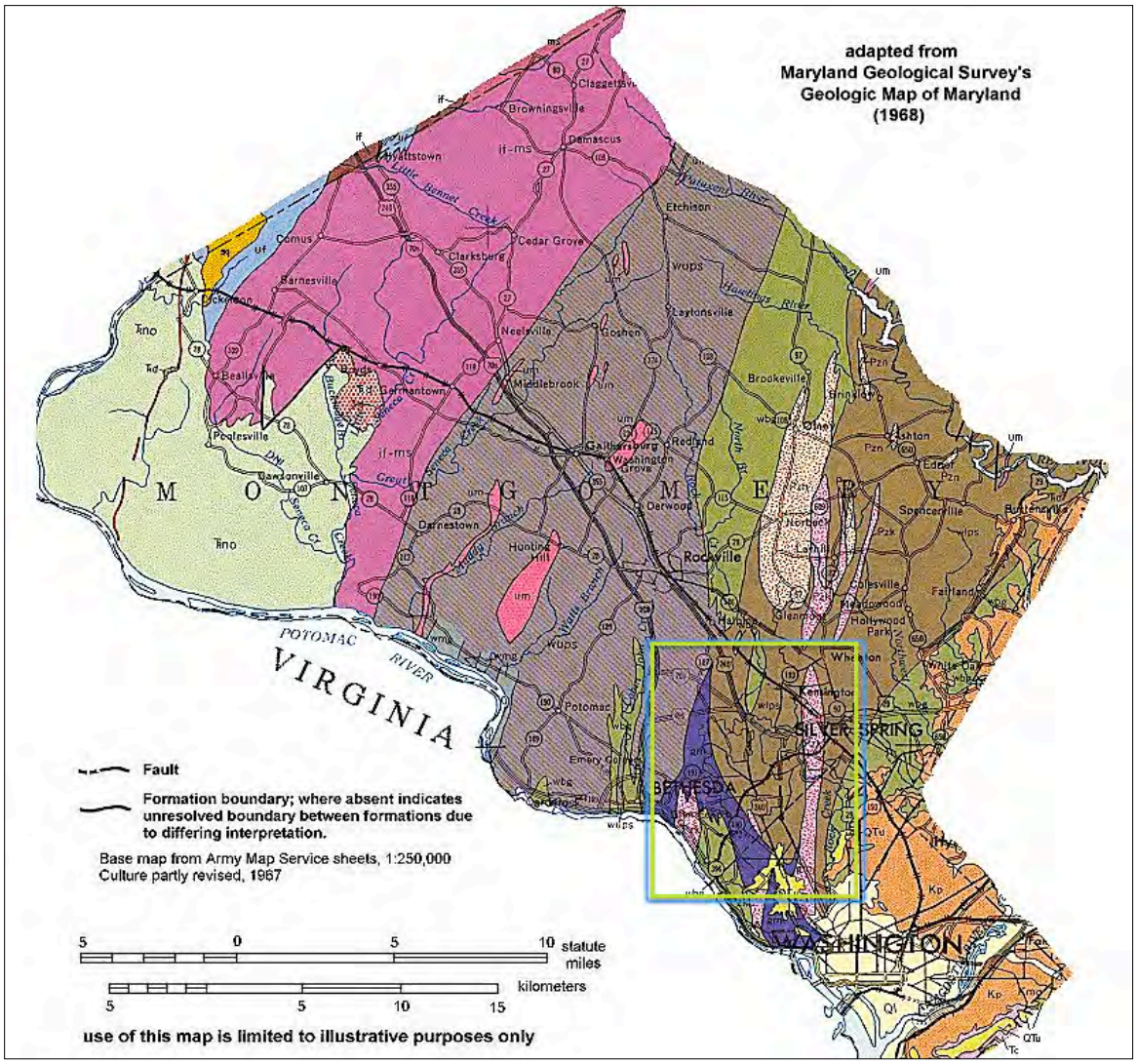


Figure 3-3: U.S. Geological Survey Montgomery County Geological Map, Maryland

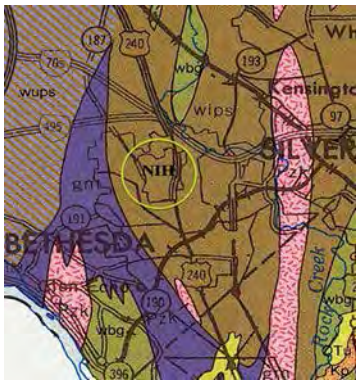


Figure 3-4: U.S. Geological Survey –Map of soil and rock types for the Region and NIH

The soil type is Lower Pelitic Schist (Formerly mapped as oligoclase facies of Wissahickon Formation) Medium-to-coarse-grained biotite-oligoclase-muscovite-quartz schist with garnet, staurolite, and kyanite; fine-to medium-grained semipelitic schist; and fine-grained granular to weakly schistose psammatic granulite; psammatic beds increase upward; apparent thickness 5,500 feet or more.

Previous EIS documentation indicates that the central portion of the campus has been disturbed by construction of facilities. Surface soils can be a mixture of native, borrow, and fill materials. Most of the area occupied by Buildings 11, 12, 13, and 14 is covered by fill material placed in the NIH stream valley with the bottom of the 96-inch storm drain carrying the stream representing the original ground elevations. Geotechnical subsurface borings performed for the Building 11 Phase I expansion project indicated that fill material ranges from 300 to 350 feet to either side of stream bed before feathering to original soils.

Campus soils have comparatively low nominal erodability. However, erosion control measures are necessary when slopes exceed about 5 percent, and exposure during construction should be minimized. Cut slopes tend to be stable, and steep slopes can be maintained. The Baile silt loam found in the northeast corner of the campus is listed as a hydric soil. Hydric soils are generally associated with streambed soils or wetlands. Surface and subsurface soils are reported to have bearing strengths ranging from 4,000 to 8,000 lbs/sf near the surface to 9,000 lbs/sf at greater depths.

Water tables of these soils are reported to range from 1.3 to greater than 6 feet in depth. Surface run-off is reported to be medium to very high for the soils except for Glenelg Urban Land Complex and Glenville silt loam soils. Groundwater in the overlying saprolites may be encountered 10 to 50 feet below the natural ground surface. Soil boring data from NIH projects and the U.S. Geological Survey (USGS) indicates that this most frequently occurs 20 to 30 feet below the surface. The saprolites collectively act as one uniform groundwater storage reservoir. The water table in the saprolites does not reportedly respond to precipitation events, and wells

or excavations encountering the stored groundwater do not produce much drawdown. Transmissivity of groundwater ranges from 0.0001 to 10 gallons/sf/day with the values increasing with depth.

Groundwater would be expected to flow to the east and northeast based on surface topography. Surface runoff is expected to flow towards intermittent tributaries associated with Stone Lake and Rock Creek located to the east and northeast of the site, which further deposits into the Potomac River further south of the project area.

3.2 BIOLOGICAL RESOURCES

3.2.1 Terrestrial Vegetation and Habitat

This section reviews the existing policies and physical conditions regarding on trees, vegetation, and habitat on campus and assesses the potential impacts the three alternatives might have on them.

3.2.1.1 *Trees and Vegetation Applicable Policies*

The protection and planting of trees and forests on the campus are directed by the following federal goals and guidelines, state and county regulations, and NIH policies. The federal government has a goal to protect and enhance vegetation and habitat on its facility compounds. The National Capital Planning Commission (NCPC) has issued the following guidelines in The Comprehensive Plan for the National Capital for achieving these goals:

- The incorporation of trees and vegetation in all federal developments to moderate temperatures and minimize energy consumption,
- To encourage the use of street trees to enhance visual and aesthetic features,
- To 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.

The Maryland Forest Conservation Act of 1991 along with the Montgomery County Forest Conservation Law (Chapter 22A) established a program for conserving forest and tree resources. Effective July 1, 1992, all applications for development, or sediment control permits for construction projects encompassing at least 40,000 square feet of previous area, must be accompanied by a Natural Resources Inventory (NRI), Forest Stand Delineation (FSD), Forest Conservation Plan (FCP), and Forest or Tree Protection Plan (FPP or TPP).

NIH has prepared a campus-wide Urban Forest Stand Delineation Plan and a Forest Conservation Plan that was based on the 2003 Master Plan. These meet current state and county requirements. They were reviewed and approved by Maryland Department of Natural

Resources (MDNR). Further NIH prepares individual tree preservation and replacement plans for individual construction projects on the campus. These are planned to fit within the framework of the overall campus-wide Conservation Plan. Each of these is submitted to the Maryland Department of Natural Resources for review and approval.

NIH handles impacts on an individual tree basis. Since 1996 NIH has had a policy of no net tree loss, and a requirement of a one for one replacement, of trees lost due to either natural causes or construction. In general, NIH does much more than this. For example the Neuroscience Research Center construction planted 110 new trees to compensate for a loss of 56 trees of all sizes. Similarly, 264 trees and about 850 shrubs and smaller plants were planted to compensate for the loss of trees at the Commercial Vehicle Inspection Facility site. NIH loses 60 to 70 mature trees each year from natural attrition. These are tracked and replaced. For example in Fiscal Year (FY) 2000, 184 trees were lost for these reasons. They were replaced with 382 trees planted around the campus. Further NIH has a tree transplanting policy. Trees that may be affected by development or other situations are transplanted when feasible. Most transplants on campus have been five inches or less in bole diameter, although transplants have been successful with trees up to ten inches in diameter. NIH has an active program to care for planted trees and other vegetation. NIH has installed drip irrigation systems in selected shrub beds. As an innovative measure, groundwater that seeps into the excavations of ongoing campus construction projects is pumped and used for grounds irrigation.

3.2.1.2 *Terrestrial Conditions*

The grounds of the NIH campus are managed and controlled to a high degree. It has mature trees, broad lawns and extensive areas of ornamental gardens and courts, with shrubs, ground covers and flowers give it the appearance of a college campus and create an appealing setting that is important to a world class research campus. Campus plantings are increasing and enhanced regularly.

The campus currently contains about 4.2 acres that meet the Maryland Department of Natural Resources (MDNR) criteria for forests. The MDNR density criteria are for 100 trees or more per acre. This is a recent designation, as the campus contained no forests except a small area around the historic Wilson Estate for many years. Campus trees grew in open conditions with lawn, ground cover or mulch below. The managed ground surface was free of natural tree litter and vertical forest stratification. Densities were generally less than 50 per acre. Two smaller areas on the north side of the campus few areas had densities of up to about 85 per acre. This condition started to change when no-mow zones were established over ten years ago along campus streams and selected perimeter buffer areas. These areas filter and absorb storm water run-off, provide wildlife habitat and decrease campus maintenance costs. They have become, and are becoming, naturalized forested areas as natural plant succession occurs and smaller trees and other understory materials grow up. Currently there are approximately 22 acres of ‘no-mow’ areas. These areas represent about 12 percent of the campus’s 186 acres of

open space. More acres around the southeast storm water pond have been identified and would be officially added in the fall of 2012. So far, as a result of these changes, the tree density has risen sufficiently that the 4.2 acres within the first 'no-mow' area, called Cedar Lane Woods between the Children's Inn and NIH Fire Station, now qualifies as forest.

The NIH Grounds Maintenance and Landscaping Section (GMLS) carry out a continuing program for tree inspection, maintenance, and care. GMLS also conducts an extensive annual campus tree inventory that counts all trees with trunks of a diameter two inches or greater at Diameter at Breast Height (DBH). Trees are identified by number, tagged and monitored. The inventory is plotted on a Geographical Information System (GIS) map that is continually updated, using a software program such as ArcGIS. The inventory process shows that the total number of trees on campus has been steadily increasing. The total number of trees has increased each year since 2003 except in 2010. In that year there was a net loss of 178 trees. In 2009 there was a net gain of 342 and in 2011 the net gain was 54. Figure 3-5 shows the last completed Tree Inventory Map. The 2011 survey which is ongoing at this time has counted over 8,500 trees of two inches DBH or greater.

NIH has planted a majority of the existing campus trees. They include both exotic and native species. The trees that predate NIH occupancy are primarily comprised of tulip poplars, very large oaks, and maples and are scattered throughout the campus. A vast majority of the largest trees are located away from developed areas in the perimeter buffer, particularly in the northern half of the campus, or along the stream valleys. Champion trees are those that have the highest formulaic sum total of tree bole or trunk circumference in inches, height and crown or spread in feet. The campus has five Montgomery County champion trees (Table 3-1). The locations of the champion trees are shown in Figure 3-5 on the following page.

Table 3-1: Champion Tree Inventory – NIH Bethesda Campus

Tree Number	Species	Circumference	Height	Crown
2179	Black Willow	59 inches	54 feet	61 feet
2341	Red Buckeye	129 inches	35 feet	42 feet
3040	Japanese Zelkova	99 inches	54 feet	82 feet
4724	Golden Rain	53 inches	46 feet	30 feet
4875	Carolina Hemlock	42 inches	38 feet	24 feet

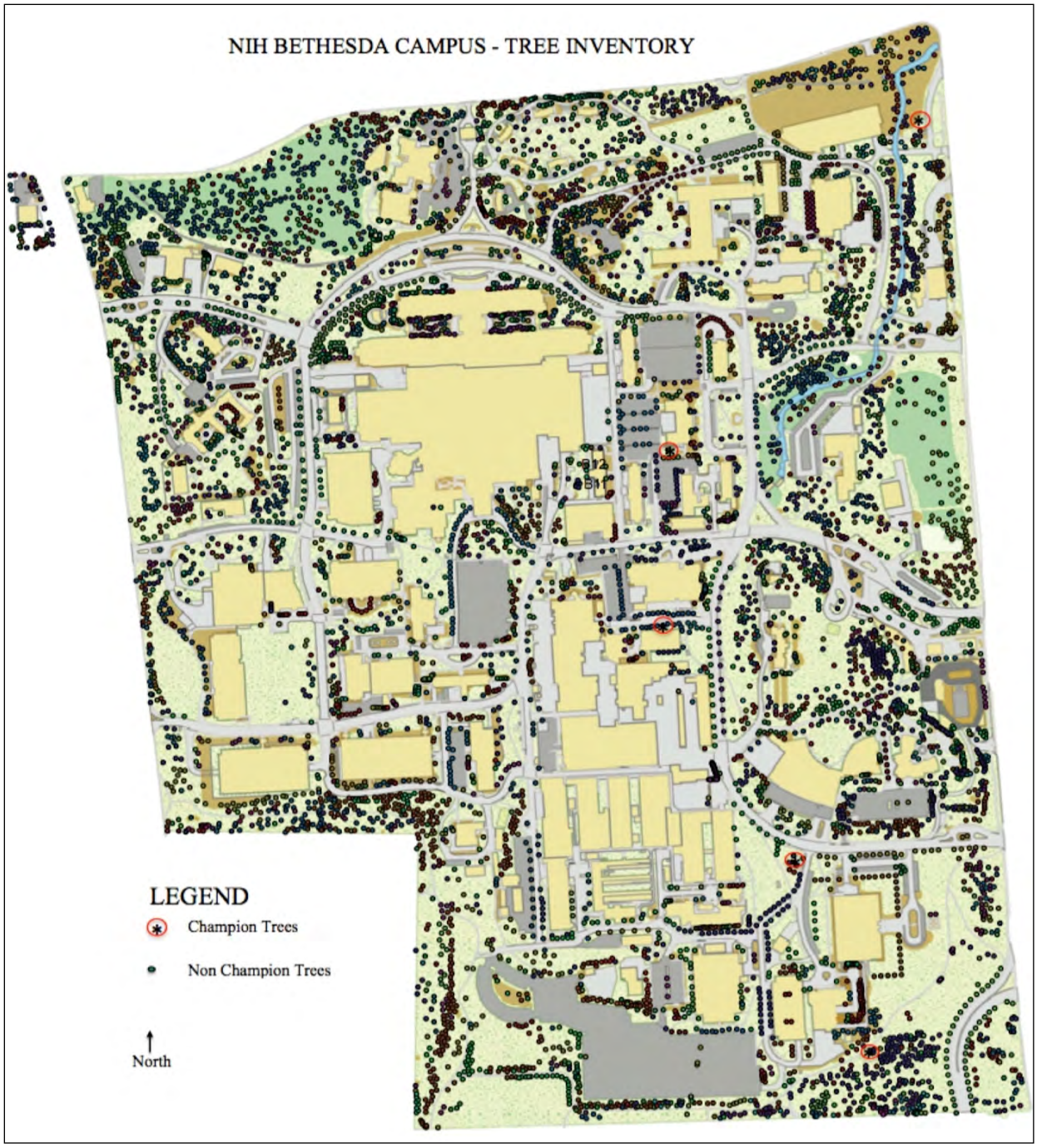


Figure 3-5: Forest Conservation Plan and Tree Inventory with Champion Tree Locations

3.2.2 Fauna and Habitat

3.2.2.1 *Wildlife Habitat*

The NIH campus, with a 2013 population of 20,594, is surrounded by commercial and residential development in all directions. The only large tracts within this region that remain natural are parklands used for active recreation or as stream valley parks. The highly controlled natural environment on the campus has limited value as habitat for terrestrial fauna. There is little protective cover at ground level and no substantive natural food resource. Exceptions include the Eastern gray squirrel, and other rodents, which find ideal conditions among the many oak, walnut, and dogwood trees on the campus, primarily in the buffer area. Avian species also have suitable habitat. Transient and nesting birds are those common to a suburban environment in the mid-Atlantic area. The campus contains no critical habitat areas; however, NIH has identified and assigned natural areas throughout the campus as environmentally sensitive locations to help support fauna and habitat.

3.2.2.2 *Threatened and Endangered Species*

In accordance to the Maryland Department of Natural resources letter dated September 19, 2012, no records of threatened or endangered species are known to inhabit the area within the bounds of the project site. Migratory hawks and other birds may make transient visits, but are not resident on campus.

3.3 WATER RESOURCES

3.3.1 Stream Characteristics and Flow

Three water courses traverse the campus: the NIH Stream; the North Branch, a normally dry tributary swale of the NIH Stream which joins the former in the northeast corner of the site; and Stony Creek, designated as such in previous studies conducted by NIH. All three are unnamed tributaries of Rock Creek (Basin Code 02.14.02.07). All are classified as intermittent streams on U.S. Geological Survey (USGS) topographic mapping and are non-jurisdictional waters and have been heavily impacted by past development. They now function principally as storm water drainage courses and process water outfall.

The NIH Stream enters the campus via a 42-inch diameter storm drain in the southwest corner. The off-site business district and residential area is approximately 57-acres. All of the headwater drainage area upstream from NIH is contained in the pipe network of the Montgomery County storm water collection system. The western boundary of the drainage area follows Old Georgetown Road as shown on the drainage area mapping. It is roughly estimated that the drainage area upstream from NIH encompasses approximately 57 acres as indicated in Table 3-2: Estimated Stream Drainage Area (In Acres) .

The NIH Stream crosses the campus, via a piped storm drainage system, in a northeasterly direction, passing under Buildings 12B and 13, in a progressively larger storm drain interceptor for a distance of about 2,350 feet. The interceptor is 8 to 20 feet below the surface. Storm water branch lines for most of the southwest quadrant of NIH connect to the interceptor throughout this length. Connections carrying chilled water system blow down effluent join the interceptor as it passes Building 11.

The stream finally exits to daylight at a 96-inch diameter outfall northeast of the Center Drive/South Drive intersection, where it immediately passes through two oil and grease separators. Total drainage area upstream of this point is estimated to be 204 acres. The NIH Stream continues to flow north northeastward toward the northeast corner of the campus for about 2,000 feet. Once exposed, the stream follows a riffle and pool flow regimen, ranging from two to twelve feet in width and averaging about four feet wide. The stream banks are most commonly about 25 feet across and from 2 to 7 feet deep. The width of the stream itself varies from about 3 to 10 feet.

The stream gradient averages about 1.5 percent between Center Drive and the Rockville Pike culvert. North of Wilson Drive, the stream winds between East Drive and parking lots for its full length. The security checkpoint entrance crosses the stream over a concrete arch bridge near the intersection of East Drive and Wilson Drive. Sixteen storm water culverts empty into the stream in its exposed section. These culverts have no flow except for north branch in the northeast corner is estimated to be 294 acres of which 212 acres are on the NIH campus.

After leaving the campus, the stream passes under Rockville Pike and Cedar Lane in successive culverts. It then flows through an arm of Rock Creek Park following Cedar Lane and Park Drive through the Locust Hill Estates before flowing into Rock Creek about one mile to the northeast of NIH near the intersection of Cedar Lane and Beach Drive. The elevation at the confluence with Rock Creek is 199 feet based on M-NCPPC topographic mapping.

The NIH Stream is not gauged and there is no information about base flow rates. It is uncertain how much of the natural flow is attributable to headwater springs, and how much results from ground water infiltration in the storm water system.

Flows after rainfall or storms are estimated to be in tens of cubic feet per second (cfs). By permit, NIH is allowed to release up to 300,000 gallons per day (GPD) (0.464 cfs) of chilled water blow down effluent to the NIH Stream. Releases vary with chilled water production, which in turn, varies with the ambient temperature. Under peak production conditions when the temperature exceeds 90 degrees Fahrenheit (F), the estimated blow down release is 0.39 cfs. During the winter, the average estimated release is computed to be about 0.09 cfs.

The Metro tunnel under Rockville Pike is subject to heavy groundwater infiltration. Water is pumped continuously to the surface and deposited in the NIH Stream on the east side of Rockville Pike.

The North Branch of the NIH Stream runs along the northern boundary of NIH. Its drainage area covers the residential area to the north of West Cedar Lane and the northern periphery of NIH. All of the drainage off the campus is encased in the County storm water collection system. It enters the campus from a series of outfalls from curb catch basins or inlets on West Cedar Lane. On campus, the watercourse is channelized in a concrete ditch for two-thirds of its length. The remaining third of its length passes under an existing parking area to an underground storm water management facility.

The underground detention facility would serve the entire North Branch and is designed to provide adequate storage to meet 3.14 acre-feet of detention storage volume. The detention facility outfalls directly into the NIH main outfall stream just prior to passing under Route 355 at the northeast corner of the site. During dry weather, there is no stream flow. Flows are limited to the 24 to 48 hour period after rainfalls with the greatest portion occurring as intercepted runoff.

Stony Creek traverses the southeast corner of the campus in a shallow valley. As is the case for the other watercourses, its original stream network upstream from the campus is encased in the Montgomery County storm water collection system.

Two branches join just before entering the NIH campus. The main branch flows through a 66-inch pipe and drains most of the Woodmont Triangle area in the Bethesda Central Business District. The other branch flows eastward in a 42-inch pipe that parallels the southern boundary of NIH and drains the apartment complex area along Battery Lane. Construction documents indicate that the first 200 feet of stream length on the NIH property was subject to channelization when the County installed the 66 and 42-inch pipes in the early 1960's.

The stream width varies from six inches to six feet with an average width of about three feet. Stream depths range from one to about 15 inches as it follows a riffle and pool flow regimen. The stream falls only 9 feet as it passes the 1,040 feet across the campus to Woodmont Avenue. Before exiting the site in twin 66-inch culverts under Woodmont Avenue and proceeding as an independent tributary to Rock Creek across the National Military Medical Center, it flows through an inline storm water management facility that is currently under construction.

Stony Creek joins Rock Creek about 0.3 miles downstream from the NIH Stream confluence, about 500 feet to the west of Connecticut Avenue. Where it was channelized by past construction, the stream has banks about 12 feet wide and 3 feet deep. For the remainder of its length across NIH, there are no distinct banks. Maintained lawn extends up to the water's edge throughout this reach. On a basin wide basis, the creek is classified as a Level II, Type F4, and stream under the Rosgen channel stability rating system. Class F streams are typical of urban conditions. The stream was rated in 1998 as being in fair to good hydrologic condition; there is no current rating.

Sources and volumes of natural flows in Stony Creek are unknown. Much of the flow during dry weather may be attributable to man-made sources in the Bethesda Central Business District. The dry weather flow is generally less than one cfs. Studies completed for a County storm water management pond in the southwest corner of the campus indicate that the 1, 2, 10, and 100-year storm flows at the Woodmont Avenue culvert are 197, 325, 698, and 1,133 cfs, respectively.

Table 3-2: Estimated Stream Drainage Area (In Acres)

NIH Stream	Sub Area In Acres	Area In Acres
NIH Campus Upstream of 96" Outfall	147	
Off Campus – Glenwood Residential Area	57	
AT 96" Pipe Culvert Outfall		204
North Branch Stream NIH Campus	65	
West Cedar Lane and North of West Cedar Lane	45	90
Eastern Sector of Maplewood (Outfall at Rockville Pike Bridge)		55
Estimated TOTAL NIH Stream Drainage Area at Rockville Pike		455
Booze Creek NIH Campus		5
Stony Creek		
Off-site South of NIH Campus (residential)	129	
Off-site South of NIH Campus (Bethesda CBD)	58	
NIH Campus	32	219

3.3.2 Water Quality

The NIH Stream and Stony Creek are designated as Class I surface waters by the Maryland Department of the Environment (MDE). Uses for Class I waters include water contact recreation, aquatic life, and water supply.

The MDE in conjunction with the EPA have developed and approved two Total Maximum Daily Loads (TMDL's) for the Rock Creek Watershed. A TMDL (Total Maximum Daily Load) establishes the maximum amount of an impairing substance or stressor that a waterbody can assimilate and still meet WQSs and allocates that load among pollution contributors. TMDLs are also a tool for implementing State water quality standards. They are based on the relationship between pollution sources and in-stream water quality conditions. The TMDL addresses a single pollutant or stressor for each waterbody.

As of July 2012, approved TMDL's have been developed for Bacteria, approved in July 30, 2007, titled *Total Maximum Daily Loads for Fecal Coliform for the Non-Tidal Rock Creek Basin in Montgomery County* and Sediment, approved September 29, 2011, and titled *Total Maximum Daily Loads of Sediment for the Non-Tidal Rock Creek Basin in Montgomery County, Maryland*.

A TMDL for Nutrients (Phosphorous) is also being developed. The public comment period for this TMDL would end on August 15, 2012. Additional detailed information regarding the Rock Creek TMDL's can be reviewed on the MDE's website: (http://www.mde.state.md.us/programs/Water/TMDL/CurrentStatus/Pages/Programs/WaterPrograms/TMDL/Sumittals/index.aspx).

NIH currently holds a storm water discharge permits at both the State (permit number 08-DP-2520) and Federal National Pollutant Discharge Elimination System ((NPDES) permit MD0025496) level. The permits were issued on June 1, 2012 and expire May 31, 2017. The permit authorizes the discharge of non-contact water, discharge associated with maintenance of water distribution systems and storm water defined as the exit from an oil\grease trap. This also includes discharge of chilled water system blow down from Buildings 11 and 34 into NIH streams. The current permit allows an average release of 580,000 gallons per day (gpd) provided that total residual chlorine does not exceed 0.1 mg/l and the temperature of the NIH Stream does not exceed 90 degrees F at the point where it exits to daylight to the northeast of the Center/South Drive intersection.

3.3.3 Aquatic Habitat

The NIH Stream and Stony Creek drainage sheds are heavily urbanized and altered by past development at NIH and in the surrounding area. The upper reaches of both streams are encased in storm water collection pipe systems. The Stony Creek watershed drains the Bethesda Central Business District and less than 5 percent of the drainage area upstream from NIH is in natural cover.

A biological assessment of the streams was conducted in April and May 1992 (Wetlands Assessment, Natcher Building Phase II, Booz, Allen, Hamilton and AEPA, 1992). The study indicated that both streams had a relatively sterile benthic structure. Submerged vegetation and algae growth was insufficient to support an aquatic community. Vertebrates were not found in either stream. A survey of Stony Creek in 1998 also noted the absence of macro invertebrates and fish throughout its length to Rock Creek.

Based upon these assessments NIH has conducted a phased improvement plan for the NIH Stream. The improvement plan included stream bank stabilization in the northernmost campus reach between Rockville Pike and the North Branch. In 2003, NIH completed the second phase of the improvements, which improved the remainder of the NIH stream both biologically and physically. The project goal is to return the stream environment to its natural condition. Work included installation a bio retention pool planted with indigenous and native species, bank stabilization using natural stones, rocks, and hydrophilic plantings, and control or retardation of flows from storm drain pipe outfalls and drainage ditches.

The NIH Stream is subjected to NIH power plant process water releases that have an elevated temperature. The releases make up most of the dry weather flow. The banks of the stream are

now stabilized by concrete block, rubble, gabions, and riprap. The areas adjacent to both streams are now grass that is mowed to the top of the stream banks or the edge of the stream. Both streams receive over land runoff from impervious areas. All of these factors contribute to a reduction in the natural values of the aquatic habitat.

The Stony Creek Pond (South Pond) is, as of November 2012 being built by Montgomery County Department of Environmental Protection. It is anticipated that this extended detention wet pond should improve the downstream drainage area Aquatic Habitat due to the pond's control of run-off (i.e., Channel Protection Volume Control).

A Stormwater Management Facility is located at the north of the NIH site and serves the North Branch storm network. Drainage is conveyed in a piped network, to the facility located in the parking lot north of Building 31 and discharges into the main NIH channel at the northeast corner of the site. This facility should also improve the downstream Aquatic Habitat due to the facilities control and treatment of storm water run-off.

3.3.4 Wetlands

The U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (EPA) define jurisdictional wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions (33 C.F.R. § 328.3). USACE regulates the discharge of dredged or fill material in jurisdictional wetlands pursuant to Section 404 of the Clean Water Act and regulations contained in 33 C.F.R. §§ 320-330. Identification and delineation of jurisdictional wetlands is based on three parameters:

- Hydrophytic vegetation: the dominant vegetation consists of species capable of growing in water or on substrate that is at least periodically deficient in oxygen as a result of the presence of water.
- Hydric soils: soils are saturated, flooded or ponded for long enough during the growing season to develop anaerobic conditions that favor the growth of hydrophytic vegetation.
- Wetland hydrology: the area is inundated permanently or periodically, or the soil is saturated to the surface for at least 5 percent of the growing season, providing sufficient duration during the growing season to support the growth of hydrophytic vegetation.

A Wetland delineation of the campus was conducted as part of the on-site investigation of the NIH Stream and Stony Creek (William Natcher Building, Phase II Wetlands Assessment, AEPA, 1993). The only hydric or normally saturated soil on the campus is the Baile loam in the northeast corner of the site (See Figure 3-6). Approximately 90 percent of the soil area is now covered by parking lots. No wetlands were identified as part of this assessment.

Figure 3-6: Maryland Department of Natural Resources Wetland Mapping

Additionally, National Wetland Inventory Maps (http://www.fws.gov/wetlands/Data/Mapper.html) do not indicate the presence of wetlands on the campus. However, possible wetlands are indicated on the Maryland Department of Natural Resources (MDNR) on-line mapping system (http://www.mdmerlin.net/mapper.html). The possible wetland areas are indicated along the stream valley channels of the NIH Stream and the Stony Creek Pond (Figure 3-7).

The entire remaining Baile loam surface area is covered by turf or lawn grasses even to the banks of the NIH stream. There is no herbaceous, shrub, or understory layers. Most of the trees in the area are cultivated. There are a few occurrences of natural facultative species within the hydric soil zone such as tulip tree (*Liriodendron tulipifera*); red maple (*Acer rubrum*); and silver maple (*Acer saccharinum*), but landscape and ornamental trees are dominant.

Stony Creek and NIH Stream experience over bank flow after every large or intense storm. The headwaters of both streams are entirely contained within storm water collection pipe systems draining the Bethesda Central Business District and the NIH campus, respectively. Flows generally return to bank flow within a period measured in hours as runoff is completed. Long-term inundation or saturation is not present. Campus areas bordering site streams can be classified as hydrologic zone V during the growing season in that they are irregularly inundated or saturated. The William Natcher Building, Phase II Wetlands Assessment concluded that that the wetland delineation criteria are not met and wetlands are not present.

3.3.5 Floodplains

There is no Federal Emergency Management Agency (FEMA), M-NCPPC, U.S. Geological Survey floodplain mapping for the NIH Stream or Stony Creek.

Floodplain conditions were analyzed for the NIH Stream as well as Stony Creek and its associated storm water management facility. The NIH Stream floodplain was determined by calculating the enclosed watershed upstream from NIH as a storm drain system to determine flows at the outfall as it enters the campus. The Hydraulic Engineering Center (HEC) developed the River Analysis System (RAS) computer program HEC-RAS, which was used to determine the 100-year flood plain for the exposed section of the drainage shed on the NIH campus (Figure 3-8). Flood flows were estimated to be 530 cubic feet per second (cfs) at the point where the stream exists from the piped storm drainage system at Center and South Drives and 656 and 1,016 cfs above and below the confluence of the NIH Stream with its north branch in the northeast corner of the campus. Montgomery County storm drains to the eastern portion of Maplewood and Rockville Pike to the north of Cedar Lane empty into the stream immediately downstream from this point.

In flood, the NIH Stream is generally confined within relatively narrow limits widening only in the vicinity of existing Building 21. The Wilson and North Drive vehicle bridges and three pedestrian bridges all have sufficient clearances to maintain access, although about a foot of backwater is created at the Wilson Drive Bridge. The curb on the west side of the Building 21 parking lot is an important constraint limiting the flood zone in this area.

Stony Creek makes outfall from the NIH main campus on the west side of Woodmont Avenue, through twin 66-inch diameter culverts. The culverts course to the northeast under Woodmont Avenue passing below the Rockville Pike intersection. The Stony Creek has a gradient of only 0.9 percent as it crosses the campus. Except for the first 100 feet or so on campus, it does not have well defined banks. The banks range from nonexistent to 18 inches in height where they occur. Areas adjacent to the stream are flat, and it overflows into these lawn-covered areas after nearly any rainfall of significance. While a comparatively large area is flooded under maximum potential flow conditions, the water is not deep.

Upstream from NIH, Stony Creek flows within the County storm drain system. Two storm drains outfall to form the stream just beyond the NIH property line; a 66-inch line which approaches from the south Battery Lane Urban park, and a 42-inch line that runs parallel to and a few feet outside the NIH boundary from the west. The pond has a drainage area of approximately 219 acres. The gravity flow capacities of the two lines are 333 and 75 cfs, respectively, or 408 cfs total.

The 100-year rainfall in Montgomery County is 7.2 inches in 24 hours. The estimated 100-year storm flow at the entrance to the Woodmont Avenue culverts is 1,468 cfs (Stony Creek Pond Design For Montgomery County Department of Environmental Protection, A. Morton Thomas, Spring 2006). Since the 100-year run-off volume exceeds the storm drain capacity, which is designed to handle 10-year recurrence storm run-off, much of the flood volume would arrive by overland sheet flow through the areas to the south of NIH to reach the Stony Creek 100-year flood pool.

The 100-year floodplain as determined in design analysis for the Stony Creek Pond is shown in Figure 3-7. The existing floodwater surface elevations of Woodmont and Wisconsin Avenues with the Stony Creek Pond in place are 308.04 and 307.12 feet, respectively. The difference in stream discharge with and without the facility dam is virtually identical. Water surface elevations are about 0.21 feet (3 inches) less under existing conditions. A dam breach analysis for the facility determined that there was no increase in flood hazards downstream.

Under 100-year flood conditions, floodwater would flow to a depth of several feet across Woodmont and Wisconsin Avenues. The maximum depth of flooding along Glenbrook Parkway is approximately 4 feet. This occurs under both existing and future conditions. Similar conditions occur along Maryland Route 355 at two locations between the Beltway and Cedar Lane, and in the Bethesda CBD, when 100-year floods occur.

3.3.6 Coastal Zone Conditions

The NIH Bethesda campus is not located within an area governed by the Maryland Coastal Zone Management Program.

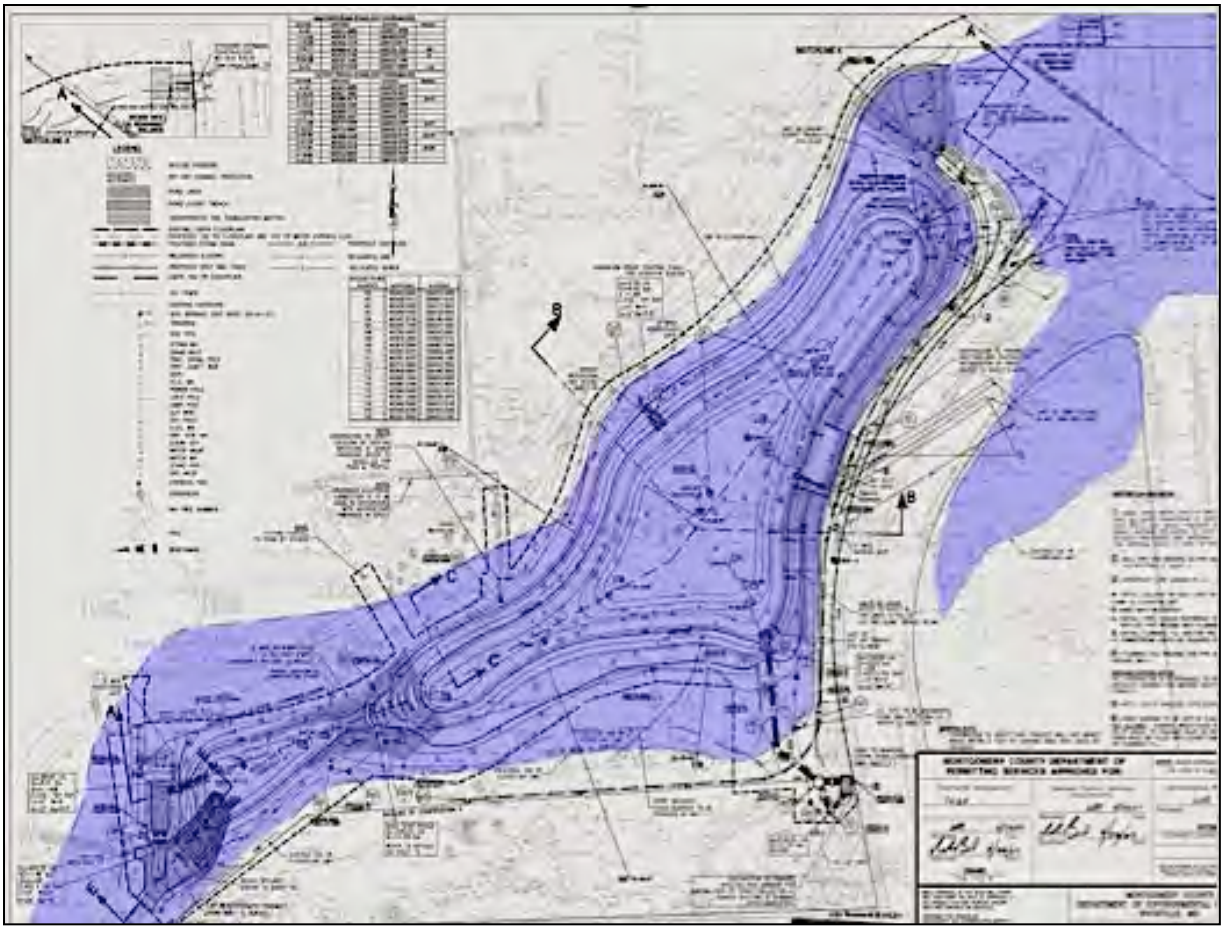


Figure 3-7: Stony Creek Pond 100-Year Floodplain

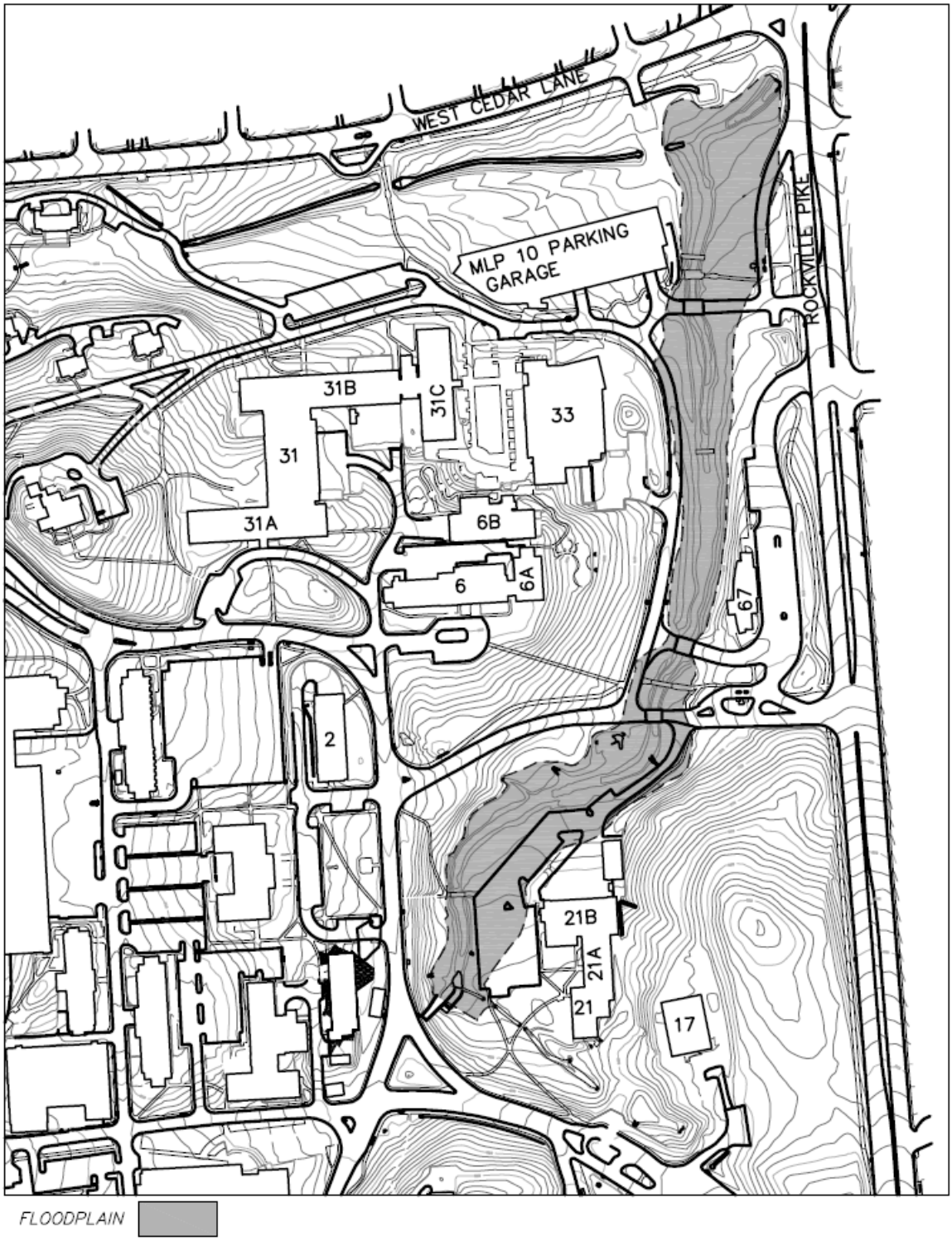


Figure 3-8: NIH Stream 100-Year Floodplain

3.4 AIR QUALITY

3.4.1 Regional Conditions

The Environmental Protection Agency (EPA) initiative to improve air quality nationally and regionally and to address climate change falls under the Clean Air Act. The EPA defines the Federal Clean Air Act as the law for protecting and improving the nation's air quality and the stratospheric ozone layer. The Federal Clean Air Act of 1970 required that air quality in designated Air Quality Control Areas (AQCA) meet the National Ambient Air Quality Standards (NAAQS) (42 U.S.C.§ 7407) and was further amended in 1990. The new amendment required standards to limit wide spread pollutants from numerous and diverse sources that were considered harmful to the public health and environment such as smog in cities which are out of attainment with the public health standards for ozone.

The Clean Air Act established two standards, Primary and Secondary. Primary standards are based on health effects, secondary standards on environmental effects. For several pollutants, these standards are the same. If the standards are not met, then the AQCA is in "non-attainment". EPA has set standards for six criteria pollutants: carbon monoxide (CO); lead (Pb); nitrogen dioxide (NO_2); ozone (O_3); particulate matter (PM), and sulfur dioxide (SO_2). The criteria pollutant standards are shown in Table 3-3. The EPA required 5-year review of the updated science that supports the standards is to be completed in 2013.

Ground level ozone is generated when nitrogen oxides (NOx) combine with volatile organic compounds (VOCs) at times of persistent high temperature, abundant sunshine and prolonged periods of air stagnation. Ozone generation is controlled indirectly through control of NOx and VOC emissions. SO_2 is generally generated from fossil fuel combustion at power plants and industrial facilities. CO is emitted from fuel combustion generally by mobile or stationary sources. Particulate matter is comprised of several components, including acids (such as nitrates and sulfates), organic chemicals, metals, and soil or dust particles. Lead (Pb) is a metal that can found naturally in the environment and is present in manufactured products. Historically lead emission in the air was a result from vehicle and industrial emissions. The EPA regulated the removal of lead gasoline that dramatically declined lead in the air by 94 percent between 1980 and 1999. Lead found in the air currently is typically associated with the use of lead smelters, waste incinerators, utilities, lead-acid battery manufacturers, and general aviation airports. With the decline in lead found in the air, EPA has reduced the allowable lead level of the primary (health-based) standard from 1.5 micrograms per cubic meter of air ($\mu g/m^{3)}$ to 0.15 $\mu g/m^3$. The final rule became effective on January 26, 2011.

Nonattainment areas are classified as marginal, moderate, serious, severe, and extreme. EPA designated the metropolitan Washington region as moderate nonattainment for the 8-hour ozone standard in April 2004. The one-hour ground level ozone (O_3) standard applies to areas

that are in non-attainment for ozone. The eight-hour standard was intended as a replacement for the one-hour standard in those areas where the one-hour standard is attained.

Amendments to the Clean Air Act require the nonattainment areas develop an air quality State Implementation Plan (SIP) that indicates how the NAAQS would be attained (42 U.S.C.§ 7502). The subject campus is located within the Washington D.C. metropolitan area. The Washington D.C. metropolitan area extends from Frederick County, Maryland to Stafford County, Virginia, and from Calvert County, Maryland to Loudoun County, Virginia. The states of Maryland and Virginia, and the District of Columbia each have air quality programs.

PM is divided into two classes, coarse PM (PM_{10}), i.e., particles less than 10 microns in

diameter, and fine PM ($PM_{2.5}$), i.e., particles less than 2.5 microns in diameter. As of March 2008, all of Maryland, including the Bethesda region, was in attainment for all NAAQS criteria pollutants except for $PM_{2.5}$ and ozone. Montgomery County is officially designated as being in a $PM_{2.5}$ nonattainment area. On March 29, 2007, the EPA issued a rule defining requirements for state plans to clean the air in areas with levels of fine particle pollution that do not meet national air quality standards. State, tribal, and local governments must now prepare plans, known as implementation plans that describe their efforts to reduce levels of $PM_{2.5}$ to meet the national air quality standard. The state of Maryland submitted their SIP 3 April 2008 and proposed an implementation and enforcement plan for the SIP in February 2008.

Overall, the ozone, CO, and NO_2, levels were reported by EPA to meet the minimum trend completeness criteria. However, Pb, PM, and SO_2 levels were not reported meeting the EPA minimum criteria trend levels. SO_2, and PM levels were reported to be within the national standards, although the ozone levels were reported to be above the national standards.

The Metropolitan Washington Air Quality Committee (MWAQC) prepared a plan for outside NOx and VOC emission sources (Washington SIP Revision Phase II, Attainment Plan, Metropolitan Washington Council of Governments (MWCOG, 2000). The Phase II Plan projected “budget level” for NOx and VOC emissions for the year 2005 were listed as 418 and 355 tons per day, respectively.

In reviewing the available EPA data at monitoring stations located within the regional area the following data was obtained for the criteria pollutants. As shown in Table 3-4 and based on the EPA data for monitoring station Site No. 110010025 located along Dahlia Street, NW in Takoma, Maryland approximately 5.6 miles east of the campus, ozone levels from 1990 to 2010 ranged from 0.089 ppm to 0.079 parts per million (ppm), respectively, based on an 8-hour average. CO levels were reported by the EPA at Station No. 110010023 in Georgetown, DC to have decreased from 7.2 ppm to 2.0 ppm from 1990 through 2010, respectively, based on an 8-hour average. Lead levels in Chevy Chase, Maryland located at Site No. 110010027 reported to have ranged from 0.03 to 0.02ug/m^3 from 1990 to 2001, respectively, based on a three-month average. NO_2 levels were reported to have ranged from 27.27 in 1990 to 14.47 ppb in 2010

according to the annual average obtained at the Takoma, Maryland station No. 110010025. Particulate Matter (PM-10) was reported to have ranged from 48 ug/m^3 in 1991 to a high of 74 ug/m^3 in 1995 to 47 ug/m^3 in 2001 at the Chevy Chase, Maryland station No. 110010027. SO_2 was reported only from 1990 to 1995 at the Georgetown, DC station No. 110010023. The SO_2 levels ranged from 11.16 to 8.53 for years 1990 and 1995, respectively.

Overall, the ozone, CO, and NO_2, levels reported by EPA meet the minimum trend completeness criteria. However, Pb, PM, and SO_2 levels were not reported meeting the EPA minimum criteria trend levels. SO_2, and PM levels were reported being within the national standards, although the ozone levels were reported being above the national standards. Further detailed information provided in Table 3-5 below.

In October 2006, the U.S. EPA issued regulations requiring annual monitoring network plan for state and local agencies. The state of Maryland currently utilizes 22 air-monitoring sites that measure ground-level concentrations of criteria pollutants, air toxics, meteorology, and other measurements located primarily in the urban/industrial areas.

The Metropolitan Washington Council of Governments (MWAQC) reports ozone and particulate matter daily data from various monitoring stations within the region of the NIH campus and references its data into Air Quality Index system (AQI). Daily data for all criteria parameters is not available for each station. The AQI ranges from zero to 500, with zero being no air pollution and 500 representing severely unhealthy air pollution levels. An AQI value between 101 and 150 indicates that air quality is unhealthy for sensitive groups. Values between 151 and 200 are considered to be unhealthy for the general public. AQI values above 200 are considered very unhealthy. An AQI over 300 represents hazardous air quality.

AQI indexes for Montgomery County were not reported above 300 from 2006 through 2010. Levels reported between 151 and 200 were listed at 1 day intervals for years 2006 and 2007. Generally AQI values are reported between 101 and 150 for the area.

Greenhouse gases are gases that trap heat into the atmosphere. The gases are produced by various sources including release of carbon dioxide CO2 from burning fossil fuels; release of methane (CH4) from transport of coal, natural gas, and oil, livestock and other agricultural practices, and by the decay of organic waste in municipal solid waste landfills; NOx may be emitted during agricultural and industrial activities; and fluorinated carbons (CF_X) are emitted by a variety of industrial processes.

The EPA indicated in 2010 greenhouse gas emissions consisted primarily of carbon dioxide at 84 percent; methane at 10 percent; nitrous oxide at 4 percent; and fluorinated carbons at 2 percent. These gases may remain in the atmosphere for long periods of time and may have an impact of global temperatures. The EPA also references global warming potential factors for each of these gases based on their characteristics in terms of climate impact. Gases that have a higher potential would likely absorb more energy, per pound, than gases with a lower potential

values, and would likely contribute to higher temperature levels. Fluorocarbons are considered to have the highest potential.

Carbon dioxide emissions are reported to be the generated the highest from sources such as electricity at 40 percent, transportation at 31 percent, and industry at 14 percent. High sources of methane are reportedly generated from natural gas and petroleum systems at 37 percent and enteric fermentation at 21 percent. 68 percent of nitrous oxides are generated from agricultural soil management. 80 percent of fluorinated hydrocarbons are generated from the substitutes of ozone depleting substances.

EPA has referenced that greenhouse gas emissions have increased by 10 percent since 1990. Emissions would vary depending on the economic factors. In 2010, gas emissions were reported have increased associated with an economic increase demand for increase in energy usage.

Facilities with greater than 25,000 metric tons of direct CO2-equivalent greenhouse gas emissions are required to report emissions under the Clean Air Act. NIH is required under the Clean Air Act to report for emissions, FRS Id No. 110000869720. The following emissions are referenced for the NIH Bethesda campus combustion sources at the CUP for years 2010 and 2011:

Table 3-3: Total Facility Emissions at NIH Bethesda Campus

	2010 Year	2011 Year
Total Facility Emissions in metric tons of CO2 &CO2e (Excluding Biogenic CO2)	180,787	195,303
Emissions of Carbon Dioxide (CO2) in metric tons CO2e	180,560	195,303
Emissions of Methane (CH4) in metric tons CO2e	82	87
Emissions of Nitrous Oxide (N2O) in metric tons CO2e	145	153

The EPA is addressing several steps in regards to climate change and greenhouse gas emissions by collecting data and promoting a clean energy economy. Montgomery County, Maryland has also established strategies for reducing greenhouse gas emissions. The state of Maryland also proposed to reduce emissions by 25 percent by 2020. In 2011 Maryland reported that CO2 emissions were reported at 117.4 million metric tons. Their goal is to lower the level to 80.2 million metric tons.

Previous computer modeling performed in preparation for the 2005 EIS indicated that the inventory emissions would result in regional ozone concentrations that met the NAAQS criteria. However, the MWAQC claimed that up to one-third of ozone pollution within the region arrives from upwind sources outside the National Capital Interstate (NCI) AQCA resulting in continuing non-attainment. The regional area of NIH is under the jurisdiction of the Maryland Department of

the Environment (MDE) for air quality permitting and regulations. MDE maintains the SIP for the Maryland portion of the regional AQCA as well as the State NOx allowance tracking (NATS) and NOx emissions tracking (NETS) systems. NIH stationary source emissions are identified and accounted for through the MDE permitting process.

Air quality data recorded at monitoring stations representative of conditions at NIH Bethesda Campus are shown in Table 3-4. Maryland no longer monitors carbon dioxide, sulfur dioxide, nitrogen dioxide, or 2.5 micron particulate matter in the Washington region. The Washington D.C. metropolitan area was reported to have 10 or more monitors with recordings exceeding the 2008 Ozone Standard (0.075 ppm) for the 2012 Ozone Season. A submitted request to MDE was made to obtain updated information that may be available for preparation of this report. No correspondence has been received upon the completion of this study. The lack of response may be an indication that information may not be available for review.

The Chantilly, Balls Mill, and McLean Government Center stations are in the Virginia monitoring network. These stations are located in Fairfax County, inside the Washington Beltway (I-495). The mix of commercial and residential development in the vicinity of these stations is similar to that located within the area of NIH in Bethesda, Maryland. The location of the station in relation to prevailing winds crossing the NCI AQCA is also similar to NIH's position. The ground level ozone monitoring station nearest NIH Bethesda is located in Rockville, Maryland. Although the region is in non-attainment, monitored one-hour ozone levels at this station are consistently below the NAAQS.

The second highest maximum one-hour zone concentration of 209 micrograms per cubic meter is equivalent to a concentration of 0.11 ppm. Updated levels at each station referenced in Table 3-5 were not readily available. Available information/data from regional monitoring stations maintained by the EPA was previously referenced.

Table 3-4: Ambient Air Quality Standards and Available Air Quality Data

Pollutant/ Averaging Time	Primary Ambient Standards (ug/m^3) ****	Primary Ambient Standards (ppm) ****	Secondary Ambient Standards (ug/m^3)	Secondary Ambient Standards (ppm)	Monitoring Data Maximum Concentration (ug/m^3)	Monitoring Data Maximum Concentration (ppm)	Location Distance - Direction*** (Year)
Carbon Monoxide (CO) 1-Hour*	40,000	35	0	0	3,900	3.3	McLean Gov't Center/ 6mi/ SW (2002)
Carbon Monoxide (CO) 8-Hour*	10,000	9	0	0	2,700	2.3	McLean Gov't Center/ 6mi/ SW (2002)
Sulfur Dioxide (SO_2) 3-Hour*	1,300	0.50	1,300	0.50	86	0.033	Balls Mill/ 7mi/SW (2002)
Sulfur Dioxide (SO_2) 24-Hour*	365	0.14	0	0	47	0.018	Balls Mill/ 7mi/SW (2002)
Sulfur Dioxide (SO_2) Annual	80	0.03	0	0	18	0.007	Balls Mill/ 7mi/SW (2002)
Nitrogen Dioxide (NO_2) Annual	100	0.053	100	0.053	38	0.020	Balls Mill/ 7mi/SW (2002)
Ground Level ozone (O_3)1-Hour**	235	0.125	235	0.12	0	0	Broad Run High School/ 7mi/S (2011)
Ground Level ozone (O_3)8-Hour**	157	0.075	157	0.08	0	0.086	Broad Run High School/ 7mi/S (2011)
Particulate Matter (PM-10) 24-Hour*	150	0	150	0	45	0	Chantilly/ 20mi/SW (2002)
Particulate Matter (PM-10) Annual	50	0	50	0	18	0	Chantilly/ 20mi/SW (2002)
Particulate Matter (PM-2.5) 24-Hour*	35	0	35	0	23.7	0	Broad Run High School/ 7mi/S (2011)
Particulate Matter (PM-2.5) Annual	15	0	15	0	9.1	0	Broad Run High School/ 7mi/S (2011)
Lead (Pb) Quarterly	0.15	0	0.15	0	0	0	Not Monitored Regionally

Table 3-4 notes:
* Short Term (1-Hour, 3-Hour, 8-Hour, & 24-Hour) Standards are not to be exceeded more than once per year. Second highest annual values are compared to the standards rather than the highest.
** 3-Year Average of the 4th highest annual concentration may not exceed standard. 1-Hour standard applies to areas in ozone non-attainment; 8-Hour standard applies to those meeting 1-Hour standard.
*** Approximate distance and direction from NIH
**** The State of Maryland has adopted the National Ambient Air Quality Standards (NAAQS) as the state standard
ug/m^3 – micrograms per cubic meter
ppm – parts per million
Source – Maryland and Virginia Annual Air Quality Data Reports

3.4.2 Affected Environmental Air Quality NIH – Campus

Air emissions from NIH operations vary at the campus from multiple sources that are stationary and mobile. Stationary sources include central heating plant boilers, and cogeneration units (COGEN), a natural gas boiler located in Children's Inn (bldg. 62) emergency generators, laboratory fume hood exhausts, and fugitive refrigerant emissions from chiller operations. Mobile sources generally consist of exhaust emissions from traffic entering and departing the campus, federal government vehicle fleet emissions, and Bethesda Campus shuttle operations. NIH is committed to the quality of its campus, workers, visitors, and regional and local communities in regards to maintaining air quality standards.

The following supplied data and information is summarized based on previous air quality studies conducted at the NIH campus and available local, regional, or federal government information. The campus studies were performed in coordination with the previous Environmental Impact Studies for the similar proposed development at the campus. The purpose was to address the current master plan development in relation to air quality for the campus.

3.4.3 Mobile Source Air Quality

3.4.3.1 *Traffic Emissions*

Traffic is expected to be the primary mobile source of air emissions at or near the campus. Traffic management plans and studies are further referenced in this report in the applicable areas. Mobile air emissions for the campus at this time are expected to originate from vehicles associated with visitors, employee commuting, public transportation, commercial delivery, and construction vehicles.

Traffic related air quality impacts are considered on two scales: mesoscale (regional level) and microscale (local level). In the SIP, regional impacts are generally assessed in terms of total regional vehicle miles of travel producing tons of pollutants, such as carbon monoxide (CO) and

NOx, per year. In urban areas, traffic generated by individual projects has little or no influence at the regional level. Projects are therefore evaluated at the local level.

Analysis of CO is typically made to assess whether local violations of the NAAQS may occur. CO is used as the reference criteria pollutant for traffic air quality analysis because it is the standard that would generally be exceeded as a result of vehicle emissions.

Previous air quality studies were performed at NIH addressing the “worst case” local analysis using EPA approved methodology and computer models during preparation of the 2005 EIS.

Eight potential study sites were evaluated on a preliminary basis. From these, two receptor sites with the highest potential CO concentrations were selected for more detailed study. The two sites are near intersections subject to vehicle idling as well as running emissions.

Site 1 (Figure 3-9) was listed as a single family detached residence on the north side of West Cedar Lane located closest to the Rockville Pike/Cedar Lane intersection. According to the 2012 Montgomery County traffic counts, the intersection of West Cedar Lane and Rockville Pike is rated the fourth most congested intersection in the county.

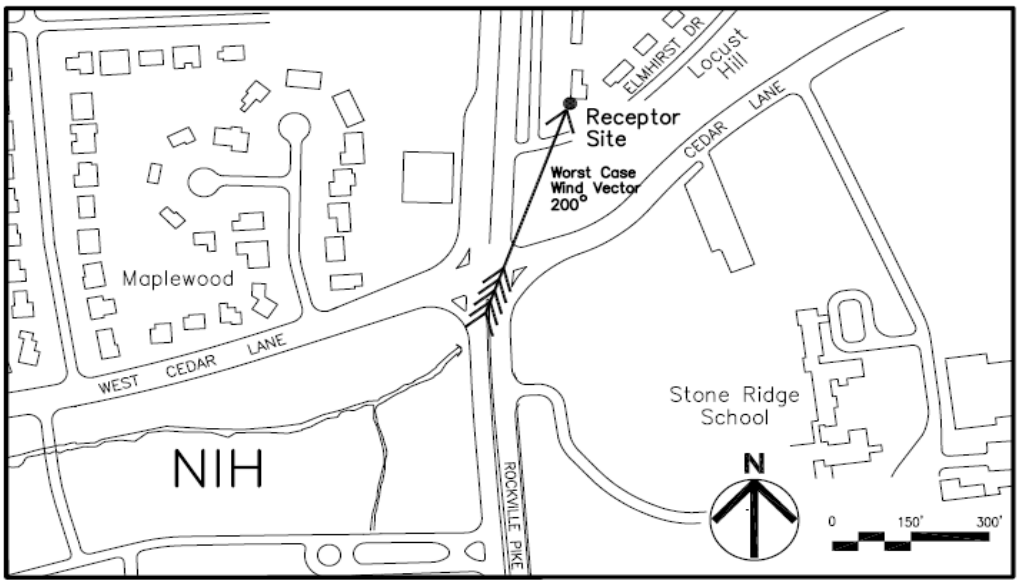


Figure 3-9: Traffic Air Quality Analysis: Receptor Site at Rockville Pike and Cedar Lane Intersection

Site 2 (Figure 13) was listed as a townhouse located to the southeast of the Rockville Pike - Jones Bridge - Center Drive intersection. The total and NIH traffic volumes at the Jones Bridge - Rockville Pike intersection were reported to be less than at the Cedar Lane intersection, but the townhouse is located closer to the intersection travel lanes than the residence at Site 1.

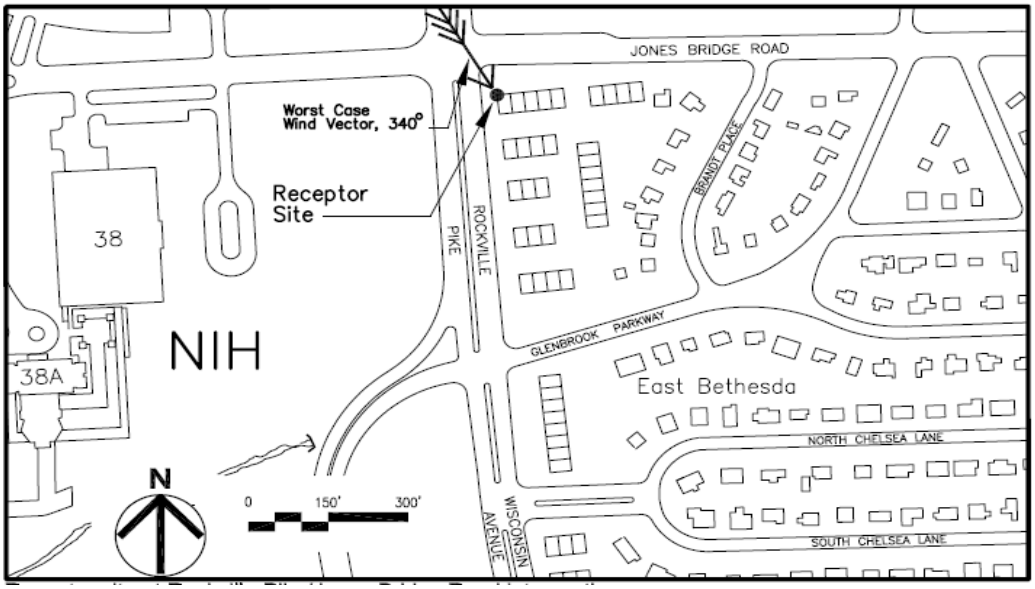


Figure 3-10: Traffic Air Quality Analysis: Receptor Site at Rockville Pike and Jones Bridge Intersection

CO concentrations were determined from those values obtained in 2003 Receptor Site conditions and for ultimate conditions predicted for 2033. The Receptor Sites were analyzed as an intersection with both moving and idling vehicles contributing to resultant concentrations. Data included various parameters and were adjusted for local site conditions. The predicted potential "worst case" traffic generated CO concentrations are shown in Table 3-5 and Table 3-6 below. Predicted CO concentrations at both intersections were determined by emissions idling in queues at each signalized intersection. At the Cedar Lane intersection, all of the vehicle queues contribute to the total CO concentrations, although the northbound Rockville Pike queue is predominant.

Table 3-5:Traffic CO Concentrations 2003

Year	Case	1-Hour Average Maximum CO Concentrations (ppm) for Site 1	8-Hour Average Maximum CO Concentrations (ppm) for Site 1	1-Hour Average Maximum CO Concentrations (ppm) for Site 2	8-Hour Average Maximum CO Concentrations (ppm) for Site 2
2003 Conditions (Base Data)	Traffic	1.8	1.4	1.2	0.7
2003 Conditions (Base Data)	Background	3.3	2.3	3.3	2.3
2003 Conditions (Base Data)	Total	5.1	3.7	4.5	3.0

Table 3-6: Predicted Worst Case Traffic CO Concentrations 2033

Year	Case	1-Hour Average Maximum CO Concentrations (ppm) for Site 1	8-Hour Average Maximum CO Concentrations (ppm) for Site 1	1-Hour Average Maximum CO Concentrations (ppm) for Site 2	8-Hour Average Maximum CO Concentrations (ppm) for Site 2
2033 Master Plan	Traffic	3.0	2.4	1.8	1.4
2033 Master Plan	Background	2.0	1.4	2.0	1.4
2033 Master Plan	Total	5.0	3.8	3.8	2.8

At the Jones Bridge Road intersection, the worst-case wind vector passes through the center of the intersection. Rockville Pike traffic contributes about two-thirds of the total CO in all cases due to higher traffic volume. Future traffic generated CO concentrations were predicted to be less than 2003 concentrations in all cases due to projected vehicle emission rate reductions. Based on this model, the one and eight-hour average NAAQS CO concentrations would not be exceeded and no impacts are expected.

For the increased traffic reported to be associated with BRAC, the Maryland State Highway Administration has proposed improvements to the intersections for West Cedar Lane and Jones

Bridge Road along Rockville Pike; Connecticut Avenue and Jones Bridge Road; and West Cedar Lane and Old Georgetown Road. Widened road paths on West Cedar Lane and Jones Bridge Road have also been performed. Funding has also been proposed for a pedestrian underpass from the Medical Center Station and Metro station to Walter Reed National Military Medical Center (WRNMMC) to increase pedestrian's ability to access each facility. This effort would reduce the use of shuttle or taxi usage and vehicle exhaust from idling traffic at the intersections.

3.4.3.2 *Commercial Vehicle Inspection Facility Emissions*

The Commercial Vehicle Inspection Facility (CVIF) is located at the east side of the campus adjacent to Rockville Pike between Wilson and North Drives. The facility operates as a 24-hour a post for all commercial vehicles inspections, passenger vehicles, pickup trucks, SUV's, and motorcycle traffic when the Gateway Inspection Center (GIC) and the West Drive Patient Entrance (Patients Only) are closed.

The peak number of vehicles arriving at the facility in the short term was expected to be 83 per hour based on a three-day commercial traffic survey conducted at NIH in 2003. Current values have not been provided for the preparation of this report. Peak volumes were projected during the previous study to grow to about 105 vehicles per hour under the 2013 Campus Master Plan Proposed Action conditions.

Commercial vehicles were classified during the 2003 survey into four categories: light vehicles, and heavy two, three, and four axle trucks. About 46 percent of the traffic was reported to consists of "light duty" vehicles for air quality analysis purposes with the remaining 54 percent classified as heavy duty vehicles, i.e. those with gross vehicle weights over 8,500 pounds (lbs.)

Emission factors for the vehicles using the facility were determined during the preparation of the 2005 EIS report by using the EPA MOBILE 6.2, Mobile Source Emission Factor Computer Model. The Montgomery County local area vehicle mix distribution used in regional air quality conformity analysis was used as a basis for the facility vehicle mix distribution. The facility vehicle mix was determined by proportioning 45 percent of the facility traffic among the County light duty vehicle classes, and 54 percent of the facility traffic among the 16 County or MOBILE 6.2 heavy duty vehicle classifications. The latter include both diesel and gasoline fueled trucks.

The U.S. EPA CAL3QHC computer program for analysis of air quality at road intersections was used to model conditions in the vicinity of the CVIF. The program computes predicted CO concentrations at specified receptor locations based on topographic, road, and receptor geometry traffic and its emission factors, and pollutant dispersion algorithms. The program has the capability of simulating emissions from vehicles idling in queues at signalized intersections.

The CVIF was simulated as a four-lane approach road to a signalized intersection with the stop line at the front of the CVIF inspection area canopy. Each of the four lanes was modeled

separately. The resultant average queue lengths ranged between five and six vehicles. Vehicles not idling moved at five miles per hour within the facility. The adjacent Rockville Pike/Wilson Lane intersection with its idling vehicles was included in the model. Although they do not occur concurrently, the traffic volumes associated with CVIF and Rockville Pike peak hour conditions were used in the model.

By 2033, with the full build out of the Proposed Action of the 2013 Campus Master Plan, CVIF traffic volumes are expected to increase by about 26 percent, but overall vehicle emission factors would decline by about 50 percent. There were no reported sensitive receptors in the vicinity of the CVIF. The CVIF building itself, and NIH Building 6A, the next closest building to the inspection facility at a 380 feet distance from the inspection lanes, were selected as analysis sites.

Predicted peak one-hour CO concentrations at the receptor sites are influenced by traffic at the Rockville Pike/Wilson Lane intersection as well as CVIF traffic. The total CO concentration at the north end of the CVIF building occurs when the wind is from the southeast (azimuth 160 degrees). Under these circumstances, the estimated CO concentration is 1.2 parts per million (ppm) with Rockville Pike traffic and CVIF idling vehicles contributing equally or 0.6 and 0.6 ppm, respectively.

The maximum effect of CVIF vehicles occurs when the wind blows from the east across the vehicles at the front of the queues at the stop line. In this case, the peak one-hour average CO concentration is 1.4 ppm. CVIF vehicles contribute 1.1 ppm, and Rockville Pike traffic contributes 0.3 ppm. The 1.1 ppm contribution from CVIF idling vehicles is constant all along the west side of the inspection area as long as all four inspection lanes are occupied when the wind is blowing from the east. The predicted CO concentrations under these circumstances with background ambient concentrations are referenced in Table 3-7 below.

Table 3-7: Predicted Total CO Concentrations

Area	2003 (Most Recent Available Data) 1-Hour Average (ppm)	2003 (Most Recent Available Data) 8-Hour Average (ppm)
CVIF Contribution	1.1	1.1
Rockville/Wilson Contribution	0.3	0.2
Background	3.3	2.3
Total	4.7	3.6

The results were reported to be below the 3.5-ppm one-hour average and 9 ppm eight-hour average national standards. The maximum CVIF vehicle contribution to a receptor at NIH Building 6A was reported to be 0.1 ppm, therefore, no impacts were expected based on these values.

3.4.3.3 *Parking Emissions*

As of 2012 there were 10,528 parking spaces on campus. A “worst case” local analysis was previously conducted to determine the highest potential carbon monoxide (CO) concentrations generated by campus parking. CO concentrations produced by parking facilities at a given receiver site are directly proportional to the facility capacity, assuming parking spaces are occupied, but decrease exponentially with the distance between vehicle source and receiver site.

Worst-case conditions occur under a combination of high vehicle count coupled with short distance between source and receiver. This is reported to occur at multiple level parking structures. The two structures (MLP-6 and MLP-8) reportedly concentrate a large number of vehicles in a relatively small area. Their combined capacity is 2,545 spaces, about 26 percent of the campus total. The distance between MLP-6 and MLP-8 and nearby residences is 250 feet. MLP-6 and MLP-8 are existing structures and would continue in service.

Remaining parking lots are expected to have less impact on air quality. Existing surface lots in the north and south perimeter buffer are closer to nearby residential areas, but they have less than half the combined capacity of MLP-6 and MLP-8. The 2013 NIH Bethesda Campus Master Plan’s long-term goal is to maintain effective parking at a rate of 0.5 parking spaces per NIH employee and a 16 percent visitor parking. The number of exits from each structure was previously surveyed at hourly periods. The greatest level of vehicular exits was reported between the hours of 3PM and 5PM ranging from 249 to 550 exits. The peak hour was reported at 4PM.

The five sites were lasts analyzed at part of the 1995 Master Plan, and for the maximum or "worst case" one-hour average CO concentrations. It was determined that Site 3 (located between MLP-8 and McKinley Street) was subject to the highest overall concentrations. Resultant estimated CO concentrations are shown in Table 3-8 below.

Each parking level was modeled separately, as vehicle volumes increase progressively from top Level 7 down to a maximum on Level 3, which has an exit. Volumes on Levels 1 and 2 were intermediate, but followed different patterns within the garage. Levels 3 and 4 contributed virtually all of the CO concentration at the receptor since they have both the highest traffic volumes and the least elevation differential with the receptor.

Future vehicle volumes are expected to decrease from a land area of parking at 10 percent existing conditions in 2003 to 9 percent in 2013. Minimal development efforts predicted from

2013 to 2033 indicate that the land area of parking would consist of 9 percent of the total campus land area. Redevelopment or Maximum Development efforts would consume 5 percent of the land area.

Table 3-8: Worst Case Parking CO Concentrations at Site 3

Location	1-Hour Average (ug/m3)	8-Hour Average (ug/m3)
National/State Air Quality Standard	40,000	10,000
Parking (2002 Data)	555	182
NIH Roads (2002 Data)	400	275
Background (2002 Data)	3,900	2,700
Total (2002 Data)	**4,855**	**3,157**
Parking (2033 Master Plan and No Action Alternative)	166	85
NIH Roads (2033 Master Plan and No Action Alternative)	250	150
Background (2033 Master Plan and No Action Alternative)	2,350	1,625
Total (2033 Master Plan and No Action Alternative)	**2,766**	**1,860**

Parking space supply is expected to increase from existing 10,528 spaces in 2012 to 15,297 under the Maximum Development Alternative. Future vehicle volumes and physical parameters generally remain similar under all the considered alternatives and the No Action Alternative as the MLP operates at capacity conditions in all cases. Additions of future parking structures have not been estimated to consider the number of spaces that would be provided. However, generated CO concentrations are expected to possibly decline overall. This is due solely to the model including U.S. EPA projected reductions in individual vehicle emission rates over time.

NIH continues to provide carpools and vanpools for visitors within close proximity of the campus. NIH has also implemented a Transhare program, paid parking for visitors, internal and external shuttle bus routes and services, and promotes alternate work schedules for its employees. Biannual traffic counts at campus access points indicate that single occupancy vehicles at NIH have decreased by more than 30 percent. The numbers of NIH generated vehicles on the roads that surround the campus are reported to be below the 1991 baseline numbers aside from the growth of NIH's population. Based on the available information, mobile source emissions do not appear to have significant impact on the Proposed Action.

3.4.4 Stationary Source Air Quality

3.4.4.1 *Central Steam Plant Emissions*

The main stationary source, or point, for emissions on campus is the central heating plant in Building 11. Existing Boilers 1 through 4, installed in 1952 and 1968, each have a capacity to generate 150,000 pounds per hour (lbs/hr) of steam. Boiler 5 has a 200,000- lbs/hr capacity and went into service in 2001. The Cogeneration plant (COGEN) installed in 2004 has a capacity of 180,000 lbs/hr.

In the event of an outage, (loss of a major boiler / heat source (HRSG)) NIH has the potential to request from MDE a Permit to Construct and Operate two (2) Temporary Boilers to replace the lost capacity of either the cogeneration system boiler / HRSG or one of the five main boilers in the power plant. This replacement would be on a temporary basis until repairs on the lost boiler / heat source (HRSG) unit have been completed. At that point in time the temporary boilers would be taken off-line and removed from the Bethesda campus. The MDE will consider NIH's request for a Permit to Construct and Operate a temporary boiler based on the fact that the emissions from the temporary boiler would be offset by the loss of emissions from the outage.

The total plant capacity is 980,000 lbs/hr. Steam is produced in 5 boilers and is distributed at 165 pounds per square inch (psi) in the lines. Steam is also utilized for humidity control, sterilization of equipment, cleaning of animal areas, and at the lab benches.

The Potomac Electric Power Company (PEPCO) Cogeneration (COGEN) turbine and Heat Recovery Steam Generator (HRSG), has a capacity of 108,000 lbs/hr when it uses the exhaust heat from the turbine under standard daily operating conditions. An additional 72,000 lbs/hr of steam can be produced through direct supplemental firing within the unit for a total capacity of 180,000 lbs/hr on a temporary basis.

Prior to 1994, No. 6 fuel oil was used as the primary fuel supply. The estimated annual 1993 sulfur dioxide and nitrogen oxides emissions using No. 6 fuel oil were 803 and 343 tons per year, respectively. In the mid-1990s, NIH implemented the first steps in the central heating and cooling plant modernization program. NIH retrofitted Boilers 1 through 4 for dual natural gas and No. 2 distillate fuel oil feed.

Natural gas, which is a much cleaner burning fuel than oil, is the primary fuel with No. 2 low sulfur content diesel oil used as a backup source. Boilers 1 through 4 were also retrofitted with low nitrogen oxides (NOx) burners, and flue gas recirculation emission controls to further cut nitrogen oxides emissions. Boiler 5 was installed with the new features. Emission reductions of 80 percent or more have been realized through the modernization program since 1993. In 2010, natural gas was reported as the primary fuel usage at the campus and supplies 98 percent of the campus demand. Approximately 1.748 billion cubic feet of natural gas was used on campus in 2010.

The dispersion of air pollutants emitted from a source is influenced by several factors such as topography, weather, wind, air pressure, temperature, turbulence, stack types, plume rise, etc. The visible flow viewed from a stack is called the plume. Heat is often added to the stack gases to influence an increase in height of the plume, called plume rise. This facilitates the emission to loft higher in to the air and at a further distance from the ground. The plume release is associated with the height of the stack. Taller stacks would have higher plume rises. The plumes may travel long distances. The concentration of the pollution is proposed to decrease over the estimated distance to ground level and height of release.

Emissions from Boilers 1 through 5 are routed to a central stack, which encompasses the five individual stacks. Each individual stack is 40 inches in diameter. Stack height is 117 feet above ground level. The COGEN facility has an independent 8-foot diameter stack that is 140 feet high.

Title V, Part 70, of the Clean Air Act Amendments of 1990 establishes a national program for permits for regulated air emission sources. For program purposes, NIH is classified as a major source because its overall emissions from fossil fuel fired equipment exceed regulatory threshold limits. NIH Title V permit 24-031-00324 describes all the regulated NIH emission sources, emission control equipment, operations, and compliance procedures.

The Title V permit is applicable to Boilers 1 through 5, the COGEN facility, gasoline storage tanks, and emergency diesel generators with a capacity over 375 KW. The permit identifies applicable regulations for emissions, monitoring, and record keeping. As a permit condition, NIH conducts tests of stack emissions every two years and files certification reports to MDE. The permit is renewable every five years. Although changes can occur in the interim, the permit is usually revised at renewal time to account for changes in conditions and regulations.

3.4.4.2 *Annual NOx Emissions*

Previous sources of sulfur oxides, nitrogen dioxides, and suspended particulate matter were associated with the combustion of fuel in the boilers at the central heating plant. In 1994, NIH implemented a program to reduce emissions by converting boilers to use natural gas. In addition, stack heights were increased to improve emission dispersion and thus a reduction in the concentration of emitted pollutants. The annual NOx emissions from the NIH central heating plant are limited to 55.6 tons for the COGEN unit and 81.7 tons for boilers 1 through 5, or a total 137.3 tons.

Heat is measured in British Thermal Units (BTU). When burned, natural gas and fuel oil release fixed amounts of heat, in BTU Cubic Feet (BTU/CF) about 1,025 BTU/CF and 140,000 BTU/gallon, respectively. A fixed amount of heat is needed to generate a pound of steam. Compliance with the permit is ascertained by annual tests which determine a pollutant emission factor for each plant boiler in terms of pounds of pollutant per million BTU of fuel consumed (lb/mm BTU). This factor is multiplied by the annual fuel consumption of each type for each

boiler as indicated in plant records to determine the aggregate or total plant pollution emissions for the year. The 2011 Air Pollutants Emissions Certification Report of actual NOx emissions at the NIH campus, 68.7 tons of NOx emissions were recorded for the year, well within the limits for the campus.

NIH currently operates under Title V permit No. 24-031-00324 (issued May 1, 2013; expiration April 30, 2018). Title V NOx emission compliance limits under each of the Master Plan considered actions, was previously assessed by developing a simulated annual plant operation that would meet the projected steam demands of each action, (Proposed Action, No Action and Maximum Development). Year 2003 conditions were simulated using the same procedures for comparison to actual operations and emissions. Existing conditions may be simulated using similar procedures for comparison to actual operations and emissions. This data has not been provided during this draft study.

Steam drive would be most effective during the summer months. Since the overall summer campus chilled water demand is higher, the chiller steam load would be uniform over time. Operation at 15,000 tons would reduce electric power consumption by an 8,850 kilowatt hours (kWh) necessary for electrical drive. Most of the power delivered to the campus is generated in commercial power plants fueled by coal or oil, which produce higher amounts of NOx than natural gas per BTU of heat generated.

Further, more than one kilowatt of power must be generated at a distant plant to delivery one kilowatt to the customer due to transmission line losses. NOx emissions factors using bituminous coal can range from about 0.20 to 0.85 pounds per millimeter (lb/mm) BTU depending on combustion unit characteristics, and emission controls. The entire range of emission factors for coal is far above those for natural gas.

Generation of electric power in the COGEN unit, in effect, substitutes natural gas for coal and oil as the power generation fuel. On a regional basis, NOx emissions are reduced by a factor of four or more for each kW generated by the NIH plant. Use of the power within NIH and the immediate neighborhood virtually eliminates distribution losses, and creates additional NOx reductions. Driving the chillers using steam generated by the plant boilers also reduces regional emissions. The emissions factors applicable to the existing stationary sources are shown in Table 3-9 below.

Table 3-9: Emission Factors for Estimating Boiler Plant Pollutant Emissions

Emissions	Boilers 1-5 No. 2 Oil	Boilers 1-5 Natural Gas	COGEN 1 Natural Gas	COGEN 2 No. 2 Oil	COGEN 2 Natural Gas
Carbon Monoxide (CO) lbs of pollutant/mm BTU	0.0779	0.0739	0.0243	0.004	0.007
Sulfur Dioxide (SO_2) lbs of pollutant/mm BTU	0.0507	0.0006	0.00066	0.054	0.00066
Particulate Matter (PM-10) lbs of pollutant/mm BTU	0.0143	0.0062	0.021	0.015	0.007
Volatile Organic Compounds (VOCs) lbs of pollutant/mm BTU	0.00143	0.00278	0.0014	0.002	0.003
Nitrogen Oxides (NOx) lbs of pollutant/mm BTU	0.130	0.050	0.0442	0.120	0.120

(1) At 107,000 lbs/hr and no supplemental HSRG firing.
(2) At 180,000 lbs/hr with supplemental HSRG firing.

3.4.4.3 *Laboratory/Other Emissions*

In contrast to vehicles or the boiler plant where emissions are limited to a few combustion products, laboratory emissions can have a multitude of potential components. These components and their concentrations vary from day to day depending on the collective experimental protocols. The pollutant emission volumes of any one researcher are small, since the amount of chemicals or biological materials handled at any one time is for research and limited in volume.

Safe air quality levels must be maintained not only for the general public, outside the laboratory, but also the workers and visitors within the buildings and laboratories. This is accomplished through national building and mechanical codes that set ventilation requirements. These requirements ``and NIH/CDC Good Laboratory Practice (GLP) are used as the standard for the design and construction of university laboratories and biomedical research facilities in both the public and private sectors throughout the U.S.

Since the amount and character of potential pollutant generation vary, the codes that apply to it are based on the principle of mixing air with emissions. For biomedical laboratories, they call for 12 to 20 air changes per hour throughout the building. Ventilation air is only resident in the building for three to five minutes. Air is pulled through the building by large exhaust fans located in mechanical penthouses on the roof and released to the atmosphere. To illustrate, new laboratory Building 50 has about 290,000 GSF of floor space. The floor to ceiling height in

laboratory spaces is 12 feet. If the average number of air changes is 15 per hour, then about 52 million cubic feet of air is drawn through the building each hour.

Further mixing occurs once the rooftop fan emissions are released, due to atmospheric dispersion in both the horizontal and vertical direction and the exit velocity of the exhaust. The magnitude of this dispersion is several million-fold. For a parallel example, it is estimated that traffic on Rockville Pike, Old Georgetown Road, and West Cedar Lane together, produce about six tons of carbon monoxide per day on the lengths of roads adjacent to the campus. The contribution of this traffic to the carbon monoxide at residences adjacent to the roadways is measured in terms of a few parts per million (ppm), or micrograms per cubic meter (ug/m^3).

If necessary, experimental work is done in sealed chambers with built-in hand access that are within the laboratory room. Codes and standards require the laboratory room to be kept at a "negative" or lower air pressure in relation to the building as a whole to contain any release of material to the room itself. The codes also require all air exhausted from laboratories handing hazardous substances to pass through High Efficiency Particulate Arresting (HEPA) air filters before release. These filters reduce particles down to the 0.1-micron level from outflowing air content. Materials removed include dust, smoke, spores, bacteria, and viruses.

Other emissions may be expected from ventilation associated with petroleum storage tanks and construction vehicle or equipment usage. The Underground Storage Tanks (UST) and Above Ground Storage Tanks (AST) at the campus are regulated by the MDE oil control program. The tanks are required to comply with MDE regulations for use and are inspected regularly. Non-compliance of tank ventilation would not be expected.

Minor and temporary increases in air pollution are expected as a result of construction activities associated with demolition and/or development efforts. These sources may be dust and emissions from construction equipment and vehicles. These increases are expected to be sporadic and temporary. All compliances to releases of hazardous materials such as lead or asbestos should comply with federal and state government regulations. The temporary increases would occur during the time when buildings are demolished and when the sites for new buildings are developed. Required safety procedures for remediating asbestos and lead during demolition operations would be followed.

3.4.4.4 *Greenhouse Gas Emissions*

Greenhouse gases emitted from NIH reportedly originate from the use of the facilities and laboratories. Emissions are reported to include carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), and sulfurhexafluoride (SF6). These parameters are generally reported to be associated with the combustion of fuel, emission from chillers, and the transmission of electricity. As part of NIH's Environmental Management Program, their goals are to maintain a comprehensive greenhouse gas inventory and to reduce emissions.

Under Executive Order 13514, NIH was required to develop a comprehensive inventory of fiscal year 2010 greenhouse gas (GHG) emissions. Emissions are classified into three scope categories, 1, 2, and 3. Scope 1 emissions are associated with emissions owned and controlled by a federal agency. Scope 2 emissions are generated by electricity, heat, and/or steam purchased by a federal agency. Scope 3 emissions originate from sources not controlled by the federal agency but are related to activities of the agency. NIH is required to report the inventory emissions annually. The order also requires NIH to establish percentage reduction targets. NIH goals for 2020 include a 7.5 percent reduction of Transmission and Distribution (T&D) Energy Losses; overall Carbon Dioxide Equivalent (CO2e) emissions are to reduce by 3.3 percent; federal employee travel reduction by 1 percent; and reduction in contracted waste disposal by 15 percent.

NIH's Strategic Sustainability Performance Plan proposes to reduce emissions from facilities and their fleets. NIH proposes to reduce its stationary sources and greenhouse gas emissions by 10.4 percent by 2020 through energy reduction efforts and the use of renewable energy. This reduction would be 22.9 percent reduction in energy per square foot. In addition, mobile sources are proposed to reduce by 3 percent. The goal is further reached by their efforts to reducing petroleum use in their fleet vehicles; increasing use of alternative fuels; optimize the use of vehicles; and increasing use of low emission and high fuel economy vehicles.

Onsite production and off-site purchases are proposed to increase the use of renewable energy by 7.5 percent by 2020. A 30 percent reduction of petroleum based fuels in the fleet and increasing alternative fuel usage by 30 percent is expected by 2020. CO2e greenhouse gas emissions are proposed to reduce by 10.4 percent by 2020.

NIH has established a sustainable building program to include sustainability through the management of building design, construction, renovation, procurement, landscape, energy, water, waste, emissions, transportation, human health, and productivity. NIH proposes to implement several design mandates to achieve zero-net energy by 2030.

3.5 NOISE LEVELS

3.5.1 Guidelines and Criteria

Noise levels vary continuously with time. Two measurable descriptions of noise are used to account for this variance. Leq is the average mean square sound level measured in decibels over a time period of consideration, usually one hour. Ldn (day-night noise level) is the 24-hour average sound level for the period from midnight to midnight obtained after adding 10 decibels to sound levels recorded or computed from 10 PM to 7 AM. This "penalty" accounts for local residential needs for quiet during nighttime and early morning hours. L10, L50, and L90 are sound pressure levels that are exceeded 10, 50, and 90 percent of the time, respectively.

Noise levels are measured in A-weighted decibels (dBA), which match the sensitivity of the human ear across the frequency spectrum. It is a logarithmic measurement. A three-dBA increase is equivalent to a doubling of the sound pressure level or loudness. Conversely a one or two dBA increase is barely perceptible to the human ear.

Different noise criteria have been established depending on noise source and land use. The Federal Highway Administration (FHWA) Federal Aid Policy Guide establishes traffic noise impact criteria. Impacts are expected to occur if the peak hour Leq exterior noise level exceeds 67 dBA for activity areas such as residences, schools, churches, libraries, hospitals, hotels, motels, parks, playgrounds, and recreation areas, or if there is an increase of 5 dBA or more. Other federal agencies define noise criteria in terms of Ldn (Guidelines for Considering Noise in Land Use Planning and Control, Federal Interagency Committee on Urban Noise, 1980). U.S. Department of Housing and Urban Development, the U.S. Department of Transportation, and EPA recognize an Ldn of 55 dBA as a non-regulatory goal for outdoor residential areas.

The Guidelines indicate proposed activities are compatible with the following land uses provided the Indicated Ldn is not exceeded:

Table 3-10: Noise Criteria Limit by Activity or Use

Activity/Use	Ldn Limit
Residential	65
Hospitals	65
Schools	65
Churches	65
Government Services	70
Parks, Recreational Areas	75

State noise level criteria are given in Code of Maryland Annotated Regulations (COMAR) 26.02.03.03 and Montgomery County criteria are in the Montgomery County Noise Ordinance. The State and County have the same daytime and nighttime noise criteria, but apply them to different day and night hour intervals. The maximum allowable Leq or time averaged noise criteria for the State and County are shown in Table 3-11 below.

Table 3-11: Maximum Allowable Leq (noise level measured in Decibels) By Use and Time

CATEGORY	DAYTIME	NIGHTTIME
Commercial	67-dBA	62 dBA
Residential	65-dBA	55 dBA

The Maryland regulations define daytime hours as the period between 7 AM and 10 PM. The Montgomery County ordinance defines daytime as the period between 7 AM and 9 PM on weekdays, and 9 AM and 9 PM on weekends.

3.5.2 Traffic Noise

Levels were previously measured at eight representative receptor locations. Measurements were taken using a Rion Instruments sound and vibration measuring RION-N4 meter, meeting ANSI Type 2 criteria. Leq, L10, L50, L90, and Lmax values were measured using FHWA criteria for measuring traffic noise. Traffic data during measurement periods was recorded.

It was determined that Leq noise levels on Rockville Pike and Old Georgetown Road were relatively constant throughout the day, i.e. Level of Service C traffic produced noise levels equivalent or close to those recorded during the peak hour. This is attributable to the frequent acceleration and deceleration of vehicles at the closely spaced signalized intersections, and a greater number of trucks in the traffic during the non-peak hours.

The dominant source of noise in the vicinity of NIH is produced by traffic on Rockville Pike and Old Georgetown Road. Time averaged noise levels adjacent to these two arterials are relatively constant between 6 AM and 9 PM on weekdays. Values may be only one or two dBA higher during short-term peak noise periods. At the building line adjacent to these roads, Leq noise levels are generally 68 to 71dBA (Table 3-12). Under Similar conditions, noise levels on Jones Bridge Road and West Cedar Lane are 66 and 64 dBA, respectively.

Based on 2010 traffic count data West Cedar Lane and Rockville Pike intersection is the fourth most congested intersection in Montgomery County. Intersection improvements are currently underway by the Maryland State Highway Administration.

From within the core area of the campus, numerous sources contribute to the overall noise environment. Noise from traffic exterior to the campus dominates noise levels on the campus for a distance extending 500 feet into the interior of campus. On campus traffic is comparatively light, particularly during the middle of the day, and moves at low speeds. Noise from the passing of individual groups of vehicles can be recorded. Since campus traffic is not sufficiently high to create a noise continuum, other sources can be heard. These include human activities, mechanical equipment, and grounds maintenance.

Measurements taken in 1987, 1992, 1993, and 2003 through 2006 (Colin, Gordon, and Associates, 2007) at many locations at various times of the day indicate that typical day time (Ld) noise levels range from 55 to 60 dBA throughout the core area (Table 3-14). Construction is generally underway around the campus on a continuous basis at one location or another. Where this occurs, Leq noise levels would be elevated by an average of 2 to 5 dBA locally. Nighttime (Ln) noise levels range from 45 to 55 dBA (Colin, Gordon, and Associated, 2007). Nighttime levels are about 5 dBA higher in the immediate vicinity of the Clinical Center. Leq

noise levels in the 45-to 50-dBA ranges were recorded along the northern periphery of the site in areas beyond the direct influence of traffic noise from Rockville Pike and Old Georgetown Road in the early morning hours (1 AM to 4 AM).

Two Metro subway fan shafts located near the station entrance are another minor source of periodic noise. When operating, fans in the shafts produce a steady mechanical drone of 70 dBA. They operate automatically when tunnel or station ventilation is needed. The length of the operational period is variable depending on the number of trains and ambient weather.

Table 3-12: Baseline 1993 Leq Traffic Noise Measurements (dBA)

Location/Area	Time	L95	L90	L50	L10	L5	Lmax	Leq
1. Stone Ridge School	5:38-5:53 PM	58	58	61	63	63	66	61
2. Locust Hill Estates	8:20-8:35 AM	61	62	66	71	72	91	68
2. Locust Hill Estates	9:47-10:02 AM	60	61	68	74	74	83	69
3. Carriage Hill Elderly Care	10:10-10:25 AM	55	56	62	68	70	79	64
4. Alta Vista	9:30-9:45 AM	57	60	67	73	74	82	69
4. Alta Vista	4:38-4:53 PM	59	60	68	72	73	105	69
5. Beth El Temple	10:44-10:59 AM	59	61	69	75	76	83	71
6. East Bethesda Wisconsin Ave	3:22-3:37 PM	58	60	68	73	74	82	70
6. East Bethesda Wisconsin Ave	4:39-4:45 PM	58	60	69	74	75	81	70
7. East Bethesda Jones Bridge Rd	2:50-3:05 PM	59	60	64	69	71	82	66
8. East Bethesda Windsor Lane	4:06-4:21 PM	55	56	59	64	65	75	61

A single operating cycle may last for an hour or more followed by several hours of silence. Noise from the shafts is projected upward and has little influence on ambient levels at the

ground level beyond a radius of about 50 feet. The Metro exhaust fans are supported by an emergency generator with a stack exhaust immediately east of and adjacent to the NIH Metro entrance. When the generator is exercised temporary noise is expected, similar to the fan dBA.

Traffic noise predictions were previously determined using the FHWA TNM 1.1 Traffic Noise computer model, which includes information on traffic volumes, mix and speeds, and roadway and receptor geometry as inputs. The model also accounts for vehicle deceleration and acceleration at signaled intersections. Volumes were based on a field survey or count; future volumes were projected based on NIH and background (non-NIH) growth in trip generation.

Traffic generated by implementation of the Maximum Development Alternative is not expected to create noise impacts on the surrounding neighborhoods (Table 3-13). Noise levels may increase by 2 dBA or less regardless of whether the Maximum Development Alternative or No Action Alternative is selected. One or two dBA differences are not considered readily discernible to the human ear. Traffic volumes must double or halve to produce a 3-dBA increase or decrease, respectively. Even with projected non-NIH growth in the Bethesda CBD and Rockville Pike corridor, traffic volumes are and noise levels are not expected to double.

Predicted noise levels are typical for urban arterials and collector-distributor roadways. Predicted levels are representative of those experienced now at residences and buildings that directly front the streets with 50 to 100 foot setbacks from the curb line. Residences screened by a row of houses would experience levels 5 dBA less than indicated. In those locations where traffic generated noise dominates or is the prime contributor to overall noise levels, future noise levels were proposed to remain unchanged. This includes areas within approximately 600 feet of Rockville Pike, Old Georgetown Road, and Cedar Lane. Vehicles associated with the Gateway Center garage and the Commercial Vehicle Inspection Facility was included in the analysis. They are not reported to have an impact on noise levels because they comprise only a fraction of the total traffic.

Table 3-13: Existing Traffic Leq Noise Levels (dBA)

Location	Baseline 2003 Data
Stone Ridge School & Convent of The Sacred Heart	59
Locust Hill Estates Residences East Side of Rockville Pike	68
Maplewood and Carriage Hill Elderly Care Residences North Side of Cedar Lane	66
Alta Vista Residences Both Sides of Old Georgetown Road	68
Suburban Hospital	61
Greenwich Park at Old Georgetown Road (End of Park)	65
Edgewood/Glenwood Residential Neighborhoods Bethesda United Methodist Church Wesley Nursery School & Residences Facing Old Georgetown Road	66
Beth El Temple & Congregation Beth El Day Care	67
East Bethesda Residences Facing Wisconsin Avenue	68
East Bethesda Residences Facing Jones Bridge Road East of Glenwood Parkway	68

3.5.3 Mechanical Source Noise

Data presented in a 2007 study (Colin, Gardin and Associates 2007) indicated that out of more than 200 separate mechanical sources evaluated, exhaust stacks are the source of the loudest noise onsite. The most significant of the stacks are on located on Buildings 10, 33, 35, 37, and 41. Other noise sources that produce significant amounts of noise are air handling units and mechanical rooms, which are found on top of Buildings 14, 35, 40 and 50.

The NIH central refrigeration plant produces chilled water in Building 11. Chilled water is generated through the combined use of chillers and cooling towers. Currently, there are 12 chillers inside Building 11. On the roof of the plant there are two cooling towers for each chiller, i.e. 24 cooling tower cells.

The number of chillers and cooling towers that are operating fluctuates with the outdoor temperature. When the temperature exceeds 95 degrees Fahrenheit (F), all or nearly all of the units are in service, at lesser temperatures, fewer units are needed and typically one half of the

units may be in service when daytime temperatures are around 75 degrees F. The plant operates throughout the year even on the coldest days in winter to accommodate the campus base or process chilled water load. Operations also vary daily as temperatures rise and fall. On any given day, the maximum chiller and the cooling tower noise would be during daytime hours when the space cooling loads are highest.

As a condition of the contract between NIH and PEPCO, steam from COGEN Boiler 6 must be available to NIH for campus use for a minimum of 94 percent of the time each year. To meet this condition, PEPCO must provide alternative steam capacity. This is accomplished by installing two temporary boilers on the west side of Building 11, when if needed, and, as space and facilities are available for them, through the duration of the contract.

The COGEN/Boiler 6 is operated preferentially to the other boilers, which would normally be rotated in service when demand exceeds the COGEN capacity. The current emission permits for the COGEN/Boiler 6 unit allow for additional supplemental firing capacity in Boiler 6 during 384 hours of operation per year. Operation times for supplemental firing depend on the plant's day-to-day status in relation to permissible annual emission limits. The COGEN facility includes outdoor cooling tower fans, exhaust stacks, and cascading cooling water which all contribute to a large noise source for the south end of the campus. According to the study by Colin, Gordon and Associates (2007), acoustical louvers that are installed around the facility are not as effective as they could be because of the way they have been mounted on the building.

Building 11 is the top contributor of noise on the south end of the campus. Under all three proposed actions (Proposed Action, No Action Alternative, Maximum Development Alternative), noise from Building 11 (and future building 34) chillers would increase due to the addition of more equipment. Any additional noise source would add to the total noise. Additional acoustical louvers could be installed properly to minimize the effect of added chillers.

The graphic plan in Figure 3-11below shows the location of Building 11 on the NIH Campus.

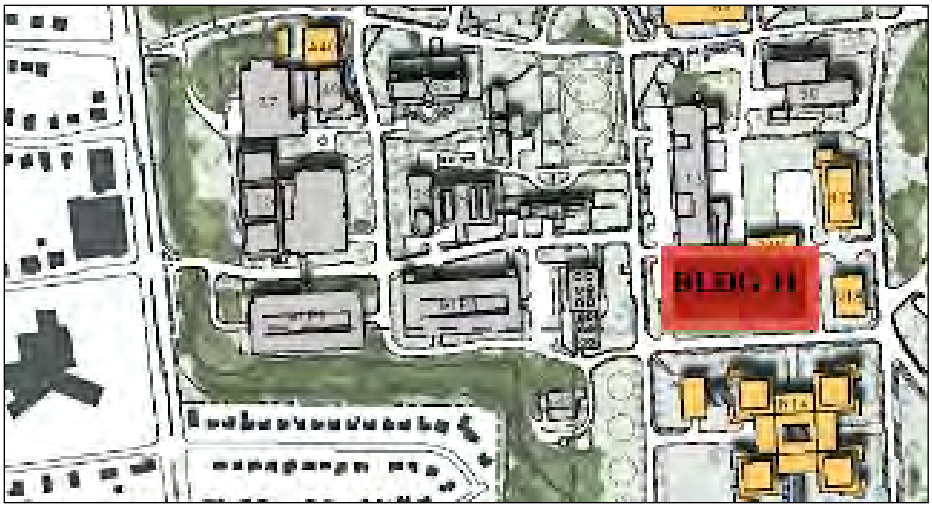


Figure 3-11: Building 11 Noise Impact Site Evaluated In Glenwood

Noise levels for the baseline measurement, were monitored on seven occasions for up to a week at Site A and along the southern NIH property line between 1987 and 1994 (Figure 3-11above). The general Leq daytime noise level at Site A was consistently 59 to 60 dBA unless the NIH chilled water plant was operating at near capacity. In July 1993, a one-hour Leq of 62.4 dBA was recorded at Site A when the outdoor temperature was 95 degrees F.

One week of continuous monitoring in August 1994 recorded the average daytime Leq noise level at 61.9 dBA between 6:00 AM and 9:00 PM, and an average nighttime (9:00 PM to 6:00 AM) noise level of 60.0 dBA. A review of the noise data revealed a complex noise environment at Site A and at residences on the north side of McKinley Street in Glenwood. The composite or overall noise in the area has several components: background noise comprised of Old Georgetown Road traffic noise, other background noise, and noise produced by the NIH chilled water plant with facilities in Buildings 11 and 34.

Noise generated by Old Georgetown Road traffic dominates and governs the overall ambient noise levels over an area extending about 600 feet to the east of the roadway. It is dominant in this area at all times of the day. The combination of vehicle volumes and speeds is such that noise generated by this traffic is relatively constant with a variance of only 1 to 2 dBA from 6 AM to 9 PM. Noise levels drop from 3 to 6 dBA after 9 PM. Weekend noise levels, both day and night, are about the same as weekday levels. A study conducted by Colin, Gordon, and Associates (2007) found that noise levels in the neighborhood averaged between 39 and 50 dBA, shown in Table 3-14 below.

Table 3-14: Noise Levels in Neighborhood (adapted from Colin, Gordon, and Associates, 2007)

Location	Campus Area	Measured (L90) dBA
4479 Battery Lane	South	50-52
5021 West Cedar Lane	Northeast	45-50
5202 Roosevelt Street	Southwest	48-50
5333 McKinley Street	Southwest	47-49
5516 Southwick Street	West	44-45
5601 Sonoma Road	West	41-43
8903 Seneca Lane	West	40-43
9007 Mohawk Lane	West	39-42
Glenbrook Village	Southeast	49-50
NW Monitor	On Campus	47-57
W Monitor	On Campus	55-60
S Monitor	On Campus	51-54

Background noise includes noise not specifically accounted by a main noise source. It includes working hour NIH campus traffic (48 dBA), NIH electrical and mechanical equipment, transformer hum from PEPCO facilities in Building 46, children playing at the NIH child care center, birds, insects, aircraft, sirens on ambulances and fire engines, residential air conditioners, dogs barking, lawn mowers and leaf blowers, vehicles on McKinley Street, and many human activities, including pedestrians passing Site A on nearby footpaths.

None of these noise sources dominates the background levels individually or is continuous, but all contribute to it.

The principal sources of exterior noise are the cooling towers located on the roofs of the two buildings (Buildings 11 and future Building 34). The towers have three separate sub sources of noise: tower fans and motors, water splashing in tower trays, and high velocity air passing through the tower and its fans (Figure 3-12). The fans and motors produce a steady drone.

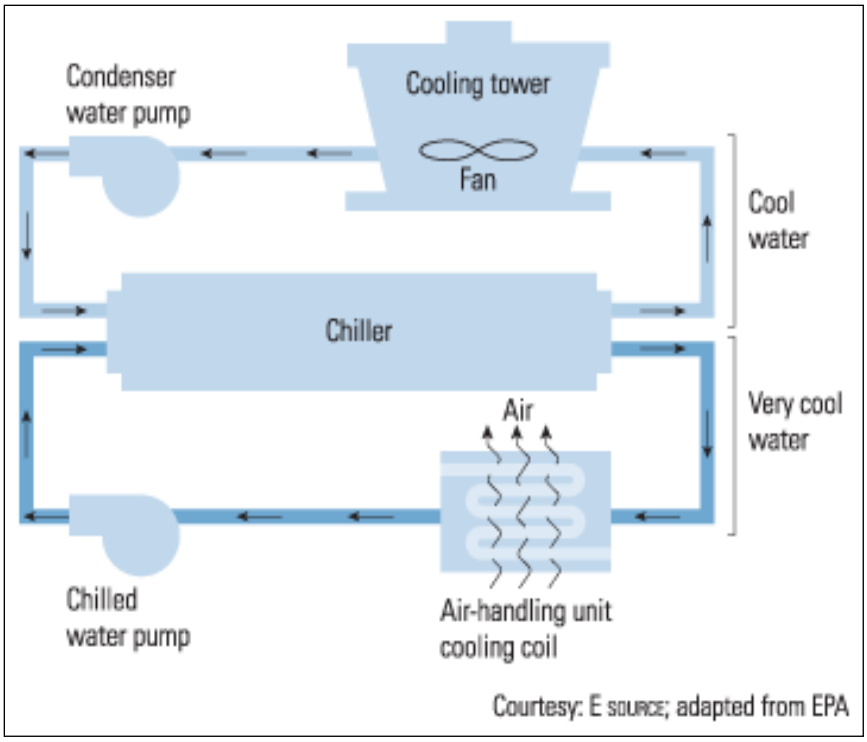


Figure 3-12: Refrigeration Plant Schematic

The splash of water in the trays generates tones similar to a waterfall. The airflow noise is similar to the sound produced by high winds. The noise levels produced by a cooling tower unit are the logarithmic sum of these three sub-sources. Total plant noise varies incrementally with the number of units in service. Reference Leq noise levels were obtained for NIH tower operations by recording levels when one, two, and three units were in operation.

Observation of the monitored noise levels and field conditions indicated that the NIH chilled water plant produced different noise impacts at different times. Except for summer, noise produced by the plant during the daytime was submerged within the overall noise environment. Then, the plant was not a primary contributor. During summer months, when temperatures exceed 90 degrees F, plant noise increases as the number of units in service increase. During the day, plant noise is equivalent to all other noise sources combined in terms of loudness. It is during the summer nighttime (9 PM to 6 AM) when plant noise becomes most evident. Although the plant produces less noise during the nighttime hours than during the day, the noise from all other sources decreases to a greater extent, and plant noise becomes the dominant or loudest contributor to the overall noise environment as shown in Figure 3-13 below.

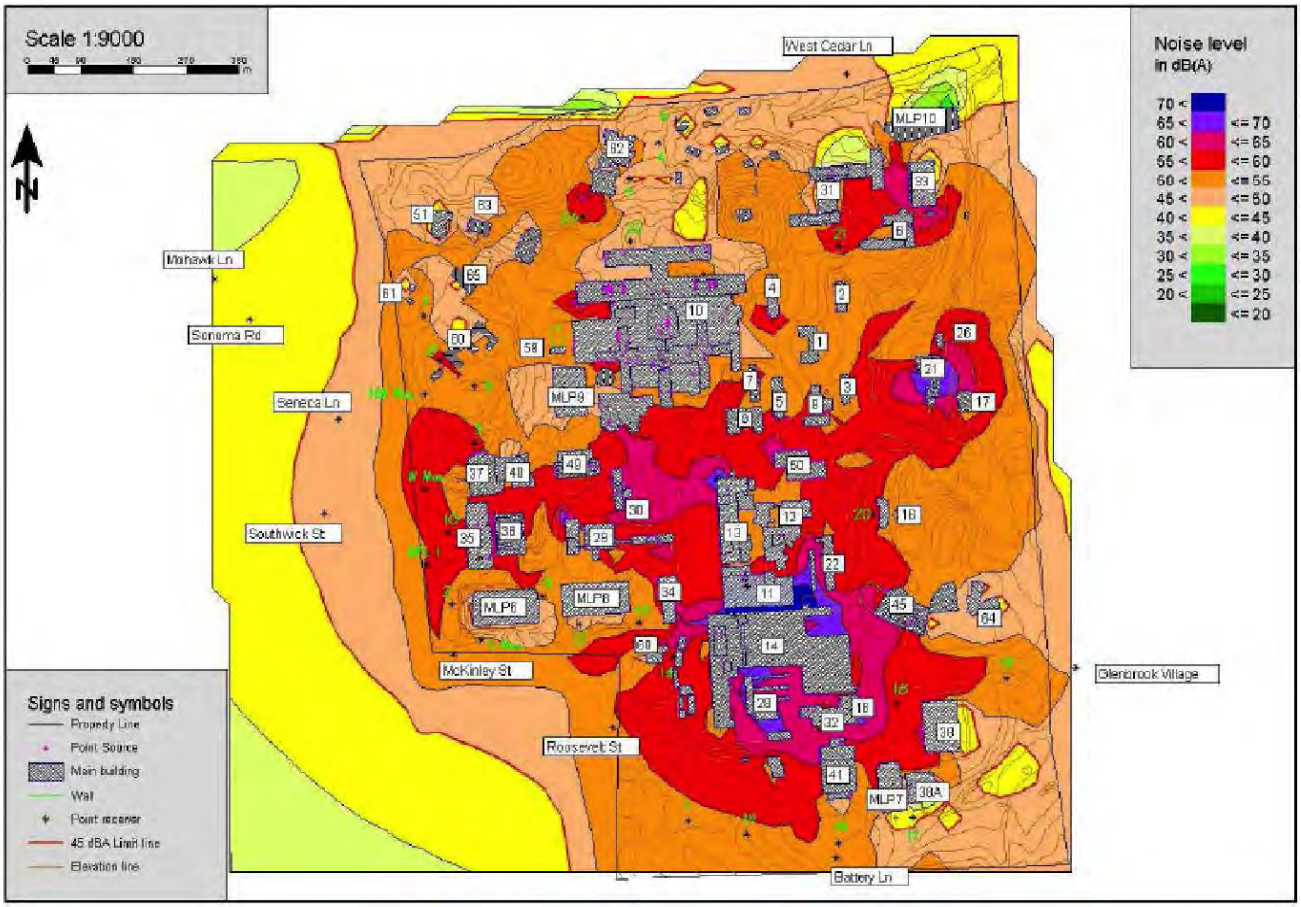


Figure 3-13: Noise Grid Map of Baseline NIH Campus (Colin, Gordon, and Associates, 2007)

In order to determine the relative merits of potential mitigation options for the plant, an analysis of the existing noise environment was conducted. The analysis was based on partitioning the week long day/night time Leq noise levels monitored at Site A into its contributing components (daytime 61.9 dBA, night time 60.0 dBA). The contributing components were cooling tower noise, Old Georgetown Road traffic noise, and other background noise. The first two can be determined by computer modeling, the last is unaccountable.

The FHWA STAMINA 2 noise prediction computer model was used, which is the standard to predict noise generated by traffic on roadways. Conditions were simulated by modeling Old Georgetown Road and its traffic conventionally, the residences in Glenwood, existing campus roads and buildings such as MLP-6, MLP-8, the PEPCO substation in Building 46, and topography in the vicinity of Site A.

Buildings 11 and 34 were also modeled. Cooling tower cells were modeled as individual line sources with a length equal to the cell width. The three tower noise sub-sources were modeled separately, so that each tower was represented by three line sources. The analysis included all

chillers/towers through Unit 27. These units face to the south. Towers 28 through 32 would be located on the east side of the plant and face in that direction, and have no effect on noise to the south or west of the plant.

The model was then calibrated until the noise levels at Site A under a variety of operating conditions (peak, nonpeak, day, night) could be reproduced. Day and night time peak operating Leq noise levels, or maximum impact conditions, are shown in Table 3-15. The existing data represents conditions that were present at the time of the analysis. It shows that NIH chilled water plant noise becomes the dominant source in the nighttime in hot summer weather. Day and nighttime plant noise levels during the non-summer seasons are 2 to 5 dBA lower than summer levels.

NIH incorporated noise attenuation in the design of the Building 11 expansion and installation of new equipment as mitigation following the 1995 Master Plan EIS. Phase II and I chilled water plant expansion have been completed. Chillers 22 through 25 went into service in 2002 and Chillers 26 and 27 in 2004. The new cooling towers associated with these chillers operate more quietly that older towers, producing about 6 dBA less noise per chiller. A 60-foot high louvered acoustical screen running the length of the south side of Building 11 has also been installed as part of the project.

Table 3-15: Existing & Projected Peak Day & Night Leq Noise Levels at Glenwood Property Line (dBA)

Time & Location	Existing	Master Plan Projection
Peak Day Time (6 AM-9 PM) Background noise	57.6	57.6
Peak Day Time (6 AM-9 PM) Building 34	56.2	0
Peak Day Time (6 AM-9 PM) Building 11	57.2	49.6
Peak Day Time (6 AM-9 PM) Total CHW Plant	59.7	49.6
Peak Day Time (6 AM-9 PM) Plant and Background	61.9	58.2
Peak Night Time (9 PM-6 AM) Background noise	54.3	54.3
Peak Night Time (9 PM-6 AM) Building 34	50.9	0
Peak Night Time (9 PM-6 AM) Building 11	57.2	48.9
Peak Night Time (9 PM-6 AM) Total CHW Plant	58.1	48.9
Peak Night Time (9 PM-6 AM) Plant and Background	59.6	55.4

The total net attenuation produced at Site A under peak (high) outdoor temperature conditions by quieter operating towers and the acoustical screen would be about 10 dBA in plant noise. Daytime plant noise would decrease from 59.7 to 49.6 dBA. Overall, however, only a 3 to 4 dBA improvement in the noise environment would be realized as other un-attenuated background noise begins to dominate the acoustic environment. However, noise generated by the plant

would contribute significantly less to the total noise environment. This mitigation would occur under each of the three actions considered (Proposed Action, No Action and Maximum Development).

It is only when all cooling tower units are running that the combined or cumulative noise produced becomes significant. Operationally, it would be relatively immaterial which of the towers are run to meet a less than capacity cooling load due to the distance between Building 11 and Glenwood. Noise levels decrease by 3 dBA for each successive doubling of distance between source and receiver (i.e. 100, 200, 400, 800 feet). The westernmost (Chiller 22) and easternmost (Chiller 27) ends of the plant, for example, are about 700 and 1,000 feet distant from Site A, respectively. The estimated combined effect of Cooling Towers 22 and 23 at the west end would be to produce Leq noise levels of 52.2 dBA at Site A. Towers 26 and 27 at the east end generate 50.7 dBA, a barely discernable audible difference.

In contrast to Site A, Leq noise levels on the north side of Building 14 would be high and operation of individual tower units does make a difference in the noise environment. Construction of the chilled water plant expansion reduces the wall-to-wall distance between Building 11 and 14 from 90 to 30 feet. The source-receiver distance is so small that the Leq noise level of any point along the north face of Building 14 is determined by the nearest operating tower cell.

The un-attenuated Leq noise level at the center of the north face of Building 14 is estimated to be 84 dBA when the plant operates at capacity with all towers in service. The noise screen reduces the level to 76 dBA, which is only half as loud as levels were prior to installation of the noise screen. However, when the plant operates at less than capacity, the Leq noise level at any point opposite the center of a single operating tower cell would be 72 dBA due to distance. Similarly, if the point is centered on two or three adjacent operating tower cells, the resultant noise levels are 74 and 75 dBA respectively.

3.5.4 On Campus Noise

In general, the future campus noise environment for both alternatives would be similar to existing conditions, since no one source of noise dominates and no new significant noise source would be created. Traffic noise levels increase with vehicle volume and speed. A doubling of vehicle volume increases noise levels by 3 dBA, if all other factors are held constant. Gateway Center and Commercial Vehicle Inspection Facility traffic volumes are low in comparison to volumes on adjacent Rockville Pike and move at lower speeds. Noise levels in the Rockville Pike corridor are dominated by Rockville Pike traffic. Noise levels in the east side buffer area would be the unchanged by these projects.

Typical Leq noise levels would continue to be in the 55 to 60 dBA range, and Ldn levels in the 50 to 55 dBA ranges, in the core area of the campus away from the influence of the road network surrounding the campus.

Current and future peak hour traffic entering and leaving the campus is constrained by the MOU trip limits. Internal campus traffic volumes under the each of the three alternatives would be similar to existing conditions. Currently, most vehicles make short internal campus trips to the nearest peripheral surface parking. In the future, under the Master Plan the pattern would be similar except that the vehicles would proceed to structured parking along the Loop Road.

The previously estimated Loop Road peak hour traffic volume for the links and sections in the southwest quarter of the campus was approximately 1,100 vehicles per hour under the Master Plan build-out conditions. The predicted Leq noise level generated by vehicles at the property line nearest to the Loop Road on the east side of Edgewood/Glenwood is 49 dBA. This is significantly less than the combined daytime noise levels produced by Old Georgetown Road, the chilled water plant, and background noise from all other sources (57 dBA).

Biannual traffic counts are conducted at NIH at the campus access points. These counts indicate that single occupancy vehicle (SOV) traffic has decreased by more than 30 percent. No new overall campus peak hour trips are proposed to be generated by future NIH growth beyond the trip generation goal defined for the Transportation Management Plan *(Memorandum of Understanding*, 1992), traffic volumes are proposed to increase at some intersections due to the increase of employment and the increase and redistribution of parking within the campus.

Building exhaust fans and emergency diesel power generators are additional campus noise sources. Fans and generators maybe located on building roofs, at ground level, or in subsurface areaways or chambers. Individual exhaust fans generally produce Leq noise levels in the range of 73 to 76 dBA at a reference distance of 50 feet. While public road traffic is the dominant noise source between 6 AM and 9 PM Individual exhaust fans generally produce Leq noise levels in the range of 73 to 76 dBA at a reference distance of 50 feet.

While public road traffic is the dominant noise source between 6 AM and 9:00 PM around the campus periphery, fan noise, which has the character of a steady hum or tone with a few dominant resonant frequencies, can be noticed during the remaining hours. Individual diesel generator noise levels can range to 88 to 90 dBA at a reference distance of 50 feet. Noise emissions from generators are limited to a few occurrences when the public electric power supply is lost, or when the units undergo periodic test operations to ensure serviceability.

New NIH facilities should be designed to abate or mitigate excessive noise and vibration impacts to nearby NIH facilities, and the neighborhoods surrounding the campus. The potential impacts and necessary abatement must be evaluated on a case-by-case basis. In a study conducted by Colin, Gordon, and Associates (2007), a model predicted the reduction in noise on campus by putting silencers on the exhausts stacks of buildings 10, 28, 35, and 41.

The difference in noise ranged from 1 to 6 dBa less than without the exhaust silencers. Maximum building operational Leq noise levels should meet the Maryland or Montgomery

County noise criteria. Mitigation can be achieved through physical shielding, equipment noise silencers, or project design configuration and layout.

3.6 UTILITY & INFRASTRUCTURE

3.6.1 Utilities –General

Extensive infrastructure such as roads, utilities, and support facilities are needed for campus operations. Planned improvements to infrastructure would be in response to the NIH 2013 Bethesda Campus Master Plan. The Master Plan covers infrastructure modernization needed to upgrade facilities to meet current conditions as well as growth alternatives. The NIH 2013 Bethesda Master Utilities Plan (MUP) is address the Master Plan aspirational goals, to provide a planned program for improvements to central utilities which heat, cool, and power the existing and proposed campus facilities. These utilities include the generation and distribution of steam, chilled water, compressed air and electrical power. The central utility plant does not handle or produce secondary utilities, which include natural gas or fuel or handle water, sanitary sewer or storm drainage. These utilities also are addressed as they distribute or collect systems that are affected by the Master Plan proposed growth.

3.6.2 Central Heating and Cooling

3.6.2.1 *Building 11 - Central Utility Plant*

When a large site such as the NIH campus has sufficient density of buildings, central heating and cooling (also referred to as district energy) is more energy efficient, less environmentally deleterious and more reliable than stand-alone building heating and cooling systems, while delivering energy at a lower cost. The International District Energy Association (IDEA), an international trade group that monitors the benefits of district energy, notes that district energy systems substantially reduce Greenhouse Gases (GHG) while improving reliability. For these reasons, many large government installations and university campuses use central heating and cooling. Examples in the area include the Federal Triangle (Capital District Heating and Cooling), the Navy Yard, the University of Maryland, George Mason University, and Bethesda Naval Hospital.

The NIH Central Utilities Plant (CUP) provides central heat and chilled water to the campus. Steam and chilled water are generated in Building 11 by dual fuel boilers, electric and steam driven chillers and also by use of combined heat and power, or cogeneration (COGEN). The COGEN generates electricity from clean burning natural gas in a combustion turbine generator. Then it recovers the waste heat for generation of steam for heating and process uses. This COGEN process enables the local utility, PEPCO, to generate combined electricity and steam at more than double the efficiency (from about 35 percent to 75 percent) of a traditional power plant, while conserving fuel and greatly reducing GHG emissions.

Building 34 previously housed chilled water systems that are not currently in use. This building is available for the addition of future chillers, with significant remodeling required. The steam and chilled water produced in the CUP Building 11 is distributed to buildings around the campus by a pipe distribution network located in utility tunnels; trench envelope, or directly buried piping.

The National Institute of Health (NIH) Central Utility Plant (CUP) generates saturated steam at 165 psig (373 degrees F) for distribution to the NIH campus. The campus distribution system provides steam to individual buildings where it is used to generate hot water for space heating, heating of domestic hot water, laboratory and animal facility uses, and in humidification and process systems.

As the steam is used in the buildings it condenses into water (condensate), which is returned to the CUP for treatment and re-use in the boiler systems. Proper water chemistry and oxygen content are critical to the longevity and reliability of the piping, boilers, and all other systems in contact with water. Normal loss in the system, which occurs with removal of impurities and venting by the deaerator, requires the continuous addition of fresh water.

The NIH CUP also has a cogeneration facility (COGEN) that burns Natural Gas to produce electricity and uses the exhaust heat of the turbine electric generator to produce steam. The steam produced by the COGEN is at the same pressure as that from the boilers and is delivered via the common distribution system. The COGEN cannot produce steam if its electric generation turbine is not in service.

The CUP includes five dual-fuel saturated steam boilers in addition to the COGEN. Four of the boilers are steam rated at 150,000 pounds per hour (pph) and one are rated at 200,000 pph. The cogeneration facility, installed in 2003, is rated for 107,000 pph, with a maximum of 180,000 pph when the turbine generator exhaust heat is supplemented by burning additional fuel in duct mounted burners (duct fired). Since the COGEN is more efficient, less polluting, and produces low cost electrical power, it runs continuously. The five conventional boilers are started and stopped as needed to match supply with campus demand for steam.

In order to operate as an efficient and long lasting steam system, the water and steam in the system are treated to maintain the proper water chemistry, gas content, pressure and temperature. To accomplish these goals, the CUP system consists of deaerators, economizers, condensate polishers, water softeners, steam and electric feed water pumps, steam and electric drives on the force draft fans, bearing cooling water, chemical feed, and condensate receiver tank systems.

The distribution system consists of approximately 84,000 linear feet of steam and condensate lines. The campus distribution consists of approximately 11,000 linear feet of tunnel and 5,000 linear feet of trench. In most cases, the steam/condensate and chilled water lines share the same tunnel or trench.

Building 11 has a floor footprint of about 76,000 square feet (SF) and a total building gross area of 307,188 SF. The five boilers that supply steam to the campus occupy the north side of the building, consuming natural gas (with fuel oil as a back-up). The height of the building on the boiler side is approximately 90 feet. Chillers, which generate chilled water while consuming electrical power, occupy the south half of the building at ground level. Each chiller has a set of cooling towers located on the roof, which is about 30 feet above ground level on the south side of the building.

The chiller and boiler plants operate throughout the year. They not only cool and heat buildings but also supply chilled water and steam for process use. Examples of process steam use include building humidity control, laboratory bench supply, animal cage cleaning, and sterilization of laboratory and hospital equipment.

Steam and chilled water are supplied to individual buildings as needed at different times throughout the day or among separate areas within a building at the same time to meet heating, cooling, and humidification requirements. Steam is also supplied to laboratory benches in research spaces. NIH and The Association for Assessment and Accreditation of Laboratory Animal Care International (AAALAC) standards for rooms holding individual animal species require temperatures in the range from 61 degrees F to 84 degrees F. These individual space or room temperatures must be maintained within a tolerance of +/- 1.8 degrees F. Temperatures in laboratories containing biological materials must also be maintained at the required tolerances, and animal spaces and laboratories have relatively small tolerances for humidity level variations.

NIH, therefore, requires very high service reliability for steam and chilled water production, even when outdoor temperatures range to record levels. As a result, there are two applicable definitions for boiler and chilled water plant capacities. The first is “production plant capacity,” which is the sum of all equipment nominal or nameplate capacities. Capacity is also defined in terms of "firm" plant capacity. Firm plant capacity is the full plant production capacity less the capacity of the largest generating boiler or chiller unit and interrelated support equipment. Firm capacity indicates that one boiler/steam generator or chiller may be out of service for maintenance or repairs at any given time including periods of peak demand.

These plant capacities must be able to accommodate the instantaneous or peak requirements for the coldest winter day (peak steam) and hottest summer day (peak chilled water) that is reasonably expected to occur. To provide a high level of reliability, system owners would like to be able to handle these peak occurrences with the firm capacity, when one producer of steam or chilled water is out of service. This is referred to as the N-1 firm capacity. For a greater contingency level, the degree of firm capacity can also be increased to an N-2 level where it is assumed that the next largest producer (of steam or chilled water) is also out of service for repair or maintenance. An increase in this contingency level would require a revision of the MUP and the related sections of this EIS.

3.6.2.2 *Central Steam System*

Steam demand at NIH Bethesda has two primary components: steam used to heat buildings, and "process" steam that is used for all other purposes such as cleaning animal facilities, sterilization of research and medical equipment, building humidity control, and at the laboratory bench. Steam demands vary daily and by season. Heating steam demand fluctuates with outdoor temperature. Previous analysis indicated that, on the average during the heating season, NIH needs an additional 6,300 lb./hr of steam for each Fahrenheit degree drop in outside temperature during the heating season.

The 2011 PEPCO report indicated a calculated peak of 644,500 pounds per hour (pph) of steam generation load when utilizing a 7 percent flow requirement for in-plant auxiliary use. Additional data for more recent years is under review for inclusion in the 2013 MUP. The current CUP steam capacity is 980,000 pph with a firm capacity of 707,000 pph assuming the COGEN is running at its maximum (duct fired) capacity.

The data for existing conditions are derived from plant steam production records for 2010. Plant operators record the total pounds of steam generated each day and the daily peak production in pound hours (lbs/hours). Peak demands are important in establishing necessary plant and fuel supply capacities. Total seasonal and annual production is important in estimating annual boiler stack pollutant emissions. Operating permit emission limits are set on an annual basis.

The increments of added steam producer (boiler or COGEN) are 150,000 pph preliminary and would require further engineering and economic analysis to determine the best type and size of system to be added. These values are based on the most recent information available and would be updated when the 2013 MUP is complete.

The unitary factors used in this preliminary analysis in terms of steam flow rate in pounds per hour per gross square foot for the Research & Support (Lab) and Animal facilities is 0.1818 pounds per hour/gross square feet (pph/gsf). For Clinical Research a unitary factor of 0.0230 pph/gsf was used, while 0.0253 pph/gsf was used for Utility. Office/Administration buildings were given a 0.0933 factor and Residences used 0.0253 pph/gsf. The factors were applied to the projected square footage of each type and accumulated into totals for the campus as a whole.

Campus steam demands do not increase steadily. They increase or decrease in steps as new buildings are brought online, or existing buildings are demolished or taken out of service for renovation. Short-term demand peaks occur when a new replacement building and its associated building waiting to be demolished are online at the same time. Projections of future steam demands are based on factors for potential peak demand developed from modeling of the existing campus and future alternatives. For these reasons it would be prudent for the increased CUP steam capacity to be increased before significant additional building space is constructed.

The Gateway Visitor Center, Commercial Vehicle Inspection Facility, Children's Inn addition, Building 15 residences, and several utility vaults are not connected to the central steam and chilled water systems. These are either unconditioned or are heated and cooled by independent building systems and are not included in central plant demands.

The COGEN Boiler 6 serves as a heat recovery steam generator downstream from the turbine. Hot exhaust gases from the turbine pass through the boiler to generate 107,000 pph of steam. Supplemental natural gas fired turbine exhaust duct burners in the boiler permits generation of additional steam, increasing the overall COGEN facility capacity to 180,000 lb/hr temporarily. This higher supplemental duct fired capacity is considered temporary since stack emissions are higher in this mode. Air pollution permit limits constrain the continuous operation of the duct firing burners to approximately sixteen days per year.

Total plant capacity is 907,000 pph. Firm capacity is 707,000 pph with Boiler 5 (the largest) out of service. Boilers 1, 2, and 3 were installed in 1952. Boilers 4 and 5 went into service in 1969 and 1997, respectively. All the units supply 373 degrees F steam at 165 pound force per square inch (psig). Boilers 1 through 4 were overhauled between 1995 and 1997 as part of the central plant infrastructure modernization program. Earlier renovations included general refurbishment, installation of natural gas feed and new state-of-the-art low nitrogen oxides (low NOx) emission burners for greater operating efficiency and reduced emissions. Boiler 5 was installed incorporating the new features and in addition incorporates and flue gas recirculation (FGR) for reduced emissions.

As a condition of the contract between NIH and PEPCO, steam from COGEN Boiler 6 must be available to NIH for campus use for a minimum of 94 percent of the time each year. To meet this condition, PEPCO must provide alternative steam capacity, if it is necessary, to meet the 94 percent availability requirement. This is accomplished by installing two temporary boilers on the west side of Building 11 if needed. Space and facilities are available for them through the duration of the contract.

The almost continuous availability of the COGEN Boiler 6 changed the central plant’s operational patterns. Boiler 6 operates at 107,000 pph throughout the year to satisfy base campus steam loads and demands up to this level. Other boilers would be used only to supplement Boiler 6 as daily demands exceed the COGEN capacity. The total campus steam demand ranges from a minimum in the summer of only the COGEN output to a maximum in severe winters requiring all five boilers and the COGEN to be in operation at full capacity.

The COGEN/Boiler 6 is operated preferentially to the remaining boilers, which would normally be rotated in service when demand exceeds the capacity. The current emissions permits for the COGEN/Boiler 6 unit allow for additional supplemental firing capacity in Boiler 6 during 384 hours of operation per year. Operation times for supplemental firing depend on the plant’s day-to-day status in relation to permissible annual emission limits.

Within the CUP, steam is used as an alternative power source to electric power in some cases. On the cooling side, Chillers 21 through 23 have been equipped with dual steam and electric power drives. Each has a 5,000-ton cooling capacity. If they are steam driven, each requires 47,000 pph of steam when operating at capacity, assuming 70 percent efficiency. The NIH boilers or COGEN can be used to supply chiller steam during the warmer or summer months when campus demand for steam is comparatively low.

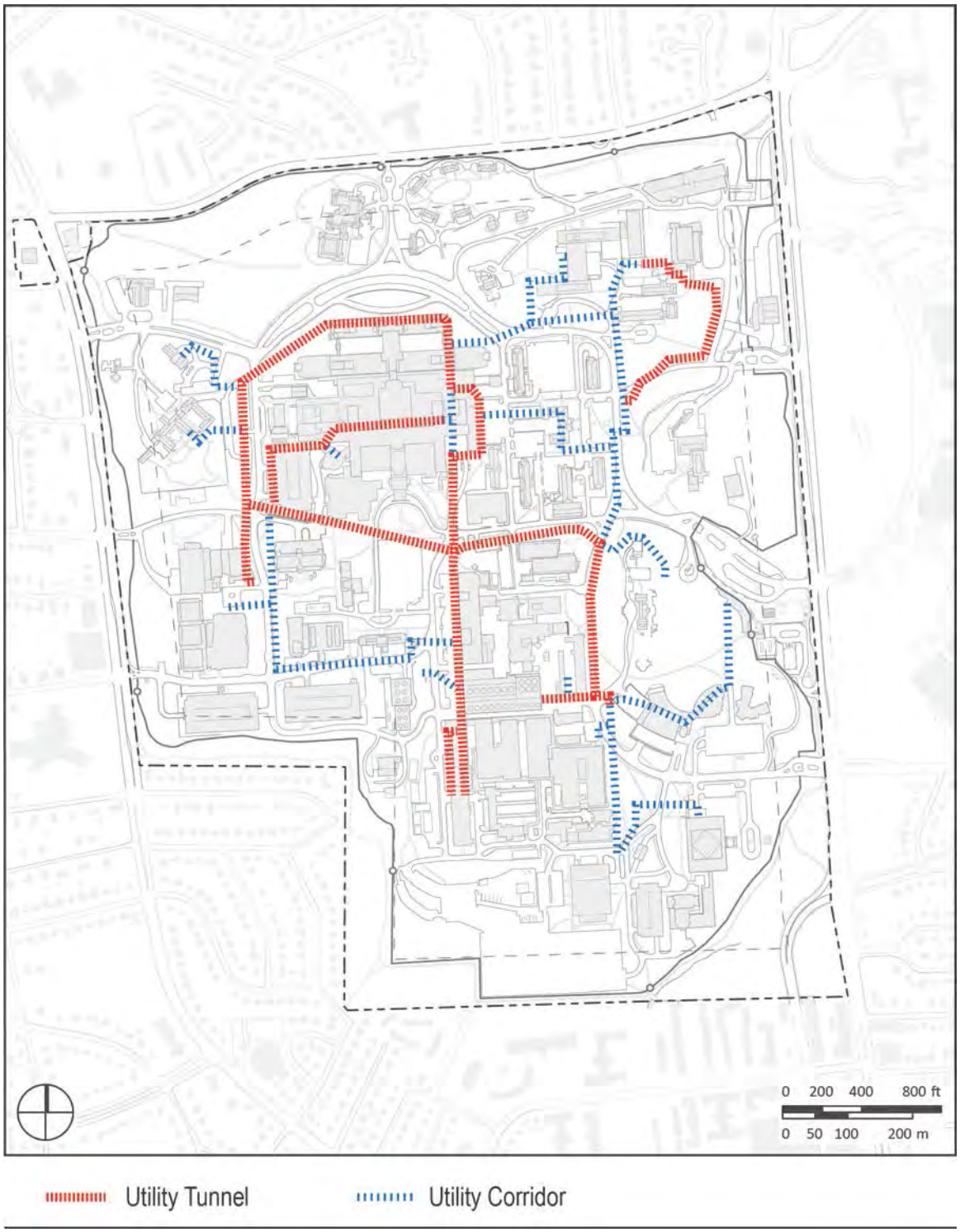


Exhibit 3-1: Campus Diagram – Utility Tunnels

3.6.2.3 *Chilled Water System*

The plant currently includes twelve chillers, each with a 5,000-ton capacity in Building 11. The overall total and firm plant capacities are 60,000 and 55,000 tons, respectively. All of the chillers have electric drive. Three have the option of either electric or steam drive, with steam supplied by NIH boilers. Auxiliary equipment is all electric and supportable by diesel generators under emergency conditions.

NIH also has four 2,500 ton “free cooling” flat plate heat exchangers in Building 11 that can meet all or most of demand. Free cooling takes advantage of cold outdoor winter temperatures. Condenser water is circulated between a cooling tower, where it is exposed to cold air, and the heat exchanger. The chilled water returning from buildings bypasses the chillers but passes through the heat exchanger. It is cooled by direct contact with the condenser water across the inner surfaces of the exchanger. The operation is thermodynamically efficient when outdoor temperatures are 38°F or less. Total nominal and firm free cooling capacities are 10,000 and 7,500 tons, respectively. The heat exchangers may be operated in parallel or series with chillers. Since the exchangers are not available during the summer months, their capacity is not included in the plant total.

Each chiller in the central chilled water plant has an associated cooling tower located on the roof above. Each cooling tower serving one of the twelve 5,000 ton chillers has two cells, which are 36 feet square each. One side of each cell is an air intake side and must face outward.

3.6.2.4 *Steam and Chilled Water Distribution*

The Master Plan proposes the continued consolidation of utility tunnels into corridors to provide adequate routes for steam, chilled water, and other utilities to the new constructions and renovations. The existing steam and chilled water distribution systems are shown in Exhibit 3-2 and Exhibit 3-3. These corridors would be developed under either of the Master Plan Alternatives. In general, the corridors follow existing utility concentrations, but many collection and distribution lines other than individual building services crisscross development blocks. The concept formalizes long term planning for the transfer or relocation of these lines to the corridors. Utilities would be relocated to the corridors as road improvements are made, individual building sites are developed, or as the existing utility tunnel system is expanded.

The general concept for steam and chilled water is to create a grid of distribution and return lines throughout the campus. This would permit distribution and return by two paths to the point where individual building service drops connect to the utility distribution system. Major steam and chilled water lines on the campus are located in tunnels or concrete-encased utility trenches (trench envelopes). Minor lines and most building services are buried directly. Lines in tunnels are accessible for direct inspection, maintenance, and repair. Utility trenches generally are only wide and deep enough to contain the distribution and return lines. Access to trenches is available at interspersed vaults or inspection points. The main existing tunnel runs north-south

between Building 11 and the Clinical Center. This tunnel extends southward to service Building 14 and includes pedestrian access.

Steam and chilled water service for the South Quad and other facilities to the south of Building 11 are provided in a utility trench. Service to Buildings 31 and 33 in the northeast campus sector are also accommodated through a utility trench loop system.

Hydraulic analysis of the campus chilled water distribution system would be completed in the 2013 MUP, which is in progress. This analysis would allow for recommendations on additions or modifications to the chilled water distribution system if necessary.

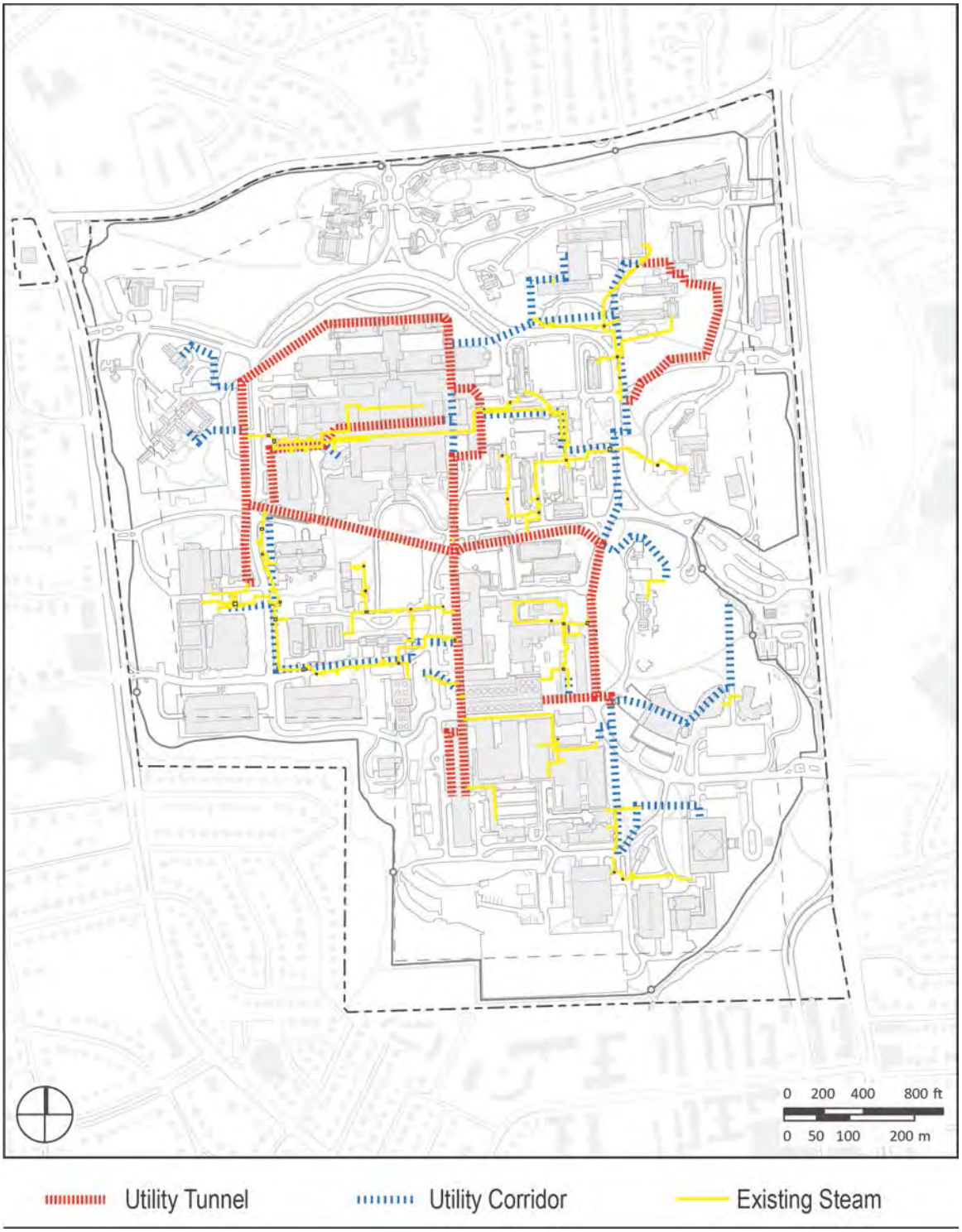


Exhibit 3-2: Campus Diagram – Steam Utility Tunnels

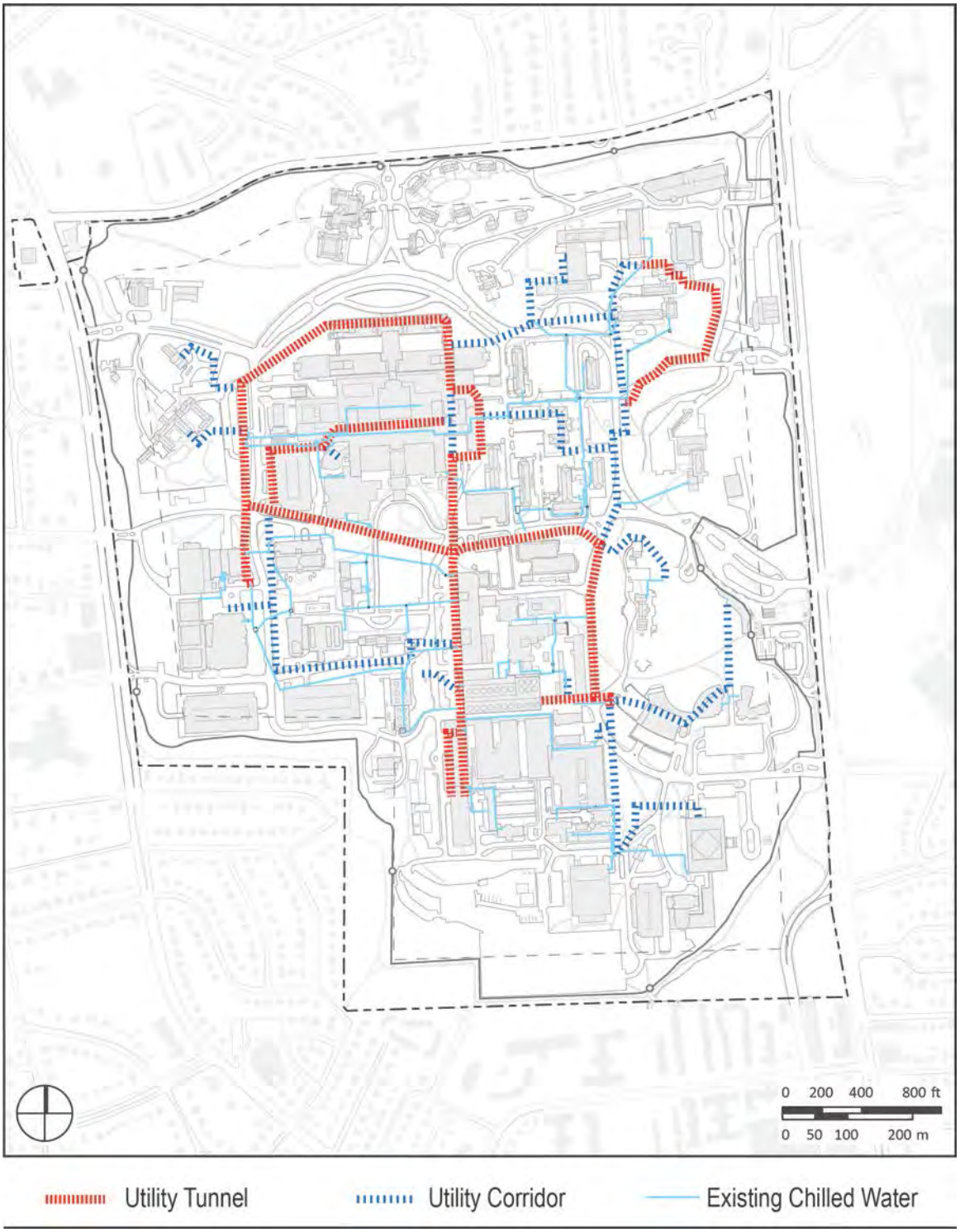


Exhibit 3-3: Campus Diagram – Chilled Water Utility Tunnels

3.6.3 Electric Power

3.6.3.1 *Electrical Power Supply and Distribution*

The NIH Bethesda campus receives power from the Potomac Electric Power Company (PEPCO) via three PEPCO substations. PEPCO Substation 80 is located in Building 17 to the northwest of the Rockville Pike/South Drive intersection. Primary distribution to the substation is via four 35 kilovolt (KV) lines from Rockville Pike. PEPCO equipment in substation 80 includes one 30,000 kilovolt-amp (KVA) transformer, two 20,000 KVA transformers, one 10,000 KVA transformer, and related switchgear.

PEPCO Substation 167 is located in Building 46 on the southwest side of the campus. It is served by three 35 KV lines, extending from Old Georgetown Road, that supply three 20,000 KVA transformers.

The third substation, NIH North substation in Building 63 was completed in 2002, and equipment installed in 2003. This substation is wholly owned and operated by NIH. The purpose of the station is to not only providing needed additional capacity, but also to increase service reliability. The substation has space for three 30,000 KVA, 35/13.8 KV transformers. Only two of the transformers were installed initially. These are dedicated to NIH service. The 60,000 KVA additional capacity would increase the total capacity of the three campus substations to 200,000 KVA and the allocated NIH capacity to approximately169, 000 KVA. The installation includes a new satellite switching station in Building 59. The substation went into service in 2005.

The total capacities of Substations 80 and 167 are 80,000 KVA and 60,000 KVA, respectively, for a combined capacity of 140,000 KVA. Capacity is shared with customers other than NIH. Substation 80, supplies power to the Walter Reed National Military Medical Center and to one non-government outgoing 15 KV feeders to the Bethesda area. Substation 167 supplies the Uniformed Services University of the Health Sciences and the Medical Center subway station as well as NIH. The capacities available to NIH, 70,000 KVA at Substation 80 (Building 17) and 39,000 KVA at Substation 167 (Building 46), are set by a NIH-PEPCO service contract.

Buildings 17 and 46 are joint PEPCO-NIH use substations. PEPCO owns the buildings, the 20,000 KVA transformers and some related 15 KV switchgear. NIH owns and operates 15 KV main breakers, tie breakers, and feeder breakers that protect the internal campus 15 KV cable distribution system that feeds spot networks in different NIH buildings. Both substations have an interior wall that separates PEPCO switchgear and facilities from NIH switchgear and facilities. The interconnecting electric bus through the common wall belongs to PEPCO.

NIH identifies their facilities in Building 17 as the East NIH Substation, and those in Building 46 as the West NIH Substation. NIH has extended the East NIH Substation switchgear to a satellite station in Building 45 (NIH East Satellite Substation) via a cable extension from the East NIH Substation switchgear bus.

PEPCO Substation 121 via PEPCO Substation 6 feeds the East and West NIH substations in Buildings 17 and 46, although one feeder to Building 46 is routed directly from Substation 121. Substation 121 is fed by three independent power sources interconnected to four distribution busses, and it is considered to have high operational reliability. However, the existing lines between the station and NIH through Bethesda are overhead and subject to potential storm damage and outages. The North Substation is fed underground directly from PEPCO Substation 121 by a route totally separate from existing routes, providing redundancy.

PEPCO Energy Services Inc. and NIH have installed an electric power cogeneration (COGEN) unit in Building 11. The COGEN unit is composed of a turbine, boiler, and auxiliary support equipment. The natural gas fired turbine has a nominal gross capacity of 23 Megawatts (MW) (23,000 KW), and would generate about 19.6 MW of net electric power, when internal loads and operational efficiency are accounted.

The hot exhaust gases from the turbine pass through Boiler 6 to recover heat prior to release in the plant stack. The heat recovered generates 107,000 pph of steam. The turbine and boiler operates in an on-off mode. Supplemental direct firing of Boiler 6 would provide a capability to produce an additional 73,000 pph of steam, if needed on a temporary basis.

PEPCO Energy Service, Inc. would operate the COGEN for ten years starting in 2004. NIH takeover is projected to occur in 2014. NIH purchases the electricity produced during this period. Power produced is sent via a 15 KV underground cable to the West NIH Substation in Building 46. NIH payments for the electricity produced are credited toward the purchase of the COGEN plant. Previous economic analysis completed for the project indicates that it would save NIH about $5.5 million annually in power costs when it owns the unit.

The East NIH Substation serves 43 buildings in a service area north of South Drive and east of Service Drive West. At the East NIH Substation, all PEPCO and NIH switchgear was replaced in 1991 with new 750 MVA rated vacuum breakers. The West NIH Substation covers 12 buildings in the southwest sector of the campus. Both substations provide power to the Clinical Center Complex. Power is fed to clusters of buildings directly or via satellite switching substations. The East NIH Substation supplies the power plant, Building 11. Three transformers in Building 11 convert 13.8 KV to 2.4 KV for large motor loads. Other transformers convert 13.8 KV to 480Y/277 volt or 208Y/120 volt to operate auxiliary and pumping equipment and for house current. Building 34, the Auxiliary Chiller Plant, is served from the West NIH Substation. A few small buildings around the campus receive power directly from the PEPCO system rather than through the campus substations.

All internal campus distribution lines and electrical equipment are owned by NIH and operated by its personnel. The general layout of the campus electrical power distribution is shown in Exhibit 3-4. Primary distribution is made at 13.8 KV direct to all campus buildings where it is converted to the building's utilization voltage, which may be either 277Y/480 or 120Y/208 volts, three phase, four wire systems. This primary campus distribution system consists of 21 miles of

13.8 KV cables, 150 manholes and interconnecting underground ducts, and six electrical equipment vaults.

NIH is subject to load curtailments during periods of high regional electric power usage. For example, NIH experienced three curtailments in the summer of 1999. In return for reducing campus loads temporarily on request from PEPCO, NIH receives a discount on purchase costs. NIH Bethesda power usage is to be collected and analyzed in the ongoing 2013 MUP effort in order to revise this section of the EIS with current data.

NIH demand increases in the summer due to power requirements to drive the chillers in the Central Refrigeration Plant (0.86 KW/ton). Chilled water generation accounts for 50 to 60 percent of the total campus demand when the outdoor temperature is 90 degrees F or above. Overall campus electric power demands have increased steadily by 32 percent between 1992 and 2003. Maximum demand for each month is recorded on PEPCO billings. The campus-wide recorded maximum demand was about 88,000 kilowatts (KW) in 2010, according to the PEPCO study 50 percent submission in 2011. The annual maximum power demand generally corresponds with maximum or peak chilled water production. While there are wide diurnal fluctuations in demands, it is estimated that building demands are relatively consistent from workday to workday.

Exhibit 3-4: Campus Diagram – Electrical Duct Distribution

3.6.3.2 *Emergency Electric Power*

Emergency power is defined as backup electric power that is needed quickly when the normal means of supply is interrupted or lost. Emergency power requirements are divided into two general levels.

- Level 1 service requires replacement of electric power with an alternate source within ten seconds of loss. It is divided into two categories: life support and critical. Examples of demands within Level 1 service include fire alarms, firewater pumps, emergency lighting, hospital patient care, and support such as life support equipment, surgery room power and lighting, intensive care spaces, and critical laboratory equipment.
- Level 2 Alternate source power at Level 2 service can be replaced within intervals greater than ten seconds. Examples include heating, ventilation, and restart of refrigerators or freezers holding temperature sensitive biomaterial or stored Medical Pathological Waste (MPW) awaiting pickup and disposal.

Currently, there are 63 permanently installed generators and seven portable trailer-mounted generators, which provide backup electric power to emergency and essential loads throughout the campus. There are 55 emergency diesel generator units on the campus, 7 natural gas generators, and one steam driven generator with a total fixed capacity of 52,050 kW. In addition there are 7 portable generators with a total capacity of 1,540 kW. This generator inventory information is from the PEPCO report of 2011.

Three 1,500 kW units were installed in a central emergency generator plant in Building 59A which replaced two smaller units in Building 11. The three new units supply power to Building 10 and the central steam and chilled water plants in Building 11. Five additional generators at Building 10 with a combined capacity of 2,635 kW supplement the Building 59A facility and serve individual functions within Buildings 10 and 10A. Emergency power generators at the Building 14 and 28 animal care complex support the entire building demand (2,005 kW or about seven watts per gross square foot (w/gsf)).

In older buildings on the campus, backup or emergency power is generally limited to critical loads. Emergency power at Buildings 31 and 38 support only emergency lighting (0.25 w/gsf). Supported loads or demands in older laboratories varies considerably from building to building, but averages about four watts per gross square foot.

Recently developed emergency power design criteria for hospital and research space account for increased loads per unit of space. Demands have increased due to the increased use of electronic equipment and personal computers. Industry trends indicate these demands would grow further over the next decade. Recent construction at NIH reflects this trend. Backup or emergency power is supplied for greater portions of the entire building load or demand. Building 45, an office building, has a 1,000 kW generator capable of supplying emergency power at 4

w/gsf. Laboratory Building 49 and 50 are serviced at 6 w/gsf, and Building 40 would be serviced at 5.5 w/gsf when Phase II is built.

3.6.4 Water Distribution

The Washington Suburban Sanitary Commission (WSSC) supplies water to NIH. The WSSC transmission and distribution grid surrounds NIH. WSSC maintains 12 inch and 24-inch diameter mains under Old Georgetown Road and a 24-inch main under West Cedar Lane. The water main along Rockville Pike is 12 inches in diameter between West Cedar Lane and South Drive, and 8 inches in diameter to the south. Service pressures in the area are established at the Alta Vista standpipe and tank located on the north side of West Cedar Lane about 300 feet to the east of Old Georgetown Road and across the street from NIH. The system head or pressure elevation is 495 feet. Area mains are fed by water from the WSSC Patuxent and Potomac Water Filtration Plants. NIH receives water at seven metered locations around the campus:

- 8 inch line at Rockville Pike and Woodmont Avenue,
- 8 inch line north of South Drive at Rockville Pike,
- 12 inch line at West Cedar Lane and Crest Drive,
- 12 inch line at West Cedar Lane and West Drive,
- 10 inch line at West Cedar Lane and West Drive,
- 16 inch line at Old Georgetown Road and South Drive, and
- 10-inch line via Roosevelt Street in Edgewood/Glenwood.

Internally, a grid network of 16 inch, 12 inch, 10 inch, 8 inch, and 6 inch water mains owned and operated by NIH serves the campus. The grid forms 14 separate squares or loops which surround individual clusters or blocks of buildings. An 8-inch main serves the southern periphery of the campus and 6-inch diameter main services the residential area on the north side of the campus. Service lines to all buildings except the residences range from 4 to 8 inches in diameter. Since 1995, NIH has cleaned and restored the campus distribution system, returning it to the original capacity. Building service lines have also been upgraded or increased in size.

Based on WSSC meter readings at the seven water service entrances to the campus, the average water usage at NIH Bethesda in 2011 and 2012 was approximately 2.37 million gallons per day (MGD). The maximum month water usage in 2011 and 2013 was 3.41 MGD. Campus-Wide domestic water usage between 8:00 am and 4:00 pm on weekdays is generally around 1,000 gallons per minute (GPM). On the evenings and weekends the average domestic flow decreases to roughly 400 GPM. During the summer months, flows increase significantly due to

cooling loads. Fire flows at NIH are 1,250 gpm for buildings with an additional 500 gpm for site building density in accordance with the National Fire Protection Association Code.

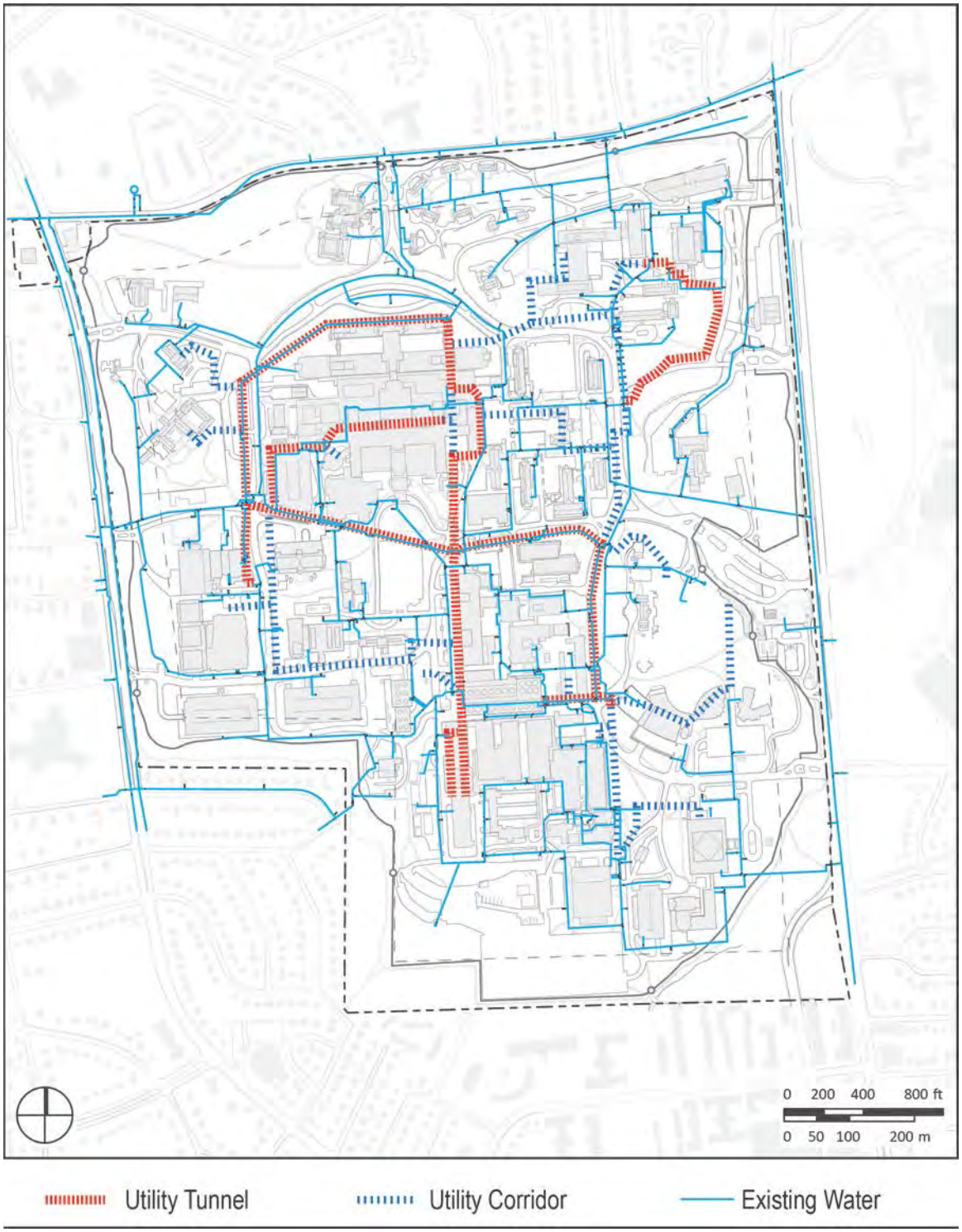


Exhibit 3-5: Campus Diagram – Water Main Distribution

3.6.5 Sanitary Sewer

NIH is in the Washington Suburban Sanitary Commission (WSSC) sanitary sewer service area. WSSC maintains an 8 to 12 inch diameter sanitary main under Old Georgetown Road that ultimately connects to a collection system to the west of the campus. An 8 inch main runs under most of the length of West Cedar Lane on the north side of the campus. This line carries an estimated 80,000 gallons per day of sanitary waste from sources outside NIH campus, primarily the Maplewood residential neighborhood. WSSC maintains a 6 inch sanitary sewer line within Rockville Pike (MD Route 355) originating at the NIH Visitors Center.

WSSC also operates and maintains short sections of sanitary mains within the NIH campus at four locations. The first of these is in the northeast corner of the campus where the main NIH sanitary system serves all but a few buildings and connects to WSSC and NIH manholes 4 and 23 (Exhibit 3-6). WSSC maintains two short sections of main between the NIH manholes and WSSC lines under Cedar Lane.

The WSSC system expands to two parallel mains, 15 and 18 inches in diameter downstream from the NIH outfall. These mains combine with one another on the east of Rockville Pike to form a main that follows the NIH Stream to a connection with the Rock Creek Trunk sewer. The WSSC 15 and 18 inch lines are not interconnected. Flows from NIH are roughly equalized between the two WSSC mains by separate connections to each, and an interconnection between NIH manholes 2 and 4. Manhole 2 is located on a separate 8 inch main serving the National Walter Reed National Military Medical Center (WRNMMC).

The second WSSC main crosses the southeast corner of the campus following the Stony Creek stream valley. It is 18 inches in diameter as it crosses the campus, but increases to 21 inches in size at Woodmont Avenue. This main serves most of the Woodmont Triangle of the Bethesda Central Business District CBD as well as residential areas to the southwest of Old Georgetown Road before entering the campus. It proceeds to the east after crossing Woodmont Avenue, collecting sanitary waste from the bulk of the WRNMMC as well as the Uniformed Services University of the Health Sciences (USUHS) and East Bethesda. The WSSC main paralleling Stony Creek follows that stream to Rock Creek about 0.5 miles to the east of the campus.

The third WSSC line on campus drains the Glenwood neighborhood to the southwest. It enters the campus at the east end of Roosevelt Street as an 8 inch main. The main connects to the NIH system near the southwest corner of Building 11. The last WSSC main on campus is a short section serving the Cloisters, Building 60, which connects to a WSSC Line under Old Georgetown Road.

The main NIH sanitary system can be divided, in general, into two separate collection networks that join one another in the northeast corner of the campus. The north network drains most of the old and new Clinical Centers and all the campus buildings north of Center Drive and the administrative area. The southern branch of this northern network is 15 inches in diameter

between Building 10 and West Cedar Lane, and the northern branch primarily serves non-research type buildings (Building 15A-K, the fire station and the Children's Inn).

The south network drains most of the remainder of the campus and divides into three principal branches. One serves the laboratories on the west side of the campus; the second follows the original course of the NIH Stream valley to Edgewood/Glenwood, while the third extends south to Building 41.

An 8 inch sanitary main from the National Walter Reed National Military Medical Center joins the south network near East Drive. Buildings 38, 38A, and 46 are serviced separately by short, direct, and independent connections to surrounding WSSC mains that flow to the Stony Creek main. Buildings 1 through 9 are serviced by a small lateral system that connects to the southern network.

As part of the campus utility infrastructure modernization program, NIH constructed a sanitary wastewater monitoring station in the northeast corner of the campus. The station is a small underground structure that would facilitate access for obtaining monitoring samples.

Wastewater in the Rock Creek trunk sewer is ultimately routed to the Blue Plains Wastewater Treatment Plant operated by the D.C. Water and Sewer Authority. The Blue Plains plant treats approximately 370 million gallons of wastewater per day. Discharges from the plant to the Potomac River must meet the National Pollutant Discharge Elimination System (NPDES) permit requirements established by the U.S. EPA. The Plant NPDES permit contains the most stringent effluent discharge requirements of any plan of its size.

NIH wastewater discharges must meet the pollutant concentration limits established by WSSC Discharge Authorization Permit No. 05967 (Table 3-16). The limits are those for a standard industrial discharger modified to meet more stringent criteria for discharges to the Blue Plains Wastewater Treatment Plant. Sanitary effluent is sampled once every four days at the NIH sanitary system discharge points with results reported to WSSC semiannually as is applicable for all industrial discharges under the NPDES program. The effluent sampling points monitor sanitary discharges from all campus sources such as Building 11 and 21, the Clinical Center, and all laboratories as well as normal human waste. Most laboratories have separate acid waste drains to holding tanks. These wastes are not sent to the sanitary system; but disposed of in containers through the hazardous waste collection and treatment system (See Section 5).

The total toxic organic (TTO) permit limit is a cumulative one, i.e. the combined concentration of about 125 U.S. EPA designated priority chemicals cannot exceed 2.13 mg/l. Over the years, monitored concentration, have been consistently far below permit limits. In 1999, NIH implemented a Toxic Organic Management Plan (TOMP) to further reduce releases of TTOs to the sanitary system. WSSC has exempted NIH from reporting TTO monitoring results unless monitored TTO concentrations exceed 1.07 mg/l, and it has not been necessary to do so since 1999.

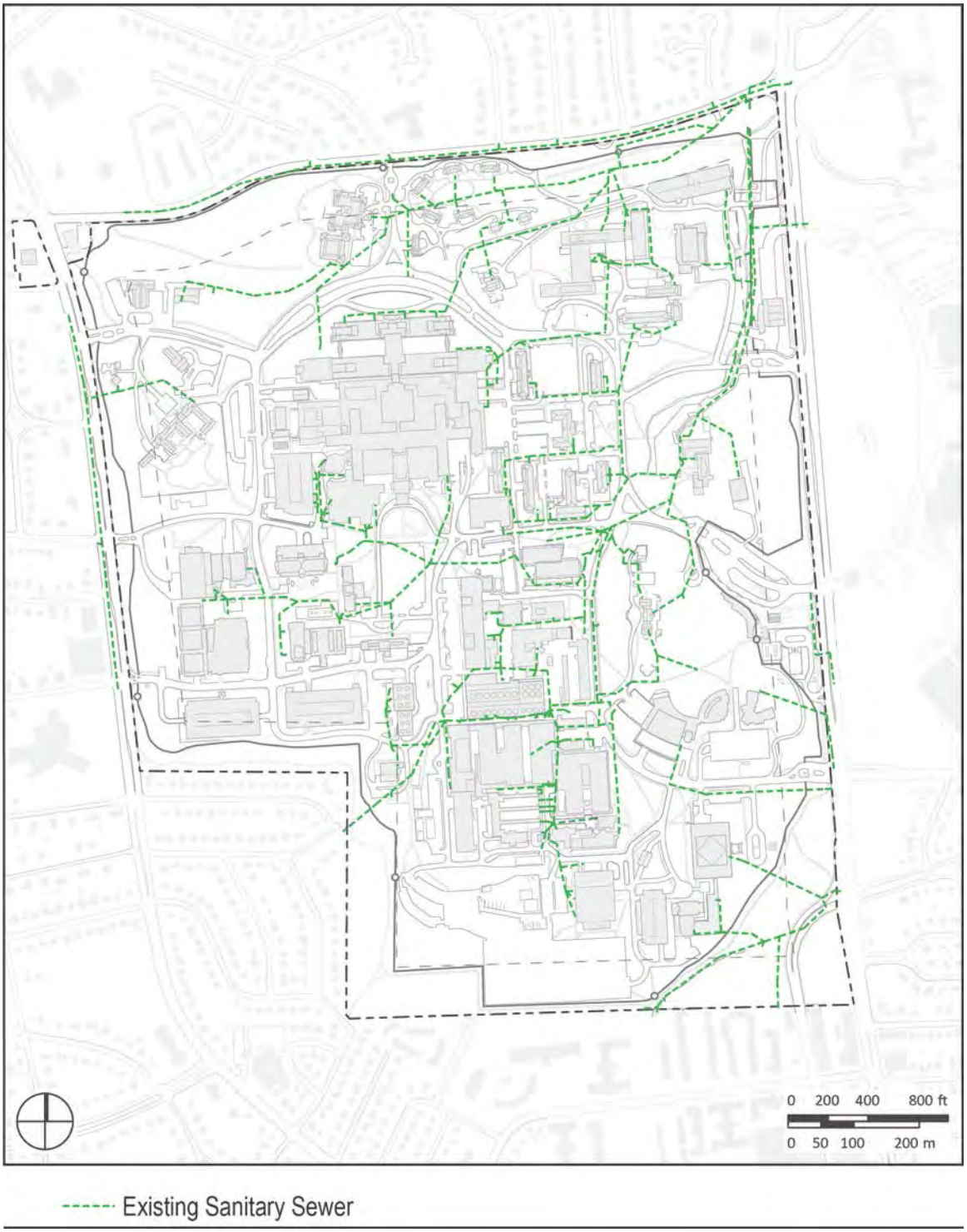


Exhibit 3-6: Campus Diagram – Sanitary Sewer Distribution

Table 3-16: WSSC Discharge Limits for NIH Sanitary Wastewater

Pollutant	Daily Max (mg/l)	NIH Self-Monitoring Required
Cadmium (Cd) (total)	0.07	Yes, Blue Plains Limit
Chromium (Cr) (total)	7.0	Yes
Copper (Cu) (total)	2.0	Yes, Blue Plains Limit
Cyanide (CN) (total)	1.3	Yes
Lead (Pb) (total)	0.4	Yes
Mercury (Hg) (total)	.001*	No
Arsenic(As) (total)	0.23*	No
Molybdenum (Mo) (total)	0.89*	No
PCBs	Non-detect*	No
Nickel (Ni) (total)	2.2	Yes
Silver (Ag) (total)	1.2	Yes
Zinc (Zn) (total)	3.4	Yes
Total Toxic Organics	2.13	See Section 3.6.3.2
Dissolved Solids	1,500	No
Suspended Solids	400	No
Total Solids	1,900	No
Biological Oxygen Demand	300	No
Fats, Oils, Greases	100	No
pH	6.0 to 10.0 Units	Yes
Chemical Oxygen Demand	500	No
Temperature	500	No

Note: Mercury, arsenic, molybdenum, and PCBs are monitored for presence by Washington Suburban Sanitary Commission (WSSC).

3.6.5.1 *Storm Drainage*

The Bethesda Campus consists of three major drainage divides, the NIH Stream, the North Branch and the Stony Creek. With the exception of a 32 acre section in the southeast corner of the campus and a 5 acre section along Old Georgetown Road, all of the NIH topography drains to the northeast toward the West Cedar Lane/Rockville Pike intersection (Exhibit 3-7). The drainage area upstream from this point is 455 acres including 57 acres in the Edgewood/Glenwood neighborhood to the southwest of the campus, 55 acres north of West Cedar Lane in Maplewood, and 25 acres east of NIH along Rockville Pike and on the Walter Reed Naval Military Medical Center property (See Table 3-17).

All storm drainage systems on the campus are owned and maintained by NIH. The main collection system has a trunk line interceptor that follows the original NIH Stream course. It enters the campus at the east end of Roosevelt Street after draining Edgewood/Glenwood as a 42 inch line and crosses the campus in a northeasterly direction, passing under existing Buildings 12B and 13, for a distance of approximately 2,350 feet. It progressively increases in diameter until it exits to daylight to the northeast of the South Drive/Center Drive intersection as a 96 inch pipe. It carries the flow of the NIH Stream during wet weather. Three other tributary drainage networks connect to the interceptor as it crosses the campus. A 12 inch to 36 inch line drains the southern area of the campus; an 18 inch to 36 inch line follows Lincoln Drive in the southwestern area; and a 12 inch to 48 inch line drains the laboratory area on the western side of the campus.

The second drainage (North Branch) area covers the northern sector of the campus. The dry channel of the North Branch of the NIH Stream is the main drainage stem for this area. Flows occur in the branch only during wet weather. The branch flows in a 48 inch diameter culvert under the residential area between West and Zelkova Drives. Elsewhere it is confined to a concrete-lined channel as it crosses the campus. Campus drainage occurs via overland flow, and through small individual collection networks serving building roofs as well as street and parking lot inlets. Storm water drainage from West Cedar Lane and the western two thirds of Maplewood also flows to the channel by direct pipe connections.

The third drainage shed is independent of the other two, covering the southeast corner of the campus. Most drainage is overland. A small storm drain network collects flows from the vicinity of Buildings 38, 38A, and MLP-7, and directs them to a storm water pond to the southeast of these structures.

In general, the campus storm drain systems are in good condition and adequately serve present conditions. In older areas of the campus developed prior to about 1965, drainage laterals from individual building downspouts and road inlets are often only 10 to 12 inches in diameter.

Table 3-17: NIH Impervious Surface Inventory and Projected Ultimate Conditions

Description	North Branch	NIH Stream	Booze Creek	Stony Creek	NIH Total
Existing Site Area by Drainage Area (Acres)	61.4	212.4	5.2	31.5	310.5
Baseline Buildings (Acres)	4.5	39.0	0.1	4.0	47.6
Baseline Roads (Acres)	15.8	48.2	0.3	1.0	7.4
Baseline Sidewalks (Acres)	1.6	4.8	0.0	1.0	7.4
Total Existing Baseline Impervious	21.9	92.0	.04	14.9	129.2
Additional ISMP Build Out Development(Acres)	9.0	27.0	2.0	5.0	43.0
Total Ultimate ISMP Impervious	31.1	118.6	2.4	19.5	171.7

Note: Table includes adjustments for post-Clinical Research Center (CRC) conditions

Exhibit 3-7: Campus Diagram – Storm Sewer Distribution

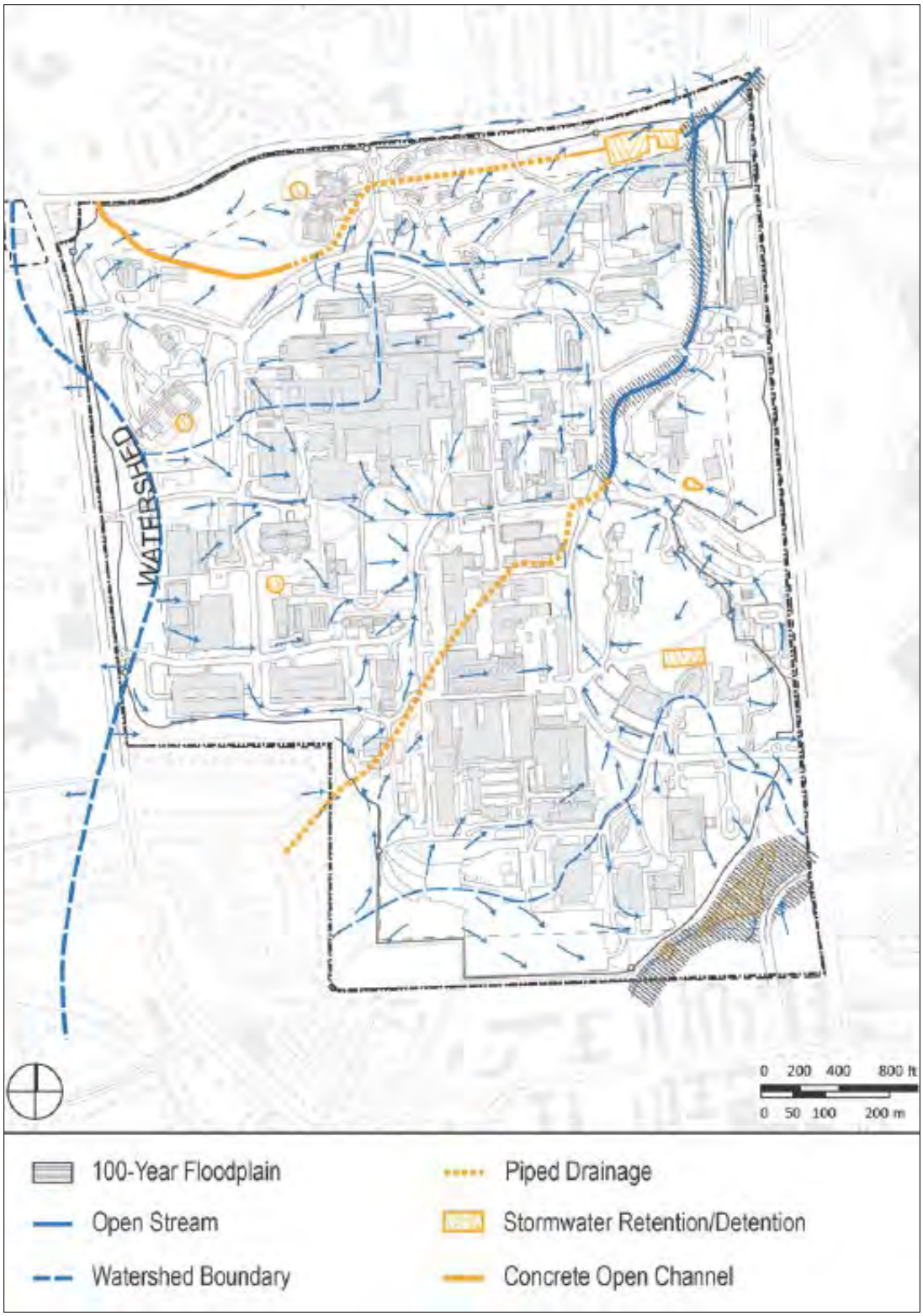


Exhibit 3-8: Campus Diagram – Storm water Management Distribution

3.6.5.2 *Stormwater Management Regulations*

Regulatory management of storm water has been delegated by the U.S. EPA to local jurisdictions, in this case the Maryland Department of the Environment (MDE). Federal projects must follow the requirements of the Maryland Storm water Management Guidelines for state and federal government projects, MDE, April 15, 2010, and state regulations given in COMAR 26.17.02.

On April 24, 2007, Governor Martin O'Malley signed the *Storm water Management Act of 2007*, which became effective on October 1, 2007. Prior to this Act, environmental site design (ESD) was encouraged through a series of credits found in Maryland's Storm water Design Manual. The Act requires that ESD, through the use of nonstructural best management practices and other better site design techniques, be implemented to the maximum extent practicable.

The purpose of these guidelines is to protect, maintain and enhance the public health, safety, and general welfare by establishing minimum requirements and procedures to reduce the adverse impacts associated with increased storm water runoff. The goal is to manage storm water by using environmental site design (ESD) to the maximum extent practicable (MEP) to reduce stream channel erosion, pollution, siltation, sedimentation, and local flooding, and to use appropriate structural best management practices (BMPs) only when necessary. This would restore, enhance, and maintain the chemical, physical, and biological integrity of streams, minimize damage to public and private property, and reduce the impacts of land development.

The Annotated Code of Maryland, Environment Article, Title 4, Subtitle 2 and the Storm water Management Regulations, COMAR 26.17.02.01 through 26.17.02.12 contain the provisions of these guidelines. These guidelines supplement the 2000 Maryland Storm water Design Manual and all subsequent revisions. They provide the minimum storm water management requirements for plans submitted by state and federal government agencies to the Maryland Department of the Environment (MDE), for review and approval. These guidelines do not affect the validity of any portion of either the Environment Article or COMAR and apply to all new and redevelopment projects.

In addition to MDE requirements, all federal government projects must follow Section 438 of the Energy Independence and Security Act of 2007 (EISA). Section 438 of EISA instructs federal agencies to "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," for any project with a footprint that exceeds 5,000 square feet.

The EPA developed the "Technical Guidance on Implementing the Storm water Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act," December 2009. The purpose of this document is to provide technical guidance and background information to assist federal agencies in implementing EISA Section 438. Each

agency or department is responsible for ensuring compliance with EISA Section 438. The document contains guidance on how compliance with Section 438 is achieved, measured and/or evaluated.

3.6.5.3 *Storm water Management on Campus*

Management of storm water at NIH Bethesda presents complex issues. Factors impacting potential management include four separate stream watersheds, storm drain and stream hydraulics, limited space available for potential storm water management (SWM) facilities, and concentration of development in the NIH Stream watershed. NIH Bethesda is also different from normal residential and commercial development. It is dynamic with construction and demolition almost continuously underway, which results in continually changing management requirements.

Discussions between NIH and MDE have concluded that NIH can meet the MDE SWM requirements through development and implementation of a NIH Bethesda Institutional Storm water Management Plan (ISMP). The NIH has prepared a Draft ISMP, which has been submitted, to MDE for review. The ISMP has been developed on storm water management on a campus wide or “regional” basis. This offers several advantages. It significantly reduces the complexity of the factors involved. Site wide facilities are more cost effective than smaller facilities serving individual buildings. Site wide evaluation of impacts and management is more realistic. It permits increases in imperviousness in one area to be balanced or offset by decreases in imperviousness in another.

For the purpose of storm water management in the ISMP, “existing” campus conditions are defined as those present just prior to the start of construction of the Hatfield Clinical Research Center. This baseline status was established at the design level for a proposed 1995 Master Plan Site SWM Facility that was included as an element in the Hatfield CRC project. The Hatfield SWM facility has been subsequently superseded by ISMP proposals. The “existing” campus impervious area is calculated as 129.2 acres, or 41.8 percent of the total campus.

The Montgomery County Department of Environmental Protection (MCDEP) conducted a study of the Stony Creek watershed to assess conditions and make recommendations for returning Stony Creek flows to predevelopment conditions (Regional SWM Facility, Continuation of SWM Study for WRNMMC, A. Morton Thomas and Associates, Inc., 1998). The study determined that existing management facilities upstream in the Woodmont Triangle, and downstream on WRNMMC, were in good condition, but they provided only partial quantity control. Downstream facilities on WRNMMC could provide suitable quality control. The most beneficial SWM best management practice for the watershed would be a regional facility in the southeast corner of the campus. This South Pond is currently under construction (November 2012) with estimated completion in 2013.

The County Storm water Management Facility, or South Pond, has four elements. The first is an underground screening facility to trap trash and sediments. Access would be provided through the roof for clean out and maintenance. Runoff would then flow into a small fore bay water pool, about 60 feet in diameter, where settlement of suspended material would occur. Outfall from the fore bay pool would then flow into the main pool, which would be one acre in extent under dry weather conditions. A second trash collection facility would be located at the Woodmont Avenue outfall. The pools would have water depths up to 5 or 6 feet in the center. The main pool would have a 12 foot wide “bench” around the perimeter, where water depths would be less than a foot, for planting hydrophilic species. Montgomery County requires fencing around all wet ponds greater than two feet in depth.

The total drainage area upstream from Woodmont Avenue is 219 acres. For county purposes, the facility would serve as a quantity control facility. For example, it would reduce the one-year recurrence interval storm peak outflows through the twin 66 inch culverts under Woodmont Avenue from 219.5 cubic feet per second (cfs) to an estimated 45 cfs (NIH South Pond Design, A. Morton Thomas Assoc., 2006), and provides a channel protection storage volume of 5.52 acre-feet. The Pond would be capable of storing a six-month storm, and quantitative management for 68 percent of the flow in a one-year storm.

The facility would also provide 4.61 acre-feet of Water Quality Volume (WQv) storage for NIH. The wet pool of the main pond would contain 2.98 acre-feet of WQv at a water surface elevation of 300 feet elevation above sea level. Extended Detention of the one-year storm runoff between the 300.0 and 301.5 pool elevations above sea level would achieve water quality storage of the remaining 1.63 acre-feet of expected water runoff.

NIH and the county have signed a Memorandum of Understanding (MOU) for storm water wherein NIH would grant an easement for the project, provided that certain conditions are met and issues are satisfactorily resolved. Monitoring and maintenance of the facility would be the responsibility of the county. Response to emergencies such as upstream pollutant spills would be handled jointly by the county and NIH through procedures to be given further definition as the project progresses. Additionally, the NIH has previously restored the NIH Stream to its “natural condition.” Work included bank stabilization, placement of rocks and riprap in a natural way, creation of micro pools, and planting of native species within and alongside the stream. Flow velocity attenuators were installed on storm drains, which outfall directly to the stream. The NIH Stream restoration project also included the installation of six storm water runoff quality treatment or storage facilities at strategic locations around the campus. Either a bio retention or sand filter facilities was installed. The estimated MDE WQv for these facilities combined is 0.96 acre-feet. This WQv is not included in the campus storm water management total.

A Storm water Management Facility is located at the north of the site and serves the North Branch storm network. Drainage is conveyed in a piped network to the facility located in the parking lot north of Building 31. The facility provides 3.14 acre-ft of storage volume and

discharges into the main NIH channel at the northeast corner of the site. The facility provides both storm water management quality and quantity for the North Branch storm network.

Several smaller storm water management facilities are located throughout the NIH campus and provided localized storm water management treatment. Although these facilities are on a smaller scale than the underground detention facility discussed in the paragraph above, each facility still provides quality and quantity treatment for the related drainage areas. A new Phase II National Pollution Discharge Elimination Systems (NPDES) permit for federal, state, and small municipality storm water discharge systems went into effect in January 2005. Requirements include six measures: (1) Public outreach and education, (2) Public involvement and education, (3) Illicit discharge detection and elimination, (4) Construction site runoff controls, (5) Post-construction runoff controls, and (6) Pollution prevention and good housekeeping. NIH has filed a Notice of Intent to obtain a Phase II NPDES permit for the Bethesda campus.

3.6.6 Communications

Outside communication lines reach NIH via Verizon subsurface lines in Rockville Pike. Internal lines on the campus are owned and maintained by NIH. Communication lines on campus are routed through a complex network of 4 inch diameter conduits, as shown in Exhibit 3-9. Conduits are generally located under or immediately adjacent to the existing street grid. Conduits also carry the NIH fire alarm, security, and internal campus communication networks.

Exhibit 3-9: Campus Diagram – Communication Signal Duct Distribution

3.6.7 Natural Gas, Fuel Oil and Gasoline

Natural gas is supplied to NIH by Washington Gas (WG) mains running under Old Georgetown Road and West Cedar Lane. Washington Gas maintains 8 inch and 12 inch high-pressure (HP) (200 pound force per square inch (psig)) mains in Old Georgetown Road. Two 8 inch service mains branch from these mains and enter NIH at a Washington Gas pressure regulating station in the southwest corner of the campus along Old Georgetown Road. One of these 8 inch service mains, installed in 1992, supplies 100 pound force per square inch (psig) natural gas to the power plant for boiler fuel. The other 8 inch main closely follows the southern boundary of the campus along the buffer area to Rockville Pike, which it subsequently crosses to supply gas to the Walter Reed National Military Medical Center. The natural gas distribution system layout is shown in the following Exhibit 3-10.

A 6 inch service main from West Cedar Lane supplies: low-pressure gas (15 psig) to 38 campus buildings through a distribution system ranging from 3/8 inch to 6 inch size lines. There are about 15,000 linear feet of gas lines on the campus. Two to 4 inch service lines branch from the mains to individual buildings. Gas lines on the campus are owned and operated by WG, although many smaller building service lines are owned and operated by NIH. More than 99 percent of campus natural gas demand is for generation of steam in Building 11. Boilers 1 through 5 have dual natural gas and No. 2 distillate fuel oil burners. The fuel for the COGEN turbine generator is natural gas only, although the duct burners on the exhaust are dual fuel (gas and oil). The gas for the COGEN is provided by the gas utility contractually as “Firm” so that the COGEN is not subject to curtailment of gas in the winter like the balance of the boilers. The estimated existing and projected Master Plan Alternative peak demand is provided in Section 2, Table 2-1.

Previous analysis in 2005 indicated that the existing NIH line between the Washington Gas system and Building 11 to the campus is capable of delivering approximately 700,000 cubic feet per hour (cf/hr). Estimated potential peak natural gas demand currently exceeds this physical capacity. Further analysis would be performed in the ongoing 2013 MUP.

NIH is one of many customers served by the Washington Gas distribution mains outside the campus. Since NIH can use oil as an alternative fuel supply, Washington Gas can curtail natural gas service to NIH. During the winter, when Washington Gas demands are high, NIH may have to reduce or eliminate its use of natural gas. Curtailment is the prerogative of Washington Gas under the service contract, and generally occurs when the average daily temperature is below about 27 degrees F. NIH operated exclusively on oil during three periods totaling 38 days while under curtailment in January and February 2003. Therefore, as a practical matter, natural gas delivery to NIH is usually curtailed before the 700,000 cf/hr-campus line capacity is reached.

Maximization of natural gas as a boiler fuel is important to NIH for controlling boiler stack emissions and maintaining operations within operating permit limits. Burning fuel oil generates more NOx emissions per pound of steam produced than natural gas. For example, Boilers 1

through 5 currently produce about 2.6 times more NOx when firing on fuel oil than when on natural gas, for a given amount of steam generation. NOx compounds are precursors for generation of ground level ozone. The Washington Metropolitan Area Air Quality Control Region has been classified by the U.S. EPA as being in "severe" to “moderate” non-attainment for ozone, i.e. regional ozone levels do not meet the Federal Ambient Air Quality Standards.

Regional measures for reaching NOx attainment have been identified. It is not certain whether these measures would be sufficient or not. Regardless, the potential for reduction of emissions from all sources, stationary and mobile, is a goal for NIH.

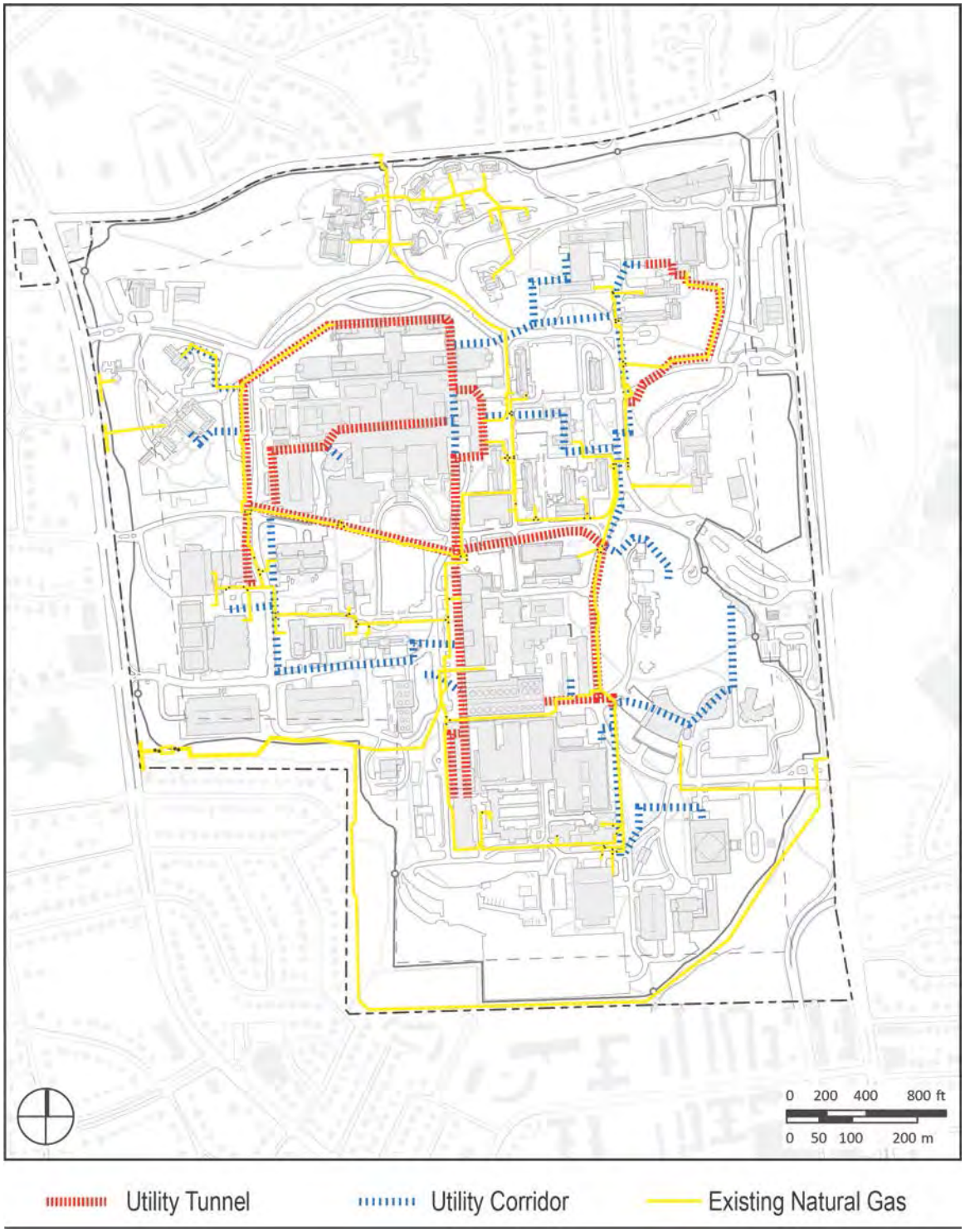


Exhibit 3-10: Campus Diagram – Natural Gas Distribution

3.6.8 Compressed Air

Central compressed air at 125 psig is delivered to the Clinical Center and other facilities, serves the process needs of the facilities and provides the motive force for operating duct dampers in some building HVAC systems. The distribution north of the central plant is through pipes in the steam/chilled water tunnel running between the power plant and the Clinical Center shown in Exhibit 3-11. This line extends to Building 6. A branch main and network services the laboratories on the west side of the campus. A second branch network services laboratories, animal care spaces and Building 38 to the south of the plant. Delivery pressures are approximately 110 psi at the buildings. Compressed air is critical to the operation of the central utilities plant and a compressor is dedicated to this load to maintain plant operation in the event that the process air compressors are out of service.

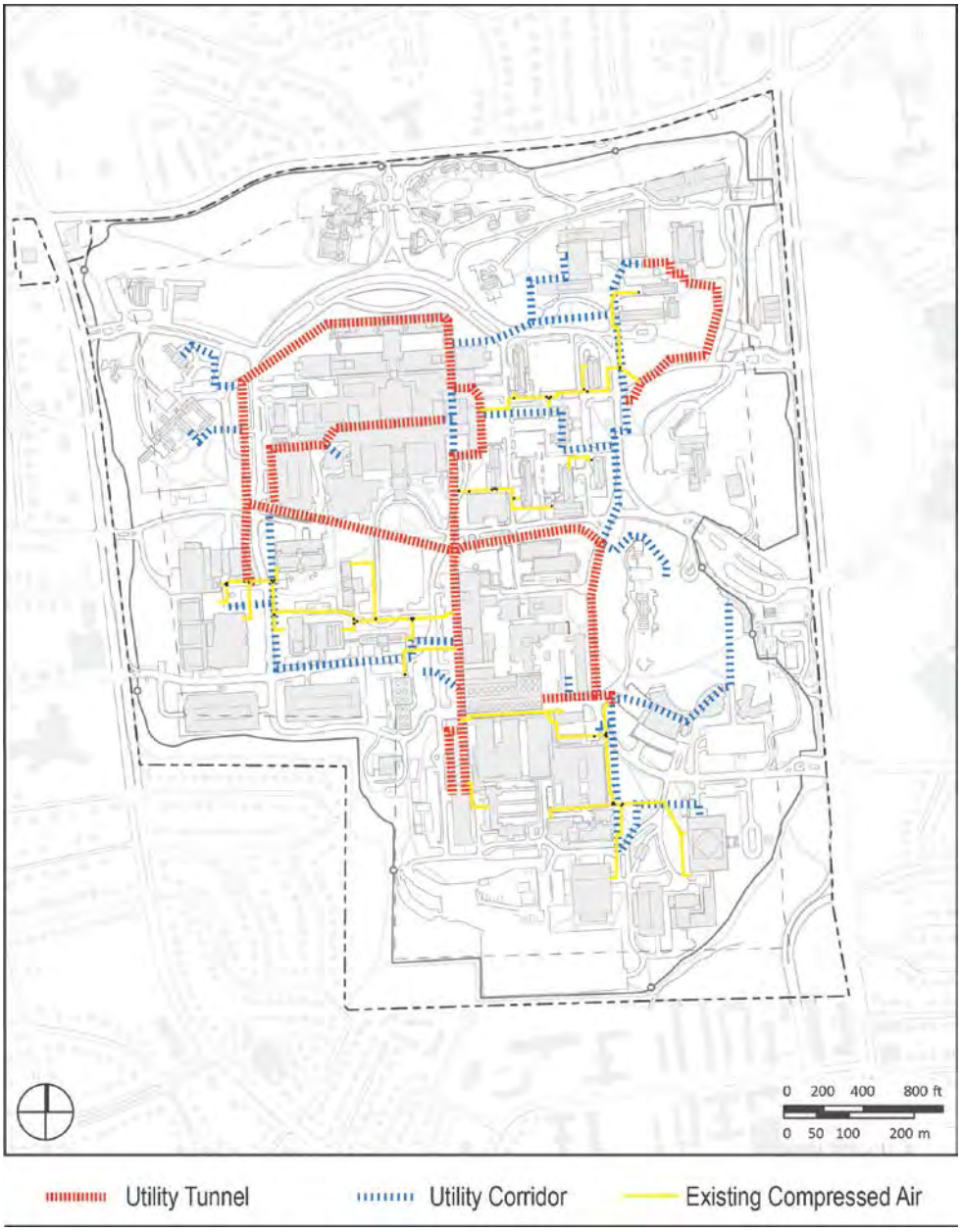


Exhibit 3-11: Campus Diagram – Compressed Air Distribution

3.6.9 Energy

Executive Order 13514, issued on October 5, 2009, set sustainability goals for Federal agencies and focuses on making improvements in their environmental, energy, and economic performance. The Executive Order requires agencies to submit a 2020 greenhouse gas pollution reduction target within 90 days, and to increase energy efficiency, reduce fleet petroleum consumption, conserve water, reduce waste, support sustainable communities, and

leverage federal purchasing power to promote environmentally-responsible products and technologies.

The Executive Order has established a number of goals: 30% reduction in vehicle fleet petroleum use by 2020; 26% improvement in water efficiency by 2020; 50% recycling and waste diversion by 2015; 95% of all applicable contracts will meet sustainability requirements; implementation of the 2030 net-zero-energy building requirement; implement of storm water provisions of the Energy Independence and Security Act of 2007, section 438, and development of guidance for sustainable federal building locations. In January 2010, President Obama announced Federal Government-wide greenhouse gas emission reduction targets for 2020 from 2008 levels of 28% of direct emissions, such as those from fuels and building energy use, and of 13% of indirect emissions, such as those from employee commuting and business travel. Greenhouse gases include carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4), and halogenated fluorocarbons (HFC).

Agencies shall undertake cost-effective projects in which source energy decreases even if site energy use increases. Agencies shall reduce petroleum use by switching to natural gas and renewable energy sources, or other methods. Overall energy consumption at NIH Bethesda would unavoidably increase under all alternatives due to projected overall growth in building space. The projected growth, including existing building areas is shown in Table 3-18, below.

Table 3-18: NIH Areas by Use Classification Existing and Proposed GSF

Case	Clinical Research Building 10 (gsf)	Total Research Space (gsf)	Total Space (gsf)	Percent of Research Space each Alternative
Proposed Action	4,438,619	8,555,238	15,248,639	71.9
No Action Alternative	4,438,619	7,397,717	12,623,473	69.7
Maximum Development Alternative	4,438,619	8,247,453	17,611,674	61.9

Research space includes laboratories, animal holdings facilities, and the clinical research hospital for energy use purposes. Research spaces have much higher utility and subsequent energy demands per unit of space than other types of space used for administration and support. Steam, chilled water, and electric power are the three primary energy related utilities. Table 3-19 below compares the projected energy use by gross square foot factor for utility function classification.

Table 3-19: NIH Projected Energy Use by Utility Function Classification

Utility	Clinical Research Center Building 10 (gsf)	Research/Laboratory	General/Office
Steam	4,438,619	0.1818 pph/gsf	0.0933 pph/gsf
Chilled Water	4,438,619	90 gsf/ton (0111 kW/gsf)	152 gsf/ton (.0065 ton/gsf)
Electric Power	4,438,619	.0111 kW/gsf	0.00616 kW/gsf

High ventilation rates severely reduce the cost effectiveness of many conventional energy conservation measures, particularly those involving the transport of energy through the building envelope. The air circulating through a research building is resident only for 3 or 4 minutes, when the exchange rates are 15 to 20 per hour. It is evident that many conservation measures would be only one-third as effective when applied to research space as they would be applied to other space types, if the respective air change rates were 15 and 5 per hour. Under weather extremes, the amount of energy need to heat or cool accumulated air from outdoor ambient temperatures to interior levels dwarfs that passing through the building envelope in research space. Conservation measures must be evaluated in this context.

The above implies that the most cost effective life cycle energy conservation measures are those that are applied to the airflow, i.e. where it is heated and cooled, or where energy that would normally be exhausted is recovered for use. It is in this area where NIH has concentrated its efforts and would continue to do so.

The current chillers require approximately 0.85 kW/ton (32 percent less energy than older chillers). The peak chilled water demand in 2010 was about 57,000 tons. Demand is projected to grow to about 71,000 tons in Proposed Action of the Master Plan build out conditions.

Installation of the PEPCO NIH COGEN unit, which includes NIH heat recovery steam generator, has had several benefits that satisfy Federal Executive Order goals. The Executive Order encourages use of alternative financing mechanisms, including energy savings and performance contracts, particularly those with “no net cost to taxpayers.” The NIH PEPCO contract to build and operate the COGEN unit meets these conditions through performance clauses. NIH would pay for the facility over ten years, ending in 2014, by receiving monetary credits for the electricity generated, eliminating the need for federal government funding for the project.

The Executive Order also notes that federal government agencies shall consider combined cooling, heating, and power facilities when upgrading and assessing facility needs. The COGEN unit at NIH would combine all three when the chillers are steam driven. The COGEN unit, in effect, uses “free” energy that would normally be wasted if steam generation were not present

where power was generated. Hot gases from the combustion of natural gas are used to drive a turbine that would generate about 21.6 megawatts of electricity. Exhausted heat that would otherwise be sent into the atmosphere is recovered and used a second time to generate over 107,000 pounds per hour of steam before it is released up the stack. Supplemental firing of burners into the turbine exhaust when desired would allow NIH to generate up to 180,000 pounds per hour. On an annual basis, the steam produced by the COGEN system satisfies about half of the existing demand.

The electric power produced in the COGEN unit would conserve off site source energy. Electric power is lost in the transmission through a distribution system; electric resistance in the transmission lines converts power to heat. The greater the distance traveled the greater the line losses. Power companies may have to generate three or four watts to deliver one watt to the customer. Power generated by the NIH PEPCO unit would be routed to the nearby PEPCO substation in Building 46, where it can be distributed to NIH and other connected customers. Transmission line losses would essentially be eliminated. Transmission distances are measured in feet instead of miles.

Similarly, the NIH central plant is capable of running three chillers with a combined capacity of 15,000 tons with dual electric/steam drives. Using the Steam drive eliminates about 0.6 kW/ton of electric power demand for chilled water generation. If the units are run at capacity, about 885 MW as measured on site, are saved. As noted above, the energy needed to generate this power at off-site sources and deliver it to the campus would be still greater. This type of steam driven chiller operation is practical when campus steam demand is at low levels (summer months). NIH has also installed free cooling heat exchangers to produce chilled water during the winter. The exchangers use outdoor air to cool the returned chilled water.

Since 1992, NIH has successively switched from fuel oils to cleaner burning natural gas as the primary boiler fuel. Natural gas has significantly lower pollutant emission rates per unit of energy consumed than oil or coal. Emissions at NIH have been reduced further by the boiler modernization program, which was implemented in the interim. Measures included the installation of economizers to preheat combustion air and low nitrogen oxides emitting burners. Boilers 1 through 3 also have oversized combustion chambers with high heat transfer rates between the boiler firing and steam sides. Less fuel is needed to generate a pound of steam than that in conventional boilers.

The resultant reductions in greenhouse gas emissions are dramatic. The 1992 MUP estimated that the 1990 NIH power plant emissions for nitrogen oxides and volatile organic compounds (VOC) were 324 and 4.4 tons per year. The two pollutants combine with sunlight as a catalyst to form low atmospheric level ozone. The corresponding 2001 annual emissions are estimated to be 61 and 1.4 tons, respectively, equivalent to reductions of 81 and 68 percent in 1990 emission levels. Although sulfur dioxide is not a greenhouse gas, the above boiler modernization improvements would reduce annual emissions.

In the future, further reductions per unit of energy consumed would occur, if NIH installed a boiler with high efficiency units. Such units emit nitrogen oxides at a per energy unit consumed rate that is approximately half that of conventional boilers. Still further greenhouse gas reductions would be experienced indirectly with double effect. NIH uses low pollutant emitting natural gas as its primary fuel for generating site steam, and electricity in the COGEN unit. Most of the power produced by public utilities and private suppliers is generated using coal, the fossil fuel with the highest uncontrolled stack emission rates. Substitution of onsite energy sources for power is cleaner, and has no additional fuel consumption or consequent emissions, which would be part of the delivery of an outside source power to compensate for transmission losses.

The lowest emission rates for steam production would be obtained by the use of additional Cogeneration units instead of additional boilers. As previously described Cogeneration produces steam from the waste heat produced by an electrical generator powered by natural gas. This result is a net reduction in coal burned to produce electrical power and a reduction in conventional boiler emissions.

In accordance with the Executive Order, NIH is preparing a Draft Strategic Energy Conservation Plan. The plan identifies additional measures that NIH can take to conserve energy use and lower concomitant emissions. Individual measures are judged for life cycle cost effectiveness in each application. The measures can be generally categorized as follows.

- Matching energy delivery to demands more closely; they may be applied building wide or to individual spaces. Measures include state-of-the-art equipment or systems that permit variance in airflow or the energy it contains. These systems are coupled to, and quickly respond to, sensors and monitoring conditions.
- Innovative technologies - NIH already has installed an energy recovery heat wheel in the Building 50 laboratory. The wheel transfers heat from building air exhausts to supply air streams, it is estimated that the device would reduce peak heating demands by 40 percent. Another innovative concept involves using the steam distribution system to generate electric power sufficient for individual building needs. Steam is driven through the distribution system under pressure. The pressure is reduced at individual buildings for use by passing it through pressure reducing valves. Substitution of small turbines or generators for the values would accomplish the same reduction. However, about 400 kW of power could be generated using the turbines.
- High efficiency lighting that is tied to programmable controls that allow adjustment of intensity, or automatically shut off lighting depending on space occupancy or night setback schedule. Greater emphasis is given to limiting lighting to work stations and where needed, and maximizing the use of natural light through fenestration.
- Chilled Water Distribution System Improvements - Chilled Water produced in the central plant is released to the distribution system at 42 degrees F. It returns from individual

buildings at about 52 degrees F, a 10 degrees difference. The 1992 MUP and its update recommend increasing the temperature to 18 degrees F. Raising the temperature increases the amount of heat a fixed amount of chilled water can transport. With a greater amount of heat carried, the distribution system pipe, pumps, and equipment do not need to be enlarged to increase system capacity. All new central plant and building systems are installed in accordance with the 18 degrees increase design criteria. Full realization of benefits would require retrofitting older buildings.

- Installation of Chilled Water Storage system to allow for production of chilled water during off peak electrical cost hours (nighttime) to reduce overall electrical power consumption.
- Installation of added cogeneration systems to increase steam production and emergency electrical power capacity.
- Sub-metering of steam, chilled water, and electric power that the building level to monitor demands, and evaluate energy conservation measures.
- Replacement of existing central plant computer control systems with modern state of the art steam and chilled water control and monitoring systems.

3.7 TRANSPORTATION AND TRAFFIC

3.7.1 Road Network

The National Institutes of Health is located in Bethesda, Maryland (Montgomery County), south/southeast of the Capital Beltway (I-495) and I-270 spur, which forms the major corridors for east-west and north-south regional traffic movements. The campus boundaries are Old Georgetown Road (MD Route 187) to the west, Rockville Pike (MD Route 355) to the east and Cedar Lane to the north. Residential neighborhoods and the Bethesda Central Business District (CBD) are to the south of the campus.

The network and classification of the roadway system providing access to NIH is defined in the 1990 approved and adopted Master Plan for the Bethesda-Chevy Chase area as follows:

3.7.1.1 *The Capital Beltway - Interstate Highway (I-495)*

This road is classified as the freeway circulating the Nation’s Capital with a varying number of lanes and varying width. This road provides interchange access to Maryland Route 355 and Maryland Route 187 just north of the NIH where the majority of access points into the campus are located. This Interstate Highway carries the bulk of the traffic passing through the Washington region. The Capital Beltway experiences congestion during the peak periods.

3.7.1.2 *Wisconsin Avenue/Rockville Pike - Maryland Route 355 (MD 355)*

Wisconsin Avenue or Rockville Pike is a divided roadway with up to six lanes and classified as a major highway with the recommended right of way of 120 feet. This road provides north-south access from Washington, D.C. to Frederick, Maryland. Wisconsin Avenue/Rockville Pike is in a major development corridor that includes access to areas such as Friendship Heights, Bethesda CBD, NIH, National Walter Reed National Military Medical Center (WRNMMC), City of Rockville, City of Gaithersburg, Clarksburg, and areas in Frederick County. This roadway also provides access to other major transportation corridors and facilities such as the Capital Beltway connecting to I-95 and I-270 and other major north-south arteries.

Parallel to the road, the Metro red line provides high-speed transit from Shady Grove to the NIH campus and beyond extending to the rest of the D.C. metropolitan region. The Medical Center Station is situated midway along the eastern access points of the NIH campus. This station carries a large number of passengers destined for the NIH and WRNMMC campuses.

MD Route 355 provides direct access to the NIH campus at five locations. These access points are designated to accommodate employees, large delivery trucks, and visitors. The South Drive access point, located at the Metro station, also provides access to a large fleet of metro bus and Ride-On buses bringing passengers to and from the station and the NIH campus.

Rockville Pike is heavily traveled in the vicinity of the NIH campus. During the AM peak period, the southbound peak direction of traffic is causing congestion at the major intersections. This situation is replicated in the PM northbound peak direction. This congestion is primarily due to commuters traveling through this area between Washington, D.C. and the suburbs in the northern part of Montgomery County and beyond. Through traffic is the majority of traffic congestion experienced near the NIH campus. In fact, NIH has established a Transportation Management Plan (TMP) that has reduced the non-auto driver mode share to approximately 50 percent. This program would be discussed later in this report.

3.7.1.3 *Old Georgetown Road - Maryland Route 187 (MD Route 187)*

This road is a six lane divided roadway and is classified as a major highway with the recommended right of way of 120 feet. This road provides north-south access to areas from the Bethesda Central Business District (CBD) to the City of Rockville. It is connected to the Capital Beltway (I-495) and I-270, which provides access throughout the region. The NIH campus gains three points of entry from this road. The middle access point, located at South Drive, is currently closed to vehicular traffic but would be available if the results of the safety study currently underway determine that additional access on the east side of campus is needed. The Lincoln Drive access to the campus from MD Route 187 is the busiest point of entry on the west side of the campus for vehicular traffic destined for garages along Lincoln Drive. These locations provide access for pedestrian and bicycle users coming onto the campus. Old Georgetown

Road is a heavily traveled road with the majority of traffic being through traffic as opposed to NIH traffic, which comprises only a small fraction of the total traffic.

3.7.1.4 *West Cedar Lane and Cedar Lane*

This is a two-lane road with a two-way left turn lane in the section between MD Route 355 and MD Route 187. This roadway is widened at MD Route 355 and MD Route 187 to provide multiple lanes in each direction at these two major intersections. It is classified as an arterial, traversing east and west, connecting Old Georgetown Road to Clearbrook Lane on the west side of Chevy Chase View neighborhood just south of the municipality of Kensington. This road provides vehicular access to the NIH campus for patients and families only via West Drive on the north side of the campus. The heaviest traffic congestion occurs at its intersections with MD Route 187 and MD Route 355 during the peak traffic periods.

3.7.1.5 *Jones Bridge Road*

This is a two-lane road classified as an arterial road connecting Rockville Pike to Jones Mill Road. The section of the road between Rockville Pike and Connecticut Avenue (MD Route 185) is classified as an Arterial, and the road between Connecticut Avenue and Jones Mill Road is classified as a Primary Residential street. This is a heavily traveled road connecting residential and employment centers of eastern Montgomery County to the NIH, WRNMMC, and Bethesda area. The Jones Bridge Road intersection with Connecticut Avenue would be under construction in the near future to add lanes and reduce congestion as part of BRAC improvements. The Jones Bridge Road intersection at Rockville Pike forms a four-legged intersection with the Center Drive access point to the NIH campus, which carries a large number of vehicular and pedestrian traffic in and out of the NIH.

3.7.1.6 *Greentree Road*

This is a two-lane road classified as a Primary Residential street traversing west from Old Georgetown Road into large residential neighborhoods west of the NIH. This road is primarily collecting traffic from residential neighborhoods and connecting them to major highways and freeways.

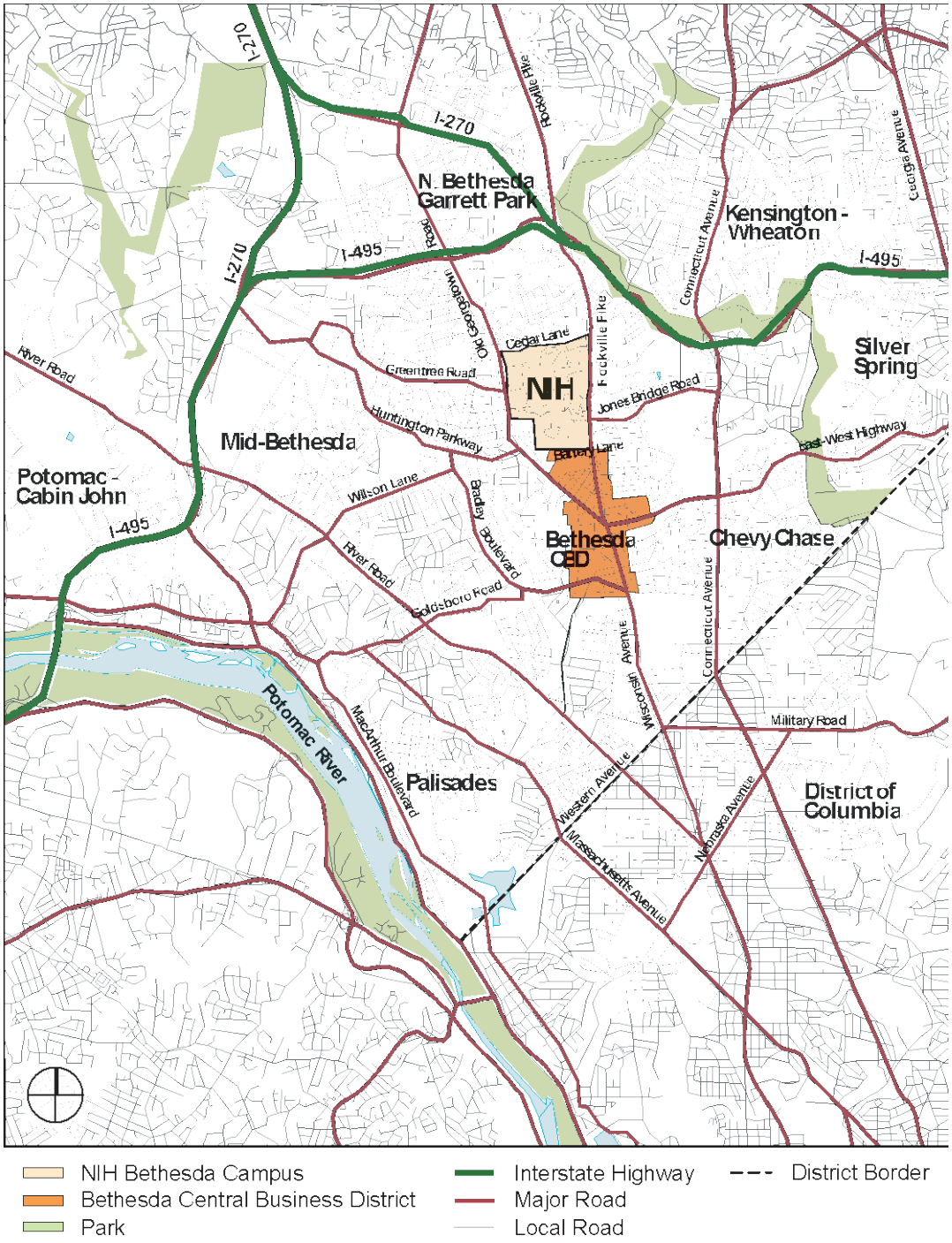


Exhibit 3-12: Map of Roads to NIH Campus – NIH Maps

3.7.2 NIH Access

Until September of 2001 NIH had 11 full access points around the periphery of the campus. Due to security concerns and the federal facility security directive, modifications were made to the campus access to limit access points for employees, visitors, and delivery vehicles. A fence was erected and the number of access points to the campus was reduced to nine (9) with designation of exclusive visitor and delivery vehicle entrances. Prior to these changes, many residents of the neighborhoods on the west side of the campus were able to cross the campus by vehicles, bicycles or on foot to reach the Metro station on campus.

These changes restricted access and cross campus movements. As the result of dialogue between the neighbors and the NIH, a cooperative system of access to the campus was devised to ensure campus safety as well as easy access for residents on foot or bicycle to cross the campus to reach the Metro station or to reach areas east of Rockville Pike.

Employee access was separated from visitor access to facilitate and speed up the entry of the employees into the campus and to reduce the queuing problem at the entry points from the major roadways providing access to the campus. The visitor entrance is located half way between Center Drive and South Drive on Rockville Pike. The visitor entrance provides vehicle inspection and visitor parking adjacent to the visitor security checkpoint. This point of entry provides a right turn in and right turn out only access since the median on Rockville Pike at this point prevents left turns.

Commercial and delivery vehicle entrance and inspection occurs at the Commercial Vehicle Inspection Facility (CVIF). The CVIF, located south of the intersection of West Cedar Lane and Rockville Pike, is serviced by its own dedicated entrance and accesses the campus at North Drive. Commercial vehicles enter the inspection center from Rockville Pike and can exit at other locations.

Other access points include the following:

- West Cedar lane and Locust Avenue/West Drive
- Rockville Pike and Wilson Lane
- Rockville Pike and South Drive
- Rockville Pike and Jones Bridge Road/Center Drive
- Old Georgetown Road and Lincoln Drive
- Old Georgetown Road and Greentree Road/South Drive
- Old Georgetown Road and Center Drive

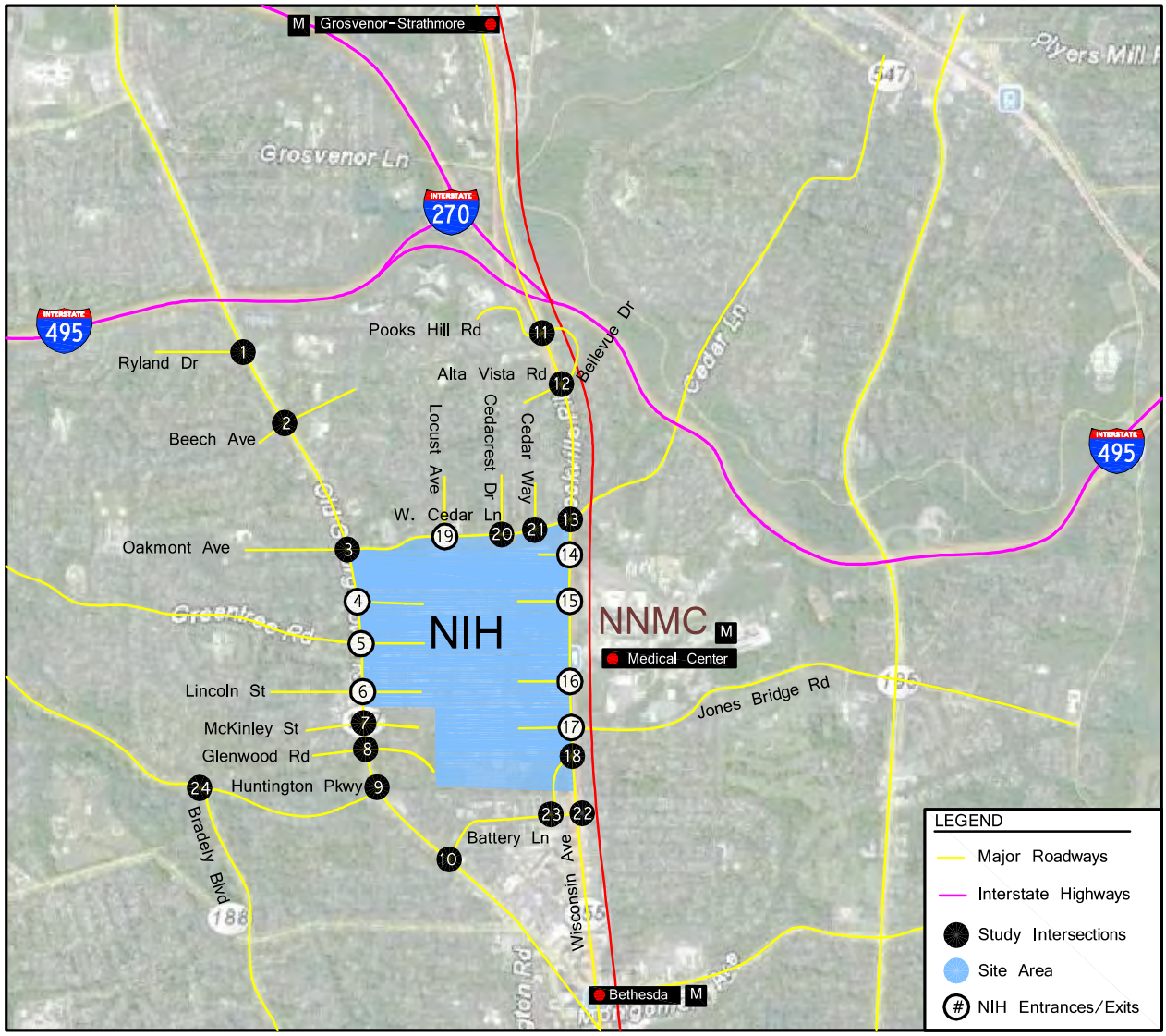


Exhibit 3-13: NIH Campus Entrances

3.7.3 Traffic Safety

The traffic safety assessment in the study area was conducted to determine the overall safety situation for the area as compared to other similar locations in the state. The assessment was made on two bases.

- The traffic accident data for 2008 through 2010 for MD Route 355 (Rockville Pike), MD Route 187 (Old Georgetown Road), Cedar Lane, and Bradley Lane surrounding the NIH campus provided by the Maryland State Highway Administration (SHA).
- The pedestrian and bicycle traffic counts and inventory of facilities that serve them in the surrounding areas.

3.7.3.1 *MD Route 187 (Old Georgetown Road)*

The accident reports reveal that the overall number of accidents along the segment of Old Georgetown road between Battery Lane and I-495 are significantly lower than the statewide average. Fatal accident and injury rates, along with property damage accidents, were also lower than the statewide average.

3.7.3.2 *MD Route 355 (Rockville Pike)*

The area between I-495 and Battery Lane bordering the eastern part of NIH campus revealed that there were no fatal accidents in a three year period compared to a statewide average of 1.2 fatalities in the same period. There was 15 percent higher injury and property damage rates in this area than statewide average accidents. Some of the BRAC improvements planned along MD 355 within this area are expected to enhance the safety at certain intersections, and therefore reduce the number of accidents below the statewide average number of accidents.

3.7.3.3 *MD Route 191 (Bradley Boulevard) at Huntington Parkway*

This area has shown very few accidents during the three-year period. There were two reported accidents involving injuries and one property damage accident. These numbers are significantly lower than similar locations in other parts of Montgomery County or statewide.

3.7.3.4 *Cedar Lane*

The area between MD Route 355 (Rockville Pike) and MD Route 187 (Old Georgetown Road) was analyzed and the results revealed that there were a total of 14 accidents during a three-year period. Of those accidents, nine involved injury and five involved property damage. This road carries heavy traffic, crossing two major roadways at Old Georgetown Road and Rockville Pike, but the number of accidents is significantly lower than similar facilities statewide.

It is the overall conclusion of this accident data analysis that this area, with its planned intersection improvements, including the planned construction of a tunnel connecting the Medical Center metro station to National Walter Reed National Military Medical Center on the east side of MD Route 355, would significantly enhance the safety of vehicular and pedestrian traffic. It is the conclusion of this analysis that no additional safety improvements are needed to remedy the accident situation in the vicinity of the NIH campus. The overall area is experiencing lower than statewide average accidents and future improvements would potentially help reduce the number of accidents and continue to operate better than similar locations in the state of Maryland.

The result of the accident data analysis was compared to statewide averages to determine if this area needs to consider safety improvements (Figure 3-14 and Table 3-20 through Table 3-24). The result of accident data analysis is summarized below.

Table 3-20: Accident Data Summary at Old Georgetown Road (MD-187)

Intersection	Year 2008	Year 2009	Year 2010	Total	Avg./ Yr.	Dominant Type: LT: light, RE: rear end, ANG: angle, SS: side, FO: front, BIKE: Bicycle	Pedestrian Related
I-495 Ramp	4	6	11	21	7.00	LT (8)	0
Ryland Drive	4	4	3	11	3.67	RE (6)	0
Beech Avenue	4	5	5	14	4.67	ANG (4)	1
West Cedar Lane	4	6	5	15	5.00	RE (6)	1
Center Drive	1	3	1	5	1.67	None	0
Greentree Road	1	2	3	6	2.00	SS (3)	0
Lincoln Drive	2	2	2	6	2.00	LT (2), RE (12), ANG (2)	0
McKinley Street	3	3	2	8	2.67	RE (3)	0
Glenwood Road	1	0	2	3	1.00	RE (2), FO (1), ANG (1)	0
Huntington Pkwy	4	4	1	9	3.00	RE (3)	0
Battery Lane	8	3	2	13	4.33	ANG (3)	0
Old Georgetown Road (MD-187) Total	36	38	37	111	37.01	RE	2

Note: State Wide Average per Year is 206.

Table 3-21: Accident Data Summary at Rockville Pike (MD-355)

Intersection	Year 2008	Year 2009	Year 2010	Total	Avg./ Yr.	Dominant Type: LT: light, RE: rear end, ANG: angle, SS: side, FO: front, BIKE: Bicycle	Pedestrian Related
I-495 Ramp	6	6	2	14	4.67	RE (7)	0
Pooks Hill Road	8	4	13	25	8.33	RE (12)	0
Alta Vista Road	8	4	0	12	4.00	RE (6)	0
Elsmere Avenue	4	5	4	13	4.33	RE (7)	0
Locust Hill Road	3	6	3	12	4.00	RE (8)	0
West Cedar Lane	5	15	11	31	10.33	RE (13)	0
North Wood Road	4	3	3	10	3.33	RE (3)	0
Winston Drive	10	5	9	24	8.00	RE (16)	0
South Drive	6	22	12	40	13.33	RE (19)	3
Center Drive	10	7	6	23	7.67	RE (7)	1
Woodmont Avenue	12	11	5	28	9.33	RE (7)	0
Battery Lane	6	6	6	18	6.00	RE (8)	0
Rockville Pike (MD-355) Total	82	94	74	250	83.32	RE	4

Note: State Wide Average per Year is 206.9

Table 3-22: Accident Data Summary at West Cedar Lane

Intersection	Year 2008	Year 2009	Year 2010	Total	Avg./Yr.	Dominant Type: LT: light, RE: rear end, ANG: angle, SS: side, FO: front, BIKE: Bicycle	Pedestrian Related
Old Georgetown Road	0	3	3	6	2.00	BIKE (4)	1
Locust Drive	3	2	2	7	2.33	RE (3)	0
Cedarcrest Drive	0	0	0	0	0.00	0	0
Cedar Way	0	1	0	1	0.33	RE (1)	0
West Cedar LaneTotal	3	6	5	14	4.66	BIKE (4)	1

Table 3-23: Accident Data Summary at Battery Lane

Intersection	**Year 2008**	**Year 2009**	**Year 2010**	**Total**	**Avg./ Yr.**	**Dominant Type: LT: light, RE: rear end, ANG: angle, SS: side, FO: front, BIKE: Bicycle**	**Pedestrian Related**
Wisconsin Avenue	4	1	4	9	3.00	RE (3), SS(3)	0
Woodmont Avenue	2	3	3	8	2.67	ANG (4)	0
Total	6	4	7	17	5.67	None	0
Bradley Boulevard	0	0	0	0	0	None	0
Huntington Parkway	1	1	1	3	1.00	RE (1), FO (1)	0
Battery Lane Total	13	9	15	37	12.34	RE and ANG	0

Table 3-24: Accident Data Summary Grand Total

Roadway	Year 2008	Year 2009	Year 2010	Total	Avg./ Yr.	Dominant Type: LT: light, RE: rear end, ANG: angle, SS: side, FO: front, BIKE: Bicycle	Pedestrian Related
Old Georgetown Road (MD-187) Total	36	38	37	111	37.01	RE	2
Rockville Pike (MD-355) Total	82	94	74	250	83.32	RE	4
West Cedar LaneTotal	3	6	5	14	4.66	BIKE (4)	1
Battery Lane Total	13	9	15	37	12.34	RE and ANG	0
Grand Total	134	147	131	412	137.33		7

Figure 3-14: Study Area Accident History

3.7.4 Pedestrian and Bicycles Resources

Existing pedestrian counts were taken to determine the most pedestrian heavy intersections surrounding NIH (Figure 3-15 and Figure 3-16). An inventory of all sidewalks and crosswalks on roadways surrounding NIH was conducted to assess the current conditions and Americans with Disabilities Act (ADA) compliances of these facilities. Overall, the surrounding sidewalks were found to be in good condition, and the vast majority of crosswalks at intersections complied with the ADA requirements. In addition to sidewalks for pedestrians, the sidewalks along the south side of Jones Bridge Road and Battery Lane were wide enough to accommodate bicyclists as well. Along with the wide sidewalks in these two locations, the Bethesda Trolley Trail accommodates bicyclists along the west side of the NIH campus.

Figure 3-15: Pedestrian Volume Map AM Peak

Medical Center station provides 88 bike racks and 38 bike lockers. These bike facilities are fully utilized during the weekdays and the potential for additional bike stations and bike parking facilities in this area should be explored. As recently as May 2012, the Montgomery County Department of Transportation received a grant to start a bike share program in Bethesda. A bike share program provides short-term bicycle rentals where bicycles can be picked up and returned at any bike share station, thereby allowing one-way trips. The NIH has already embarked on another study and is currently underway to assess and improve the safety of pedestrians and bicyclists on campus. The result of that study and its recommendations could be included in this report for implementation.

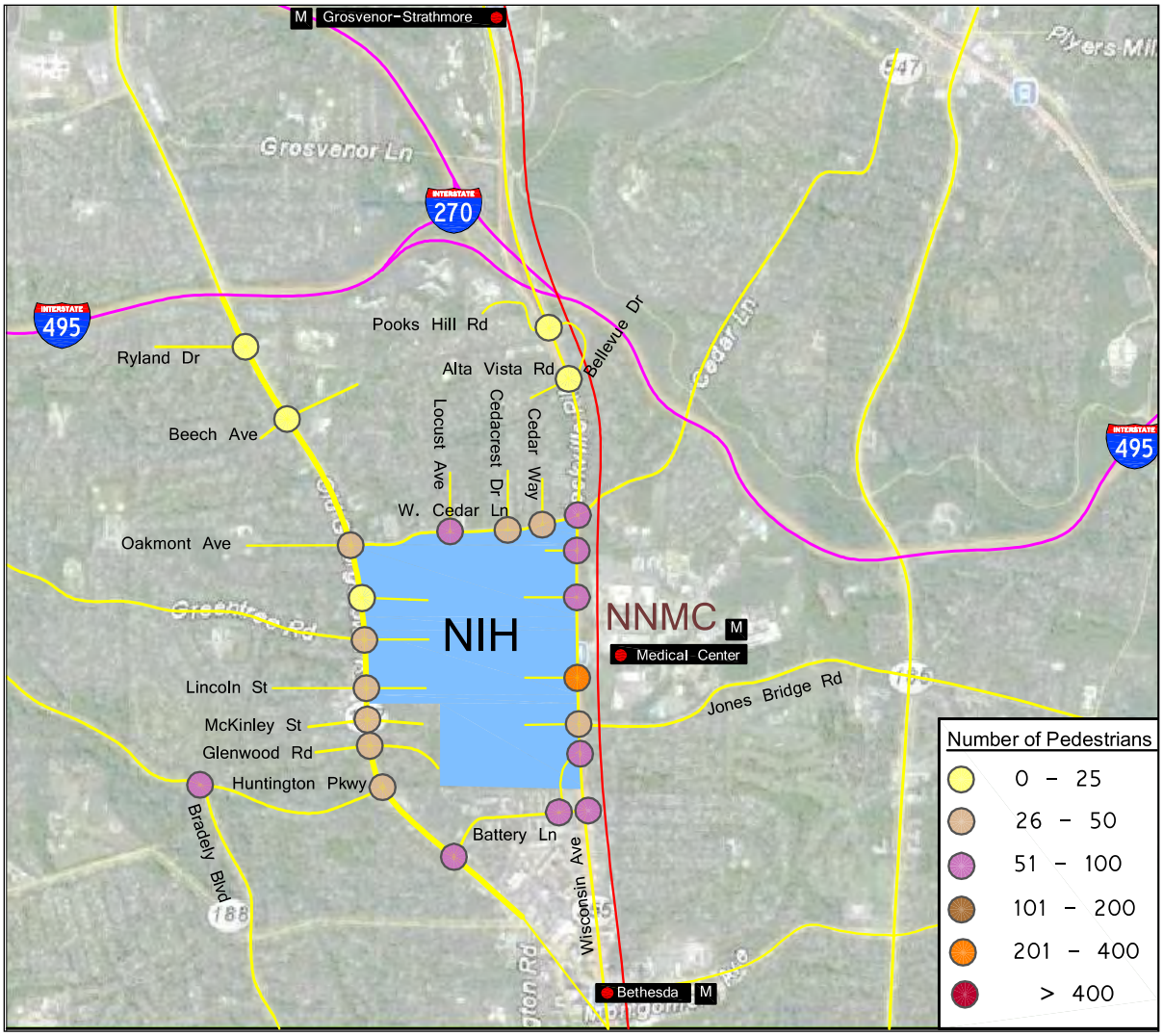


Figure 3-16: Pedestrian Volume Map PM Peak

3.7.5 Public Transportation

NIH is well served by public transportation systems including the Medical Center Metro station that is on the east side of the campus. This metro station serves tens of thousands of employees and visitors to NIH and WRNMMC located on the east side of Rockville Pike opposite of NIH. The 2011 average weekday ridership at this station was 5,866 people, a 5 percent increase over the previous year. This increase is partly due to 2,500 new jobs created by the BRAC program at the WRNMMC site. With additional employees continuing to move to WRNMMC campus, the ridership for metro at this station is expected to increase. The trains operate with 5 minute headways during the weekday peak hours, 12 minute headways during the mid-day hours, and 15 minute headways during the evening hours.

The NIH is served by 10 Metro-bus and Ride-on bus routes on MD Route 355, MD Route 187, Jones Bridge Road and Cedar Lane (Figure 3-17). The Metro bus routes serving the area are as follows:

3.7.5.1 *Metro Bus Services*

J1 – This route operates between Bethesda and Silver Spring during the weekday peak hours with approximately 20 minutes headway.

J2 – This route operates between Bethesda and Silver Spring during the weekday hours of 4:45 AM and 1:20 AM with approximately every 20-30 minutes on weekdays.

J3 – This route operates between Bethesda and Silver Spring during the weekday peak hours with 20 minutes headway.

J7 – This route operates between Gaithersburg and Bethesda during weekday peak hours with approximately 15-20 minutes headway.

J9 – This route operates between Gaithersburg and Bethesda during weekday peak hours with approximately 15-20 minutes headway.

3.7.5.2 *Ride-on Services*

- **70** – This route operates between Germantown and Bethesda during the weekday hours of 5:15 AM and 7:50 PM. This bus is an express bus with approximately 12-15 minutes headway.
- **30** – This route operates between the NIH Medical Center and Bethesda during the weekday hours of 5:40 AM and 9:00 PM with approximately 30 minutes headway.
- **47** – This route operates between city of Rockville and Bethesda during the weekday hours of 5:15 AM and 10:10 PM with approximately 30 minutes headway. This route also

operates on weekends from 7:15 AM to 9:55 PM on Saturdays and 7:45 AM to 8:35 PM on Sundays.

- **46** – This route operates between Shady Grove Metro station and the NIH Medical center during the hours of 4:50 AM to 1:45 AM with approximately 15 minutes headway on weekdays and 30 minutes on weekends.
- **33** – This route operates between Glenmont Metro station and the NIH Medical Center during weekday peak hours with approximately 25 minutes headway.

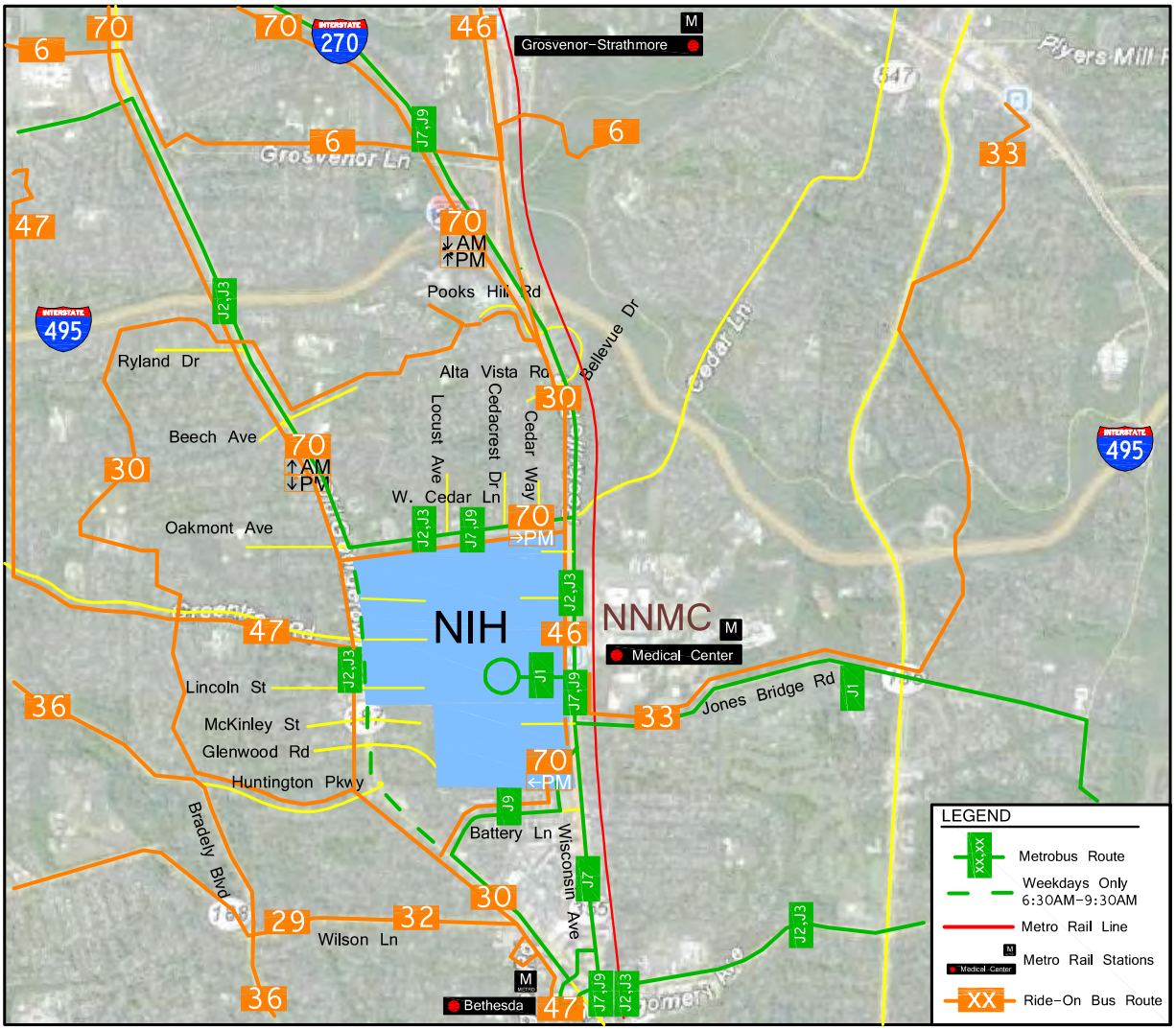


Figure 3-17: Existing Public Mass Transit Service Routes

3.7.5.3 *NIH Shuttle Services*

NIH operates six shuttle bus service routes that link buildings and parking facilities on the NIH campus as well as connecting to three locations outside of the campus at Rockledge Building,

Mid-Pike Plaza, and Executive Plaza in the areas of North Bethesda and Rockville. The shuttles leaving the campus connect employees and visitors to nearby Metrorail stations as well as other employment centers (Figure 3-18) below for NIH Shuttle Routes.

- **Red** – The Red shuttle is an internal route with express stops and the headways of 10-minute intervals. This shuttle runs from 6:30 AM to 6:40 PM
- **Purple** – The Purple shuttle is a limited internal route with express stops and the headways of 21-minute intervals. This shuttle runs from 9:20 AM to 4:20 PM
- **Blue** – The Blue shuttle is a perimeter route with 20 minutes headway. This shuttle runs during peak hours.
- **Green** – The Green shuttle runs from locations within the NIH campus to the Rockledge building. This route has express stops with headways of 25 minutes. This shuttle runs from 6:00 AM to 7:05 PM
- **Yellow** – The Yellow shuttle runs from locations within the NIH to the Mid-Pike Plaza. This route has express stops within the NIH campus with 15 minutes headways. This shuttle runs during weekday peak hours.
- **Orange** – The Orange shuttle runs from locations within the NIH to the Executive Plaza. This route has express stops within the NIH campus with 30 minutes headways. This shuttle runs from 6 AM to 6:30 PM

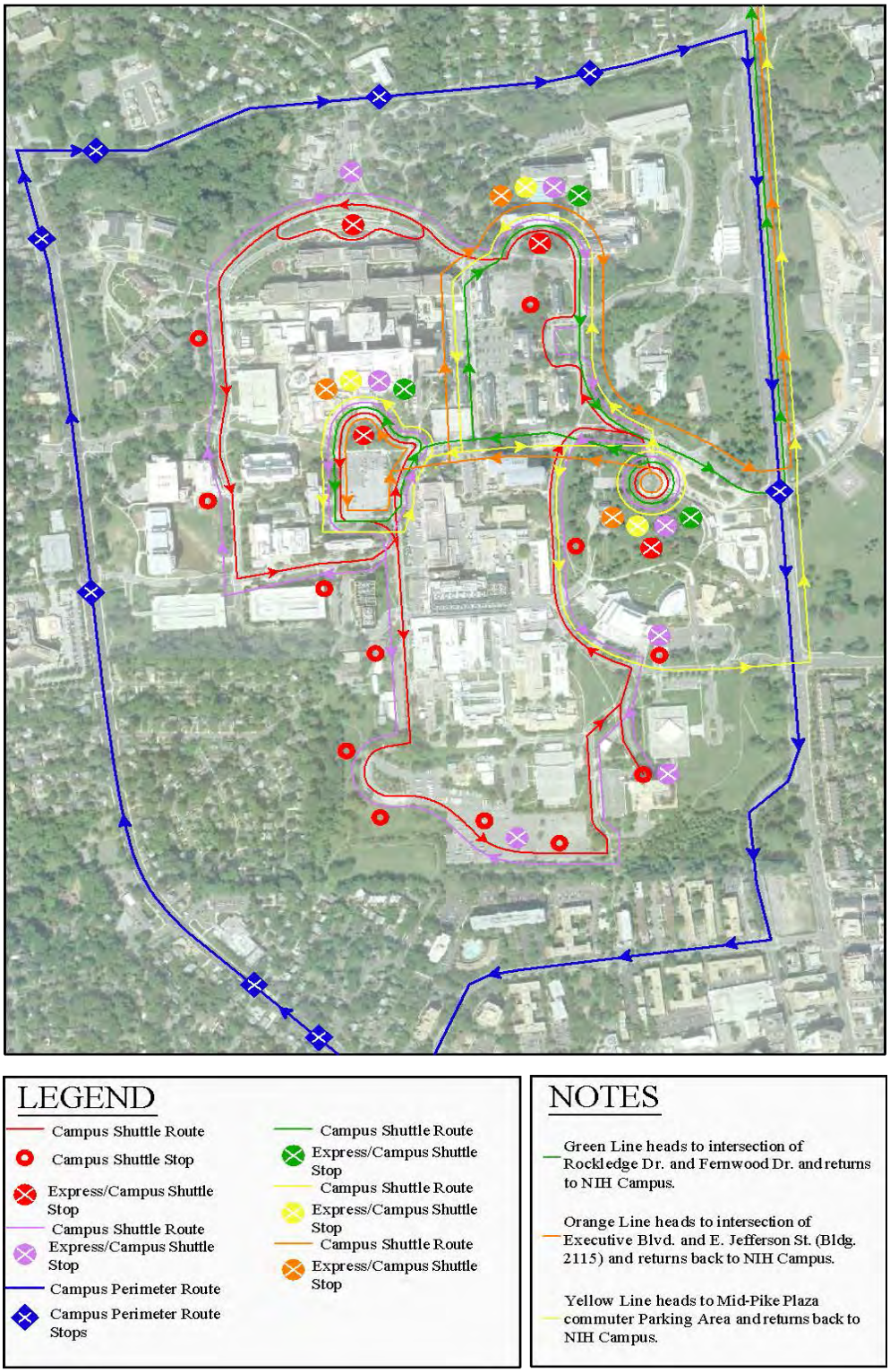


Figure 3-18: NIH Campus Shuttle Routes

3.7.6 Parking Analysis

This section discusses the historical and current employee parking ratios for the NIH campus. As part of the 1992 MOU parking agreement with National Capital Planning Commission (NCPC) NIH is required to periodically assess the need for parking associated with proposed growth, with the intent to reduce future parking demand. This agreement stated that the NIH would not exceed a parking supply ratio of 0.50 spaces per employee.

As part of this assessment, a parking occupancy study was done to determine the current parking ratio on campus. The Office of Research Services has provided the information regarding the existing number of parking spaces, which is totaled at 10,302 spaces. Parking spaces are found in both surface lots and Multi-Level Parking (MLP) garages. Without visitor spaces, the total number of parking spaces is 9,208. This ratio is 0.45, within the 0.50 ratio for the 20,594-campus population.

Twenty-four hour machine counts were conducted on May 31, 2012 at all NIH access points. In addition, a count of all parked cars on campus was conducted before the machine counts began at midnight on May 31, 2012. Table 3-25 illustrates the total vehicles per hour entering and leaving the NIH campus on a typical day. The total number of vehicles parked on campus was 9,744 between 10 and 11 AM, which equates to a 95 percent parking supply usage, resulting in a parking demand ratio of 0.45. Including visitor parking demand, this ratio is comparable to previous studies over the last several years. Table 3-26 depicts the parking supply and demand ratios for the period 2003-2012. This data shows that the parking supply ratio and parking demand ratio are lower than the maximum of 0.50 spaces per employee as established by the 1992 TMP.

Table 3-25: Parking Occupancy Analysis

Time	In Bound Traffic	Out Bound Traffic	Vehicles on Campus
12-1 AM	19	50	701
1-2 AM	19	25	695
2-3 AM	18	23	690
3-4 AM	42	7	725
4-5 AM	243	35	933
5-6 AM	931	72	1,792
6-7 AM	2,037	152	3,677
7-8 AM	1,957	172	5,462
8-9 AM	2,478	229	7,711
9-10 AM	1,871	249	9,333
10-11 AM	754	343	9,744
11-12 AM	402	456	9,690
12-1 PM	584	687	9,587
1-2 PM	528	804	9,311
2-3 PM	421	1,218	8,514
3-4 PM	264	1,517	7,261
4-5 PM	225	2,098	5,388
5-6 PM	195	2,149	3,434
6-7 PM	165	1,209	2,390
7-8 PM	69	433	2,026
8-9 PM	118	343	1,801
9-10 PM	94	182	1,713
10-11 PM	122	188	1,647
11-12 PM	23	91	1,579
Maximum Vehicles	2,478	2,149	9,744

Table 3-26: NIH Parking Utilization

Year	On-Campus Population	Parking Supply	Parking Supply Ratio	Parking Demand Ratio
2002/2003	17,500	8,319	0.48	0.48
2005	17,500	8,304	0.47	0.46
2007	17,800	10,134	0.57	0.43
2008	18,550	10,134	0.55	0.48
2009	18,804	10,134	0.54	0.48
2011 June	19,334	9,971	0.52	0.49
2011 October	23,470	10,002	0.47	0.46
2012 May	20,594	9,208	0.45	0.45

Note: Parking Demand Ratio is the maximum number of parked cars on campus divided by the total number of employees including visitors.

3.7.7 Infrastructure: Transportation Management Plan (TMP)

NIH executed a trilateral memorandum of understanding (MOU) with the National Capital Planning Commission (NCPC) and Maryland-National Capital Park and Planning Commission (M-NCPPC) and implemented s Transportation Management Plan (TMP) on October 4, 1991. The following TMP strategies were adopted and remain in place today:

- Establish an Employee Transportation Service Office to coordinate TMP strategies and promote non-single occupant travel modes by employees
- Continue current guidelines for placing carpool, vanpool, handicapped and visitor parking in close proximity to intended destination of the users
- Implement a transit discount for employees and initiate legislative action to allow parking and transit ticket revenue and/or appropriated funds to be used by NIH to such a program to be self-sustaining
- Improve NIH Campus Shuttle Bus Services
- Implement a comprehensive campus-wide re-signage for vehicles and pedestrians, including a study of internal safety signage and signaling
- Emphasize parking regulation enforcement by an adequately staffed parking enforcement workforce

3.8 CULTURAL URBAN AND SOCIAL RESOURCES

3.8.1 Visual and Aesthetic Effects and Conditions

3.8.1.1 *Visual and Aesthetic Effects*

The visual and aesthetic character of the campus, for purpose of this EIS, considers both external conditions seen by the surrounding community as well as the internal character for campus users. The key exterior elements are the perimeter buffer edge along the surrounding streets, adjacent community areas and the views into the campus as seen from key areas off campus. Interior issues considered, include the quality of campus open space, streetscapes, and architectural aesthetics. The interior issues are important to the NIH goal of providing a world-class facility capable of attracting internationally recognized researchers.

This section considers changes to existing physical conditions and changes to the policies and anticipated projects approved by the prior 2003 NIH Bethesda Campus Master Plan, and assesses the extent to which the three proposed actions in the 2013 NIH Bethesda Campus Master Plan would cause positive or negative impacts to both these conditions and plans/policies.

3.8.1.2 *Visual & Aesthetic Conditions*

The campus perimeter directly abuts streets on three sides and a residential neighborhood on the fourth side to the south, as shown below in Figure 3-19 below. About two-thirds of the campus perimeter face or abut mixed-use neighborhoods. The remaining sections face the WRNMMC Bethesda campus to the east and the Suburban Hospital to the west. The various four sides of the campus are referred to here as the:

- North Side which abuts West Cedar Lane
- South Side with abuts a residential neighborhood
- East Side which abuts Rockville Pike and faces the WRNMMC Bethesda campus
- West Side, which abuts Old George Town Road and faces Suburban Hospital campus for a portion of its length

The current Bethesda-Chevy Chase Master Plan that was adopted in 1994 notes that the visual impact of the NIH campus is important to the adjacent communities, and to occupants of vehicles travelling by on Old Georgetown Road and Rockville Pike. The 1990 Bethesda-Chevy Chase Master Plan emphasizes that the buffer surrounding the campus is critical to continuation of the existing campus ambiance, and as an interface with the surrounding neighborhoods.

The NIH has had a designated perimeter buffer zone around the campus. It has a policy that prevents new buildings and parking areas in the buffer. Prior to 1995 the designated buffer zone

varied in depth from 150 to 200 feet. In the 1995 NIH Campus Master Plan the buffer depth was increased to a uniform 250 feet. This expanded perimeter buffer area included 82.1 acres, or more than one-fourth of the 310 acre campus; The 2003 NIH Campus Master Plan continued this standard. The 2013 NIH Campus Master Plan continues to maintain the buffer in its current condition. The No Action Alternative has no changes; the Proposed Action and the Maximum Development Alternative remove surface parking lots that encroach on the buffer.

Figure 3-19: NIH Existing Campus Condition – Aerial Map 2012

NIH has been making improvements to the perimeter buffer for a long time. Prior to 1995 NIH was in conformance with the buffer limits except in two or three areas. When the width was expanded to 250 feet many older buildings, parking lots, and other facilities were within the new expanded zone. Both the 1995 and 2003 plan recommended removal of these elements over time and for landscape enhancements throughout. In 2003 the designated perimeter buffer included about 66.0 acres of natural vegetative cover; about 1.9 acres were covered by buildings, 6.2 acres by roads and sidewalks, and 7.4 acres by surface parking. The remaining 0.6 acres were occupied by Metro station facilities. The 2013 Master Plan proposes a reduction of impervious areas and increase of natural cover. Exclusive of the new security entrance facilities along Rockville Pike, impervious area in the buffer is to be returned to natural cover. Also proposed is the augmentation of the understory and tree cover along the entire southern edge of the campus from the campus Lincoln Drive entrance around to Stony Creek at the southeast corner.

Improvements to the buffer have occurred in the past ten years. Redevelopment actions have facilitated removal of surface parking lots on the east side and north side of campus. Proposed removal of surface parking in the south part of campus has not been implemented. Changes have included several new security and storm water facilities. A Gateway Visitor Center and parking garage was added at the Metro rail station. In the Rockville Pike buffer, an employee vehicle inspection station, queue lanes at the North Drive entrance, and a truck or commercial vehicle inspection station between North and Wilson Drives were added. A new storm water retention area, with associated landscaping is being constructed in the southeast corner. In the northeast corner the NIH Stream was restored, visually enhancing the stream corridor, removing parking in the buffer and thickening the tree and shrub screening along West Cedar Lane.

The character of views into the campus from the surrounding streets and community areas are currently monitored and regulated. Vegetation, buildings and topographic features influence views. Vegetation has become a more significant factor in recent years. While certain areas have been kept open in general, the views into the campus from the outside have gradually decreased. Large areas of buffer plantings have been added and are maturing, trees have become taller and a natural shrub understory is regenerating in the expanded campus ‘no-mow’ areas as discussed in the prior Section 3.2.1.2 Existing Terrestrial Conditions. For example, in the northwest corner of the campus the tulip poplar grove has been allowed to revert to natural conditions.

Along Old Georgetown Road, the wooded buffer at the Convent was extended north and south. Along Rockville Pike, street and landscape enhancements have been added. In the south campus, the community accessible park-like area has continued to mature where the Bethesda Trolley Trail passes through the property. While the Rockville Pike buffer is relatively open, the depth of views are reducing and becoming more filtered with the addition of elements such as the visitor center and landscape added to screen security facilities,

enhance the hiker biker trail, and replace large surface parking lot expanses. Building 10 and the Peter Estate and other low historic NIH buildings within the campus have become less visible from Rockville Pike.

The southeast corner of the campus is an important arrival view for people traveling to and from the Bethesda CBD. It presents open pastoral views across the Stony Creek Valley to the National Library of Medicine and the Natcher Building. The current construction of the shared storm water management (SWM) pond at this corner, with its associated plantings would alter and filter this view as it is another ‘no mow’ area. The northeast corner is another important arrival route for people coming to and from the Capital Beltway (I-495) and points north. A skyline view of taller buildings appears above the trees throughout the growing season and dominates winter views of the campus when the trees are leafless. Along the western side of the campus, along Old Georgetown Road, open views of the laboratory complex occur in the section between South and Lincoln Drives and these views are to be maintained.

The height and placement of NIH buildings is an important aesthetic factor in community views. The 2003 NIH Master Plan regulates campus-building designs so that their siting, design, relative elevation, and height take into consideration impacts on the surrounding community.

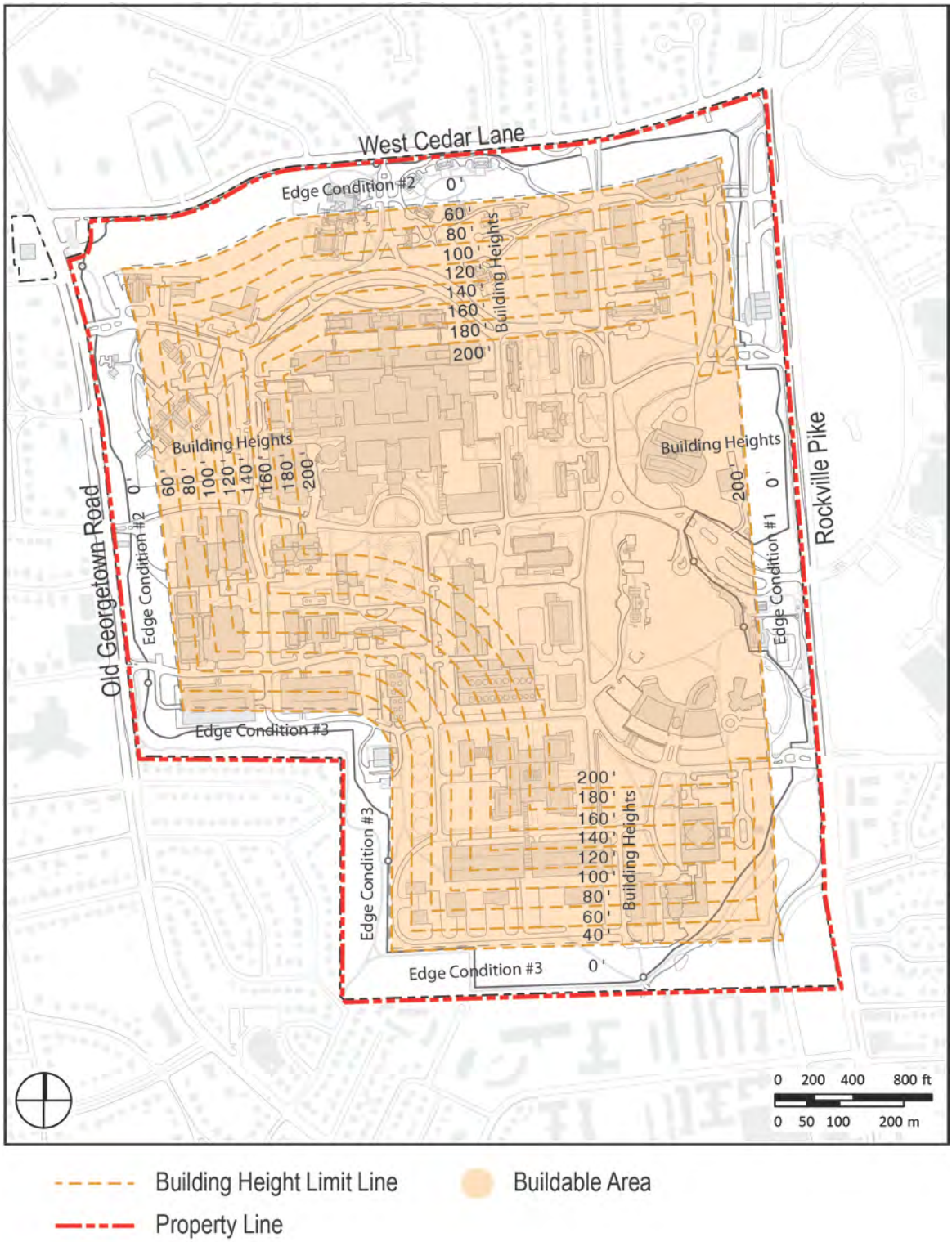


Exhibit 3-14: NIH Campus Recommended Maximum Building Heights

Buildings within 950 feet of designated property lines are to be reduced in height. Placement and heights for future buildings are planned to take advantage of the topographic elevation differences on the campus. There is a 152 foot variance on campus, and the land generally drops in elevation from Old Georgetown Road to Rockville Pike with a low point in the northeast corner.

The 2013 NIH Bethesda Campus Master Plan requires lower building profiles relative to the community by siting future structures into grades to manage views and impacts and by setting campus-wide height restrictions. General height guidance is designed to maintain the visual dominance of the Clinical Center (Building 10) as the highest, largest, and most important building within the campus.

The 2003 Master Plan established varied buildings height limits on the campus. The height limits restricted taller buildings to the center of the site, the Rockville Pike area around the Metro station, and across from the WRNMMC Bethesda campus.

These restrictions reduce visual impacts in adjacent residential neighborhoods by allowing both building mass and employees to be concentrated near the Metro station. This provides density at the designated campus front door and away from residential neighborhoods. While the interior on the campus is planned to allow 200 foot tall buildings, buildings heights are restricted along the perimeters as follows.

- North Side West Cedar Lane Frontage: a 250 foot building setback, 60 foot building heights to start stepping in seven increments up to 200 foot building heights, 950 feet from the property line.
- South Side Neighborhood Edge: a 250 foot building setback, 40 foot buildings to start stepping in 8 increments to 200 foot building heights, 1050 feet from the property line.
- East Side Rockville Pike Frontage: a 250 foot building setback, with 200 foot tall at buildings permitted at the setback only along the sections that faces WRNMMC Bethesda. At the south end 40 foot buildings are allowed at the setback line and at the north end 60 foot buildings are allowed, in both these areas the restriction steps to 200 foot tall buildings, 450 feet back from the property line in 2 increments.
- West Side Old Georgetown Road Frontage: 180 foot building setback, 60 foot building height to start stepping in 7 increments to 200 foot building heights, 950 feet away from the property line.

Since campus access control was instituted after September 11, 2001, the interior character of the campus has become less visited and less visible to the general public. However, as noted in Section 3 Purpose and Need, the aesthetic quality of the campus interior is a critical part of NIH's ability to attract world-class research talent.

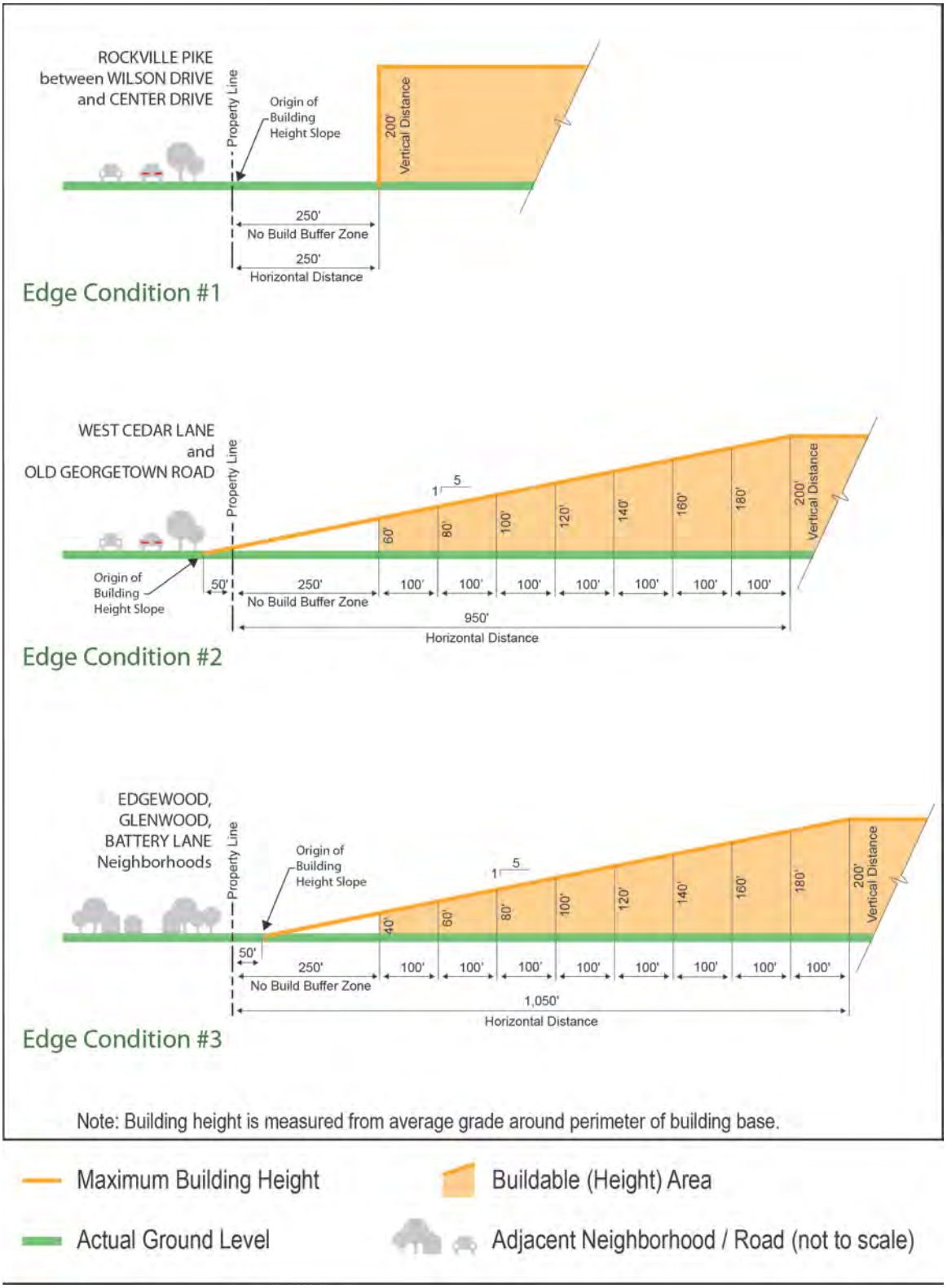


Exhibit 3-15: NIH Campus Building Height Setbacks from Adjacent Roads and Neighborhoods

The 2003 Master Plan planned enhancements to areas of the campus to correct identified deficiencies, and to enhance and reinforce the visual quality of the campus and upgrade amenities for employees and researchers. The proposed campus reorganization featured an orthogonal north/south and east/west pattern and focused on development of a central campus green network with a central park, and a series of active and formal open space quadrants surrounded by buildings. The Building 34 renovation was proposed as a university style campus center on the southern edge of the enlarged central green.

This reorganization was to have demolished certain buildings and replaced surface parking lots with parking structures. These changes have not occurred. Four key existing buildings - Buildings 12, 13, 29 and 30 have not been demolished and the surface parking still exists in the central space.

A landscaped broad streetscape network was also proposed, new lighting and signage was recommended. Benches and other features were recommended. The intention was to enhance the aesthetic appeal of the campus, provide lunchtime respite and recreation for NIH staff and visitors. The goal was to create an ample and pleasant environment for pedestrians and bicyclists and to encourage mass transit use. The design for the new buildings, materials and landscaping was to be compatible with the campus vision.

The majority of the planned grounds improvements and many of the building projects have not been implemented. Planned demolitions of buildings and parking garages, which would have allowed improvements to move forward, have not occurred. While existing and new building facades are attractive, the pedestrian streetscapes and bike network remain unattractive and not representative of a world-class research campus. Few usable outdoor green spaces exist. Areas planned for active green spaces are still used for surface parking. In some areas temporary trailers house functions not yet accommodated in permanent buildings.

3.8.2 Community Facilities

The Stone Ridge School of the Sacred Heart is a private Catholic school for girls located to the southeast of the Rockville Pike/Cedar Lane intersection. School buildings are set back about 500 feet from Rockville Pike and 300 feet from Cedar Lane on a knoll which rises 40 to 50 feet above each street. The Walter Reed National Military Medical Center, Bethesda (WRNMMC) is south of the school, and Elmhurst Parkway Neighborhood Conservation Area is on the north side. Access is via Cedar Lane or northbound Rockville Pike.

Primary access to Stone Ridge is via two entrances on Cedar Lane; one to a parking lot adjacent to Cedar Lane, the other to parking and areas behind the school buildings. Egress in and out of the school entrances to and from the westbound lanes of Cedar Lane is difficult during the morning rush hour. Traffic on Cedar Lane waiting for the Rockville Pike signal queues beyond the entrances, and outbound vehicles from the school may wait several light cycles before they can enter the westbound traffic flow.

On the west side of Rockville Pike, the same issue occurs at the Boy Scouts of America office building on the northwest corner of the intersection and adjacent residences on the north side of West Cedar Lane to the west. Outbound movements from the entrances to the eastbound lanes of West Cedar Lane during the evening rush hour are difficult due to waiting queues of vehicles.

Traffic movements in and out of the entrances to the Knights of Columbus and Foundation for Advanced Education in the Sciences (FAES) on West Cedar Lane just to the east of Old Georgetown Road are also difficult during the morning rush hour. However, most of the activities at these two facilities do not coincide with weekday morning peak period traffic conditions. Access to these facilities would continue to be difficult with the 2013 NIH Bethesda Campus Master Plan.

Bethesda and Bradley Hills Elementary Schools, North Bethesda Middle School and Bethesda-Chevy Chase High School are Montgomery County public schools serving the neighborhoods south and west of the NIH campus. Recreation facilities for local neighborhood use that are on the grounds of the schools include tennis courts; play areas, and ball fields. Childcare centers in the area are incorporated within other community organizations. The Bethesda-Chevy Chase YMCA operates a childcare facility on Oakmont Avenue in Ayrlawn. The Bethesda United Methodist Church and Temple Beth El are located at the intersection of Old Georgetown Road and Huntington Parkway to the southwest of the campus. Each has childcare facilities, the Wesley Nursery School, and Beth El Day Care, respectively.

Childcare center demand in the area is at a premium. For convenience, most parents seek childcare facilities near their residence or work location. In the Proposed Action of the 2013 Master Plan, NIH proposes construction of new childcare centers for NIH employees. One would be in the Northwest Child Care Center, the other in a renovated Building 34. Current childcare center capacity on the campus is 183 children. The proposed N23 Northwest Child Care Center would increase the childcare capacity to approximately 375.

Elder care and health care facilities include the privately operated Phoenix Retirement Community, which occupies a high-rise apartment building on Battery Lane adjacent to NIH's southern boundary. Suburban Hospital is a 310 bed regional general hospital with full emergency, diagnostic, and treatment facilities located west of the campus. The Carriage Hill Nursing Center is a 72-bed facility providing geriatric care for the elderly. None of these facilities are affiliated with NIH.

The R.A. Bloch International Cancer Information Center is located on the southwest corner of the Old Georgetown Road/West Cedar Lane intersection. The Center is part of the National Cancer Institute, and has the mission of preparing, publishing, and disseminating information on cancer detection and treatment. The building was built privately and was purchased by NIH in 1982. Approximately 30 employees work in the building. The effects and impacts generated by the Center are included within the overall environmental analysis for the Bethesda campus.

NIH has attracted other private bio-medically related organizations that have constructed facilities nearby. The Federation of American Societies for Experimental Biology occupies a large building on the west side of Rockville Pike about 0.4 miles to the north of the campus. The American College of Cardiology is located on the east side of Old Georgetown Road about one block north of NIH, and the American Association of Blood Banks is located two blocks south of the campus on Rugby Avenue in the Woodmont Triangle part of Bethesda.

The Foundation for Advanced Education in the Sciences (FAES) maintains facilities on the northeast corner of the Old Georgetown Road/West Cedar Lane intersection. This is an independent private institution dedicated to education in the sciences, but many members are NIH staff. Each year, 3,000 students matriculate in the FAES School, which offers almost 200 courses. Most are in biomedical disciplines, but there is strong representation in the physical and behavioral sciences, English, and foreign languages.

Courses are at the undergraduate and graduate level and held in the evening. A majority of the faculty is composed of NIH personnel that share their special knowledge with a larger audience. Although courses are primarily oriented toward NIH scientific staff, the school is open to the public. Postgraduate medical courses are offered for Medical Board examinations and continuing physician education. The school also has a "Frontiers in Biology" program that provides high school biology teachers with information and assistance in classroom and laboratory teaching. Cooperative advanced degree programs with Johns Hopkins University and the University of Maryland are offered.

The Walter Reed National Military Medical Center (WRNMMC) is located to the east of NIH in 75 buildings on a 232-acre site. About 10,000 military and civilians work in medical research, patient care, and advanced medical education at WRNMMC. Of 14 tenant activities at WRNMMC, the Bethesda Naval Hospital is the largest. The primary mission of the hospital is medical care and treatment of active duty military personnel, dependents, and retired military on a space available basis. High-level government officials such as the U.S. President and Vice President, their families, members of Congress, Supreme Court Justices, as well as foreign embassy personnel, are beneficiaries of medical service at the WRNMMC. The WRNMMC is a ten building complex with the most notable building being the original historic hospital tower designed by Paul Cret, that serves as a local landmark. The center hospital has over 427 beds and is expandable to 779 beds, if a local or regional catastrophe occurs. It has 50 clinics that treat more than 2,500 outpatients daily. More than 6,000 are employed at the hospital.

Other WRNMMC tenant activities include the Naval Medical Research Institute, which performs research on diseases and occupational health concerns of sailors and Marines, the Naval Dental Center, the Naval School of Health Sciences, the Armed Forces Radiobiology Research Institute, Naval Dosimetry Center, Naval Health Sciences Training Command, and the Naval Medical Research and Development Command.

The nearest Montgomery County Police station is located in the Bethesda CBD. NIH has its own campus police force, with enforcement jurisdiction limited to the NIH property. Other County emergency response facilities in the vicinity of NIH are the Bethesda Fire Company No. 20 located at the northwest corner of the campus, and the Bethesda Chevy Chase (BCC) Rescue Squad at the intersection of Old Georgetown Road and Battery Lane. The WRNMMC also has a fire station. NIH maintains its own fire department and hazardous incident response unit, with a fire truck, emergency response truck, and ambulance. NIH Fire Department would be the first responders to on campus incidents, and cooperate as second responders to the County and WRNMMC. Each year, the NIH Fire Department and Emergency Response Unit respond to about 200 calls from Montgomery County and WRNMMC.

The neighborhoods surrounding NIH are mature and stable. There are few opportunities for additional or new single-family housing. NIH employees who purchase or rent housing in the immediate vicinity would replace residents in existing housing, and not place new demands on community facilities. New housing proposed for the Bethesda CBD and Bethesda-Chevy Chase and North Bethesda planning areas would be built over the next 20 years regardless of NIH growth, because there is sufficient demand created by proposed job development in the proposed Montgomery County Bethesda-Chevy Chase planning areas to sustain housing demand without NIH growth. NIH employees who move into new housing would be indistinguishable from the general resident population as far as community facility impacts are concerned. No impacts are expected on community facilities as a result of growth in campus population. Community facilities in the vicinity of NIH are listed in Table 3-27:

Table 3-27: Community Facilities in the NIH Vicinity

Number	Type of Facility	Name of Facility
1	School	Stone Ridge School and Convent of the Sacred
2	School	Bradley Hills Elementary School
3	School	Wesley Nursery School
4	School	North Bethesda Middle School
5	School	Bethesda – Chevy Chase High School
6	Child Care Centers	Congregation Beth El Day Care
7	Child Care Centers	Ayrlawn Day Care Center
8	Religious	Bethesda United Methodist Church
9	Religious	Temple Beth El
10	Religious	Temple Hill Baptist Church
11	Religious	Christ Lutheran Church
12	Health Care	Carriage Hill Nursing Center
13	Health Care	Suburban Hospital
14	Community Organizations	Women's Club of Bethesda
15	Community Organizations	Boy Scouts of America
16	Community Organizations	Goodwill Industries
17	Community Organizations	Knights of Columbus - Rock Creek Council
18	Emergency Response	BCC Rescue Squad
19	Emergency Response	Bethesda Fire Company No. 20
20	Parks and Recreation	Ayrlawn Park
21	Parks and Recreation	Greenwich Park
22	Parks and Recreation	Battery Lane Park
23	Parks and Recreation	Elmherst Parkway Neighborhood Conservation
24	Parks and Recreation	Bethesda-Chevy Chase YMCA
25	Parks and Recreation	Bethesda-Chevy Chase YMCA (Ayrlawn)
26	Parks and Recreation	Rock Creek Park

Number	Type of Facility	Name of Facility
27	Parks and Recreation	Wyngate Woods Park
28	Parks and Recreation	Madison Park
29	Parks and Recreation	Bradley Park
30	Parks and Recreation	Maplewood Park

3.8.3 Housing and Population

Eight residential neighborhoods are located around the periphery of NIH. These include Maplewood, Ayrlawn, Sonoma, Huntington Terrace, Edgewood/Glenwood, East Bethesda, and Locust Hill as defined by citizen association boundaries. The neighborhoods are predominantly single-family detached homes on lots of a quarter acre or less. The eighth neighborhood, Battery Lane is composed of high-rise and mid-rise apartment and/or condominium buildings in the Bethesda CBD south of the campus. Census tracts for the neighborhoods are shown in Figure 3-20.

Residential neighborhoods in the vicinity of NIH have been established for nearly half a century. The oldest homes not associated with original farms; date from about 1900 when District of Columbia residents built summer cottages in the area. Some residences in Huntington Terrace and Alta Vista date from this period. Development of NIH and the WRNMMC shortly before and after World War II triggered rapid growth in the neighborhoods north and west of NIH that continued though the 1960’s.

Units constructed in the 1970's in tract 44.02 are attributable to the Pooks Hill Apartments and other apartment and condominium construction on the north side of the tract. New construction on undeveloped or recycled parcels includes a former school site, Trafton Place, in Ayrlawn.

The area of Bethesda surrounding NIH has no large tracts available to develop. Activity includes remodeling existing structures or ‘tear down and rebuilds’ this varies by neighborhood with some areas having most of the homes rebuilt. These are neighborhoods with their convenient location to employment areas, shopping, amenities, and highly rated schools, command high sales prices for their respective size and categories.

Most of the detached residences are family and owner occupied with some occupied by one or more individuals without children. Demand created by NIH employees supports available rental properties.

Multi-family construction in nearby neighborhoods account for the large increases in local housing numbers and include both for-sale and rental units. Rising land prices and State of

Maryland ‘smart growth policies’ to promote density, future growth in housing units is expected to continue.

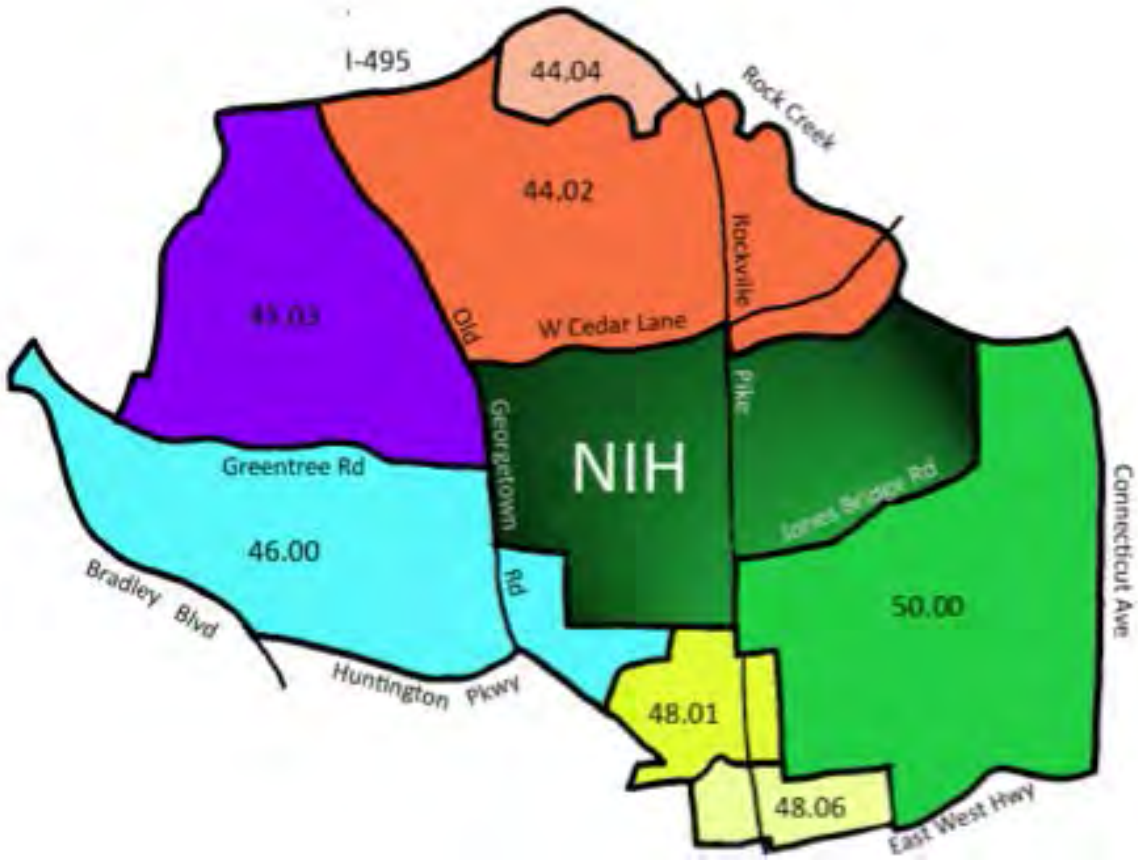


Figure 3-20: Census Tracts in the NIH Vicinity 2010

Tract 48.01 south of the NIH Bethesda campus differs from the other neighborhood areas, with predominantly rental apartments. Mid and high-rise apartment complexes line both sides of Battery Lane for its entire length between Woodmont Avenue and Old Georgetown Road. Older mid-rise units built after World War II are on the east portion and include the Glen Lane, Glendorra, Glenmont, Glenbrook, Glenwood, and the Glen Aldon all operated under one management company. Other complexes include Camelot Mews, Cambridge Square, Battery Lane apartments, and the newer high-rise Madison Park, Whitehall Condominium and Middlebrook complexes. Over 875 units are located in the 12 complexes along Battery Lane, providing a major source of affordable housing in Bethesda. In contrast to the single-family neighborhoods, nine out of 10 properties in Tract 48.01 are rented, and nearly three-fourths of the units are non-family occupied.

A higher proportion of residents over 65 reside in this area of Montgomery County, particularly in Tracts 44.02 and 50.00 to the north and east of the campus. The Carriage Hill Nursing Home influences data for Tract 44.02 disproportionately.

Younger professional couples are replacing the older residents in the single-family residences. Younger couples frequently make substantial renovations and alterations to the older and smaller homes. This phenomenon is most evident in the East Bethesda neighborhood (Tract 50.0), which shows a significant decline in the elderly, but only the initial phases of growth in those under 18.

The current Bethesda-Chevy Chase Master Plan (2006 update) proposed 4,000 additional housing units by the year 2010 including 2,675 units that were already approved when the plan was adopted in 1990. The Bethesda CBD Sector Plan estimates that there is capacity for an additional 3,000 units in the CBD. Most of these are planned as apartments. It is estimated that 375-500 units could be phased-in annually. Areas adjacent to the NIH campus have a potential capacity for 218 dwelling units, if developed.

North of the Beltway, the North Bethesda planning area anticipated construction of several thousand dwelling units, primarily apartments and townhouses, in the 1990-2010 period, including some 1,250 apartment and townhouse units are projected for Rock Spring Park near Montgomery Mall. Many of the units proposed for North Bethesda are near Metrorail stations such as Grosvenor, White Flint, and Twinbrook.

NIH has about 20,594 employees on the Bethesda campus and more than half of them live in Montgomery County. Some of them live in Bethesda, Chevy Chase, Cabin John and Kensington, and others reside in Gaithersburg and Germantown. Housing demand created by routine employee turnover and retirement is an important element in sustaining housing demand in Montgomery County, and this effect increases, as one gets closer to the campus.

3.8.4 Parks and Recreation

Several parks and recreation areas, which are owned and operated by M-NCPPC or Montgomery County Department of Parks, are located in the vicinity of the NIH campus.

3.8.4.1 *Rock Creek Park*

In Maryland, Rock Creek Park is a regional Montgomery County park that serves countywide outdoor recreation needs, and conserves national resources. It protects Rock Creek watershed stream valleys, floodplains, and wetlands. Rock Creek Park is the second largest park in the County system, encompassing 1,795 acres. The park follows branches of the creek into residential neighborhoods. The park is a critical element within the county park system. Large areas remain undeveloped. Active recreation facilities in the form of ball fields, picnic areas, tennis and basketball courts, and lakes are interspersed throughout the park. All are linked by a trail and bike path system.

The closest point of approach for the main stem of the park to NIH is about 0.6 miles from the northeast corner of the campus. However, a small portion of the park extends through the Locust Hill Estates to the northwest corner of the Rockville Pike/West Cedar Lane intersection. This spur is an important bicycle and pedestrian access route between Bethesda and connects to the main stem of Rock Creek Park. The NIH Stream flows through this section of the park after it leaves the campus.

3.8.4.2 *Elmhurst Parkway Neighborhood Conservation Area*

The Elmhurst Parkway Neighborhood Conservation Area is located northeast of Stone Ridge School. It is a natural area dedicated to watershed protection and open space preservation with no recreation facilities. Local residents use it for walking and nature study. The 22.7 acre property is included in the Rock Creek park system by the M-NCPPC Department of Parks.

3.8.4.3 *Battery Lane Urban Park (also referred to as Madison Park)*

This park is a small 2 acre green oasis located between the urban high-rise and garden apartment complexes on Battery Lane. It is 600 feet long and from 50 to 200 feet in width, extending from the intersection of Norfolk and Rugby Avenues at its south end to Battery Lane. It has a tennis court, a basketball court, and a tot lot or child play area. A bike path or trail extends through the park. This path extends to the south side of the NIH campus through a narrow right-of-way between the Glen Lane and Phoenix apartments. This is a popular pedestrian access route between the NIH campus and the Bethesda CBD.

The Bethesda CBD Sector Plan recommends an increase in recreational uses at this park by installing improvements to increase park access and visibility. Landscaping and seating could be added to serve workers from the Woodmont Triangle and adjacent residents. The trail through the park would be extended along Glenbrook Parkway to tie into the regional CBD bike path system.

3.8.4.4 *Ayrlawn Park*

Ayrlawn Park is a 20.4 acre park located two blocks to the west of the Old Georgetown Road/ West Cedar Lane intersection. It is classified as a local park providing facilities for programmed or organized recreation. Ayrlawn is an adjunct to the Bethesda YMCA Program Center with community meeting rooms, child care and gymnastics centers; fenced and unfenced play areas, four tennis courts, and soccer, softball, and regulation and Little League baseball fields.

3.8.4.5 *Greenwich Park*

This 2.8 acre neighborhood park is located on the west side of Old Georgetown Road about three blocks south of the campus. It has facilities for informal leisure activities and two tennis courts, a basketball court, gazebo, play area, benches, and picnic tables can be found in the eastern half of the park. Groomed open woods and lawn cover the western half of the park. The

rear yards of residences on Glenwood and Custer Roads overlook the park to the north and south.

3.8.4.6 *Maplewood Park*

Maplewood Park is located on Bradley Boulevard at the corner of Valley Road about two blocks north of the NIH campus. This facility has onsite parking two tennis courts, two softball fields and a basketball court.

3.8.4.7 *Hillmead Park*

The Hillmead Park is located on Bradley Boulevard at the corner of Valley Road about four blocks west of the NIH campus. Two tennis courts, and a basketball court, are located in the northern portion of the park. Open woods and groomed lawn cover the southern portion. This facility has no on-site parking.

3.8.4.8 *YMCA Bethesda-Chevy Chase*

The Bethesda-Chevy Chase YMCA is located four blocks to the north of the campus on Old Georgetown Road. Facilities include tennis courts, indoor and outdoor swimming pools, soccer fields, outdoor track and a recreation center.

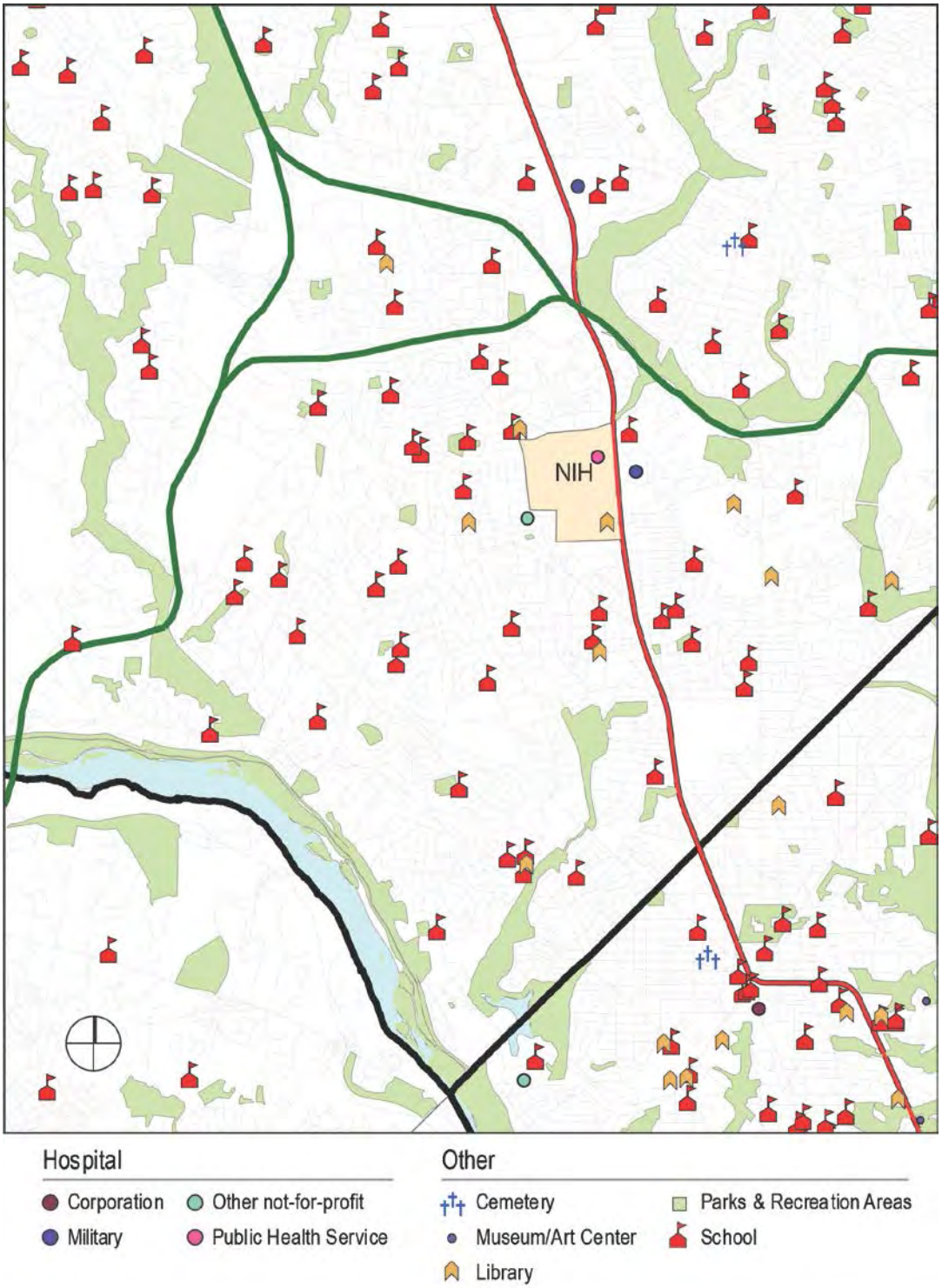


Exhibit 3-16: Cultural and Recreational Assets in Proximity to NIH Campus

3.9 CULTURAL HISTORIC RESOURCES

Under the National Environmental Policy Act of 1969 (NEPA) and the regulations of the National Capital Planning Commission, environmental impact statements must address the impacts of proposed federal government actions on historic resources. There is a link between NEPA and the National Historic Preservation Act of 1966 (NHPA), as amended, which governs federal government agencies in their handling of historic properties. Section 106 of the NHPA requires that federal agencies take into account the effects of their actions on cultural resources. Regulations implementing Section 106 are published in 36 CFR Part 800, and less than 36 CFR Part 800.8. Federal agencies are encouraged to coordinate Section 106 compliance with NEPA.

Although the Master Plan is not an “undertaking” as defined in 36 CFR Part 800.15, NIH acknowledges its Section 106 responsibilities relative to the actual implementation of future construction, renovation, or demolition projects called for in the Master Plan. NIH would consult with the Maryland State Historic Preservation Office (MD SHPO) and, as necessary; the Advisory Council on Historic Preservation (ACHP) before taking any action that may affect cultural resources.

The sections below identify the cultural resources within the area of potential effects and describe the potential impacts of the Master Plan alternatives on these resources.

3.9.1 Historic and Architectural Resources

3.9.1.1 *Identification of Historic and Architectural Resources*

Under 36 CFR 800.4, NIH must determine and document the area of potential effects and take the steps necessary to identify historic resources within this area. Historic resources include any district, site, building, structure, or object listed in or eligible for listing in the National Register of Historic Places (National Register).

3.9.1.2 *The Area of Potential Effects (APE)*

The Area of Potential Effects (APE) is defined in 36 CFR 800.16 as “the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties.” Based on the scale and nature of the 2013 NIH Master Plan and setback distances, sightlines, and the screening effect of existing vegetation, the area of potential effects has been defined as the entire NIH campus and the area within a half-mile radius of it.

3.9.1.3 *Resources Located Outside the NIH Campus*

As defined in 36 CFR 800.16, historic resources include properties listed in or eligible for listing in the National Register. The following four properties (identified by their Maryland Inventory of

Historic Properties number and described below) located outside the NIH campus and within the APE are listed in the National Register.

- Bethesda Naval Hospital Tower, M: 35-8
- Bethesda Meeting House, M: 35-5
- Bethesda Theater, M: 35-14-4
- Moreland, M: 35-154
- Walter Reed National Military Medical Center Historic District, M: 35-98

The Bethesda Naval Hospital Tower and the Walter Reed National Military Medical Center Historic District are located immediately east of the NIH campus within the Walter Reed National Military Medical Center (formerly the Naval Medical Center) at 8901 Rockville Pike. The Bethesda Naval Hospital Tower (M: 35-8) was constructed in 1939-42 as the U.S. Navy's principal medical center. Noted architect Paul Philippe Cret designed the tower in a modern, Art Deco inspired style. The original building consisted of a 20-story central tower flanked by three- and four-story pavilions to the north and south. It is constructed of reinforced concrete and structural steel clad in concrete panels faced with quartz. The Bethesda Naval Hospital Tower is sited on a prominent rise along Rockville Pike and is aligned on a direct east-west axis with Building 1 of the NIH Historic Core Historic District (Exhibit 3-17). The Bethesda Naval Hospital Tower was listed in the National Register on March 8, 1977.

The National Register-eligible National Walter Reed National Military Medical Center Historic District (M: 35-98) is a 131 acre district within the Walter Reed National Military Medical Center consisting of 18 contributing buildings, including the Bethesda Naval Hospital Tower. The Walter Reed National Military Medical Center (WRNMMC) was founded as a state of the art facility for the care of naval officers, veterans, and their families. Its proximity to Washington, D.C., designated it the primary care facility for high-level government dignitaries, including the President of the United States. The facility has made significant contributions in the field of medical science through its research and educational divisions. Additionally, the WRNMMC is important for its associations with President Franklin D. Roosevelt, who was instrumental in the center's establishment, and with architect Paul P. Cret. The National Walter Reed National Military Medical Center Historic District is significant in the areas of architecture, health and medicine, and World War II. The National Walter Reed National Military Medical Center Historic District was determined eligible for the National Register on November 16, 1998.

The Bethesda Meeting House (M: 35-5) is located immediately south of the NIH campus at 9400 Rockville Pike. The site consists of the Meeting House, constructed in 1850 in the Greek Revival style, a mid- to late nineteenth-century parsonage, and an associated cemetery. The Bethesda Meeting House is significant for its architecture as well as for its association with the

early history of the modern community of Bethesda. The Bethesda Meeting House was listed in the National Register on April 18, 1977.

The Bethesda Theater (M: 35-14-4), at 7719 Wisconsin Avenue, was constructed in 1938. It is a significant local example of an Art Deco cinema designed by the firm of renowned theater architect John Eberson. The theater is important as the premier facility in the regional chain of independent movie theaters operated by Sidney Lust. Additionally, it played a significant role in the development of the central business district of Bethesda and in the suburbanization of the National Capital region. The Bethesda Theater was listed in the National Register on February 5, 1999.

Moreland (M: 35-154), a frame dwelling featuring Colonial Revival and Queen Anne style influences, is significant as a skillful representation of domestic architecture of the 1890's. Washington, D.C., businessman and former D.C. Commissioner Samuel E. Wheatley constructed Moreland. Moreland was among a handful of country houses built before widespread development in the early twentieth century transformed Bethesda's bucolic, rural landscape into an automobile-centered suburb of the District. Moreland is located at 7810 Moorland Lane and was listed in the National Register on August 11, 2005.

The impacts of the Master Plan alternatives on the National Register or National Register-eligible resources described above are evaluated in the Impacts sections.

The Maryland Inventory of Historic Properties is an archive of information to further the understanding of the State's architectural, archeological, and cultural resources. The Locational Atlas and Index of Historic Sites was created by the Maryland-National Capital Park and Planning Commission (MNCPPC) and identifies historic and potentially historic resources that are protected from demolition or substantial alteration under Chapter 24A of the Montgomery County Code. The Master Plan for Historic Preservation is Montgomery County's list of officially designated historic sites and districts. Several resources listed in the Maryland Historical Trust Inventory of Historic Properties, identified in the Locational Atlas and Index of Historic Sites, or designated in the Montgomery County Master Plan for Historic Preservation are also located within the APE:

- Keiser House (Alta Vista, Perry House), M: 35-3
- Locust Hill (Clifford House, Samuel Perry House), M: 35-4
- Bethesda Community Store, M: 35-43
- Walter P. Johnson House, M: 35-46
- Old Bethesda Commercial District (Bethesda Commercial District), M: 35-14
- Little Tavern, M: 35-14-3

- Leslie Beall House (Mrs. Wither's House), M: 35-14-13
- Greenwich Forest Historic District, M: 35-165

All historic resources listed in Montgomery County's Master Plan for Historic Preservation located within the Bethesda/Chevy Chase planning area are also delineated in NIH Bethesda Campus Master Plan Exhibit 3.8.B.

3.9.1.4 *Resources Located on the NIH Campus*

The NIH campus is located in Maryland Archeological Research Unit 12 of the Piedmont Province. No Phase I cultural survey of the entire NIH campus has been completed. An inventory of known prehistoric and historic sites and identification of areas of potential sites was completed in 1985 (NIH Cultural Asset Inventory, D. R. Bush, 1985). The inventory included a review of Maryland Historic Trust records and files, research literature, and prior investigations in the immediate area, and a visual inspection of the campus.

Other investigations related to the campus include a Maryland DOT survey along Rockville Pike on the eastern boundary from the NIH Stream to Jones Bridge Road in 1981 (The Maryland DOT Archeological Resources Survey Volume 3; Piedmont, Md. Historical Trust, Manuscript Series 7, K. W. Wesler, 1981). This study extended only 50 to 100 feet into NIH property. In 1983, Koski-Karrell and Ortiz conducted archeological surveys of what was at the time the extreme southeast corner of the campus as a preliminary for construction of the Woodmont Avenue extension (Phase I and Phase II Archeological Evaluation for the Woodmont Avenue Extension Project, National Institutes of Health, D. Koski-Karrell, L. Ortiz, J. C. Beasley, 1983, 1986). The sector of this site within the NIH campus was reinvestigated as part of the South Pond installation (Phase II Archeological Evaluation of the South Pond Water Retention Project

Area, EAC/Archeology, 2002). Phase I and II surveys have also been completed for the Building 45 site (Phase I and II Archeological and Architectural Investigations for the Proposed Site of the William H. Natcher Building, R. C. Goodwin & Associates, Inc. and AEPA Architects Engineers, 1992). Other studies include a series of Phase I investigations and Phase II evaluations completed for five archeological sites in the northern sector of the campus by EAC/Archeology Inc. between 1997 and 2001.

The first historic period occupancy date in the environs of NIH is uncertain. The property was identified as "Claggett's Purchase" as early as 1716. Robert Peter purchased 600 acres of the tract circa 1760. By 1865, the NIH site had been subdivided between the Peter family, Joseph and H. Gingle, Robert Spate, and Alexander Briton.

By 1879, A. Peter had built a summer house called "Winona" on the present site of the Stone House (Figure 5-23). In 1902, George Freeland Peter and his three brothers inherited 200 acres of the "Claggett's Purchase" tract presumably from A. Peter. George Freeland Peter received 47.9 acres. In 1931, George Freeland Peter commissioned the design and construction of the

Stone House. Winona was demolished and the Stone House, with Colonial Revival architecture, was erected on the same knoll along with a caretaker's house and landscaped grounds. It was one of the substantial County estates built along Rockville Pike in the early twentieth century. The Gingle site is located in the area between Woodmont Avenue and Wisconsin Avenue, just north of Stony Creek, and in the present location of the National Library of Medicine. It is uncertain whether there were two houses, a relocation, or if one of the sites was an outbuilding. Koski-Karrell found no evidence of foundations and one site was destroyed by library construction.

Robert Spate owned an 82 acre farm in the northwest sector of the campus, and Alexander Britton owned a 61 acre farm in the north central sector along West Cedar Lane. They probably grew wheat as their primary crop, if they followed typical Montgomery County agricultural patterns during the 19th century.

Mapping from 1890 shows the farms distinctly as open fields with trees growing limited to the knoll now occupied by Tree Tops. Britton owned his farm until he died in 1907. A subsequent owner sold the property to Helen Wilson Woodward in 1923. Robert Spate sold his farm to the Roman Catholic Church also in 1923 for subsequent construction of a convent.

Both Gingle and Spate were listed in an 1879 directory as farmers. The Peter properties around the Stone House were formally landscaped after 1931, but Phase I surveys around the Building 45 indicate a deep plow zone dating from an earlier period. Other than agriculture, the only other land use was the Town and Country golf course, which occupied the former Gingle property in southern third of the campus in 1920. This golf course was part of the Woodmont Country Club for a short period.

In 2002, there were 23 archeological sites in the vicinity of NIH on record at the Maryland Historical Trust (MHT). Of these, 15 sites were located outside the campus, but within two miles of its periphery, and eight were on the campus. Among the 15 off campus sites, 10 were classified as prehistoric, two as historic, and three contained both historic and prehistoric materials.

Information about campus archeological resources is summarized from the various reports and surveys below.

3.9.1.4.1 *Informal Surveys*

Informal archeological surveys of the NIH campus include a collection of prehistoric material donated to the Smithsonian Institution by George F. Peter, and a collection of several flaked stone tools and tool fragments by Vernon Taylor, an NIH employee, prior to 1970. Both collectors were amateurs, and materials were gathered through casual, unscientific examination of the surface.

Site 18MO35 has no definite location. Rather, it is documentation of the Peter collection by McNett in 1871, plus a single quartz triangular blank recovered by McNett himself at an unknown location on the campus.

Only one of the three original Taylor sites or areas remains undisturbed. One Taylor site in the northern sector of the campus was overtaken by construction. A second area is now encompassed within, and has been professionally evaluated as, Site 18MO243.

3.9.1.4.2 *Site 18MO354*

A total of 183 artifacts were recovered during Phase I and II archeological investigations of the site (18MO354). Prehistoric artifacts included 18 quartzite flakes, one fragment of steatite, and nine quartzite fragments. These 28 items accounted for 15.30 percent of the total artifact assemblage. The 42 (22.95 percent) historic and modern materials consisted of architectural and hardware items including nails and window glass; kitchen materials including bottle glass, white ware, pearl ware, ironstone, and domestic brown and gray stoneware. One faunal item, a fragment of oyster shell, also was recovered. A majority of the artifacts were modern materials, including bottle glass (clear, amber, and aqua), foil, metal, plastic, wire, leather, and a .22 caliber cartridge.

The area encompassed by this scatter of modern, historic, and prehistoric artifacts or components has been identified as multicomponent archeological site 18MO354. All components were found as a thin intermixed scatter in the historic plow zone and overlying root mat. No significant concentration of historic artifacts was observed; most cultural materials recovered dated from twentieth century domestic and institutional occupation. Prehistoric materials were found in association with modern and historic materials and lacked temporal context. All components lack integrity and the ability to yield significant data pertinent to themes in local or regional history and prehistory. This site did not meet Criterion D for eligibility for the National Register of Historic Places, i.e. it did not yield, or is likely to yield, information important in prehistory or history. The site is now occupied in part by Building 45 and the East Child Care Center.

3.9.1.4.3 *Site 18MO243*

A third site, 18MO243, was originally investigated by Koski-Karrell in 1983. A further survey and evaluation was conducted in the summer of 2002 as part of the South Pond storm water management project (Phase II Archeological Evaluation of the South Pond Water Retention Project Area,) EAC/Archeology, 2002).

The 2002 Phase II survey for Site 18MO243 dug shovel test pits on a fire meter grid throughout the potential limits of the site to the west of Woodmont Avenue. Small clusters of low density prehistoric materials were found, but no ceramics or projectile points that could be assigned to specific prehistoric archeological periods were recovered. The survey also revealed that site soils had been extensively disturbed by prior 20th Century golf course construction, and burial

of natural gas, sanitary sewer, and electric power trunk lines that are interspersed throughout the area. The site did not meet Criterion D eligibility for the National Register of Historic Places.

3.9.1.4.4 *Sites 18MO462, 18MO463, and 18MO464*

These sites are located in the northern sector of the campus. Phase II evaluations surveys of 18MO462, the Knoll site, recovered a mix of historic and prehistoric materials at the investigation site. The site appears to have been a farmstead dating to the late 18th or early 19th century. The principal historic component was a cut stone foundation that appeared to be associated with a smokehouse. Artifact recovery patterns indicated the site extends northward into an area that had been covered by a parking lot in the past.

Documentary evidence for 18MO463, the Tree Tops Terrace site, indicates that it was the location of a 19th century farmstead. Some artifacts dating to that period were recovered during a Phase II survey, but most were 20th century items almost surely associated with the Wilson Tree Tops Estate.

A Phase I investigative survey of 18MO464, the Spate/Convent site, found no trace of historic occupation earlier than Convent construction.

All three sites yielded prehistoric quartz stone tools notably projectile points, numerous quartz flakes generated during tool construction, and cores of quartz from which flakes were struck. Site 18MO463, in particular contained a large quantity of prehistoric material. Quartz occurs in veins in the micaceous schist bedrock at several locations on the NIH campus and is visible on the surface. The exposure is evident particularly in the vicinity of Tree Tops. Projectile point styles indicate that all three sites were occupied intensively in the Late Archaic and Early Woodland periods between 3,000 and 2,000 years before the present.

Prior farming, homesteads, and Wilson Estate and NIH activities have significantly disturbed all three sites. None contained prehistoric features or preserved organic remains such as seeds. All three were found to be insufficiently important for National Register nomination.

3.9.1.4.5 *Site 18MO465*

A Phase I survey of 18MO465, the Clinical Center site, found it to be completely disturbed by construction for the original Clinical Center.

3.9.1.4.6 *Site 18MO469*

In September 1997, a Phase I survey was conducted at the area just across South Drive from the Spate/Convent Site. A prehistoric archaeological site was found, and named the Vaccine Center Site, 18MO469. In February and March 1998, a Phase II evaluation was conducted of the Vaccine Center Site. Although the Phase II evaluation established that the site had been extensively disturbed, the nature of the stone artifacts found there were interesting. Prehistoric quartz quarrying was occurring at the site, as evidenced by the recovery of numerous cores,

preforms, and bifaces. Further, the bifaces could be clearly classified into those produced during early, middle, and late manufacturing stages. Also found were seven projectile point fragments. Phase I and a limited Phase II survey were also conducted at the Neuroscience Research Center (Building 23) construction area in 2001. Materials found in the perimeter buffer area on the west side of the site revealed that this area has been used for prehistoric quarrying of quartz and tool making. Although many fragments were recovered, no complete projectile points were found.

It was determined that the Neuroscience Research Center site was related to, and an extension of, the Vaccine Research Center site. Both were subsequently identified as Site 18MO469. No features yielding important information were observed at either site, and no floral or found material permitting dating to prehistoric times were found. Both areas also had considerable soil disturbance dating prior to and including NIH occupancy. For these reasons, the combined 18MO469 sites were determined to be ineligible for inclusion in the National Register.

The ground surface in the central core of the campus, defined here as the area inside the Master Plan Loop Road, has been extensively altered by prior construction. Buildings, roads, loading docks, driveways, sidewalks, and parking lots cover about 90 percent of this area. A review of site topographic mapping indicates that the surface in each of these areas has been graded, cut, or filled to accommodate facilities. Further, the NIH Stream crosses the site from a point to the southwest of Building 46 to the northeast corner of the South and Center Drive intersection in a 96-inch pipe that is as much as 40 feet below the existing surface. The original stream valley has been buried for several hundred feet to either side.

Exhibit 3-17 shows the few remaining campus areas that have not been investigated previously and remain relatively undisturbed by modern construction. They are identified as archeologically sensitive areas based on their potential, although this does not imply that they contain materials or soil context. Sites in proximity to where historic structures were located also hold potential.

Future construction in these areas will require Phase I cultural surveys prior to design and construction to satisfy Section 106 of the National Historic Preservation Act criteria for determining archeological significance and potential eligibility for the National Register. If Phase I surveys indicate that the areas contain materials of potential significance, then a Phase II survey will be completed. In the master planning process, efforts were made to avoid or minimize intrusion into archaeologically sensitive areas.

Under Section 110 of the NHPA, the NIH is responsible for the identification, evaluation, and nomination to the National Register properties under its control or jurisdiction. In fulfillment of this requirement, the NIH sponsored a cultural resources study in 1997 of all buildings located on the campus over 50 years of age and all buildings that exhibited the likelihood of possessing exceptional significance regardless of age. In this effort, the NIH worked with the Maryland Historical Trust (MHT), which serves as the Maryland SHPO, to determine which resources on the NIH campus were eligible for listing in the National Register as individual resources or as

contributing resources to a historic district. Since then, the NIH has carried out periodic additional review of their resources to determine their potential eligibility for the National Register.

To date, the following three historic districts (and associated contributing buildings) have been determined eligible for listing in the National Register:

NIH Historic Core Historic District:

- Building 1 (Administration Building)
- Building 2 (Industrial Hygiene Laboratory)
- Building 3 (Public Health Methods and Animal Unit)
- Building 4 (Laboratory)
- Building 5 (Laboratory)
- Building 6 (National Cancer Institute)

Officer's Quarters Historic District:

- Building 15B1-B2
- Building 15C1-C2
- Building 15D1-D2
- Building 15E1-E2
- Building 15F1-F2
- Building 15G1-G2
- Building 15H
- Building 15I

George Freeland Peter Estate Historic District:

- Building 16 (Stone House, George Freeland Peter Estate)
- Building 16A (Caretaker's Residence)

In addition, the following four buildings have been determined individually eligible for listing in the National Register:

- Building 7 (Memorial Laboratory)

- Building 15K (Tree Tops)
- Building 38 (National Library of Medicine)
- Building 60 (Convent of the Visitation of Washington)

The NIH Historic Core Historic District (M: 35-9-2) forms the foundation of the NIH Bethesda campus. It is comprised of six contributing resources (Buildings 1, 2, 3, 4, 5, and 6) and one noncontributing resource (Building 8). Buildings 1-6 are Georgian Revival brick buildings dating from 1936-41, the earliest period of construction of the NIH Bethesda campus. These buildings housed the first administration and medical research offices of the Bethesda campus and today form the symbolic and visual core of the expanded campus. Building 1 within the Historic Core has served as the primary administrative facility for the NIH for decades. The historic district is significant for its association with the early functions of the institution and for its design. The Maryland SHPO determined the NIH Historic Core Historic District eligible for the National Register on August 23, 2000. After reviewing the National Register eligibility documentation for the NIH Historic Core Historic District, NIH has noted that the view from Building 1 east toward the WRNMMC and the Bethesda Naval Hospital Tower is not a documented NIH historic view. Therefore, this view is not illustrated in Exhibit 3-17. Impacts on the view are also not being considered as part of this evaluation.

The Officer's Quarters Historic District (M: 35-9-7) consists of eight brick duplex and detached housing units featuring elements of the Georgian Revival style. Constructed in 1940, the houses (duplex units Buildings 15B1-B2, 15C1-C2, 15 D1-D2, 15E1-E2, 15F1-F2, and 15G1-G2, and detached units Buildings 15H and 15I) represent the only small-scale housing constructed by the NIH. The residential complex illustrates the Radburn principle, a precursor to modern-day suburban design employed throughout the country in the 1930s and 1940s. The historic district is significant in the areas of significance of architecture, community planning, politics and government. The Maryland SHPO determined the Officer's Quarters Historic District eligible for the National Register on August 23, 2000.

The George Freeland Peter Estate Historic District (M: 35-9-1) is comprised of a large stone Colonial Revival house (Building 16), also known as the Stone House, and a small frame caretaker's cottage (Building 16A). George Freeland Peter, a prominent Episcopal clergyman, built the house on a hill overlooking Rockville Pike in 1931. Walter G. Peter, George Peter's brother and a noted Washington architect, designed the estate. The Federal Government purchased the estate in 1949 for the expansion of the NIH Bethesda campus. The George Freeland Peter Estate Historic District is significant for its architectural style and for its association with the early twentieth-century development of Rockville Pike. The Maryland SHPO determined the George Freeland Peter Estate Historic District eligible for the National Register on August 23, 2000.

The Memorial Laboratory (Building 7) was completed in 1947 as a research laboratory specifically designed for infectious disease research. The building was constructed using the same massing and materials as the other Georgian Revival buildings on the NIH Bethesda campus, but featured innovative design and engineering attributes that focused on providing a safe work environment and limiting the inherent risks associated with research on infectious diseases. The Maryland SHPO determined the Memorial Laboratory eligible for the National Register on August 23, 2000. The primary residence of Luke and Helen Wilson from 1926 to 1942, Tree Tops (Building 15K) was developed in the 1920s as one of several large early twentieth-century country retreats built by wealthy Washingtonians along Rockville Pike. Beginning in 1935, the Wilsons donated significant portions of their estate to the Federal Government for the development of the NIH Bethesda campus. Tree Tops is significant due to its association with the Wilson family's role in providing a catalyst for the growth of the NIH into one of the world's leading biomedical research institutes and is significant as one of the great Rockville Pike estates of the early twentieth century. Tree Tops is the only remaining resource of the former Wilson Estate Historic District, which was determined eligible for the National Register by the Maryland SHPO on September 28, 1995.

Completed in 1962, the National Library of Medicine (Building 38) houses an extensive collection of medical literature and services an international readership. The library was designed by the New York firm O'Connor and Kilham and features a hyperbolic paraboloid concrete shell roof. Built during the height of the Cold War, the library was designed with half of its structure below grade as a precaution against atomic threats envisioned by civil defense planners of the 1950s. The Maryland SHPO determined the National Library of Medicine eligible for the National Register on August 23, 2000.

The Convent of the Visitation (Building 60) was constructed in 1922-23 as a cloistered monastery for the Catholic Order of the Sisters of the Visitation. It is a three-story, brick building in the Georgian Revival style designed by A.B. Mullett and Company in consultation with Marsh and Peter, the noted Washington architectural firm. Active until the 1980s when the NIH assumed ownership of the property, the Convent was one of five of this order in the Washington area. The Maryland SHPO determined the Convent of the Visitation eligible for the National Register on August 23, 2000.

To date, in conjunction with the Maryland SHPO, the following buildings on the NIH campus have been determined ineligible for listing in the National Register:

- Building 8 (Laboratory)
- Building 9 (Animal Building)
- Building 10 (Clinical Center)
- Building 11 (Power Plant)

- Building 12 (Vehicle Maintenance and Storage Facility)
- Building 13 (Maintenance and Storage Facility)
- Building 61 (Caretaker's Cottage)

Additionally, the following resources have been evaluated or are currently under evaluation by the NIH to determine their potential National Register status: Buildings 14A-H, Building 22, Building 25, Building 29, Building 30, Building 31, and Building 38A. Preliminary NIH evaluations suggest that of these, the following resources qualify for the National Register: Building 29 (Center for Biologics Evaluation and Research), Building 30 (National Institute of Dental Health), and Building 38A (Lister Hill). NIH would continue to work in coordination with the Maryland SHPO to determine which resources on the NIH campus are potentially eligible for listing in the National Register as either individual resources or as resources contributing to a historic district.

Historic resources on the NIH campus are depicted in Exhibit 3-17. These resources include buildings and districts that have been determined eligible for the National Register (including the NIH Historic Core Historic District, the Officer's Quarters Historic District, the George Freeland Peter Estate Historic District, Building 7, Building 15K, Building 38, and Building 60) as well as resources the NIH has determined qualify for listing in the National Register (including Building 29, Building 30, and Building 38A).

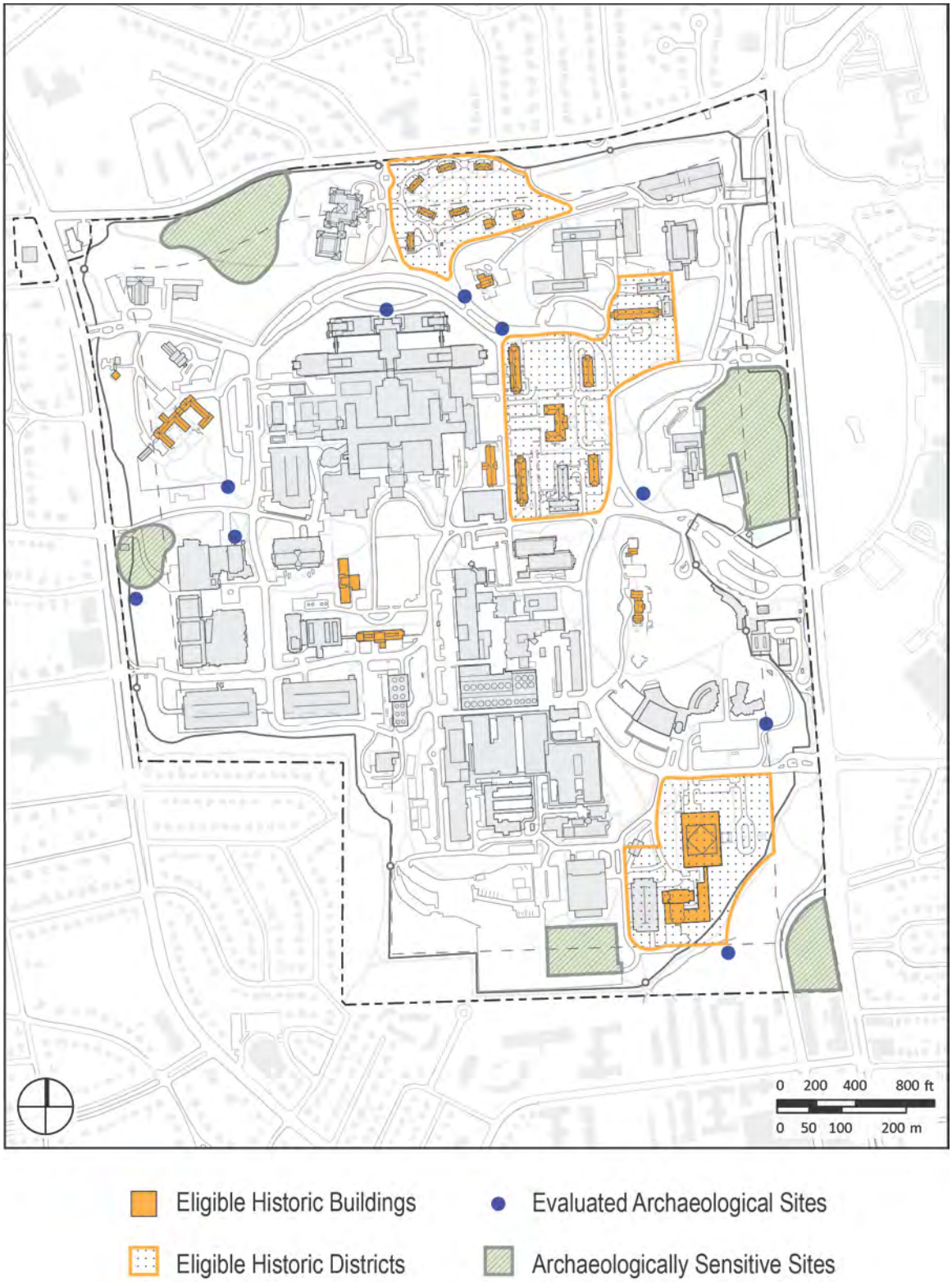


Exhibit 3-17: NIH Historic Properties and Archaeologically Sensitive Sites

3.10 LAND USE & ZONING EXISTING CONDITIONS

3.10.1 Overview Existing Conditions

The National Institutes of Health main campus is located in Montgomery County, Maryland, one of the largest jurisdictions in the Washington, D.C. region. As a result of expansion of the urbanized area, cross-commuting patterns, and other economic interrelationships, the Federal Government recently designated a broader Consolidated Metropolitan Statistical Area (CMSA) for this region. This CMSA encompasses both the Baltimore and Washington metropolitan areas, incorporating an area of nearly 9,600 square miles circumscribed by a 75-mile radius around downtown Washington, D.C. The limits of the CMSA extend from the Pennsylvania border to the edge of metropolitan Richmond, Virginia. On an east-west axis, the CMSA stretches from Queen Anne's County, Maryland, on the eastern shore of the Chesapeake Bay to Berkeley and Jefferson Counties, in the West Virginia panhandle (Population of Metropolitan Areas and Component Geography: 1980 and 1990 (6/30/93 definition), 1990 CPH-L-145, U.S. Bureau of the Census, 1993.

Figure 3-21: Baltimore-Washington Metropolitan Area (DC-MD-VA-WVA) Map-Wikimedia Commons

The region is growing rapidly, with communities spreading over a widening geographic area. This spread continues to be reflected in the residential location patterns of NIH employees and the broad area affected by NIH's local procurement. The population of the Washington-Baltimore CMSA in 2010 was 8.9 million, making it the fourth largest in the nation out of 280 designated CMSAs. It is also one of the most rapidly growing of the larger urbanized areas, with

a population increase of 17 percent between 2000 and 2010. The MD-VA-DC Metropolitan Washington Area portion had 5.6 million people in 2010, an increase of 5 percent over 2000.

Montgomery County is the second largest jurisdiction within the Washington-Baltimore region. With 971,777 people in 2010, it is second only to Fairfax County, Virginia, which has a population of 1,081,727. Baltimore County ranked third, with 805,029. Montgomery County's population represents about 11 percent of total CMSA population. Montgomery County has experienced rapid growth over the past decade. Population increased by nearly 98,000 between 2000 and 2010, or 11 percent. Only Fairfax County experienced a larger absolute growth with a 111, 000-population increase during the same period. Projections call for Montgomery County to continue to grow, albeit at a somewhat slower rate than over the past decade. Between 2000 and 2020, Montgomery County is expected to increase by about 93,820 people, bringing its total population to 1,065,600 (Preliminary Population Projections for Maryland's Jurisdictions, Maryland Department of Planning, 2010).

The County's land area is approximately 495 square miles, or about 320,000 acres. Between 1960 and 1991, the amount of developed land in the County more than tripled. As of 1960, about 49,000 acres, or 15 percent, of the County's land area had been developed; by 1991 a total of about 155,000 acres, or 48 percent, was urbanized. Residential land uses have grown most rapidly, with single-family dwellings occupying the largest portion of the expanded urbanized area. In 1960, 23,000 acres, or 7.2 percent of the land area, was in single-family use, and by 1991, single-family residential areas had increased to 86,800 acres, or about 27 percent of the County's land area.

Multi-family residential land use has been clustered in a relatively few locations, utilizing far less land - 700 acres in 1960 and 6,700 acres in 1991, the latter scarcely over 2 percent of the County's land (General Plan Refinement Goals & Objectives: Then & Now, Supplemental Fact Sheets, Montgomery County Planning Department, January 1993). One of the largest concentrations of multi-family housing in the County is in Bethesda. Including local and Federal Government, land use devoted to institutional uses in constituted 10,600 acres in 1960, and had grown to 22,800 acres by 1991. The National Institutes of Health main campus with its 310 acres is counted in the institutional category of land use.

Montgomery County had a total of nearly 296,000 housing units in 1990, having added over 8,000 dwellings a year in the two decades since 1970. The number of housing units nearly doubled during this period, exceeding the 56 percent growth rate experienced in the metropolitan region as a whole. During this period of rapid growth, the County's housing stock also changed significantly. Single-family detached housing declined in share of the market from 68 percent to 52 percent, while townhouses increased from just 1 percent in 1970 to 17 percent (50,000 units) in 1990 (ibid). Multi-family units remained relatively constant with a 30 percent share of the mix. Montgomery County housing units increased to 334,000 in 2000. By 2008, Montgomery County had an estimated 365,083 housing units.

Growth in housing supply has basically followed the patterns established in the County's General Plan, known as Wedges and Corridors. That plan sought to avoid suburban "sprawl" by channeling growth into the County's radial transportation corridors, particularly 1-270 and U.S. 29, and into the more densely developed down-County area nearest the District of Columbia, known as the urban ring, while preserving the wedges in between the corridors for rural land use and open space. Bethesda and NIH are in the urban ring. Residential zoning under the General Plan has been "pegged" to growth projections for the year 2000. Undeveloped residential land under densities projected in the Plan could accommodate 144,300 new dwellings. At County absorption rates of the past 20 years, this would be an 18-year supply. Less than 10 percent of the total future residential development areas are within walking distance of Metrorail stations in the County.

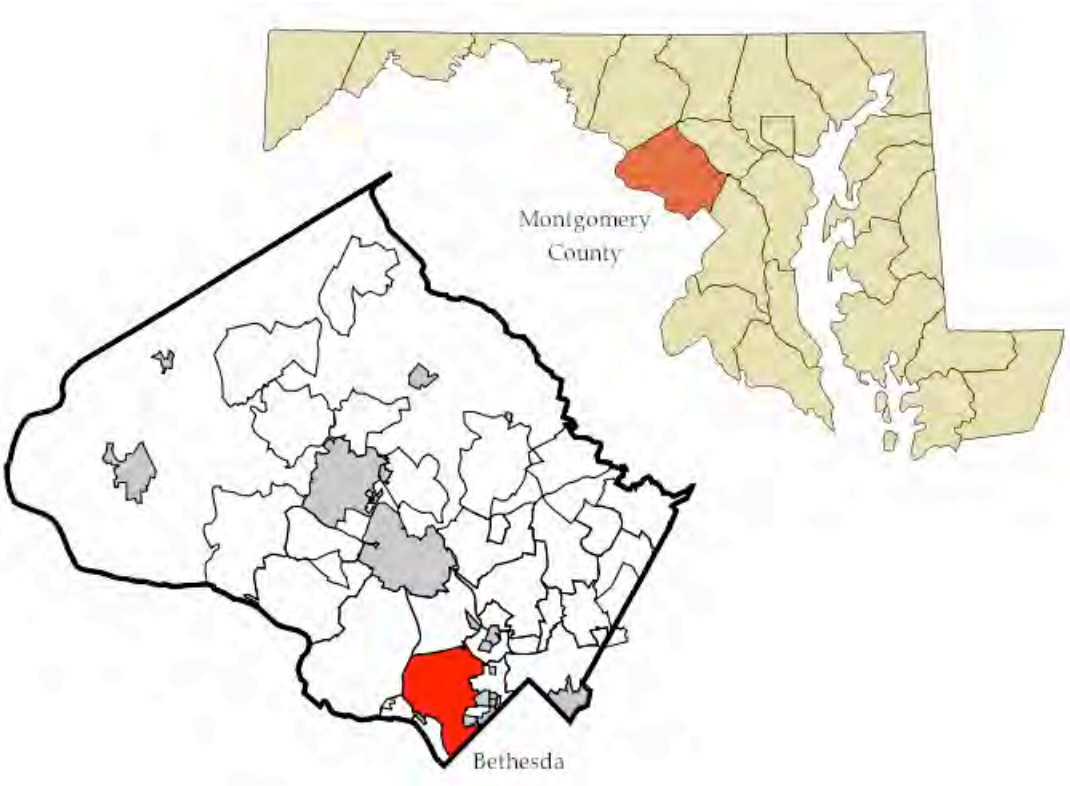


Figure 3-22: State of Maryland Map - Montgomery County highlighted in orange & Montgomery County Map - Bethesda highlighted in red Wikimedia Commons

3.10.2 Land Use and Regional Planning

Montgomery County is divided into 37 planning areas. Master plans for each planning area provide a comprehensive set of recommendations and guidelines for growth and development while protecting existing land uses, community facilities and needs, and environmental and historic resources, and maintaining the transportation network. The area master plans are

combined to form a general plan for the County, which in turn, is an element in regional planning for the Washington metropolitan area.

Sector plans are prepared for local communities and heavily developed areas within the planning areas. Master area and sector plans are prepared by the Maryland-National Capital Park and Planning Commission (M-NCPPC) and pass through several stages of development before adoption: preliminary draft, final draft, and adopted plan.

The NIH Bethesda campus is located in the Mid-Bethesda sector of Bethesda-Chevy Chase, Montgomery County Planning Area 35, and the southernmost in the County. The applicable planning document for the area is the Bethesda-Chevy Chase Master Plan, M-NCPPC, 1990, which was approved and adopted by M-NCPPC in April 1990. The purpose of the plan is to establish a policy framework that would guide the direction of Bethesda-Chevy Chase. As of 2012, any updates of this plan that may have occurred in the intervening years, have not been published.

Figure 3-23: Montgomery County Map - NIH Location Highlighted - Google Maps

Bethesda was a suburban village until the 1960s, a focal point for shopping and community services on a limited scale. Now it is the "downtown" or Central Business District (CBD) of the planning area with the greatest concentration of commercial and office development within the

Bethesda Chevy Chase planning area. Planning for the Bethesda CBD is conducted in much greater detail, nearly on a parcel-by-parcel basis, in the Bethesda CBD Sector Plan.

Planning for the two areas is coordinated and complementary. From 1990 to 1992 M-NCPPC undertook research and elaboration of preliminary proposals that were presented to the Montgomery County Planning Board in July 1993. A Citizen Advisory Committee, including representation from senior NIH staff, participated in formulating the Draft. After public review in hearings and work sessions, the County Council adopted the Comprehensive Amendment to the Bethesda CBD Sector Plan in 1994.

The area master and sector plans are tied to County planning through the Annual Growth Policy (AGP) for Montgomery County (FY 2000 Annual Growth Policy, Montgomery County Planning Board, 1999), which is updated each year. This document provides guidelines that translate needs indicated in local plans into capital improvements, not only for a specific area, but also county-wide.

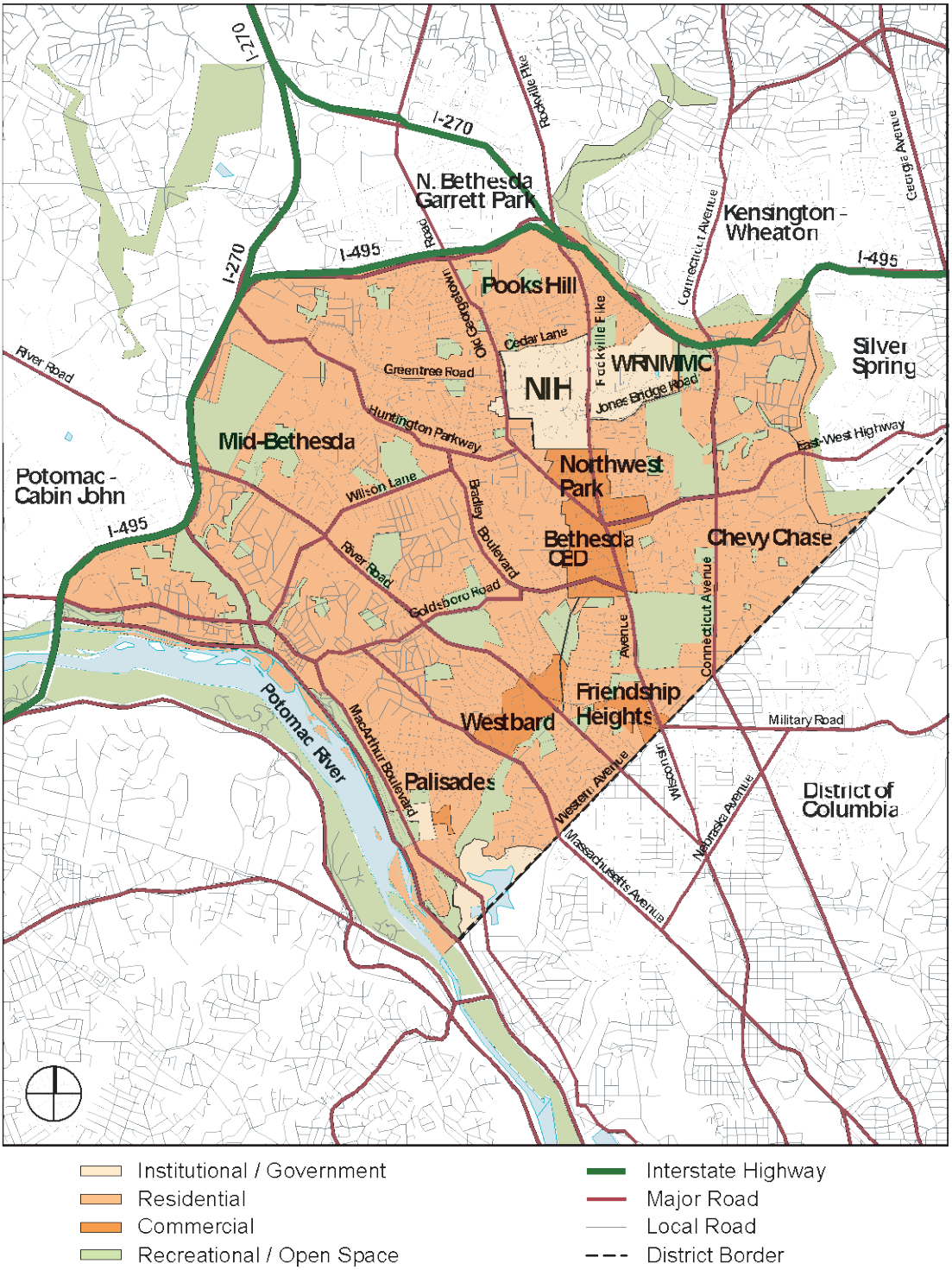


Exhibit 3-18: Land Use in Proximity to NIH Campus

3.10.3 Bethesda-Chevy Chase Master Plan

- The Bethesda-Chevy Chase (BCC) Master Plan establishes seven goals and objectives for the planning area. Perpetuate and enhance the high quality of life, which exists in the BCC Planning Area.
- Achieve a level of future employment development that is in balance with a high quality of life and the transportation capacity of the Planning Area.
- Provide for a balanced housing supply so that persons of varying income levels, ages, backgrounds, and household characteristics may find suitable housing appropriate to their needs.
- Protect the high quality residential communities throughout the Planning Area as well as the services and environmental qualities that enhance the area.
- Achieve a significant shift of new travel from auto to transit and other mobility alternatives.
- Protect the natural resources and environmental qualities of the Planning Area.
- Contribute to a strong sense of community and help reinforce community cohesion.

The plan recommends reconfirmation of the existing residential character and zoning of the planning area. Three levels of future development were assessed assuming a set of moderate improvements to the road system. The plan endorses a moderate level of development in terms of employment and housing, provided that a balance is maintained with the overall transportation capacity of the area. This proposed level of development could be implemented through the following recommendations.

- Maintain the relative level of households compared to jobs to reduce the pressures on commuting into the area.
- Share new employment development between the Sector Plans and the Federal Government employment centers.
- Locate new employment and residential development in existing centers near Metro stations.
- Continue to recognize the importance of biomedical and medically oriented development in the area, but place less emphasis on large-scale office projects. Support existing businesses, including those that meet community retail and service needs.
- Support increased housing density and multiple types in Sector Plan areas and where compatible with nearby properties. Transportation improvements are assumed to be

limited to moderate ones applied to the existing highway system, coupled with a strong effort to increase use of public transit and other alternatives.

Figure 3-24: Bethesda Zoning Map with NIH outlined - MNCPPC Website Publications

3.10.4 Bethesda Central Business District Sector Plan

The Bethesda Central Business District (CBD) forms the southern boundary of the NIH campus. It covers 405 acres, about one-third larger than the NIH campus. In 1990, the CBD contributed 5 percent of Montgomery County property tax revenues and 15 percent of the yield for commercial properties (BCC Chamber of Commerce, Statement Regarding Bethesda Central Business District Plan, Nov. 1991). Montgomery County no longer segregates tax revenues by district.

Unlike most suburban commercial core areas that are predominantly office complexes, the CBD contains a wide variety of retail space, restaurants, and many apartments and hotels. The core of development is concentrated around the Bethesda Metro subway station at Wisconsin Avenue and East-West Highway. This is surrounded by lower density commercial development that transitions gradually to surrounding residential areas.

A feature of Bethesda is the presence of more than 170 restaurants. Many of these are located in the Woodmont Triangle, the area in the northern part of the Bethesda Central Business District CBD between Old Georgetown Road and Wisconsin Avenue. The area immediately to the south of NIH is occupied by mid and high-rise apartment complexes that front on Battery Lane.

While the Sector Plan recommends a wide range of densities for the various components of the business district, it concentrates the highest densities in the Metro Core centered on the Metrorail Station and the intersection of Wisconsin Avenue with Old Georgetown Road and East-West Highway. It calls for gradually decreasing densities between the core and the CBD fringe and both establishment and maintenance of buffers between the CBD and residential and institutional uses abutting the CBD fringe.

In the immediate vicinity of the NIH campus, land use to the east of NIH and north of Jones Bridge Road is institutional with the National Naval Medical Command and the Uniformed Services University of the Health Sciences occupying a large block of land extending to Rock Creek.

The Stone Ridge School of the Sacred Heart lies between the Walter Reed National Military Medical Center and Cedar Lane, although this property is zoned for single family residential. All remaining frontage surrounding NIH is zoned residential except for a commercial area between Woodmont Avenue and Wisconsin Avenue to the southeast of the campus.

The surrounding residential areas are zoned R-60, single family residential, except for the area in the Bethesda CBD where the zoning is R-10 or RT-12.5 for multifamily high density residential use. Land use generally conforms to zoning. Special zoning exceptions have been granted to schools, churches, Suburban Hospital, professional offices, and community oriented associations along Rockville Pike, West Cedar Lane, and Old Georgetown Road.

In the future, the Bethesda-Chevy Chase Master Plan recommends that the existing zoning surrounding the NIH campus remain unchanged. It does not recommend redevelopment, but does recognize that large lots and special exception sites may be developed in the next 20 years.

For Old Georgetown Road and adjacent communities, the objective is to maintain the residential character, preserve neighborhood stability, and discourage further special zoning or land use exceptions, except for those that serve the community.

If development of large lots and special exception sites should occur in the future, the plan recommends that the new land use be residential, with the potential for construction of 193 dwelling units around the periphery of the NIH campus. If developed the Goodwill property would add another 25 dwelling units.

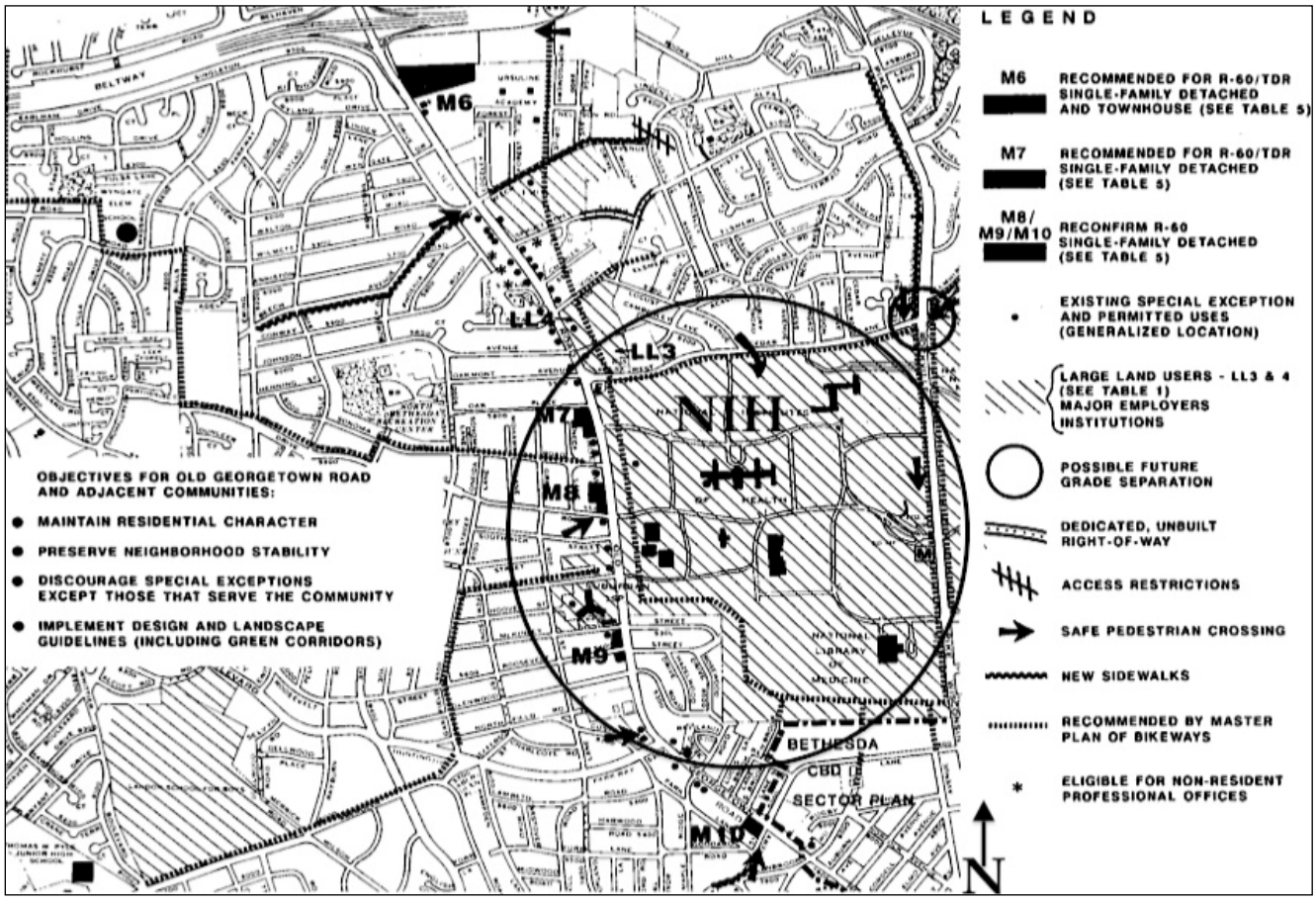


Figure 3-25: Bethesda Sector Map– NIH Circled on Map - MNCPPC Website Publications

3.11 SOCIOECONOMICS – EXISTING CONDITIONS

3.11.1 Economic Analysis

The National Institutes of Health (NIH) is the leading public medical research agency in the world. The research funded by NIH has led to many dramatic improvements in our nation's healthcare capabilities. The economic benefits and "reach" of the NIH, however, extend much further. The analysis, which follows organizes the primary economic benefits of the proposed master plan capital programs into three basic categories.

- First: Enabling Public Health Economic Benefits Through Capital Programs & Leadership
- Second: Reciprocal Economic Benefits with Forward & Backward Linkages
- Third: Local One Way Economic Benefits

These three categories of economic impacts and benefits are quite different in many respects and are easier to understand once they are broken down, yet they all work together and are all interconnected to create a substantial overall public benefit.

3.11.2 Enabling Economic Benefits through Capital Programs

Federal Government funding of pending NIH maintenance and capital projects is critical to enabling continued advances and developments in the public health and medical sciences.

Recent research advances in the biotechnology and genomics areas, alone, have enabled the development of new treatments for a wide range of diseases, such as cancer, Alzheimer's, diabetes, autism, and obesity. NIH financed research has contributed to the identification of over 800 genetic variants identified in the last five years alone. Progress in stem cell biology has enabled the development of new treatment innovations for a wide range of diseases. With continued support, NIH would help to reduce health care costs, and generate economic growth.

3.11.3 Enabling Economic Benefits through Leadership

There is an overall economic benefit that accrues primarily to the United States to have a national institute addressing health that adds direction, priorities, focus, managerial expertise, and capital to some of the most pressing current-day health science challenges facing the world.

To attract leadership talent, scientific talent, as well as capable support staff talent, it is critical to maintain an attractive and state of the art facility. To achieve this, NIH implements the following capital improvements strategies:

- Continuous maintenance and capital improvements of the campus setting;
- Well developed, functional master planning strategies along with high quality design standards;
- Attention to the myriad of details that together have an important impact on the appearance and character of the campus such as, landscaping, site lighting, signing, and wayfinding, etc.

It is also an NIH goal to incorporate a number of mitigation measures, which contribute to the quality of life on campus and the surrounding neighborhoods. These include:

- Measures to maintain and improve safe and efficient vehicular and pedestrian traffic flows;
- Visual and acoustical perimeter buffer zones around the campus;
- The application of noise abatement construction processes, reduction of light pollution and the improvement of air quality procedures.

3.11.4 Reciprocal Economic Benefits with Forward and Backward Linkages

Reciprocal linkages enable favorable, supportive workforce demographics, a conveniently located housing stock, and effective utility infrastructures. These in turn enable health science innovations while also simultaneously benefiting the local, regional, and state economies.

NIH benefits from the highly educated, stable local workforce demographics while the local workers and their families also in turn benefit from the NIH Bethesda presence. The local economy, at-large, benefits as well as the local governmental entities that provide public services to non-NIH individuals through tax revenues.

The same reciprocal benefits exist on various other levels, for example, there are many local businesses that serve and benefit NIH as well as NIH's employees and contractors.

3.11.5 Summary of Local Demographic Data

Attracting talented and accomplished people to the NIH benefits public health, but having talented, accomplished people and their families living in the community benefits: the community at large, as well, economically, and in many other less-tangible ways.

3.11.6 Local Workforce Education Level

Montgomery County ranks third in the Washington, D.C. metropolitan statistical area in the share of adults who have earned an advanced degree (29 percent).

Among counties with 250,000 or more residents, Montgomery County ranks first nationwide in the share of adults who have earned an advanced degree. The high percentage of educated professionals in the local workforce is a critical human resource for the NIH as well as an important benefit to the local community.

Senior research scientists at NIH are often faculty visiting from some of the most prestigious higher educational institutes in the country providing cutting edge research knowledge to the NIH research teams. NIH also provides opportunities for graduate students to participate in various research programs.

3.11.7 Median Household Income and Highly Skilled Local Workforce

The higher median household income is indicative of the more highly skilled local workforce, which is a necessity for a leading research institute like NIH. There is a direct and upward effect on the average employee compensation as a result of NIH's massive funding in the state of Maryland. Higher salaries attract more interest in the health sciences and further build the industry, which accelerates innovation and fuels the region's economic engine.

At $94,319, Montgomery County's median household income is nearly 32 percent higher than in 2000, when it was $71,551. The share of County households making more than $200,000 per year was 16 percent in 2008. Twenty-four percent of all households in the County make less than $50,000 per year.

3.11.8 Montgomery County Population Statistics

Montgomery County accounts for 8 percent of the total population of the Washington, D.C. metropolitan statistical area and ranks 45th in population among counties nationwide.

Montgomery County has a total population of 971,600 persons, up 20,920 (2.2 percent) from 2008 and 98,259 (11.3 percent) from 2000. There are 198,400 new County residents forecasted between the years 2010 and 2040, i.e., a 21 percent increase. 98,000 new households are expected between 2010 and 2040, a 27 percent increase. Between 2000 and 2008, the average household size increased from 2.66 persons per household to 2.75 persons per household. However, in the long run, average household size is expected to regress back to the national trend and decline to 2.51 by 2040.

There were 510,000 jobs and 33,166 employers in Montgomery County in January 2010. Montgomery County's three largest public sector employers are the National Institutes of Health, the Montgomery County Public School System, and the Walter Reed National Walter Reed National Military Medical Center. The three largest private sector employers are Lockheed Martin, Giant Food and Adventist Healthcare. Sixteen percent of County residents employed in the County; work in professional and technical services.

3.11.9 Surrounding Neighborhoods & Local Housing Stock

The local counties surrounding NIH provide good quality residential neighborhoods, public schools, higher education systems, and a substantial residential stock to house the growing number of NIH employees.

3.11.10 NIH Employee Housing

NIH recently published that they have 32,397 workers in Montgomery County, Maryland. Those working at the Bethesda campus and at Montgomery County leased sites live in every

jurisdiction of the Baltimore-Washington CMSA and beyond, in Pennsylvania, Delaware and West Virginia.

The distribution of NIH employees by state is 8 percent in Virginia, 9 percent in the District of Columbia, 1 percent in Pennsylvania, 1 percent in West Virginia and 81 percent in Maryland (primarily in Montgomery County). Note: Most of the NIH personnel who reside in Pennsylvania work in off campus leased facilities.

Personnel employed at the Bethesda campus and sites at Poolesville, Frederick and Baltimore, live in every jurisdiction of the Baltimore-Washington CMSA and beyond including Pennsylvania, and West Virginia. They are widely scattered, with no more than 1,655 in a single zip code.

There are 28 Zip Codes in Maryland with 95 or more resident NIH employees comprising 10,203 employees, or 53 percent of the NIH Bethesda campus population. There are 17 Zip Codes, each with 200 or more NIH employees, comprising 8,542 or 30 percent of NIH Bethesda campus employees. The largest of these are Rockville, Bethesda, Gaithersburg, and Potomac containing 15.5 percent of the NIH population.

3.11.11 Housing Supply and Valuations

NIH's effect on residential property values cannot be computed with precision, but the strong, continuous demand causes relatively high resale prices and new housing prices. In Montgomery County, the most important factors in determining property values are location and quality of the local school district. Neighborhoods in the vicinity of NIH rank high in both categories.

Montgomery County had a total of 334,632 housing units in 2000, having added over 6,400 dwellings per year in the decades since 1980. Over this period, the average annual growth of 5,358 households amounted to a 2.1 percent gain, practically matching the 2.2 percent average annual rate of population increase. The housing valuations in the neighborhoods immediately surrounding the Bethesda campus largely maintained their values during the recession starting in 2008. This speaks to the sustained forces of demand that the NIH applies to the local housing market. On the other hand, the rise in demand also makes it difficult for a certain percentage of local population to be able to afford housing due to the relatively high prices.

The Montgomery County property tax records for the neighboring communities were searched to determine if there was any decrease in property values as one drew closer to the campus or as a result of these projects. Comparisons between neighborhoods cannot be made because of differing housing types and lot sizes, but neighborhood valuation comparisons between 2010 and 2011 indicated no evidence of decreasing land, improvement, or assessed values as a function of the proximity from the Bethesda campus. Property values abutting the campus had little value variance from those one or two blocks from the campus, although, generally, properties abutting the campus had slightly higher values.

The geographic proximity and concentration of world class regional health sciences i.e., research, academia and industry, creates a powerful, local synergy of innovation, development and affluence. The Master Plan implementation would make it more likely that NIH employees would patronize Bethesda restaurants and businesses during midday as a result of the greater concentration of employees within five minutes walking distance of the institute.

3.11.12 One-Way Economic Benefits

Federal Government funding of pending NIH capital projects benefits the local, private regional and state economies. The resulting enhanced tax revenues, also generally benefit the overall population of the local, regional jurisdictions as well as the State of Maryland.

Table 3-28: Summary of Economic Impact for Association of American Medical Colleges 2009 (Washington Metropolitan Area) – Federal & State Government funded research

State/Jurisdiction	State Rank	Total Economic Impact	Total Employment Impact
Maryland	8	$1,785,291,194	11,902
Virginia	19	$714,777,147	4,765
District of Columbia	23	$507,709,004	3,385

Table 3-29: Value of NIH Extramural Research Awards before ARRA ($ millions) In the Washington Metropolitan Region

State/Jurisdiction	2007	2008	2009	2010
Maryland	1,343.0	1,391.6	1,008.5	1,018.8
Virginia	378.6	331.4	314.3	290.5
District of Columbia	223.9	226.2	185.8	177.5

Table 3-30: Jobs supported by NIH Awards to the Regional States FY2010

State or Jurisdiction	NIH Awards	Jobs per $ change in NIH Awards	Intrastate Jobs	Interstate Jobs	Total Jobs
Maryland	1,198	13.77	16,491	1,476	17,918
Virginia	340	13.68	4,650	2,051	6,701
District of Columbia	223	2.15	479	123	602

3.11.13 RIMS II – Economic Model

RIMS II is an economic model data created by the U.S. Department of Commerce, Bureau of Economic Analysis. It is used to compute the expected change in economic activity in any state when demand in the scientific research and development industry changes by a certain amount. This coefficient, the ultimate change in the state based economic activity given an initial stimulus, is known as the "state multiplier". The "state multiplier" is higher in the states that have diverse economic bases drawing from manufacturing, services, agriculture and resources, and other sectors.

3.11.14 Life Sciences Employment

Private employment in Maryland's Life Science's community is spurred by NIH extramural spending. Maryland has a concentration of Life Science employment, the 9th largest in the country, with a 30 percent higher concentration of life sciences businesses, Maryland is the 5th largest in the country, with a 20 percent higher concentration of life sciences business establishments than the U.S. overall. Compared to other states Federal Government life science funding has a disproportionate impact on Maryland. With the high number of Federal Government life science employment, increases the significance of direct Federal Government life science activity in the state. The Bethesda main campus with 14,261 Federal Government employees accounts for 48 percent of Maryland's Federal Government life sciences jobs.

Table 3-31: Academic Life Sciences Research & Development Spending 2009

Rank	State	Life Sciences R&D Spending in Dollars (Millions)	Life Sciences R&D Spending in Dollars per Capita
1	Maryland	$1,450	$254
2	Massachusetts	$1,203	$182
3	North Carolina	$1,621	$173
4	Connecticut	$606	$172
5	Vermont	$103	$165
6	Nebraska	$268	$149
7	Wisconsin	$821	$145
8	New York	$2,693	$138
9	Missouri	$821	$137

Rank	State	Life Sciences R&D Spending in Dollars (Millions)	Life Sciences R&D Spending in Dollars per Capita
10	Pennsylvania	$1,656	$131
	United States	$32,791	$107

Source: DBED calculations based on data from NSF, National Center for Science and Engineering Statistics and the Census Bureau

3.11.15 Environmental Justice

Presidential Executive Order 12898, issued on February 11, 1994, requires Federal Government agencies to identify and address those impacts generated in the undertaking of its activities which have disproportionately high and adverse human health or environmental effects on minority or low income populations to the greatest extent practicable. The EPA defines Environmental Justice "as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."

As defined by the Environmental Justice Guidance Under NEPA, minority populations include persons who identify themselves as Asian or Pacific Islander, Native American or Alaskan Native, Black (not of Hispanic origin), or Hispanic. Race refers to census respondents' self-identification of racial background. Hispanic origin refers to ethnicity and language, not race, and may include persons whose heritage is Puerto Rican, Cuban, Mexican, and Central or South American.

A minority population exists where the percentage of minorities in an affected area either exceeds 50 percent or is meaningfully greater than in the general population. Low-income populations are identified using the Census Bureau's statistical poverty threshold, which is based on income and family size. The Census Bureau defines a poverty area as a census tract with 20 percent or more of its residents below the poverty threshold and an extreme poverty area as one with 40 percent or more below the poverty level. A census tract is a small geographic subdivision of a county and typically contains between 1,500 and 8,000 persons (U.S. Census, 2011).

Five census tracts are located within close proximity to NIH. Among the five census tracts, Tract 7048.01 had the highest percentage of its population living below the poverty level at 13 percent. In comparison, the county had 5 percent, while the state had 8 percent living below the poverty threshold. Census Tract 7048.01 is located to the south of NIH and to the west of Wisconsin Avenue. It is known as the Woodmont Triangle and is predominantly composed of medium density housing and retail establishments. NIH Bethesda is located entirely within Census Tract 7050, and includes an area of a single family, suburban neighborhood located to the south of NIH Bethesda along the east side of Wisconsin Avenue. This census tract does not

have meaningfully larger proportions of minority populations when compared to the minority populations in the Region of Interest (ROI) and the state. Similarly, there are no census tracts in close proximity to NIH with more than 20 percent of their populations living below the poverty level.

3.12 HUMAN HEALTH AND SAFETY – EXISTING CONDITIONS

3.12.1 Construction

Physical facility requirements for conducting and supporting biomedical research change continuously. Revisions to national building codes, hospital laboratory design standards, and regulation for occupational safety and handling materials and wastes respond to these changes. Increasing emphasis on need for specifically designed room types and specific equipment, electronics, lights, computers, and their data servers have an increased the need for interior space and renovations. Useful life expectancies for laboratories and hospitals are approximately 40 to 50 years, and major renovations are frequently performed every 10 years.

3.12.2 Construction Fugitive Dust

Fugitive dust is defined as natural or manmade dust that becomes airborne due to wind or human activity. Construction associated with fugitive dust is generated by operations that expose or disturb soil such as site clearing, excavation, fills, cuts, and grading operations. Quantities of dust generated depend on construction practices, the frequency of operations, the weather, and soil characteristics.

Large amounts of dust can also be generated by demolition activities. Where demolition is internal to buildings, NIH General Provisions in construction contract specifications require drop cloths, drapes, barriers, and partitions to control dust and dirt that can be spread by tracking or air currents. The effect of outdoor heavy construction activities and site preparation on air quality, are generally short-term and confined to the vicinity of construction activity, i.e. normally within 500 feet.

NIH is committed to including the mitigation measures in construction specifications. These may include:

- Contractors comply with applicable State regulations governing open bodied trucks carrying loose materials,
- Areas disturbed during construction would be seeded and stabilized as soon as possible,
- Provide stabilized stone construction entrances, and
- Sprinkle or wet high dust areas.

3.12.2.1 *Construction Sedimentation/Siltation*

Erosion, sedimentation and siltation can occur when storm water runoff flows over exposed soils without vegetative or protective cover. Any Federal Government project located in Maryland that disturbs more than 5,000 square feet of land or 100 cubic yards of earth movement requires permit approval from the Maryland Department of the Environment (MDE).

The governing standards are the *Maryland Erosion and Sediment Control Guidelines for State and Federal Projects, revised January 2004* and the *2011 Maryland Standards and Specifications for Erosion and Sediment Control.* Typical erosion control measures include stabilization practices, silt fence, earth dikes, and sediment traps/basins and stabilized construction entrances. On January 2012, the Maryland Department of the Environment updated its regulations to enhance erosion and sediment control practices across the State, improve water quality of construction site run-off and help the Chesapeake Bay restoration efforts. Some of the changes include but not limited to establishing a maximum 20-acre grading unit for most construction sites and improving stabilization requirements. This would be required for both the demolition and the new construction projects.

3.12.2.2 *Construction Scheduling*

In general, contractors are permitted to work at NIH only from 7AM to 4 PM Monday through Friday, in accordance with the General Provisions on NIH's construction contract specifications. Some construction activities are completed outside of these hours to minimize disruptions to campus operations and activities. For example, building utility services connections to the campus systems can be made most easily during the evening or weekend hours. During these periods, they can be shut down or segmentally disconnected when loads or service requirements are comparatively low.

Contractor employee traffic would generally arrive between 6:30 and 7 AM and depart between 4 and 4:30 PM. Delivery and unloading of construction materials are generally restricted to the normal working hours. Deliveries may occur throughout the day. Construction specifications at NIH assign specific preapproved routes to the work site for deliveries. Future specifications can route truck deliveries to the Rockville Pike and South and Center Drive entrances or to the Center Drive entrance on Old Georgetown Road as a mitigation measure.

3.12.2.3 *Construction Waste*

Construction generates considerable amounts of waste materials and debris. These include materials from demolition; trimming and fitting; and packaging and shipping. Based on current generation from renovation projects, it is estimated that about 1,500 tons per year of construction wastes would be produced, and in some years, more.

There would be considerable variance in amounts depending on the number and type of projects underway at any one time. NIH General Provisions in construction contract

specifications require prompt removal of waste material and debris. Waste materials may also be submitted for recycling as appropriate and related to the construction projects. Waste management would be further defined for specific construction efforts.

3.12.2.4 *Hazardous Waste and Other Materials*

NIH has a standard protocol for inspection and removal of hazardous and other materials prior to demolition. The inspection and testing phase can last for several weeks to include removal of materials that could result in duration of several months. If necessary, prior to demolition or renovation, radioactive, chemical, and biomedical materials would be relocated using standard NIH procedures for distribution, handling, storage, and collection of such materials. If the contractor uses hazardous working materials in the course of work, the contractor must maintain Material Safety Data Sheets, and store, handle, and use the materials in accordance with OSHA regulations.

Prior to renovations or disturbance of materials a complete hazardous material survey by appropriate licensed inspectors should be in accordance with federal and state government regulations. Before demolition or renovation, any identified asbestos containing materials (ACMs) and lead based paint is to be removed by licensed asbestos and/or lead based paint abatement contractors. Removal must be performed prior to disturbance. All similar materials identified in this survey that are found in the building should also be assumed to contain asbestos unless tests prove otherwise. Disposal efforts would also be required for additional hazardous materials that may be encountered.

Buildings known to handle radioactive, chemical and other regulated hazardous materials must be reviewed by the regulating authority, which may include the NRC, EPA, OSHA or others. With the Master Plan scheduled removal and replacement of Building 21, the primary waste marshaling facility on the NIH campus, the NRC, EPA and OSHA would need to review and approve the plans and procedures, inspect and test prior to starting demolition to assist with the proper decommissioning of the facility, as well as the demolition, the disposal of the demolished materials and the post demolition site restoration procedures. Similarly, the same regulatory agencies would need to review and approve the replacement facility and site.

Asbestos or lead-based paint containing material that remains within the structure would be placed within an operations and maintenance program. It should be understood that asbestos containing or lead-based paint or other hazardous materials might be present within the structures (i.e., sub-grade sealants, enclosed wall or ceiling systems, flooring located below underlayment, etc.). As required under OSHA (29 CFR 1926.1101) and EPA (40 CFR 763) a survey for asbestos is required prior to renovation /demolition to be conducted in accordance with these regulations. Assessments for other materials including LBP and PCBs etc. should also be performed prior to renovation activities.

If the lead paint is not abated from the building prior to demolition activities, the EPA requires that representative samples of the waste stream be collected and analyzed using the EPA Toxicity Characteristic Leaching Procedure (TCLP) method.

Positive and negative lead-based paint results are based on U.S. Department of Housing and Urban Development (HUD), U.S. Environmental Protection Agency (EPA), and Maryland guidelines. It is important to note that even if a component is negative based on HUD, EPA, and Maryland standards, it may still contain concentrations of lead in the paint, which when disturbed, may generate lead dust greater than the Permissible Exposure Limit (PEL) of 50 micrograms per cubic millimeter (ug/m^3) as an 8-hour Time Weighted Average (TWA) established by the OSHA "Lead Exposure in Construction Rule (29 CFR 1926.62)."

The OSHA standard gives no guidance on acceptable levels of lead in paint at which no exposure to airborne lead (above the action level) would be expected. Rather, OSHA defines airborne concentrations, and references specific types of work practices and operations from which a lead hazard may be generated (reference 29 CFR 1926.62, section d). Environmental and personnel monitoring should be conducted during any removal/demolition process (as appropriate) to verify that actual personal exposures are below the Permissible Exposure Limit (PEL). Under OSHA requirements, the contractor performing the work would be required to conduct this monitoring and follow all of the other requirements found in 29 CFR 1926.62.

If specific building components or materials are not in use, any identified or suspect PCB containing ballasts, mercury containing fluorescent lamps, unused refrigerants, and other regulated substances should be properly removed from the building. The disposal of such items should be performed according to local and Federal Government regulations.

All generators of spent fluorescent tubing, thermostats, and other mercury containing components are responsible for their proper disposal under the Resource Conservation and Recovery Act (RCRA). The act specifies that unless you are a household, you are liable for proper disposal of mercury. Recycling is required unless site conditions restrict the removal of mercury containing articles. If mercury containing articles are not removed from the building prior to demolition activities, the EPA requires that representative samples of the waste stream be collected and analyzed using the EPA TCLP method.

Certain landfills, municipal waste incinerators and disposal facilities do not accept mercury-containing articles regardless of the TCLP analytical test results. Mercury containing lamps should be disposed at an EPA registered recycling center.

With regard to refrigerant containing equipment, the EPA requires that any equipment dismantled on-site prior to disposal must have its refrigerant recovered in accordance with EPA's Refrigerant Recycling Rules (Section 608). However, equipment that typically enters the waste stream during demolition with the charge intact (e.g. air conditioners, refrigerators, and water fountains) is subject to special safe disposal requirements. Under the EPA requirements,

the final party in the disposal chain (e.g. scrap metal recycler or landfill owner) is responsible for ensuring that refrigerants are recovered from equipment prior to final disposition. However, refrigerants can also be evacuated prior to disposal provided proper documentation of the evacuation is provided to the disposal facility.

3.12.3 Waste

Wastes generated at NIH are classified by Federal and Maryland State Government regulations, which define procedures for waste handling, treatment, storage, transport, and disposal. In some cases, NIH has defined classifications for management of waste within NIH to ensure that waste is handled within the Federal and State regulatory framework. Classifications of waste generated at NIH include solid or general waste, medical/pathological waste (MPW), radioactive waste, chemical waste, and multi-hazard/mixed waste.

3.12.3.1 *Solid or General Waste*

Solid waste is general waste as defined by Title 40 of the Code of Federal Regulations (CFR) Parts 239 through 259 for regulations governing solid waste. Solid waste generally consists of putrescible waste containing organic materials and non-putrescible waste that has no organic waste. At NIH, solid waste includes office waste; disposable paper products, plastics, glass and wood; animal bedding which is not contaminated; cafeteria or dining center waste; and a small amount of residential trash, all of which are classified as general solid waste. Solid waste at NIH also includes yard waste and waste from campus maintenance and construction.

Solid wastes at NIH include construction waste from the continual remodeling of the building to suit the changing requirements. Alterations are occurring around the campus on a continuing basis. Materials may include partitions, doors, glass, and office furniture. Solid waste from construction of distinct projects is under a separate category of construction waste and includes a wide variety of waste construction materials. As part of the construction requirements, NIH can require the contractor to recycle and reclaim significant portions of waste and demolished materials, reducing the waste stream from construction activities.

General waste is collected by custodial staff and placed in about 60 dumpsters located throughout the campus. Yard and construction waste are handled separately by ground maintenance. A private contractor collects the waste and disposes it at the Montgomery County Transfer Station where fees are paid to the County on a pass through basis. About 8 to 12 truckloads per weekday are hauled to the transfer station.

NIH is the largest Federal Government employer in Montgomery County, and a major source of solid waste from Federal facilities in the County. However, Federal Government facilities contributed less than 5 percent of the solid waste processed in the County. More than half of the total NIH campus general waste originates in the Clinical Center, or Building 10.

NIH has proactive recycling programs, which include:

- Mixed Paper which is collected in segregated bins and transported to the paper-recycling center. Disposal in general trash is illegal in Montgomery County, MD.
- Commingled Waste including aluminum and tin cans, glass (non-tempered) and plastic containers, plastic bags, plastic silverware, buffer and saline bottles, and aluminum foil and all plastic resin codes. Commingled waste is collected in segregated bins and transported to the recycling center. Styrofoam is not accepted for recycling, it is considered solid waste trash.
- Corrugated Cardboard and paperboard boxes are flattened, baled, collected, and transported to the recycling center. Disposal in general trash is illegal in Montgomery County, MD.
- Electronics consisting of computers, monitors, laptop computers, and keyboards, hard drives, memory cards, power cords. These items are consider government property and must be transferred to the Division of Personal Property Services (DPPS), which processes items for recycling, donation, or reuse.
- Polypropylenes, consisting of pipette tip racks or piping which is collected and recycled.
- Tyvek Suits that are not biohazard contaminated are collected and recycled.
- Toner Cartridges including, Laser jet, ink jet, and copier cartridges are collected and recycled. NIH Charities receive $1 for every cartridge recycled.
- Fluorescent Lamps and Batteries of all varieties are collected and recycled by a chemical waste contractor.
- Scrap Metal is collected and recycled. General disposal is illegal in Montgomery County.
- Wooden Pallets are collected and recycled.
- Transparency Films including X-ray and transparency films are collected and recycled by a chemical waste contractor. Polyester film is recovered for reuse.
- Yard Waste is collected and recycled by NIH Grounds Maintenance Department.

Using a factor of .64 tons per employee per year (interpolated between .65 for scientific employees and .64 for health care from the *Commercial Waste Management Study Volume II, Commercial Waste Generation and Projects: Architecture and Engineering PC, Sub Consultants Ecodata Inc. and Franklin Associates*, applied to the approximate 20,000 NIH employees, the NIH Bethesda Campus produces about 12,800 tons of solid waste per year. This is supported by the prior 10-year average solid waste generation from 1992 to 2002, which was 12,582 tons. Variations can be expected due to the nature of continually changing research and support operations. The initiation or end of a research project, or the number of laboratory renovations

or alterations can influence the amount of solid waste generated in a given year. An increase in solid waste generation can be expected as the population increases to approximately 23,000 by 2033, by the 2013 Master Plan buildout projections. Using the same factor of .64 tons per employee per year the increase would be an additional 1,920 tons or an approximate 15 percent increase over the next ten years.

Since 1995, NIH has more than tripled its recycling amounts. NIH Bethesda recycled 310 tons of solid waste in FY 1992, the first year of the effort to recycle. By 1996 NIH was recycling 740 tons of solid waste. In CY2012 NIH recycled 4,773 tons of solid waste.

NIH has many types of solid wastes from the health care and laboratory environments, which could be classified as hazardous waste. After the initial stages of waste minimization and recycling programs, incremental gains in waste reduction and amounts of materials to recycle and recover are likely to be smaller in percentages. Long term, it is estimated that NIH may be able to recycle close to 100 percent of the solid or general waste material generated on the campus, which is the goal.

Montgomery County has one of the highest per capita waste generation rates in the U.S. All burnable solid waste is hauled to the County Resource Recovery Facility near Dickerson, Maryland. Ash from that facility and non-processed waste is hauled by rail and truck to a landfill in Brunswick County, Virginia.

This facility would accept Montgomery County waste under a contractual agreement through 2013. It is assumed that the agreement would be extended. NIH solid wastes have negligible or no impacts on the Montgomery County system according to the Montgomery County Office of Solid Waste Management. No solid waste goes to a landfill. NIH waste goes to a waste-to-energy incinerator.

Montgomery County currently recycles approximately 35 to 50 percent of its solid waste. In 2012 the County announced a goal of reaching 70 percent recycling of its solid waste by year 2020.

Projections for solid waste generation and recycling cannot be made with precision. In most years, future yard waste generation should fall between 40 and 50 tons. However yard waste may spike in individual years, if NIH has a periodic tree maintenance and pruning project underway, or if there is extensive tree storm damage. Construction wastes would also have a wide variance, depending on the number and character of projects underway. Particularly high values would occur in those years when buildings are demolished or undergoing renovation.

3.12.3.2 *Biomedical Research Waste*

As a world leader in biomedical research, NIH expects its waste management program to be exemplary. According to NIH policy and manuals, all waste types are generated, identified, handled, packaged, collected, transported, treated, and disposed of in a manner that protects

employee and public health and safety, assures compliance with environmental regulations and permits, and promotes the effective use of resources. Waste related to biomedical research is generated in the Clinical Center hospital and most of the research laboratories.

Researchers may generate a teaspoonful or less of working material for experiments. The amounts of materials used in any one experiment are therefore generally small.

NIH stringently controls waste generated by biomedical research. The NIH Divisions of Environmental Protection (DEP) and Radiation Safety (DRS) are responsible for all aspects regarding the safe use of materials and the management of waste, including the training of personnel in these areas. Waste is managed from "cradle to grave", i.e. from generation to ultimate disposal. All nonradioactive hazardous waste is managed by the Waste Resource and Recovery Branch (WRRB) within the DEP. Similarly, DRS is responsible for the management of radioactive materials and waste.

NIH has professionals in health and safety who inspect and monitor research laboratory and Clinical Center facilities and waste. The same professionals advise and train researchers about laboratory and experimental safety as standard operational procedures. Thirty-five of the health and safety professionals are specialists in radiation health and safety. These specialists inspect all facilities where radioactive materials are handled or stored, at quarterly or semi-annual basis as a minimum, to ensure safe use of the materials.

All NIH personnel involved in the handling, transport, or use of radioactive materials are trained in accordance with U.S. Nuclear Regulatory Commission (NRC) requirements and must pass the training course examination before handling or using radioactive materials. Beyond the initial training classes, employees handling radioactive materials are required to complete refresher training once every two years. Training emphasizes radioactive material waste minimization through the use of less radioactive nuclides, lower volumes of materials used in experimentation, and delineating alternatives that do not involve radioactive materials.

The DEP and DRS act as central repositories for information regarding the handling of materials, waste management technology, and regulations for all Institute researchers. In many cases, procedures developed at NIH are used throughout the biomedical research community. These include Laboratory Safety at NIH, Working Safely with HIV (Human Immunodeficiency Virus) and other Blood Borne Pathogens in the Research Laboratory, NIH Chemical Hygiene Plan, NIH Radiation Safety Guide, NIH Hazard Communication Program, Management of Chemical and Mixed Waste at the NIH, and Waste Disposal. The last gives summary guidance in calendar form. The documents are reviewed and updated frequently in response to changing conditions and regulatory requirements. Advisory services in the DEP, DRS, and Occupational Safety and Health Division are available to the researcher in developing experimental and waste minimization protocols.

Specially trained and qualified private contractors run chemical, radioactive, and multi-hazard/mixed waste management operations on a turnkey basis; The NIH Chemical Recycling and Disposal Service (CRDS) handles chemical waste from laboratory pickup to final disposal. Radioactive waste is handled in the same manner by the NIH Radioactive Waste Service (RWS). Contractor personnel are qualified professionals in the handling, packaging, storing, transporting, and disposing of chemical, multi-hazard, mixed, and radioactive waste as well as applicable spill prevention and control measures.

Waste minimization is an integral part of each experimental protocol in the research laboratories. Experiments are designed to reduce or eliminate hazardous waste in the selection of reagents and other materials. Just-in-time inventory strategy for chemical procurements is planned to avoid waste created by outdated and unused stock and to minimize storage requirements and hazards. When possible, less hazardous or nonhazardous materials are substituted. If a hazardous waste is generated, procedures that may reduce the volume of that waste are also applied.

Waste is strictly segregated in the laboratory to avoid creating unnecessary amounts of multi-hazard/mixed waste. Aqueous and organic solvents, liquid and solid waste, and short and long half-life radioactive materials are kept separate. A wide assortment of appropriate waste containers, many defined and specified by Federal and State Government regulations, are provided to researchers by the appropriate waste management groups within the DEP and DRS. The researcher labels the container for date, source, constituents, and potential hazard. Accumulated waste is stored temporarily in cabinets or in secure areas in the laboratories away from general public and easy employee access.

For chemical, radioactive, and multi-hazard/mixed waste, CRDS or RWS contractor personnel inspect the waste, researcher packaging and labeling. Currently the waste is removed and transported to Building 21. In the future, the Building 21 operations would be relocated per the master plan. Before Building 21 is demolished, it would be decommissioned according to NRC and EPA requirements, and the waste material from its demolition would be handled and disposed of according to NRC and EPA requirements.

The hazardous waste is picked up within 24 hours after the researcher calls for a pickup. If waste is generated cumulatively in an experiment over time, waste are picked up when containers are no more than three fourths full, or at a maximum duration of sixty days from the first generation regardless of the accumulated amount.

At Building 21, chemical, radioactive, and multi-hazard/mixed waste are segregated by different regulatory categories. If there is doubt, waste is analyzed for content, pH, and other characteristics to ensure proper classification, handling, treatment, storage, transport, and disposal. If necessary, waste are treated to render them nonhazardous, reduce hazard, reduce volume, or convert multi-hazard or mixed waste to a single classification. Waste may be bulked

by consolidation of compatible waste from the multiple small containers produced in the laboratory to a single container or fewer containers for subsequent shipment.

Waste is then shipped weekly by the CRDS and RWS to off site management facilities. Off-site transport is manifested under applicable regulations. Ultimate disposal sites, licensed or approved by federal or state agencies, depending on material and hazard involved, are reviewed and may be inspected by NIH. In general, all distribution, disposal, and recycling of waste occurs at offsite facilities where sufficient quantities accrue to make recycling economical, or where special equipment is available. When waste is disposed, NIH keeps a permanent certificate of disposal record.

3.12.3.3 *Medical Pathological Waste (MPW)*

Medical waste is routinely generated at all hospitals, in private medical testing and biomedical research laboratories, and dentist and doctor offices.

Procedures for handling, treatment, storage, and disposal of medical waste are controlled by Federal and State Government regulations. Each defines the waste differently and gives minor variances in procedures. Pertinent regulations include EPA regulations for "regulated medical waste" in 40 CFR Part 259, OSHA regulations for waste containing "blood borne pathogens" in 29 CFR §1910.1030, and State of Maryland regulations for "special medical waste" in COMAR 10.06.06, 26.13.12, and 26.13.13. Transport of medical waste is controlled by US DOT regulations in 49 CFR Part 171 and State regulations. To ensure compliance, NIH has merged the definitions and requirements of the various regulations into a single classification, Medical Pathological Waste (MPW), for internal NIH use. This unification simplifies employee understanding of requirements, and in meeting NIH procedures for MPW, the employee satisfies all the Federal and State Government regulations.

MPW is defined as waste that because of, actual or perceived, presence of pathogenic agents requires containment or treatment to prevent occupational or environmental exposure. Pathogenic agents are bacteria, viruses, or other organisms that can cause diseases. Examples of MPW include microbiological cultures; clinical urine, fecal and blood specimens; tissue cultures; waste from surgical and autopsy suites; contaminated animal bedding; and "sharps". Sharps include needles, syringes, scalpels, razor blades and similar objects. Disposable clothing, paper towels, and sorbent materials contaminated or potentially contaminated with pathogenic agents are also classified as MPW.

At NIH, MPW is packaged at the point of generation according to established procedures. It is sealed inside two thick opaque bags, and then packed in cardboard containers referred to as "MPW Boxes". Sharps are placed intact in puncture resistant plastic containers, before packing in the outer MPW Box.

Boxes are labeled for source and content and sent to designated pick-up locations inside buildings around the campus. MPW is stored under refrigeration at each of these designated locations. MPW is then picked up, inspected for potential radioactivity in Building 21, and marshaled in Building 25 for subsequent transport to off-site disposal. If radioactivity is found, the MPW is handled as radioactive waste, or treated until classifiable as MPW alone.

About 40 tons of MPW is generated at the NIH Animal Center in Poolesville each year and transported to the campus. About 70 percent of the MPW is generated in the Clinical Research Center and is hospital related.

In Fiscal Year 1994, NIH established an MPW minimization program that included employee and researcher training on MPW source reduction, management of materials and waste, and identification, packaging, and labeling of MPW. In the five years previous to FY 1994, NIH had generated MPW at an annual average rate of 1,895 tons. The annual average amount produced in FY 1994 through FY 1998 was about 1,200 tons, a 33 percent reduction from levels prior to the initiation of the minimization program. Through further minimization programs, annual generation has decreased an approximate 1,000 tons in the last five years (2007-2012), or about 45 percent of pre-1994 levels. This reduction has occurred while the number of researchers on campus has increased.

The NIH intends to continue with the minimization program and further reductions are possible in smaller increments. It is expected that future MPW generation would be of the same order of magnitude or slightly less per worker. Since the new Clinical Center hospital would have fewer beds than the existing one, generation from this source would be anticipated to decline. Conservatively, it is anticipated that future MPW generation under the Master Plan would remain relative constant or decline slightly, although specific estimates are not given. Generation under the No Action Alternative would also continue to decline. Under the Master Plan Alternative, the campus MPW marshaling facility now in Building 25 on the south side of Building 11 would be relocated and Building 21 operations are to be relocated.

3.12.3.4 *Radioactive Waste*

The NIH is licensed by the US Nuclear Regulatory Commission (NRC) to use, store, and dispose of radioactive materials. The license sets maximum possession limits for various radionuclides, as well as the conditions governing their use, storage and disposal. Activities involving radioactive material are controlled by the NRC through Federal Government regulations: 10 CFR Parts 19, 20, 30, and 35, and others. The NRC inspects all NIH facilities for compliance with the regulations on a regular basis. Applicable regulations of the U.S. DOT (49 CFR Part 171) and U.S. EPA (40 CFR Part 60) also apply.

Examples of radioactive waste generated by NIH's biomedical research activities include contaminated paper, plastics and glassware, radioactive liquids, liquid scintillation counting

fluids and vials, contaminated experimental or cleanup materials, and contaminated medical pathological waste, including patient care waste.

Nearly all radioactive material used at NIH involves quantities of very low levels of radioactivity.

Materials are generally in the form of labeled proteins and compounds. Examples of radioactive materials used are Hydrogen-3 (tritium), Carbon-14, Sulfur-35, and Phosphorous-32. Most of the radioactive materials used on the campus, with the exception of C-14 and H-3, have a half-life of less than 100 days.

Building 21 has laboratories designated for the use of radioactive materials with quantities of radioactivity higher than typically used in a standard laboratory. These laboratories have restricted access; fume hoods, and stringent contamination survey and control procedures. For the Master Plan moderate growth alternative and the maximum growth alternative, Building 21 is proposed to be demolished and the operations relocated to new facilities. As a licensed NRC facility, Building 21 would need to be decommissioned according to NRC procedures. The new facility would need to be constructed to NRC standards and obtain the requisite permits to operate.

Radioactive waste is sorted by physical form, chemical form, and half-life, if appropriate. Some radioactive waste that is contaminated with materials that have a short half-life (<100 days) may be stored until they are no longer radioactive, and only then disposed of as non-radioactive waste. Some radioactive wastes are treated and processed in Building 21. Waste that is not treated or processed on-site, is shipped to a NRC licensed commercial processing facility for treatment and disposal.

The NIH is also licensed to dispose of aqueous liquid radioactive waste to the sanitary sewer, with specific concentration limits for each isotope and a total aggregate limit per year. In general, the total aggregate amount released for the year is significantly less than the permit aggregate total. All aqueous radioactive waste disposed in the sanitary system must meet all WSSC discharge criteria. Before each release occurs, WSSC is notified, and WSSC may have an inspector on the scene to observe the release.

The amount of radioactive waste generated by NIH varies considerably from year to year depending on individual research projects using radioactive materials and the amounts they use. NIH initiated a rigorous radioactive waste minimization program in Fiscal Year 1998. Proposed research protocols are reviewed for alternatives to methods requiring radioactive materials, and when they are necessary, their absolute minimization. Prior to the program, NIH Bethesda generated an average 399 tons of radioactive waste per year from 1989 through 1997. The annual generation has significantly reduced from pre-minimization program levels.

Future generation is difficult to estimate. Research and waste handling organizations predict a long-term trend for lower use of radioactive materials in medical treatments and biomedical research.

3.12.3.5 *Holding Tanks for Radioactive Wastes*

Liquid waste holding tanks with low-level radioactive isotopes are located in Building 21. There are multiple 2,200 gallon, radioactive waste underground holding tanks. These tanks are located within an enclosed reinforced concrete vault located inside the building where the tanks can be visually monitored. The radioactive liquids are held for analysis prior to release into the sanitary sewer system.

3.12.3.6 *Building 21 Complex Radioactive, Chemical and Multi-Hazardous Mixed Waste*

Before Building 21 can be demolished, it would be decommissioned according to all regulatory requirements and approvals. Waste material from building demolition would be handled and disposed of according to NRC requirements. Inspection and testing of the building and the soils under and around the building would be made by NRC prior to demolition, at points during demolition and after demolition.

The RCRA permit allows NIH to have the capacity to store up to 26,360 gallons of liquid hazardous waste for subsequent treatment, transport, and disposal. This volume represents the cumulative capacity of Building 21 waste management facility, and is for operation of this facility.

The actual amount of material on hand at any one time is less than this capacity since waste are shipped once a week to off-site treatment and disposal facilities. In the proposed Master Plan moderate growth alternative and the maximum growth alternative, Building 21 is proposed to be demolished and the operations relocated to new facilities. Building 21 as a licensed RCRA facility would need to be decommissioned according to NRC- RCRA procedures. The new facility would need to be constructed to RCRA standards and obtain the requisite permits.

3.12.3.7 *Chemical and Multi-Hazardous Mixed Waste*

Chemical waste consists of discarded non-radioactive chemicals, including hazardous and nonhazardous chemicals. Chemical waste includes items defined as Hazardous Waste (40 CFR 261), Hazardous Substances (40 CFR 302.4), Hazardous Materials (49 CFR 171.8), and Controlled Hazardous Substances (26 COMAR 13.02.06). Chemical waste that is not regulated under Federal or State of Maryland Government regulations as hazardous, but which have toxic or hazardous waste characteristics, are considered to be hazardous waste by NIH. Nonhazardous chemical waste includes nonradioactive chemicals that are not regulated by any government agency as a hazardous waste. Examples of nonhazardous waste frequently encountered at NIH include most salts; sugars; agar; enzymes and nutrients used to formulate culture media; saline solutions; and silica and polyacrylamide gels. Most of the chemical waste at NIH consists of used, spent, or surplus chemicals.

Chemical waste generation at NIH follows no particular pattern. The average annual amount can range from 143 to 318 tons per year depending on individual and collective research programs that are underway at any given time.

Some reductions per research worker are expected due to two predicted long-term biomedical research trends. The first trend is greater use of computers, replacing bench research protocols. Much of the research involving DNA and genetics can be done more efficiently on a computational basis. The second trend is greater use of miniaturization techniques in research protocols to control costs. Researchers must compete for NIH grants in terms of potential results and costs. The amount of chemicals needed and the waste produced are directly proportional to costs. With computation research and minimization, chemical and multi-hazardous waste reductions are expected.

Multi-Hazard waste is an NIH definition for a waste that meets the definition and properties of more than one of the restricted waste, which are MPW, radioactive waste, and chemical waste. Mixed waste is a combined chemical and radioactive waste and is therefore a subset of Multi-Hazard waste.

Examples of multi-Hazard waste are aqueous radioactive waste with trace levels of chloroform or heavy metals; radioactive methanol/acetic acid solutions from protein precipitations; phenol/chloroform mixtures used to extract DNA from radioactively labeled cells; and chemical or radioactive waste containing blood products.

Amounts of Multi-Hazard/mixed waste are included within the chemical and radioactive waste totals. Prior to 1987, NIH conducted its hazardous waste activities under an "interim status" hazardous waste facility authorization from the U.S. Environmental Protection Agency. Since that year, NIH has managed hazardous waste under terms and conditions established by an agreement with the Maryland Department of the Environment (MDE). NIH has a Resource Conservation and Recovery Act (RCRA) hazardous waste management facility-operating permit. The permit allows NIH to continue to:

- Provide short-term storage of hazardous materials in approved containment until disposal or preliminary treatment can be arranged,
- Chemically and physically treat hazardous waste to render it non-hazardous, reduce hazard, or reduce volume,
- Provide longer-term storage of hazardous waste (mixed waste) for which off-site disposal or treatment is currently unavailable, and
- Receive hazardous waste from off-campus NIH facilities for treatment and storage along with campus generated waste.

Under the permit, NIH continues to operate under the same MDE hazardous waste treatment and storage regulations and criteria that have applied since 1987. Treatments include bulking,

blending, neutralization, and detoxification using carbon adsorption and ultraviolet peroxidation to reduce the amounts of hazardous waste or make them less hazardous. None of the treatment methods includes or involves on-campus incineration.

In an average year, NIH generates about 5,000 different types of regulated and non-regulated hazardous waste items. The majority of discarded material is commercially available hazardous chemical products, or mixtures of these products with nonhazardous chemicals. The individual amounts produced at any one time in any experimental procedure are one liter or less. Approximately 150,000 vials and 50,000 small bottles containing expired or spent chemicals classified as hazardous are produced each year.

The RCRA permit allows NIH to have the capacity to store up to 26,360 gallons of liquid hazardous waste for subsequent treatment, transport, and disposal. This volume represents the cumulative capacity of Building 21 waste management facility, and is for operation of this facility. The actual amount of material on hand at any one time is less than this capacity since waste are shipped once a week to off-site treatment and disposal facilities. In the proposed Master Plan moderate growth alternative and the maximum growth alternative, Building 21 is proposed to be demolished and the operations relocated to new facilities. Building 21 as a licensed RCRA facility would need to be decommissioned according to RCRA procedures. The new facility would need to be constructed to RCRA standards and obtain the requisite permits.

If it is assumed that the chemical/hazardous waste per researcher remains constant in the future, then the amount generated under full Master Plan buildout is estimated to be about 172 metric tons per year. Under the No Action Alternative, waste generation would stabilize around 150 metric tons.

3.12.3.8 *Animal Waste*

Animal waste is classified as solid waste, MPW, or sanitary waste, as determined by waste characteristics. It consists of animal bedding with animal droppings, and wash down from daily cleaning of animal holding areas and cages. Research generally employs pathogen free healthy animals under the care of professionally trained animal husbandry and veterinary personnel. The animals are used in biomedical research frequently in a preliminary step before clinical trials on human patients. The research animals include mice, voles, rats, guinea pigs, rabbits, and nonhuman primates such as rhesus monkeys and macaques. Others include chickens, chinchillas, gerbils, frogs, and sea urchins. The many differing species are kept because each possesses some characteristic in terms of organs, function, or expected experimental response that closely approximates that of humans.

Animals are housed in Buildings 14 and 28, and in other laboratory buildings around the campus. About 30 percent of all animals at NIH Bethesda are located in Buildings 14 and 28. Buildings 6B, 7, 10A, 37, 49 and 50 also have animal populations. Most of the new laboratory buildings have been designed to be “animal holding” compatible. Building 14 currently is the

location for the NIH Veterinary Resources Program. Other individual Institutes also have small veterinary programs.

All animal facilities are reviewed and accredited triennially by the American Association for Accreditation of Laboratory Animal Care (AAALAC). The Food and Drug Administration (FDA) inspects vivarium facilities twice a year. Internal NIH groups also make frequent facilities inspections.

Since it is a subset of other types of waste, no breakout or quantification of the amounts of animal waste generated is recorded. Animal waste amounts or volumes, however, are included within the general solid waste, MPW, or sanitary waste data given elsewhere in this report.

Bedding material and animal droppings from diseased animals are managed as MPW or sterilized by heating to sufficient temperatures in a steam autoclave and disposed of as general solid waste. Bedding from healthy animals is disposed of as general solid waste. Wash down from areas housing healthy animals is routed to the sanitary sewer.

3.12.3.9 *Underground Storage Tanks (USTs) and Above Ground Storage Tanks (ASTs)*

NIH Bethesda campus utilizes Underground Storage Tanks (USTs) and Aboveground Storage Tanks (ASTs) registered with the Maryland Department of Environment Oil Control Program. UST and AST references are for fuel oil only. Other gases and liquids have containment tanks.

The campus is listed by MDE to utilizes two 567,000 gallon heating oil USTs located on the west side of Building 11. Additionally, the campus is listed by MDE to utilize the following USTs: two 10,000-gallon heating oil USTs; two 10,000 gallon diesel USTs; a 10,000-gallon ethanol UST; a 10,000-gallon gasoline UST; a 5,000-gallon diesel UST; two 4,000-gallon diesel USTs; three 1,000-gallon diesel USTs; three 550-gallon diesel USTs; and a 600-gallon diesel UST. Fourteen USTs are reported to have been permanently out of use and/or removed from the ground. Information in regards to petroleum releases indicates two minor releases in the past three years, which were immediately contained with no contamination. In total the campus has 18 USTs as listed above for powering boilers or fuel to power generators or vehicles. In addition there are 56 ASTs, which power emergency generators throughout the campus.

MDE performs routine 3-year inspections on the USTs as part of their Oil Control Program. The tanks are required to meet the 1995 Underground Storage Tank regulations. Tank compliance inspections were not part of this study. All the tanks have been inventoried and inspected in 2012. According to the inventory report there were two releases reported to MDE in the past three years. Per NIH, the report indicated that there was no contamination of the ground.

The tanks and associated piping are regularly tested for tank tightness, in accordance with the Oil Control Program of MDE and Federal Government regulations. In both the Proposed Action and the Maximum Development Alternative, existing fuel oil tanks would be excavated and

replaced with new USTs with cathodic protection and leak detection devices. The large fuel tanks located to the north of Building 11 would be replaced when Boiler 7 is installed. Old tanks would be removed or decommissioned in accordance with Federal and State of Maryland regulations. NIH has completed a program to bring the current USTs on the campus into conformance with Federal (40 C.F.R. Part 280) and State regulations (COMAR 26.13). In the No Action Alternative, the existing fuel oil tanks would remain in service.

Prior to demolition of buildings or land disturbance, further assessment will be made to verify the condition of the USTs and ASTs that may be present. Environmental Consultants will work with NIH representatives to confirm the presence and location of existing tanks. Given the record keeping of the NIH and the tracking and monitoring required by Federal Government and State of Maryland laws, the presence of unknown tanks are unlikely, but not impossible.

NIH is studying a new location for the two main underground fuel tanks holding approximately 567,000 gallons of No.2 fuel oil to provide additional stand-off distance and protective berms. The study includes a recommendation for fuel tank redundancy. The impacts will be the same for all the Alternatives

3.12.3.10 *Containment Tanks for Gases*

Many of the research laboratory buildings and Building 10 have bulk tanks for specialty gases including oxygen and liquid nitrogen, which are typically located above ground. Bulk oxygen and other volatile gas containment tanks require standoff clearances per the MDE regulations and also locations that allow ease of access for re-filling. Bulk gas containment tanks typically are fenced to prevent accidents. NIH follows all regulations and standard procedures for storing and handling volatile gases.

Bulk Liquid Nitrogen tanks are typically positioned close to their use destination to reduce loss of temperature over distance. Liquid nitrogen displaces oxygen if it is spilled in an enclosed area. In exterior settings the safety concern would be freeze burns from touching liquid nitrogen. NIH follows all regulations and precautionary requirements for handling liquid nitrogen.

3.12.4 Hazardous Materials

3.12.4.1 *Mercury in Plumbing Systems*

Mercury is a very common contaminant in wastewater plumbing and laboratory vacuum systems at NIH. In older biomedical facilities and laboratories much of this contamination is a legacy of past uses of mercury, primarily in thermometers and disposal of mercury containing spills and wastes via drains. Since elemental mercury (liquid metal) is very heavy – about 13.5 times denser than water it rapidly settles in to the bottoms of traps, joints and other low areas of systems where it can reside for very long periods of time. NIH has published protocols for discovery and assessment of mercury contamination for their buildings.

3.12.4.2 *Microbial Interaction with Mercury (Hg)*

Microbial interactions may increase the environmental toxicity of mercury contaminants released with wastewater and result in other subsidiary hazards. NIH has published protocols for discovery and assessment of mercury contamination for their buildings.

3.12.4.3 *Formaldehyde (CH2O)*

In accordance with OSHA Regulation 29 CFR 1910.1048, NIH has established a Formaldehyde Surveillance Program. The Technical Assistance Branch (TAB) of the Division of Occupational Health and Safety (DOHS) maintains the Formaldehyde Surveillance Program. For more information contact the TAB at (301) 496-3353. NIH has a formaldehyde surveillance program to identify and quantify exposure levels of workers potentially exposed to formaldehyde. This program covers all NIH locations.

3.12.4.4 *Ethylene Oxide (EtO)*

In accordance with OSHA Regulation 29 CFR 1910.1047, Ethylene Oxide, the NIH has established an Ethylene Oxide (EtO) Surveillance Program. In health care and research settings, EtO is commonly used for sterilizing medical supplies and equipment. At room temperature and normal atmospheric pressure, it is a colorless gas with a characteristic ether-like odor. Ethylene oxide is both flammable and highly reactive. Laboratories using EtO that have not been evaluated should contact the DOHS, TAB to schedule an evaluation.

3.12.4.5 *Asbestos Containing Materials (ACM)*

Asbestos containing materials (ACM) may be present at the NIH as pipe, duct and equipment insulation; core material of Virginia Metal wall partitions; original wooden doors; acoustical ceiling plaster; ceiling tiles, duct mastic; floor tiles and their associated mastic; asbestos-cement sheets (Transite board) and spray-on fireproofing. These materials are most commonly found in mechanical rooms, pipe chases, stairwells and above suspended ceilings.

The potential for ACM to release airborne fibers depends on its' degree of friability. Friability is the ability of materials, when dry, to be crumbled, pulverized, or reduced to powder by hand pressure. The sprayed-on or troweled-on materials used, as acoustical plaster on ceilings or as fireproofing is considered friable and readily releases airborne fibers if disturbed. Materials such as vinyl-asbestos floor tiles are considered non-friable and do not release airborne fibers unless sanded or broken. Transite board can release fibers only if sawed, drilled or broken.

Whenever suspect ACM are encountered in a work area at the NIH, the presence or absence of asbestos would be confirmed by sampling and analysis conducted by a specialty offsite contractor.

The Technical Assistance Branch (TAB), DOHS, maintains information regarding the NIH locations where the presence or absence of asbestos has been documented.

The DOHS provides technical guidance on employee protection when disturbing asbestos, as well as coordination of collection and analysis of suspected asbestos containing materials. The DOHS also reviews asbestos abatement plans submitted by contractors and coordinates air monitoring of asbestos abatement projects to assess airborne levels and to provide re-occupancy clearances.

3.12.4.6 *Lead (Pb) and Other Hazardous Materials*

Lead-based paint containing materials that remain within the structures scheduled for demolition or renovation, should be identified, tested and removed prior to demolition or renovation. It is understood, given the age of many of the buildings that lead based paint materials or other hazardous materials may be present within the structures (i.e., sub-grade sealants, enclosed wall or ceiling systems, flooring located below underlayment, etc.). As required under OSHA (29CFR 1926.1101) and EPA (40 CFR 61 subpart m) a survey for asbestos is required prior to renovation /demolition to be conducted in accordance with these regulations. Assessments for other materials including Lead Based Paint (LBP) and Polychlorinated Biphenyls (PCB), heavy metals etc. should also be performed prior to renovation or demolition activity.

All generators of spent fluorescent tubing, thermostats, and other mercury containing components are responsible for their proper disposal under the Resource Conservation and Recovery Act (RCRA). The act specifies that unless you are a household, you are liable for proper disposal of mercury. Recycling is required unless site conditions restrict the removal of mercury containing articles. If mercury containing articles are not removed from the building prior to demolition activities, the EPA requires that representative samples of the waste stream be collected and analyzed using the EPA TCLP method.

Certain landfills, municipal waste incinerators and disposal facilities would not accept mercury-containing articles regardless of the TCLP analytical test results. Mercury containing lamps should be disposed at an EPA registered recycling center.

With regard to refrigerant containing equipment, the EPA requires that any equipment be dismantled on-site prior to disposal must have its refrigerant recovered in accordance with EPA's Refrigerant Recycling Rules (Section 608). However, equipment that typically enters the waste stream during demolition with the charge intact (e.g. air conditioners, refrigerators, and water fountains) is subject to special safe disposal requirements. Under the EPA requirements, the final party in the disposal chain (e.g. scrap metal recycler or landfill owner) is responsible for ensuring that refrigerants are recovered from equipment prior to final disposition. However, refrigerants can also be evacuated prior to disposal provided proper documentation of the evacuation is provided to the disposal facility.

4 ENVIRONMENTAL IMPACT

4.1 SUMMARY

Environmental Impacts present the impacts that would result from the proposed 2013 NIH Bethesda Campus Master Plan Development (Proposed Action), the Maximum Development Alternative and the No Action Alternative. The section also discusses appropriate measures to avoid, minimize, or mitigate impacts that would result from the implementation of the actions.

4.2 TOPOGRAPHY, GEOLOGY & SOILS IMPACTS

Short-term temporary impacts to topography and soils at proposed building locations should be expected as a result of campus development and expansion. The proposed development would be expected to directly affect micro topography and soils as a result of clearing and grubbing, grading, excavation, placement of fill, compaction, and mixing. Additional temporary effects could result from erosion and associated sediment where soils are exposed due to removal of vegetative cover during construction.

Potential impacts to the soils and groundwater can be expected with the significant amount of earthwork and soil disruption projected in the Proposed Action. The Maximum Development Alternative also has more significant grading proposed. The No Action Alternative has several new building projects, which would have grading, and the potential for soil erosion. Enforcement of measures to reduce soil erosion by either dust or stormwater runoff would be important in all three scenarios.

4.2.1 Topography Impacts

4.2.1.1 *Proposed Action*

The proposed development under this alternative would affect the existing site topography significantly particularly with the removal of existing buildings that are built into hillsides and replacement new buildings which will similarly be placed on sloped grades. Impacts would be around the specific building project and affect the general area to provide positive drainage away from the buildings. Impacts, short term and site specific, would be temporarily adverse for topographic site disturbance.

With the Proposed Action area for new development expected to affect an approximate 5-10 acres per year, over the next 20 years there will be significant grading and potential for soil erosion. Impacts would be directly around the specific building project. Impacts, short term and site specific, would be temporarily adverse for topographic site disturbance. During construction and demolition operations, all protective measures to prevent soil erosion and sedimentation and control stormwater run-off would be required.

4.2.1.2 *No Action Alternative*

The proposed development under this alternative would, in general, maintain the existing site topography. Impacts would be isolated to directly around the specific few building projects. Impacts would be minor, short term and site specific. During construction and demolition operations, all protective measures to prevent soil erosion and sedimentation and control stormwater run-off would be required.

4.2.1.3 *Maximum Development Alternative*

The proposed development under this alternative would affect the existing site topography significantly particularly with the removal of existing buildings that are built into hillsides and replacement with new buildings which will similarly be placed on sloped grades. Impacts would be around the specific buildings and affect the general area to provide positive drainage away from the buildings. Impacts, short term and project site specific, would be temporarily adverse for topographic site disturbance.

With the Maximum Development Alternative, the proposed area for new development is expected to affect an approximate 10 acres per year. Over the next 20 years there will be significant grading and potential for soil erosion. Impacts would be directly around the specific project buildings. Impacts, short term and site specific, would be temporarily adverse for topographic site disturbance. During construction and demolition operations, all protective measures to prevent soil erosion and sedimentation and control stormwater run-off would be required around the specific building project. Impacts would be minor, adverse, short term and site specific.

4.2.2 Geology and Soils Impacts

4.2.2.1 *Proposed Action*

The Proposed Action site developments are primarily redeveloped existing sites. The topography contains steep and moderate slopes in many of the project areas. Over the twenty year period approximately 60 acres will be disturbed by demolition of existing buildings and construction of new facilities. Construction would require extensive grading and cut and filling operations. Additional site disturbance for trenching would occur during construction of the utilities that would be necessary to support the new facilities. The construction would require ground disturbance and would affect more than 5,000 SF of earth and would require an approved erosion and sediment control plan. The impact to the soils would be temporary. The impact of compaction of previously non-compacted soils would be a lower percentage as the majority of sites are previously developed. Geotechnical investigation would be required for each project to determine the level of groundwater and bedrock.

New roadways and new buildings planned for previous surface parking lots would affect soil compaction in those areas. Site berms required for the new waste handling facilities would provide an opportunity for relocating excavated soils. The removal of excavated soils would require significant truck haul away operations during construction, which would be a temporary adverse impact and site specific to the particular project.

Some ground disturbance would occur as a result of construction operations and staging around the project sites. Soil erosion and sediment control measures would be implemented on the perimeter of the site, including the construction staging. The underlying geology of schist may necessitate removal of rock for projects that include below grade structures. Rock removal may affect the location of buildings and the construction procedures to minimize the impact of rock removal operations. In the event of rock removal the impacts will be significant, adverse and temporary. Rock removal would be conducted in accordance with Federal state and local government requirements and per safety regulations.

Overall there would be some impacts on bedrock and for particular projects, temporary or permanent dewatering. Impacts on geology would be temporary.

4.2.2.2 *No Action Alternative*

The No Action Alternative includes buildings previously undeveloped sites. The construction will require ground disturbance and will affect more than 5,000 SF of earth disturbance and will require an approved erosion and sediment control plan. Interior renovations would not require ground disturbance, other than support utility trenching or other support utility tanks. The impact to soils and geology would be minor and temporary.

4.2.2.3 *Maximum Development Alternative*

The Maximum Development Alternative will also have considerable ground disturbance, similar to the Proposed Action, requiring geotechnical investigation prior to starting the projects and approved erosion and sediment control plans during construction.

4.3 BIOLOGICAL RESOURCES IMPACTS

4.3.1 Tree & Vegetation Impacts

In assessing the potential positive and negative impacts of the three master plan alternatives on campus trees and vegetation, several factors were considered. These include: changes in relevant policies, if any; the possible net loss or gain of trees and vegetation; loss of existing trees and or forest areas; and change in the campus land area available for planting

Impacts from implementation of the three alternatives were found to be generally positive and NIH is and is likely to continue exceeding requirements. Procedures for mitigation for any

negative impacts to existing trees and vegetation are already in place through NIH policy, the campus wide Forest Conversation Plan and project specific protection and design processes.

None of the three alternatives represent a departure from the policies in place or planned for in the current Master Plan. Current NIH tree, forest and vegetation policies would require ongoing protection, replacement and enhancement on a campus wide basis. The requirements for preparation and approval of forest conservation plans, which have been implemented since the last master plan would continue for the proposed individual projects. The current policies and plans would ensure that individual existing trees and forest areas would be preserved where possible, would be protected during construction. Any trees or forest areas removed would be replaced and/or mitigated.

Current NIH policy is for no net loss of trees. This policy would continue under all three alternatives so that no alternative would result in a net decrease of trees or vegetation. The requirements for preparation and approval of forest conservation plans for individual projects would also continue. The current policies and plans ensure that individual existing trees and forest areas would be preserved where possible, and would be protected during construction.

Tree losses would be dependent on the final configurations of the individual proposed projects in the Proposed Action and the Maximum Development Alternative, which would not be defined for years. Tree losses on individual projects would be determined when individual project site designs and tree conservation plans are prepared. Individual projects would also include mitigation and replacement plans and determine if any smaller trees could be salvaged through transplanting. The tree impacts and mitigation is known for the No Action Alternative as the proposed building projects are in a more developed state.

Under the Proposed Action there would be about 5 percent net increase of open space creating about fifteen acres of new open space, which includes four acres of new green areas in the perimeter buffers. Under the No Action Alternative, no new open space would be created as the existing parking areas in the buffers would not be removed. There will be building demolition and tree removal associated with those projects. The Maximum Development Alternative would result in about a 3 percent net increase of open space thereby creating about eight acres of new open space, which also includes four acres of new green areas in the perimeter buffers. The extent of natural forested areas would increase as the naturalizing process continues in the no-mow areas and the extent of natural areas increase for all three alternatives.

4.3.1.1 *Proposed Action*

A continued increase in the number of trees and forested areas is anticipated from ongoing planting and naturalizing programs. New construction projects would include new tree and shrub plantings. Any loss of existing trees would be evaluated on a project by project basis as the project proceeds.

Change in land area available for planting would increase about 4 acres in the perimeter buffer would occur as surface parking lots are removed and about 11 acres of other additional open space is anticipated elsewhere

4.3.1.2 *No Action Alternative*

A continued increase is anticipated through ongoing planting and naturalizing programs and a net gain of 159 to 164 is anticipated from the construction of the Porter Neuroscience Center Phase II and the Northwest Childcare Center

4.3.1.3 *Maximum Development Alternative*

A continued increase in the number of trees and forested areas is anticipated from ongoing planting and naturalizing programs. When new construction projects proceed, replacement trees would be provided. The Maximum Development will remove more trees during construction and demolition than the other two alternatives. The Maximum Development contains the same increase of about 4 acres in the perimeter buffer would occur as surface parking lots are removed and about 11 acres of other additional open space is anticipated elsewhere.

4.3.2 Fauna and Habitat Impacts

4.3.2.1 *Proposed Action*

The Proposed Action would conserve the campus perimeter buffer zones. While the NIH population is expected to increase by 3,000, this alternative focuses construction primarily on previously developed areas with the exception of the Northwest Child Care Center, which is also included in the No Action Alternative. Although there would be an increase in development, current NIH tree, forest and vegetation policies remain in place requiring ongoing protection, replacement, and enhancement. Tree losses would be determined on an individual project basis but policy prohibiting a net loss of tree and\or vegetative cover remains in place. Proposed Action also calls for an increase in open space area of roughly 15 acres, increasing the extent of naturally forested area. Impacts would be minor, adverse, long-term, and site specific.

4.3.2.2 *No Action Alternative*

The Porter Building is currently under construction and the Northwest Child Care Center is planned to start construction by 2013. The Northwest Child Care would be constructed within an existing cleared area north of Center Drive. The Child Care may require some tree clearing along the edge the existing wooded area located between Center Drive and Cedar Lane. Impacts would be minor, adverse, long-term, and site specific. Although the ongoing development calls for the demolition of approximately 60 trees, current NIH tree, forest and vegetation policies remain in place requiring ongoing protection, replacement, and enhancement. Policy prohibiting a net loss of tree and/or vegetative cover is maintained with the

addition of 159 to 164 trees anticipated, occurring with site development. Impacts would be minor, adverse, long-term, and site specific.

4.3.2.3 *Maximum Development Alternative*

The Maximum Development Alternate would conserve the campus perimeter buffer zones. While the NIH population would increase by 10,000, this alternative focuses construction on previously developed areas with the exception of the Northwest Child Care Center, which is described in the No Action Alternative.

Current NIH tree, forest and vegetation policies remain in place requiring ongoing protection, replacement, and enhancement. The Maximum Development tree losses would be more significant than the other two actions. The tree losses would be determined on an individual project basis. The policy prohibiting a net loss of tree and/or vegetative cover remains in place. This alternative also calls for an increase in open space area of roughly 8 acres, increasing the extent of naturally forested area. Impacts would be minor, adverse, long-term, and site specific.

4.3.3 Wildlife Impacts

The NIH is committed to conserving as much as the natural environment as possible. Within the gates the NIH many animals and plants thrive. None of these plants or animals are listed on the Department of Natural Resources list of Endangered Species; the NIH takes special measures to keep habitat on campus. Running through the NIH campus is a renovated stream. The stream is home to many aquatic species like crayfish, blacknose dace, American toads, spotted salamanders and wood frogs. The stream is a vital source for more than the aquatic species; many birds and mammals located on campus utilize the stream. NIH has designated areas on campus as Forest Conservation Areas. In these areas, people are blocked from disturbing the species habitat. The area is allowed to grow independently and no landscaping or interaction occurs here. No-mow areas are also untouched by landscaping. No-mow areas are open land areas free of mowing, which allow natural grasses to flourish. The forest conservation areas and the no-mow land are ideal for small mammal habitat. The house mouse, white-footed mouse, deer mouse, least shrew, short-tail shrew and the Norway rat are all animals that use these habitats. Birds are also a large part of campus life. Whether the birds are transient or nesting, the NIH provides 87 bird boxes or bird homes. These boxes attract bluebirds, tree swallows, chickadees, house wrens, and Carolina wrens. Other larger mammals that seem to have found their niche on NIH campus are raccoons, opossum and white-tailed deer.

4.4 WATER RESOURCE IMPACTS

4.4.1 Stream Characteristics and Flow Impacts

4.4.1.1 *Proposed Action*

The Proposed Action decreases the amount of developed area on the campus from 42 percent to 40 percent. The amount of open space would increase from 58 percent to 60 percent. Under this alternate, N21, the New Administration Building, located at the site of existing Building 21, comes in close proximity to the stream channel of the NIH Stream. Based on the conceptual building layout, a direct impact to the NIH Stream could be avoided with planning. As the design progresses, the site plan needs to include stream protection. The demolition of existing Building 21, which includes the decommissioning and removal of the radioactive waste holding tanks, the historical abandoned holding tanks and containment vault, has the potential for impacting the stream. There is a spring under the vault area of the building, which would require care and protection during demolition and construction activities.

The construction of the Northwest Child Care facility requires the relocation of the existing concrete drainage channel. Since the concrete channel is a man-made conveyance system, there would be no impacts to the natural Water Resources. Additionally, with stormwater management treatment required for new development projects and demolition, improvements to water resources would be anticipated.

With the proposed increase in overall campus open space and decrease in impervious area, water resources should be expected to show general signs of improvement. Due to the size of the proposed improvement in relationship to the overall watershed(s), the improvements would be minimal. The impacts from demolition and construction would be adverse, temporary during the periods of demolition and construction and local to the project sites. Other watershed impacts would be minor, adverse, long-term and local.

4.4.1.2 *No Action Alternative*

The No Action Alternative maintains the existing 58 percent of open space. The No Action Alternative does not impact the NIH Stream or Stony Creek. A portion of the concrete drainage channel behind the Northwest Child Care Center site, that carries flow of the North Branch, may require relocation for the construction of the Northwest Child Care facility. Since the concrete channel is a man-made conveyance system, there would be no impacts to the Water Resources.

Although the No Action Alternative proposes new development the overall campus impervious area would not increase. Channel flow and stream characteristics are not anticipated to deviate from existing conditions. Impacts would be minor, adverse, long-term and local.

4.4.1.3 *Maximum Development Alternative*

This decreases the amount of developed area on the campus from 42 percent to 40 percent. As such the amount of open space would increase from 58 percent to 60 percent. Under this alternate, as described in the Proposed Action, the demolition of existing Building 21could impact the NIH Stream, as could the proposed new building N21. Similar to the Proposed Action, the construction of the Northwest Child Care facility may require the relocation of the existing concrete drainage channel. The impacts would be the same as the Proposed action for the Building 21 and the Northwest Child Care Center projects.

Similar to the Proposed Action the Maximum Development Alternative would increase in overall campus open space and decrease in impervious area, water resources should be expected to show general signs of improvement. However, due to the relative size of the proposed improvement in relationship to the overall watershed(s), the improvements would be minimal. Demolition and construction impacts would be adverse, temporary during the periods of demolition and construction and local to the project sites. Other watershed impacts would be minor, adverse, long-term and local.

4.4.2 Water Quality Impacts

Impacts under the Master Plan Proposed Action and the No Action Alternative are similar except for the volume of heated water released. To accommodate the expansion proposed in the Master Plan, the chiller plant capacity would increase from 43,000 to 80,000 tons. Heated water discharges are projected to increase from 300,000 to 560,000 gallon per day (gpd).

As the Master Plan develops, it is assumed that Chillers 22 through 27 are committed, and would still be installed under the Building 11 Phase I expansion. This would increase the chiller capacity to 66,000 tons to meet increasing demands from existing and recently built buildings. This would increase the average daily discharge to about 460,000 gpd.

NIH expects to apply for a new National Pollutant Discharge Elimination (NPDES) permit increasing the permitted discharge rate when it is necessary to accommodate the proposed new development. It is anticipated that the parameters set for temperature, chlorine content, and pH would remain the same. Since the releases under both alternatives must meet the criteria, it is expected that neither would produce significant water quality impacts as a result of power plant heated water releases

For the Proposed Action, No Action and Maximum Development Alternatives, there would be an increase in chiller plant capacity. The specific increase would be determined as part of the 2013 Master Utility Plan. All proposed developments would need to comply with the NPDES Permit and Total Maximum Daily Loads (TMDLs) requirements including any required mitigation. Impacts would be minor, adverse, long-term and local.

4.4.3 Stormwater Management Impacts

The NIH Integrated Stormwater Management Plan (ISMP) is applicable to the all Master Plan Alternatives. For the most part, the Master Plan Alternates are generally constructed over existing developed, impervious areas and would be considered as “Redevelopment”. All development in the Master Plan in impervious areas, as defined by Building 10 pre-Hatfield CRC conditions, is considered as “redevelopment” for determining individual project Stormwater Management (SWM) requirements as outlined in the ISMP.

Determination of necessary Master Plan site-wide Environmental Site Design (ESD) volumes is complex. In agreement with MDE, an assumption is made in the ISMP to simplify calculations, to ensure sufficient capacity for intermediate campus conditions and contingencies, and to avoid uncertainties about details at the future project level. Although the actual campus impervious area is projected to decrease or remain the same under the Master Plan Alternative developments, stormwater management would be required in accordance with the current federal and state SWM requirements and the ISMP.

Future campus impervious surface area cannot be calculated with precision because the Master Plan is conceptual at this time. Actual impervious cover would be dependent on the design layout of the individual buildings, parking, roads, and sidewalks. Although the Master Plan would add over 4 million gsf of floor space under full build out conditions, approximate computations indicate there would be little or no net change in site imperviousness. This is due to the redevelopment goals, which replace existing low-rise one to three story facilities with mid-rise five to seven story structures and include a few high-rise structures.

While there may be no net increase in the overall impervious area, stormwater management would still be required for each respective building project. For example, Redevelopment of a site with 10 acres of building and paving that would result in no change in physical impervious area would require the treatment or removal of 50 percent of the redeveloped areas or 5 acres in this example. This indicates a significant amount of site grading.

4.4.3.1 *Proposed Action*

The Proposed Action slightly reduces the amount of developed land from 42 percent to 40 percent and increases the amount of open space from 58 percent to 60 percent. Individual building projects would need to comply with all stormwater management permitting requirements at the time of construction. There is a sizeable amount of grading expected during construction and demolition activities. Impacts are expected to be minor, beneficial, long-term, site specific and local.

4.4.3.2 *No Action Alternative*

The No Action Alternative maintains the approximate land use conditions at the existing 2013 conditions; with 42 percent developed land and 58 percent open space. Individual building

projects would need to comply with all stormwater management permitting requirements at the time of construction. Impacts are expected to be minor, beneficial, long-term, site specific and local.

4.4.3.3 *Maximum Development Alternative*

The Maximum Development Alternative slightly reduces the amount of developed land, similar to the Proposed Action percentages. The Maximum Development has considerably more total grading, demolition and construction than the Proposed Action. Individual building projects would need to comply with all stormwater management permitting requirements at the time of construction. Impacts are expected to be minor, beneficial, long-term, site specific and local.

4.4.4 Aquatic Habitat Impacts

In summary, the impact assessment for each of the three alternatives on Aquatic Habitat is as follows:

4.4.4.1 *Proposed Action*

Proposed Action increases the campus population by 3,000 persons while preserving the current land use conditions with minimal changes to the developed and open space areas. Due to the state's stormwater management treatment requirements, the Aquatic Habitat should be expected to improve over time. However, due to the size of the proposed improvement in relationship to the overall watershed(s), the impacts are expected to be minor, adverse, long-term, and local. The main impact would occur with the demolition and construction activities.

4.4.4.2 *No Action Alternative*

This Alternative maintains the current land use conditions with minimal changes to the developed and open space areas. The Aquatic Habitat should be expected to improve with stormwater management treatment per the state requirements. Due to the size of the proposed improvement in relationship to the overall watershed(s), the impacts are expected to be minor, adverse, long-term, and local.

4.4.4.3 *Maximum Development Alternative*

Maximum Development increases the campus population by 10,000 persons while preserving the current land use conditions with minimal changes to the developed and open space areas. Implementation of the state's stormwater management treatment should improve the Aquatic Habitat. The impacts are expected to be minor, adverse, long-term, and local given the overall size of the campus watershed. The main impact would occur with the demolition and construction activities and would extend for a longer period than the Proposed Action, as there are more projects.

4.4.4.4 *Wetland Impacts*

Since no wetlands are present, impacts are not applicable for the Proposed Action, the No Action Alternative or the Maximum Development Alternative.

4.4.5 Flood Plain Impacts

4.4.5.1 *Proposed Action*

In accordance with Executive Order 11988, Floodplain Management, this alternative proposes to construct N21, the New Administration Building, at the site of existing Building 21, which is in close proximity to the stream channel of the NIH Stream. The proposed improvements for this new Administration Building appear to avoid impacts to the NIH Stream floodplain located directly to the west of the proposed building. However, a detailed floodplain study should be conducted as part of the development of the New Administration Building. Floodplain avoidance should be considered. If floodplain avoidance is not feasible, the necessary mitigation and permitting measures should be implemented. Impacts are expected to be negligible, adverse, long-term, and site specific. This is also true for the Maximum Development Alternative.

4.4.5.2 *No Action Alternative*

In accordance with Executive Order 11988, Floodplain Management, this alternative does not propose construction of non-stormwater management facilities in the floodplain nor do they support floodplain development within the campus or outside of the campus. The addition of the proposed improvements under this alternative is expected to have negligible, adverse, long-term, and site specific impacts.

4.4.5.3 *Maximum Development Alternative*

Similar to the Proposed Action, this alternative proposes to construct the New Administration Building at the location of existing Building 21. The consequences would be the same.

4.4.6 Coastal Zone Impact

Since the NIH Bethesda campus is not located within an area governed by the Maryland Coastal Zone Management Program, impacts to the coastal zone are not applicable to any of the considered Alternatives.

4.4.7 Construction Sedimentation/Siltation Impacts

4.4.7.1 *Proposed Action*

Construction sedimentation and potential siltation would be encountered with a projected disturbed site area of 3,771,980 GSF for the demolition and redevelopment new construction.

Disturbance would be significant and would generally occur around each individual site. Erosion control measures would be used to mitigate impacts in accordance with the NIH Sediment and Erosion Control protection policy, the Maryland Erosion and Sediment Control Guidelines for State and Federal Government projects, and the 2011 Maryland Standards and Specifications for Erosion and Sediment Control. Impacts are expected to be significant, short-term, adverse and site specific.

4.4.7.2 *No Action Alternative*

Less construction sedimentation and potential siltation would be encountered with 292,450 GSF of disturbed site area for demolition and redevelopment new construction. Disturbance would generally occur around each individual site. Erosion control measures would be used to mitigate impacts in accordance with the NIH Sediment and Erosion Control protection policy, the Maryland Erosion and Sediment Control Guidelines for State and Federal projects, and the 2011 Maryland Standards and Specifications for Erosion and Sediment Control. Impacts are expected to be minor, short-term, adverse, and site specific.

4.4.7.3 *Maximum Development Alternative*

Construction sedimentation and potential siltation would be encountered with a projected disturbed site area of 5,092,019 GSF for the demolition and redevelopment new construction. The amount of disturbance is significant and more than the Proposed Action. Disturbance would generally occur around each individual site. Again, erosion control measures would be used to mitigate impacts in accordance with the NIH Sediment and Erosion Control protection policy, the Maryland Erosion and Sediment Control Guidelines for State and Federal projects, and the 2011 Maryland Standards and Specifications for Erosion and Sediment Control. Impacts are expected to be significant, short-term, adverse, and site specific.

4.5 AIR QUALITY IMPACTS

4.5.1 Traffic Emissions

Traffic is expected to be the primary mobile source of air emissions at or near the campus. Mobile air emissions for the campus at this time are expected to originate from vehicles associated with visitors, commuter transportation, employee parking, commercial delivery, and construction vehicles. Rockville Pike traffic contributes about two-thirds of the total CO due to higher traffic volume. Future traffic generated CO concentrations were predicted to be less than 2003 concentrations in all Alternatives due to projected vehicle emission rate reductions. Based on predicted values, the one and eight-hour average National Ambient Air Quality Standards (NAAQS) CO concentrations would not be exceeded and no impacts are expected for any of the proposed Alternatives.

For the increased traffic reported to be associated with Base Realignment and Closure (BRAC), the Maryland State Highway Administration has proposed improvements to the intersections for West Cedar Lane and Jones Bridge Road along Rockville Pike; Connecticut Avenue and Jones Bridge Road; and West Cedar Lane and Old Georgetown Road. Widened road paths on West Cedar Lane and Jones Bridge Road have also been performed. Funding has also been proposed for a pedestrian underpass from the Medical Center Station and Metro station to Walter Reed National Military Medical Center (WRNMMC) to increase pedestrian's ability to access each facility. This effort would reduce the use of shuttle or taxi usage and vehicle exhaust from idling traffic at the intersections, and improve air quality.

Table 4-1: Predicted Worst Case Traffic CO Concentrations

Year/Case	Site 1: 1-Hour Average (ppm)	Site 1: 8-Hour Average (ppm)	Site 2: 1-Hour Average (ppm)	Site 2: 8-Hour Average (ppm)
2002 Conditions: Traffic	1.8	1.4	1.2	0.7
2002 Conditions: Background	3.3	2.3	3.3	2.3
2002 Conditions: Total	**5.1**	**3.7**	**4.5**	**3.0**
2013 Master Plan: Traffic	3.0	2.4	1.8	1.4
2013 Master Plan: Background	2.0	1.4	2.0	1.4
2013 Master Plan: Total	**5.0**	**3.8**	**3.8**	**2.8**

4.5.2 Commercial Vehicle Inspection Facility Impacts

By 2033, with full Master Plan build out, CVIF traffic volumes were expected to increase by about 26 percent. Overall vehicle emission factors are predicted to decline with the expected increase in mass transit use, more electric and natural gas powered vehicles, as well as improvements in vehicle emission control technologies. Expectations also consider the continued Traffic Management Plan by NIH, which encourages reduced number of trips by contractors and employees. However, this is based on broad assumptions and would be subject to change. There were no reported sensitive receptors in the vicinity of the CVIF.

The maximum effect of CO from CVIF vehicles occurs when the wind blows from the east across the vehicles at the front of the queues at the stop line. In this case, the peak one-hour average CO concentration is 1.4 ppm. CVIF vehicles contribute 1.1 parts per million (ppm), and Rockville Pike traffic contributes 0.3 ppm. The 1.1 ppm contribution from CVIF idling vehicles is constant all along the west side of the inspection area as long as all four inspection lanes are occupied when the wind is blowing from the east. The results were reported to be below the 3.5-

ppm one-hour average and 9 ppm eight-hour average national standards. The maximum CVIF vehicle contribution to a receptor at NIH Building 6A was reported to be 0.1 ppm, therefore, no impacts were expected based on these values.

Table 4-2: Predicted Total CO Concentrations

Area	2003 Baseline 1-Hour Average (ppm)	2003 Baseline 8-Hour Average (ppm)	2033 - Predicted 1-Hour Average (ppm)	2033 Predicted 8-Hour Average (ppm)
CVIF Contribution	1.1	1.1	1.38	1.38
Rockville/Wilson Contribution	0.3	0.2	0.378	0.252
Background	3.3	2.3	4.158	2.89
Total	**4.7**	**3.6**	**5.91**	**4.52**

4.5.3 Parking Emissions

Two parking structures (MLP-6 and MLP-8) were previously studied as part of the emission analysis for CO concentrations. Their combined capacity is 2,531 spaces, about 26 percent of the campus total and would continue in service for the all the considered Alternative Plans. The Plan's long-term goal is to maintain effective parking at a rate of 0.5 parking spaces per NIH employee and 16 percent with visitor parking.

During the development of the 1995 Master Plan EIS five sites were analyzed for the maximum or "worst case" one-hour average CO concentrations. It was determined that Site 3 (located between MLP-8 and McKinley Street) was subject to the highest overall CO concentrations. Resultant estimated CO concentrations indicated that Levels 3 and 4 of the parking garages contributed virtually all of the CO concentration at the receptor since they have both the highest traffic volumes and the least elevation differential with the receptor. The greatest level of vehicular exits was reported between the hours of 3pm and 5pm ranging from 249 to 550 exits. The peak hour was reported at 4pm.

As of 2012 there were 10,528 parking spaces on campus. Future vehicle volumes are expected to decrease from a land area of parking at 10 percent existing conditions in 2003 to 9 percent in 2013. Minimal development efforts predicted from 2013 to 2033 indicate that the land area of parking would consist of 9 percent of the total campus land area. Redevelopment or Maximum Development efforts would consume 5 percent of the land area.

Parking space supply is expected to increase from existing 10,528 spaces in 2012 to 15,297 under the Maximum Development Alternative. Future vehicle volumes and physical parameters generally remain similar under the proposed Alternatives and the No Action Alternative as the MLP operates at capacity conditions in all cases. Additions of future parking structures have not been estimated to consider the number of spaces that would be provided. However, generated CO concentrations are expected to possibly decline overall. This is due solely to the model including U.S. EPA projected reductions in individual vehicle emission rates over time.

NIH continues to provide carpools and vanpools for visitors within close proximity of the campus buildings. NIH has also implemented a Transhare Program, paid parking for visitors, internal and external shuttle bus routes and services, and promotes alternate work schedules for its employees. Biannual traffic counts at campus access points indicate that single occupancy vehicles at NIH have decreased by more than 30 percent. NIH generated vehicles currently on the roads that surround the campus are reported to be below the 1991 baseline numbers aside from the growth of NIH's population. Based on the available information, mobile source emissions do not appear to have significant impacts for the proposed Alternative plans.

4.5.4 Stationary Source

4.5.4.1 *Central Steam Plant Emissions*

The main stationary source, or point, for emissions on campus is the central heating plant in Building 11 where steam is generated for heating of the campus buildings. Steam is also utilized for humidity control, sterilization of equipment, cleaning of animal areas, and at the lab benches.

Previous sources of sulfur oxides, nitrogen dioxides, and suspended particulate matter were associated with the combustion of fuel in the boilers at the central heating plant. In 1994, NIH implemented a program to reduce emissions by converting boilers to use natural gas. In addition, stack heights were increased to improve emission dispersion and thus a reduction in the concentration of emitted pollutants.

The annual NO_x emissions from the NIH central heating plant are limited to 55.6 tons for the COGEN unit and 81.7 tons for boilers 1 through 5, or a total 137.3 tons. The NOx emissions in 2011 were 81.16 tons per the Criteria Air Pollutions Emissions Certification Report provided by NIH. This within the prescribed limits as stated above. Use of the power within NIH and the immediate neighborhood virtually eliminates distribution losses, and creates additional NOx reductions. Driving the chillers using steam generated by the plant boilers also reduces regional emissions.

Computer stack plume dispersion modeling previously estimated the atmospheric dispersion and resultant concentrations of pollutants at selected receptors in the vicinity of emission sources. The resultant estimated receptor concentrations were reported in the 2003 EIS data findings and include adjustments for the trend lines in the MDE 2002 Maryland Air Quality

Report. Based on the reported findings, the total existing and projected pollutant concentrations met the NAAQS criteria in each of the proposed Alternatives.

4.5.4.1.1 *Proposed Action*

Based on the utility capacity and future plans for peak demand, the Proposed Action would result in an estimated 1,099,179 pounds per hour (pph) of steam production. The Proposed Action plan would also require the addition of one boiler similar to the COGEN (Boiler 6) at 1,000,000 pph steam, and the addition of one chiller at a 5,000 ton capacity.

4.5.4.1.2 *No Action Alternative*

Based on the utility capacity and proposed future plans for peak demand, the No Action Alternative plan would result in an estimated 880,641 pph of steam production. This is the least steam demand option presented.

4.5.4.1.3 *Maximum Development Alternative*

The maximum development alternative would require more need for steam production and the addition of additional facility equipment to supply the demand. Based on the utility capacity and proposed alternative plans for peak demand, Maximum Development Alternative plan would result in an estimated 1,204,903 pph of steam production. This would require the addition of a boiler with a similar capacity of Boiler 5 at 200,000 pph of steam and the addition of two chillers for a total capacity increase of 10,000 tons.

4.5.4.1.4 *Pollutant Emission Factors*

The use of the pollutant emission factors shown in Table 4-3 produces conservatively high emission estimates. Actual plant emission factors based on annual stack tests for Boilers 1 through 5 are generally less than the computed values. Since the units have different pollutant emission factors for each type of fuel, actual or estimated emissions depend on which unit is used and the amount of steam produced by each unit using each fuel type. A simulated annual plant operation that would meet the projected steam demands of each alternative and assess compliance to Title V NOx emission limits under each of the Master Plan Alternatives is shown in Table 4-4.

Table 4-3: Emission Factors for Estimating Boiler Plant Pollutant Emissions (Lb. of pollutant/mm BTU)

Emission Type	Boilers 1-5 No. 2 Oil	Boilers 1-5 Natural Gas	COGEN 1 Natural Gas	COGEN 2 No. 2 Oil	COGEN 2 Natural Gas	Boiler 7 (FUTURE) No. 2 Oil	Boiler 7 (FUTURE) Natural Gas
Carbon Monoxide (CO)	0.0779	0.0739	0.0243	0.004	0.007	0.07796	0.0739
Sulfur Dioxide (SO2)	0.0507	0.0006	0.00066	0.054	0.00066	0.051	0.0006
Particulate Matter (PM-10)	0.0143	0.0062	0.021	0.015	0.007	0.00929	0.00745
Volatile Organic Compounds (VOCs)	0.00143	0.00278	0.0014	0.002	0.003	0.00446	0.00423
Nitrogen Oxides (NOx)	0.130	0.050	0.0442	0.120	0.120	0.10243	0.02427

(1) At 107,000 lb./hr and no supplemental HRSG firing.
(2) At 180,000 lb./hr with supplemental HRSG firing.

Additional simulated annual plant operations may be developed as part of the 2013 MUP. In all projections, natural gas is a preferential fuel because it produces less NOx and other pollutants per pound of steam generated when compared to oil. Oil is generally used when Washington Gas curtails the gas supply, and demands outside NIH are high. Curtailment is also coincident with high campus steam demand. Gas was curtailed at least in part on 38 days (840 total hours) in 2003, and NIH used oil exclusively during these periods. Although oil was used for less than 10 percent of the year, nearly 17 percent of the annual steam production was generated using this fuel. The Title V operating permit NOx limit would be met in both cases under the assumed conditions. These projections would be evaluated and adjusted as needed after the completion of the 2013 MUP.

Table 4-4: Projected Annual Emissions (Tons Per Year) for 2033

Emission Type	No Action Alternative No. 2 Oil	No Action Alternative Natural Gas	Proposed Action No. 2 Oil	Proposed Action Natural Gas	Maximum Development No. 2 Oil	Maximum Development Natural Gas
Carbon Monoxide (CO)	8.6	128.9	10.9	163.8	11.9	178.9
Sulfur Dioxide (SO2)	5.6	1.0	7.2	1.3	7.8	1.5
Particulate Matter (PM-10)	1.0	13.0	1.3	16.5	1.4	18.0
Volatile Organic Compounds (VOCs)	0.5	7.4	0.6	9.4	0.7	10.2
Nitrogen Oxides (NOx)	11.3	42.3	14.4	53.8	15.7	58.7

Actual emissions would vary from the projected estimates, either up or down, depending on several conditions. NIH would have some latitude in controlling overall annual emissions, particularly in the Maximum Development Alternative Master Plan case. The proposed Boiler 7 and the existing COGEN unit produce less NOx than Boilers 1 through 5 per pound of steam produced. Maximization of the amount of steam generated by these units over the year would lower the annual amount of NOx generated for a fixed steam demand.

Steam drive would be most effective during the summer months. Since the overall summer campus chilled water demand is higher, the chiller steam load would be uniform over time. Operation at 15,000 tons would reduce electric power consumption by an 8,850 kWh necessary for electrical drive. Most of the power delivered to the campus is generated in commercial power plants fueled by coal or oil, which produce higher amounts of NOx than natural gas per BTU of heat generated. Further, more than one kilowatt of power must be generated at the distant plant to delivery one kilowatt to the customer due to transmission line losses. NOx emissions factors using bituminous coal can range from about 0.20 to 0.85 lbs/mm BTU depending on combustion unit characteristics, and emission controls. The entire range of emission factors for coal is far above those for natural gas.

Generation of electric power in the COGEN unit, in effect, substitutes natural gas for coal and oil as the power generation fuel. On a regional basis, NOx emissions are reduced by a factor of four or more for each kW generated by the NIH plant. Use of the power within NIH and the immediate neighborhood virtually eliminates distribution losses, and creates additional NOx reductions. Driving the chillers using steam generated by the plant boilers also reduces regional emissions.

4.5.4.2 *Laboratory Emissions*

In contrast to vehicles or the boiler plant where emissions are limited to a few combustion products, laboratory emissions can have a multitude of potential components. These components and their concentrations vary from day to day depending on the collective experimental protocols. The pollutant emission volumes of any one researcher are small, since the amount of chemicals or biological materials handled at any one time is small. Quantities handled at any time are generally contained with beakers, phials and Petri dishes. Biological materials may consist of tissue, DNA, or body fluid samples that are kept in refrigerators when not in active use. Until recently, although they would be locked at the discretion of the researcher, Biosafety Level 1 and 2 laboratories were otherwise accessible to anyone because there are no significant hazards or expected air emissions.

Safe air quality levels must be maintained not only for the general public, outside the laboratory, but also the workers and visitors within the building itself. This is accomplished through national building and mechanical codes that set ventilation requirements. These requirements are used for the design and construction of university laboratories and biomedical research facilities in the private sector throughout the US.

Since the amount and character of potential pollutant generation vary, the codes that apply to it are based on the principle of massive dilution and the number of laboratory hoods or stations is not yet predicted, the overall dispersion cannot be calculated.

However, verification should be made that adequate clean fresh outside air is being supplied to the occupied spaces of the building, especially in light of occupancy requirements or operational use of each space. The current American Society of Heating and Air-Conditioning Engineers (ASHRAE) recommendation is 20 Cubic Feet per Minute (CFM) of outside air per person.

Further dilution of ventilation from sources would be expected to occur once roof top emissions are released due to atmospheric dispersion in both the horizontal and vertical direction. The magnitude of this dispersion is several million-fold. As a parallel example, it is estimated that traffic on Rockville Pike, Old Georgetown Road, and West Cedar Lane produces about six tons of carbon monoxide per day solely on those links adjacent to the campus. But the contribution of this traffic to the carbon monoxide at residences adjacent to the roadways is measured in terms of a few parts per million (ppm), or micrograms per cubic meter.

Further operational and ventilation requirements are set for Biosafety Level 3 and 4 laboratories. If necessary, experimental work is done in sealed chambers with built-in hand access that are within the laboratory room. Codes and standards require the laboratory room to be kept at a "negative" or lower air pressure in relation to the building as a whole to contain any release of material to the room itself. The codes also require all air exhausted from Biosafety Level 3 and 4 laboratories to pass through High Efficiency Particulate Arresting (HEPA) air filters before release. These filters reduce particles down to the 0.1-micron level from outflowing air content. Materials removed include dust, smoke, spores, bacteria, and viruses.

Minor and temporary increases in air pollution are expected as a result of construction activities associated with demolition and/or development efforts. These sources may be dust and emissions from construction equipment and vehicles. These increases are expected to be sporadic and minimal. All compliances to releases of hazardous materials such as lead or asbestos should comply with Federal and State regulations.

4.6 GREENHOUSE GAS EMMISIONS

Based on the proposed alternative plans, increases in energy usage are proposed to increase by approximately 20 percent under the Proposed Action and by 40 percent under the Maximum Development Alternative. This would result in an approximate increase in CO_2e emissions by 39,060 tons and 93,745 tons, respectively for each alternative, the Proposed Action and Maximum Development Alternative plans with no changes to providing sustainable energy. However, through NIH's Strategic Sustainability Performance Plan, a reduction of Scope 1 and 2 emissions are proposed for a 10.4 percent reduction by 2020 through a combination of energy reduction activities and use of renewable resources. The overall reduction is proposed to be a 22.9 percent reduction in overall energy per square foot. The goal is further reached by their efforts to reducing petroleum use in their fleet vehicles; increasing use of alternative fuels; optimize the use of vehicles; and increasing use of low emission and high fuel economy vehicles.

Onsite production and off-site purchases are proposed to increase the use of renewable energy by 7.5 percent by 2020. A 30 percent reduction of petroleum based fuels in the fleet and increasing alternative fuel usage by 30 percent is expected by 2020. CO_2e greenhouse gas emissions are proposed to reduce by 10.4 percent by 2020. NIH has established a sustainable building program to include sustainability through the management of building design, construction, renovation, procurement, landscape, energy, water, waste, emissions, transportation, human health, and productivity. NIH proposes to implement several design mandates to achieve zero-net energy by 2030.

4.7 NOISE IMPACTS

4.7.1 Traffic Noise

Traffic noise predictions were previously determined which included information on traffic volumes, mix and speeds, and roadway and receptor geometry as inputs and data for the peak PM hour was used.

4.7.1.1 *Proposed Action*

Traffic generated by implementation of this plan is not expected to create noise impacts on the surrounding neighborhoods. Noise levels may increase by 2 dBA or less under this development plan. One or two dBA differences are not considered readily discernible to the human ear. Traffic volumes must double or halve to produce a 3-dBA increases or decrease, respectively. Even with projected non-NIH growth in the Bethesda CBD and Rockville Pike corridor, traffic volumes are not expected to double.

Predicted noise levels are typical for urban arterials and collector-distributor roadways. Future noise levels were proposed to remain unchanged. This includes areas within approximately 600 feet of Rockville Pike, Old Georgetown Road, and Cedar Lane.

Vehicles associated with the Gateway Center garage and the Commercial Vehicle Inspection facility was included in the analysis. They are not reported to have an impact on noise levels because they comprise only a fraction of the total traffic.

4.7.1.2 *No Action Alternative*

Traffic generated by implementation of this plan is not expected to create noise impacts on the surrounding neighborhoods. Future noise levels were proposed to remain unchanged.

Vehicles associated with the Gateway Center garage and the Commercial Vehicle Inspection facility was included in the analysis. They are not reported to have an impact on noise levels because they comprise only a fraction of the total traffic.

4.7.1.3 *Maximum Development Alternative*

Traffic generated by implementation of the Maximum Development Plan is not expected to create noise impacts on the surrounding neighborhoods. Noise levels may increase by 2 dBA. One or two dBA differences are not considered readily discernible to the human ear. Traffic volumes must double or halve to produce a 3-dBA increases or decrease, respectively. Even with projected non-NIH growth in the Bethesda CBD and Rockville Pike corridor, traffic volumes are not expected to double.

Predicted noise levels are typical for urban arterials and collector-distributor roadways. Future noise levels were proposed to remain unchanged. This includes areas within approximately 600 feet of Rockville Pike, Old Georgetown Road, and Cedar Lane.

Vehicles associated with the Gateway Center garage and the Commercial Vehicle Inspection facility was included in the analysis. They are not reported to have an impact on noise levels because they comprise only a fraction of the total traffic.

4.7.2 Mechanical Source Noise

Data presented in a 2006 study (Colin, Gordon and Associates; 2007) indicated that out of more than 200 separate mechanical sources evaluated, exhaust stacks are the source of the loudest noise onsite. The most significant of the stacks are on located on Buildings 10, 33, 35, 37, and 41. Other noise sources that produce significant amounts of noise are air handling units and mechanical rooms, which are found on top of Buildings 14, 35, 40 and 50.

Previous studies indicated that Building 11 is the top contributor of noise on the south end of the campus. The principal sources of exterior noise are the cooling towers located on the roofs of the two buildings (11 and 14). The towers have three separate sub sources of noise: tower fans and motors, water splashing in tower trays, and high velocity air passing through the tower and its fans.

Total plant noise varies incrementally with the number of units in service. Observation of the monitored noise levels and field conditions indicated that the NIH chilled water plant produced different noise impacts at different times. Except for summer, noise produced by the plant during the daytime was submerged within the overall noise environment. Then, the plant was not a primary contributor. During summer months, when temperatures exceed 90° F, plant noise increases as the number of units in service increase. During the day, plant noise is equivalent to all other noise sources combined in terms of loudness. It is during the summer nighttime when plant noise becomes most evident. Although the plant produces less noise during the night time hours than during the day, the noise from all other sources decreases to a greater extent, and plant noise becomes the dominant or loudest contributor to the overall noise environment.

4.7.2.1 *Proposed Action*

Under the redevelopment plan, noise from Building 11 would be expanded and two additional boilers and three additional chillers would likely be required. The additional noise sources would add to the noise, however, additional acoustical louvers could be installed properly to minimize the effect.

It has been reported based on the previous studies that noise generated by the plant would contribute significantly less to the total noise environment. It is only when all cooling tower units are running that the combined or cumulative noise produced becomes significant.

Leq noise levels on the north side of Building 14 would be high and operation of individual tower units may make a difference in the noise environment. However, when the plant operates at less than capacity, the Leq noise level and the noise generated by cooling towers associated with the chillers would increase under this Alternative. The addition of one chiller similar to those already installed may be installed, based upon the preliminary analysis previously performed.

The Redevelopment plan proposes replacing Building 14. The north wall of the new Building N14 would be about 130 to 140 feet from Building 11. The projected maximum future Leq noise level at Building N14 is 65 dBA, an acceptable level in an urban environment. This would occur under high summer temperature conditions.

4.7.2.2 *No Action Alternative*

Under the minimum development plan, noise from Building 11 would be expanded one additional boiler and one additional chiller would likely be required. The additional noise sources would add to the noise, however, additional acoustical louvers could be installed properly to minimize the effect.

It has been reported based on the previous studies that noise generated by the plant would contribute significantly less to the total noise environment. It is only when all cooling tower units are running that the combined or cumulative noise produced becomes significant.

Leq noise levels on the north side of Building 14 would be high and operation of individual tower units may make a difference in the noise environment. However, when the plant operates at less than capacity, the Leq noise level at any point opposite the center of a single operating tower cell would continue permanently under the No Action Alternative.

4.7.2.3 *Maximum Development Alternative*

Under the Maximum development plan, Building 11 would be expanded and three additional boilers are likely required. Five additional chillers would also likely be required. The additional noise sources would add to the noise, however, additional acoustical louvers could be installed properly to minimize the effect.

It has been reported based on the previous studies that, noise generated by the plant would contribute significantly less to the total noise environment. It is only when all cooling tower units are running that the combined or cumulative noise produced becomes significant.

Leq noise levels on the north side of Building 14 would be high and operation of individual tower units may make a difference in the noise environment. However, when the plant operates at less than capacity, the Leq noise level and the noise generated by cooling towers associated with the chillers would increase under this Alternative. The addition of one chiller similar to those already installed may be installed, based upon the preliminary analysis previously performed.

The Maximum Development Plan proposes replacing Building 14. The north wall of the new Building N14 would be about 130 to 140 feet from Building 11. The projected maximum future Leq noise level at Building N14 is 65 dBA, an acceptable level in an urban environment. This would occur under high summer temperature conditions.

4.7.3 On Campus Noise

In general, the future campus noise environment for each alternative would be similar to existing conditions, since no one source of noise dominates and no new significant noise source would be created. Traffic noise levels increase with vehicle volume and speed. A doubling of vehicle volume increases noise levels by 3 dBA, if all other factors are held constant. Gateway Center and Commercial Vehicle Inspection Facility traffic volumes are low in comparison to volumes on adjacent Rockville Pike and move at lower speeds. Noise levels in the Rockville Pike corridor are dominated by Rockville Pike traffic. Noise levels in the east side buffer area would be the unchanged by these projects.

Internal campus traffic volumes under the each of the three alternatives would be similar to existing conditions. Currently, most vehicles make short internal campus trips to the nearest peripheral surface parking. In the future, under the Master Plan the pattern would be similar except that the vehicles would proceed to structured parking along the Loop Road.

Traffic counts at the campus reportedly indicate that single occupancy vehicle (SOV) traffic has decreased by more than 30 percent. No new overall campus peak hour generated trips are proposed by future NIH growth beyond the trip generation goal defined for the Transportation Management Plan *(Memorandum of Understanding*, 1992).

New NIH facilities should be designed to abate or mitigate excessive noise and vibration impacts to nearby NIH facilities, and the neighborhoods surrounding the campus. The potential impacts and necessary abatement must be evaluated on a case-by-case basis. Maximum building operational Leq noise levels should meet the Maryland or Montgomery County noise criteria. Mitigation can be achieved through physical shielding, equipment noise silencers, or project design configuration and layout.

4.7.3.1 *Proposed Action*

Future campus noise environment is expected to be similar to existing conditions, since no one source of noise dominates and no new significant noise source would be created. Internal campus traffic volumes are expected to be similar to existing conditions.

Traffic volumes are proposed to increase at some intersections due to the increase of employment and the increase and redistribution of parking within the campus.

4.7.3.2 *No Action Alternative*

Future campus noise environment is expected to be similar to existing conditions, since no one source of noise dominates and no new significant noise source would be created. Internal campus traffic volumes are expected to be similar to existing conditions.

4.7.3.3 *Maximum Development Alternative*

Future campus noise environment is expected to be similar to existing conditions, since no one source of noise dominates and no new significant noise source would be created. Internal campus traffic volumes are expected to be similar to existing conditions.

The previously estimated Loop Road peak hour traffic volume for the links and sections in the southwest quarter of the campus was approximately 1,100 vehicles per hour under the Master Plan build-out conditions. The predicted Leq noise level generated by vehicles at the property line nearest to the Loop Road on the east side of Edgewood/Glenwood is 49 dBA. This is significantly less than the combined daytime noise levels produced by Old Georgetown Road, the chilled water plant, and background noise from all other sources (57 dBA).

Traffic volumes are proposed to increase at some intersections due to the increase of employment and the increase and redistribution of parking within the campus.

Based on this plan, adjoining neighborhoods would be partially screened by new structures, topography, and enhanced landscaping. Sound attenuation in adjacent structures should be accomplished through minimization of wall openings, careful treatment of fenestration, and exterior wall detailing.

4.8 UTILITY/INFRASTRUCTURE IMPACTS

4.8.1 Utility/Infrastructure Impacts

4.8.1.1 *Infrastructure Redundancy*

As NIH continues to make long-term facility improvements, the ability of the campus to sustain its mission critical functions during emergencies has become a priority. To achieve utility system sustainability during emergency situations, NIH has determined it needs redundant fuel and water supplies. As part of the 2013 Master Plan, additional water and fuel supply tanks are being planned.

There are two large water tanks planned, one is planned for an underground location in the proposed new Central Green area, which is to replace the large impervious asphalt parking lot on the south side of Building 10, directly north of Building 29. The second tank will be an aboveground tank located in MLP 12. The proposed underground water tank would impact the overall site grading and displace existing site conditions with the proposed weight of the tank.

Soil bearing capacity will need to be verified with a feasibility study as well as the campus domestic water capacity to maintain the constant replacement of the water in the tanks to keep it fresh. The second tank will be incorporated into the construction phase of MLP 12 and have the same impacts as any construction of a MLP garage.

Both tanks would need to receive approvals with the State of Maryland and Federal Government jurisdictional authorities and would require commissioning for the installation. Associated grading and earthwork would need to comply with soil and sediment erosion control and stormwater management requirements.

The tanks are to be included in the Proposed Action and the Maximum Development Alternatives. The impact would be long-term and absent any data, assumed to be minor. The consequence would be beneficial overall with the ability of the campus to sustain operations in the event of emergency situations.

4.8.1.2 *Domestic Water*

4.8.1.2.1 *Proposed Action*

The Proposed Action would increase the average daily water usage with additional development. To facilitate the construction of the improvements under this proposed alternative, the existing water distribution system would need to be relocated as necessary. With the increase in water demand, NIH should consult with the Washington Suburban Sanitary Commission (WSSC) to ensure adequate water supplies are available for the campus. This consultation would also assist WSSC in determining if and when any of the public lines surrounding the campus need to be upgraded. All water distribution design should be in accordance with the NIH Facilities Development Manual, *"Section 8-3: Water Systems" of the 2008 National Institutes of Health Design Requirements for Biomedical Laboratories and Animal Research Facilities* and WSSC requirements. Impacts are expected to be minor, adverse, long-term and local.

The **Maximum Development Alternative and the No Action Alternative** will have the same requirements and impacts as the Proposed Action for domestic water. All the Alternatives increase the daily water usage and will require improvements to the infrastructure.

4.8.2 Sanitary Sewer

4.8.2.1 *Proposed Action*

The Proposed Action would increase the amount of wastewater generated on campus with the proposal of additional development. To facilitate the construction of the improvements under this proposed alternative, the existing wastewater distribution system would need to be relocated and upgraded as necessary. With the increase in demand, NIH should consult with the Washington Suburban Sanitary Commission (WSSC) to ensure adequate sewer capacity is available for the campus. This consultation would also assist WSSC in determining if and when

any of the public lines surrounding the campus need to be upgraded. All sanitary sewer design should be in accordance with the NIH Facilities Development Manual, “Section 8-6: Drainage Systems” of the *2008 National Institutes of Health Design Requirements for Biomedical Laboratories and Animal Research Facilities* and the WSSC requirements. Impacts are expected to be moderate, adverse, long-term and local.

The Maximum Development Alternative and the No Action Alternative will have the same requirements and impacts as the Proposed Action on the Sanitary Sewer utilities. All the Alternatives increase the sanitary usage and will require improvements to the sanitary sewers.

4.8.3 Storm Sewer Impacts

4.8.3.1 *Proposed Action*

The Proposed Action would increase the impervious area adjacent to proposed building locations but ultimately maintain the current overall campus land use conditions with a decrease in the overall campus impervious area-to-open space ratio. This, coupled with the compliance each individual proposed building would need with the Maryland Department of Environment (MDE) requirements outlined in the *Maryland Stormwater Management Guidelines for State and Federal Projects*, should ensure that downstream discharge would not increase with proposed development. Consideration should be given to maintaining on-site drainage patterns to ensure adequacy of existing systems. Deviations may require additional analysis and utility upgrade. Proposed on-site storm sewer systems should be designed in accordance with the Maryland State Highway Administration standards. Impacts are expected to be negligible, adverse, long-term, and site specific.

4.8.3.2 *No Action Alternative*

The No Action Alternative would increase the impervious area adjacent to proposed building locations but ultimately maintain the current overall campus land use conditions with no change in the overall campus impervious area-to-open space ratio. This, coupled with the compliance each individual proposed building would need with the Maryland Department of Environment (MDE) requirements outlined in the *Maryland Stormwater Management Guidelines for State and Federal Projects*, should ensure that downstream discharge would not increase with proposed development. Consideration should be given to maintaining on-site drainage patterns to ensure adequacy of existing systems. Deviations may require additional analysis and utility upgrade. Proposed on-site storm sewer systems should be designed in accordance with the Maryland State Highway Administration standards. Impacts are expected to be minor, adverse, short-term, and site specific.

4.8.3.3 *Maximum Development Alternative*

The Maximum Development Alternative will have the same or similar requirements and impacts as the Proposed Action on the Storm Sewer utilities. All the Alternatives increase the storm sewer usage with increases to impervious area.

4.8.4 Natural Gas, Fuel Oil and Gasoline Impacts

The Master Plans for Bethesda-Chevy Chase and Bethesda Central Business District forecast continuing residential and commercial growth. Continued growth implies increased natural gas demand by customers outside NIH. If the gas distribution capacity is not increased, then curtailment of NIH supply can be expected to occur more frequently and for longer periods during each occurrence, regardless of growth in campus demands.

NIH, as it has done in the past, would continue to reexamine its utility requirements on the campus on a regular basis and alert the appropriate utilities, as well as the community, if its requirements dramatically change. The master plan would continue to be updated on a regular basis, and if new proposals come forward that would introduce a new utility requirement not identified in the 2013 Master Plan, these proposals would be reviewed, shared with the community, and go through the established environmental and other review processes with the Federal and State of Maryland authorities that presently oversee development on the Bethesda campus. In the future, if NIH would require a new natural gas line dedicated solely to NIH use, it would follow the NEPA process. If area natural gas demands, such as Bethesda CBD, WRNMMC, commercial and residential growth, etc., require expansion of the public system, NIH would follow or participate, as appropriate, in all applicable environmental review processes conducted by others.

NIH would continue to maintain facilities for the delivery and storage of No. 2 distillate oil as an alternative backup supply of fuel for the boilers. Fuel oil is now stored in two 90-foot diameter underground tanks on the east side of Building 34. Each tank holds 567,000 gallons. The tanks were inspected and brought into conformance with Underground Storage Tank regulations in 1995.

Addition of fuel oil storage capacity is desirable in order to maintain the central utilities plant capacity during extended periods of natural gas curtailment. These contingencies would be evaluated during the development of the 2013 Master Plan and MUP. Proposed would be a complete redundant fuel supply tanks for the boilers. These tanks would provide approximately 1.2 million – 2.4 million gallons of fuel oil in two to four additional tanks.

The tanks would need to follow the approval process and commissioning requirements of EPA and MDE. The impact to the soils and grade with the amount of soil displacement would be significant. The location of the tanks would also need to be studied and would be close to the Central Utility Plant. Placement of the tanks would need to be in a subgrade reinforced concrete

vault to guard against corrosion. This redundancy proposal would be the same for both the Proposed Action and the Maximum Development Alternatives.

The NIH gasoline station, which supplies fuel for government vehicles and grounds maintenance equipment has two storage tanks. Each has a 10,000-gallon capacity. These tanks are to be relocated in both the Proposed Action and the Maximum development Alternatives. The tanks will need to be located in an underground vault located close to the new vehicle maintenance facility. Similar soil, displacement and bearing capacity issues would need to be addressed, although the gasoline tanks are considerably smaller than the redundant fuel tanks.

For both the redundancy tanks and the relocated gasoline tanks, approvals through the state and federal jurisdictional review processes would be necessary. The tanks and their design would also require commissioning. The impact would be long-term, significant and would require study and planning to implement.

4.8.5 Strategic Central Plant Operating Program Impacts

Management of the NIH central plant steam, chilled water, and electric power generation operations is rapidly increasing in complexity. Recently, or soon to be, installed equipment creates options for running the plant. However, these options introduce new relationships among the utilities as well as new boiler plant stack emissions. The amount of stack pollutants emitted by the boiler plant on an annual basis is limited or constrained. An important consideration in choosing an operation option on a given day, or strategically for the next few months or remainder of the year is the cumulative amount of pollutants that have been emitted when the decision is made compared to the annual emission limits.

Selecting an option is no longer straightforward as many factors are involved. To illustrate, the following are some of the factors that must now be taken into account:

- Steam may be generated using either boilers or the COGEN unit or both.
- Some chilled water may be generated using steam or electric power.
- Electric power from the COGEN reduces the use of more expensive power from the utility.
- Only natural gas may be used to generate steam and electric power in the COGEN unit.
- The burning of oil and natural gas produces air pollutant emissions with oil producing more emissions.
- For each pollutant, the stack emission rate per pound of steam or kilowatt of electric power generated by oil or natural gas differ. For example, making one pound of steam using oil generates more nitrogen oxides than using natural gas.

- For a given fuel, the boiler and COGEN emission rates for each pollutant differ. Smaller variances, as determined by annual monitoring, exist among the boilers.
- Current or contract oil, natural gas, and electric power prices, and their relationship to one another.
- Projected oil, natural gas, and electric power prices as indicated by commodity markets.
- The availability of natural gas and outside electric power through local utilities, or by contract from other entities at various terms for quantity and price.
- When NIH owns the COGEN unit, whether to sell the power generated, or use it internally within NIH.
- The extent to which past or future steam, chilled water, and power generation is affected by unusually hot or cold weather.
- Anticipated changes in utility demands created by scheduled new buildings, demolitions, and space use changes.
- Contingencies, such as outside utility curtailments or loss, or unexpected demand changes.

The above factors become increasingly important during those periods when campus demands approach plant capacity, i.e. just before new chillers or boilers go into service, or when emissions approach annual limits.

To resolve the situation, a previous Master Plan (2003) recommended the development of a Strategic Central Plant Operating Program (SCPOP). It is visualized as a computer program that would give the status of plant operations and emissions over any selected period of time. Input would include information on steam, chilled water, and power production, fuel and utility usage, prices, and also estimated stack emissions based on monitoring data. The status information could be used for preparing reports to regulatory agencies and internal NIH records. The program could also be tied to plant or distribution system metering or monitoring.

However, to be of maximum value, the program should also be a tool for strategic planning of operations over a future period of time. This can be done by creating a computer model of the plant. The annual cycle of demands can be projected or synthesized on a daily basis from past records. Equipment, fuel, and emission characteristics can be modeled mathematically. The program should also have the ability to test various potential future operating scenarios on a user interactive basis, i.e. the user should be able to change all the variables involved. For example, for a desired test scenario, the user should be able to turn equipment on or off, run chillers on steam or electric power, select type of fuel to be used, add an anticipated demand, or change the price of oil or gas, all for testing any given day or period.

Output would include the effects of the test scenarios on plant stack emissions, or on operating costs. It is the intent of the 2013 Master Utilities Plan development, currently underway to revisit this issue and determine what implementation has been accomplished to date and what further actions are required.

4.8.6 Compressed Air

Compressed air is critical to the operation of the central utilities plant and a compressor is dedicated to this load to maintain plant operation in the event that the process air compressors are out of service.

Outside of the CUP, air is used primarily for laboratory experiments and processes. New individual laboratory building service laterals would be needed for the Proposed Action, the Maximum Development Alternative and the No Action Alternative.

The 2013 Master Utilities Plan development, currently underway, would review this system and determine what further actions are required.

4.9 TRANSPORTATION AND TRAFFIC IMPACTS & CONSEQUENCES

4.9.1 Project Purpose and Scope

To meet the Federal Government mandated requirements of the EIS, among other subjects; the impacts of the future campus expansion on the area transportation system must be evaluated. The following sections present the result of a comprehensive transportation analysis of future land use scenarios for additional development on the Bethesda NIH campus.

This section shows results of tests of two alternatives for future expansion of the NIH campus consistent with their work on the master plan. The two scenarios included Proposed Action with an additional 3,000 new employees and the Maximum Development Alternative with an additional 10,000 new employees working on the Bethesda Campus. These two future scenarios were evaluated for their impact on the area transportation system.

Additional discussion of these land use scenarios would be provided later, when discussing the future trip generation for the expanded campus. The No Action Alternative was evaluated as the existing condition, as the development in the No Action Alternative is already in process.

4.9.1.1 *Report Organization*

The following tasks were undertaken in this study:

- Reviewing the background information including the previous Comprehensive Plans, the Environmental Impact Statement (EIS), Transportation Management Plan, 1992 Memorandum of Understanding (MOU) with Montgomery County agencies regarding

expansion of the campus without increasing the traffic above the 1992 level. Previous NIH and Base Realignment and Closure (BRAC) EIS documents as well as other relevant records were reviewed to assess the current situation as the basis for further analysis of transportation conditions in the future.

- Conducting turning movement counts and gathering traffic accident data within the study area.
- Identifying background developments in the study area.
- Evaluating existing conditions.
- Evaluating background traffic conditions.
- Evaluating future conditions- two campus expansion scenarios of 3,000 and 10,000 additional employees working on the Bethesda campus.
- Evaluating accident data in the study area.
- Evaluating existing and future parking demand and capacity.
- Evaluating public transportation and mode share.
- Evaluating existing and future pedestrian and bicycle use and access.
- Evaluating existing and future NIH Transportation Management Plan and Program.

The 2013 NIH Bethesda Campus Comprehensive Master Plan makes specific recommendations regarding the future development of the campus that provides for better access to and within the campus in a way that helps to reduce traffic congestion and increases use of mass transit.

The recommendations for better access, when implemented, would have a significant positive impact on the area transportation system as well as facilitating bike, pedestrian, and vehicular movements. The specific recommendations in the 2013 Master Plan affecting access are listed below:

- Locate buildings, pedestrian pathways, and bicycle routes that favor the Medical Center Metro Station to encourage use of mass transit as much as possible.
- Re-establish and reinforce the campus' original orthogonal grid system. Reinforce campus organization through the use of the established orthogonal grid when locating and placing new structures.
- Provide vehicular ingress and egress on Cedar Lane to reduce peak hour congestion
- Reconnect South Drive at Building 10 to ease the flow of east-west campus traffic.

- Provide for orderly, efficient, and safe pedestrian pathways between buildings and transportation nodes.
- Promote and emphasize the pedestrian character of the campus to employees.
- Concentrate parking in existing or new parking “receptors” which are:
- Conveniently accessed from major campus entries; and
- Distributed in proportion to campus population in the various sub-areas of the site so that no employee is more than a five-minute walk from a parking space to work space.

4.9.1.2 *Impact Study Area*

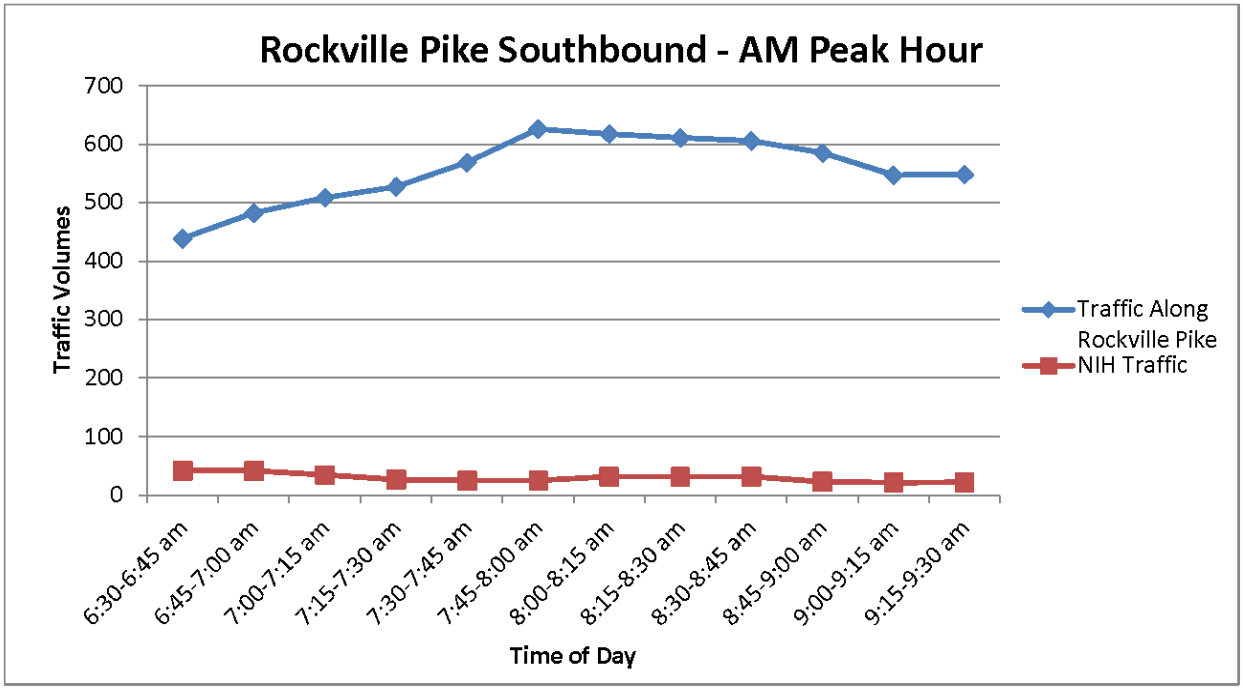
The study area for evaluating the impact of future NIH expansion was delineated based on the Maryland-National Capital Park and Planning Commission (M-NCPPC), Montgomery County Local Area Transportation Review (LATR), and Policy Area Mobility Review (PAMR) Guidelines.

The guidelines establish parameters for doing traffic impact assessments for new developments in Montgomery County. Historical trip generation statistics for employees at the NIH campus since 1992 and recent data reveals that the total future expansion of the NIH campus with 10,000 new employees would likely generate an additional 1442 AM and 1466 PM peak hour trips during the weekday peak periods. Accordingly, the traffic impact study guidelines suggest that four signalized intersections in each direction from the site access points be included for impact analysis, which determines the study area.

Table 4-5 below tabulates the morning and afternoon peak loads on the intersections in the vicinity of the NIH Bethesda Campus. Figure 4-1 illustrates the NIH generated morning (AM) traffic compared to through traffic and Figure 4-2 illustrates the NIH generated afternoon (PM) traffic compared to the through traffic.

Table 4-5: Existing Intersection Capacity Analysis – Highest Count is Shaded

Ref #	Intersection	AM Peak CLV	PM Peak CLV	LATR STD	Policy Area
1	Old Georgetown Road & Ryland Drive	1318	1042	1600	Bethesda/Chevy Chase
2	Old Georgetown Road & Beech Ave.	1315	1262	1600	Bethesda/Chevy Chase
3	Old Georgetown Road & W. Cedar Lane	1320	1529	1600	Bethesda/Chevy Chase
4	Old Georgetown Road & Center Drive	1153	1277	1600	Bethesda/Chevy Chase
5	Old Georgetown Road & Greentree Rd.	1167	1085	1600	Bethesda/Chevy Chase
6	Old Georgetown Road & Lincoln Drive	783	1185	1600	Bethesda/Chevy Chase
7	Old Georgetown Road & McKinley St.	1082	773	1600	Bethesda/Chevy Chase
8	Old Georgetown Road & Glenwood Rd.	1025	1003	1600	Bethesda/Chevy Chase
9	Old Georgetown Rd & Huntington Pkwy	1154	1059	1800	Bethesda/Chevy Chase
10	Old Georgetown Road & Battery Lane	1153	1388	1600	Bethesda CBD
11	Rockville Pike & Pooks Hill Road	1049	1191	1600	Bethesda/Chevy Chase
12	Rockville Pike & Alta Vista Road	1131	1011	1600	Bethesda/Chevy Chase
13	Rockville Pike & W. Cedar Lane	1742	1507	1600	Bethesda/Chevy Chase
14	Rockville Pike & N. Wood Road	1203	1161	1600	Bethesda/Chevy Chase
15	Rockville Pike & Wilson Drive	1070	1151	1600	Bethesda/Chevy Chase
16	Rockville Pike & S. Wood Road	1094	1223	1600	Bethesda/Chevy Chase
17	Rockville Pike & Jones Bridge Road	1178	1296	1600	Bethesda/Chevy Chase
18	Rockville Pike & Woodmont Avenue	748	1055	1600	Bethesda/Chevy Chase
19	W. Cedar Lane & Locust Avenue	517	772	1600	Bethesda/Chevy Chase
20	W. Cedar Lane & Cedarcrest Drive	917	1170	1600	Bethesda/Chevy Chase
21	W. Cedar Lane & W. Cedar Way	519	773	1600	Bethesda/Chevy Chase
22	Wisconsin Avenue & Battery Lane	1009	877	1800	Bethesda CBD
23	Battery Lane & Woodmont Avenue	966	869	1800	Bethesda CBD
24	Bradley Boulevard & Huntington Pkwy	1034	1326	1600	Bethesda/Chevy Chase



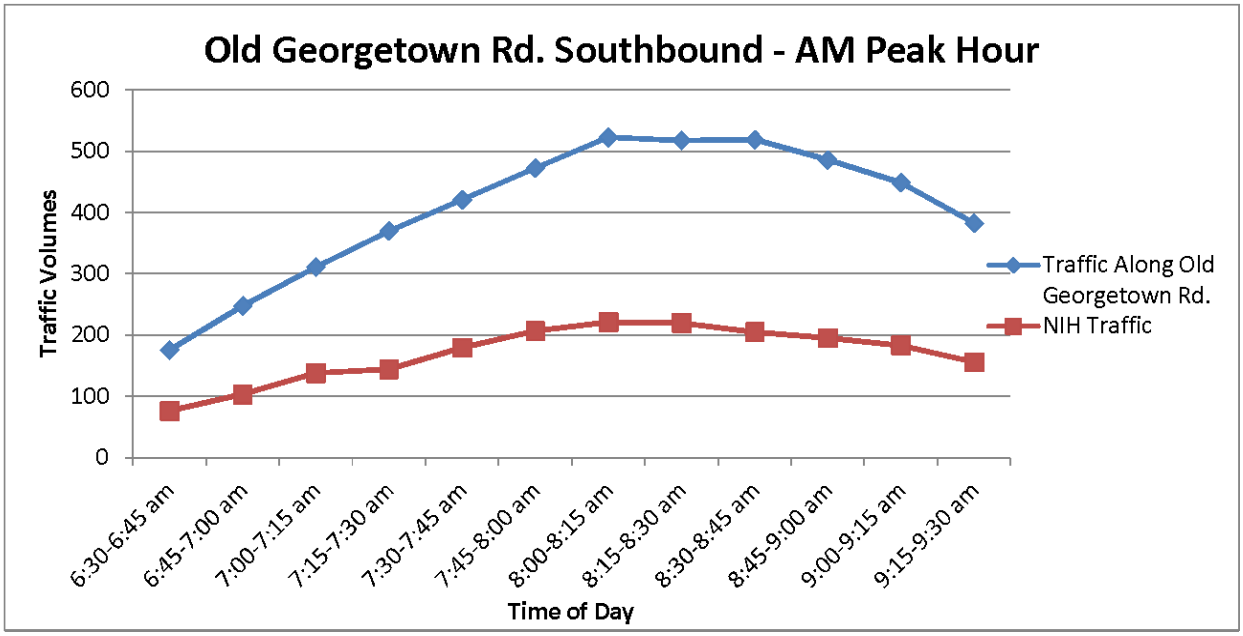
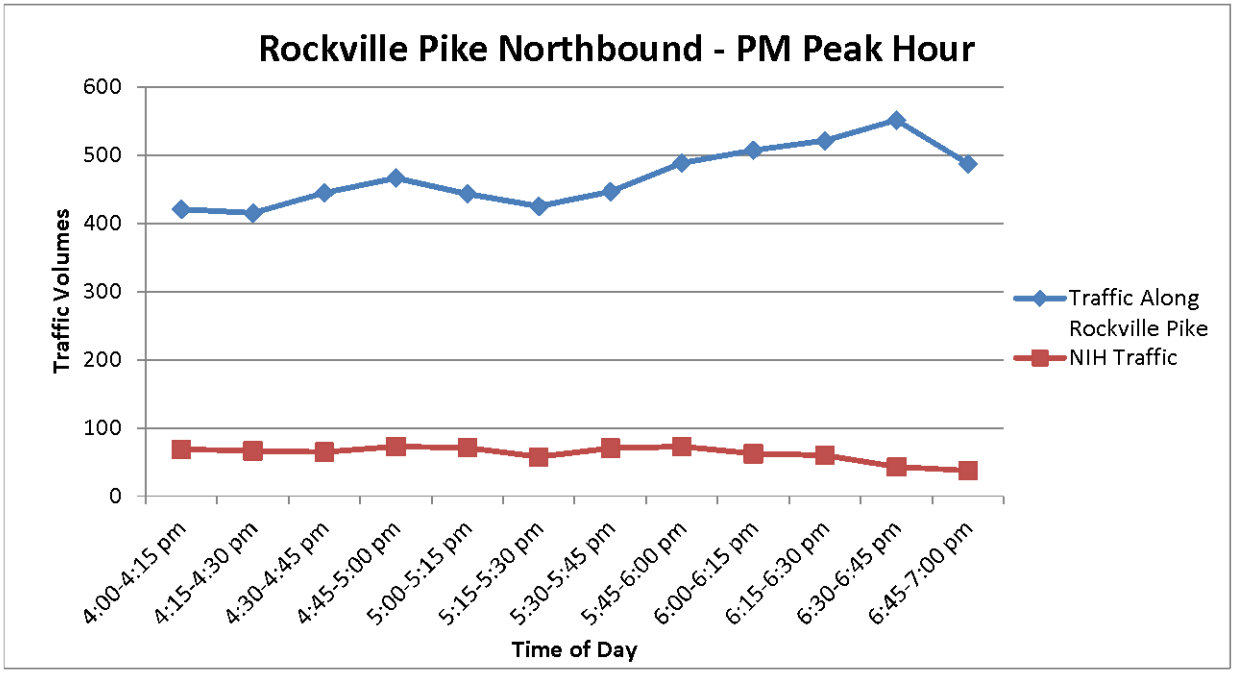


Figure 4-1: NIH Generated Traffic vs. Through Traffic – AM Peak Hours



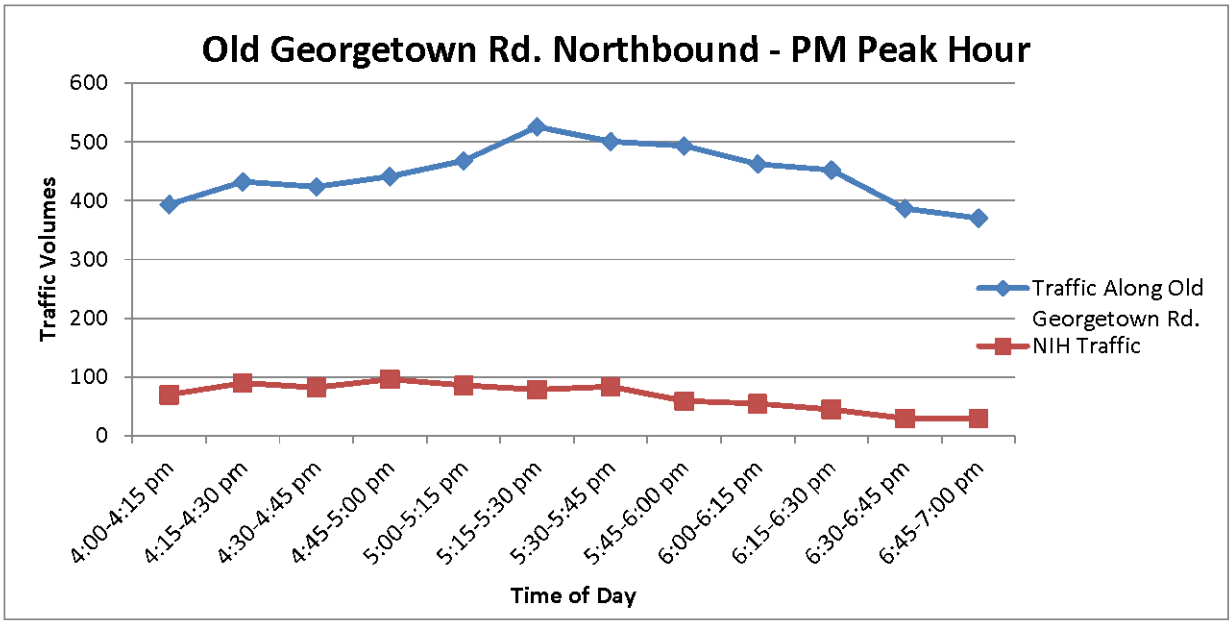


Figure 4-2: NIH Generated Traffic vs. Through Traffic – PM Peak Hours

4.9.1.2.1 *Proposed Action*

The Proposed Action assumes an additional 3,000 employees working on the Bethesda Campus, which would add 433 trips in the AM and 440 trips in the PM peak hours throughout the study area. These numbers are based on the actual counts taken during the peak hours for the existing number of employees. The site trip assignments, along with the total expected traffic for this alternative are illustrated in Appendix C: Figures C-14 & C-15, and C-16 & C-17, respectively. The additional peak hour trips were added to the existing and background traffic to assess the total impact of traffic on area intersections. The results of CLV analysis in Table 4-5 show the levels at all intersections within the study area. Table 4-9 shows the results of CLV analysis for the Proposed Action, No Action (Existing) and the Maximum Development Action. For the Proposed Action, the intersections of West Cedar Lane with Rockville Pike (CLV 1,779 AM) and Old Georgetown Road (CLV 1,623 PM) fail to operate within the congestion standards without the BRAC improvements. Again, the BRAC improvements at these two intersections would result in reducing the CLV to 1,497 in the AM at West Cedar Lane and Rockville Pike and 1,371 at West Cedar Lane and Old Georgetown Road in the PM peak, both within the congestion standard of 1,600 CLV. Therefore, all intersections with additional trips from scenario one and the BRAC improvements would operate within the congestion standards.

4.9.1.2.2 *Maximum Development Alternative*

Maximum Development assumes an additional 10,000 new employees working on the Bethesda Campus adding 1,442 trips in the AM and 1,466 trips in the PM peak hours throughout the study area based on the actual counts. The site trip assignments for this alternative, along with the total expected traffic for this alternative are illustrated in Appendix C, Figures C-18 & C-19, and C-20 & C-21, respectively. The additional peak hour trips were added to the existing and background traffic to assess the total impact of traffic on area intersections. The result of CLV analysis in Table 4-9 shows the level of congestion with and without BRAC and NIH proposed improvements at all intersections. In this Alternative the following four intersections would fail to operate within the congestion standards without improvements:

- West Cedar Lane and Rockville Pike (CLV 1,838 AM and 1,645 PM)
- West Cedar Lane and Old Georgetown Road (CLV 1,725 PM)
- Rockville Pike and Jones Bridge Road (CLV 1,626 PM)
- Old Georgetown Road and Center Drive (CLV 1,627 PM)

The BRAC improvements would result in reduced CLVs at the following three intersections:

- West Cedar Lane and Rockville Pike (CLV 1,559 AM and 1,368 PM)
- West Cedar Lane and Old Georgetown Road (CLV 1,473 AM)

- Rockville Pike and Jones Bridge Road (CLV 1,346 PM)

The NIH proposed improvement would result in reduced CLV at the following intersection:

- Old Georgetown Road and Center Drive (CLV 1,477 PM)

After improvements, all intersections in the study area with proposed improvements would operate within the congestion standard.

4.9.1.2.3 *No Action Alternative*

The existing conditions at 24 intersections within the study area were evaluated to determine what would be the result of the No Action Alternative. In order to accomplish this task, vehicular turning movement counts; bike and pedestrian traffic data, lane configuration, and traffic signal phasing and timing information were collected (C; 1a and b, 2a, and b). The method called Critical Lane Volume (CLV) in the LATR/PAMR guidelines was used to determine the adequacy of intersections to accommodate the existing traffic volume. The adequacies of the intersections are determined by verifying that the CLV at each location does not exceed the established congestion standard of 1,600 CLV for the Bethesda/Chevy Chase and 1,800 CLV for the Bethesda Central Business District (CBD) policy areas. The result of the CLV analysis for the existing conditions is shown in Table 4-5. Using existing volume counts, it was determined that the majority of the traffic along MD 355 (Rockville Pike) and MD 187 (Old Georgetown Road) was not caused by the NIH (Figure 4-3 and Figure 4-4).

The results show that the intersection of Rockville Pike and West Cedar Lane is the only intersection in the study area that currently exceeds the 1,600 CLV congestion standard during the AM peak with a congestion level of 1,742 CLV. However, as part of the BRAC improvements, this intersection has received funding for physical improvements that reduce the congestion level to 1,458 CLV during the AM peak hour, which is within the congestion standard.

4.9.1.3 *Impact of Future BRAC Improvements*

The following improvements are planned for the three intersections impacted by expansion of the WRNMMC campus as part of the Department of Defense BRAC program. The improvements described below are funded for construction and some are currently being implemented.

4.9.1.3.1 *Old Georgetown Road and Cedar Lane: Old Georgetown Road*

The planned improvements would ultimately provide for an exclusive left turn lane, three through lanes, and an exclusive right turn lane in the northbound direction by:

- A through-right movement in the northbound direction, and
- Addition of an exclusive left turn lane in the southbound direction.

4.9.1.3.2 *Old Georgetown Road and Cedar Lane: Cedar Lane*

The planned improvements would ultimately provide for an exclusive right lane, a shared left-through lane, and an exclusive left lane in the westbound direction by:

- A through-right movement to a through-left movement on the westbound direction, and
- Addition of an exclusive right turn lane in the westbound direction.

4.9.1.3.3 *Rockville Pike and Cedar Lane: Rockville Pike*

The planned improvements would ultimately provide for an exclusive right turn lane, a shared through-right lane, three (3) through lanes, and an exclusive left turn lane in the southbound direction by:

- Addition of a shared through-right movement in the southbound direction.

4.9.1.3.4 *Rockville Pike and Cedar Lane: Cedar Lane*

The planned improvements would ultimately provide for two exclusive left turn lanes, two through lanes, and an exclusive right lane in the eastbound direction. In the westbound direction, the planned improvements would provide for two exclusive left turn lanes, a through lane, and a shared through-right lane by:

- Addition of an exclusive left turn lane in the eastbound direction,
- Addition of an exclusive right turn lane in the eastbound direction,
- A left-through movement to a through movement in the eastbound direction,
- A right-through movement to a through movement in the eastbound direction,
- Addition of an exclusive left turn lane in the westbound direction, and
- A left-through movement to a through movement in the westbound direction.

4.9.1.3.5 *Rockville Pike and Jones Bridge Road: Rockville Pike*

The planned improvements would ultimately provide for a shared through-right lane, two (2) through lanes, and two (2) exclusive left turn lanes in the AM in the southbound direction. In the PM, the planned improvements would provide for a shared through-right lane, a through lane, and three (3) exclusive left turn lanes in the southbound direction by:

- Addition of an exclusive left lane in the southbound direction,
- A through movement to an exclusive left movement on the southbound direction in the PM.

4.9.1.3.6 *Rockville Pike and Jones Bridge Road: Jones Bridge Road*

The planned improvements would ultimately provide for two exclusive left turn lanes, a through lane, and an exclusive right lane in the eastbound direction by:

- Addition of an exclusive left lane in the eastbound direction, and
- A through-left movement to an exclusive left turns in the eastbound direction

4.9.1.3.7 *Old Georgetown Road and Center Drive: Center Drive*

This improvement is proposed to help alleviate the traffic along Center Drive as this intersection exceeds the 1992 MOU requirements for CLV.

The planned improvements would ultimately provide for two exclusive right lanes and an exclusive left lane in the westbound direction by:

- Addition of an exclusive right lane in the westbound direction, and
- A left-right movement to an exclusive left movement in the westbound direction.

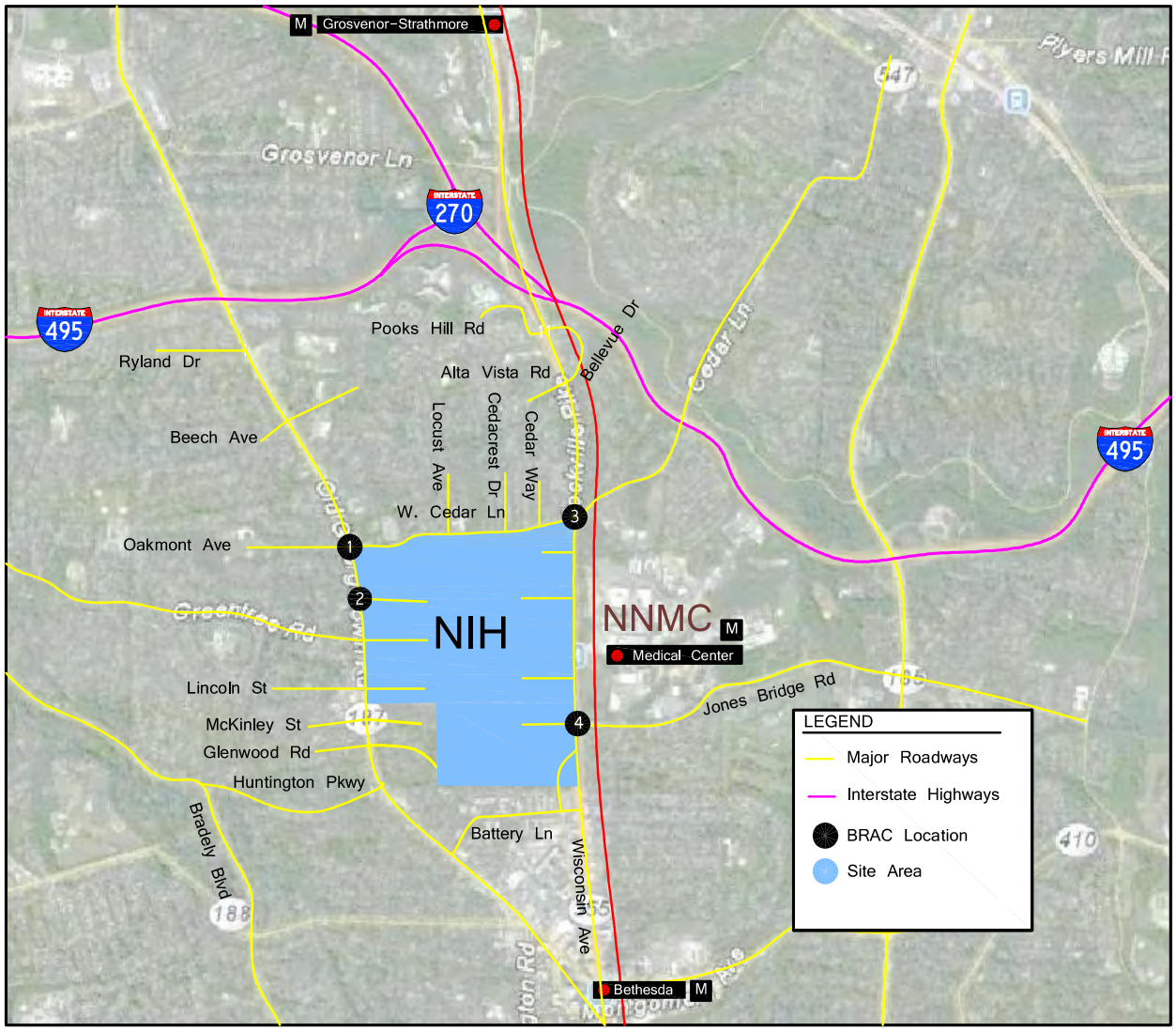


Figure 4-3: Locations of BRAC Improvements

4.9.1.4 *Background Development Impacts*

Background developments include planned projects or projects currently under construction that are expected to generate trips prior to any NIH expansion. The background development site locations are depicted in Figure 4-4. The pipeline trip generation data, shown in Appendix C; Figures C-10 & C-11, and Table 4-6, was distributed and assigned to the roadway network using the methodology contained in the Montgomery County Planning Department's LATR and PAMR Guidelines, the results of the analysis are shown in Figure 4-5. This was added to the existing traffic at all intersections to calculate the background traffic volumes (Appendix C; Figures C-12 & C13). The same methodology was used to distribute and assign NIH peak hour

trip generation for both scenarios to the area roadways and intersections. The impact of total future traffic on area intersections are determined by adding the NIH trips to the existing traffic counts and background traffic.

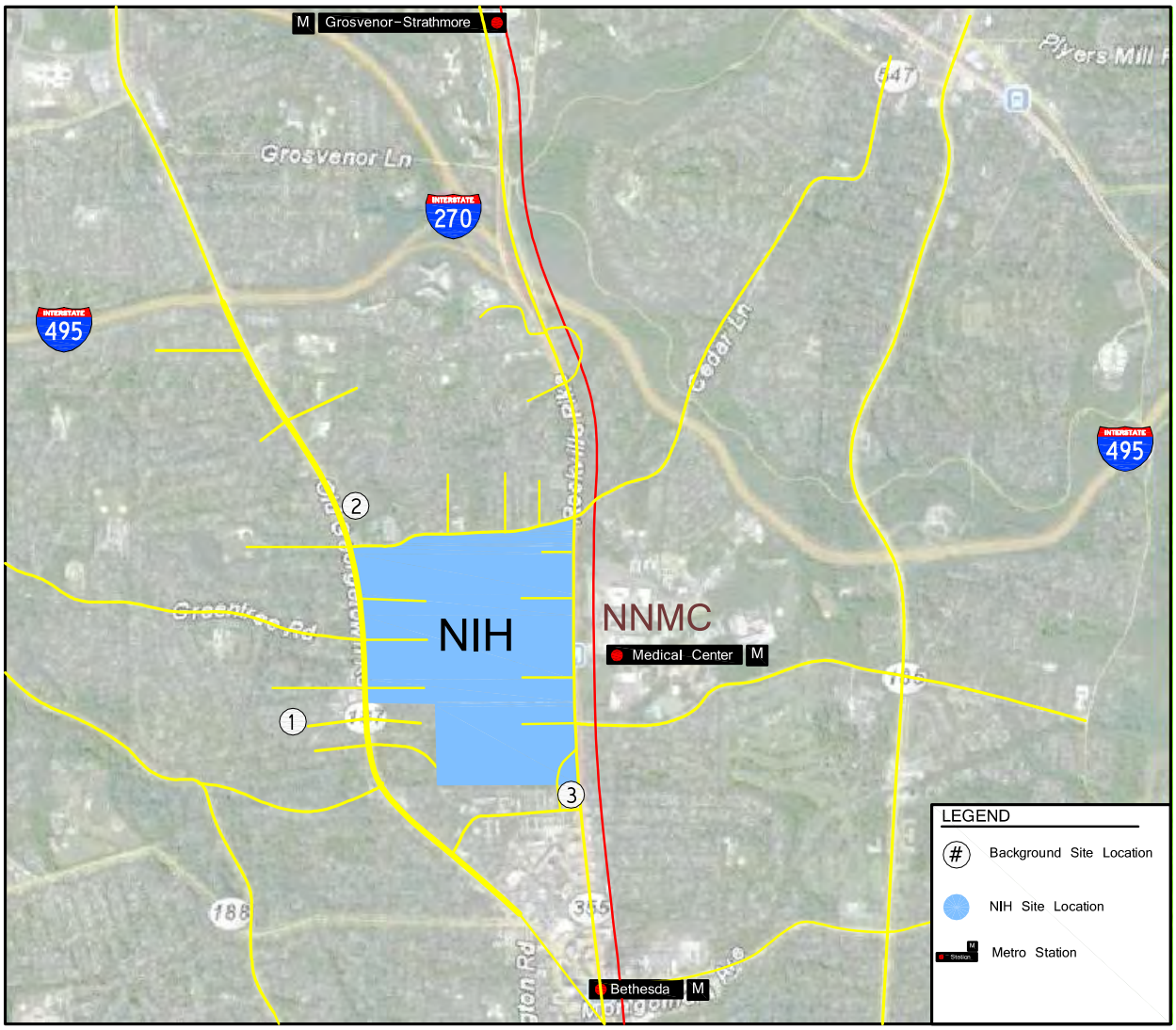


Figure 4-4: Background Development Locations

The only intersection experiencing a CLV above the congestion standard for background development is Rockville Pike and West Cedar Lane with a CLV of 1,753 during the AM peak hour only. Again, with the BRAC improvements, the AM peak hour CLV would be reduced to 1,470, which is within the congestion standard.

Table 4-6: Pipeline Project Trip Generation

Location	AM Peak Hour Trips In	AM Peak Hour Trips Out	AM Peak Hour Trips Total	PM Peak Hour Trips In	PM Peak Hour Trips Out	PM Peak Hour Trips Total
Suburban Hospital Expansion Existing	210	86	296	92	212	304
Suburban Hospital Expansion Future	111	35	146	51	130	181
Suburban Hospital Expansion New Total Future Trips	321	121	442	143	342	485
American College of Cardiology Proposed Single Family Dwellings	9	25	34	26	14	40
American College of Cardiology Future MP Peak Hour Traffic Volumes	-102	-14	-116	-22	-108	-130
American College of Cardiology Net New Trips	0	11	0	4	0	0
8300 Wisconsin Avenue Residential	10	39	49	33	16	49
8300 Wisconsin Avenue Grocery Store	47	20	67	171	170	341
8300 Wisconsin Avenue New Total Future Trips	57	59	116	204	186	390
Total Pipeline Project Trips	**378**	**191**	**558**	**351**	**528**	**875**

Suburban Hospital Expansion Traffic Study, March 30, 2012
8300 Wisconsin Avenue Traffic Study, April 2, 2012

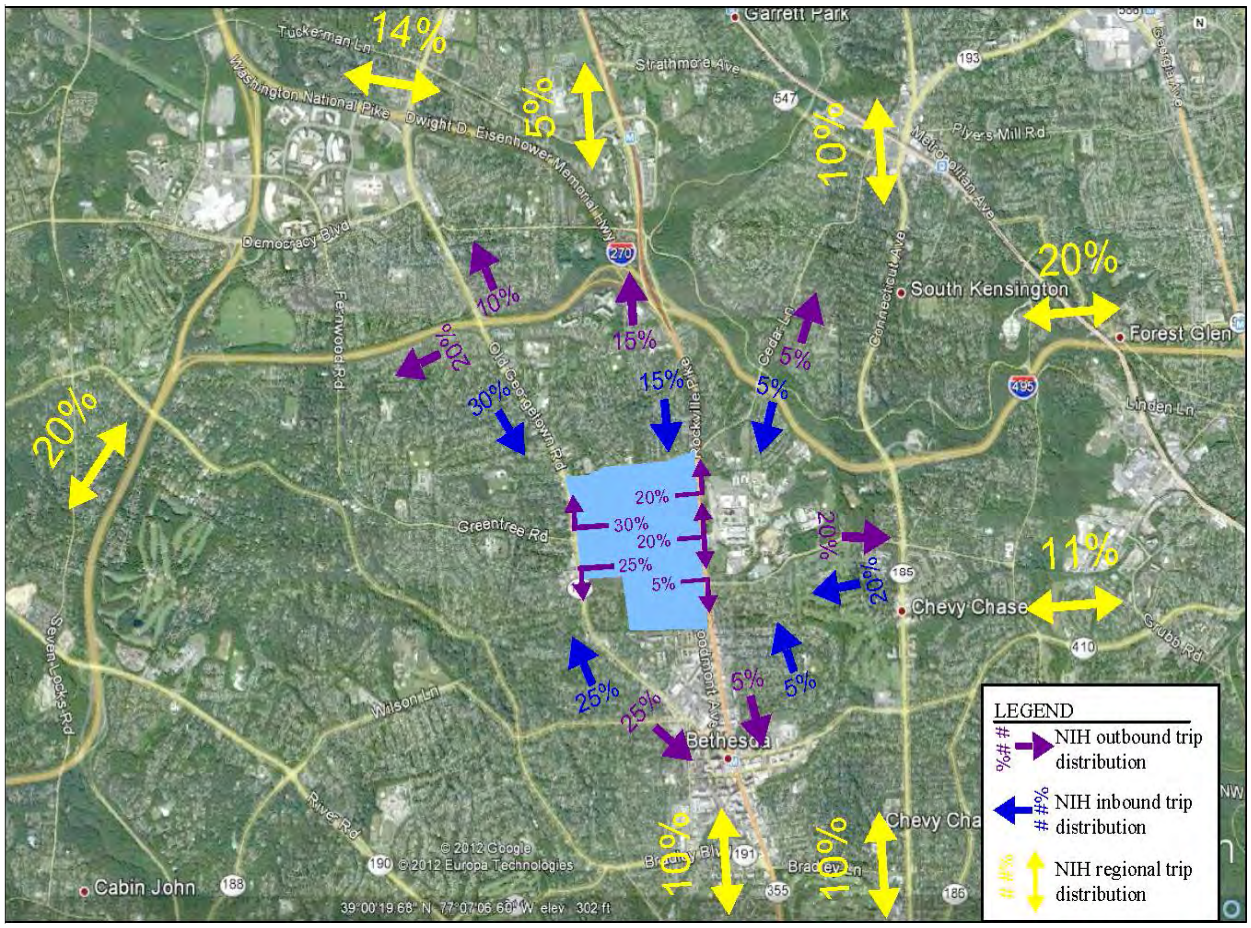


Figure 4-5: NIH Generated Inbound and Outbound Trips

4.9.2 Traffic Impacts Future Expansion of the NIH Campus

4.9.2.1 *Overview*

Of the three alternatives described in the Master Plan, only the Proposed Action and the Maximum Development Alternative call for expansion of the campus. The Proposed Action includes 3,000 additional employees, and would generate an additional 432 AM and 439 PM trips. The Maximum Development Alternative includes 10,000 additional employees and would generate 1,442 AM and 1,466 PM trips. The trip generation rates for the Proposed Action and the Maximum Development Alternative are shown in Table 4-7.

The employee trip generation rates for the NIH campus are determined by historical semi-annual traffic counts cumulated over a 20-year period starting in 1992. The trip generation rates for the last five years for the peak hours in the AM and PM have been compared to the 1992 rates in Table 4-8.

Table 4-7: Forecasted Additional Trips

Alternative	AM Peak Hour Trips In	AM Peak Hour Trips Out	AM Peak Hour Trips TOTAL	PM Peak Hour Trips In	PM Peak Hour Trips Out	PM Peak Hour Trips TOTAL
Proposed Action Alternative Trip Rate (Trips/Person)	0.125	0.019	0.144	0.016	0.130	0.147
Proposed Action Alternative (Additional 3,000 Employees) Forecasted Additional Trips	376	56	432	48	391	439
Maximum Development Alternative Trip Rate (Trips/Person)	0.125	0.019	0.144	0.016	0.130	0.147
Maximum Development Alternative (Additional 10,000 Employees) Forecasted Additional Trips	1254	188	1442	161	1305	1466

Note: Based on trip generation rates calculated using the average of the previous two studies conducted in July and November 2011. Traffic counts at the gates were taken and divided by the number of employees on campus. These rates are comparable to those developed in similar studies since 2007 on a semi-annual basis.

Table 4-8: Historical and Projected Trip Generation Rates

Count Date	Number of Employees On Campus	AM Peak Hour Inbound Trips	AM Peak Hour Inbound Trips per Employee	PM Peak Hour Outbound Trips	PM Peak Hour Outbound Trips per Employee
1992	16,251	4,925	0.303	4,450	0.274
May 2007	17,500	2,039	0.117	2,846	0.163
Nov. 2007	17,800	2,070	0.116	2,345	0.132
May 2008	18,050	2,337	0.129	2,040	0.113
Nov. 2008	18,553	2,583	0.139	2,475	0.133
May 2009	18,553	2,120	0.114	1,882	0.101
Nov. 2009	18,804	2,755	0.147	2,624	0.140
July 2011	19,334	2,223	0.115	2,630	0.136
Nov. 2011	21,470	2,917	0.136	2,682	0.125
Existing (Feb. 2012)	21,468	2,519	0.117	2,598	0.121
PROJECTED FUTURE Proposed Action Alternative	24,468	2895	0.118	2989	0.122
PROJECTED FUTURE Maximum Development Alternative	31,468	3773	0.120	3903	0.124

Table 4-9: CLV Analysis Results for Bethesda Chevy Chase Policy Area

#	Intersection	AM Peak CLV Existing Total	AM Peak CLV Back ground	AM Peak CLV Proposed Action Total	AM Peak CLV Maximum Development Total	PM Peak CLV Existing Total	PM Peak CLV Back ground	PM Peak CLV Proposed Action Total	PM Peak CLV Maximum Development Total	LATR STD
1	Old Georgetown Rd & Ryland Dr	1318	1353	1395	1493	1042	1082	1125	1227	1600
2	Old Georgetown Rd & Beech Avenue	1315	1351	1393	1490	1262	1301	1344	1446	1600
3	Old Georgetown Road +& W. Cedar Lane	1320	1371	1412	1510	1529	1580	1623	1725	1600
3a	With BRAC Improvements	1320	1371	1272	1370	1529	1580	1371	1473	1600
4	Old Georgetown Road & Center Drive	1153	1163	1272	1530	1277	1324	1416	1627	1600
4a	With Improvements	1153	1163	1272	1504	1277	1324	1416	1477	1600
5	Old Georgetown Road & Greentree Rd	1167	1236	1256	1305	1085	1136	1163	1223	1600
6	Old Georgetown Road & Lincoln Drive	783	890	895	1025	1185	1280	1341	1479	1600
7	Old Georgetown Road & McKinley St	1082	1114	1122	1139	773	819	871	992	1600
8	Old Georgetown Road & Glenwood Rd	1025	1046	1053	1071	1003	1043	1049	1064	1600
9	Old Georgetown Road & Huntington Pkwy	1154	1183	1191	1208	1059	1105	1112	1190	1600
10	Old Georgetown Road & Battery Lane	1153	1180	1187	1205	1388	1521	1527	1542	1600
11	Rockville Pike & Pooks Hill Road	1049	1058	1076	1116	1191	1228	1250	1301	1600
12	Rockville Pike & Alta Vista Road	1131	1144	1164	1213	1011	1048	1069	1120	1600

#	Intersection	AM Peak CLV Existing Total	AM Peak CLV Back ground	AM Peak CLV Proposed Action Total	AM Peak CLV Maximum Development Total	PM Peak CLV Existing Total	PM Peak CLV Back ground	PM Peak CLV Proposed Action Total	PM Peak CLV Maximum Development Total	LATR STD
13	Rockville Pike & W. Cedar Lane	1742	1753	1779	1838	1507	1545	1575	1645	1600
13a	With BRAC Improvements	1742	1753	1497	1559	1507	1545	1319	1368	1600
14	Rockville Pike & N. Wood Road	1203	1212	1236	1305	1161	1194	1221	1282	1600
15	Rockville Pike & Wilson Drive	1070	1079	1131	1254	1151	1184	1238	1397	1600
16	Rockville Pike & S. Wood Drive	1094	1104	1153	1266	1223	1256	1279	1334	1600
17	Rockville Pike & Jones Bridge Road	1178	1193	1233	1327	1296	1343	1429	1626	1600
17a	With BRAC Improvements	1178	1193	1233	1327	1296	1343	1243	1346	1600
18	Rockville Pike & Woodmont Avenue	748	766	76	769	1055	1111	1112	1114	1600
19	W. Cedar Lane &Locust Avenue	517	523	531	551	772	791	799	820	1600
20	W. Cedar Lane & Cedarcrest Drive	917	935	943	963	1170	1197	1205	1226	1600

4.10 CULTURAL URBAN AND SOCIAL RESOURCES

4.10.1 Visual and Aesthetic Effects

In assessing the likely positive and negative impacts of the three Alternatives on visual and aesthetic quality, both the overall extent of physical change is considered as well as the specific physical changes proposed. Both views from the community into the campus from the outside and changes to the aesthetic quality of the interior of the campus where assessed.

4.10.1.1 *Proposed Action*

Under this alternative, major new development on existing developed sites are planned including improvements already planned. The focus of change would shift away from the center of the campus and towards the east and southeast. Specific impacts include:

4.10.1.1.1 *Perimeter Buffer Depth and Conditions*

The buffer depth would increase, as encroachments to the buffer would be removed. Buffer landscape enhancements would continue, and expansion of the land available to planting natural cover would increase.

4.10.1.1.2 *Building Height and Off Campus Visibility/Views*

Gradual decreases of offsite views into the campus would continue as plantings mature. No changes to the current limitations on building height would occur. Specific views into the campus would be altered by certain projects assuming full implementation as follows.

- The construction of the new 11-story NIH Administrative Building along Rockville Pike would impact views into the campus from the main employee and transit center. The building requires demolition of the Building 21 Hazardous Waste Handling Facility, which is not readily viewable from Rockville Pike. This building would establish a visual presence of NIH campus along Rockville Pile, off-center from Building 10 and off-center from the historic tower building at the Walter Reed National Military Medical Center, which aligns with NIH Building 1 and Building 10. Visual impact on adjacent residential neighborhoods would be low.
- The new multi-story Building 14 that replaces a number of existing outdated facilities would enhance views into the campus to the southeast corner.
- The proposed addition to the Natcher building.
- New development along the southern boundary, include previously planned multi-level parking structures, which set further back from the buffer than approved in 2003. The existing surface parking in the buffer would be removed. Several new low-rise buildings are proposed, which replace the existing Building 21 hazardous waste handling

functions. Landscaped berms would be part of the design to conceal the replacement hazardous waste facility.

4.10.1.1.3 *Interior Aesthetic Quality*

Significant improvements to the visual and aesthetic character of the campus interior would occur. The cluster approach organizes the proposed redeveloped buildings with the existing campus planning, which centers on Building 10. Specific features included in this plan are:

- Construction of 20 new structures would occur. This includes 13 new buildings, 4 building additions, and 3 new parking garages.
- Demolition/removal of 14 buildings and temporary trailers would occur, and 8 other buildings would be renovated for new uses. Seventeen acres of surface parking would be removed.
- About 11 acres of open space would be added as surface parking lots and older low building are replaced with structured parking and multi-story buildings. This would be a long-term beneficial impact to the site features and also stormwater management control.
- A new campus focus to the east would be created with a north-south primary axis along Center Drive, which connects to the Cedar Lane entrance and provides access to new buildings and parking structures placed along the spine. The axis would terminate at one end in a formal open space and the southern end in front of a new Building 14.
- The low scale cluster of historic buildings of the original NIH campus (Buildings 1, 2,3,4,5, and 8) would receive the infill of a new matching building to complete the originally planned symmetrical quadrant. This development would also include a pedestrian area, and outdoor spaces that replaces large surface parking areas.
- Significant improvements to the campus streetscapes would be made with plantings, street furnishings, night lighting, and changes in the abutting ground level facades. The landscaping and additional planned green areas would enhance the visual quality of the campus.

The Figure 4-6 below shows the estimated potential physical extent and location of changes that are likely to occur with full implementation of the Proposed Action as shown on an aerial photograph of the campus taken in 2011. The approximate change is 844,030 square feet of new building footprint and 4,451,798 gross square feet of new building or garage space. The new developed gross area replaces an existing 1,395,855 square feet, which will be demolished. Limiting development to existing sites and building higher structures reduces the net impervious area from what currently exists on the campus.

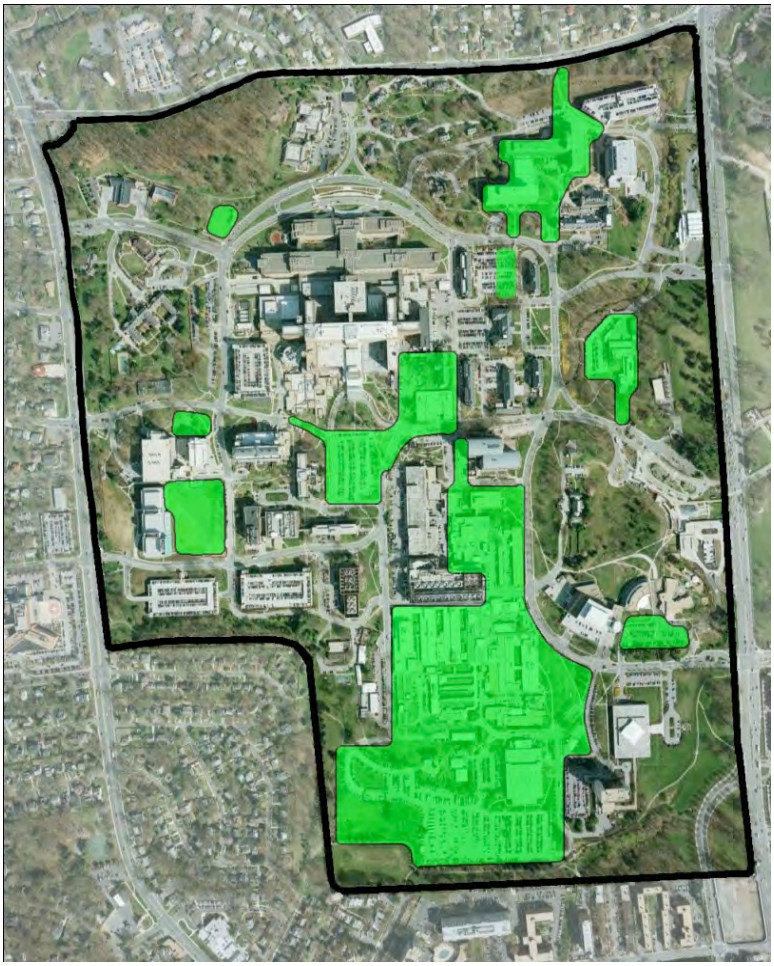


Figure 4-6: Proposed Action—Estimated Extent of Changes

The Proposed Action would have a moderate positive impact. Implementation would have a moderate positive impact on external conditions with removal of surface parking lots from the buffer. Low-scale development would be placed between the residential edges of the campus and the more intensely developed center of campus. A modest reduction of visual impacts would occur on the southern boundary. A positive impact to interior campus would occur, as extensive enhancements to the buildings and grounds would be made. A new high-rise building would be added near the campus main entrance. Temporary significant adverse environmental impacts from both demolition and site excavation and grading for new construction would be expected. A moderate positive impact to interior campus condition would occur, as aesthetic enhancements to campus buildings and grounds would be made and obsolete, older buildings would be replaced.

4.10.1.2 *No Action Alternative*

Under this alternative; previously planned improvements from the prior 2003 Master Plan would not occur. Campus new building improvements would stop after completion of two buildings now under construction on the west side of the campus. Renovations would continue. New space requirements for research initiatives would have to use leased space. Specific impacts include:

- Perimeter Buffer Depth and Conditions – No additional removal of surface parking from buffer and no change in the designated buffer depth would occur. Buffer landscape enhancements would continue in the existing open areas. Additional open space for plantings and natural cover would not increase.
- Building Height and Off Campus Visibility/Views – No added changes would occur, as no new building would be added after the two currently under construction. Gradual decreases of off-site views into the campus would continue as buffer plantings mature and re-naturalizing programs continue. Views into the campus would be kept open through the retention of selected lawn areas along Rockville Pike and Old Georgetown Road.
- Interior Aesthetic Quality – Improvements to the overall visual and aesthetic character of the campus would be limited. This alternative would preserve the existing campus character and its historic buildings. Campus growth would not continue.

The Figure 4-7 below shows the estimated potential physical extent and location of changes that are likely to occur with full implementation of the No Action Alternative as shown on an aerial photograph of the campus taken in 2011. The approximate site area of change is 170,788 square feet.

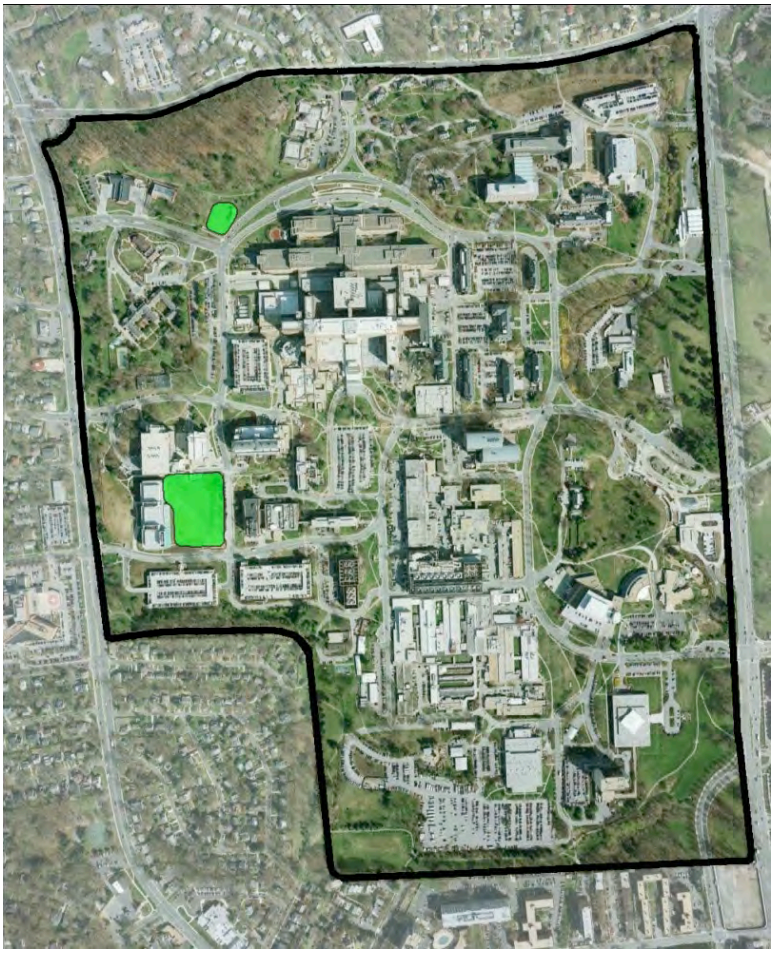


Figure 4-7: No Action Alternative Estimated Extent of Changes

The No Action Alternative would have minimal to moderate adverse impact. The No Action alternative would have minimal change to existing conditions. It would have small negative impact to external conditions, as planned removals of surface parking from the buffer would not occur. A moderate to significant negative impact to campus conditions would occur as new buildings and grounds enhancements and replacement of obsolete facilities would not occur.

4.10.1.3 *Maximum Development Alternative*

Under this alternative all the changes proposed in the Redevelopment Alternative and No Action Alternative would occur, along with additional campus development. The major improvements already planned would continue as planned. Specific impacts include all the Proposed Action development along Rockville Pike, and in the southeast quadrant of the campus. The Maximum Development alternative also includes the following added projects:

- Demolition and redevelopment of the historic NIH core, including Buildings 4, 5 and 8
- Demolition and redevelopment of the Historic Peters Estate buildings (Buildings 16 and 16A)
- Construction of five new multi-story administrative buildings totaling an approximate 1,582,700 square feet of space with a footprint area of 197,838 square feet
- Construction of two multi-story parking structures occupying a footprint of about 175,000 square feet and providing an additional 1,050,000 square feet of structured parking.

All the impacts and enhancements of the Proposed Action are repeated for the Maximum Development Alternative. The major added impact will be the following:

- Two administrative office buildings with employee amenities and a parking structure would replace the Historic Peters Estate and caretaker cottage, which are visible from Rockville Pike; and structured parking would be constructed into the grade between the house, the visitors center and transit station. The Historic Peter's residence would be demolished, which impacts the historic fabric and the current view from Rockville Pike.
- The historic core area and the campus northeast quadrant would be redeveloped intensely with three administrative office buildings and another multi-level parking garage. The NIH historic fabric would be adversely impacted. The view of the campus from both Cedar Lane and Rockville Pike will be affected, as the new development will dominate the view.

The estimated change effected by the Maximum Development Alternative is an approximate 7,084,496 square feet of newly developed space which includes 2,312,700 square feet of structured parking and 4,771,796 square feet of new building space. The new developed footprint area is an approximate 1,226,429 square feet, which replaces an existing 870,292 square feet. By limiting development to existing sites and building higher structures the overall net impervious area is not significant. Figure 4-8 below shows the potential physical extent and location of change that would occur if the Maximum Development Alternative were to be fully implemented.

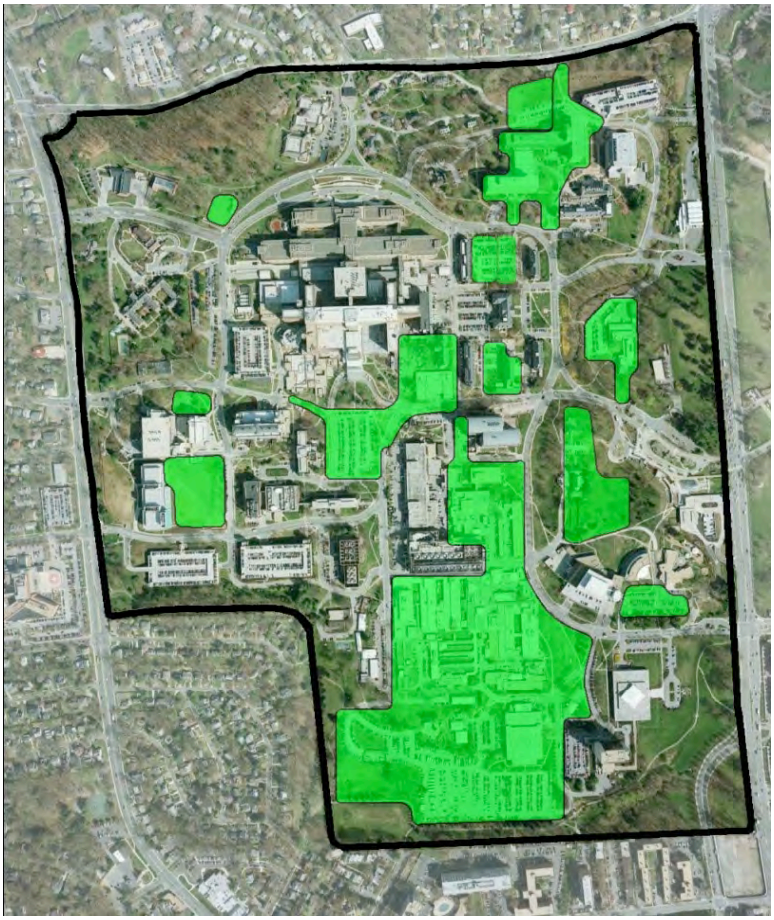


Figure 4-8: Maximum Development Alternative Estimated Extent of Changes

The Maximum Development would have minimal to moderate positive impact overall. Implementation would have a moderate positive impact to external conditions, as planned removals of surface parking from the buffer would occur. Only low-rise development would be placed near the residential edges of the campus. A moderate to significant positive impact to interior campus conditions would occur as enhancements to the campus buildings and grounds of the campus would be made. Multiple new high-rise buildings would be added near the campus main entrance and in the current historic campus core. A significant negative impact would occur with the demolition of multiple buildings in the historic core and with the removal of the historic Peters Estate. Temporary significant adverse environmental impacts from both demolition and site excavation and grading for new construction would be expected. A moderate positive impact to interior campus condition would occur, as aesthetic enhancements to campus buildings and grounds would be made and obsolete, older buildings would be replaced.

4.10.2 Community Facilities Impact

4.10.2.1 *Proposed Action*

Adjacent institutions and residential neighborhoods would be impacted by a modest increase in traffic. The proposed demolition and construction of millions of square feet of buildings and site disturbance would impact the adjacent institutional and residential neighborhoods with increased construction activities and truck traffic. There would be temporary impacts to ground, topography, soil, air, water, noise and other environmental factors during the demolition and construction periods presented in the 2013 Bethesda Campus Master Plan. NIH would take appropriate measures to mitigate noise, dust, number of vehicular deliveries, monitor and mitigate air quality and water quality throughout the term of construction and development.

Long-term positive impact would be realized from the economic benefit of an improved NIH campus achieved by replacing obsolete facilities with newer state of the art buildings. Another benefit would be the increased regional economic impact. The improvement to the campus would improve NIH's global stature as a world-class life and clinical science research center. As a result, the immediate neighborhoods and the entire region would economically benefit. Intangible benefits from NIH's stature and its ability to attract world-class scientists and researchers would be achieved.

4.10.2.2 *No Action Alternative*

Adjacent institutional and residential neighborhoods would experience minor adverse impact from traffic, construction, noise, parking, air quality, water quality or other environmental impacts. There would be modest socio-economic benefit with modest increase in construction activities and the improvement of NIH facilities. One building of historic significance is proposed to be demolished. NIH has already received authorization from the State of Maryland to proceed with this removal.

4.10.2.3 *Maximum Development Alternative*

Adjacent institutions and residential neighborhoods would be impacted by a moderate increase in traffic. The proposed demolition and construction of millions of square feet of buildings and site disturbance would temporarily significantly impact the adjacent institutional and residential neighborhoods with increased construction activities and truck traffic. Also temporary adverse impacts to topography, soil, grades, air, water, noise and other environmental factors during the construction periods would be expected. Similar to the proposed Action, long-term economic benefits would be realized with the improvement of the NIH campus by replacing obsolete facilities with newer state of the art facilities. Long-term intangible benefits from the improved state of the NIH campus and its ability to attract world-class scientists would also be achieved.

A permanent adverse impact would be the demolition of multiple historic buildings on the NIH campus, including large portions of the original historic core and the iconic Peters Estate, which

currently has a prominent location on one of the higher elevations on the NIH campus. This alternative adversely impacts the cultural resources of the area with the removal of buildings with historic significance.

Under the Proposed Action, the campus employee population would increase by 3,000 to about 23,859 by 2033. Impacts on housing demand or prices are expected to be minor. Except for recruited clinicians and scientists, it is probable that many new employees would come from the Washington region. The new hires would be looking for residences in the region. With the passage of time, they would become part of the regular NIH work force, increasing the annual volume of employee turnover and retirements, and adding to the regional housing demand.

About 1,000 of the NIH employees at the Bethesda campus are temporary to NIH. This group includes researchers or fellows in training and visiting scientists. Temporary researchers and fellows, stay at NIH Bethesda or at satellite locations for periods ranging from a few weeks to several years. Proximity of residence to NIH or the satellite locations is desirable for these personnel. However the cost of housing in the close-in Bethesda neighborhoods is prohibitive for many NIH employees and temporary staff. If regional transportation management measures are implemented, then residential locations in proximity to the Metrorail become more desirable.

The turnover from a transient group at NIH, coupled with the reduced work-home travel distance, would contribute to a strong rental housing market in the region, would include rental apartments on the Rockville Pike corridor and along the Metrorail Red Line corridor.

4.10.3 Community Facilities and Housing Impact

The impact of the three proposed alternatives on community facilities and housing are as follows:

4.10.3.1 *Proposed Action*

Under the Proposed Action -Redevelopment, the building program would improve existing laboratory and office spaces. This would allow NIH to attract well-qualified personnel to the campus. Under the Proposed Action the campus building program would be expanded with nominal population increases. These added employees would continue to seek regional housing options and use local community services. Community services would be expected to expand at a moderate pace. This modest expansion would have a modest beneficial economic impact with modest increased demand for housing and community services.

4.10.3.2 *No Action Alternative*

Under the No Action Alternative, the building program would not be expanded, so additional space, necessary to continue the mission of NIH, would be located off campus and future employees would likely locate around those off campus locations. Under No Action Alternative the campus would not have a program to replace obsolete buildings, and a lack of population

increases from younger staff would be anticipated. As the general population continues to age there could be less demand on currently well maintained and operated community facilities. This could adversely impact the local area.

4.10.3.3 *Maximum Development Alternative*

Similar to the Proposed Action, Maximum Development Alternative the building program would improve existing laboratory and office spaces. The increase of 10,000 employees would have a more significant economic benefit on the region. There would be an increased demand for housing in the regional real estate market. Housing in the immediate Bethesda area is already in demand, commanding premium prices. The increased number of employees would only increase that condition. Future employees would probably locate further from NIH along mass transit line. There would be a regional benefit from the increased housing demand, in addition to the economic benefit from community services with the increased number of employees.

4.10.4 Parks and Recreation Impacts

The Master Plan Alternatives would not create significant direct or indirect negative or positive impacts on M-NCPPC park facilities, the YMCA, or their respective recreational values.

4.11 CULTURAL HISTORIC RESOURCES IMPACTS

The Master Plan is a conceptual road map for future development. Determining the impacts of the plan on historic and architectural resources can only be accomplished in a broad context. Factors such as the exact size and design of planned buildings would not be decided until individual projects are initiated. For these reasons, the following analysis represents a preliminary assessment of the potential impacts of the Master Plan alternatives on resources within the Area of Potential Effects (APE) listed in or eligible for listing in the National Register (for Historic Buildings and Sites). This broad assessment is not a substitute for future Section 106 review, which would occur when projects are initiated. The evaluations below serve in determining the future success of the Master Plan.

4.11.1 Potential Impacts of the Proposed Action Alternative on Resources

The Proposed Action would include 4,684,706 gross square feet of new development. This alternative proposes both the demolition and adaptive reuse of mid-twentieth-century laboratories and the adaptive reuse of residential housing constructed in the 1940s. With the exception of the construction of a new data center (Building N7) within the National Register-eligible NIH Historic Core Historic District, the Proposed Action would preserve historic resources. This would allow for the adaptive reuse of existing historic resources. The Proposed Action would improve the landscape that enhances the campus and would maintain and add to the current perimeter buffer zones.

4.11.1.1 *North Research Cluster*

Demolition of Buildings 31A-C is proposed to allow construction of a new biomedical research laboratory and a new multilevel parking structure. The North Research Cluster is adjacent to the NIH Historic Core Historic District, the Officer's Quarters Historic District, and Tree Tops, Building 15K. In addition, the North Research Cluster includes Building 6, a contributing resource to the NIH Historic Core Historic District. Under the Proposed Action, the proposed parking garage would be constructed into the hillside to minimize its perceived height and mass from the NIH Historic Core Historic District. In general terms, Proposed Action would protect the historic setting of Building 6.

Although Building N7 would be one story below grade on one side, it would impact the integrity of the historic district by altering the design, setting, feeling, and association. The design, massing, and scale of Building N7 would be compatible with the contributing resources within the NIH Historic Core Historic District, limiting the impact of this new construction. The renovation of Buildings 4 and 5, both contributing resources within the NIH Historic Core Historic District, would convert the buildings from laboratory spaces to administrative offices. Since the building interiors are already heavily altered, the impact of the renovations would be minimal. The addition to Building 1 (Building 1A) would be constructed on the west (or rear) facade of Building 1. Although the construction of Building 1A would change the historic building configuration of Building 1, its design, massing, and scale would be compatible to Building 1 and the other contributing buildings within the historic district. Under Proposed Action, all new construction and renovation within the NIH Historic Core Historic District would follow the Secretary of the Interior's "Standards for the Treatment of Historic Properties."

4.11.1.2 *Administrative Research Cluster*

The Proposed Action proposes the demolition of the modern addition to Building 8, which is not a contributing resource. The demolition of the modern addition would restore open space and the symmetrical relationship between existing buildings within the historic district. Proposed Action proposes to remove surface parking from the NIH Historic Core, enhancing the open space and landscape of the historic district. The Proposed Action would protect the integrity of the NIH Historic Core Historic District by recommending 100-foot setbacks between buildings and creating appropriately scaled open spaces between new and existing buildings. The Proposed Action would recommend new construction materials within the NIH Core Historic District be the NIH blend red and iron-spot brick, compatible with existing historic resources. The Proposed Action would relocate the historic anchor and commemorative plaque, currently located in a traffic island to an accessible and visible location in front of Building 1.

4.11.1.3 *East Research Cluster*

The East Research Cluster is located west of the National Register-eligible George Freeland Peter Estate Historic District. The Proposed Action proposes the demolition of Buildings 12, 12A,

and 12B, which have been determined ineligible for the National Register. The Proposed Action would protect the integrity of the National Register-eligible historic resources including the Peter Estate Historic District by recommending 100-foot setbacks between new buildings and creating appropriately scaled open spaces and relationships between new and existing buildings. Within the East Research Cluster are Buildings 11 and 13, which have also been determined ineligible for the National Register.

4.11.1.4 *Biomedical Research Education Cluster*

The Biomedical Research Education Cluster on the southeast part of the NIH campus includes the National Register eligible Peter Estate and National Library of Medicine (Building 38). The proposed addition to the Natcher Building 45 would be located southeast of the George Freeland Peter Historic District and would not impact its historic setting or views. It also would have no impact on the National Library of Medicine or Lister Hill (Building 38A). The Proposed Action would maintain open views of the National Library of Medicine from Rockville Pike and from the southeast corner of the campus.

4.11.1.5 *Central Research Cluster*

The Central Research Cluster is located in the central part of the NIH campus and is adjacent to the National Register-eligible NIH Historic Core Historic District to the east and the National Register eligible Officer's Quarters Historic District and Tree Tops (Building 15K) to the north. In addition, the Center Research Cluster is located east of the National Register eligible Convent of the Visitation of Washington (Building 60). Proposed Action would include the demolition of Building 9, which has been determined ineligible for the National Register, and the demolition of Building 7, which is National Register eligible. In their place, the Proposed Action proposes the construction of a 299,891-square-foot animal research laboratory (Building N9), which would be located directly west of Building 5, a contributing resource of the NIH Historic Core Historic District. Building N9 has the potential to alter the integrity of the historic district by impacting its setting, feeling, and association. The Proposed Action would help to protect the scale and integrity of the NIH Historic Core Historic District by recommending 100-foot setbacks between buildings and creating appropriately scaled open spaces and relationships between new and existing buildings. Additionally, the Proposed Action would maintain a transition in building heights from the center of the research cluster toward the lower height buildings of the surrounding historic resources and districts. The Proposed Action also proposes adapting Building 30 for use as physicians' offices.

4.11.1.6 *West Research Cluster*

Within the West Research Cluster, the Proposed Action proposes the construction of Building A40, a 46,200-square-foot addition to Building 40. Although the proposed Building A40 would be located south of the National Register-eligible Convent of the Visitation of Washington (Building

60), its potential to impact the Convent is negligible due to the distance between the buildings and the screening effect of existing vegetation and the convent wall.

4.11.1.7 *South Research Cluster*

A proposed new 774,504-square-foot research facility (Building N14) would require the demolition of the building complex consisting of Buildings 14A-G, Building 18, Building 25, and Buildings 28 and 28A. The Proposed Action proposes that a formal open space would be set aside to buffer the new construction and protect the setting of the National Register-eligible National Library of Medicine (Building 38).

4.11.1.8 *Service Support Clusters*

The Central Service Support Cluster includes a new police station (Building N18), which would require the demolition of Buildings 22 and 22A. Building N18 would be located near Building 11, which has been determined ineligible for the National Register.

In the South Service Support Cluster, south of proposed Building N14, the Proposed Action would include two new multilevel parking structures and multiple new service buildings, which would have no impact on historic resources within the NIH campus.

4.11.1.9 *Perimeter Buffer Zone*

Within the Perimeter Buffer Zone, the Proposed Action would increase open space buffers around the perimeter of the NIH campus. The southeast corner buffer zone would maintain its open views to the National Library of Medicine. Along Rockville Pike, the landscape character would remain open maintaining views to the National Register eligible George Freeland Peter Estate Historic District. The National Register-eligible Officer's Quarters Historic District falls within the Perimeter Buffer Zone. Proposed Action proposes adaptive reuse of Buildings 15B2, 15C1-C2, 15D1-D2, 15E1-E2, 15F1-F2, and 15G1, converting the buildings from residential to administrative use. The adaptive reuse of these contributing resources would be limited to interior spaces and would not impact the integrity of the historic district.

4.11.1.10 *Outside the NIH campus*

The National Naval Center Historic District and the Bethesda Naval Hospital Tower are located immediately east of the NIH campus. The Bethesda Meeting House is located immediately south of the NIH campus at 9400 Rockville Pike. Due to setback distances, sightlines, the screening effect of vegetation, and perimeter buffer zones, Proposed Action would have no impact on these or other National Register or National Register-eligible historic resources within the APE.

4.11.2 Potential Impacts of the No Action Alternative on Resources

Under the No Action Alternative, new development would be limited to the construction of the Porter Neuroscience Research Center (Building 35 complex) and the Northwest Child Care Center (Building N23) for a total of 768,598 gross square feet. The No Action Alternative would preserve all existing historic resources and maintain the system of landscape that enhances the quality and character of the campus. The No Action Alternative would maintain the current perimeter buffer zones and preserve existing views and vistas.

The No Action Alternative proposes minimum development and assumes that there would be no demolition of existing structures and limited new construction. New development would consist of the construction of 747,263 gross square feet for the Porter Neuroscience Research Center (Building 35 complex) and the Northwest Childcare Center (Building N23). Due to their location, height, and scale, the construction of Building 35 and Building N23 would have no impact on historic resources within the NIH campus.

Due to setback distances, sightlines, and the screening effect of existing vegetation, the construction of Building 35 and Building N23 would have no impact on historic resources outside the NIH campus.

4.11.3 Potential Impacts of Maximum Development Alternative on Resources

Under the Maximum Development, new development would consist of approximately 7,317,406 gross square feet of new construction. This alternative proposes the replacement of mid-twentieth-century laboratories with new state of the art laboratories. The Maximum Development would demolish historic buildings to adverse impacts and would increase the current perimeter buffer zone for a beneficial impact.

4.11.3.1 *North Research Cluster*

Within the North Research Cluster, Maximum Development would demolish Buildings 31A-C which is adjacent to the NIH Historic Core Historic District, the Officer's Quarters Historic District, and Tree Tops (Building 15K). In addition, the North Research Cluster includes Building 6, a contributing resource to the NIH Historic Core Historic District. Building NMLP14 has the potential to adversely impact adjacent historic resources.

4.11.3.2 *Administrative Research Cluster*

Within the Administrative Research Cluster, Maximum Development would demolish Building 21 and replace it with Building N21. The new building would be constructed in a topographically low site, which would reduce its perceived height and mass from the NIH Historic Core Historic District. The Administrative Research Cluster includes Buildings 1 through 5 of the National Register-eligible NIH Historic Core Historic District. Within this historic district, The Maximum Development Alternative proposes the demolition of Buildings 4 and 5, contributing resources of

the historic district, for the construction of new administrative buildings; the demolition of Building 8 for the construction of a new administrative building; and the construction of Building N7. The demolition of Buildings 4 and 5 and the construction of Building N7 within the NIH Historic Core Historic District would significantly and adversely, impact the integrity of the historic district by altering its design, setting, materials, workmanship, feeling, and association. The extent of the impact would depend on its final design, massing, and scale. Under Maximum Development Buildings 1, 2, and 3 would be the only remaining contributing resources within the NIH Historic Core Historic District.

The Maximum Development Alternative proposes the demolition of Buildings 12, 12A, and 12B, which have been determined ineligible for the National Register. This Alternative also proposes the construction of an addition to Building 45. This addition would have no impact on the National Library of Medicine. More significantly, the Maximum Development Alternative proposes to eliminate the George Freeland Peter Estate Historic District by demolishing its contributing resources – Building 16 (Stone House) and Building 16A. This would eliminate a National Register eligible property and would be a significant adverse impact the historic character of the NIH campus, permanently altering the character of the site and NIH campus.

4.11.3.3 *Central Research Cluster*

The Central Research Cluster is centrally located within the NIH campus and is adjacent to the National Register-eligible NIH Historic Core Historic District to the east and the National Register-eligible Officer's Quarters Historic District and Tree Tops (Building 15K) to the north. In addition, the Center Research Cluster is located east of the National Register eligible Convent of the Visitation of Washington. The Maximum Development Alternative proposes demolition of Building 9, which has been determined ineligible for the National Register, and the demolition of Building 7, which is National Register eligible. The proposed Building N9 would have the potential to adversely impact the integrity of the historic district by altering its setting, feeling, and association.

4.11.3.4 *West Research Cluster*

Within the West Research Cluster the Maximum Development Alternative proposes the construction of an addition to Building 40. The potential to impact the Convent is negligible due to the distance between the buildings and the screening effect of existing vegetation and the convent wall.

4.11.3.5 *South Research Cluster*

The Maximum Development Alternative proposes significant changes within the South Research Cluster. The proposed Building N14 would require the demolition of the building complex consisting of Buildings 14A-G, Building 18, Building 25, and Buildings 28 and 28A. This

Alternative proposes a formal open space to buffer the new construction and protect the setting of the National Register-eligible National Library of Medicine.

4.11.3.6 *Service Support Clusters*

Within the Central Service Support Cluster, the Maximum Development Alternative proposes demolition of Buildings 22 and 22A. The replacement building would be located near Building 11, which has been determined ineligible for the National Register.

Within the South Service Support Cluster, south of proposed Building N14, the Alternative proposes construction of two multilevel parking structures and multiple service buildings including the replacement of Building 21 which is the main hazardous waste handling facility on the NIH campus. This construction would have no impact on historic resources within the NIH campus.

4.11.3.7 *Perimeter Buffer Zone*

Within the Perimeter Buffer Zone, the Maximum Development Alternative proposes to increase open space buffers around the perimeter of the NIH campus. The southeast corner buffer zone would maintain its open views to the National Library of Medicine, which is National Register-eligible resource. Along Rockville Pike, the landscape character would remain open.

4.11.3.8 *Outside the NIH campus*

The National Naval Center Historic District and the Bethesda Naval Hospital Tower are located immediately east of the NIH campus. The Bethesda Meeting House is located immediately south of the NIH campus at 9400 Rockville Pike. Due to setback distances, sightlines, the screening effect of vegetation, and perimeter buffer zones, the Maximum Development Alternative would have no impact on these or other National Register or National Register-eligible historic resources within the APE.

4.12 LAND USE AND ZONING IMPACTS

4.12.1 Land Use Impacts

The 2013 NIH Bethesda Campus Master Plan Proposed Action, No Action and Maximum Development Alternatives are compatible with the land use recommendations of the Bethesda-Chevy Chase Master Plan. None requires or applies pressure to change existing and future recommended land use and zoning. The NIH campus provides a buffer between the Bethesda CBD and residential communities to the north and west of the campus. The campus reduces pressures to extend the CBD along Old Georgetown Road and Rockville Pike, which would occur if the property were privately held.

4.12.2 Zoning Impacts

All alternatives are compatible with the Montgomery County zoning and the MNCPPC Bethesda-Chevy Chase Master Plan and Bethesda CBD Sector Plan, which propose continuing R-60, RT-12.5 and R-10 land uses around the periphery of the campus, offering opportunities for non-vehicle home-to-work trips between NIH and the surrounding community.

The NIH Master Plan as a document does not propose to alter local planning or zoning needs or demands. As a planning tool for the evolution of the campus environment it must necessarily interface with its surroundings and adjust to critical changes affecting the region in general. NIH would not change its land-use or its campus location. NIH would not require changes to local land use or zoning policy under any of the Alternatives.

4.13 SOCIOECONOMIC IMPACTS

4.13.1 Overall Economic Impact of NIH in the United States

Nationwide, NIH obligations in FY 2010 resulted in over $31.4 billion of direct expenditures on extramural, intramural and administrative support programs. These direct expenditures generate a significant secondary impact in the U.S. The total economic impact of NIH is the sum of direct and secondary economic benefits.

The total annual contribution of NIH to the U.S. economy, sum of direct and secondary economic benefits, amounts to an estimated $135.6 billion in gross output or sales, $54.22 billion in employee income and over 484,939 jobs. The extramural awards, fellowships and obligations represent the bulk of the economic impact, nearly 84 percent of the total NIH budget appropriation of $ 31.4 billion in FY 2010.

Seven states received more than $1 billion in funding from NIH: California ($3.555 billion), Massachusetts ($2.543 billion), New York ($2.105 billion), Maryland ($1.836 billion), Pennsylvania ($1.445 billion), Texas ($1.111 billion), and North Carolina ($1.101 billion).

Jobs and Wages: In FY 2007, NIH grants and contracts created and supported more than 350,000 jobs that generated wages in excess of $18 billion in the 50 states. The average wage associated with the jobs created was $52,000. In fiscal year 2010, the increase in NIH grants and contracts from $22.846 billion to $24.449 billion, has resulted in a total of approximately 404,700 jobs.

In FY 2010, NIH awarded approximately $24.449 billion (excludes American Recovery and Reinvestment Act (ARRA) funding) in grants and contracts to universities and other research institutions worldwide. The value of NIH state awards ranged widely, from $3.555 billion (California) to $1.83 million (Guam).

4.13.2 NIH Economic Impact on Maryland

An analysis of NIH grants and contracts found those awarded to several states in FY 2010 and the economic impact of these awards in each state. Included is a framework for predicting the economic impact of NIH direct expenditures in 2010 in the State of Maryland.

Business activity on average in FY 2010 for each dollar of NIH funding generated more than twice as much in state economic output. That is an overall investment of $24.449 billion from NIH generated a total of $58.035 billion in new state business activity in the form of increased output of goods and services overall.

Using 2008 Research Information Management Systems (RIMS) II multipliers, we can evaluate the impact of the funding expended by NIH on each state. In the State of Maryland: a dollar of NIH spending there leads to a $2.09 dollar of economic activity at the state level. On a national average, every dollar spent by NIH increases the country's business activity by $ 3.11.

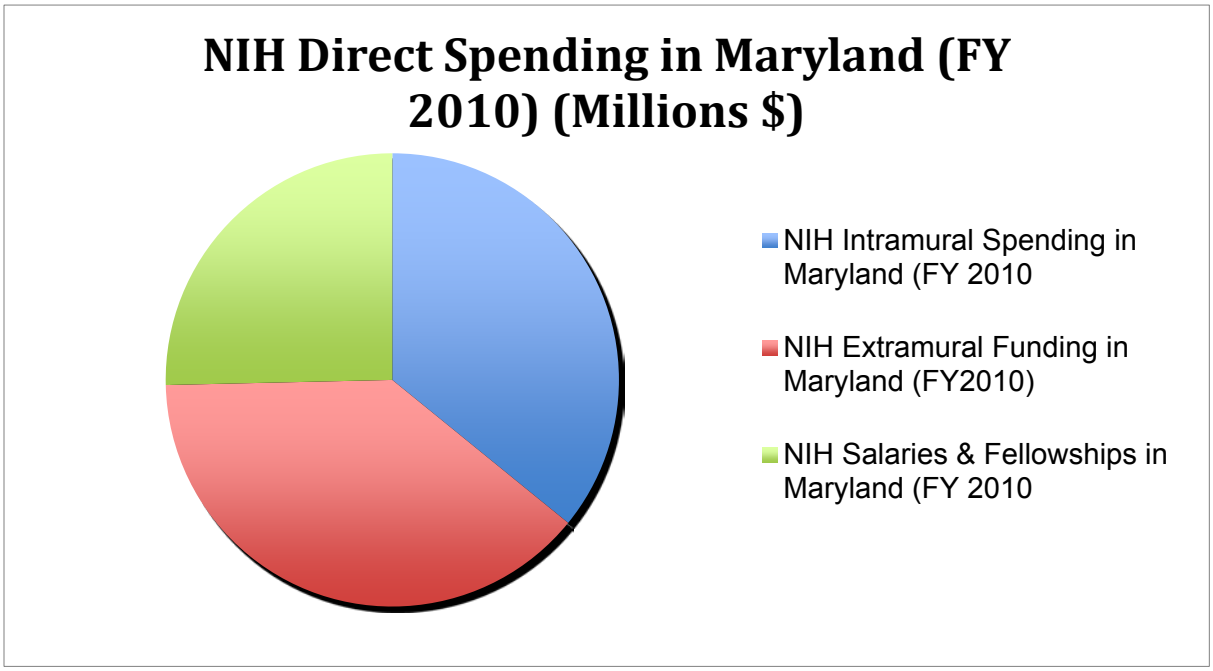


Figure 4-9: NIH Direct Spending in Maryland

Among the states, Maryland is the principal beneficiary of NIH due to receiving the bulk of NIH direct intramural program expenditures. In FY 2010, NIH contributed about approximately $5.1 billion directly to the Maryland economy. About two thirds of this amount was attributed to employee salaries and fellowships and intramural program service contracts awarded to Maryland firms and research laboratories.

Maryland ranked fourth in the nation behind California, New York and Massachusetts in total NIH extramural research grants and expenditures awarded in FY 2010. Maryland received an NIH grants total of $1.836 billion.

4.13.3 Life Sciences Employment and Funding Impact

Private employment in Maryland's Life Science's community is spurred by NIH extramural and intramural spending. Maryland has a concentration of Life Science employment, the ninth largest in the country, with a 30 percent higher concentration of life sciences businesses, Maryland is the fifth largest in the country, with a 20 percent higher concentration of life sciences business establishments than the U.S. overall.

Compared to other states, Federal Government life science funding has a disproportionate impact on Maryland. With the high number of federal life science employment, increases the significance of direct federal life science activity in the state. The higher concentration of private life science jobs makes Maryland a disproportionate beneficiary of federal life science research and market efforts. NIH is the largest federal life science facility in the state.

The Bethesda main campus with 14,261 Federal Government employees, accounts for 48 percent of Maryland federal life sciences jobs. NIH national funding of extramural research was $25.8 billion in FY2009. Maryland-based institutions are major recipients of NIH funding in FY 2010, Maryland received well over $1 billion in funding grants. The District of Columbia is also a major per capita recipient of NIH funding.

Department of Business and Economic Development (DBED) analysis of the economic impact of Maryland's life sciences finds support of 160,000 jobs, $9.6 billion in wages and salaries and nearly $500 million in tax revenues. Roughly 80,000 jobs are in the private sector, 62,000 in the Federal Government sector and 18,000 in the academic sector. NIH holds a disproportionate share and influence on all the sectors.

Table 4-10: NIH's FY2010 Direct Investment in Maryland (excludes ARRA funds)

Total FY2010 Budget Allocation to NIH	Estimated Total FY2010 Direct Maryland Expenditures, Pro Rata	Pro-Rata Ratio, Economic Impact of NIH Funding in Maryland
$31,234.41	$5,144.54	0.16

Life Sciences Maryland Jobs Analysis & Economic Impact Report

4.13.4 American Recovery and Reinvestment Act (ARRA)

NIH was allotted a total of $10 billion from the American Recovery and Reinvestment Act (ARRA) in FY 2009 and FY 2010. These funds were utilized to fund grants for 21,851 research projects and other research interests around the country. Using the ARRA funds in two consecutive financial years, NIH was able to produce and survive 50,000 additional jobs, which includes 5000 summer trainees for years 2009 and 2010.

4.13.5 Other Economic Considerations

First, master plans are conceptual by nature and do not specify dimensions and materials needed to determine costs. This permits flexibility for future planners and designers.

Second, master plans are long term. The NIH Bethesda campus Master Plan covers a twenty-year period, and estimates of implementation costs beyond currently budgeted items would be speculative.

Third, the Master Plan is presented as an envelope for development, and all projects may not be implemented. The benefit of modernizing NIH facilities to improve research efficiency and capability on campus, and to improve efficiency in administering off campus or extramural research, and thus improve the health and quality of life of the American people is undeniable, but unquantifiable.

Implementation of the Redevelopment Master Plan Alternative would be of overall benefit to the Montgomery County economy. Through its Transportation Management Plan (TMP) goal of maintaining NIH generated peak hour trips at May 1992 levels, NIH reserves traffic capacity for development in the Bethesda Central Business District and Rockville Pike corridor. Development proposed in the Bethesda-Chevy Chase Master Plan and Bethesda CBD Sector Plan can continue unabated by NIH Master Plan facilities and growth. The rate of growth proposed at NIH is less than that for the Bethesda CBD.

NIH creates significant direct and indirect benefits throughout the U.S. and in Maryland (The Economic Impact of the NIH in Maryland and the U.S., Maryland Dept. of Economics and Employment Development, 1994). Among the States, Maryland is the principal beneficiary of NIH due to receiving the bulk of NIH direct intramural program expenditures In Fiscal Year 1993, NIH contributed about $1.7 billion directly to the Maryland economy (Table 4-10). About two thirds of this amount was attributable to employee salaries and fellowships and intramural program service contracts awarded to Maryland firms. NIH also expended near $550 million in Fiscal Year 1993 in support of extramural research in Maryland by others outside NIH. Maryland ranked fourth in the nation behind California, New York, and Massachusetts in total research grants and expenditures awarded by NIH in FY 1993. Johns Hopkins University in Baltimore was the largest single recipient of NIH extramural research grants and contracts in the U.S. In FY 2010, the university received over $26.869 million for a total of 1,235 grant awards.

Direct expenditures by NIH in its intramural and extramural programs lead to secondary and tertiary indirect economic benefits as funds received directly are subsequently paid to other parties. The total or overall annual economic impact of NIH in Maryland is estimated to be $36 billion in gross sales, $1.9 billion in employee income, and about 62,900 jobs when these indirect effects are taken into account. The intramural program represents about 60 to 65 percent of this economic benefit.

It is estimated that, in FY 1993, NIH spending generated a total of $70 million in personal income tax receipts, $35 million in local County personal income taxes, and $17 million in State retail sales tax receipts in Maryland. The combined State and local tax receipts from direct and indirect NIH activities in Maryland were estimated at $122 million.

NIH on-campus growth would have positive economic benefits for commercial enterprises in Bethesda by providing a larger concentrated potential market. The Master Plan and TMP implementation would make NIH employees less hesitant to patronize Bethesda restaurants and businesses during midday by locating more employees within five minutes walking distance of the Medical Center Metrorail station, where there are now less than 1,000 on the campus in that situation. NIH creates a high demand for overnight accommodations through the large number of technical meetings and conferences held on the campus. NIH's effect on residential property values cannot be estimated with precision, but NIH has a positive effect. In Montgomery County, the most important factors in determining property values are location and school district. Neighborhoods in the vicinity of NIH rank high in both categories.

Only about 10 percent of the 20,594 NIH employees live in Bethesda, Chevy Chase, and Kensington. Housing demand created by routine NIH employee turnover and retirement is an element in sustaining housing demand and prices in these areas, and this effect increases as one approaches the campus based on a distribution analysis of employee population.

Americans move on the average of once every five years. NIH has long-term permanent employees, but about 20 percent are transient research trainees and visiting scientists assigned to NIH for only a few months or years. Conservatively, if it is assumed that NIH employees move residences once every ten years, and the distribution of employee residences are similar to current ones, then NIH employees constitute a market for about 970 residences per year in Montgomery County, and 180 residences per year in Bethesda, Chevy Chase, and Kensington. Increases in campus population would increase proportionately the NIH employee demand for housing in the immediate area. Other factors would increase the pressure to make residential proximity to the campus more desirable for NIH employees.

Regional and NIH transportation management would discourage single occupant vehicle use. Increasing long-term regional traffic congestion would place greater emphasis on living closer to work.

Growth has been relatively continuous at NIH for nearly 60 years. The Montgomery County property tax records for the neighboring communities were searched to determine if there was any decrease in property values as one drew closer to the campus or as a result of these projects. Comparisons between neighborhoods cannot be made because of differing housing types and lot sizes, but within neighborhoods comparisons of 2012 records indicated a decrease in the assessed property values.

This falling assessment can be attributed to the depressed housing market nationwide and the downturn in economic conditions within the region. The assessed property values abutting the campus had little variance from those one or two blocks from the campus. Generally, properties abutting the campus have stable values. The stability of these prices following a downturn in the economy is an indication of the positive impact that NIH has on the local economy.

The quality of life on the NIH campus is important to NIH as well as the surrounding neighborhoods. NIH must compete with other institutions for researchers, and government salaries are generally less than in the private sector. A high quality campus setting is an important factor in attracting researchers and highly qualified technical support personnel. One of the fundamental purposes and goals of the Master Plan is to enhance the quality of life and character of the campus. This fundamental tenet influences all aspects of the plan from the broad scope of functional layout of buildings and quadrangles, to the minor details of landscaping, signing, and lighting. The internal quality and character of the campus cannot be separated from the character of the campus as perceived and experienced from the surrounding neighborhoods.

4.14 CONSTRUCTION OPERATIONS IMPACTS

4.14.1 Construction Impacts

Because of the need to continually modernize and upgrade facilities, construction at NIH Bethesda would continue to occur under the No Action Alternative as existing buildings and utilities are renovated, rehabilitated, and repaired and new buildings, which are planned, would be constructed. There are 2 new buildings in the No Action Alternative. Renovation and repair with continued building occupancy takes longer than new construction, and can have similar costs.

The Proposed Action and the Maximum Development Alternatives in the 2013 NIH Bethesda Campus Master Plan propose provision of maintenance and improvements to streetscapes, landscaping, roads, and utilities. Proposed Action plans significant development of 20 new facilities by primarily redeveloping existing developed sites. This includes demolition of 12 existing buildings. The Maximum Development Alternative proposes to provide additional 7 new buildings, removal of an additional 5 existing facilities. Both will require significant upgrades to campus utilities. The overall scope for the facilities has already been referenced in this report. In the event that neither Proposed Action nor the Maximum Development alternatives are fully

implemented, construction would still occur on campus to maintain Federal, state, and laboratory accreditation regulations and renovate to provide operating facilities.

Most of the construction impact would affect NIH operations and employees due to proximity.

Those in buildings adjacent to sites would experience the greatest amount of construction related noise, dust, and traffic. The degree, to which these factors affect daily research operations or laboratory equipment, instrumentation, and conditions, would run the gamut from negligible to severe, even within a single building. For some projects it may be necessary to close internal campus streets temporarily and detour traffic. Additionally, employees may be transferred internally within the campus to other on site facilities as each newly renovated area becomes available for occupancy.

Construction impacts on surrounding residential community are dependent on proximity and general duration. Those projects with the highest potential site construction impact are 500 feet or less to the nearest residence within the Maplewood, Battery Lane, Edgewood, and Glenwood neighborhoods. Mitigation of construction site impacts would be determined at the time of project implementation when more details are known about the project and the resultant necessary mitigation.

Truck traffic associated with construction depends on the state of work. It can range from a few days to several weeks of delivery of supplies and construction crewmembers. Operations involving high truck volumes include hauling demolition and excavated soil materials away from the site, delivery of the basic structural materials such as concrete, masonry, steel framing, and delivery of miscellaneous supplies.

Under all the Alternatives, construction truck traffic would likely enter the campus via the commercial vehicle inspection area off Rockville Pike. Departures would be assigned by individual project specifications. Specific roadway paths would be determined as part of the construction project.

Table 4-11: Amount of Building Area to be Demolished or Constructed and Site Area to be disturbed by Construction or Demolition

Activity	Proposed Action	No Action Alternative	Maximum Development Alternative
Demolition Building Area	2,225,807 GSF	80,960 GSF	2,552,895 GSF
Demolition Building Site Area Disturbed	2,648,273 GSF	45,747 GSF	2,812,711 GSF
New Construction Building Area	4,451,798 GSF	535,690 GSF	7,084,498 GSF

Activity	Proposed Action	No Action Alternative	Maximum Development Alternative
New Construction Building Site Area Disturbed	1,457,268 GSF	223,641 GSF	2,310,468 GSF

4.14.2 Construction Fugitive Dust

4.14.2.1 *Proposed Action*

Significant construction dust would occur with the planned demolitions of Buildings 12, 12A, 12B, 14, 21, 22, 25, 28, 31, 41 and 41P in addition to the planned demolitions of Buildings 7 and 9 in the No Action Alternative. The planned renovation of 3,311,136 GSF would also generate significant dust internal to the occupied buildings.

4.14.2.2 *No Action Alternative*

Construction dust would be incurred with the planned demolition of Buildings 7 and 9: 80,960 GSF of building and 25,415 GSF of disturbed site area. The planned renovation of 2,903,473 GSF would generate significant dust internal to the occupied buildings.

4.14.2.3 *Maximum Development Alternative*

Significant construction dust would occur with the planned demolitions of Buildings 4, 5, 8, 16 and 16A, in addition to the planned demolitions of the Proposed Action and the No Action Alternatives. The planned renovation of 3,311,136 GSF would generate significant dust internal to the occupied buildings.

4.14.3 Construction Air Quality – Interior

NIH General Provisions for interior renovations in construction contract specifications require drop cloths, drapes, barriers, and partitions to control dust and dirt that can be spread by tracking or air currents. The effect of outdoor heavy construction activities and site preparation on air quality, are generally short-term and confined to the vicinity of construction activity, i.e. normally within 500 feet. Minimum Efficiency Reporting Value (MERV) filters should be added to all heating ventilation and air conditioning supply and intake air registers during construction renovation periods. Incorporation of the LEED CI-2009 IEQc3.1 Construction Indoor Air Quality (IAQ) Monitoring standards would assist in the control of indoor construction and demolition dust.

4.14.4 Construction Air Quality - Exterior

General provisions for Outdoor Air Quality during construction and demolition operations would need to be followed. Incorporation of LEED NC EQc1 Outdoor Air Delivery Monitoring standards would assist in the control of outdoor construction and demolition dust. Following EPA Protocols

– Method 9, 9D and 22 for the ”Visible Determination of Opacity of Emissions from Stationary Sources” involves recordation of readings as a percentage of opacity in terms of black and white particulate plumes or dense clouds of matter.

NIH is committed to including the mitigation measures in construction specifications and may include:

- Contractors comply with applicable State regulations governing open bodied trucks carrying loose materials.
- Areas disturbed during construction would be seeded and stabilized as soon as possible.
- Provide stabilized stone construction entrances.
- Sprinkle or wet high dust areas
- Follow all demolition, removal and disposal of all debris; restoration of the site and the stabilization of the site should follow the current and applicable OSHA, MOSHA, EPA and MDE guidelines at the time of demolition.

4.14.5 Construction Sedimentation/Siltation Impacts

4.14.5.1 *Proposed Action*

Construction Sedimentation and potential siltation would be encountered with a projected disturbed site area of 4,105,541 GSF for a cumulative area disturbed by both demolition and new construction. Impacts would be mitigated with above listed NIH sedimentation and siltation control measures.

4.14.5.2 *No Action Alternative*

Construction Sedimentation and potential siltation would be encountered with a projected disturbed site area of 269,388 GSF for a cumulative area disturbed by both demolition and new construction. Impacts would be mitigated with above listed NIH sedimentation and siltation control measures.

4.14.5.3 *Maximum Development Alternative*

Construction Sedimentation and potential siltation would be encountered with a projected disturbed site area of 5,123,179 GSF for a cumulative area disturbed by both demolition and new construction. Impacts would be mitigated with above listed NIH sedimentation and siltation control measures.

4.14.6 Construction Site Development Impacts

4.14.6.1 *Proposed Action*

The Proposed Action slightly reduces the amount of developed land from 42 percent to 40 percent and increases the amount of open space from 58 percent to 60 percent. The individual building projects may have isolated effects on the storm drainage system, however, the impacts are expected to be temporary, primarily during construction. Final impacts would be determined as part of the 2013 Master Utility Plan Update that is currently ongoing. Updates would be included in the final environmental impact statement.

4.14.6.2 *No Action Alternative*

The No Action Alternative approximately maintains the land use conditions at the level of existing 2013 conditions, with 42 percent developed land and 58 percent open space. The individual building projects may have isolated effects on the storm drainage system, however, the impacts are expected to be temporary, primarily during construction.

4.14.6.3 *Maximum Development Alternative*

The Maximum Development Alternative approximately maintains the land use conditions at the level of existing 2013 conditions, with 42 percent developed land and 58 percent open space. The individual building projects may have isolated effects on the storm drainage system, however, the impacts are expected to be temporary, primarily during construction. Final impacts would be determined as part of the 2013 Master Utility Plan Update that is currently ongoing. Updates would be included in the final environmental impact statement.

4.14.7 Construction Scheduling Impacts

4.14.7.1 *Proposed Action*

Planned new construction of 4,451,798 GSF and the planned renovation of 3,311,136 GSF would generate traffic and noise that would have to be scheduled to minimize the impact on the adjacent neighborhoods and traffic.

The scheduling of the redevelopment of sites has to provide either a completed new facility or temporary space for the existing building occupants. For buildings that require regulatory commissioning, the time for the approval and review process, as well as the building commissioning, needs to be included in the redevelopment schedule. For buildings that require regulatory decommissioning prior to demolition the time for the approval, review and decommissioning must be included in the development schedule.

To provide sites for the development, existing buildings, particularly those that are used for research and waste handling, all have to be properly decommissioned by the relevant authorities. The decommissioning may require remediation of various types of hazardous materials. In the case of the Building 21 complex, the decommissioning and remediation must

satisfy NIH and the NRC, EPA and MDE. This process has the potential of extending over multiple years, which in turn, affects the scheduling of the new development planned for those sites.

New development sites that handle hazardous materials would require approvals and reviews to commission the sites. This process also could extend over multiple years. The overall campus development schedule would need to include the critical path for decommissioning, remediation when needed, and demolition, commissioning and approvals for new facilities along with the standard timing for design, design reviews, bidding and construction.

4.14.7.2 *No Action Alternative*

Planned new construction of 535,690 GSF and the planned renovation of 2,903,473 GSF would generate traffic and noise that would have to be scheduled to minimize the impact on the adjacent neighborhoods and traffic

4.14.7.3 *Maximum Development Alternative*

Planned new construction of 7,084,498 GSF and the planned renovation of 3,311,136 GSF would generate traffic and noise that would have to be scheduled to minimize the impact on the adjacent neighborhoods and traffic. The same scheduling issues that affect Proposed Action would affect the Maximum Development Alternative.

4.14.8 Construction Waste Impacts

Construction waste would have temporary increases, and potential long-term impact in the solid waste disposal site downstream from NIH. The volume of projected demolition and new construction waste is large and would require planning for waste reduction and waste stream routing in the design and planning process to avoid overloading local waste disposal sites.

4.14.8.1 *Proposed Action*

Planned new construction of 4,451,798 GSF and the planned renovation of 3,311,136 GSF along with the planned demolitions of Buildings 12A, 14, 21, 22, 25, 28, 31, 41 and 41P in addition to the planned demolitions of the No Action Alternative totaling 80,960 GSF would generate a significant amount of construction waste. This will have temporary adverse impacts on roads and traffic with waste being removed and landfills for the waste destination.

4.14.8.2 *No Action Alternative*

Planned new construction of 535,690 GSF and planned renovation of 2,903,473 GSF added to the planned demolition of Buildings 7 and 9 of 80,960 GSF would generate significant construction waste that will have temporary adverse impacts on roads, traffic and landfills.

4.14.8.3 *Maximum Development Alternative*

Planned new construction of 7,084,498 GSF and the planned renovation of 3,311,136 GSF, along with the planned demolitions of Buildings 4, 5, 8, 16 and 16A, together comprise a total cumulative demolition building area of 1,818,841 GSF. This would generate a large amount of construction waste. This will have temporary adverse impacts on roads and traffic with waste being removed and landfills for the waste destination.

4.15 HAZARDOUS WASTE AND OTHER MATERIALS IMPACTS

4.15.1 Solid or General Waste Impacts

Projections for solid waste generation and recycling cannot be made with precision. In most years, future yard waste generation should fall between 40 and 50 tons. However yard waste may spike in individual years, if NIH has a periodic tree maintenance and pruning project underway, or if there is extensive tree storm damage. Construction wastes would also have a wide variance, depending on the number and character of projects underway. Particularly high values would occur in those years when buildings are demolished or undergoing renovation.

General waste is expected to increase with the increase in number of personnel on campus. Recycling efforts would also continue to increase, along with advances in solid and general waste handling. Impacts will be moderate for all the Alternatives.

4.15.2 Biomedical Research Waste Impacts

Waste is strictly segregated in the laboratory to avoid creating unnecessary amounts of multi-hazard/mixed waste. Aqueous and organic solvents, liquid and solid waste, and short and long half-life radioactive materials are kept separate. A wide assortment of appropriate waste containers, many defined and specified by Federal and State regulations, are provided to researchers by the appropriate waste management groups within the DEP and DRS. The researcher labels the container for date, source, constituents, and potential hazard. Accumulated waste is stored temporarily in cabinets or in secure areas in the laboratories away from general public and easy employee access. The proposed increases in research laboratory facilities for all of the Alternatives will have moderate adverse impact.

4.15.3 Medical Pathological Waste impacts

Medical waste is routinely generated at all hospitals, in private medical testing and biomedical research laboratories, and dentist and doctor offices. Procedures for handling, treatment, storage, and disposal of medical waste are controlled by Federal and State regulations. Each defines the waste differently and gives minor variances in procedures. Pertinent regulations include EPA regulations for "regulated medical waste" in 40 CFR Part 259, OSHA regulations for waste containing "blood borne pathogens" in 29 CFR §1910.1030, and State of Maryland

regulations for "special medical waste" in COMAR 10.06.06, 26.13.12, and 26.13.13. Transport of medical waste is controlled by U.S. DOT regulations in 49 CFR Part 171 and State regulations. With the increased amount of renovated Clinical space and new Animal Research space, additional medical pathological waste is expected for all of the Alternatives considered. This will have minor adverse impact.

4.15.4 Radioactive Waste Impacts

NIH radioactive waste is inspected packaged and labeled before transport to an NRC licensed disposal/holding facility. Currently the waste is removed and transported to Building 21. In the future, the Building 21 operations would be relocated. NIH would continue to generate Radioactive Wastes, which have environmental impacts in the handling and disposal of the waste. NIH would continue to follow NRC protocols in the handling, packaging and disposal of its radioactive waste with Radioactive Waste Service (RWS).

The relocation of Building 21 has the potential for adverse impact in the scheduling of the waste handling, which will affect the Proposed Action and the Maximum Development Alternatives. The approval process, decommissioning, commissioning, construction and demolition sequencing would determine this impact. Impacts would be temporary due to construction and not significant for all the Alternatives.

4.15.5 Chemical and Multi-Hazardous Mixed Waste Impacts

For chemical and multi-hazard/mixed waste, Chemical Recycling and Disposal Service (CRDS) or RWS contractor personnel inspect the waste, researcher packaging and labeling. Currently the waste is removed and transported to Building 21. In the future, the Building 21 operations would be relocated per the master plan. NIH would continue to generate chemical and multi-hazard mixed wastes, would continue to follow EPA and MDE protocols in the handling, packaging and disposal of its chemical and other hazardous waste. Impacts would be temporary due to construction and not significant for all the Alternatives.

4.15.6 Mercury Contamination Impacts

Mercury (Hg) is one of the most common and hazardous contaminants in health care and biomedical research facilities, particularly in older facilities where mercury was widely used and often spilled. Even small amounts of mercury can be spread rapidly, contaminating large areas and systems above safe levels, and contamination can persist for long periods of time without detection. Often spilled mercury is only revealed during renovation and demolition activities that expose areas under equipment, floor tiles and in plumbing systems.

Protocols used for assessment and remediation of hazardous substances in facilities undergoing renovation, demolition or other deconstruction processes are referred to as decommissioning. No single method or system for assessment of mercury contamination is

appropriate for all situations. NIH has published protocols for discovery and assessment of mercury contamination for their buildings.

Impacts for all Alternatives are the same, with potential adverse temporary impacts if any mercury is discovered during renovation or demolition activities. Adverse impacts would include construction scheduling.

4.15.6.1 *Mercury in Plumbing Systems*

Mercury is a very common contaminant in wastewater plumbing and laboratory vacuum systems at NIH. In older biomedical facilities and laboratories much of this contamination is a legacy of past uses of mercury, primarily in thermometers and disposal of mercury containing spills and wastes via drains. Since elemental mercury (liquid metal) is very heavy – about 13.5 times denser than water it rapidly settles in to the bottoms of traps, joints and other low areas of systems where it can reside for very long periods of time.

Even in newer facilities that have eliminated most uses of mercury and prohibit all on-site disposals significant amounts of mercury can be found in wastewater systems. This is because many common chemicals such as bleach that are ultimately discharged into wastewater systems after use contain mercury as a contaminant. While the concentration of dissolved mercury in the discharged wastewater may be very low the mercury can be accumulated in solid biofilms (biomass) and sediments to levels that are many times higher than in the water. Increased flow rates, turbulence or other conditions can cause these solids to be released from plumbing resulting in elevated concentrations the wastewater. Since the maximum concentration of mercury allowed in wastewater discharges is extremely low in many jurisdictions the release of these contaminated solids my result in violations of pollution control regulations.

An extensive amount of information on the sources of mercury accumulation in plumbing and reduction strategies has been developed. This is the result of investigations conducted by a working group comprised of the Massachusetts Water Resource Authority (MWSA) and the Medical Academic and Scientific Community Organization (MASCO). MASCO Research Reports, Pretreatment Manual, Mercury Management Guidebook and a database of Mercury content in products is a resource used by NIH.

NIH has published protocols for discovery and assessment of mercury contamination for their buildings that are provided above. Impacts for all Alternatives are the same, with potential adverse temporary impacts if any mercury is discovered in the plumbing, during renovation or demolition activities. Adverse impacts would include construction scheduling.

4.15.6.2 *Microbial Interactions with Mercury*

Microbial interactions may increase the environmental toxicity of mercury contaminants released with wastewater and result in other subsidiary hazards.

Mercury compounds have long been used as fungicides, disinfectants, and preservatives and until recently, as drugs for treatment of infectious diseases. While these compounds are toxic to most microorganisms, some bacteria have developed mechanisms to survive and grow in the presence of lower concentrations of mercury. These mechanisms have probably existed since primordial times as an adaptation to life environments where mercury is naturally present. Adaptations to mercury toxicity also allow bacteria to survive and grow in mercury contaminated plumbing and other artificial environments. In these situations the adaptive mechanisms that allow bacteria to persist may have undesirable consequences including development of resistance to antibiotics in other resident bacteria, and accumulation and subsequent biotransformation inorganic forms of mercury into organic compounds such as dimethyl mercury, which are more toxic to animals and highly persistent and bio accumulative in the environment. Even at very low levels of exposure mercury is also a potent suppressor of the immune response of mammals to some infectious agents.

Mercury is common contaminant in health care and biomedical research facilities; especially in older facilities that were in operation before restrictions on mercury use and disposal were established. The potential contribution of mercury to the development of antibiotic resistance in pathogenic bacteria and interference with immune responses is of particular concern in facilities where patients and laboratory animals, some with compromised immune responses are likely to be present. Mercury may also interfere with sensitive research protocols carried out in contaminated facilities.

Impacts for all Alternatives are the same, with potential adverse temporary impacts if any mercury interaction with microbial material is discovered during renovation or demolition activities. Adverse impacts would include construction scheduling.

4.15.7 Formaldehyde (CH2O)

In accordance with OSHA Regulation 29 CFR 1910.1048, Formaldehyde, the NIH has established a Formaldehyde Surveillance Program[1]. The Technical Assistance Branch (TAB) of the Division of Occupational Health and Safety (DOHS) maintains the Formaldehyde Surveillance Program. For more information contact the TAB at (301) 496-3353.

A formaldehyde surveillance program has been established to:

- Identify and quantify exposure levels of workers potentially exposed to formaldehyde
- Provide information on the effectiveness of the controls being used to minimize exposures

[1] http://www.ors.od.nih.gov/sr/dohs/HealthAndSafety/IH/Pages/Formaldehyde-Surveillance-Program.aspx

This program generally applies to all occupational exposures to formaldehyde (including various formaldehyde solutions). This program covers all NIH locations and the impacts for all the Alternatives would be potential adverse temporary impacts and if formaldehyde is encountered.

4.15.8 Ethylene Oxide (EtO)

In accordance with OSHA Regulation 29 CFR 1910.1047, Ethylene Oxide, the NIH has established an Ethylene Oxide (EtO) Surveillance Program[2]. In health care and research settings, EtO is commonly used for sterilizing medical supplies and equipment. At room temperature and normal atmospheric pressure, it is a colorless gas with a characteristic ether-like odor. Ethylene oxide is both flammable and highly reactive.

Potential EtO exposures at the NIH are typically associated with using EtO sterilizers or handling materials removed from the sterilizers. For the Master Plan Impacts for all the Alternatives, Ethylene Oxide would only be an impact in the demolition of buildings that contain sterilizers.

In evaluating employee exposures to EtO, the NIH complies with the exposure levels set by OSHA in 29 CFR 1910.1047. These are: 1.0 part per million (ppm) as an "8- hour time-weighted average", 5 ppm as a "short term exposure limit", and 0.5 ppm as an "action level".

Laboratories using EtO that have not been evaluated should contact the DOHS, TAB to schedule an evaluation.

Impacts for all Alternatives are the same, with only temporary impacts.

4.15.9 Asbestos Containing Materials

Asbestos–Containing Materials (ACM) may be present at the NIH as pipe, duct and equipment insulation; core material of Virginia Metal wall partitions; original wooden doors; acoustical ceiling plaster; ceiling tiles, duct mastic; floor tiles and their associated mastic; asbestos-cement sheets (Transite board) and spray-on fireproofing. These materials are most commonly found in mechanical rooms, pipe chases, stairwells and above suspended ceilings.

The potential for asbestos-containing material to release airborne fibers depends on its' degree of friability. Friability is the ability of materials, when dry, to be crumbled, pulverized, or reduced to powder by hand pressure. The sprayed-on or troweled-on materials used, as acoustical plaster on ceilings or as fireproofing is considered friable and readily releases airborne fibers if disturbed. Materials such as vinyl-asbestos floor tiles are considered non-friable and do not release airborne fibers unless sanded or broken. Transite board can release fibers only if sawed, drilled or broken.

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[2] http://www.ors.od.nih.gov/sr/dohs/HealthAndSafety/IH/Pages/ih_ethylene.aspx

Whenever suspect asbestos containing materials are encountered in a work area at the NIH, the presence or absence of asbestos would be confirmed by sampling and analysis conducted by the DOHS. The Technical Assistance Branch (TAB), DOHS, maintains information regarding the NIH locations where the presence or absence of asbestos has been documented.

The management of asbestos containing materials at the NIH campus involves the efforts of several Divisions within the NIH organizational structure. The Office of Research Facilities Development and Operations (ORFDO) provides facilities personnel with training and guidance in recognizing and responding to potential asbestos containing materials in buildings throughout the campus. Trained ORFDO personnel may perform limited asbestos abatement as required, subject to direction of their Supervisor and oversight by the DOHS. They are responsible for ensuring that areas are assessed for asbestos containing materials prior to commencement of any renovation or demolition activities. And if new suspect materials were discovered during the course of a project, they would halt operations until the materials can be assessed.

The Division of Occupational Health & Safety (DOHS) provides technical guidance on employee protection when disturbing asbestos, as well as coordination of collection and analysis of suspected asbestos containing materials. The DOHS also reviews asbestos abatement plans submitted by contractors and coordinates air monitoring of asbestos abatement projects to assess airborne levels and to provide re-occupancy clearances.

On January 1, 2010 the NIH adopted several policy changes regarding asbestos abatement oversight and clearance sampling. The letter explaining the changes can be found here.

The Division of Environmental Protection (DEP) coordinates final shipments of asbestos containing materials and asbestos waste. The DEP provides shipping documents for compliance with Federal waste regulations and signs as the “generator” on all shipping documents.http://www.ors.od.nih.gov/sr/dohs/HealthAndSafety/IH/asbestos/Pages/workplace_asbestos.asp Accessed 11/04/12

Impacts for all Alternatives are the same, with potential adverse temporary impacts if any unknown asbestos containing material is discovered during renovation or demolition activities. Adverse impacts would include construction scheduling.

4.15.10 Lead (Pb) and Other Hazardous Materials

Lead based paint containing materials that remain within the structures scheduled for demolition or renovation, should be identified, tested and removed prior to demolition or renovation. It should be understood that lead based paint materials or other hazardous materials may be present within the structures (i.e., sub-grade sealants, enclosed wall or ceiling systems, flooring located below underlayment, etc.). As required under OSHA (29CFR 1926.1101) and EPA (40 CFR 61 subpart m) a survey for asbestos is required prior to renovation /demolition to be

conducted in accordance with these regulations. Assessments for other materials including LBP and PCBs etc. should also be performed prior to renovation activities.

If the lead paint is not abated from the building prior to demolition activities, the EPA requires that representative samples of the waste stream be collected and analyzed using the EPA TCLP method.

The OSHA standard gives no guidance on acceptable levels of lead in paint at which no exposure to airborne lead (above the action level) would be expected. Rather, OSHA defines airborne concentrations, and references specific types of work practices and operations from which a lead hazard may be generated (reference 29 CFR 1926.62, section d). Environmental and personnel monitoring should be conducted during any removal/demolition process (as appropriate) to verify that actual personal exposures are below the Permissible Exposure Limit (PEL). Under OSHA requirements, the contractor performing the work would be required to conduct this monitoring and follow all of the other requirements found under 29 CFR 1926.62.

Prior to demolition or renovation the buildings should be inspected for identified or suspect PCB containing ballasts, mercury containing fluorescent lamps, unused refrigerants, and other regulated substances should be properly removed from the building. The disposal of such items should be performed according to local and Federal regulations.

All generators of spent fluorescent tubing, thermostats, and other mercury containing components are responsible for their proper disposal under the Resource Conservation and Recovery Act (RCRA). If mercury containing articles are not removed from the building prior to demolition activities, the EPA requires that representative samples of the waste stream be collected and analyzed using the EPA TCLP method.

Certain landfills, municipal waste incinerators and disposal facilities would not accept mercury-containing articles regardless of the TCLP analytical test results. Mercury containing lamps should be disposed at an EPA registered recycling center.

For refrigerant containing equipment, the EPA requires that any equipment dismantled on-site prior to disposal must have its refrigerant recovered in accordance with EPA's Refrigerant Recycling Rules (Section 608). However, equipment that typically enters the waste stream during demolition with the charge intact (e.g. air conditioners, refrigerators, and water fountains) is subject to special safe disposal requirements. Under the EPA requirements, the final party in the disposal chain (e.g. scrap metal recycler or landfill owner) is responsible for ensuring that refrigerants are recovered from equipment prior to final disposition.

Impacts for all Alternatives are the same, with potential adverse temporary impacts if any unknown hazardous material is discovered during renovation or demolition activities. Adverse impacts would include construction scheduling.

4.15.11 Building 21 Complex Radioactive, Chemical and Multi-Hazardous Mixed Waste Impacts

Before Building 21 is demolished, it would be decommissioned according to NRC requirements and approvals. Waste material from building demolition would be handled and disposed of according to NRC requirements. Inspection and testing of the building and the soils under and around the building would be made by NRC prior to demolition, at points during demolition and after demolition. Demolition procedures would follow NRC protocols and approvals. This would include the current holding tanks, the vault that contains the holding tanks, the foundations of the prior radioactive and chemical waste processing facility foundations which are encapsulated underneath the Building 21 foundations and the prior holding tanks, which are currently underground.

In addition to the NRC requirements, before Building 21 is demolished, it would be also be decommissioned according to EPA requirements. Inspection and testing of the building and the soils under and around the building would be made by EPA/MDE prior to demolition, at points during demolition and after demolition. The RCRA permit allows NIH to have the capacity to store up to 26,360 gallons of liquid hazardous waste for subsequent treatment, transport, and disposal. This volume represents the cumulative capacity of Building 21 waste management facility, and is for operation of this facility.

The actual amount of material on hand at any one time is less than this capacity since waste are shipped once a week to off-site treatment and disposal facilities. In the proposed Master Plan moderate growth alternative and the maximum growth alternative, Building 21 is proposed to be demolished and the operations relocated to new facilities. Building 21 as a licensed RCRA facility would need to be decommissioned according to NRC- RCRA procedures and obtain all the necessary approvals to be decommissioned. The new facility would need to be constructed to RCRA standards, commissioned and obtain the requisite permits prior to occupancy. The new facility must be operational and commissioned before the existing facility decommissioning can start.

If it is assumed that the chemical/hazardous waste per researcher remains constant in the future, then the amount generated under Proposed Action is estimated to be about 172.4 metric tons per year. Under the No Action Alternative generation would stabilize at around 150 metric tons.

A separate NEPA process would be started for decommission, demolition and new construction of the waste management facilities.

4.15.12 Animal Waste Impacts

NIH animal waste is classified as solid waste, MPW, or sanitary waste, as determined by waste characteristics. Since it is a subset of other types of waste, no breakout or quantification of the

amounts of animal waste generated is recorded. Animal waste amounts or volumes, however, are included within the general solid waste, MPW, or sanitary waste data. Bedding material and animal droppings from diseased animals are managed as MPW or sterilized by heating to sufficient temperatures in a steam autoclave and disposed of as general solid waste. Bedding from healthy animals is disposed of as general solid waste. Wash down from areas housing healthy animals is routed to the sanitary sewer.

All animal facilities are reviewed and accredited triennially by the American Association for Accreditation of Laboratory Animal Care (AAALAC). Facilities are also inspected twice a year by the Food and Drug Administration and at frequent intervals by internal NIH groups.

NIH would continue to generate Animal Wastes, and continue to follow AAALAC requirements and FDA requirements for the handling and disposal of animal waste. The animal waste stream is expected to increase slightly with the replacement of the current Building 14 complex. The ability to handle the waste would be improved with new facilities. The impacts would be the same for the Proposed Action and the Maximum Development Alternative.

4.15.13 Storage Tank Impacts

Buildings that are scheduled for demolition would have the underground and above ground storage tanks decommissioned per EPA and MDE requirements, and then removed per EPA and MDE requirements. Tanks include compressed gases for medical and research laboratory use, and fuel tanks. Medical gas systems must comply with NFPA Standard 99.

Buildings scheduled for demolition would need to have the fuel tanks and emergency generators decommissioned and removed prior to demolition. Soils testing per NIH and MDE/EPA protocols would need to be followed after the tank removals for both AST and UST fuel tanks. The NIH Fire Marshal would need to inspect the site prior to fuel tank removal. NIH Bethesda campus utilizes Underground Storage Tanks (USTs) and Aboveground Storage Tanks (ASTs) registered with the Maryland Department of Environment Oil Control Program.

Building 21 tanks in the enclosed vault would have to be decommissioned after the replacement building is approved, constructed and commissioned. Two older NRC registered abandoned tanks are also scheduled for removal. The tanks would then have to be removed and disposed per NRC, RCRA, and MDE requirements. During demolition operations, monitoring would occur and demolition must proceed per NIH, NRC, U.S. EPA and MDE protocols for waste tank decommissioning and removal. Post demolition would require soil testing and remediation if any contaminants were found. The site would have to be cleared and remediated by NRC, U.S. EPA and MDE before any decommissioning could start.

Potential impacts to the soils and groundwater at any of the development sites may be influenced by the presence of any storage tanks at the site or within the vicinity of the Campus. Further tank review with MDE would be required to assess the potential of any chemical, gas or

petroleum releases to groundwater or soils at the campus. The tanks are expected to have associated piping, with fill ports, and vents.

In the Proposed Action and Maximum Development Alternatives, the existing NIH service station would be relocated along with its associated USTs. In addition, many of the buildings scheduled for demolition have ASTs and USTs. Some buildings scheduled for demolition have bulk LN2 tanks or other gases. This would require the removal and decommissioning of all of the tanks associated with these structures. The removal process for all tanks will be performed in accordance with MDE requirements. Confirmatory soil testing will be performed after any tank removal.

In the No Action Alternative, several ASTs would be relocated as well as bulk oxygen and LN2 bulk tanks. This would require the decommissioning of the existing tanks regardless of the type of fuel or gas it contained. The removal process would be per MDE and EPA requirements. The locations for the new or relocated tanks would require approvals to proceed, commissioning and inspections for installation.

In the Maximum Development Alternative the 500,000-gallon fuel oil tanks would be excavated and replaced with new USTs of cathodic protection and associated leak detection devices. The fuel tanks located to the north of Building 11 would be replaced when Boiler 7 is installed. Old tanks would be removed or decommissioned in accordance with Federal and State regulations.

All Alternatives would have storage tanks for gases or fuels and impacts associated with the tank decommissioning, removal and relocation would be temporary.

4.15.14 Water Tank Impacts

NIH Bethesda campus is considering as part of the Proposed Action and the Maximum Development Alternative to install two large underground water storage tanks to provide on-campus redundancy for water. There are no adverse impacts anticipated with the water storage tanks. One additional above ground tank is being planned. The geology impacts are discussed elsewhere in this report.

4.16 UNAVOIDABLE ADVERSE ENVIRONMENTAL IMPACTS

The Master Plan is a guidance document for future development of the campus and its effect on the surrounding areas and communities. Adverse impacts are conditional upon implementation of individual projects proposed in the development plans for each Alternative. The three proposed alternatives have also been discussed throughout this report emphasizing the campus needs for changes to be flexible based on growth of essential support services and laboratory research development of the NIH scientific programs. Potential and adverse effects of each Alternative Plan have been discussed with greater detail in this document within the applicable sections. The effects must also be considered to their positive and negative overall attributes to

the health and wellness of the community and those who benefit from the services provided by NIH.

Based on the findings of this study, previously provided and existing information, and limits of ongoing development of the 2013 MUP, at the time of this draft study, significant adverse and unavoidable impacts and changes have not been proposed to occur for the three proposed alternatives for the following: local economy; local planning needs and demands; community facilities as a result of campus growth; local housing markets; environmental justice; local park facilities; air quality; fauna and habitat; and flood plains.

Unavoidable adverse impacts associated with the Proposed Action and the Maximum Development Alternative if implemented, include:

- Environmental Conditions:
    - Topography, Geology and Soils
- Biological Resources:
    - Terrestrial and Vegetation
    - Fauna and Habitat
    - Water Resources
- Air Quality
- Noise
- Utilities
- Cultural and Historic Resources
- Visual and Aesthetic
- Construction and Construction Waste Impacts
- Hazardous Materials

The impacts and/or limitations to determination of potential for adverse impacted are further discussed in more detail in the following sections.

4.16.1 Environmental Conditions

Environmental Natural Conditions at the campus under the Proposed Action and the Maximum Development Alternative would be isolated to the specific building projects. Both Alternatives have the potential for adverse impacts and would be expected to have temporary impacts.

4.16.1.1 *Topography, Geology and Soils*

The immediate topography proposed in the new development sites would significantly alter the existing grades. Potential adverse impacts to surface water run-off and soil erosion would require the project designs to include address grading and landscaping to prevent rapid surface run-off during and after construction.

4.16.1.1.1 *Proposed Action Impacts*

The Proposed Action alters 1,457,268 GSF for new construction and 2,648,273 GSF for demolition for a total of 4,105,541 GSF of disturbed site area. This is a major amount of development, which is proposed to occur over a twenty-year period. At a minimum, no less than 4-10 acres would be disturbed during any of the years. Potential temporary impacts of dust migration, noise, soil erosion and sedimentation could result from this amount of site disruption. Significant dust control, soil erosion and sediment control measures would be needed to mitigate this potential impact.

4.16.1.1.2 *Maximum Development Alternative Impacts*

The Maximum Development Alternative alters 2,310,468 GSF for new construction and 2,812,711 GSF for demolition for a total of 5,123,179 GSF of disturbed site area. This is a major amount of development, which is proposed to occur over a twenty-year period. At a minimum, no less than 5-10 acres would be disturbed at any given year. Potential temporary impacts of dust migration, noise, soil erosion and sedimentation could result from this amount of site disruption. Significant dust control, soil erosion and sediment control measures would be needed to mitigate this potential impact.

4.16.1.1.3 *Other Impacts*

Potential impacts to the soils and groundwater at the site may be influenced by the presence of various fuel, chemical, gas and/or radioactive holding tanks at the various project sites. During demolition and construction of the projects that have tanks being removed, and/or tanks being installed, regulatory authority protocols would need to be followed. Soils will need to be tested after tank removal and any releases or contamination of soils would have to be remediated per the requirements and protocols of the authorities having jurisdiction, which could include NRC, MDE, EPA and other governing entities.

4.16.2 Biological Resources

4.16.2.1 *Terrestrial and Vegetation*

Trees and vegetation under the Proposed Action and the Maximum Development Alternative would include a loss of existing trees from construction efforts, however, a net change in the

number of trees and forest areas would increase anticipated from ongoing planting and naturalizing programs and development projects.

4.16.2.2 *Fauna and Habitat*

A review of threatened and endangered species for the project area and campus in coordination with local Maryland agencies is currently in progress. Further review of these results would be needed to make a determination in regards to potential adverse impacts.

4.16.2.3 *Water Resources*

Stream resources for the Proposed Action and Maximum Development Alternative would be moderate based on the relative size of the proposed improvements in relation to the overall watershed. Impacts of water quality on Aquatic Habitat under the Proposed Action and Maximum Development Alternatives depend upon good construction practices and preventive design. A detailed study should be conducted for the proposed sites adjacent to streams. Of particular concern would be the Building 21 complex demolition and N21 (New Administration Building) construction to ensure that the NIH Stream is not impacted. Also the replacement facility for Building would need to be carefully designed, particularly the holding tank vault and associated piping to make positive outflow inverts.

A detailed floodplain study should be conducted as part of the removal of the Building 21 Complex and the development of N21. Floodplain avoidance should be considered. If floodplain avoidance is not feasible, the necessary mitigation and permitting measures should be implemented.

4.16.3 Noise

Noise generated by cooling towers associated with the chillers would increase under the Proposed Action and Maximum Development Alternative. Each of these alternatives requires adding one additional chiller similar to those already installed, based upon this preliminary analysis. A complete analysis of chiller capacity requirements would be included in the 2013 MUP. The Master Plan Proposed Action proposes replacing Building 14. The north wall of the new Building N14 would be about 130 to 140 feet from Building 11. The projected maximum future Leq noise level at Building N14 is 65 dBA, an acceptable level in an urban environment. This would occur under high summer temperature conditions.

Construction noise would temporarily increase during demolition, earthwork and new construction or renovation operations proposed in all three alternatives.

4.16.4 Utilities

Natural Gas demands are expected to increase from 739,450 CFH to 987,850 CFH under the Maximum Development Alternative. If the gas distribution capacity is not increased, then

curtailment of NIH supply can be expected to occur more frequently and for longer periods during each occurrence, regardless of growth in campus demands. NIH, as it has done in the past, would continue to reexamine its utility requirements on the campus on a regular basis and alert the appropriate utilities, as well as the community, if its requirements dramatically change. The master plan would continue to be updated on a regular basis, and if new proposals come forward that would introduce a new utility requirement, not identified in the 2013 Master Plan, these proposals would be reviewed, shared with the community, and go through the established environmental and other review processes with the Federal and State authorities that presently oversee development on the Bethesda campus. In the future, if NIH would require a new natural gas line dedicated solely to NIH use, it would follow the NEPA process. If area natural gas demands, such as Bethesda CBD, WRNMMC, commercial and residential growth, etc., require expansion of the public system, NIH would follow or participate, as appropriate, in all applicable environmental review processes conducted by others.

The No Action Alternative would result in an addition of utility demand of 304,265 gross square feet (gsf) of new building space served by the Central Utility Plant (CUP).

For the Proposed Action and the Maximum Development Alternative, further details of the type of use for each building and the resulting expected loads and demands for utilities are to be addressed in the 2013 Master Utility Plan (MUP), which is in progress.

Table 4-12: Building Areas by Alternative for Order of Magnitude Effect on Utilities

Alternative	Existing	Demolition	New Construction	Net
No Action	12,179,983	-80,960	535,690	12,634,713
Proposed Action	12,179,983	-1,445,847	4,451,798	15,185,934
Maximum Development	12,179,983	-2,552,895	7,084,498	16,711,586

With larger facilities planned for existing developed site, it is probable that the utility systems supporting the existing buildings would not have sufficient capacity for the newer larger planned facilities. This would require significant site utility upgrades and considerable impact to the site, soils, topography and roadways, in addition to the acres of grading and excavation already quantified for the new development. The construction impacts would be unavoidable and significant, adverse and temporary. The capacity impacts would continue to affect the supporting off-campus WSSC domestic water, sanitary and storm sewers, and the onsite and off-site power capacity.

4.16.5 Cultural and Historic Resources

4.16.5.1 *Proposed Action*

New development on the NIH campus would potentially impact views of the campus. The following elements of Proposed Action: Redevelopment - Proposed Alternate would have an adverse impact on the historic resources within the APE:

- The location, height, and scale of Building NMLP14 within the North Research Cluster would have the potential to impact Tree Tops (Building 15K) and contributing resources within the NIH Historic Core Historic District and the Officer' Quarters Historic District;
- The location, height, and scale of Building N21 within the Administrative Research Cluster would have the potential to impact the vista between Building 1 within the NIH Historic Core Historic District and the Bethesda Naval Hospital Tower;
- The construction of Building N7 and Building A1 within the Administrative Research Cluster would have the potential to impact the integrity of the NIH Historic Core Historic District;
- The location, height, and scale of Building N12 within the East Research Cluster would have the potential to impact the historic setting and views from the Stone House (Building 16), a contributing resource of the George Freeland Peter Estate Historic District;
- The location, height, and scale of Building N9 within the Center Research Cluster would have the potential to impact the integrity of the NIH Historic Core Historic District by altering its setting, feeling, and association;
- The conversion of Buildings 15B2, 15C1-C2, 15D1-D2, 15E1-E2, 15F1-F2, and 15G1 within the Officer's Quarters Historic District from residential to administrative use would have the potential to impact the integrity of the district by altering its feeling and association;
- New development on the NIH campus would have the potential to impact views of the campus from off campus sites, including the National Walter Reed National Military Medical Center;
- The construction of Building N7 and Building A1 would have the potential to impact views of the NIH Historic Core Historic District from the Bethesda Naval Hospital Tower;
- The construction of Building N21 would have the potential to impact the vista and the visual relationship between Building 1 and the Bethesda Naval Hospital Tower; and,
- New development within the North Research Cluster, the Administrative Research Cluster, and the Biomedical Research Education Cluster, would have the potential to

impact views of the NIH campus and its historic resources from the National Walter Reed National Military Medical Center Historic District.

4.16.5.2 *Maximum Development Alternative*

The Maximum Development Alternative would continue to preserve a select number of historic resources, but would involve demolition of certain historic buildings. The new development on the NIH campus would also impact views of the campus. The following elements of Maximum Development Alternative: Maximum Development would an adverse impact on the historic resources within the APE:

- The location, height, and scale of Building NMLP14 within the North Research Cluster would have the potential to impact Tree Tops (Building 15K) and contributing resources within the NIH Historic Core Historic District and the Officer's Quarters Historic District;
- The location, height, and scale of Building N21 within the Administrative Research Center would have the potential to impact the historic vista between Building 1 within the NIH Historic Core District and the Bethesda Naval Hospital Tower;
- The construction of Building N7 within the Administrative Research Cluster would have the potential to significantly impact the integrity of the NIH Historic Core Historic District;
- The demolition of Buildings 4 and 5, contributing resources within the NIH Historic Core Historic District, would significantly impact the integrity of the historic district by altering its design, setting, materials, workmanship, feeling, and association and would impact the historic character of the NIH campus;
- The demolition of the Stone House (Building 16) and Building 16A would eliminate the George Freeland Peter Estate and would significantly impact the historic character of the NIH campus;
- The location, height, and scale of Building N9 would have the potential to impact the integrity of the NIH Historic Core Historic District by altering its setting, feeling, and association;
- New development on the NIH campus would have the potential to impact views of the campus from the upper floors of the Bethesda Naval Hospital Tower;
- The demolition and new construction within the NIH Historic Core Historic District would have the potential to impact views of the NIH Historic Core Historic District from the Bethesda Naval Hospital Tower;
- The construction of Building N21 would have the potential to impact the historic vista and the visual relationship between Building 1 and the Bethesda Naval Hospital Tower; and,

- New development within the North Research Cluster, the Administrative Research Cluster, and the Biomedical Research Education Cluster, would have the potential to impact views of the NIH campus and its historic resources from the National Walter Reed National Military Medical Center Historic District.

4.16.6 Visual and Aesthetic

The No Action Alternative plan would have minimal to moderate adverse impact. While this alternative would have minimal change to existing conditions, it would have a moderate negative impact for campus conditions as facility improvements and landscape enhancements would not occur. A moderately negative impact to external conditions, as planned removals of surface parking from the buffer would not occur.

Proposed Action and the Maximum Development Alternatives propose significant alterations to the campus visual and aesthetic appearance, with the intention of improving the campus for its occupants, visitors and neighbors.

4.16.7 Construction and Construction Waste Impacts

4.16.7.1 *Proposed Action*

Proposed Action would include the construction of approximately 20 new buildings or additions. Redevelopment of existing occupied sites would have adverse impacts of demolished buildings being permanently removed from the campus. Redevelopment will require alterations to access roads and for the re-routing for increased capacity requirements on existing infrastructure, which is unavoidable. Impacts of construction noise, waste, dust, and traffic are adverse, unavoidable and temporary, dependent on the proposed scheduling and duration of construction. These effects are proposed to be temporary for each project, however the total proposed development would span the period of the Master Plan. This impact would be significant and unavoidable resulting in a twenty-year construction effort at the campus. The increased capacity impact on infrastructure and the replacement of infrastructure would be permanent.

4.16.7.2 *No Action Alternative*

No Action Alternative would be limited to currently planned improvements. This alternative includes demolition of several buildings and ongoing renovations, which would temporarily increase construction noise and waste.

4.16.7.3 *Maximum Development Alternative*

Maximum Development proposes 27 new structures. Redevelopment of existing occupied sites would have adverse impacts of demolished buildings being permanently removed from the campus. Alterations to access roads and for the re-routing for increased capacity requirements on existing infrastructure are unavoidable impacts. Impacts of construction noise, waste, dust,

and traffic are adverse, unavoidable and temporary, dependent on the proposed scheduling and duration of construction. These effects are proposed to be temporary for each project, however the total proposed development would span the period of the Master Plan. This impact would be significant and unavoidable resulting in a twenty-year construction effort at the campus. The increased capacity impact on infrastructure and the replacement of infrastructure would be permanent.

4.16.7.4 *Hazardous Materials*

The existing Building 21 Complex requires decommissioning that includes remedial action to remove hazardous materials before demolition starts. This sequencing and schedule impact is unavoidable and mandatory.

Several of the proposed laboratory buildings would require decommissioning with appropriate regulatory agencies for removal of material that may contain hazardous waste and all would require inspection for asbestos, lead, PCBs and similar known materials requiring remediation prior to demolition. This sequencing and schedule impact is unavoidable and mandatory.

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5 CUMULATIVE IMPACTS

5.1 GEOLOGY, TOPOGRAPHY, AND SOILS

5.1.1 Geology

The Piedmont Plateau Province is composed of hard, crystalline igneous and metamorphic rocks. Bedrock in the eastern part of the Piedmont consists of schist, gneiss, gabbro, and other highly metamorphosed sedimentary and igneous rock of probably volcanic origin. Exploratory drilling has revealed that similar metamorphic and igneous rock underlie the sedimentary rocks of the Coastal Plain.

5.1.2 Topography

Impacts to the site topography would be short term in nature and last only as long as the construction activities. Topographic changes associated with the construction of buildings proposed in all development alternatives would be bound by existing adjacent road and sidewalk grades. Cumulative impacts would be limited.

5.1.3 Soils

The soil survey map for Montgomery County, Maryland indicates that the surface deposits within NIH Bethesda Campus are composed of a combination of urban land and native soils (USDA, 2007a). Urban land is found in developed areas while the predominant native soil type is Glenelg. The surface and subsurface layers of each of the native soils on the Bethesda Campus are silt loam in texture. These soils have a high proportion of fine particles, silts, and clays and are rated as having either a moderate or severe hazard of erosion. Where these fine soils are disturbed or are not covered with sufficient vegetation, they are subject to excessive erosion; with the amount of soil disturbance proposed, construction mitigation measures to prevent soil erosion are necessary and required.

5.2 WATER RESOURCES

5.2.1 Surface Water

The Maryland Department of Environment (MDE) regulations outlined in the *Maryland Stormwater Management Guidelines for State and Federal Projects* and the Energy Independence and Security Act (EISA) have been adopted to ensure that proposed on-site developments would have no impacts to off-site areas downstream. Each individual proposed building would be required to meet both MDE and EISA standards but none of the proposed alternatives increase the overall campus impervious area-to-open space ratio typically used for the design of additional storm water management facilities. The existing regional facilities would

be sufficient for all proposed alternatives and no cumulative effects are anticipated. The cumulative surface water for the regional facilities will be impacted by proposed development at the Walter Reed National Military Medical Center, Suburban Hospital expansion, current and future large development project in the Central Business District of Bethesda.

5.2.2 Floodplains

The Proposed Action and the Maximum Development Alternative propose the construction of a New Administration Building at the location of existing Building 21. The proposed Administration Building may avoid impacts to the floodplain located directly west of the proposed building. The demolition of the existing Building 21 Complex abuts the floodplain and a portion of the parking lot is in the flood plain. A detailed floodplain study should be conducted prior to the development to determine the final location of the building. If floodplain avoidance is not feasible, mitigation and permitting measures are in place to ensure that there are no off-site increases to the floodplain water surface elevations. With preventive action and mitigation measures during demolition and construction, no cumulative effects should occur.

5.2.3 Wetlands

According to the on-site wetlands investigation of the NIH Stream and Stony Creek conducted part of the Phase II Wetlands Assessment in 1993 and the National Wetland Inventory Map, there are no wetlands located on the NIH campus. This, coupled with the Maryland Department of Environment (MDE) regulations outlined in the *Maryland Stormwater Management Guidelines for State and Federal Projects* allowing no increases in offsite drainage, ensures that no cumulative affects to wetlands would be encountered. A decrease in overall flow from the campus may affect downstream wetland resources but given the size ratio of NIH to the overall drainage shed, no cumulative impacts are anticipated.

5.3 BIOLOGICAL RESOURCES

5.3.1 Fauna and Habitat

Although there would be an increase in development, current NIH tree, forest and vegetation policies remain in place requiring ongoing protection, replacement, and enhancement. Tree losses would be determined on an individual project basis but policy prohibiting a net loss of tree and\or vegetative cover remains in place. Therefore there would be no cumulative effects on the vegetative habitat.

5.3.2 Aquatic and Wetland Habitat

According to the on-site wetlands investigation of the NIH Stream and Stony Creek conducted part of the Phase II Wetlands Assessment in 1993 and the National Wetland Inventory Map, there are no wetlands located on the NIH campus. Each individual proposed building would be required to meet both Maryland Department of Environment (MDE) regulations outlined in the

Maryland Stormwater Management Guidelines for State and Federal Projects and the Energy Independence and Security Act (EISA). Based on these regulations, site-specific stormwater management facilities may be implemented. Discharge from the facilities would be cleaner and released more frequently with less volume allowing Aquatic habitat to remain in cleaner inundated streams for longer periods of time. With the decrease in volume of water released, stream water surface elevations could decrease affecting the vegetated habitat along channel banks. Stormwater management proposed in these alternatives should not have an immediate effect on Aquatic and Vegetative Habitat on or off-site given the size ratio of NIH to the overall drainage shed, however it could contribute to a cumulative affect when combined with adjacent development restricted by the same regulations. Mitigation measures should be considered to balance the cumulative effects.

5.3.3 Threatened and Endangered Species

Except for occasional transient individuals, no Federally proposed or listed endangered or threatened species or their critical habitat is known to exist within the project areas at NIH Bethesda Campus.

5.4 AIR QUALITY

U.S. EPA defines ambient air in 40 CFR 50.1(e) as —that portion of the access. In compliance with the 1970 Clean Air Act and the 1977 and 1990 Clean Air Act Amendments, U.S. EPA has promulgated National Ambient Air Quality Standards (NAAQS). The NAAQS were enacted for the protection of the public health and welfare, allowing for an adequate margin of safety. To date, U.S. EPA has issued NAAQS for the following criteria pollutants: carbon monoxide (CO), sulfur dioxide (SO2), particulate matter (particles with a diameter less than or equal to a nominal 10 micrometers [PM10] and particles with a diameter less than or equal to nominal 2.5 micrometers [PM2.5]), ozone (O3), nitrogen dioxide (NO2), and lead.

The cumulative air quality will be impacted by proposed development at the Walter Reed National Military Medical Center, Suburban Hospital expansion, current and future large development project in the Central Business District of Bethesda. All of these proposed developments would cause additional traffic and resultant emissions. All of these proposed developments would have added building exhaust emissions. Mitigation measures would need to be considered to offset the cumulative effect of all the proposed development impacts on air quality.

5.5 NOISE

Noise is generally perceived as unwanted sound that interferes with normal activities or in some way reduces the quality of the environment. It may consist of intermittent or continuous sources.

Noise can be nondescript, involving a broad range of sound sources and frequencies, or it can have a specific, clearly identifiable sound source. The characteristics of sound include such physical parameters as intensity, frequency, and duration.

The Noise Control Act of 1972 was enacted to establish noise control standards and to regulate noise emissions from commercial products such as transportation and construction equipment. In 1981, U.S. EPA concluded that noise issues were best handled at the state or local government level, and in the early 1980s the primary responsibility of regulating noise was transferred to state and local governments.

However, the Noise Control Act of 1972 and the Quiet Communities Act of 1978 remain in effect today. The standard measurement unit of noise is the decibel (dB), which represents the acoustical energy present. Noise levels are measured in A-weighted decibels (dBA), a logarithmic scale that approaches the sensitivity of the human ear across the frequency spectrum. A 3-dB increase is equivalent to doubling the sound pressure level, but is barely perceptible to the human ear. Noise levels vary continuously with time and various measurable descriptions of noise are used to account for this variance with time. Leq is the average mean square sound level measured in decibels over a time period of consideration, usually 1 hour. L10, L50, and L90 are sound pressure levels that are exceeded 10, 50, and 90 percent of the time, respectively, while LMIN and LMAX, represent the minimum and maximum sound pressure levels recorded during the monitoring period.

According to their regulatory setting, many Federal agencies have developed their own standards, which are often used to determine acceptable noise levels. For example, U.S. EPA has established both indoor and outdoor levels that aim to protect public health and welfare by taking into account levels that would prevent hearing damage, sleep disturbance, and communication disruption. An outdoors limit of 55 dB and an indoor limit of 45 dB would protect against speech interference and sleep disturbance for residential, educational, and health care areas, which are considered noise sensitive receptors.

The sensitivity of the human ear to sound depends on the frequency or pitch of the sound. People hear some frequencies better than others. If a person hears two sounds of the same sound pressure but different frequencies, one sound may appear louder than the other. This occurs because people hear high frequency noise much better than low frequency noise. A weighting of noise levels provides a standard for noise measurement that takes into consideration the human ear's sensitivity to different frequencies. The Occupational Safety and Health Administration developed a noise exposure standard in the workplace of 90 dBA for the duration of an 8-hour period, with a maximum of 140 dBA for impulsive noise, such as a siren.

Other Federal agencies define noise criteria in terms of Ldn (Federal Interagency on Urban Noise (FICUN), 1980). Maryland state noise level criteria are given in the Code of Maryland Regulations (COMAR) 26.02.03.03, Control of Noise Pollution, and Montgomery County criteria are in the Montgomery County Noise Ordinance, although the Montgomery County Noise Ordinance is only applicable outside the NIH Bethesda Campus fence line.

Noise is expected to increase with all of the considered Alternatives for the NIH Bethesda Campus. Cumulative noise will increase in the local area with the planned expansions at WRNMMC, Suburban Hospital and the commercial developments in Bethesda CBD. Traffic, people, mechanical equipment, construction, landscape equipment and other sources would generate noise.

5.6 UTILITIES

5.6.1 Domestic Water

The development alternatives would increase the average daily water usage with additional development. To facilitate the construction of the improvements under this Proposed Action, the existing water distribution system would need to be relocated as necessary. With the increase in water demand, NIH should consult with the Washington Suburban Sanitary Commission (WSSC) to ensure adequate water supplies are available for the campus. This consultation would also assist WSSC in determining if and when any of the public lines surrounding the campus need to be upgraded. Cumulative impacts would occur if the increased NIH campus demands facilitate WSSC to upgrade their domestic water network. With the planned developments at WRNMMC, Suburban Hospital and both the Bethesda CBD and White Flint commercial developments, the cumulative demand on domestic water would be significant.

5.6.2 Sanitary Sewer

The development alternatives would increase the amount of wastewater generated on campus with the proposal of additional development. To facilitate the construction of the improvements under this Proposed Action, the existing wastewater distribution system would need to be relocated and upgraded as necessary. With the increase in demand, NIH should consult with the Washington Suburban Sanitary Commission (WSSC) to ensure adequate sewer capacity is available for the campus. Cumulative impacts would occur if the increased NIH campus demands facilitate WSSC to upgrade their sanitary sewer system. With the planned developments at WRNMMC, Suburban Hospital and both the Bethesda CBD and White Flint commercial developments, the cumulative demand on the sanitary sewer system would be significant.

5.6.3 Storm Sewer

The development alternatives would increase the impervious area adjacent to proposed building locations but ultimately maintain the current overall campus land use conditions with a decrease in the overall campus impervious area-to-open space ratio. This coupled with the compliance each individual proposed building would need with the Maryland Department of Environment (MDE) requirements outlined in the *Maryland Stormwater Management Guidelines for State and Federal Projects* and the Energy Independence and Security Act, should ensure that downstream discharge would not increase with proposed development. Consideration should be given to maintaining on-site drainage patterns to ensure adequacy of existing systems. Deviations may require additional local site analysis and site-specific utility upgrade but should not have a cumulative impact. With the planned developments at WRNMMC, Suburban Hospital and both the Bethesda CBD and White Flint commercial developments, the cumulative demand on the storm sewer system would be significant.

6 PUBLIC PARTICIPATION

6.1 MEETINGS/PUBLIC PARTICIPATION

The Environmental Impact Statement (EIS) has been prepared in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969, regulations of the CEQ in 40 CFR 1500-1508, and the NEPA compliance procedures of the DHHS found in the General Administration Manual, Part 30 (Environmental Protection). The comments received on the Supplemental Draft EIS were used to scope the development of this draft EIS.

6.2 DRAFT 2013 MASTER PLAN

NIH is committed to having an active public participation program and consultation with government agencies. NIH has sought and given different public, private and government groups the opportunity to provide early coordination, to ask questions, express opinions and identify issues, concerns and potential impacts that should be addressed during the scope of the 2013 NIH Bethesda Campus Master Plan and the Environmental Impact Statement for the Master Plan.

As required by Section 5(a) of the National Capital Planning Act of 1952, as amended (40 U.S.C.§ 71d(a)), the National Capital Planning Commission (NCPC) was notified, as was the Maryland-National Capital Park and Planning Commission (M-NCPPC) as who acts in an advisory capacity to NCPC. An informal scoping meeting was held with National Capital Planning Commission (NCPC) to obtain early comment. M-NCPPC staff was also in attendance. NIH representatives informed attendees that the Master Plan Update was starting. A brief presentation was made at the meeting. NCPC staff asked a number of general questions, but had no substantive comment on issues or requirements. NIH received a written follow-up letter from NCPC in response to this meeting.

The 2013 Master Plan public participation process began with a notice being placed in the Federal Registrar, multiple different newspapers, and websites. The notice was to inform the reader that a Master Plan along with an EIS for the Bethesda campus would be prepared and invited all to attend the formal scoping meeting to present the project and take comment. The presentation was also made to the NIH Community Liaison Council at the monthly meeting in May of 2012. A second presentation at the NIH Community Liaison Council was planned for the June monthly meeting. The Council is composed of NIH representatives, interested citizens, and community organizations.

As published, NIH held the formal scoping meeting on February 28, 2012. Brief presentations were given on the projects by NIH staff and their consultants regarding the NEPA review and comment process and the Master Plan 2013 Update and its major features. The floor was opened to attendees who wanted to make verbal statements, however no oral comments were made at the meeting. NIH

representatives were available before and after the meeting to explain the project, informally receive comment, and answer questions on a one-on-one basis with any interested parties. No written comments were received at the end of the 45-day comment period subsequent to the meeting.

7 DISTRIBUTION LIST

Bethesda Library
7400 Arlington Road
Bethesda, MD 20814

Senator Barbara A. Mikulski
503 Hart Senate Office Bldg
Washington, DC 20510

Senator Benjamin L. Cardin
509 Hart Senate Office Bldg
Washington, DC 20510

Congressman 8th District Chris Van Hollen
1707 Longworth H.O.B.
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M-NCPPC
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USEPA (via eNEPA)

Maryland Department of Environment
1800 Washington Blvd.
Baltimore, MD 21230

APPENDIX A. SITE MAPS

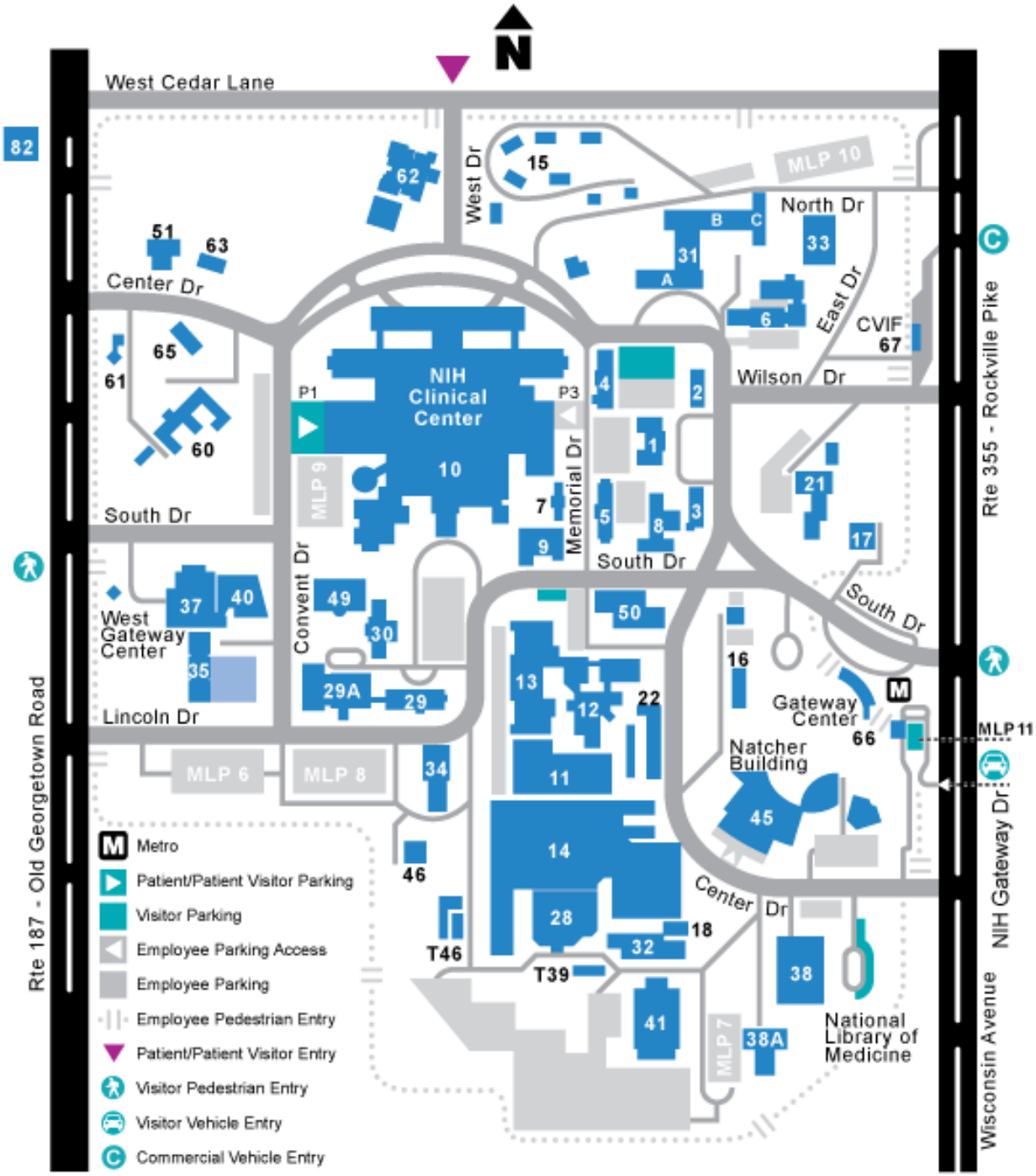

Figure A-1 Existing NIH Bethesda Campus Map

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APPENDIX B. ABBREVIATIONS AND ACRONYMNS

A

AAALAC	American Association for Accreditation of Laboratory Animal Care
AASHTO	American Association of State Highway and Transportation Officials
ACHP	Advisory Council for Historic Preservation
ACRF	Ambulatory Care Research Facility
ACM	Asbestos Containing Material
ACT	Association for Commuter Transportation
ADA	American Disabilities Act
Ag	Silver
AGP	Annual Growth Policy
AIA	American Institute of Architects
AICP	American Institute of City Planners
AIDS	Acquired Immunodeficiency Syndrome
ANG	Angle
ANSI	American National Standards Institute
APE	Area of Potential Effect
APO	Average Passenger Occupancy
AQCA	Air Quality Control Area
AQCR	Air Quality Control Region
AQI	Air Quality Index
ArcGIS	GIS software
ARRA	American Recovery and Reinvestment Act
ASA	Assistant Secretary for Administration
ASB	Assistant Secretary for Budget Technology and Finance
ASHRAE	American Society of Heating and Air-Conditioning Engineers
AST	Above Ground Storage Tanks
ATMP	Additional Transportation Management Program (measures)

B

BCC	Bethesda Chevy Chase
BCC CAB	Bethesda Chevy Chase Citizens Advisory Board
BEIP	Biomedical Engineering and Instrumentation Program
BMP	Best Management Practices
BOD5	5-day Biological Oxygen Demand
BP	Before Present
BPY	British Thermal Units per Year
BRAC	Base Realignment and Closure
BTU	British Thermal Units
BTU/CF	British Thermal Units per Cubic Foot
BTU/GAL	British Thermal Units per Gallon
BTU-HR/TON	British Thermal Units Hours per Ton
BTU/KW-HR	British Thermal Units per Kilowatt Hour
BTU/SF/F/HR	British Thermal Unit per Square Foot per Degrees Fahrenheit per Hour
BTU/YR	British Thermal Units per year

C

CAA	Clean Air Act
CAP	College of American Pathologists
CAS No.	Chemical Abstract Service number
CBD	Central Business District
CC	Clinical Center
Cd	Cadmium
CEQ	Council on Environmental Quality
CF	Cubic Feet
CFR	Code of Federal Regulations
CF/HR	Cubic feet per hour
CFM	Cubic Feet per Minute
CFR	Code of Federal Regulations
CFS/cfs	Cubic feet per second
CF/YR	Cubic feet per year
CF_X	Fluorinated Carbons
CH2O	Formaldehyde
CHW	Chilled Water
CIP	Capital Improvement Plan
CLRP	Constrained Long Range Plan (for regional transportation planning)
CLV	Critical Lane Volume
CMS	Congestion Management System
CMSA	Consolidated Metropolitan Statistical Area
CN	Cyanide
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
COG	Metropolitan Washington Council of Governments
COGEN	Cogeneration
COMAR	Code of Maryland
Cr	Chromium
CRC	Clinical Research Center
CRDS	Chemical Recycling and Disposal Service
CSX	CSX Transportation
Cu	Copper
CVIF	Commercial Vehicle Inspection Facility
CWA	Clean Water Act

D

dBA	A-weighted decibels (Measures the relative loudness of sounds)
DBH	diameter at breast height (of a tree)
DBED	Department of Business and Economic Development
DEIS	Draft Environmental Impact Statement
DEP	Division of Environmental Protection
DEPC	Division of Emergency Preparedness and Coordination
DES	Division of Engineering Services
DFP	Division of Facilities Planning
DFRS	Division of Fire and Rescue Services
DOHS	Division of Occupational Safety and Health

DOT	Department of Transportation
DP	Division of Police
DPS	Division of Public safety
DPW&T	Department of Public Works and Transportation
DNA/dna	Deoxyribonucleic acid
DRM	Design Requirements Manual
DRS	Division of Radiation Safety
DS	Division of Safety
DSO	Division of Security Operations
Dist. Oil	Distillate oil, No. 2 fuel oil
DRG	Division of Research Grants

E

EAC	External Advisory Committee
EB	eastbound
EIS	Environmental Impact Statement
EISA	Energy Independence and Security Act 2007
EMB	Emergency Management Branch
EMS	Emergency Maintenance and Safety Program
E.O.	Executive Order
EPA	Environmental Protection Agency
ERH	Emergency Ride Home Program
ESD	Environmental Site Design
EtO	Ethylene Oxide
ETSO	Employee Transportation Service Office

F

FAES	The Foundation for Advanced Education in the Sciences
FAR	floor to land area ratio
FCP	Forest Conservation Plan
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FGR	Fuel Gas Recirculation
FHWA	Federal Highway Administration
FIC	Fogarty International Center
FICUN	Federal Interagency on Urban Noise
FO	Front (Accident)
FPP	Forest Protection Plan
FPPB	Facilities Planning and Programming Branch
FRS	Federal Registry System
FSD	Forest Stand Delineation
FY	Fiscal Year

G

Gal/Hr	gallons per hour
GLP	Good Laboratory Practice
GPD/gpd	Gallons per Day
GPM/gpm	Gallons per Minute
GAO	General Accounting Office

GHG	Greenhouse Gases
GIS	Geographic Information System
GMLS	Grounds Maintenance and Landscape Section
GPD	gallons per day
gpm	gallons per minute
GSA	General Services Administration
gsf	gross square feet
GSF	Gross Square Feet

H

H	Hydrogen
HCl	Hydrochloric Acid
HEC	Hydraulic Engineering Center
HEC-RAS	Hydraulic Engineering Center (HEC) River Analysis System (RAS)
HEPA	High Efficiency Particulate Arresting or Air Filtration
HFC	Halogenated Fluorocarbons
HFCs	Hydrofluorocarbons
Hg	Mercury
HHS-OPDIV	HHS Operating Divisions
HIV	Human Immunodeficiency Virus
HOV	High Occupancy Vehicle
HP	High Pressure
HRSG	Heat Recovery Steam Generator
HUD	U.S. Department of Housing and Urban Development
Hwy	Highway
Hz	hertz

I

I.C.s	Institutes and Centers
ID	Identification Number
IDEA	International District Energy Association
IMIP	Infrastructure Modernization and Improvement Program
IRGs	Initial Review Groups
ISMP	Institutional Stormwater Management Plan
ISTEA	Intermodal Surface Transportation Efficiency Act

K

kg	Kilogram
KMCM	Keep Montgomery County Moving
KPMG	KPMG Peat Marwick
KPPH	1,000 pounds per hour
KV	Kilovolt
KVA	Kilovolt-ampere
KW	Kilowatt
KWH	Kilowatt hour
Kw/Ton	Kilowatt Tons

L

L	Leachate

L	Sound Pressure Level
LATR	Local Area Transportation Review
lb/hr	pounds per hour
lb/mm	pounds per millimeter
LBP	Lead Based Paint
lbs/sq. ft.	pounds per square foot
lb/yr	pounds per year
Ld	daytime noise levels
Ldn	day-night noise level
Leq	Equivalent continuous sound level measured in Decibels (Dba)
L/kg	Leachate Kilograms
Ln	nighttime noise levels
LN2	Liquid Nitrogen
LSM	Laboratory of Statistical and Mathematical Methodology

M

MARC	Maryland Rail Commuter
MBTU/mBTU	Thousand British Thermal Units
MBTU/YR	million British Thermal Units per year
MCDEP	Montgomery County Department of Environmental Protection
MC DOT	Montgomery County Department of Transportation
MCPB	Montgomery County Planning Board
MCTMO	Medical Center Transportation Management Organization
MD DOT	Maryland Department of Transportation
MDE	Maryland Department of the Environment
MDNR	Maryland Department of Natural Resources
MD SHA	Maryland State Highway Administration
MD SHPO	Maryland State Historic Preservation Office/ Officer
MEV	million electron volt
MGD	million gallons per day
µg/m3	micrograms per cubic meter
µmho/cm	micromhos per centimeter
mg/l	milligrams per liter
mg/L	Maximum theoretical concentration (in grams) in leachate
MHT	Maryland Historic Trust
MLP	Multilevel parking structure
MMBTU	Million British Thermal Units
M-NCPPC	Maryland National Park and Planning Commission
MOU	Memorandum of Understanding
MPN/100ml	Most probable number per 100 milliliters
MPW	Medical/pathological waste
MRI	magnetic resonance imaging
MSDS	Material Safety Data Sheet
MUP	Master Utilities Plan
MVA	Million volt-amps or Mega Volt Ampere
MW	Megawatt
MWAQC	Metropolitan Washington Air Quality Committee
MWCOG	Metropolitan Washington Council of Governments

N

NAAQS	National Ambient Air Quality Standards
NAD	non-auto driver
NATS	NOx Allowance Tracking
NB	Northbound
NCHGR	National Center for Human Genome Research
NCI	National Cancer Institute
NCI AQCA	National Capital Interstate Air Quality Control Area
NCPC	National Capital Planning Commission
NCRR	National Center for Research Resources
NE	northeast
NEI	National Eye Institute
NEPA	National Environmental Policy Act
NETS	NOx Emission Tracking
NHLBI	National Heart, Lung and Blood Institute
NHPA	National Historic Preservation Act
Ni	Nickel
NIA	National Institute on Aging
NIAAA	National Institute on Alcohol Abuse and Alcoholism
NIAID	National Institute of Allergy and Infectious Diseases
NIAMS	National Institute of Arthritis and Musculoskeletal and Skin Diseases
NICHD	National Institute of Child Health and Human Development
NIDA	National Institute on Drug Abuse
NIDDK	National Institute of Diabetes and Digestive and Kidney Diseases
NIDR	National Institute of Dental Research
NIEHS	National Institute of Environmental Health Sciences
NIGMS	National Institute of General Medical Sciences
NIH	National Institutes of Health
NIHAC	NIH Animal Center, Poolesville
NIMH	National Institute of Mental Health
NINCD	National Institute on Deafness and Other Communication Disorders
NINDS	National Institute of Neurological Disorders and Stroke
NINR	National Institute for Nursing Research
NLM	National Library of Medicine
NMC	Naval Medical Command
WRNMMC	Walter Reed National Military Medical Center
NNW	north-northwest
NO2	nitrogen dioxide
NOx	nitrogen oxides (Atmospheric Pollutants)
NO	nitrous oxide
NPDES	National Pollution Discharge Elimination System
NRI	National Resources Inventory
NRC	Nuclear Regulatory Commission
NSF	National Science Foundation
NSF	net square feet

O

O	Oxygen

O_3	Ozone
OAR	Office of AIDS Research
OC	Office of Communications
ODP	Office of Disease Prevention
OEO	Office of Equal Opportunity
OER	Office of Extramural Research
OFP	Office of Facility planning
OIR	Office of Intramural Research
OM	Office of Management
ORFDO	Office of Research Facilities Development and Operations
ORMH	Office of Research on Minority Health
ORWH	Office of Research on Women's Health
ORS	Office of Research Services
OSHA	U.S. Occupational Safety and Health Administration
OSHB	Occupational Safety and Health Branch
OSPTT	Office of Science Policy and Technology Transfer

P

PAMR	Policy Area Mobility Review
Pb	lead
PCB's	polychlorinated biphenyls
pCi/L	picocuries per liter
P.E.	Professional Engineer
PEL	Permissible Exposure Limit
PEPCO	Potomac Electric Power Company
pH	unit of acidity
pm	particulate matter
PM10	inhalable particulate matter (10 micron or less)
PMB	Program Management Branch
PNRC-II	John Porter Neuroscience Research Center
Po	Polonium
PPH/pph	Pounds per hour
PPH/GSF	or pph/gsf Pounds per Hour per Gross Square Foot
Ppm	parts per million
PSD	Prevention of Significant Deterioration
PSL	Physical Sciences Laboratory
Psig	pound force per square inch
PWB	Public Works Branch

Q

Quad	Quadrant

R

R	Residential (Montgomery County Zoning)
Ra	Radium
RACT	Reasonably Available Control Technology
RAS	River Analysis System
RAT	Recycling Action Teams
RCRA	Resource Conservation and Recovery Act

R & D	Research and Development
RE	Rear End (Accident)
Res.	Oil Residual oil, No. 6 oil
RIMS	Research Information Management Systems
Rn	Radon
RION	Rion Instruments
ROI	Region of Interest
ROW	right-of-way
RT	Residential Townhouse (Montgomery County Zoning)
RPP	residential parking permit
RSB	Radiation Safety Branch
RVP	Reid Vapor Pressure
RWS	Radioactive Waste Service

S

SB	southbound
SCID	Severe Combined Immunodeficiency
SCS	Soil Conservation Service
SCPOP	Strategic Central Plant Operating Programs
SF/sf	square feet
SF_6	sulfurhexafluoride
SHA	State Highway Administration
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan (for air quality)
SO_2	sulfur dioxide
SOV	single occupancy vehicle
SPB	Special Projects Branch
Sq. Ft./sq. ft.	square feet
SS	Side (Accident)
STAMINA 2	Noise Predictive Computer Model
STD	Standard
SWM	Stormwater Management

T

T	Temperature
TB	Technical Assistance BRANCH
TAPS	toxic air pollutants
TC	toxicity characteristic
TCA	Total Constituent Analysis
TCLP	Toxicity Characteristic Leaching Procedure
T & D	Transmission & Distribution
TDL	Target Demand Level
TMA	Transportation Management Area
TMD	Transportation Management Department
TMDL	Total Maximum Daily Loads
TMP	Transportation Management Plan
TNM	Traffic Noise Model
TOMP	Toxic Organic Management Plan
ton/yr	ton per year

Tot	Total
TPAR	Transportation Policy Area Review
TPP	Tree Protection Plan
TPY	tons per year
TSD	Treatment, Storage and Disposal
TTO	Total toxic organics
TWA	Time Weighted Average

U

U	Uranium
UB	urban land
US-ACE	U.S. Army Corps of Engineers
USC/U.S.C.	United States Code
U.S. EPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture
USGS	United States Geology Survey
US HHS	U.S. Department of Health and Human Services
US HUD	U.S. Department of Housing and Urban Development
UST	Underground Storage Tanks
USUHS	Uniformed Service University of the Health Sciences

V

V	Volt
VA	Department of Veteran Affairs
VOC	Volatile Organic Compounds
VRP	Veterinary Resources Program

W

WB	westbound
WG	Washington Gas
w/gsf	watts per gross square foot
WMATA	Washington Metropolitan Area Transit Authority
WMS	Waste Management Section
WOPR	White Office Paper Recycling Program
WQx	Water Quality Volume
WRNMMC	Walter Reed National Military Medical Center
WRRB	Waste Resource Recovery Branch
WSSC	Washington Suburban Sanitary Commission

X, Y, Z

YMCA	Young Men’s Christian Association
Zn	Zinc

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APPENDIX C. TRAFFIC DATA

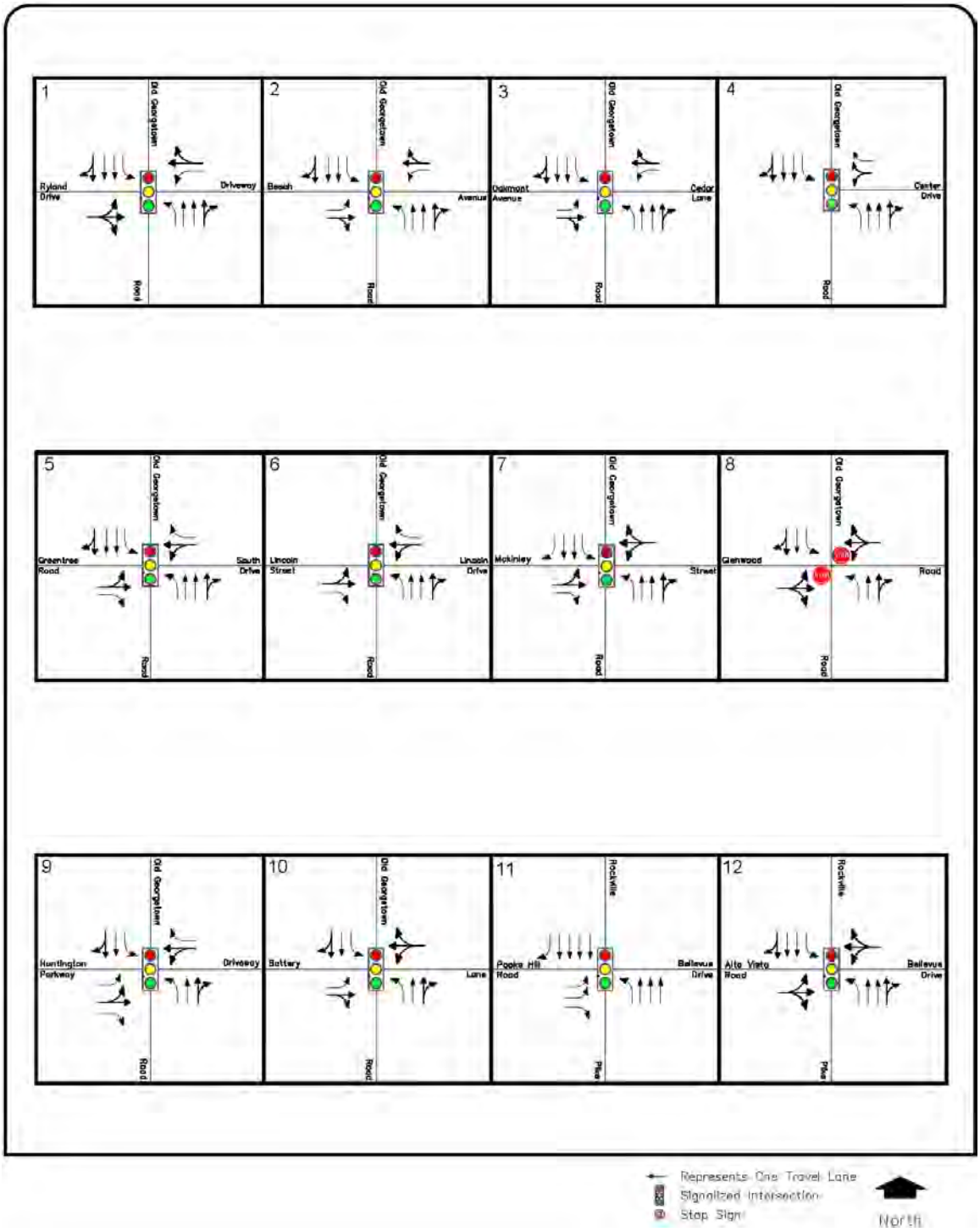

Figure C-1 Existing Lane Configurations

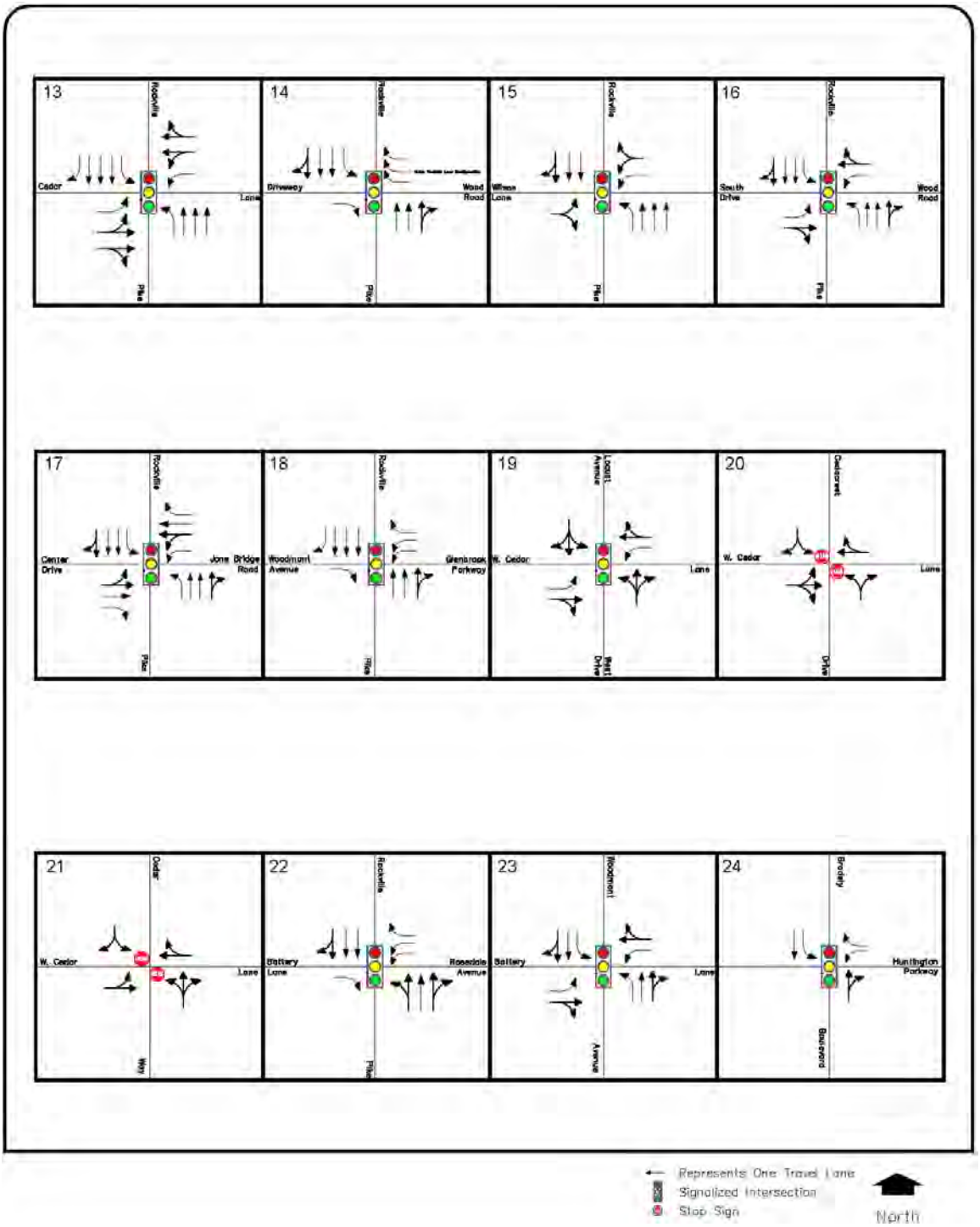

Figure C-2 Existing Lane Configurations

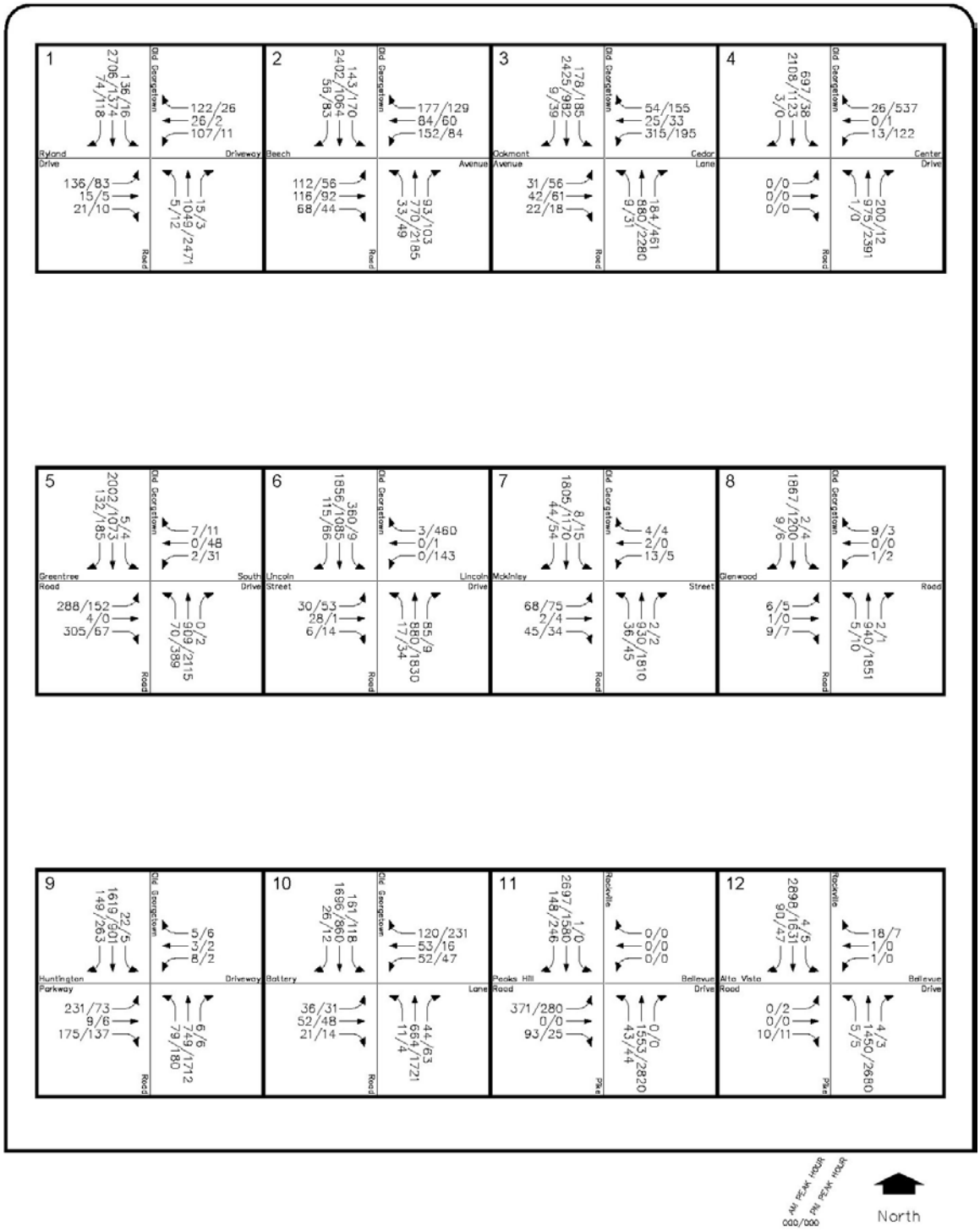

Figure C-3 Existing Peak Hour Volume

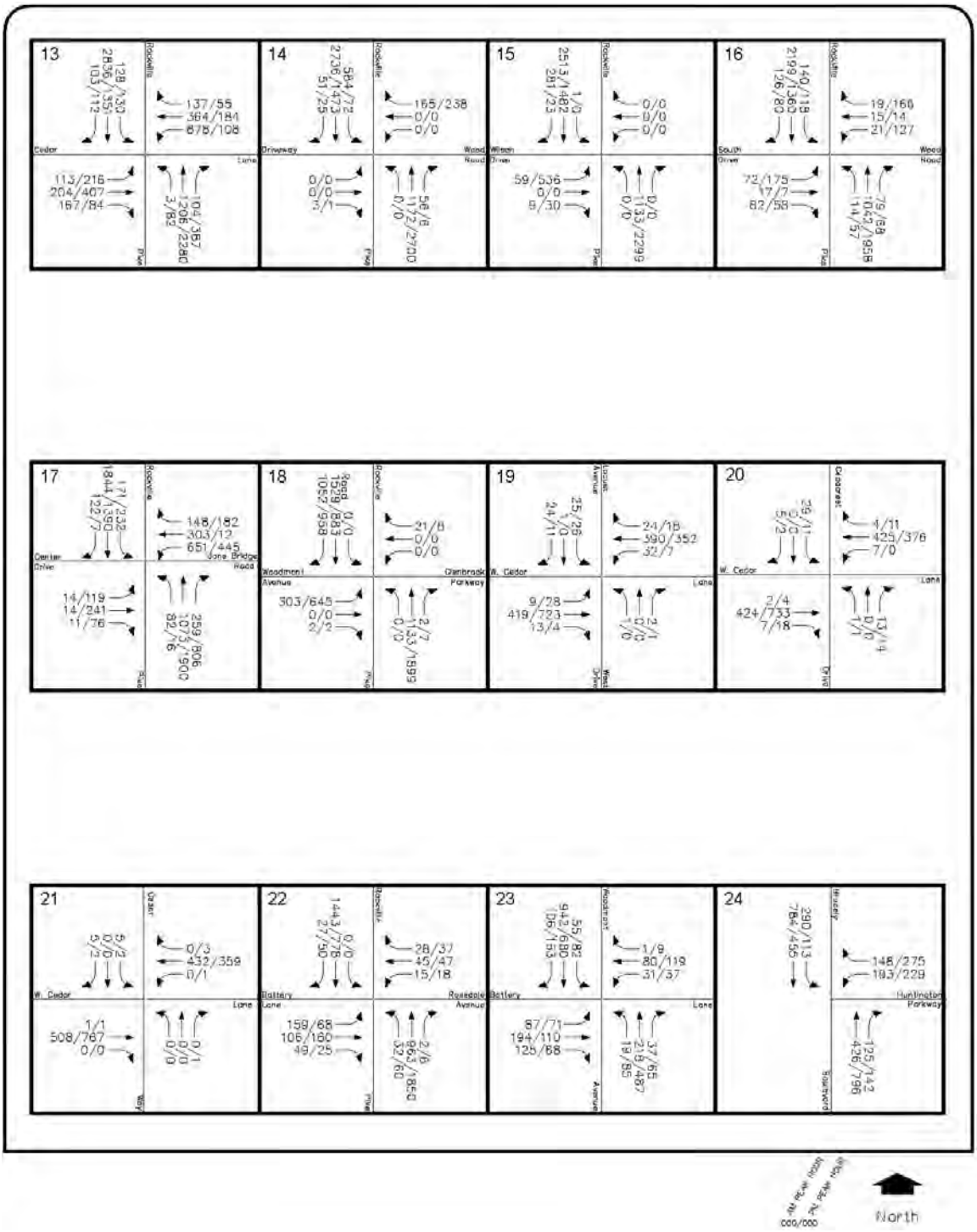

Figure C-4 Existing Peak Hour Volume

Roadway Segment	Sidewalk					Crosswalk Markings	Pedestrian-Related Signage Condition	General Notes
	Width	General Condition	Buffer	ADA Compliant	ADA Compliant Intersection Curb Ramps			
Rockville Pike (Pooks Hill to Cedar)	3' on East side; 3-5' on West; 8' infront of NIH	varies; generally fair condition; very good infront of NIH	infront of NIH; no buffer most places	yes	good	good	good	
Rockville Pike (Cedar to Battery)	5' both sides	good	3' on East side b/t Jones Bridge and South Dr; 10' on West side near NIH	yes	good	good	good	
Jones Bridge Rd	4' South side; 10' North side	good	none on South side; 2-3' on North side on some blocks	yes	good	none	good	
Battery Lane	3' on both sides	good	none on East/ South side; 5' on West	yes	good	good	good	bikeway class 2 South side

Figure C-5 Inventory of Existing Pedestrian Facilities

Roadway Segment	Sidewalk					Crosswalk Markings	Pedestrian-Related Signage Condition	General Notes
	Width	General Condition	Buffer	ADA Compliant	ADA Compliant Intersection Curb Ramps			
Woodmont	5'	good	none	yes	good	good	good	ped signals
Huntington	5' on North side; 3' in median for a couple blocks	good	4'	yes	good	good	good	
Glenwood								No sidewalks; would be hard to install due to fencing and trees
McKinley	3' on South side; none for 2 blocks	good	10'	yes	poor; not ADA compliant ramps	none	none	

Figure C-6 Inventory of Existing Pedestrian Facilities

Roadway Segment	Sidewalk					Crosswalk Markings	Pedestrian-Related Signage Condition	General Notes
	Width	General Condition	Buffer	ADA Compliant	ADA Compliant Intersection Curb Ramps			
Lincoln St	3' only on North side	good	10'	width and buffer good, but no ramps	none	none	none	installing on South side would be difficult
Greentree Rd								only exists for half a block; installing would be difficult due to trees and fencing
Oakmont	3' only on South side	good	5'	yes	good	good	good	good
Beech Ave	3'-4' on both sides	good	4'	yes	good	none	none	

Figure C-7 Inventory of Existing Pedestrian Facilities

Roadway Segment	Sidewalk					Crosswalk Markings	Pedestrian-Related Signage Condition	General Notes
	Width	General Condition	Buffer	ADA Compliant	ADA Compliant Intersection Curb Ramps			
Ryland Dr	4' on both sides;	good	5'	yes	good	good	none	goes to single walkway at Singleton
Cedar Lane	3' North side' 8' South side	North side in fair condition; South side in good condition	no buffer on North; buffer on South varies	yes	good	good	good	
Old Georgetown (Ryland to Oakmont)	5' both sides	fair	none	yes	good	good	fair	
Old Georgetown (Oakmont to Battery)	varies from 3-5'	good	buffer begins at Maple Ridge	yes	good	good	good	

Figure C-8 Inventory of Existing Pedestrian Facilities

Roadway Segment	Sidewalk					Crosswalk Markings	Pedestrian-Related Signage Condition	General Notes
	Width	General Condition	Buffer	ADA Compliant	ADA Compliant Intersection Curb Ramps			
Pooks Hill	5'	good	none	yes	good	good	none	has buffer infront of Marriott

Figure C-9 Inventory of Existing Pedestrian Facilities

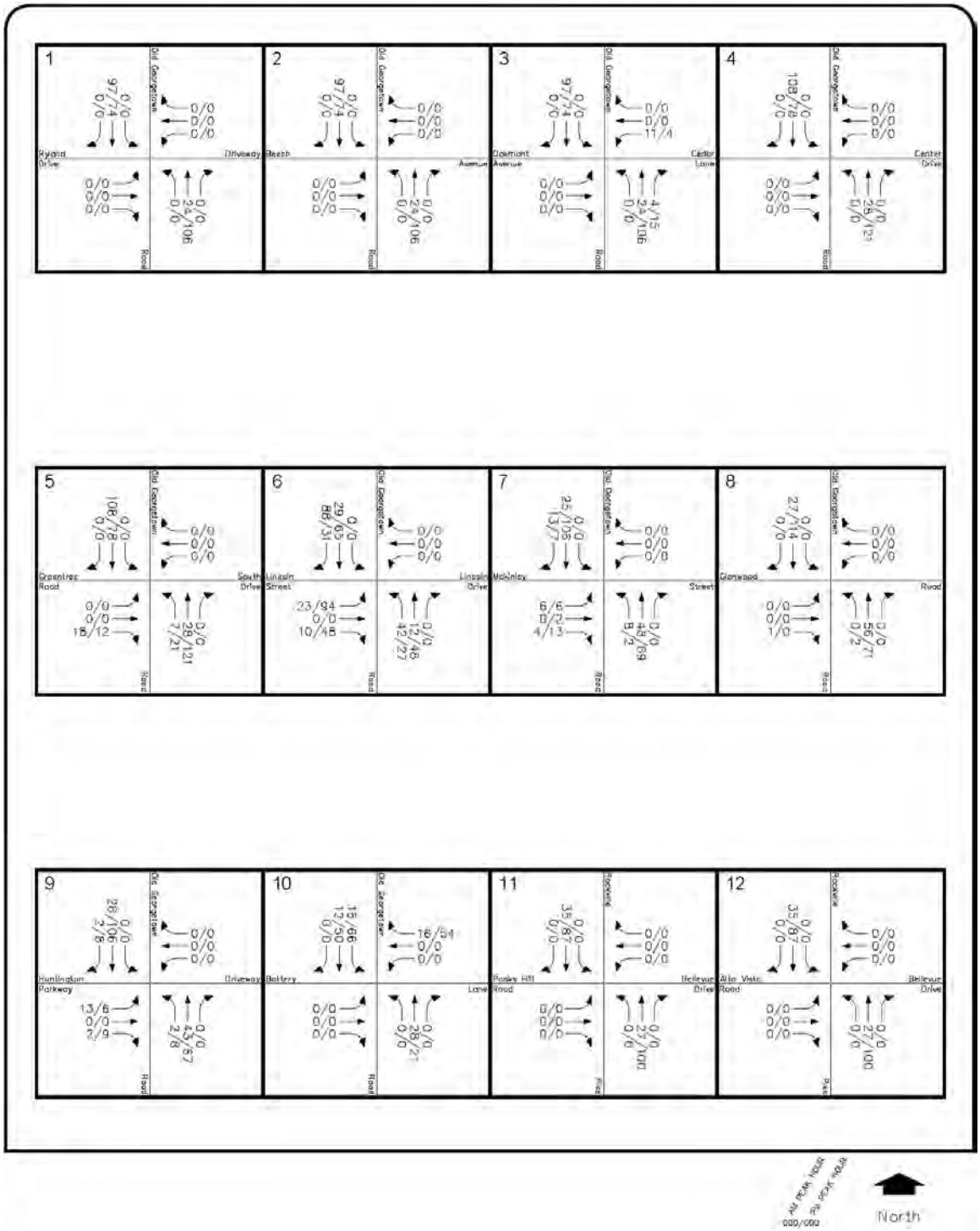

Figure C-10 Pipeline Traffic Volumes

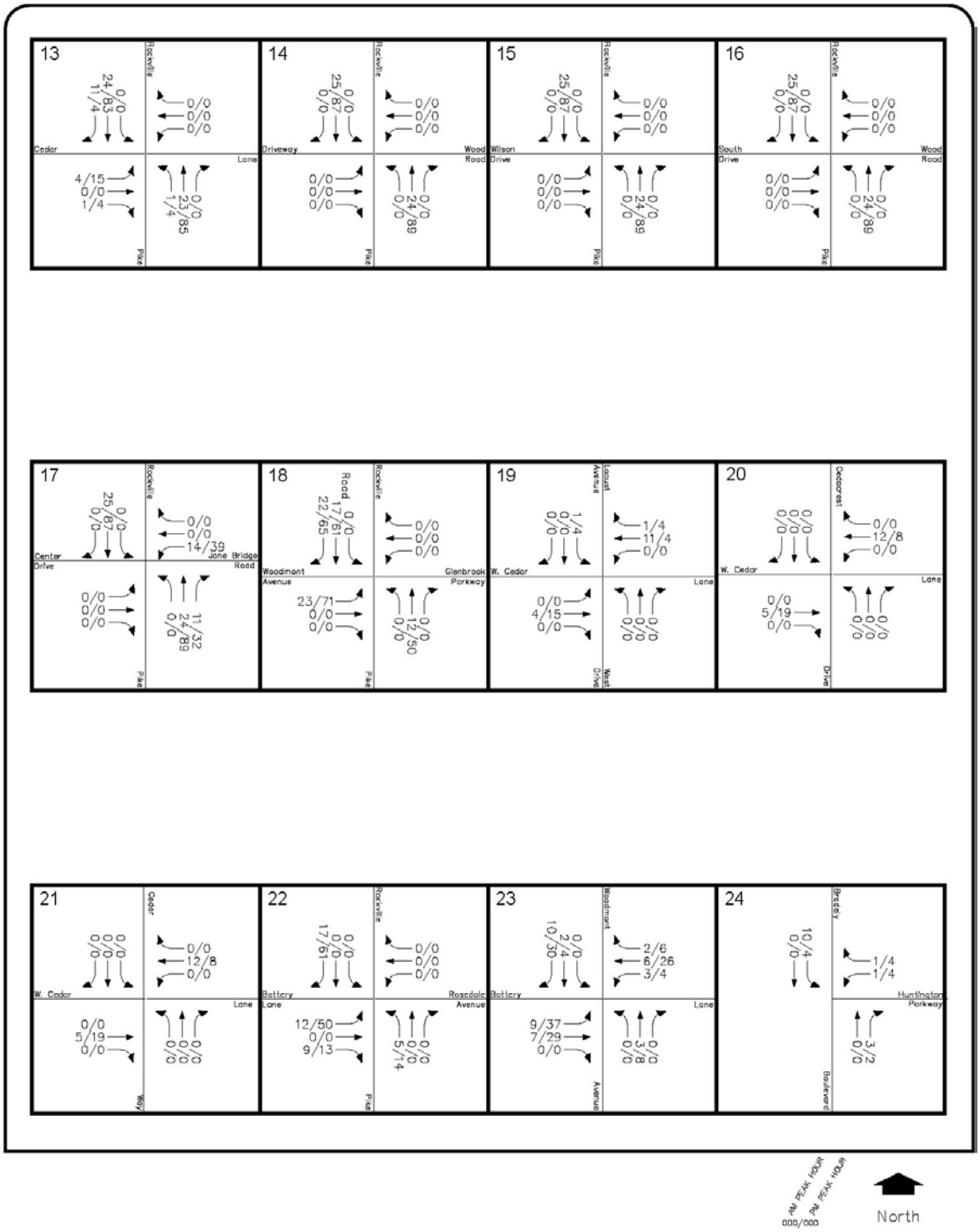

Figure C-11 Pipeline Traffic Volumes

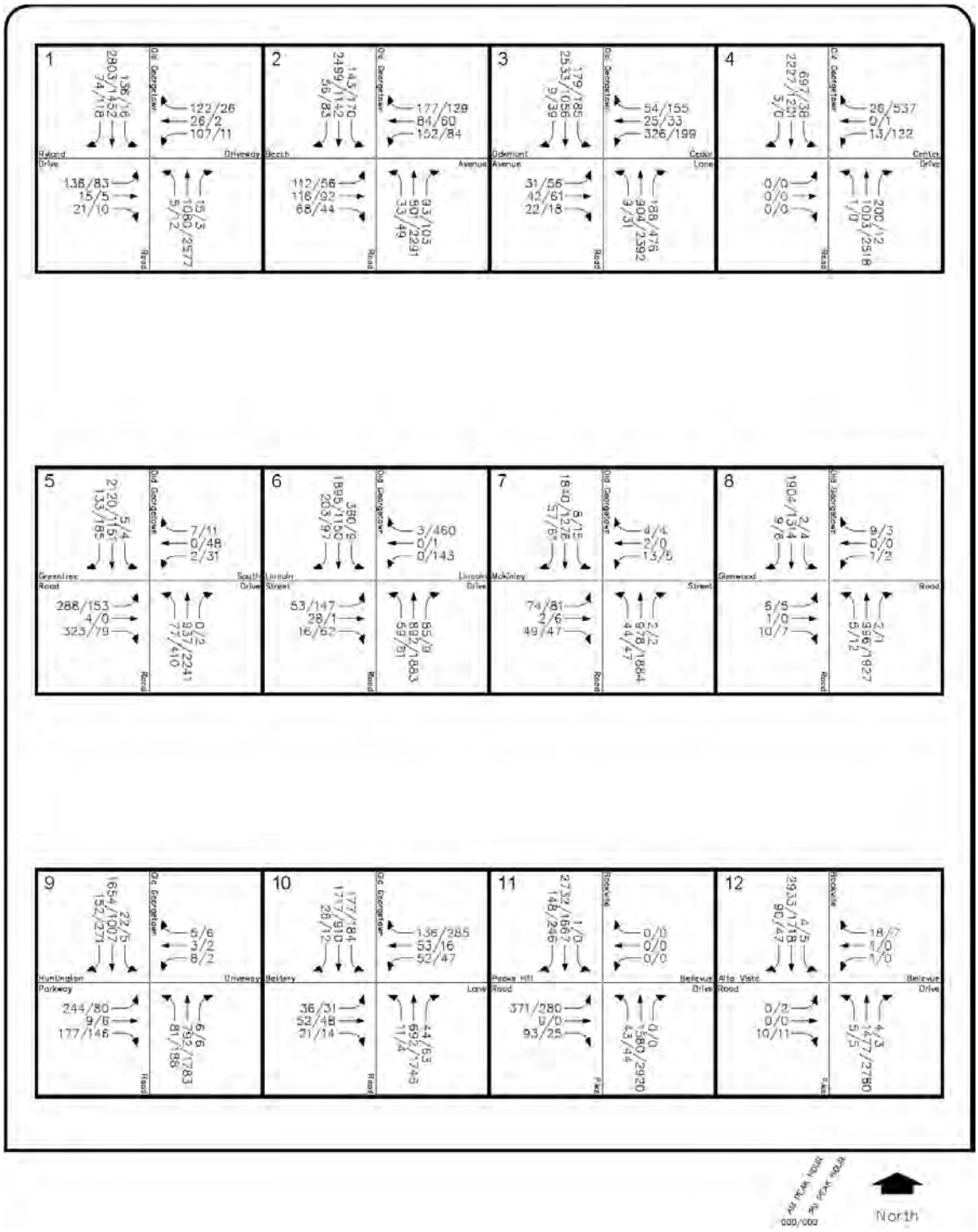

Figure C-12 Background Traffic Volumes

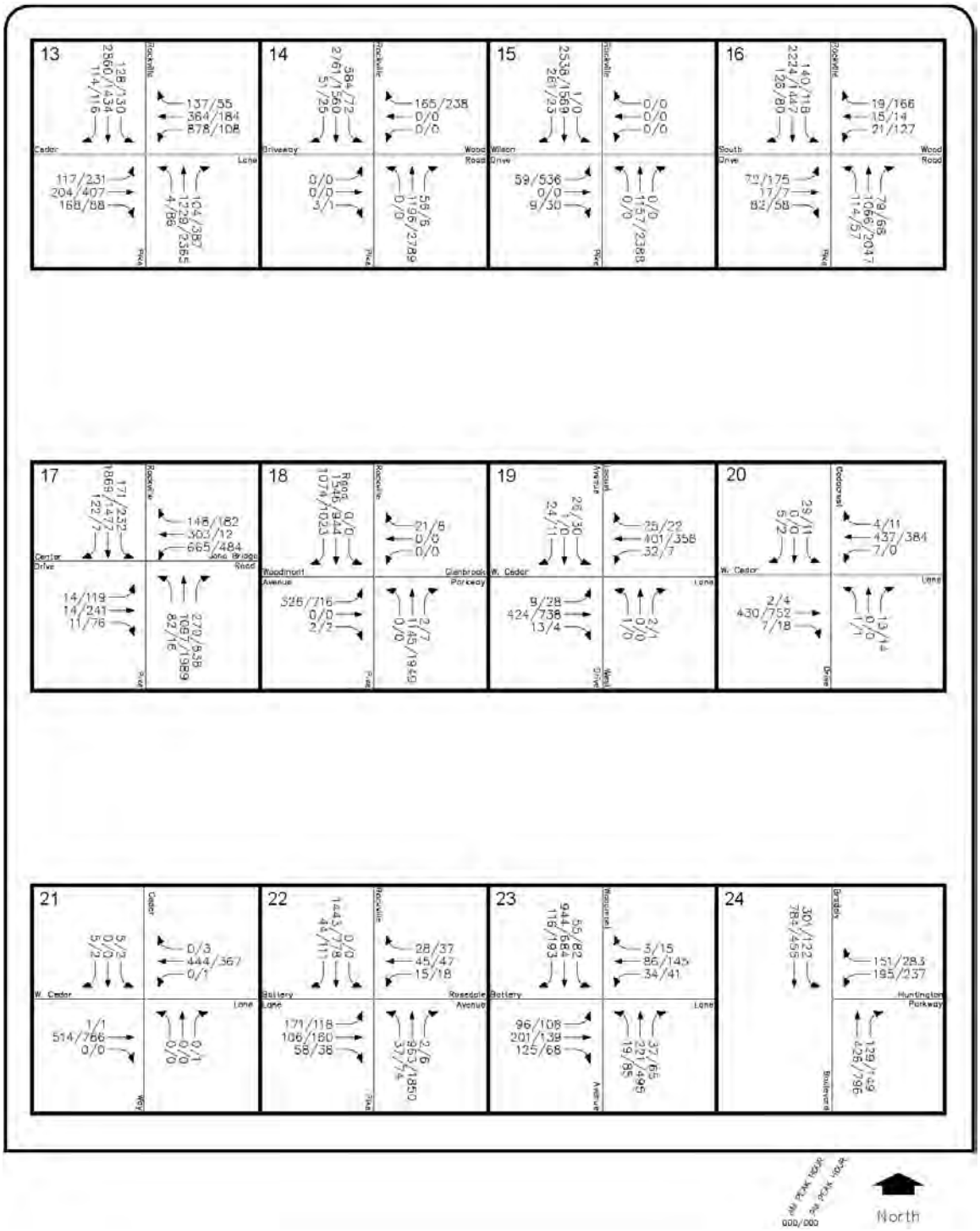

Figure C-13 Background Traffic Volumes

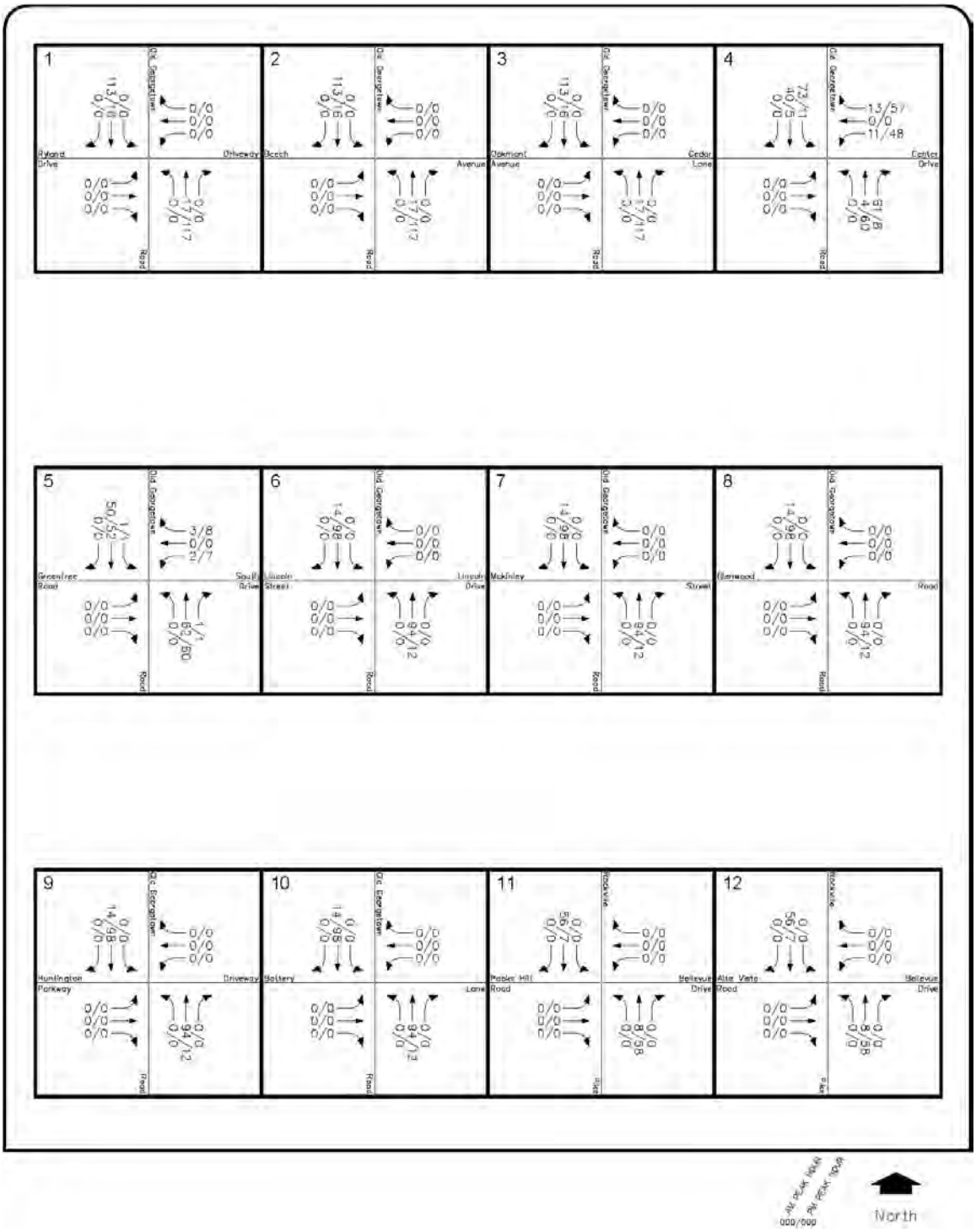

Figure C-14 Proposed Action Trip Assignment

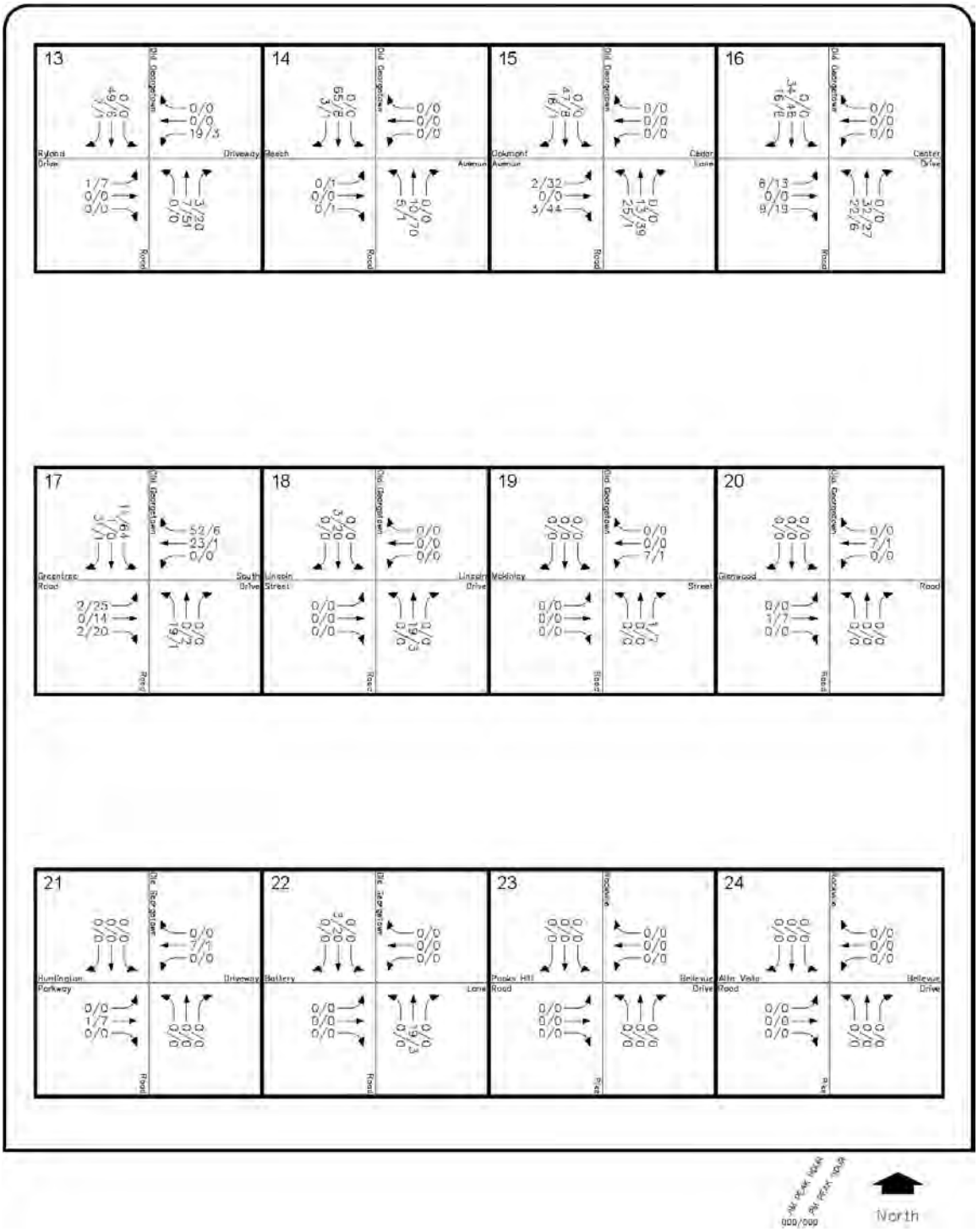

Figure C-15 Proposed Action Trip Assignment

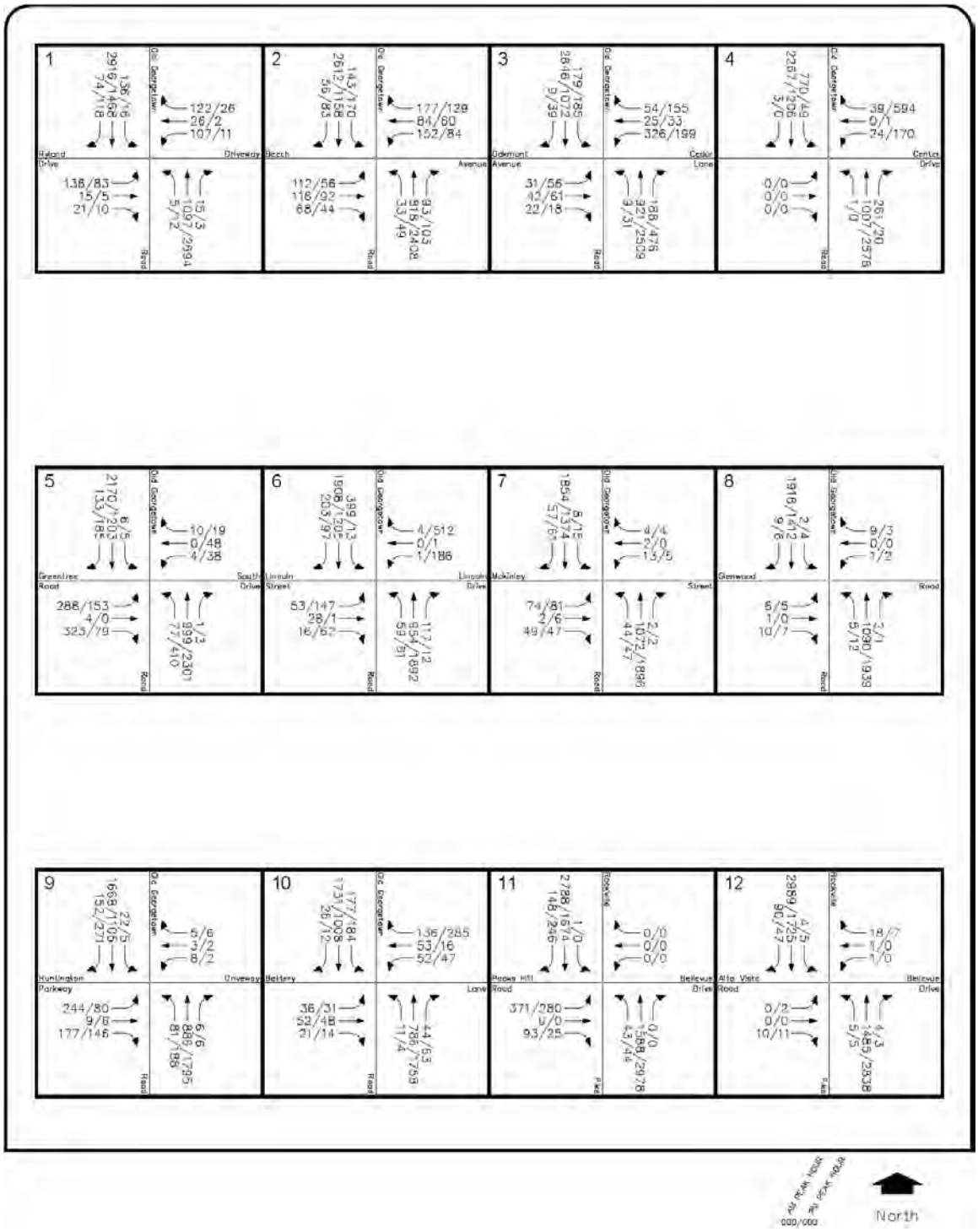

Figure C-16 Proposed Action Total Future Peak Hour Volume

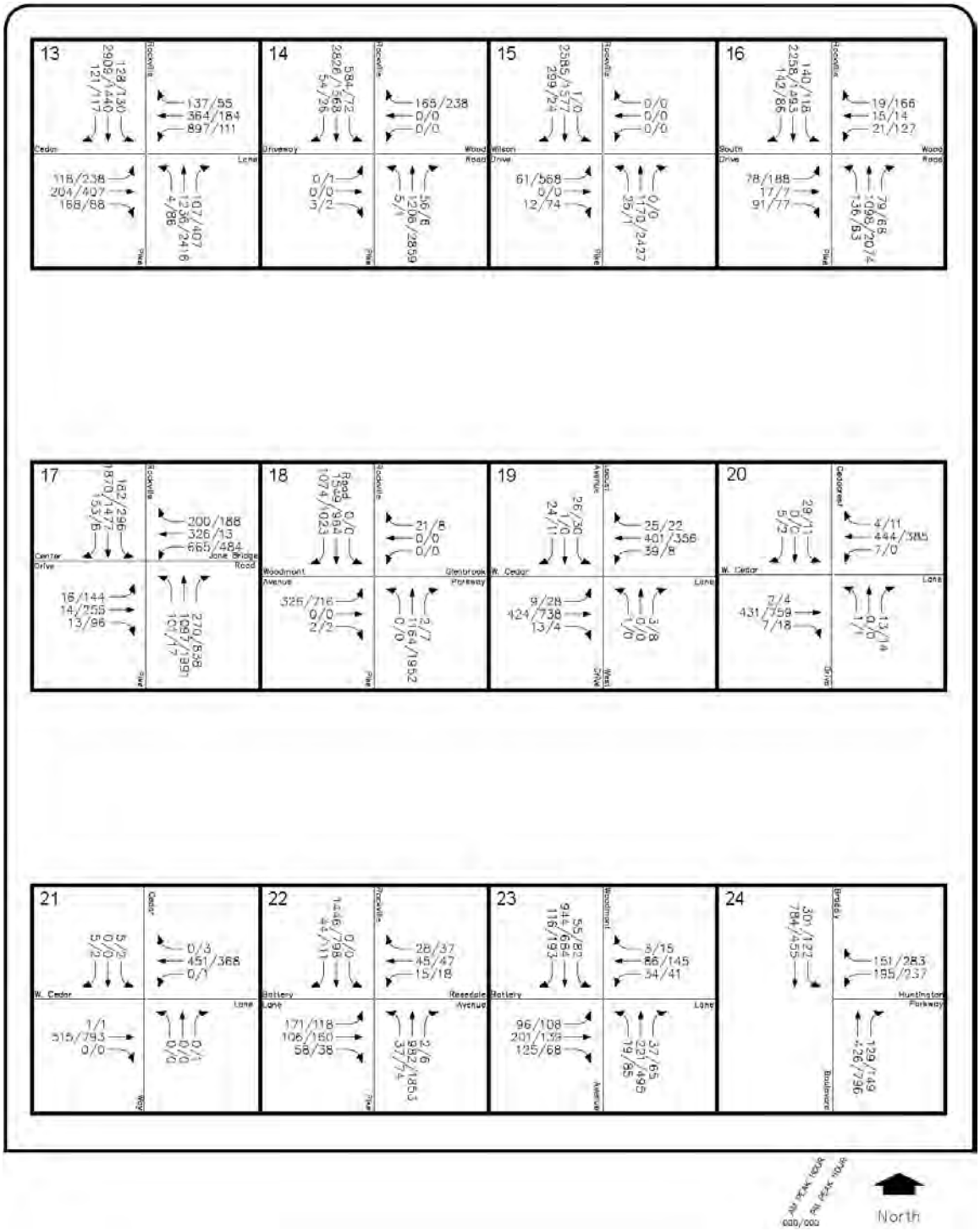

Figure C-17 Proposed Action Total Future Peak Hour Volume

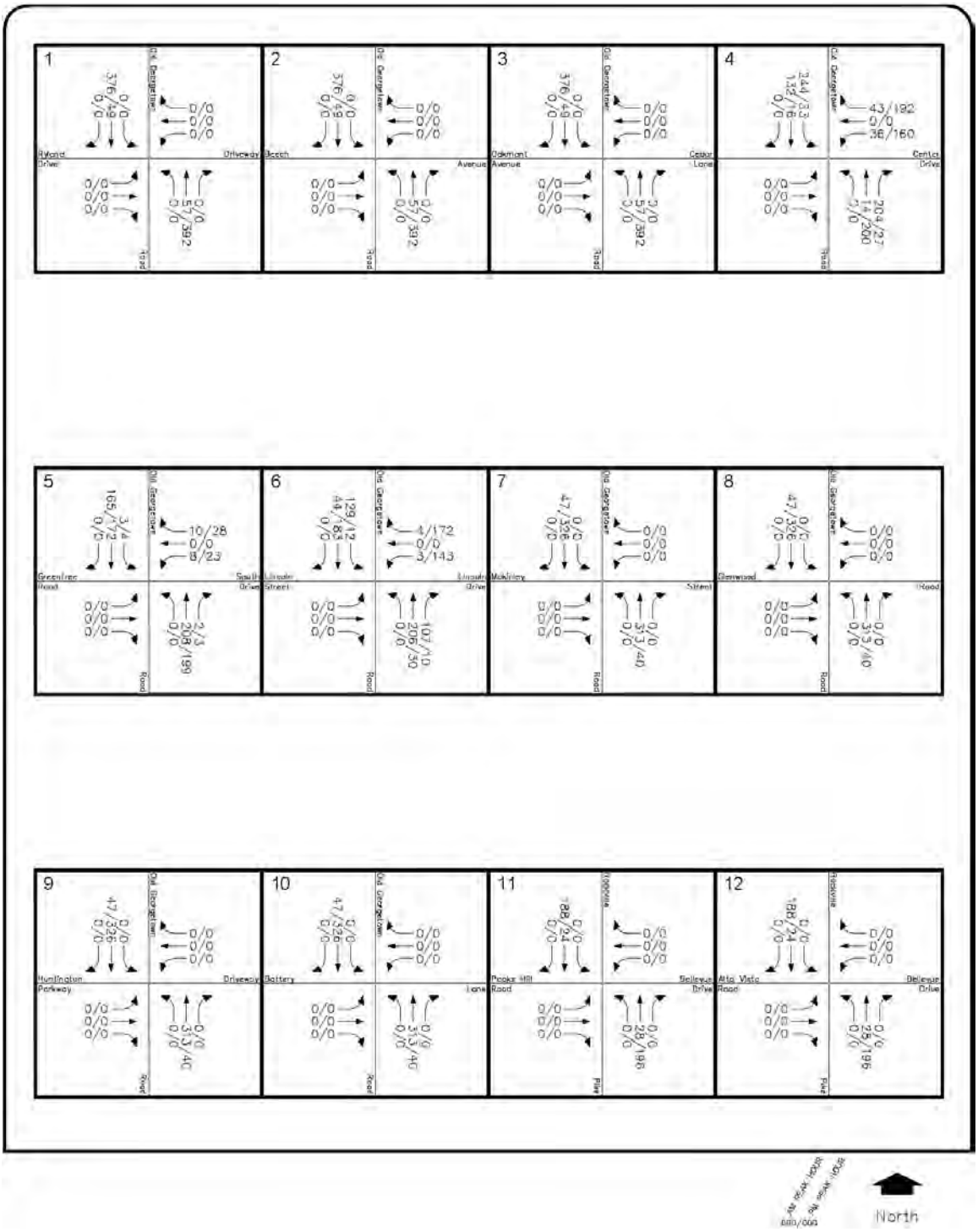

Figure C-18 Maximum Development Alternative Trip Assignment

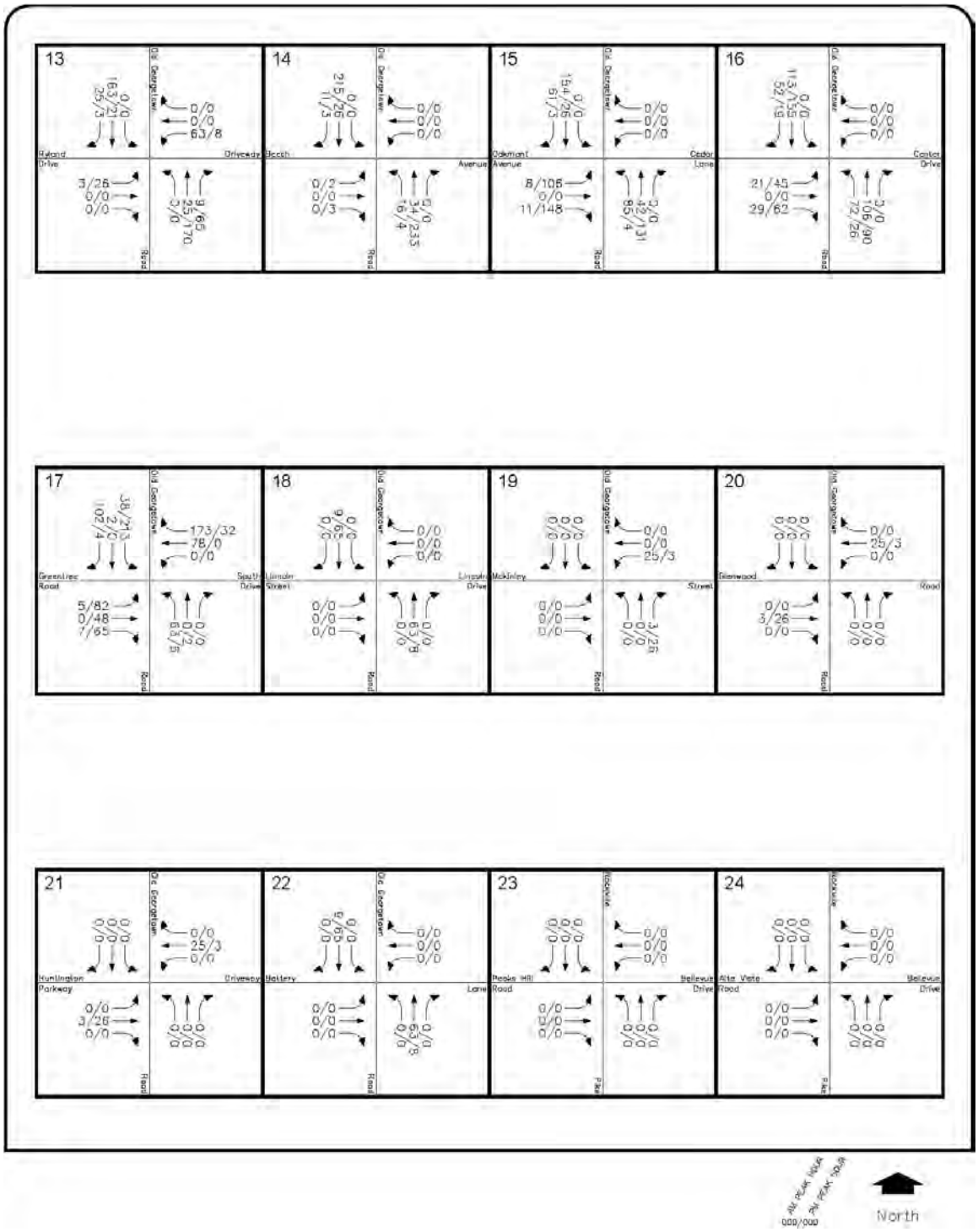

Figure C-19 Maximum Development Alternative Trip Assignment

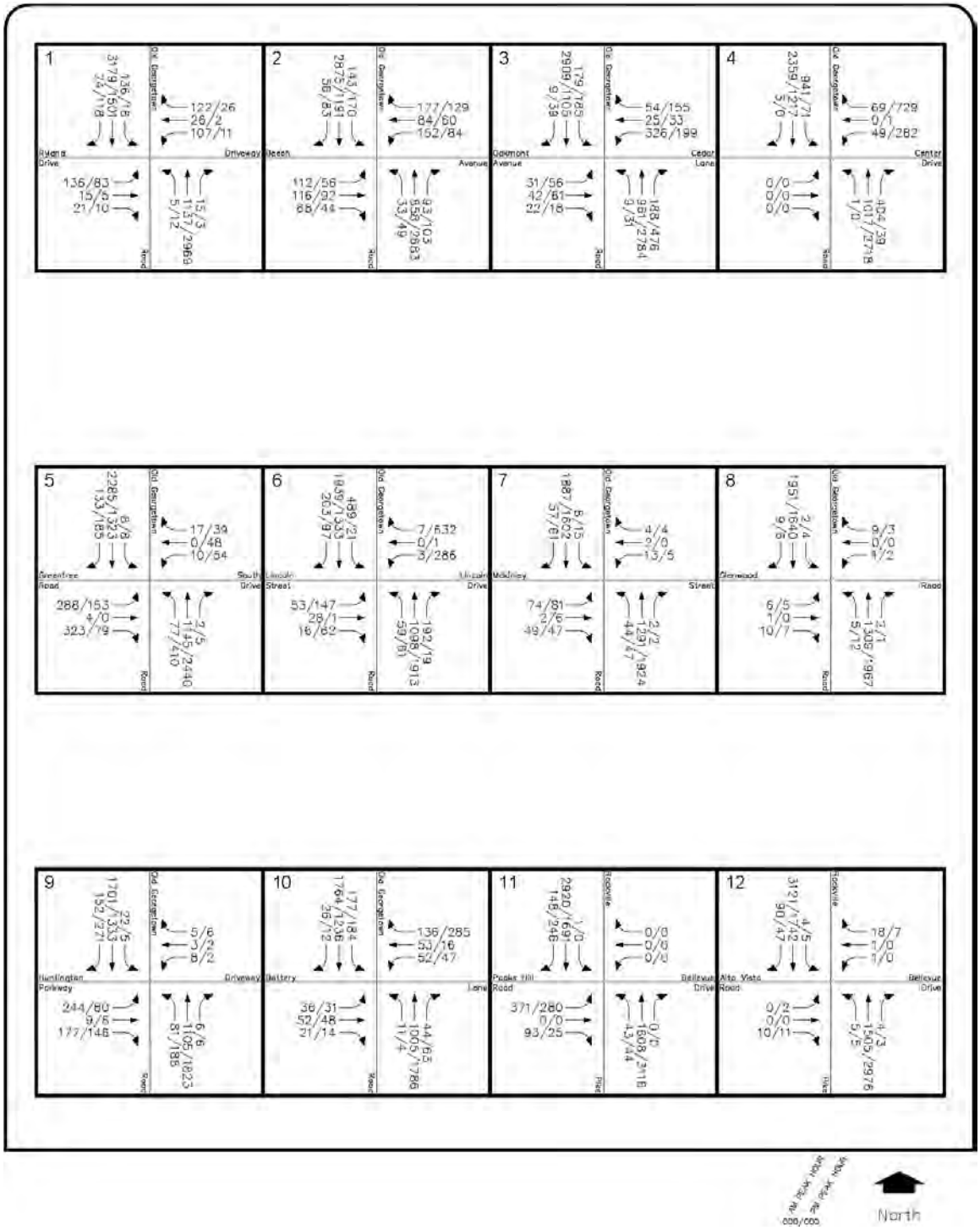

Figure C-20 Maximum Development Alternative Total Future Peak Hour Volume

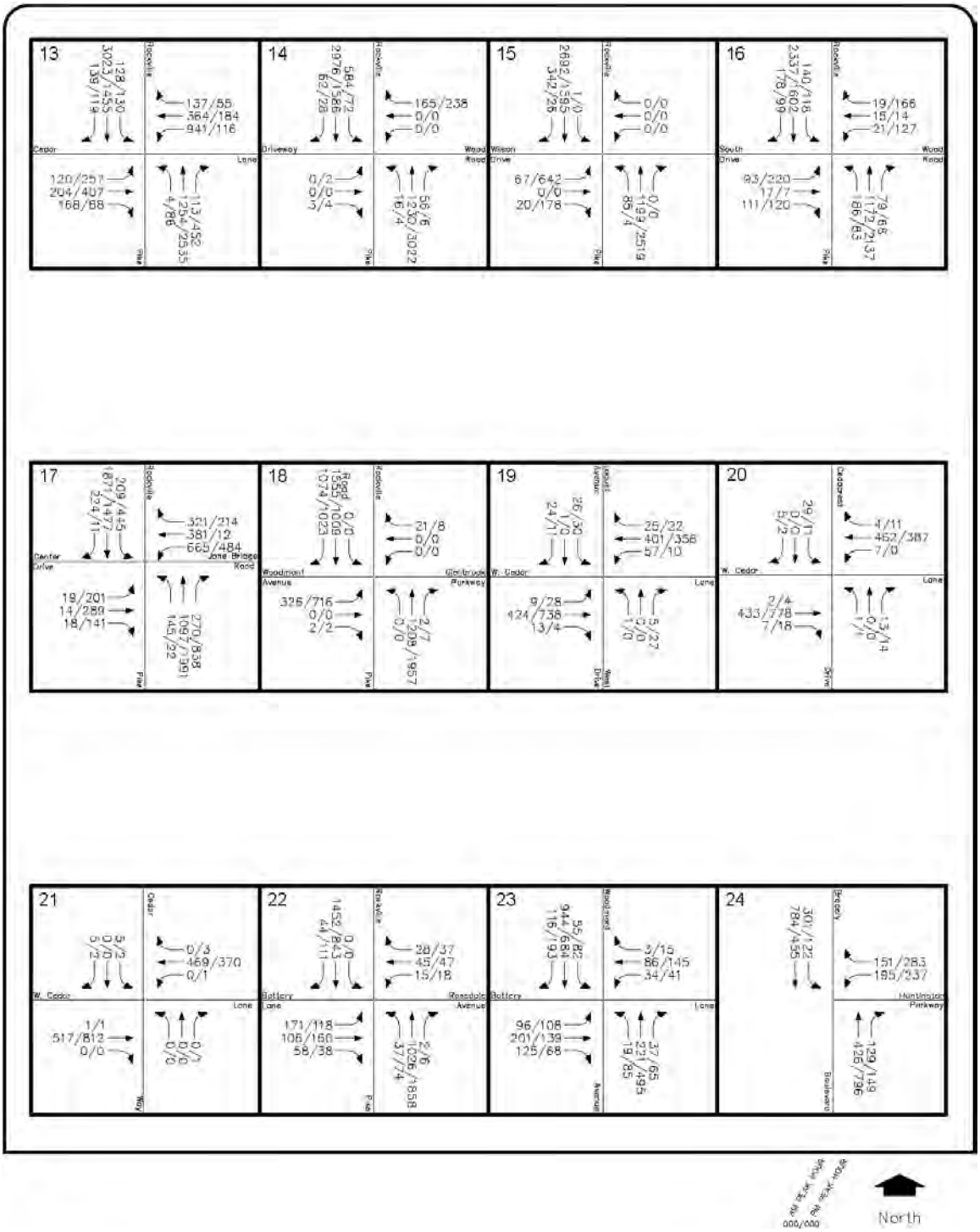

Figure C-21 Maximum Development Alternative Total Future Peak Hour Volume

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